



**Analysis of US Patent Referencing to IEEE Papers,
Conferences, and Standards 2001-2020**

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June 9, 2021

Executive Summary

Prior studies performed by 1790 Analytics have demonstrated a strong relationship between IEEE research and new patent development and have shown that citations to IEEE can often lead to higher impact patents. Specifically, the impact is measured by examining the extent to which patented inventions build upon papers from IEEE journals, IEEE-sponsored conferences, and IEEE standards. This is an update of previous reports and examines US patents issued from January 1, 2001 through December 31, 2020.

The main findings of this report are:

- New technology continues to build upon science, and the dependence is increasing. In this study, the top 50 firms (in 2020) were granted 100,818 patents, which made a total of 740,774 non-patent references (an average of 7.35 non-patent references per patent). Back in 2010 the top 30 firms had 58,179 patents which made a total of 239,789 non-patent references (an average of 4.13 non-patent references per patent) Thus, the number of patents is trending upward but the number of references from those patents is rising at a greater rate. Since many of these non-patent references are to scientific articles and conference papers, this suggests that today's technology developments are increasingly linked to developments in published science.
- A large portion of this science base comes from papers presented at IEEE sponsored conferences and published in IEEE journals. The top 50 patenting firms in 2020 have referenced over 1,987,886 articles in the last 20 years. About 29% (588,893) of those articles appeared in IEEE journals, IEEE sponsored conferences or IEEE Standards Documents.
- In this study, we also went beyond the top 50 patenting companies and analyzed all patents from the last 20 years in several technology categories of interest to IEEE members and customers. For example, 34.27% of all scientific references from Computer Hardware patents go to IEEE publications. The second most referenced publisher is ACM (Association for Computer Machinery) with 17.62% of the referenced publications. In other Information Technology areas, such as Information Storage, Semiconductor Manufacturing, and Computer Software, the results are similar.
- In Telecommunications technology, IEEE is particularly important. The 593,729 references to IEEE articles and conferences represents 42% of all science references from Telecommunications patents since 2001. To help put this in perspective consider: Telecommunications is a very technology driven industry and that technology is often built upon scientific discoveries published in journal and conference papers. If we consider this set of papers as the science base of telecommunications, then 42% of that science base is published in IEEE journals or presented at IEEE sponsored conferences. In addition, the 593,729 references to IEEE dwarf the combined total of the next 20 publishing organizations in this technology.

- Although we've generated reports like this for more than a decade, we try to add technology categories that are currently hot. In recent years we've added Blockchain and Distributed Ledgers, Cybersecurity, and Virtual and Augmented Reality. In emerging areas, IEEE enjoys a two-fold lead over second place ACM.
- We also have three other areas that are currently in vogue—Artificial Intelligence (AI), Autonomous Vehicles, and Internet-of-Things related patents—where IEEE is the dominant publisher of the science base. In AI, IEEE enjoys a 3-fold lead over second place ACM. In Autonomous Vehicles, IEEE has a dominant lead (10-fold) over the second-place entry, which is a conference sponsored jointly by IEEE and the Robotics Society of Japan, as well as a 20-fold lead over third place SPIE. And in the Internet-of-Things category IEEE has a 5-fold lead over second place ACM.
- IEEE is referenced a surprising amount in areas which are not central to its mission.
 - For example, 8.72% of the science references from patents in medical devices go to IEEE publications. This ranks IEEE fourth behind RELX and Wiley, and Wolters Kluwer (with 20.03%, 9.74%, and 9.29% respectively). The latter publishers have hundreds of journals in the medical area, whereas IEEE has only a few, so the 8.72% figure is quite solid for a non-core area and fairly close to second place Wiley's 9.74%.
 - Optics is also somewhat surprising. IEEE publications receive the most references from Optics patents, and IEEE is referenced even more than the two large Optics Societies that would be expected to lead the area: OSA – The Optical Society of America, and SPIE – The International Society of Optical Engineering.
 - In Measuring, Testing, and Control, IEEE gets 20.90% of all references, which ranks ahead of the 13.90% of second place RELX while, again, RELX has many more journal titles in the space.
 - In the Robotics and Intelligent Manufacturing category, 45.45% of the patent references are to articles published in IEEE journals or in proceedings of IEEE sponsored conferences. Second place RELX receives about one-sixth as many references in the category.
 - Patents related to Power Systems and Transmission also reference IEEE publications most frequently. The 54,532 references to IEEE journal and proceedings papers are more than the next two top referenced publishers (RELX and Electrochemical Society) combined. We also examined a specialized subset of the Power Transmission category related to smart meters and smart grids. In this category, 67.15% of the scientific references from patents go to IEEE journal or conference papers. The second most referenced publisher is RELX with only 5.05% of all references.

- Several years back we started tracking some green energy categories: Solar and Photovoltaic energy and Wind energy. In the latter category IEEE science has a big advantage over the other publishers with more than 43% of the references. In solar energy, IEEE has a smaller lead over RELX. RELX has more than 50 journal titles related to the area including several high impact journals such as *Solar Energy Materials and Solar Cells*, *Thin Solid Films*, *Solar Energy*, *Synthetic Metals*, *Journal of Crystal Growth*, and *Solar Cells*. IEEE has only a few.
- In broadcasting technologies IEEE leads with 37% of the references, which is almost 5 times as many as second place International Telecommunication Union. The latter produces standards documents while the IEEE references are to standards documents as well as peer reviewed scientific papers from journals and conferences.
- It has been shown that high-quality, high-impact, and valuable patents tend to be cited more frequently by later patents. Citation impact is thus often used as a quantitative measure for evaluating patents (see [3]). In this study, we found that the patents that reference IEEE papers are cited more often than patents that do not. This was shown to be true for each of the twenty technology categories we examined. This suggests that, not only do IEEE publications frequently provide the science base for new inventions, but that inventions that build upon IEEE publications are more likely to be valuable in the future than inventions that do not build upon IEEE.
- Although this study concentrates on patents in specific technology areas, it should be noted that the importance of scientific and technical literature to patented technology is increasing in all areas. Our research shows that the average US patent had only 2.76 non-patent references (NPRs) back in 1997. That number jumped to 11.37 by 2020 – a 312% increase. These numbers are for all issued US patents and not just those in the twenty categories covered in this report.¹ This means that in the overall patent system, patented technologies are increasingly referencing scientific articles.
- Since we only look at specific categories of technology plus the top 50 firms, there is no way to know exactly how much referencing to IEEE has increased since 1997. However, we can make an estimate for the whole patent system by identifying any Non-Patent References that mention “IEEE” or “I.E.E.E.” (This will of course miss things like the *Journal of Lightwave Technology* or *Spectrum* which may not have IEEE in the reference, but it will be a reasonable estimate.) If we do a comparison as above, we find that there were just 14,635 patent references with IEEE or I.E.E.E in 1997, but 149,769 in 2020 (a 923% increase). Thus, science referencing and IEEE referencing have both increased greatly since 1997.

¹ Including science intensive areas like Biotechnology, Pharmaceuticals, Chemicals, and other areas where IEEE typically has little influence.

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I. Introduction

In previous studies, it was found that patents reference papers from IEEE journals much more often than papers from other journal publishers. In this report, we update the previous results, and study US patents issued from January 2001 through December 2020. Although this report is an update of previous results, we have made our best efforts to make this report self-contained. The aim of this report, as in previous reports, is to analyze references from patents to journal articles, conferences, and standards documents, in order to assess IEEE's impact upon technological developments.

This report covers twenty subcategories of Technology where IEEE members and readers are active. Many, but not all are related to Information Technology. The categories patent counts are shown below in Table 1.

Table 1: Number of Patents for Each Category Covered in this Study

Category	# Patents 2001-2020
AI/Artificial Intelligence	22197
Autonomous Vehicles	5424
Blockchain/Distributed Ledger	1656
Broadcasting	192653
Computer Hardware	474905
Computer Software	282210
Cybersecurity	136231
Diagnosis/Surgery/Medical Instruments	239302
Information Storage	130972
IOT/Internet of Things	16161
Measuring, Testing and Control Devices	233067
Optics/Photography/Electrophotography	160540
Power Systems	133667
Robotics and Intelligent Manufacturing	37156
Semiconductors/Solid-State Devices/Electronics	308717
Smart Grid/Smart Meters/Energy Infrastructure	4739
Solar/Photovoltaic	14965
Telecom and Other Communications	687742
Virtual/Augmented Reality	17626
Wind Energy	8204

II. Methodology

This study is based on referencing patterns from patents to prior art documents. When an inventor files a patent for an invention, he/she will typically reference earlier documents to show that the new invention either builds upon, or improves upon, what came earlier. The inventor's patent attorney and/or the examiner may also add prior art references to either clarify or limit the claims of the invention.

As an example, Figure 1 shows the front page of a patent owned by IBM. The prior art references on this patent come in two forms - references to earlier patents, and "other

references”. These other references are often to scientific publications, such as those produced by IEEE. In this report we are primarily concerned with these other references, which are also sometimes called “Non-Patent References”.

It has been suggested that patents with many non-patent references are likely to contain new leading-edge ideas, whereas patents that only reference earlier patents are likely to be incremental improvements on earlier patented technologies. For a comprehensive study on various hypotheses surrounding the motivations of inventors in citing other references, see [1].

Patent Sets used in the Analysis

This study is based on two patent sets. Our analysis is based on determining the number of references from these patent sets to publications from publishers such as IEEE, RELX (formerly Elsevier), the American Institute of Physics, and others.

The first set contains patents from the top 50 patenting companies in 2020. Analysis of this patent set provides an insight into how the top tier companies rely upon science from IEEE and other publishers. The second set contains all patents in twenty technology categories from all companies, universities, government agencies, and individuals. The twenty technology categories examined are shown in Table 1 above. Analysis of this patent set reveals the wider influence of IEEE science in these technologies.

Identifying Relevant Non-Patent References

Non-patent references can be to any published document, from comic strips and brochures, to scientific articles and standards documents. The main difficulty in identifying relevant non-patent references for a study such as this is that inventors do not use a standard form for listing references. As an example, Table 2 contains eight different variants for the IEEE Global Telecom Conference. Note that some inventors just use the GLOBECOM shorthand, while others list the entire name. Sometimes IEEE is mentioned and sometimes it is not. When abbreviation variations are included such as Telecom, Tele, Tcom, Proc., Proceed., the number of variants increases further. The same issue exists for variants in journal names and standards documents. For example there are more than 30 variant spellings of the journal title *Journal Of Thoracic And Cardiovascular Surgery* including numerous mis-spellings of thoracic and every conceivable way of abbreviating cardiovascular.

Table 2 – Variants for IEEE Global Telecom Conference

Proceedings of Globecom '96
IEEE Global Telecommunications Conference
GLOBECOM '90:IEEE
Proceedings of IEEE Globecom '94
Globecom '97
IEEE Globecom, Global Telecommunications Conference and Exhibiton
Proc of the Global Tele Conf, U.S. New York, IEEE

Conference Identification – to identify conference proceedings among the non-patent references, we first identified references containing keywords such as meeting, symposia, conference, etc. We then used parsing software to identify 2-word and 3-word phrases that appear frequently in this set of papers. The full string was identified for these string subsequences in order to identify frequently cited conferences. In this way, we identified the top conferences referenced in the patent sets, and standardized the names of these conferences (i.e. all of the different variants of a conference were collected under a single name). As an example, all of the variants shown in Table 2 are assigned to the name ‘<conf> IEEE Global Telecommunications Conference (GLOBECOM)’.

We then looked up each of these conferences on the web to determine who is listed as their primary sponsor. For example, many of the conferences are sponsored by organizations such as IEEE, ACM (Association for Computer Machinery) and ASME (American Society of Mechanical Engineers). Some conferences are jointly sponsored by multiple organizations and this is noted as well.

When we first started identifying conferences in the 2005 report, we looked up the top 100 most referenced conferences in order to identify the primary sponsors or hosts. In this current report we have identified the sponsors for the top 1,200+ most referenced conferences. These 1,200+ conferences are listed under more than 10,000 variant names.

Standards Identification – Standards documents are increasingly referenced, and in general they are easy to identify by looking for strings such as ‘standard’ or ‘std’. Once the records containing the standards were located, it is straightforward to identify the organization that produced each standard (ITU, IEEE, ISO, JEDEC, ANSI, etc.). Further, once the standards bodies are identified, we then identify references to other documents that do not specifically list the words ‘standard’ or ‘std.’ The latter step is necessary since some references look like this “ISO/TC97/SC21/N2066” or “IEEE802.3” without a specific mention of the word “standard.” As a consequence, we also identify other non-standard documents released from these organizations including draft standards and “requests for comments” documents if they are cited by patents.

Journal Identification – identifying and standardizing journal names is a very difficult process because there are so many different journals, and their names can be abbreviated in many different ways. To make the problem more manageable, we base our analysis primarily to the 45,000+ journals covered by the combined databases of ISI/Clarivate, Elsevier/SCOPUS, and 1790 Analytics, LLC. This is not a severe limitation, since these databases include more than 200 IEEE journals, transactions, and magazines, 3,000+ RELX/Elsevier journals, and 1,200 Wiley journals. In addition, we also identify publishers of about 1,000 non-ISI, non-SCOPUS journals if they appear very frequently in the patent references, but do not appear in these databases.

Once restricted to these 45,000+ journals, we used software that transforms journal names into common abbreviations and then implements string matching. Care must be taken with string matching because, for example, searching for “Urology Journal” will also accidentally identify “Neurology Journal”. Similarly, a search for the journal “Science” would accidentally pick up any reference with ‘science’ in the paper title as well as any of the 800+ journals with science in

their titles such as “Game and Wildlife Science”. Our proprietary software for journal identification (along with some human intervention) deals with all these problems, so that we generate an accurate match between the patent references and 45,000+ journals. After identifying all the relevant journals, we then used the Clarivate and SCOPUS databases and web research to identify the publisher of each journal

III. Results

References from Top 50 Patenting Organizations

Table 3 shows the 50 firms that were granted the largest number of US patents in 2020. It should be noted that many of these firms consist of multiple subsidiaries, and these firms patent under many names. (For example General Electric has patents filed under 316 names, of which only a fraction contain General Electric in the name.) We identified all the subsidiary names for each company to ensure that our patent counts are accurate.

We identified the top 50 patenting firms because we want to understand the extent to which the current technology leaders use IEEE science. Figure 2 shows the 20 publishers of science whose publications are referenced most frequently by the 50 firms shown in Table 3. This figure shows that patents issued to the top 50 firms between 2001 and 2020 reference IEEE papers, conferences, and standards 588,893 times. This is more than three times as many references as the second placed publisher ACM.

IEEE receives 29.62% of the science references from the patents of the top 50 companies. The next closest publisher (ACM) has 8.84% of the total. About 1/3 of the 588,000+ patent references to IEEE are to IEEE sponsored conferences.

Table 4 illustrates the reference distribution of IBM, which is the top patent holder in 2020 (and for the past 15 years). This reference distribution is typical of the top 50 firms. The references from IBM to IEEE are to several different IEEE journals and conferences. In this table, IEEE journals are highlighted in yellow and IEEE conferences are highlighted in orange. The top overall reference is to IEEE is to the International Electron Device Meeting. The top IEEE journals are *IEEE Transactions on Electron Devices* and *IEEE Computer Magazine*.

Notice that 32 of the top 60 journals and conferences referenced by IBM patents are published or sponsored by IEEE. Fourteen of the top 60 journals and conferences are published or sponsored by ACM. As a software firm, IBM tends to reference ACM much more than most of the top 50 firms, but still IBM references IEEE nearly twice as often as ACM as seen in Appendix A-11 (60,229 references to IEEE and 32,357 references to ACM.) The reader may notice the large number of references to ‘IEEE Unseparated’ or ‘Misc ACM’ in Table 4. These are articles that reference IEEE or ACM, but the inventor has not given a reference specific enough to identify the proper journal or conference. A few examples can be found in

Table 3 – Top-Patenting Firms in 2020

Rank	Full Parent Name	2020 Patent Count	2001-2020 Patent Count
1	International Business Machines Corp	9405	120988
2	Samsung Electronics Co Ltd	6752	83955
3	Canon Inc	3698	61505
4	Intel Corporation	3207	44820
5	Huawei Technologies Company Ltd.	3204	17016
6	Microsoft Corporation	2966	41340
7	LG Electronics Inc.	2896	29866
8	Sony Corp	2865	46062
9	Taiwan Semiconductor Manufacturing Co.	2845	22313
10	Dell Technologies Inc	2819	19080
11	Apple Inc	2812	21823
12	Toyota Motor Corp	2597	24439
13	Google Inc.	2366	23937
14	General Electric Company	2323	33992
15	Amazon.com Inc.	2300	14323
16	Qualcomm Inc	2297	28559
17	Samsung SDI Co Ltd	2224	22474
18	Raytheon Co.	2195	22597
19	BOE Technology Group Ltd	2157	9076
20	Ford Motor Co.	2082	17768
21	Panasonic Corporation	1904	49498
22	Hon Hai Precision Industry Co. Ltd. (AKA Foxconn)	1549	39126
23	Micron Technology Inc.	1542	26889
24	Facebook Inc	1524	5693
25	Johnson & Johnson	1513	17612
26	Hyundai Motor Co.	1505	10439
27	Boeing Co.	1466	14585
28	AT&T Inc	1452	22224
29	Medtronic Inc	1430	21004
30	Ericsson	1400	19221
31	Fuji Film Holdings Corp	1391	28105
32	Toshiba Corp	1339	37566
33	Seiko Epson Corporation	1335	25264
34	Kia Motors Corp.	1324	4232
35	Hitachi Ltd	1291	35029
36	Mitsubishi Electric Corp	1273	19383
37	Siemens Aktiengesellschaft	1273	23757
38	Denso Corp	1249	17674
39	Honda Motor Co. Ltd.	1241	18603
40	Texas Instruments Inc	1147	19566
41	Bosch (Robert) GmbH	1100	20023
42	Cisco Systems Inc.	1081	16820
43	Honeywell International Inc.	1061	18830
44	NEC Corp	1034	21134
45	Fujitsu Limited	1028	32216
46	Kyocera Corp.	999	11052
47	LG Display Co Ltd	995	10741
48	HP Inc	979	28229
49	LG Chem Ltd.	960	5734
50	SK Hynix Inc	944	14451

Table 4 – Reference Distribution from IBM Patents 2001-2020

References	Journal/Conference/Standard
6157	IP.Com Prior Art Database tech Disclosure
5110	Misc ACM
3177	IEEE Unseparated
2917	IEEE Int Electron Devices Meeting (IEDM)
2893	IBM JOURNAL OF RESEARCH AND DEVELOPMENT
2629	ACM SIGPLAN Notices
2400	APPLIED PHYSICS LETTERS
2298	COMMUNICATIONS OF THE ACM
2201	IETF Network Working Group
2156	Proceedings of ACM SIGMOD
1692	IETF Document
1668	Int Conf on Very Large Data Bases (VLDB)
1651	IEEE tr ELECTRON DEVICES
1515	NIST Document
1424	JOURNAL OF APPLIED PHYSICS
1374	IEEE/JPN Soc App Phys - symp on VLSI tech
1372	IEEE int conf on Data eng (ICDE)
1367	USENIX Conference Proceedings
1366	Computer (IEEE)
1361	IETF Std
1356	Proc ann IEEE ACM int symp on Microarchitecture (MICRO)
1326	ACM/IEEE Design Automation conf
1244	IEEE JOURNAL OF SOLID-STATE CIRCUITS
1243	ACM/IEEE int symp on comp Architecture (ISCA)
1225	IBM SYSTEMS JOURNAL
1192	ACM SIGOPS
1191	Proc SPIE
1162	IEEE ELECTRON DEVICE LETTERS
1065	IEEE tr COMPUTERS
1008	JOURNAL OF THE ACM
967	ACM Conference on Human Factors in Computing Systems (CHI)
885	IEEE int Symp on High Performance Distributed comp
875	comp Architecture News
771	J Vac Sci tech
728	IEEE tr Software eng
724	IEEE int symp On High Performance comp Architecture (HPCA)
723	IEEE tr MAGNETICS
722	IEEE Int Conf Acous, Speech, and Sig Proc (ICASSP)
714	IEEE tr comp Aided Design of Integrated Circuits and sys
713	SCIENCE
692	Proceedings ACM SIGCOMM Symp
688	IEEE tr PARALLEL AND DISTRIBUTED SYSTEMS
683	IEEE Proceedings
659	International World Wide Web Conference
659	IEEE int conf on Distributed comp sys
643	IEEE/ACM Int Conf on Software eng (ICSE)
617	IEEE tr KNOWLEDGE AND DATA ENGINEERING
610	IEEE Electronic Components and tech conf
590	proc IEEE int Solid State Circuits Conf (ISSCC)
590	IEEE Misc Conf
577	ACM Conf On Architectural Support for prog Languages and Operating sys (A
570	ACSA/IEEE ann comp Security app conf (ACSAC)
562	IEEE tr INFORMATION THEORY
545	IEEE/ACM int conf on comp Aided Design (ICCAD)
529	IEEE/ACM International Symposium on Cluster, Cloud, and Grid Computing
519	IEEE Hawaii Int Conf on Sys Sci (HICSS)
515	NATURE
511	IEEE/ACM Proceedings on Supercomputing (SUPERCOMP)
510	Network Working Group RFC
508	NANO LETTERS
504	IEEE International Parallel and Distributed Processing Symposium

Table 5 below. These are relatively complete references; it is not clear why the inventors were not more careful about listing the full journal names.

Table 5 – Examples of References Mapped to “IEEE Unseparated”

Patent	NPR #	NPR Text
05692177	3	Lewis et al. "Hashing for dynamic and static internal tables." IEEE, pp. 45-56 Oct. 1988.
05699518	4	"The Design and Implementation of a Reliable Distributed Operating System--ROSE", Ng, IEEE, pp. 2-11, Apr. 1990.
05699518	5	"A service Platform for Distributed Applications", Popescu-Zeletin et al, IEEE, pp. 11-17, Jul. 1992.
05709219	5	Kotoku, Tetsuo et al., "Environment Modeling for the Interactive Display (EMID) Used in Telerobotic Systems," IEEE Nov. 3-5 1991, pp. 999-1004.
05709219	6	Kotoku, Tetsuo, "A Predictive Display with Force Feedback and Its Application to Remote Manipulation System with Transmission Time Delay," IEEE Jul. 7-10 1992, pp. 239-246.
05709219	8	Burdea, Grigore et al., "Distributed Virtual Force Feedback," IEEE May 2, 1993, Atlanta, GA, pp. 25-44.

References from Companies in Twenty Technology Categories

In the previous section, we analyzed the use of IEEE science by the top patenting organizations. Out of all science publishers, IEEE was cited most often by these organizations by a wide margin. However, looking only at the top companies tells an incomplete story. IEEE publishes journals and runs conferences mainly in information technology, electronics and other areas. It is therefore useful to examine the extent to which IEEE science is referenced by all organizations that patent in specific technologies and not just by the leading companies.

As mentioned in the methodology section, we identified all patents in the twenty technology categories shown above in Table 1. 1790 Analytics has developed a classification scheme that categorizes all patents into 50 broad technology areas based on International Patent Classes (IPCs) and Cooperative Patent Classes (CPCs) which are assigned to each patent as part of the examination process. This scheme was used to identify all relevant patents for the current analysis.

We examined each of the technology areas separately, and the results are summarized in Figures 3-19. The first category shown (in Figure 3) is Artificial Intelligence (AI). We identified all non-patent references on patents related to this technology issued between 2001 and 2020. We then determined the science publishers responsible for the largest number of these non-patent references. Figure 3 shows the result of this analysis, namely that IEEE science is referenced far more in AI related patents than science from any other publisher. 40.96% of all science references from these patents go to IEEE journal papers or IEEE sponsored conference papers (the graphs also include standards documents, but the vast majority of the references are to journal or conference papers). In second place is the ACM with 12.70% of the references.

AI is currently a very hot area and often written about in the popular press. The same can be said for Autonomous Vehicles which are shown in Figure 4. Here again IEEE dominates in references. In this case more than half (64.33%) of all references are to IEEE in this category.

Blockchain and Distributed Ledgers is a relatively new category with only a few hundred patents (as opposed to AI which is a much more established category with 10,000+ patents). We see in Figure 5 though that 48.35% of all science references from these patents go to IEEE.

Figure 6 covers Broadcasting patents, which is a category we first added in 2015. This category consists of US patents in the IPCs for Broadcast Communication and Pictorial Communication (Television). It would seem that this would be an area that is somewhat tangential to IEEE's core mission. However, thirty 37.95% of all science references from these patents go to IEEE journal papers or IEEE sponsored conference papers. The International Telecommunications Union is a distant second with 7.89% of all references.

Figures 7 and 8 show referencing patterns from Computer Hardware and Software patents. Here IEEE once again receives far more references than the other publishers. In both cases, ACM is the second most referenced publisher, but it receives about half of the references that papers published by IEEE receive.

Figure 9 shows references in the fast-growing area of Cybersecurity. This is a very hot area with a lot recent patent growth, and again IEEE leads by a wide margin (31.03% of all references compared to 15.53% for second place ACM).

Figure 10 examines the top referenced publishers in the Medical Device field, which covers devices as well as diagnostic tools and surgical instruments. Here, IEEE is a respectable fourth in an area that is somewhat outside its core competency. RELX who has more than 400 journals in the field, such as *Annals of Thoracic Surgery*, and the *Journal of the American College of Cardiology* has a substantial lead with 20.03% of all references. Wiley with 9.74% of references and Wolters Kluwer (parent of Lippincott) with 9.29% of references are just ahead of IEEE's 8.72% of references in the category.

Figure 11 contains the results for the information storage category. In this area, IEEE is particularly dominant. 44.31% of all of the science references from patents in information storage are to papers in IEEE journals or conferences. IEEE's 84,802 references in this category is about six times as many as second place American Institute of Physics (AIP).

Another hot technology area consists of Internet-of-Things patents. As Figure 12 shows, IEEE science is very important to the development of this new and active area of patenting. More than 48% of all science references are to IEEE content. ACM is a distant second with 9.93% of all references.

Figure 13 contains the results of patents covering Measuring, Testing, and Control technology. Patents in this category are related to measuring or testing, force, pressure, weight, etc. as well as chemically measuring substances (e.g. measuring CO2 levels). The category also contains control devices since these technologies are often combined. For example, a patent might be

related to a valve that adjusts at a certain pressure or at a certain pollution level. Since this type of measuring can be done both mechanically, magnetically, electrically, or chemically, it is not too surprising to see both IEEE and RELX and the Optical and Chemical Societies all near the top of Figure 13. IEEE receives the most references, but the lead is not as dominant as in the Information Technology related technology areas.

The results for the Optics category can be found in Figure 14. This is another area that is slightly outside the IEEE core. IEEE still has a lead over the second and third place publishers – the Optical Society of America (OSA) and the International Society of Optical Engineering (SPIE). Since these latter two societies are Optical societies, it would be reasonable to assume that one of these societies would lead in the category but IEEE strong journals and conferences in the area receive more references from optics patents.

Figure 15 contains results for the patents related to power generation and transmission. Although this is a non-information technology category, IEEE leads in references in this category as well. 36.17% of science references from patents in this category go to IEEE publications. RELX is second with 20.15% of all US patent references in the category.

Intelligent Manufacturing and Robotics contains patents related to robotics, and robotics and control systems related to manufacturing. According to Markets and Markets, the Robotics market is about a \$20 billion dollar industry and growing because of a population explosion in “service robots” that mow lawns, vacuum floors, and manufacture things.

As this industry grows, new innovations will be patented, and from Figure 16 it looks like those innovations will build upon ideas published in IEEE journal articles or presented at IEEE conferences. We see that 45.45% of all science references from patents in this space refer to IEEE published articles. RELX is the second ranked publisher, but its papers receive only 7.48% of the science references. In this category, IEEE has more references than the next 20 publishers combined.

Figure 17 shows that IEEE is also very strong in the Semiconductor category. Here, the inclusion of conferences gives IEEE a substantial boost. Approximately one-third of the references to IEEE are to conference papers. With conferences excluded, IEEE would be about the same level as the American Institute of Physics in terms of science references from semiconductor patents.

The Smart Meter/Smart Grid category covers patents related to improving the power grid as well as for advanced residential electric meters. This is a relatively small category but as we see in Figure 18, the IEEE provides the bulk of the science base with over two-thirds of all patent references.

Solar and Photovoltaic energy results are contained in Figure 19. IEEE holds a lead over RELX in this category in spite of having fewer journal titles. RELX has several strong journals in this category including *Solar Energy Materials and Solar Cells*, *Thin Solid Films*, *Solar Energy*, *Synthetic Metals*, *Journal of Crystal Growth*, *Solar Cells*, plus more than 50 smaller journal titles related to this technology. The references to IEEE science in this category mainly go to the *IEEE*

Photovoltaic Specialists conference, the IEEE World conference on Photovoltaic Energy Conversion, and IEEE Transactions on Electronic Devices.

The Telecommunications category is one of the strongest large categories for IEEE. There are almost three times as many references to IEEE conference and journal papers as to second place publisher 3GPP (which is a standards body). Standards are referenced more frequently in telecommunications, but still not nearly as often as journal and conference papers. About 55% of the nearly one million total references to all publishers are to journal articles; 25% of the references are to conference papers, and about 20% are to standards documents. In terms of standards documents, the 3GPP General Partnership Project, Internet Engineering Task Force and International Telecommunication Union received the most references in the category. New telecommunications patents are referencing scientific articles to a larger extent than in the past. In last year's report this figure showed 576,000 references to IEEE papers for the 21-year span of 1999-2019. Now as we see in Figure 20, there are more than 593,000 references to IEEE for telecommunications patents in the 20 year period 2001-2020.

Standards documents are referenced increasingly often in Telecommunications patents. Six of the top 20 referenced publishers are standards bodies. Moreover, of the 593,000+ references to IEEE, over 20,000 are to various IEEE standards (mostly to the IEEE 802 family of standards).

Virtual and Augmented Reality is another relatively small but hot category. We see in this category that again IEEE leads by a wide margin with 40.32% of all science references from patents. ACM is in second place with 20.57% of references.

Wind Energy is another relatively small area where IEEE has a big lead. We see in Figure 22 that in this area 43.58% of all science references from Wind Energy patents go to IEEE journal and conference papers. This is four times as many references as second place RELX receives, despite having fewer journal titles in the area than RELX does.

Figures 3-22 show aggregate counts of references from all patents in each technology category. Readers who wish to see the firms that reference IEEE publications in each category can consult Appendix B. This appendix contains the 100 organizations that reference IEEE most frequently in each category. Appendix C is similar, except that it contains the organizations that reference IEEE most frequently in the twenty technology categories combined.

Citation Index for Patents Referencing IEEE

In an earlier study (see [2]) it was shown that patents that reference specific IEEE journals perform better on a number of quality metrics. Moreover, it was shown that the results were statistically significant. In this report, we update a key figure from the previous study showing the citation index of patents that reference IEEE papers versus peer patents that do not reference IEEE.

The citation index is a normalized citation metric that takes the number of citations received by a particular set of patents and divides it by the expected number of citations for patents of the same age and technology class. A random set of patents therefore should have a citation index of 1.0.

Research has shown that patents cited by many later patents tend to contain important ideas upon which the later patents are building (see [3] and [6]). Citation indicators are also the basis for the patented financial models (see [4] and [7]) invented by the two 1790 founders Breitzman and Thomas.

Figure 23 contains the Citation Index for the patents in the twenty technology categories that reference IEEE papers and conferences. Also shown is the Citation Index for the set of the remaining patents in each category that do not reference IEEE. Note that the set of all patents in each category have an expected citation index of 1.0. Thus we see that the patents that reference IEEE are cited at least 30% more than expected, while the patents that do not reference IEEE are cited up to 10% less often than expected in some categories. This of course does not imply that all patents that reference IEEE are likely to be more valuable than patents that do not reference IEEE, but it does suggest that in general, patented technologies that build upon IEEE published or sponsored science are more likely to be valuable than patented technologies that do not reference IEEE science.

IV. Conclusions

When a patent is filed, it must reference the prior art upon which it builds, as well as any prior art that limits the claims of the new invention. This study and prior studies show that science published by IEEE forms a significant portion of this prior art for new patents.

In this study, we examined two separate patent sets. The first patent set consisted of patents granted between 2001 and 2020 to the 50 organizations with the largest number of US patents granted in 2020. The second patent set consisted of all US patents granted between 2001 and 2020 patents in twenty key technologies: Artificial Intelligence, Autonomous Vehicles, Cybersecurity, and several other categories. In both of these patent sets IEEE is the dominant source of non-patent prior art. In other words, IEEE journals and conferences are key outlets for scientific discoveries relevant to cutting edge technology.

Finally, we conducted an analysis of citation indices for IEEE related patents and non-IEEE related patents. These types of metrics have been shown in validation studies to be good markers for the quality, impact, and potential value of patents [3]. In this study, it was shown that patents that build upon IEEE published science tend to have higher citation indices than patents that do not reference IEEE. This suggests but does not guarantee that patents that build upon IEEE science are more likely to become high-quality, high-impact, valuable inventions than patents that do not build upon IEEE.

Specific key results are identified in the Executive Summary.

V. References

- [1] Branstetter, Lee. "Is Academic Science Driving a Surge in Industrial Innovation? Evidence from Patent Citations," Columbia Business School, Discussion Paper #28.
- [2] Breitzman, Anthony. "IEEE and Patents: An Analysis of Patent Referencing to IEEE Papers, Conferences and Standards", 1790 Analytics, LLC, May 23, 2005
- [3] Breitzman, Anthony and Moguee, Mary Ellen. "The Many Applications of Patent Analysis," *of Information Science*, 28, 3, 187-205, 2002.
- [4] Breitzman, Anthony and Narin, Francis., "Method and Apparatus for Choosing a Stock Portfolio, Based on Patent Indicators," US Patent #6,175,824, Jan. 16, 2001.
- [5] Fortune Magazine, "Ten Tech Trends," January 10, 2005.
- [6] Hall, Bronwyn H., Jaffe, Adam B. and Trajtenberg, Manuel., "The NBER Patent Citations Data File: Lessons, Insights and Methodological Tools" (December 2001). CEPR Discussion Paper No. 3094.
- [7] Thomas, Patrick., "System and Method for Producing Technology-Based Price Targets for a Company Stock," US Patent #6,832,211, Dec. 14, 2004.

Figure 1: Sample Patent Front Page

United States Patent
Bulzacchelli, et al.

7,822,114
October 26, 2010

Decision feedback equalizer using soft decisions

Abstract

A decision feedback equalizer (DFE) and method include at least two paths. Each path includes the following. An adder is configured to sum an input with a first feedback tap fed back from a different path. A latch is coupled to the adder to receive a summation signal as input. The latch includes a transparent state, and an output of the latch is employed as the first tap in a feedback path to an adder of a different path, wherein a partially resolved first tap in the feedback path is employed during the transparent state to provide a soft decision to supply correction information in advance of a hard decision of the latch.

Inventors: Bulzacchelli; John F. (Yonkers, NY), Friedman; Daniel J. (Sleepy Hollow, NY)
Assignee: International Business Machines Corporation (Armonk, NY)
Appl. No.: 11/761,586
Filed: June 12, 2007

Current U.S. Class: 375/233; 375/229
Current CPC Class: H04L 25/03057 (20130101); H04L 25/067 (20130101)
Current International Class: H03H 7/30 (20060101)
Field of Search: 375/233,229

References Cited

U.S. Patent Documents

7106099	September 2006	Nix
7539243	May 2009	Toifl et al.
2006/0188043	August 2006	Zerbe et al.

Other References

Grozing, "Sampling Receive Equalizer with Bit-Rate Flexible Operation up to 10 Gbit/s," Proceedings of the 32nd European Solid-State Circuits Conference, 2006, ESSCIRC 2006, Sep. 2006 pp. 516-519. cited by examiner.

Kenney, "A parallel architecture for multilevel decision feedback equalization," **IEEE Transactions on Magnetics**, vol. 34, Issue 2, Part 2, Mar. 1998 pp. 588-595. cited by examiner.

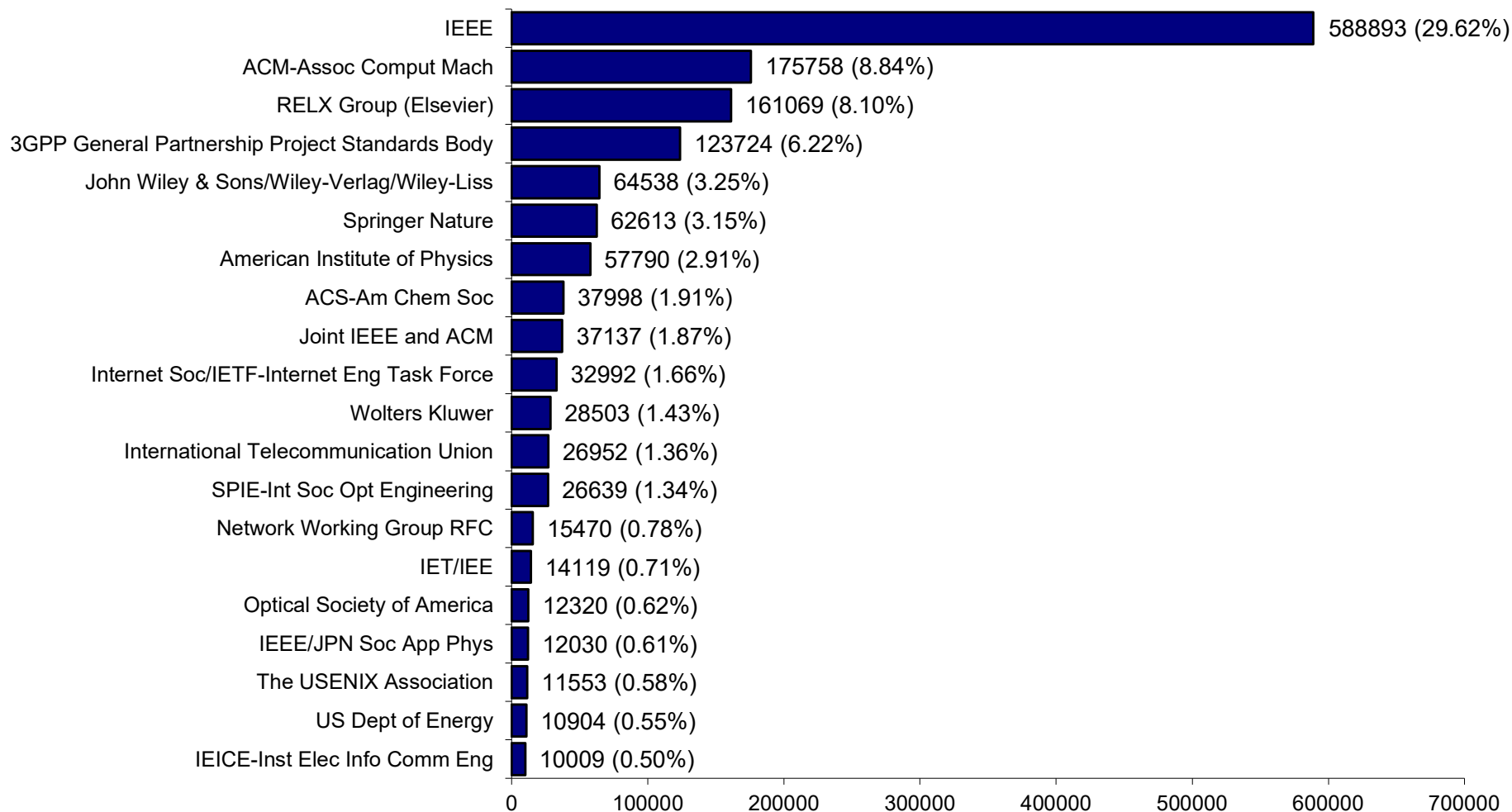
Kenney, "Pipelining for speed doubling in MDFE," 1996 **IEEE International Conference on Communications**, 1996, ICC 96, Conference Record, Converging Technologies for Tomorrow's Applications, vol. 1, Jun. 23-27, 1996 pp. 561-565 vol. 1. cited by examiner.

Varzaghani, "A 6-GSamples/s multi-level decision feedback equalizer embedded in a 4-bit time-interleaved pipeline A/D converter," **IEEE Journal of Solid-State Circuits**, on pp. 935-944, vol. 41, Issue: 4, Apr. 2006. cited by examiner.

Krishna, "A multigigabit backplane transceiver core in 0.13-.mu.m CMOS with a power-efficient equalization architecture," **IEEE Journal of Solid-State Circuits**, pp. 2658-2666, vol. 40, Issue: 12, Dec. 2005. cited by examiner.

Ren, "Performance Analysis of Edge-based DFE", Electrical Performance of Electronic Packaging Oct. 2006 pp. 265-268. cited by examiner.

Figure 2 - # and % of US Patent References from Top 50 Companies to Top 20 Journal Publishers



and % References to Papers/Standards/Conferences from 2001-2020 Patents

Figure 3 - # and % of Science References from 2001-2020 Artificial Intelligence US Patents to Top 20 Publishers, Conference Organizers, and Standards Organizations

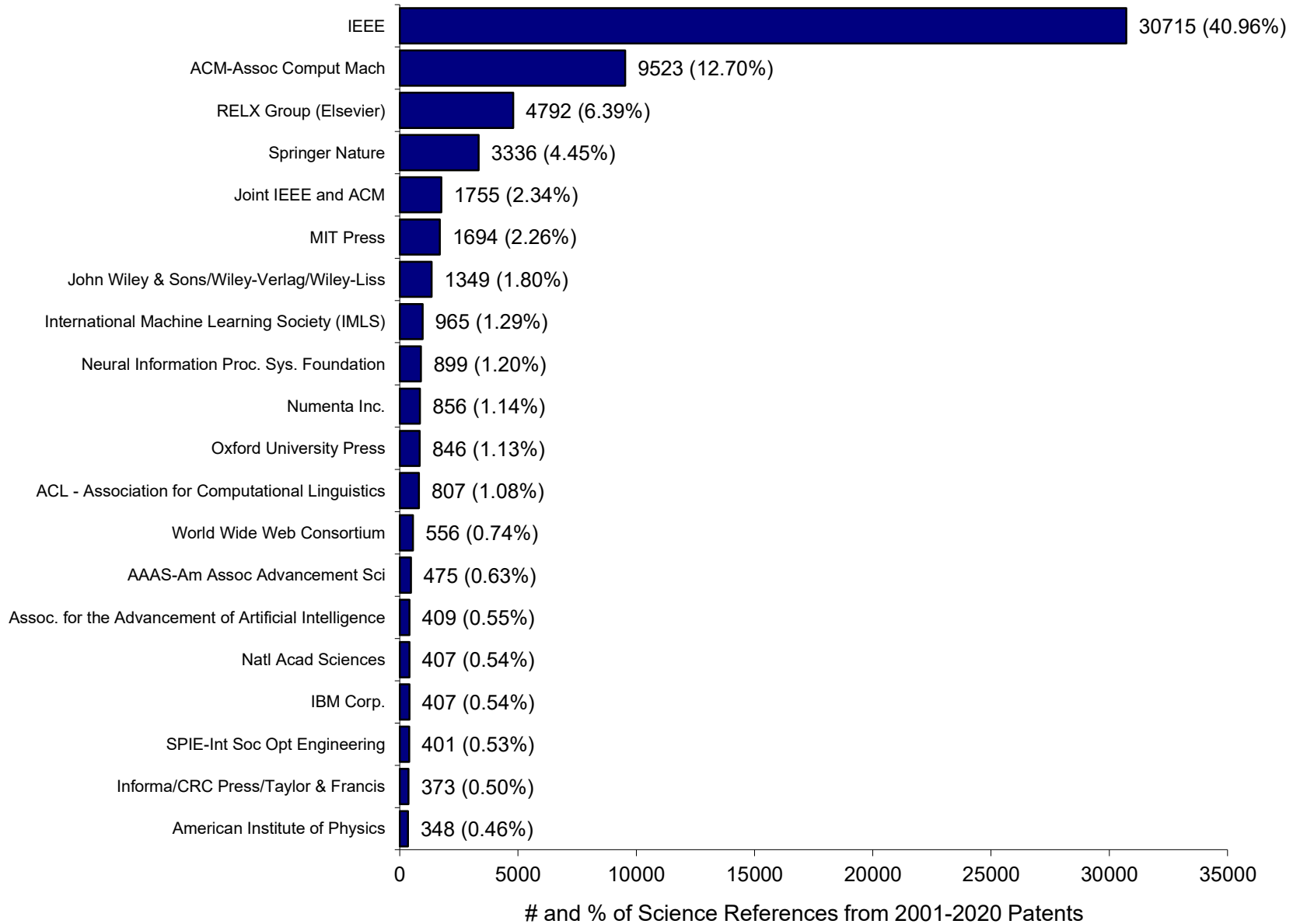


Figure 4 - # and % of Science References from 2001-2020 Autonomous Vehicle US Patents to Top 20 Publishers, Conference Organizers, and Standards Organizations

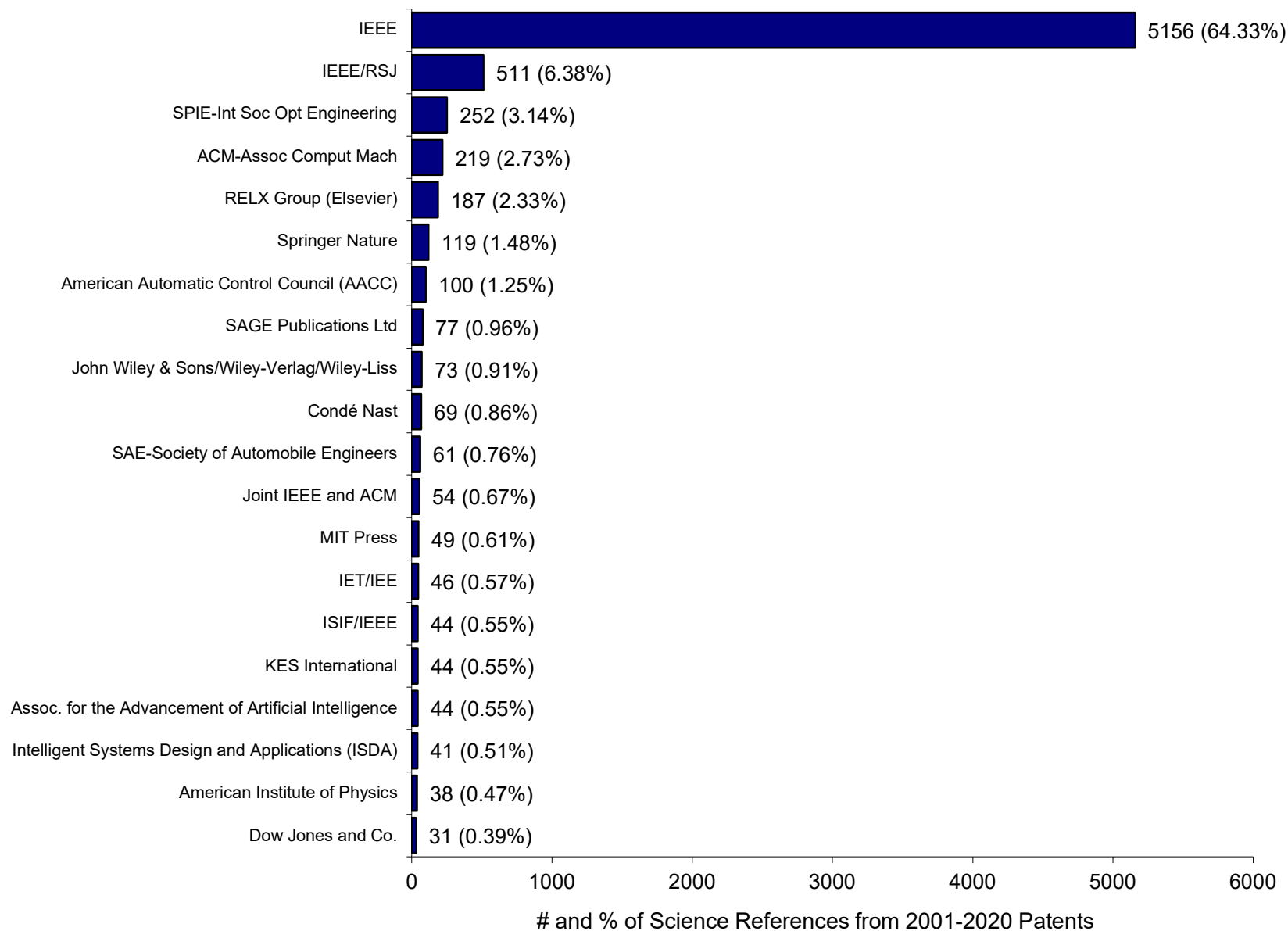


Figure 5 - # and % of Science References from 2001-2020 Blockchain/Distributed Ledger US Patents to Top 20 Publishers, Conference Organizers, and Standards Organizations

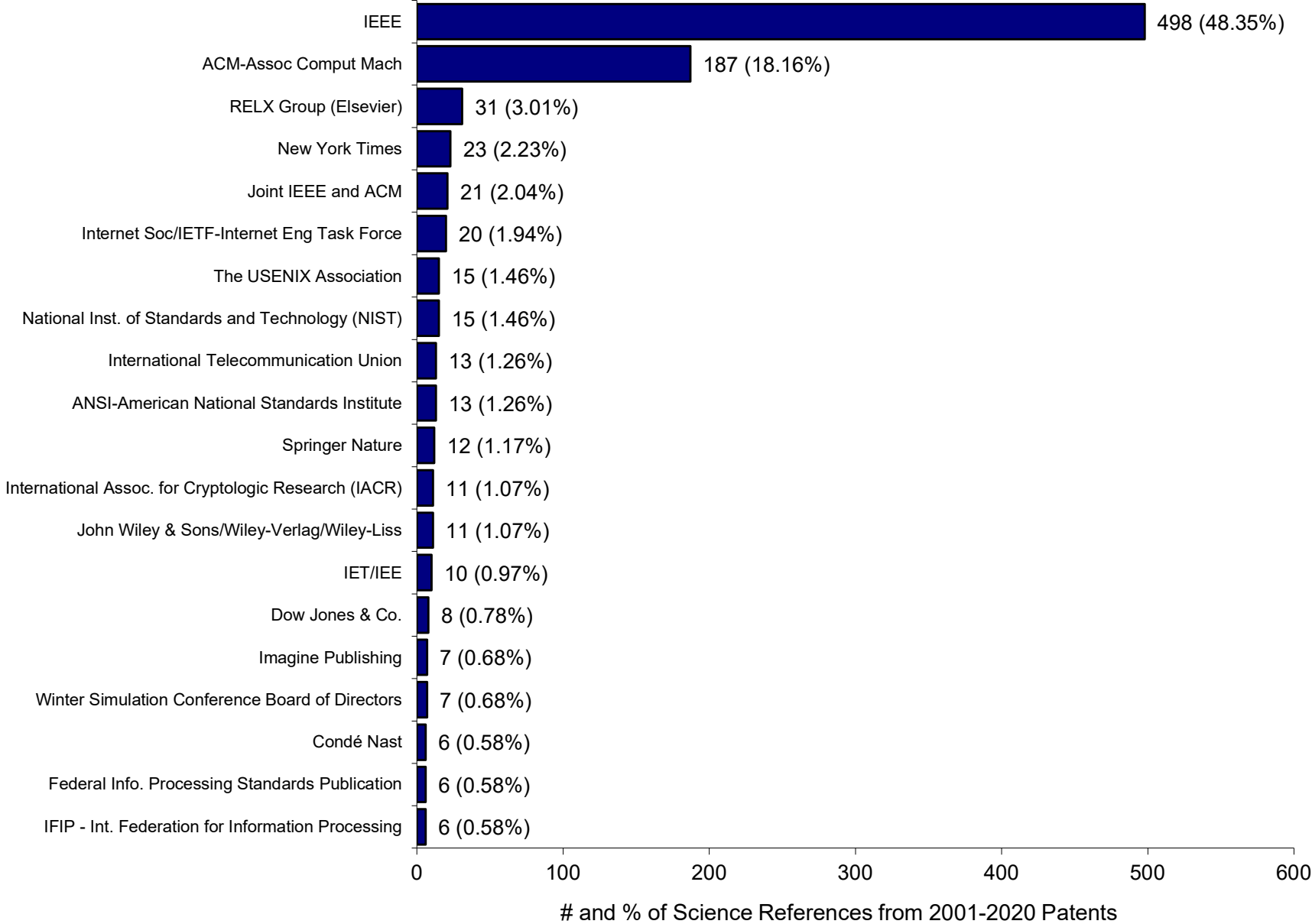
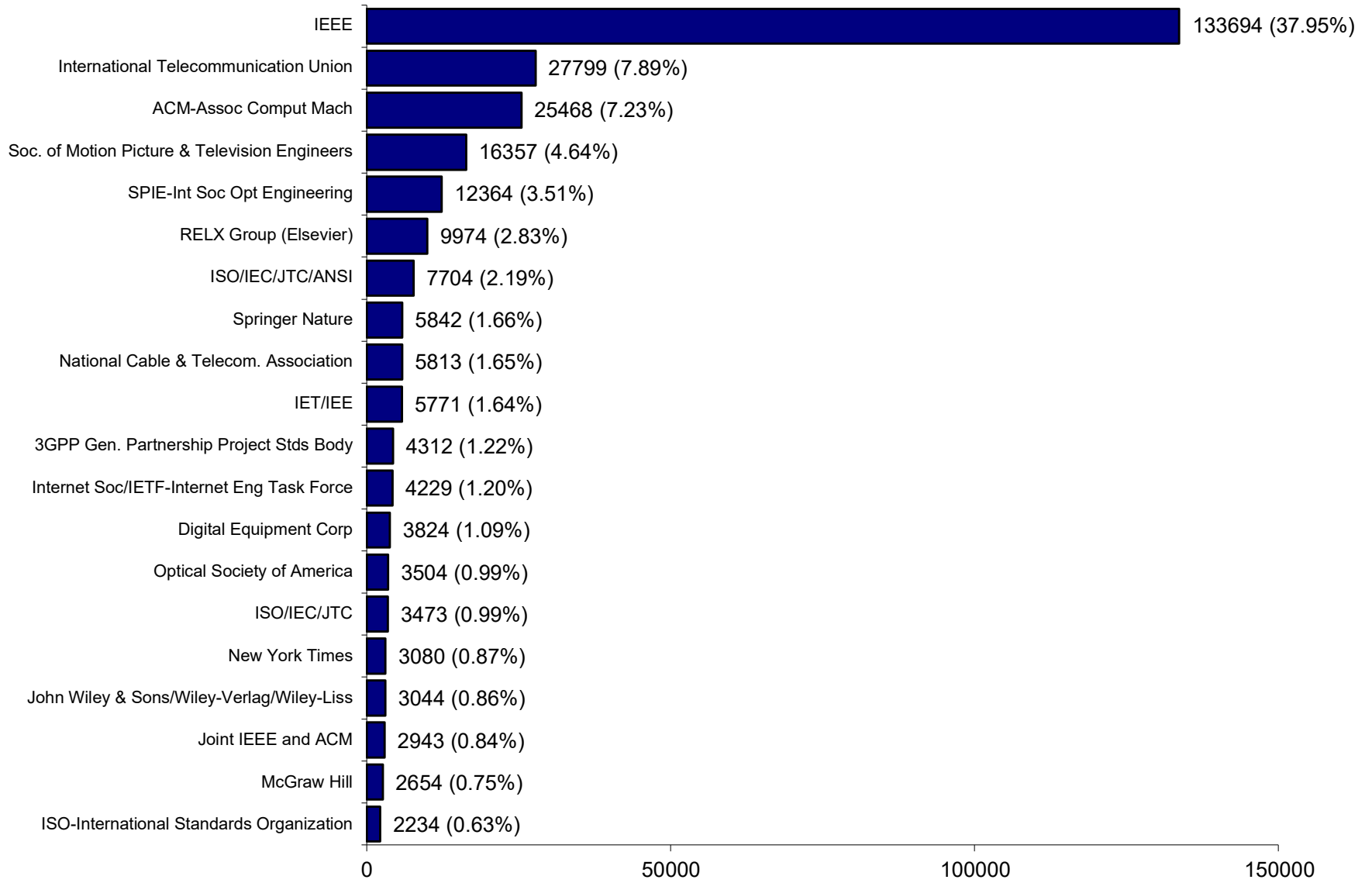


Figure 6: # and % of Science References from 2001-2020 Broadcasting US Patents to Top 20 Publishers, Conference Organizers, and Standards Organizations



and % of Science References from 2001-2020 Patents

Figure 7 - # and % of Science References from 2001-2020 Computer Hardware US Patents to Top 20 Publishers, Conference Organizers, and Standards Organizations

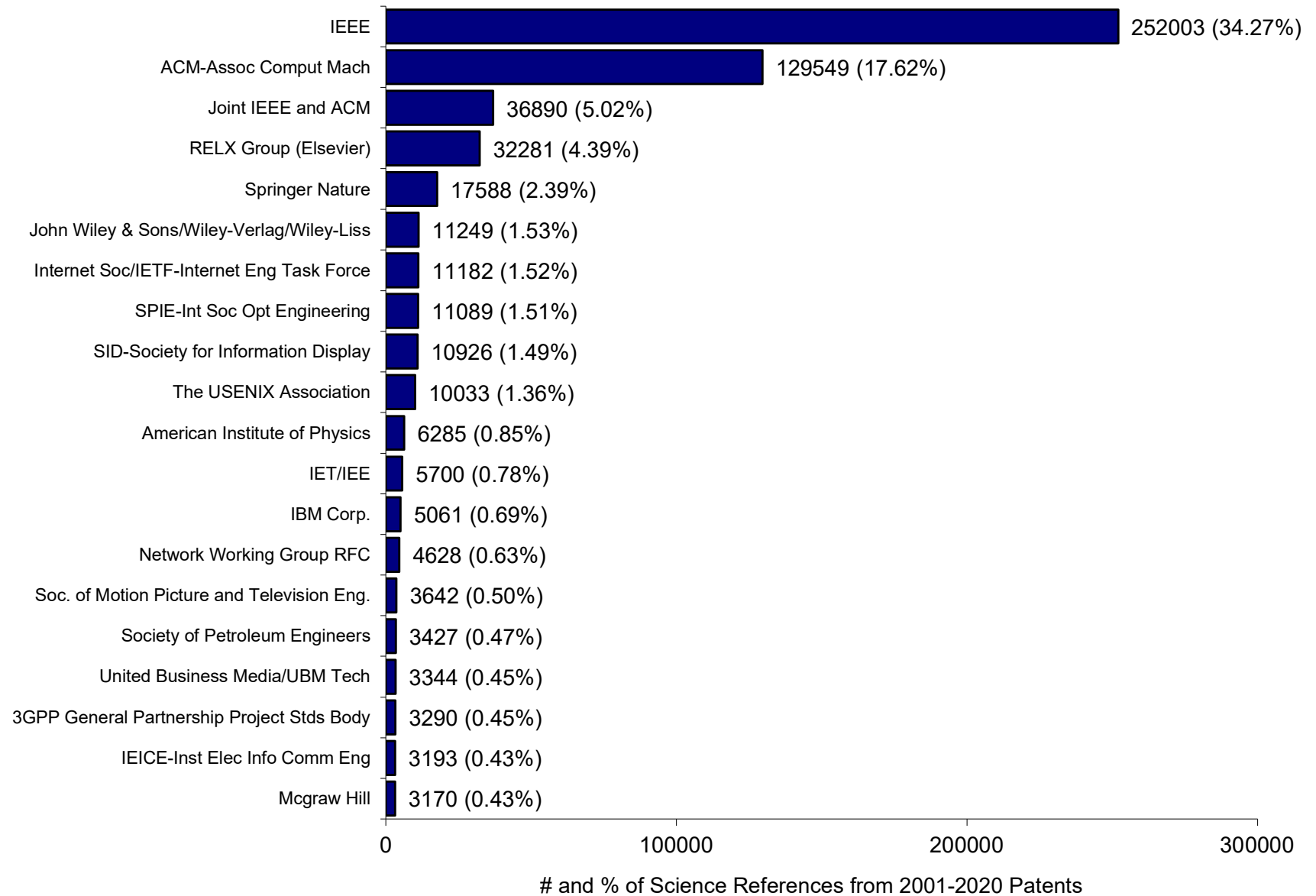


Figure 8 - # and % of Science References from 2001-2020 Computer Software US Patents to Top 20 Publishers, Conference Organizers, and Standards Organizations

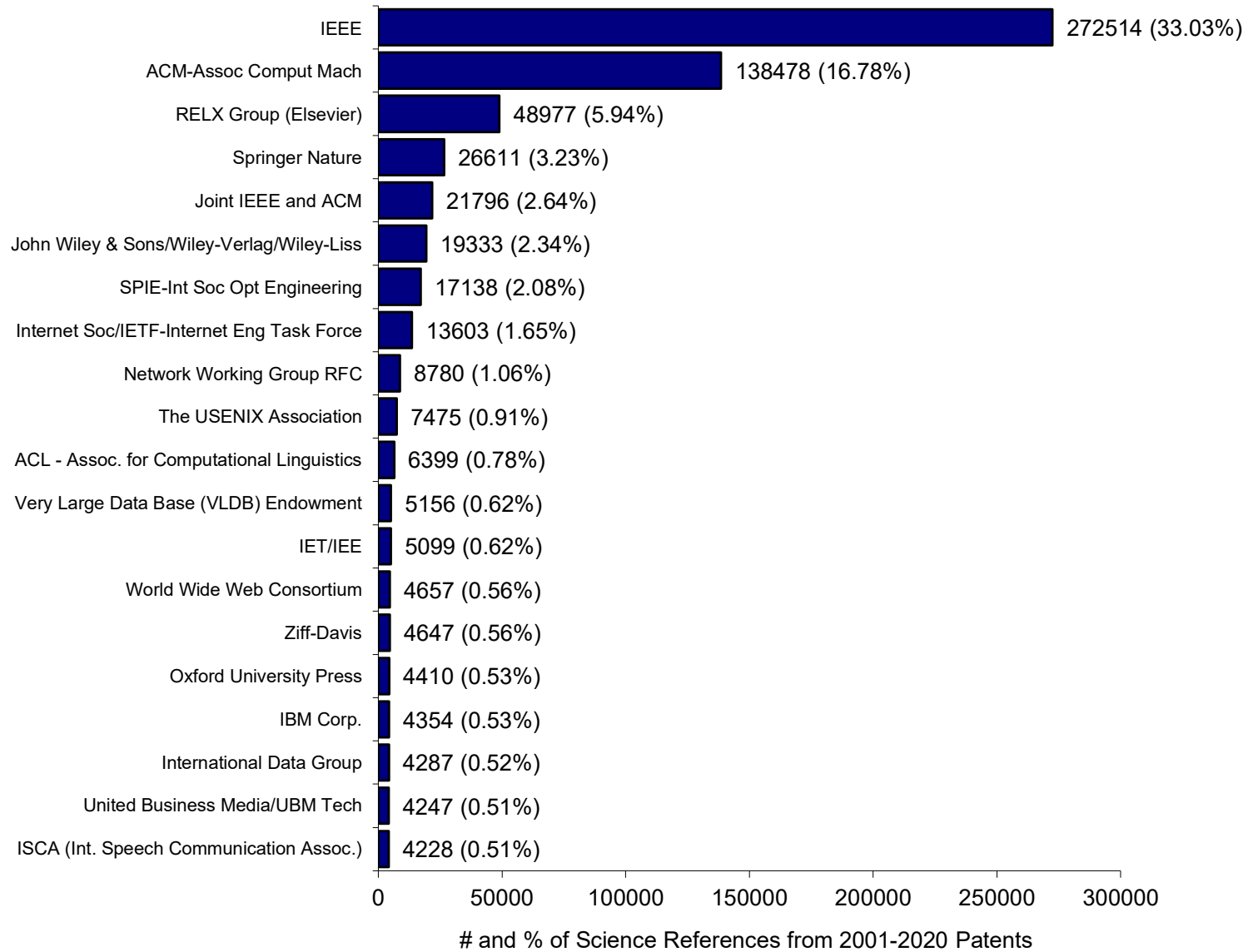


Figure 9 - # and % of Science References from 2001-2020 Cybersecurity US Patents to Top 20 Publishers, Conference Organizers, and Standards Organizations

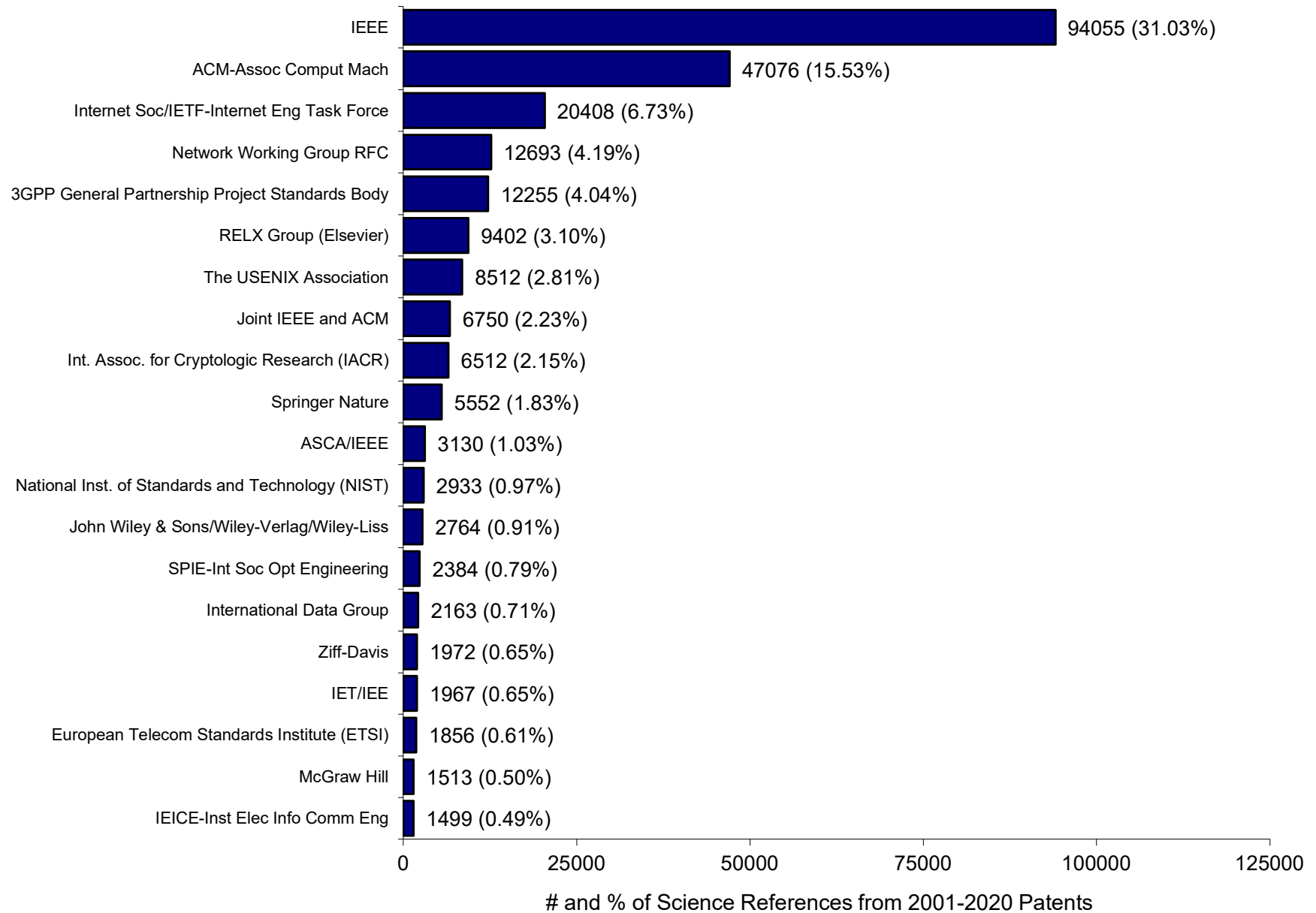


Figure 10 - # and % of Science References from 2001-2020 Medical Device US Patents to Top 20 Publishers and Conference Organizers

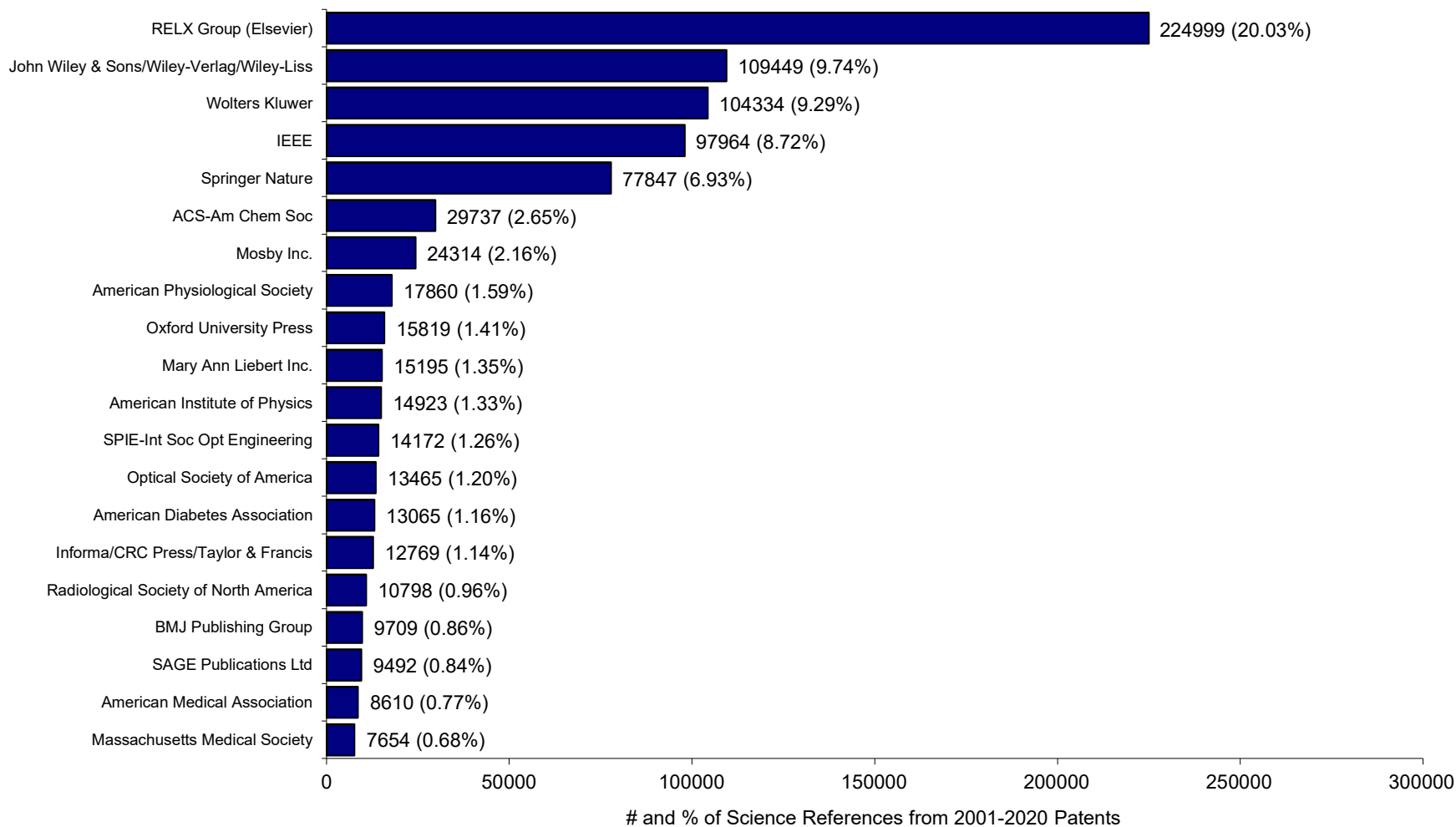


Figure 11 - # and % of Science References from 2001-2020 Information Storage US Patents to Top 20 Publishers, Conference Organizers, and Standards Organizations

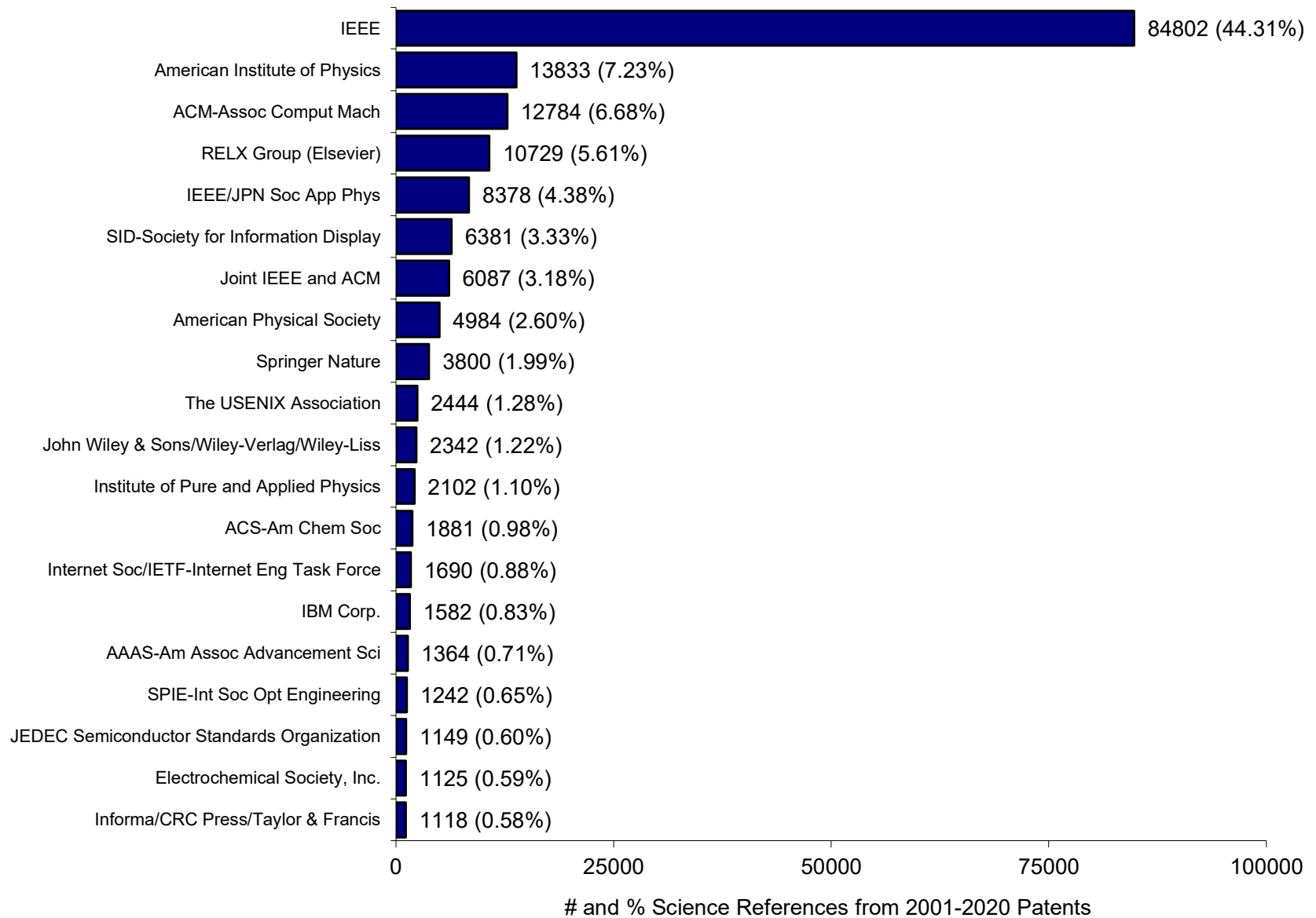


Figure 12 - # and % of Science References from 2001-2020 Internet-Of-Things (IOT) US Patents to Top 20 Publishers, Conference Organizers, and Standards Organizations

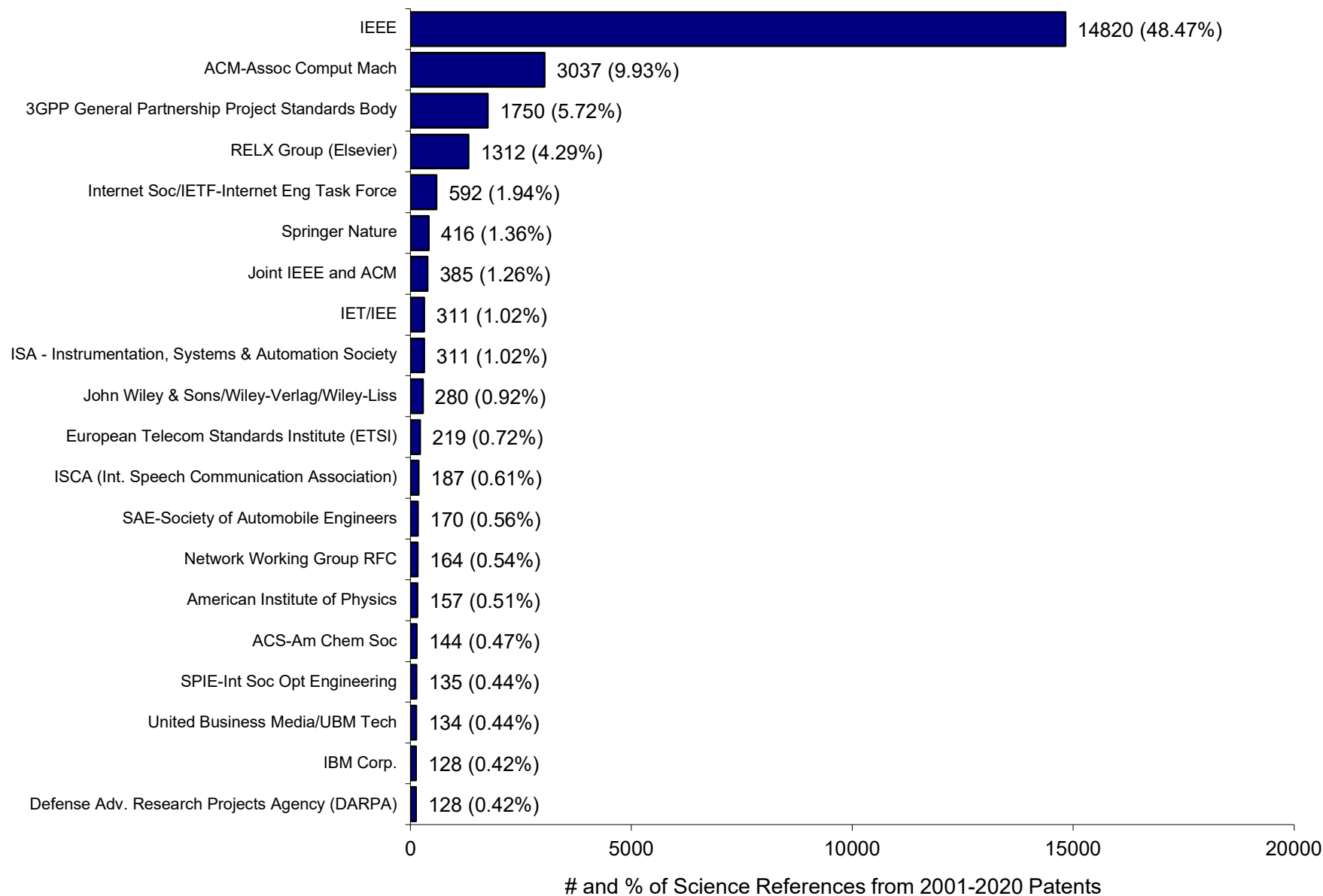


Figure 13 - # and % of Science References from 2001-2020 Measuring/Testing/Control US Patents to Top 20 Publishers and Conference Organizers

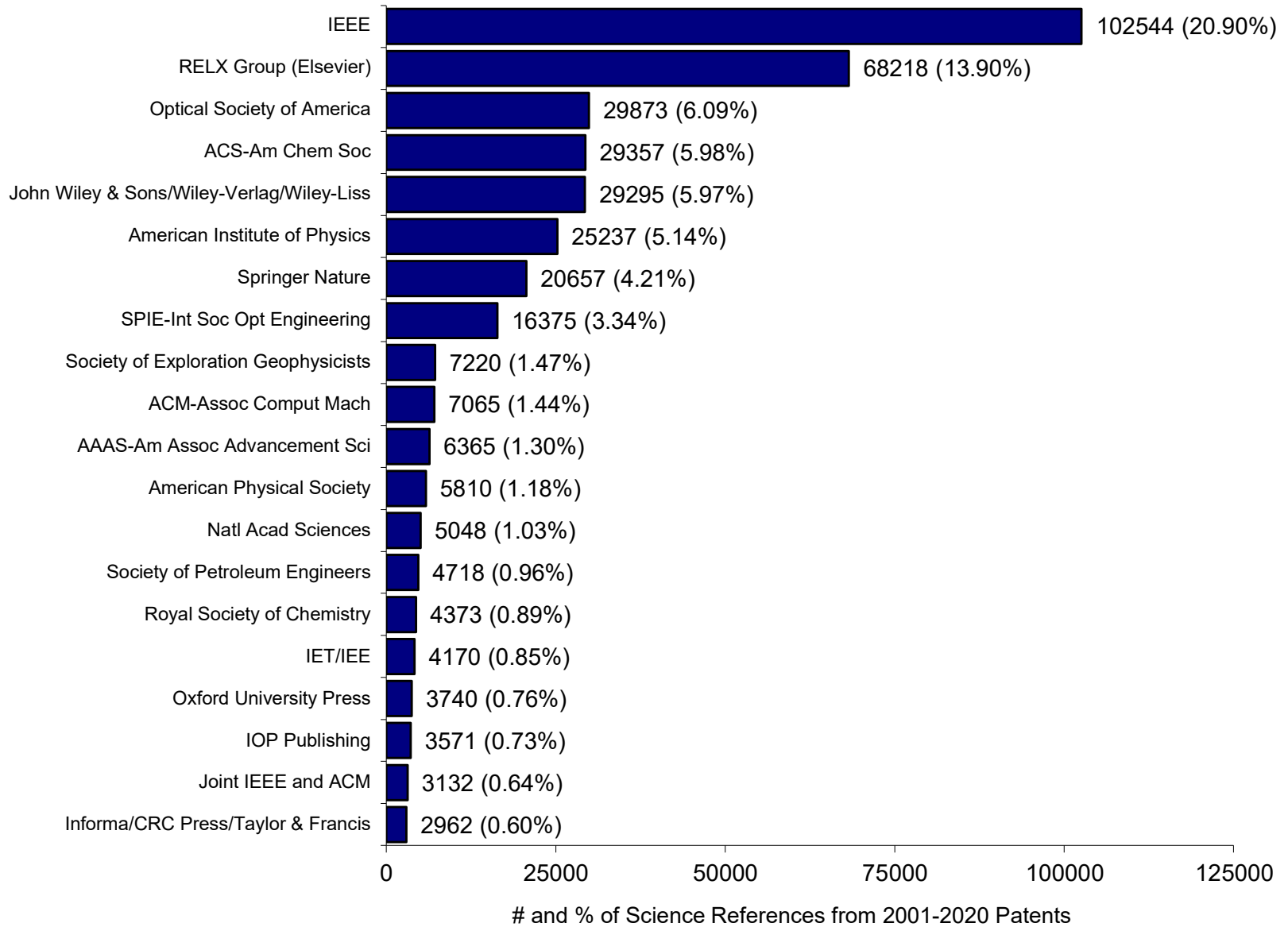


Figure 14 - # and % of Science References from 2001-2020 Optics US Patents to Top 20 Publishers and Conference Organizers

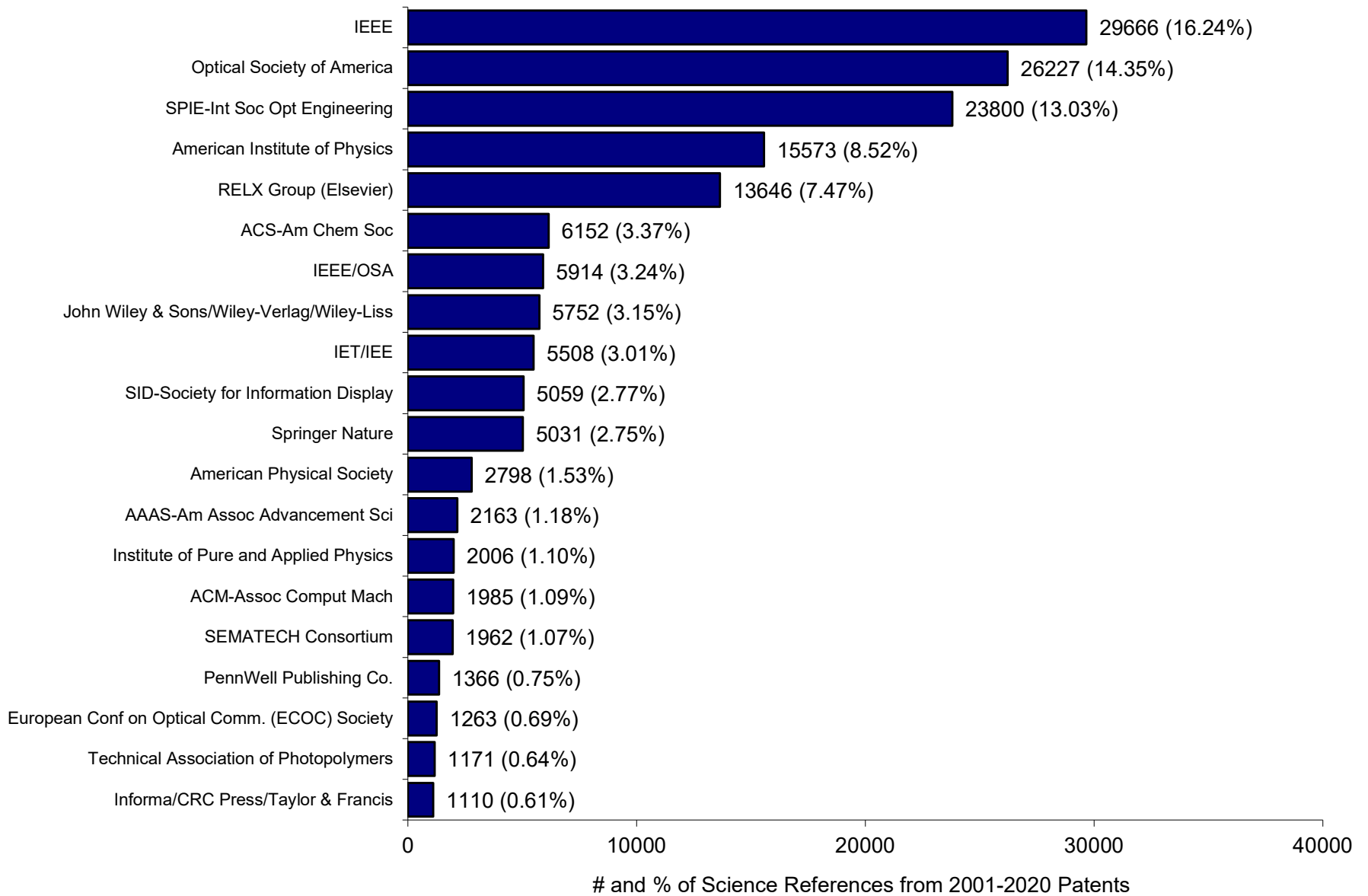


Figure 15 - # and % of Science References from 2001-2020 Power Systems US Patents to Top 20 Publishers and Conference Organizers

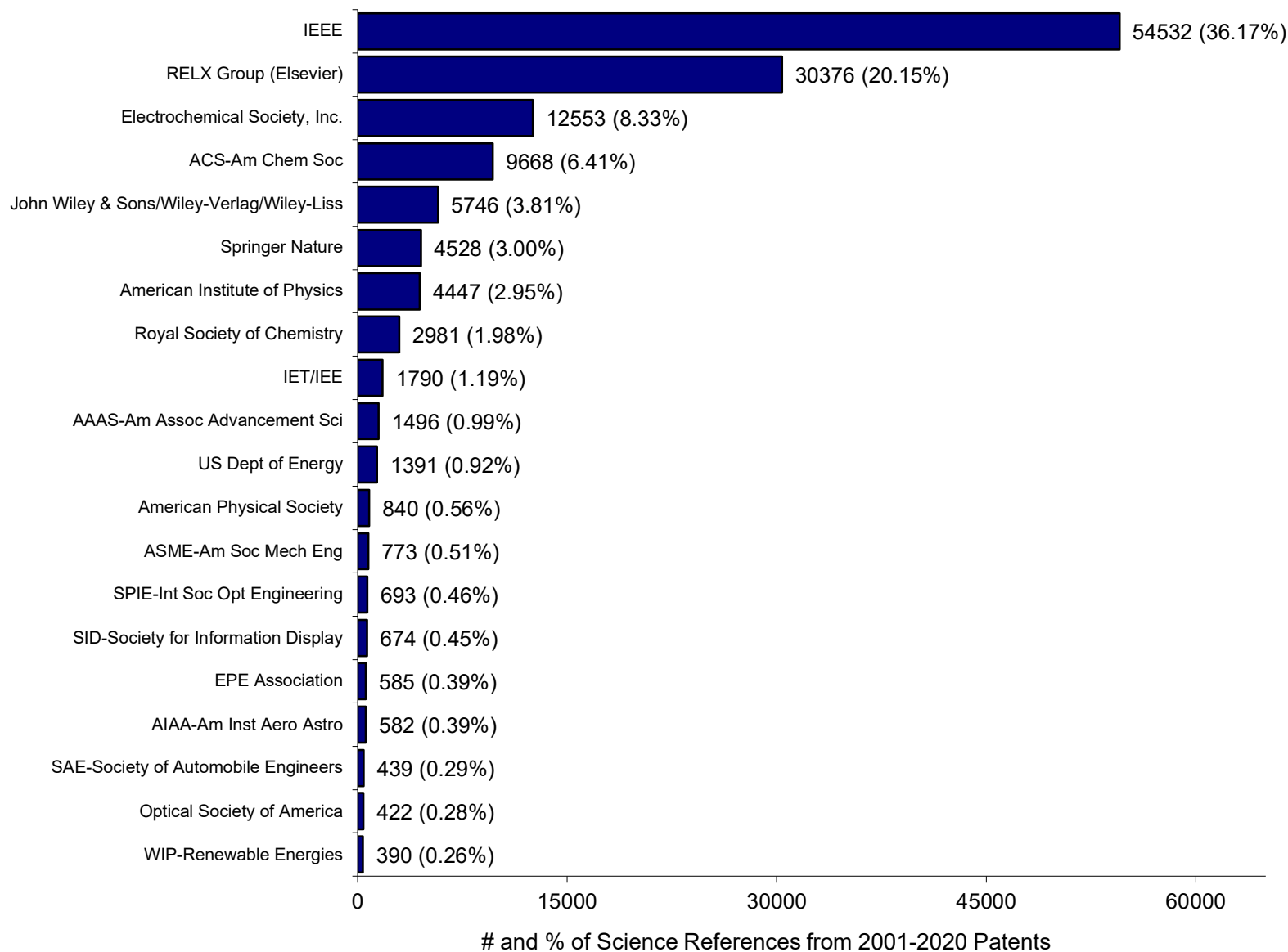


Figure 16 - # and % of Science References from 2001-2020 Robotics and Intelligent Mfg US Patents to Top 20 Publishers and Conference Organizers

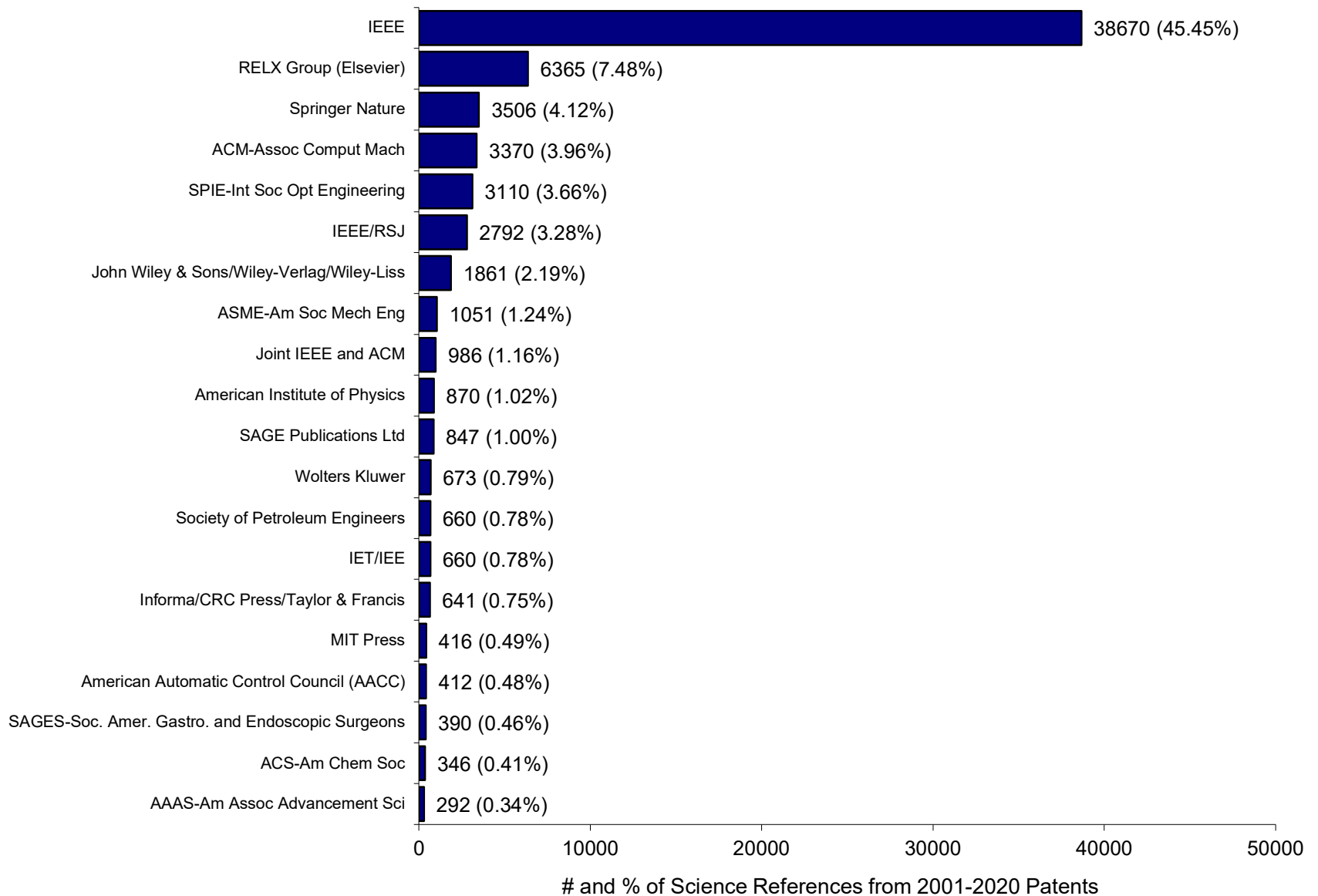


Figure 17 - # and % of Science References from 2001-2020 Semiconductor US Patents to Top 20 Publishers and Conference Organizers

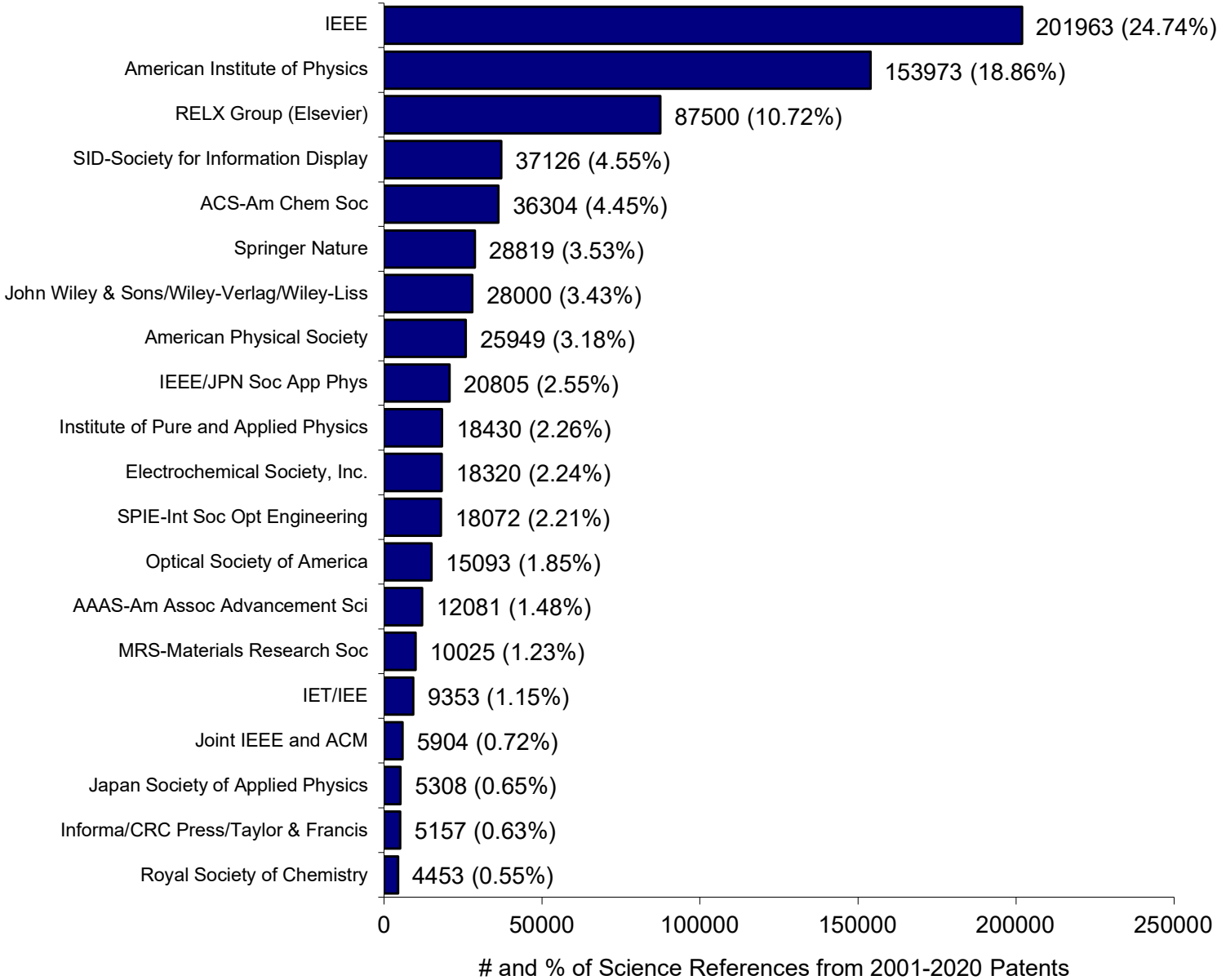


Figure 18 - # and % of Science References from 2001-2020 Smart Meter/Smart Grid US Patents to Top 20 Publishers, Conference Organizers, and Standards Organizations

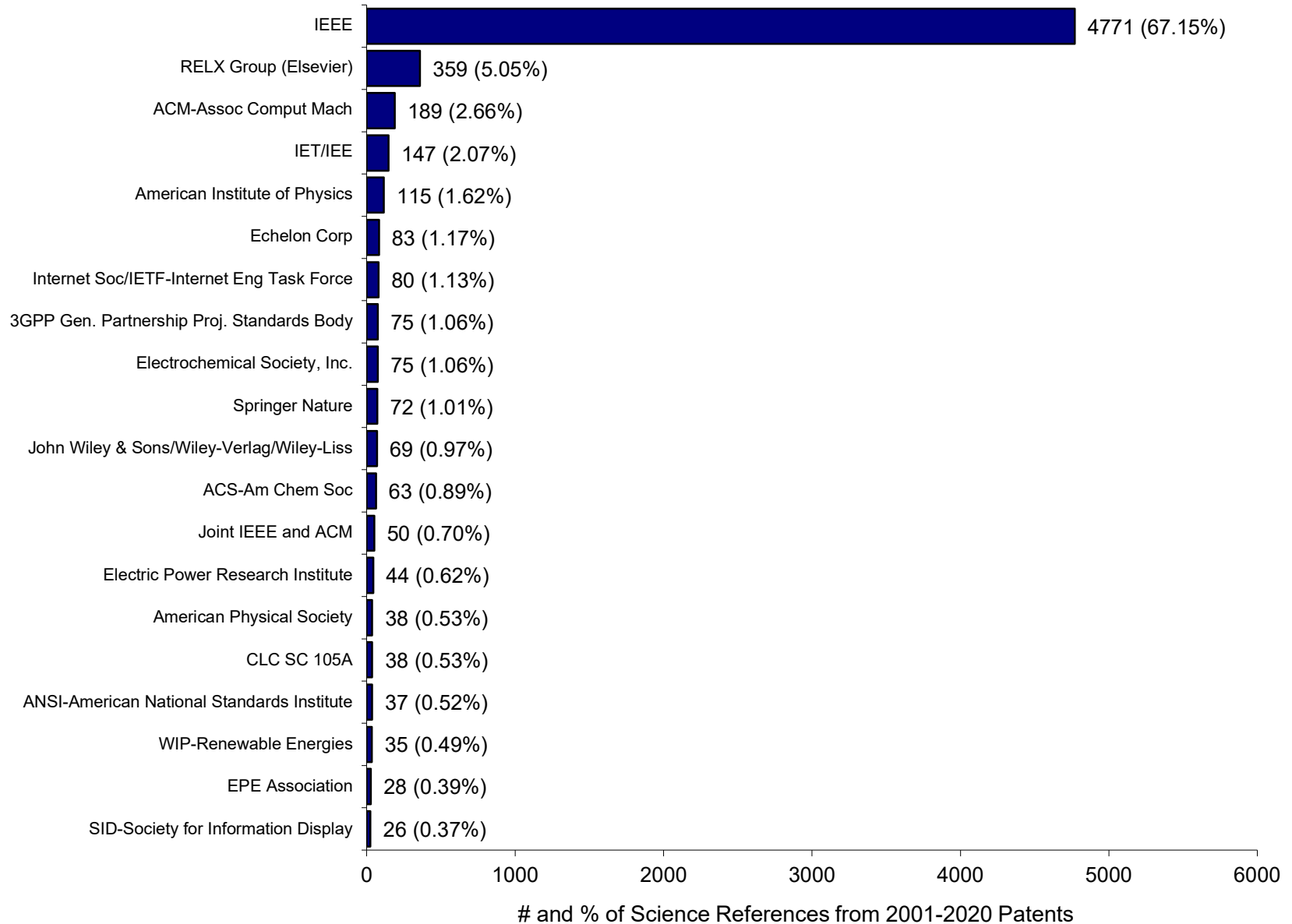


Figure 19 - # and % of Science References from 2001-2020 Solar/Photovoltaic US Patents to Top 20 Publishers, Conference Organizers, and Standards Organizations

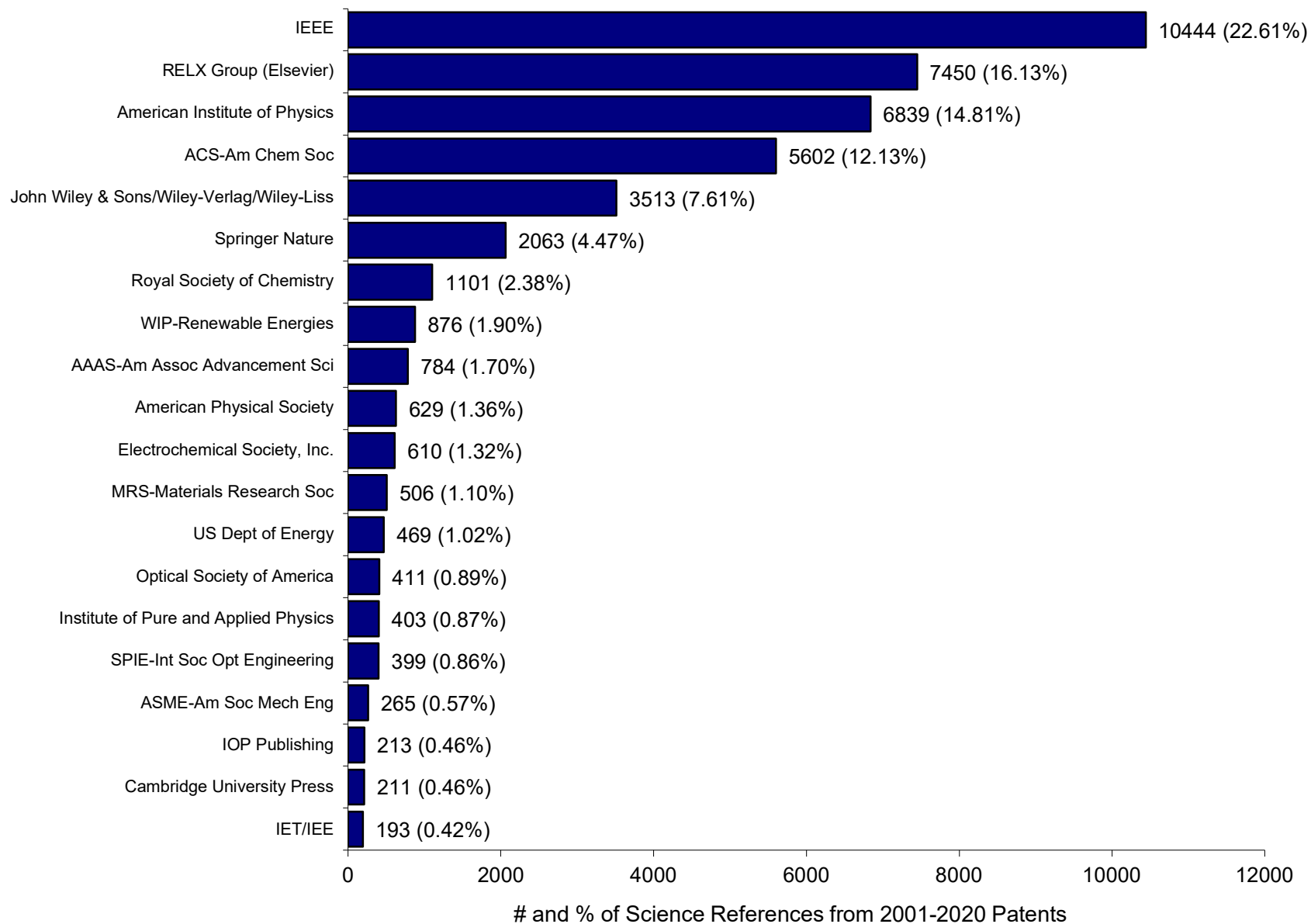


Figure 20 - # and % of Science References from 2001-2020 Telecommunications US Patents to Top 20 Publishers, Conference Organizers, and Standards Organizations

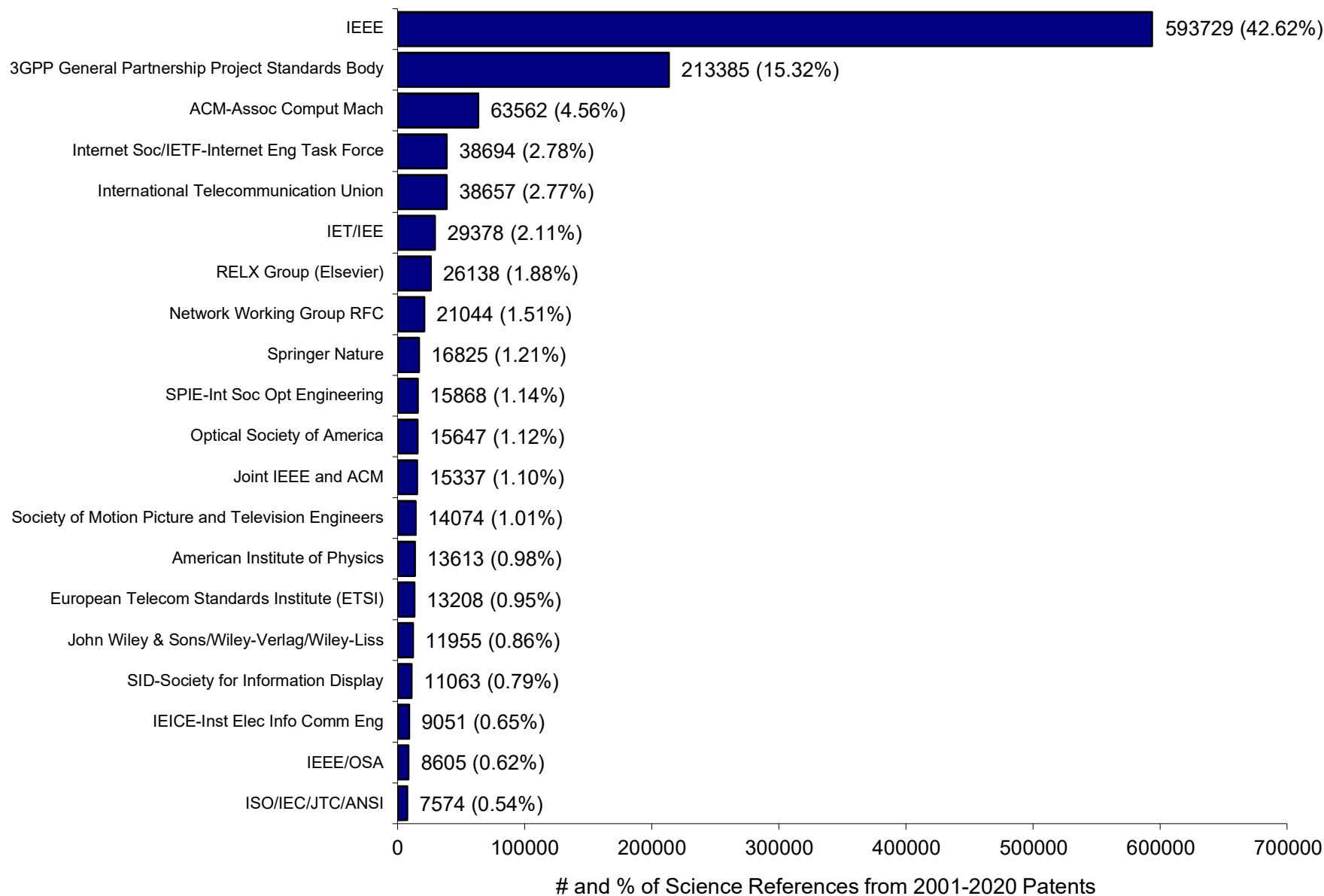


Figure 21 - # and % of Science References from 2001-2020 Virtual/Augmented Reality US Patents to Top 20 Publishers, Conference Organizers, and Standards Organizations

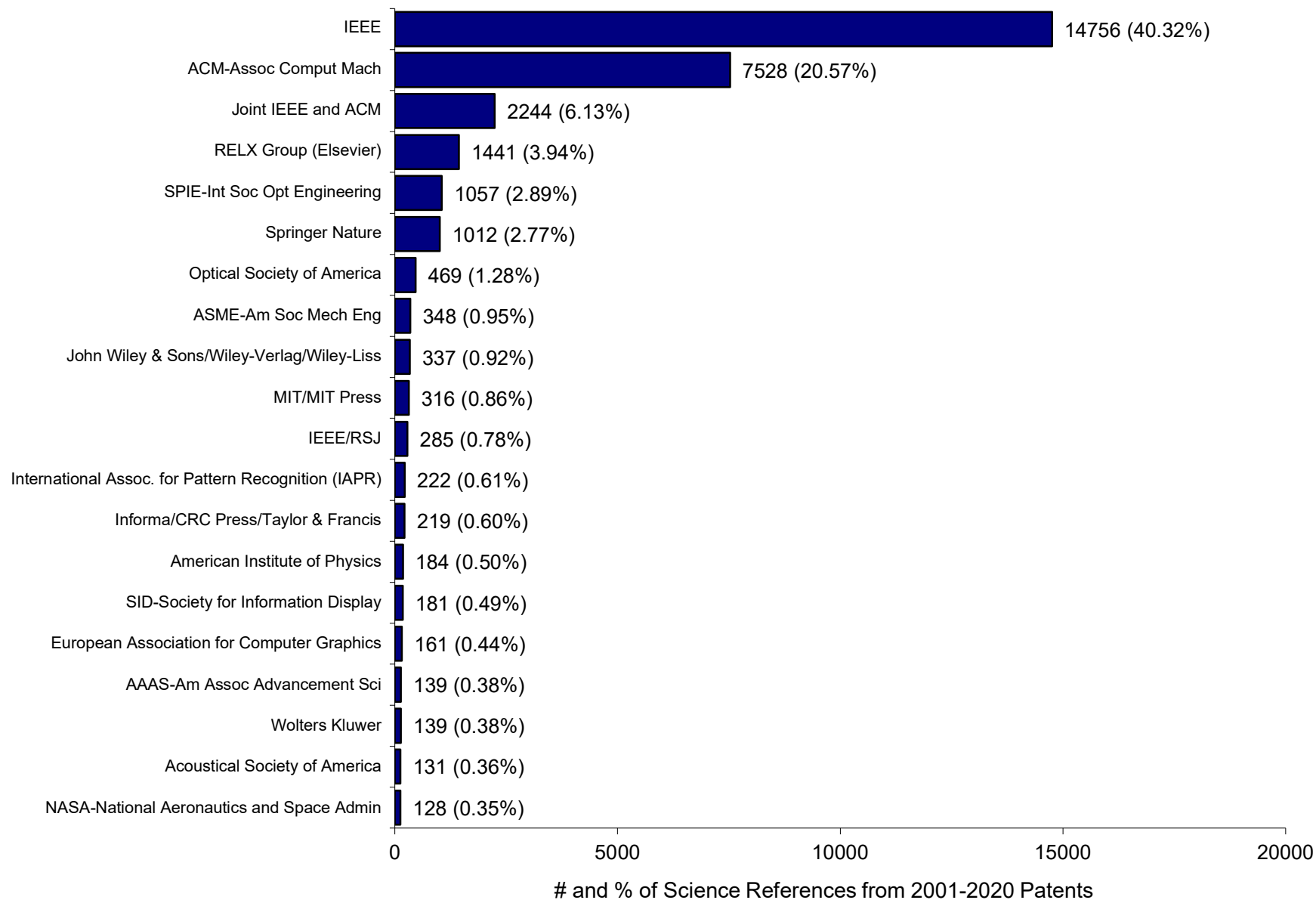


Figure 22 - # and % of Science References from 2001-2020 Wind Energy US Patents to Top 20 Publishers, Conference Organizers, and Standards Organizations

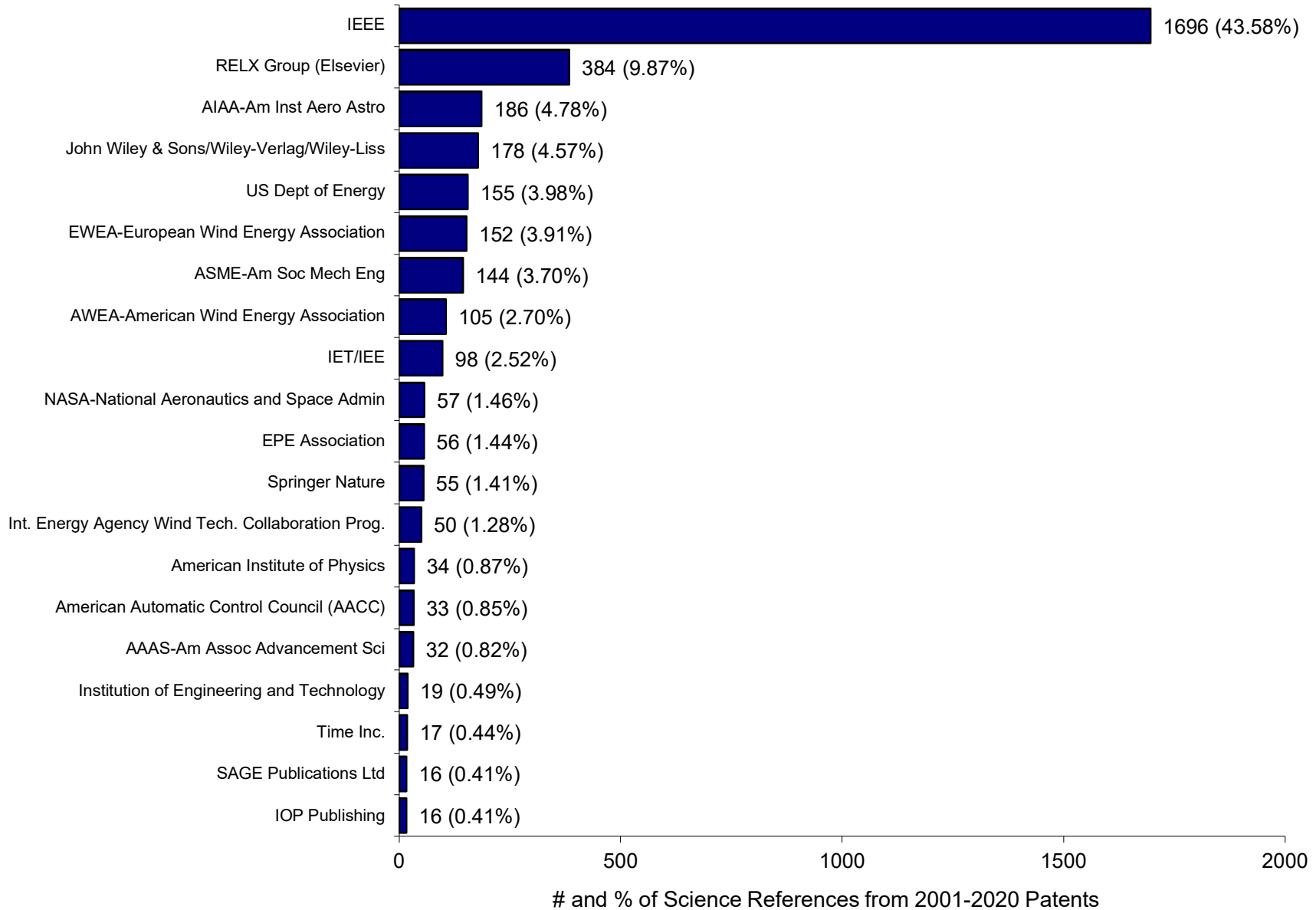
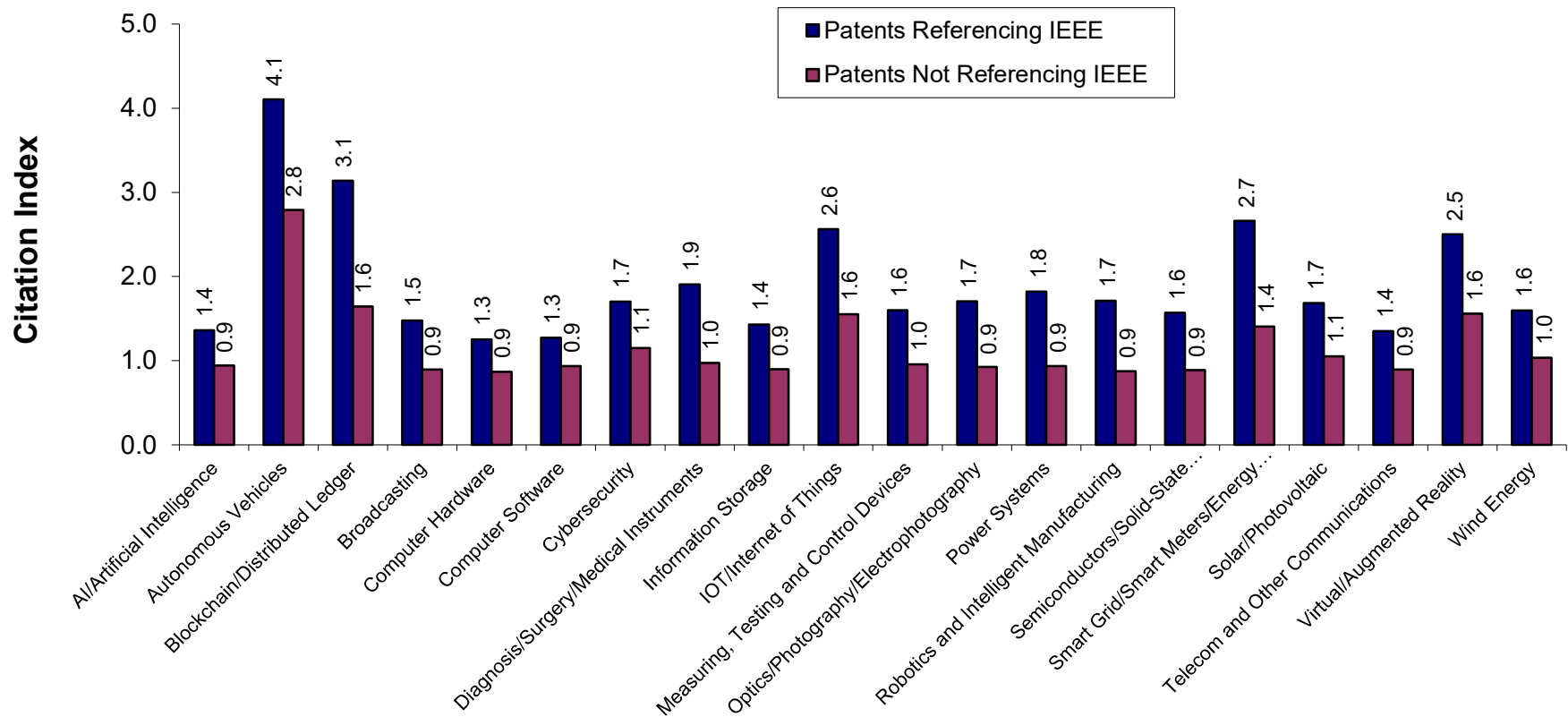


Figure 23 - 2001-2020 Citation Index of US Patents Referencing IEEE Papers and Conferences Versus US Patents not Referencing IEEE for 20 Categories



**Appendix A - Publishers Receiving Most References from Top 50 Companies
(Top 50 Companies in terms of 2020 Patent Activity; References from 2001-2020 Patents)**

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
Amazon.com Inc.		
IEEE	4118	27.8
ACM-Assoc Comput Mach	3946	26.6
Internet Soc/IETF-Internet Eng Task Force	761	5.1
RELX Group (Elsevier)	672	4.5
Joint IEEE and ACM	485	3.3
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	427	2.9
The USENIX Association	255	1.7
International Data Group	245	1.7
Springer Nature	235	1.6
Information Processing Society of Japan	239	1.6
Ziff-Davis	197	1.3
CBS Interactive	184	1.2
Network Working Group RFC	158	1.1
New York Times	147	1.0
204 others with less than 1% each	2741	17.1
Apple Inc		
IEEE	37661	41.3
ACM-Assoc Comput Mach	20365	22.3
RELX Group (Elsevier)	3378	3.7
Joint IEEE and ACM	1618	1.8
ISCA (International Speech Communication Association)	1488	1.6
Springer Nature	1420	1.6
3GPP General Partnership Project Standards Body	1285	1.4
371 others with less than 1% each	23961	24.4
AT&T Inc		
IEEE	31873	54.3
ACM-Assoc Comput Mach	4177	7.1
RELX Group (Elsevier)	1663	2.8
IET/IEE	1495	2.5
Springer Nature	1132	1.9
Internet Soc/IETF-Internet Eng Task Force	978	1.7
IEEE/OSA	785	1.3
Optical Society of America	734	1.3
3GPP General Partnership Project Standards Body	677	1.2
International Telecommunication Union	720	1.2
Joint IEEE and ACM	712	1.2
American Institute of Physics	629	1.1
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	601	1.0
354 others with less than 1% each	12494	19.2

**Appendix A - Publishers Receiving Most References from Top 50 Companies
(Top 50 Companies in terms of 2020 Patent Activity; References from 2001-2020 Patents)**

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
BOE Technology Group Ltd		
ACS-Am Chem Soc	65	14.8
RELX Group (Elsevier)	51	11.6
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	50	11.4
American Institute of Physics	50	11.4
IEEE	45	10.3
SID-Society for Information Display	29	6.6
Springer Nature	22	5.0
China Academic Journal Electronic Publishing House	12	2.7
Optical Society of America	12	2.7
Royal Society of Chemistry	11	2.5
Institute of Pure and Applied Physics	10	2.3
American Physical Society	8	1.8
Informa/CRC Press/Taylor & Francis	8	1.8
Electrochemical Society, Inc.	6	1.4
Hindawi Publishing Corporation	5	1.1
SPIE-Int Soc Opt Engineering	5	1.1
30 others with less than 1% each	49	11.0
Boeing Co. (The)		
IEEE	3698	26.5
RELX Group (Elsevier)	1968	14.1
AIAA-Am Inst Aero Astro	1204	8.6
American Institute of Physics	520	3.7
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	504	3.6
SPIE-Int Soc Opt Engineering	491	3.5
Springer Nature	404	2.9
ACM-Assoc Comput Mach	346	2.5
NASA-National Aeronautics and Space Admin	305	2.2
ACS-Am Chem Soc	290	2.1
SAE-Society of Automobile Engineers	291	2.1
SAGE Publications Ltd	195	1.4
ASME-Am Soc Mech Eng	178	1.3
Optical Society of America	167	1.2
American Physical Society	165	1.2
McGraw Hill	146	1.0
339 others with less than 1% each	3109	20.0

***Appendix A - Publishers Receiving Most References from Top 50 Companies
(Top 50 Companies in terms of 2020 Patent Activity; References from 2001-2020 Patents)***

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
<i>Bosch (Robert) GmbH</i>		
IEEE	2559	24.4
RELX Group (Elsevier)	947	9.0
Springer Nature	784	7.5
American Diabetes Association	361	3.4
Amer Thoracic Soc	347	3.3
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	245	2.3
SAE-Society of Automobile Engineers	233	2.2
Electrochemical Society, Inc.	225	2.1
SAGE Publications Ltd	205	2.0
American Medical Informatics Association	193	1.8
ACS-Am Chem Soc	186	1.8
Georg Thieme Verlag	186	1.8
Wichtig Publishing	175	1.7
Ziff-Davis	162	1.5
SPIE-Int Soc Opt Engineering	146	1.4
Wolters Kluwer	122	1.2
ACM-Assoc Comput Mach	110	1.0
Multidisciplinary Digital Publishing Institute (MDPI)	103	1.0
IET/IEEE	103	1.0
Assoc Advancement Medical Instrumentation-AAMI	102	1.0
250 others with less than 1% each	3006	26.4
<i>Canon Inc</i>		
IEEE	6688	22.0
RELX Group (Elsevier)	3730	12.3
American Institute of Physics	3686	12.1
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	1621	5.3
SPIE-Int Soc Opt Engineering	1575	5.2
ACS-Am Chem Soc	1537	5.1
Springer Nature	1202	4.0
ACM-Assoc Comput Mach	958	3.2
Optical Society of America	765	2.5
Institute of Pure and Applied Physics	511	1.7
AAAS-Am Assoc Advancement Sci	414	1.4
International Telecommunication Union	359	1.2
American Physical Society	302	1.0
447 others with less than 1% each	7024	19.5

***Appendix A - Publishers Receiving Most References from Top 50 Companies
(Top 50 Companies in terms of 2020 Patent Activity; References from 2001-2020 Patents)***

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
Cisco Systems Inc.		
IEEE	14410	31.9
Internet Soc/IETF-Internet Eng Task Force	7071	15.7
ACM-Assoc Comput Mach	5212	11.5
Network Working Group RFC	4880	10.8
3GPP General Partnership Project Standards Body	2306	5.1
Joint IEEE and ACM	1043	2.3
European Telecom Standards Institute (ETSI)	940	2.1
International Telecommunication Union	780	1.7
RELX Group (Elsevier)	728	1.6
272 others with less than 1% each	7778	15.1
Dell Technologies Inc		
ACM-Assoc Comput Mach	5817	37.1
IEEE	4019	25.7
The USENIX Association	1200	7.7
Internet Soc/IETF-Internet Eng Task Force	816	5.2
Joint IEEE and ACM	629	4.0
RELX Group (Elsevier)	291	1.9
Springer Nature	213	1.4
220 others with less than 1% each	2676	14.9
Denso Corp		
IEEE	680	39.9
RELX Group (Elsevier)	173	10.2
American Institute of Physics	99	5.8
SAE-Society of Automobile Engineers	69	4.0
IET/IEE	58	3.4
Springer Nature	43	2.5
Institute of Pure and Applied Physics	39	2.3
ACM-Assoc Comput Mach	37	2.2
IEICE-Inst Elec Info Comm Eng	36	2.1
ACS-Am Chem Soc	29	1.7
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	25	1.5
Electrochemical Society, Inc.	20	1.2
Trans Tech Publications Ltd.	19	1.1
126 others with less than 1% each	377	24.8

Appendix A - Publishers Receiving Most References from Top 50 Companies (Top 50 Companies in terms of 2020 Patent Activity; References from 2001-2020 Patents)

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
<i>Ericsson</i>		
3GPP General Partnership Project Standards Body	17836	37.6
IEEE	14547	30.6
Network Working Group RFC	3490	7.4
Internet Soc/IETF-Internet Eng Task Force	2643	5.6
ACM-Assoc Comput Mach	957	2.0
Optical Society of America	905	1.9
European Telecom Standards Institute (ETSI)	872	1.8
International Telecommunication Union	778	1.6
IET/IEE	621	1.3
272 others with less than 1% each	4819	8.2
<i>Facebook Inc</i>		
IEEE	1772	29.4
ACM-Assoc Comput Mach	1682	27.9
RELX Group (Elsevier)	245	4.1
Dow Jones & Co.	197	3.3
Internet Soc/IETF-Internet Eng Task Force	149	2.5
Joint IEEE and ACM	148	2.5
Springer Nature	136	2.3
Condé Nast	107	1.8
CBS Interactive	106	1.8
New York Times	88	1.5
C M P Media	81	1.3
Ziff-Davis	73	1.2
FUJITSU LTD	65	1.1
Gannett Co.	60	1.0
115 others with less than 1% each	1113	17.4
<i>Ford Motor Co.</i>		
SAE-Society of Automobile Engineers	2339	31.8
IEEE	1669	22.7
RELX Group (Elsevier)	811	11.0
IP.Com	344	4.7
American Automatic Control Council (AACC)	187	2.5
ACS-Am Chem Soc	154	2.1
ACM-Assoc Comput Mach	142	1.9
IEEE/RSJ	105	1.4
Society of Automotive Engineers of Japan, Inc. (JSAE)	93	1.3
Springer Nature	93	1.3
ASME-Am Soc Mech Eng	89	1.2
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	74	1.0
IET/IEE	73	1.0
179 others with less than 1% each	1186	14.6

***Appendix A - Publishers Receiving Most References from Top 50 Companies
(Top 50 Companies in terms of 2020 Patent Activity; References from 2001-2020 Patents)***

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
<i>Fuji Film Holdings Corp</i>		
IEEE	2066	13.9
RELX Group (Elsevier)	1840	12.4
ACM-Assoc Comput Mach	1361	9.2
ACS-Am Chem Soc	1124	7.6
Springer Nature	970	6.5
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	891	6.0
SPIE-Int Soc Opt Engineering	696	4.7
American Institute of Physics	672	4.5
AAAS-Am Assoc Advancement Sci	250	1.7
Optical Society of America	238	1.6
Cell Press	218	1.5
Natl Acad Sciences	201	1.4
Oxford University Press	158	1.1
IEICE-Inst Elec Info Comm Eng	147	1.0
Institute of Pure and Applied Physics	152	1.0
424 others with less than 1% each	3853	21.6
<i>Fujitsu Limited</i>		
IEEE	9495	37.0
3GPP General Partnership Project Standards Body	2907	11.3
ACM-Assoc Comput Mach	1152	4.5
Joint IEEE and ACM	1118	4.4
Optical Society of America	1081	4.2
IEICE-Inst Elec Info Comm Eng	1013	3.9
RELX Group (Elsevier)	861	3.4
American Institute of Physics	699	2.7
IET/IEE	585	2.3
IEEE/OSA	580	2.3
European Conference on Optical Communication (ECOC) Society	496	1.9
International Telecommunication Union	401	1.6
Internet Soc/IETF-Internet Eng Task Force	398	1.6
Springer Nature	351	1.4
ATM Forum Standards Body	309	1.2
353 others with less than 1% each	4211	13.5

***Appendix A - Publishers Receiving Most References from Top 50 Companies
(Top 50 Companies in terms of 2020 Patent Activity; References from 2001-2020 Patents)***

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
General Electric Company		
US Dept of Energy	10564	20.7
IEEE	8698	17.0
RELX Group (Elsevier)	6257	12.3
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	3564	7.0
General Electric Co.	3428	6.7
ACS-Am Chem Soc	2045	4.0
Springer Nature	1600	3.1
American Institute of Physics	1358	2.7
Wolters Kluwer	692	1.4
ASME-Am Soc Mech Eng	642	1.3
SPIE-Int Soc Opt Engineering	649	1.3
American Physical Society	512	1.0
685 others with less than 1% each	11029	17.6
Google Inc.		
IEEE	20211	35.4
ACM-Assoc Comput Mach	12813	22.4
RELX Group (Elsevier)	2506	4.4
Springer Nature	1652	2.9
SPIE-Int Soc Opt Engineering	1512	2.6
International Telecommunication Union	1406	2.5
3GPP General Partnership Project Standards Body	1059	1.9
Joint IEEE and ACM	987	1.7
World Wide Web Consortium	958	1.7
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	849	1.5
ACL - Association for Computational Linguistics	731	1.3
401 others with less than 1% each	12458	20.4

Appendix A - Publishers Receiving Most References from Top 50 Companies (Top 50 Companies in terms of 2020 Patent Activity; References from 2001-2020 Patents)

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
<i>Hitachi Ltd</i>		
IEEE	5481	26.0
ACM-Assoc Comput Mach	1471	7.0
RELX Group (Elsevier)	1418	6.7
American Institute of Physics	1318	6.2
IEICE-Inst Elec Info Comm Eng	770	3.6
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	602	2.9
Internet Soc/IETF-Internet Eng Task Force	574	2.7
Springer Nature	487	2.3
ACS-Am Chem Soc	455	2.2
The USENIX Association	416	2.0
Institute of Pure and Applied Physics	380	1.8
International Telecommunication Union	352	1.7
Network Working Group RFC	344	1.6
Nikkei Business Publications, Inc.	309	1.5
SPIE-Int Soc Opt Engineering	303	1.4
SID-Society for Information Display	267	1.3
Joint IEEE and ACM	253	1.2
3GPP General Partnership Project Standards Body	251	1.2
American Physical Society	229	1.1
Optical Society of America	222	1.1
IBM Corp.	235	1.1
IEEE/JPN Soc App Phys	238	1.1
IET/IEE	241	1.1
433 others with less than 1% each	4503	17.7
<i>Hon Hai Precision Industry Co. Ltd.(also known as Foxconn]</i>		
3GPP General Partnership Project Standards Body	5803	24.1
IEEE	4608	19.1
American Institute of Physics	1533	6.4
SID-Society for Information Display	1421	5.9
RELX Group (Elsevier)	1139	4.7
ACM-Assoc Comput Mach	1046	4.3
ACS-Am Chem Soc	844	3.5
International Telecommunication Union	737	3.1
ISO/IEC/JTC	521	2.2
SPIE-Int Soc Opt Engineering	524	2.2
Springer Nature	531	2.2
AAAS-Am Assoc Advancement Sci	481	2.0
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	484	2.0
Institute of Pure and Applied Physics	341	1.4
American Physical Society	309	1.3
Internet Soc/IETF-Internet Eng Task Force	285	1.2
IEICE-Inst Elec Info Comm Eng	290	1.2
278 others with less than 1% each	3185	10.5

**Appendix A - Publishers Receiving Most References from Top 50 Companies
(Top 50 Companies in terms of 2020 Patent Activity; References from 2001-2020 Patents)**

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
Honda Motor Co. Ltd.(Honda Giken Kogyo KK)		
IEEE	2326	38.4
RELX Group (Elsevier)	922	15.2
Springer Nature	391	6.5
IEEE/RSJ	196	3.2
ACS-Am Chem Soc	189	3.1
ACM-Assoc Comput Mach	177	2.9
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	138	2.3
ASME-Am Soc Mech Eng	138	2.3
AAAS-Am Assoc Advancement Sci	75	1.2
Electrochemical Society, Inc.	65	1.1
American Institute of Physics	61	1.0
237 others with less than 1% each	1375	19.3
Honeywell International Inc.		
IEEE	8500	30.8
RELX Group (Elsevier)	4140	15.0
ACS-Am Chem Soc	2034	7.4
SPIE-Int Soc Opt Engineering	1341	4.9
Springer Nature	1052	3.8
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	997	3.6
American Institute of Physics	752	2.7
Optical Society of America	505	1.8
ACM-Assoc Comput Mach	440	1.6
Royal Society of Chemistry	369	1.3
SAE-Society of Automobile Engineers	328	1.2
IET/IEE	275	1.0
450 others with less than 1% each	6871	21.4
HP Inc		
IEEE	8528	30.7
ACM-Assoc Comput Mach	4030	14.5
RELX Group (Elsevier)	1251	4.5
Joint IEEE and ACM	1172	4.2
Internet Soc/IETF-Internet Eng Task Force	1075	3.9
American Institute of Physics	969	3.5
Springer Nature	870	3.1
SPIE-Int Soc Opt Engineering	645	2.3
The USENIX Association	545	2.0
ACS-Am Chem Soc	521	1.9
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	391	1.4
American Physical Society	312	1.1
Optical Society of America	309	1.1
AAAS-Am Assoc Advancement Sci	303	1.1
Network Working Group RFC	269	1.0
411 others with less than 1% each	6561	21.2

Appendix A - Publishers Receiving Most References from Top 50 Companies (Top 50 Companies in terms of 2020 Patent Activity; References from 2001-2020 Patents)

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
<i>Huawei Technologies Company Ltd. (owned by HUAWEI Investme</i>		
3GPP General Partnership Project Standards Body	13964	40.3
IEEE	9617	27.8
International Telecommunication Union	2544	7.3
Internet Soc/IETF-Internet Eng Task Force	2297	6.6
Network Working Group RFC	1501	4.3
ACM-Assoc Comput Mach	643	1.9
European Telecom Standards Institute (ETSI)	450	1.3
Open Mobile Alliance (Standards Org)	395	1.1
214 others with less than 1% each	3210	7.3
<i>Hyundai Motor Co.</i>		
RELX Group (Elsevier)	166	29.8
IEEE	148	26.6
ACS-Am Chem Soc	47	8.4
SAE-Society of Automobile Engineers	26	4.7
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	26	4.7
Springer Nature	22	3.9
ACM-Assoc Comput Mach	16	2.9
Royal Society of Chemistry	12	2.2
American Institute of Physics	11	2.0
American Automatic Control Council (AACC)	11	2.0
Electrochemical Society, Inc.	10	1.8
IET/IEE	6	1.1
41 others with less than 1% each	56	10.7
<i>Intel Corporation</i>		
IEEE	33914	46.8
3GPP General Partnership Project Standards Body	7492	10.3
ACM-Assoc Comput Mach	5446	7.5
Joint IEEE and ACM	4701	6.5
RELX Group (Elsevier)	1884	2.6
American Institute of Physics	1593	2.2
IET/IEE	1113	1.5
Springer Nature	995	1.4
Internet Soc/IETF-Internet Eng Task Force	768	1.1
IEEE/JPN Soc App Phys	807	1.1
443 others with less than 1% each	13800	16.7

***Appendix A - Publishers Receiving Most References from Top 50 Companies
(Top 50 Companies in terms of 2020 Patent Activity; References from 2001-2020 Patents)***

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
<i>International Business Machines Corp</i>		
IEEE	60229	32.9
ACM-Assoc Comput Mach	32357	17.7
Joint IEEE and ACM	9958	5.4
RELX Group (Elsevier)	7879	4.3
IP.Com	6125	3.3
Internet Soc/IETF-Internet Eng Task Force	5743	3.1
American Institute of Physics	5286	2.9
Springer Nature	4477	2.4
IBM Corp.	4042	2.2
ACS-Am Chem Soc	3066	1.7
The USENIX Association	2768	1.5
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	2518	1.4
SPIE-Int Soc Opt Engineering	2114	1.2
National Institute of Standards and Technology (NIST)	2046	1.1
Very Large Data Base Endowment Inc. (VLDB Endowment)	1839	1.0
834 others with less than 1% each	32577	13.7
<i>Johnson & Johnson</i>		
RELX Group (Elsevier)	41875	23.4
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	18689	10.4
Springer Nature	16333	9.1
ACS-Am Chem Soc	11116	6.2
Wolters Kluwer	8304	4.6
Natl Acad Sciences	4762	2.7
IEEE	3320	1.9
American SociETY for Microbiology	2900	1.6
Oxford University Press	2662	1.5
AAAS-Am Assoc Advancement Sci	2645	1.5
Cell Press	2375	1.3
American Society for Pharmacology and Experimental Therapeutics	2326	1.3
Am Soc Biochemistry Molec Biology	2139	1.2
Mary Ann Liebert Inc.	1841	1.0
Mosby Inc.	1805	1.0
American Association of Immunologists	1731	1.0
761 others with less than 1% each	54281	25.6

Appendix A - Publishers Receiving Most References from Top 50 Companies
(Top 50 Companies in terms of 2020 Patent Activity; References from 2001-2020 Patents)

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
Kia Motors Corp.		
IEEE	46	31.5
RELX Group (Elsevier)	36	24.7
SAE-Society of Automobile Engineers	20	13.7
ACS-Am Chem Soc	13	8.9
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	4	2.7
Springer Nature	4	2.7
American Institute of Physics	3	2.1
IET/IEE	3	2.1
Royal Society of Chemistry	3	2.1
ACM-Assoc Comput Mach	3	2.1
11 others with less than 1% each	11	7.7
Kyocera Corp.		
3GPP General Partnership Project Standards Body	1545	38.8
IEEE	1216	30.5
RELX Group (Elsevier)	212	5.3
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	116	2.9
Electrochemical Society, Inc.	111	2.8
Springer Nature	65	1.6
American Institute of Physics	61	1.5
ACS-Am Chem Soc	52	1.3
IET/IEE	53	1.3
ACM-Assoc Comput Mach	47	1.2
IEICE-Inst Elec Info Comm Eng	41	1.0
111 others with less than 1% each	467	11.6
LG Chem Ltd.		
RELX Group (Elsevier)	752	29.7
ACS-Am Chem Soc	453	17.9
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	348	13.8
Royal Society of Chemistry	194	7.7
Electrochemical Society, Inc.	153	6.0
American Institute of Physics	146	5.8
Springer Nature	84	3.3
IEEE	38	1.5
AAAS-Am Assoc Advancement Sci	32	1.3
American Physical Society	25	1.0
78 others with less than 1% each	304	11.1

***Appendix A - Publishers Receiving Most References from Top 50 Companies
(Top 50 Companies in terms of 2020 Patent Activity; References from 2001-2020 Patents)***

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
<i>LG Display Co Ltd</i>		
SID-Society for Information Display	1125	44.4
Korean Information Display Society (KIDS)	349	13.8
American Institute of Physics	229	9.0
Institute of Pure and Applied Physics	118	4.7
IEEE	111	4.4
RELX Group (Elsevier)	96	3.8
Springer Nature	80	3.2
SPIE-Int Soc Opt Engineering	63	2.5
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	54	2.1
ACS-Am Chem Soc	49	1.9
National Symposium on Information Display	29	1.1
MRS-Materials Research Soc	29	1.1
49 others with less than 1% each	204	7.2
<i>LG Electronics Inc.</i>		
3GPP General Partnership Project Standards Body	23857	54.3
IEEE	9095	20.7
ISO/IEC/JTC/ANSI	1563	3.6
International Telecommunication Union	1308	3.0
ATSC Std	1180	2.7
European Telecom Standards Institute (ETSI)	1109	2.5
Audio Eng Soc	817	1.9
ISO-International Standards Organization	455	1.0
170 others with less than 1% each	4515	9.7
<i>Medtronic Inc</i>		
RELX Group (Elsevier)	25400	17.2
Wolters Kluwer	19011	12.9
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	13081	8.9
IEEE	12019	8.1
Springer Nature	11603	7.9
American Physiological Society	3653	2.5
Oxford University Press	3367	2.3
American Association of Neurological Surgeons	3289	2.2
ACS-Am Chem Soc	2668	1.8
Radiological Society of North America	2475	1.7
Mosby Inc.	2196	1.5
SPIE-Int Soc Opt Engineering	1893	1.3
International Federation of Gynecology and Obstetrics (FIGO)	1709	1.2
S. Karger AG	1536	1.0
591 others with less than 1% each	43640	26.4

Appendix A - Publishers Receiving Most References from Top 50 Companies (Top 50 Companies in terms of 2020 Patent Activity; References from 2001-2020 Patents)

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
<i>Micron Technology Inc.</i>		
IEEE	45877	34.0
RELX Group (Elsevier)	21538	15.9
American Institute of Physics	16045	11.9
IEEE/JPN Soc App Phys	5893	4.4
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	5264	3.9
ACS-Am Chem Soc	3589	2.7
Electrochemical Society, Inc.	3460	2.6
Institute of Pure and Applied Physics	3043	2.3
American Physical Society	2821	2.1
Springer Nature	2837	2.1
SPIE-Int Soc Opt Engineering	2124	1.6
MRS-Materials Research Soc	2115	1.6
Informa/CRC Press/Taylor & Francis	1405	1.0
271 others with less than 1% each	19096	13.1
<i>Microsoft Corporation</i>		
IEEE	66153	34.2
ACM-Assoc Comput Mach	54517	28.2
Joint IEEE and ACM	6030	3.1
RELX Group (Elsevier)	6047	3.1
Springer Nature	4423	2.3
The USENIX Association	4047	2.1
Internet Soc/IETF-Internet Eng Task Force	3045	1.6
International Telecommunication Union	2723	1.4
SPIE-Int Soc Opt Engineering	2360	1.2
647 others with less than 1% each	44004	18.7
<i>Mitsubishi Electric Corp</i>		
IEEE	5854	44.8
3GPP General Partnership Project Standards Body	1309	10.0
ACM-Assoc Comput Mach	874	6.7
IEICE-Inst Elec Info Comm Eng	463	3.5
RELX Group (Elsevier)	428	3.3
IET/IEE	331	2.5
American Institute of Physics	308	2.4
International Telecommunication Union	251	1.9
Springer Nature	226	1.7
SPIE-Int Soc Opt Engineering	205	1.6
International Association for Cryptologic Research (IACR)	211	1.6
IEEE/JPN Soc App Phys	176	1.3
Optical Society of America	135	1.0
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	129	1.0
253 others with less than 1% each	2153	14.2

***Appendix A - Publishers Receiving Most References from Top 50 Companies
(Top 50 Companies in terms of 2020 Patent Activity; References from 2001-2020 Patents)***

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
NEC Corp		
IEEE	8033	33.1
3GPP General Partnership Project Standards Body	5083	20.9
ACM-Assoc Comput Mach	1215	5.0
IEICE-Inst Elec Info Comm Eng	1015	4.2
American Institute of Physics	788	3.2
RELX Group (Elsevier)	758	3.1
Joint IEEE and ACM	603	2.5
Springer Nature	494	2.0
Optical Society of America	456	1.9
IET/IEE	364	1.5
Internet Soc/IETF-Internet Eng Task Force	313	1.3
SPIE-Int Soc Opt Engineering	234	1.0
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	237	1.0
IEEE/OSA	247	1.0
356 others with less than 1% each	4431	14.7
Panasonic Corporation		
IEEE	10523	31.8
3GPP General Partnership Project Standards Body	5000	15.1
RELX Group (Elsevier)	2001	6.0
IEICE-Inst Elec Info Comm Eng	1586	4.8
International Telecommunication Union	1558	4.7
American Institute of Physics	1321	4.0
Institute of Pure and Applied Physics	938	2.8
Internet Soc/IETF-Internet Eng Task Force	595	1.8
ACM-Assoc Comput Mach	511	1.5
Electrochemical Society, Inc.	483	1.5
ACS-Am Chem Soc	469	1.4
Springer Nature	452	1.4
SPIE-Int Soc Opt Engineering	425	1.3
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	391	1.2
ISO/IEC/JTC/ANSI	359	1.1
IET/IEE	375	1.1
403 others with less than 1% each	6124	16.1

Appendix A - Publishers Receiving Most References from Top 50 Companies (Top 50 Companies in terms of 2020 Patent Activity; References from 2001-2020 Patents)

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
Qualcomm Inc		
IEEE	40194	42.4
3GPP General Partnership Project Standards Body	17909	18.9
International Telecommunication Union	7643	8.1
ISO/IEC/JTC/ANSI	2610	2.8
ACM-Assoc Comput Mach	1909	2.0
RELX Group (Elsevier)	1764	1.9
SID-Society for Information Display	1808	1.9
Internet Soc/IETF-Internet Eng Task Force	1788	1.9
SPIE-Int Soc Opt Engineering	1345	1.4
European Telecom Standards Institute (ETSI)	1103	1.2
IET/IEE	1082	1.1
American Institute of Physics	1038	1.1
Springer Nature	989	1.0
Network Working Group RFC	924	1.0
ISO/IEC/JTC	978	1.0
369 others with less than 1% each	11622	10.0
Raytheon Co.		
IEEE	6479	28.6
NASA-National Aeronautics and Space Admin	1528	6.8
RELX Group (Elsevier)	1398	6.2
ASME-Am Soc Mech Eng	1005	4.4
IHS Markit	957	4.2
SPIE-Int Soc Opt Engineering	786	3.5
AIAA-Am Inst Aero Astro	700	3.1
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	673	3.0
Springer Nature	580	2.6
SAE-Society of Automobile Engineers	554	2.4
Optical Society of America	550	2.4
American Institute of Physics	547	2.4
ACM-Assoc Comput Mach	473	2.1
IET/IEE	336	1.5
ACS-Am Chem Soc	339	1.5
American Physical Society	317	1.4
McGraw Hill	286	1.3
Cambridge University Press	251	1.1
SAGE Publications Ltd	230	1.0
IOP Publishing	222	1.0
360 others with less than 1% each	4417	16.7

**Appendix A - Publishers Receiving Most References from Top 50 Companies
(Top 50 Companies in terms of 2020 Patent Activity; References from 2001-2020 Patents)**

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
Samsung Electronics Co Ltd		
IEEE	15963	28.7
3GPP General Partnership Project Standards Body	11852	21.3
RELX Group (Elsevier)	3031	5.4
ACS-Am Chem Soc	2590	4.7
American Institute of Physics	2391	4.3
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	1754	3.1
ACM-Assoc Comput Mach	1544	2.8
Springer Nature	1435	2.6
International Telecommunication Union	1420	2.5
SID-Society for Information Display	985	1.8
SPIE-Int Soc Opt Engineering	748	1.3
Audio Eng Soc	609	1.1
Joint IEEE and ACM	533	1.0
European Telecom Standards Institute (ETSI)	567	1.0
532 others with less than 1% each	10276	15.0
Samsung SDI Co Ltd		
American Institute of Physics	1811	20.8
RELX Group (Elsevier)	1783	20.5
ACS-Am Chem Soc	1147	13.2
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	769	8.8
SID-Society for Information Display	489	5.6
IEEE	358	4.1
Springer Nature	304	3.5
Royal Society of Chemistry	244	2.8
Electrochemical Society, Inc.	214	2.5
Institute of Pure and Applied Physics	166	1.9
IEC-International Electrotechnical Commission	152	1.7
American Physical Society	136	1.6
J. Van Voorst	109	1.3
143 others with less than 1% each	1012	9.6

**Appendix A - Publishers Receiving Most References from Top 50 Companies
(Top 50 Companies in terms of 2020 Patent Activity; References from 2001-2020 Patents)**

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
Seiko Epson Corporation		
IEEE	2996	33.4
Joint IEEE and ACM	704	7.9
ACM-Assoc Comput Mach	689	7.7
RELX Group (Elsevier)	643	7.2
American Institute of Physics	617	6.9
SID-Society for Information Display	460	5.1
ACS-Am Chem Soc	276	3.1
Springer Nature	205	2.3
IEEE/JPN Soc App Phys	181	2.0
Institute of Pure and Applied Physics	160	1.8
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	160	1.8
IBM Corp.	149	1.7
SPIE-Int Soc Opt Engineering	123	1.4
American Physical Society	98	1.1
IEICE-Inst Elec Info Comm Eng	100	1.1
Optical Society of America	90	1.0
198 others with less than 1% each	1308	12.3
Siemens Aktiengesellschaft		
IEEE	13130	36.1
RELX Group (Elsevier)	3736	10.3
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	2993	8.2
SPIE-Int Soc Opt Engineering	1577	4.3
Joint IEEE and ACM	1194	3.3
Springer Nature	1200	3.3
American Institute of Physics	811	2.2
ACM-Assoc Comput Mach	810	2.2
ACS-Am Chem Soc	481	1.3
Society of Magnetic Resonance in Medicine (SMRM)	481	1.3
Wolters Kluwer	422	1.2
Radiological Society of North America	412	1.1
608 others with less than 1% each	9169	21.2

**Appendix A - Publishers Receiving Most References from Top 50 Companies
(Top 50 Companies in terms of 2020 Patent Activity; References from 2001-2020 Patents)**

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
SK Hynix Inc		
IEEE	1313	54.9
American Institute of Physics	139	5.8
IEEE/JPN Soc App Phys	119	5.0
RELX Group (Elsevier)	105	4.4
Technical Association of Photopolymers	104	4.3
Joint IEEE and ACM	70	2.9
SPIE-Int Soc Opt Engineering	67	2.8
ACS-Am Chem Soc	53	2.2
ACM-Assoc Comput Mach	51	2.1
Electrochemical Society, Inc.	37	1.5
Springer Nature	34	1.4
Institute of Pure and Applied Physics	29	1.2
Japan Society of Applied Physics	27	1.1
59 others with less than 1% each	244	9.7
Sony Corp		
IEEE	13100	41.1
ACM-Assoc Comput Mach	2574	8.1
3GPP General Partnership Project Standards Body	2002	6.3
RELX Group (Elsevier)	1435	4.5
International Telecommunication Union	1395	4.4
SPIE-Int Soc Opt Engineering	781	2.4
American Institute of Physics	619	1.9
Springer Nature	542	1.7
European Telecom Standards Institute (ETSI)	503	1.6
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	468	1.5
Joint IEEE and ACM	440	1.4
Internet Soc/IETF-Internet Eng Task Force	448	1.4
IEICE-Inst Elec Info Comm Eng	402	1.3
ACS-Am Chem Soc	382	1.2
IET/IEE	313	1.0
421 others with less than 1% each	6479	17.2
Taiwan Semiconductor Manufacturing Co.		
IEEE	9499	36.8
American Institute of Physics	7248	28.1
RELX Group (Elsevier)	2327	9.0
Electrochemical Society, Inc.	890	3.4
IEEE/JPN Soc App Phys	840	3.3
Institute of Pure and Applied Physics	646	2.5
SPIE-Int Soc Opt Engineering	594	2.3
Springer Nature	525	2.0
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	473	1.8
IET/IEE	280	1.1
MRS-Materials Research Soc	260	1.0
148 others with less than 1% each	2245	7.5

***Appendix A - Publishers Receiving Most References from Top 50 Companies
(Top 50 Companies in terms of 2020 Patent Activity; References from 2001-2020 Patents)***

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
<i>Texas Instruments Inc</i>		
IEEE	11495	63.7
American Institute of Physics	655	3.6
RELX Group (Elsevier)	647	3.6
3GPP General Partnership Project Standards Body	553	3.1
International Telecommunication Union	558	3.1
Joint IEEE and ACM	322	1.8
SPIE-Int Soc Opt Engineering	308	1.7
IEEE/JPN Soc App Phys	284	1.6
IET/IEE	271	1.5
SID-Society for Information Display	213	1.2
ACM-Assoc Comput Mach	205	1.1
Springer Nature	182	1.0
United Business Media/UBM Tech	178	1.0
224 others with less than 1% each	2169	9.4
<i>Toshiba Corp</i>		
IEEE	9247	40.3
American Institute of Physics	1765	7.7
RELX Group (Elsevier)	1453	6.3
IEEE/JPN Soc App Phys	884	3.9
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	732	3.2
American Physical Society	614	2.7
IEICE-Inst Elec Info Comm Eng	587	2.6
Springer Nature	526	2.3
ACM-Assoc Comput Mach	537	2.3
SPIE-Int Soc Opt Engineering	472	2.1
Institute of Pure and Applied Physics	420	1.8
International Telecommunication Union	363	1.6
Internet Soc/IETF-Internet Eng Task Force	359	1.6
ACS-Am Chem Soc	339	1.5
AACS-Advanced Access Content System	299	1.3
Joint IEEE and ACM	249	1.1
Japan Society of Applied Physics	225	1.0
IET/IEE	232	1.0
378 others with less than 1% each	3645	12.1

***Appendix A - Publishers Receiving Most References from Top 50 Companies
(Top 50 Companies in terms of 2020 Patent Activity; References from 2001-2020 Patents)***

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
Toyota Motor Corp		
RELX Group (Elsevier)	1778	19.3
IEEE	1740	18.9
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	545	5.9
ACS-Am Chem Soc	539	5.9
Springer Nature	525	5.7
American Society of Plant Biologists	375	4.1
American Institute of Physics	302	3.3
SAE-Society of Automobile Engineers	254	2.8
Natl Acad Sciences	215	2.3
AAAS-Am Assoc Advancement Sci	215	2.3
ACM-Assoc Comput Mach	213	2.3
Electrochemical Society, Inc.	170	1.8
Optical Society of America	156	1.7
Oxford Univ Press	116	1.3
Royal Society of Chemistry	120	1.3
American SociETy for Microbiology	110	1.2
National Institutes of Health - NIH	113	1.2
American Society for Biochemistry and Molecular Biology Inc.	98	1.1
251 others with less than 1% each	1612	14.9

Appendix B: Top 100 Organizations That Cite IEEE; (2001-2020 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
<i>AI/Artificial Intelligence</i>										
1	Microsoft Corporation	2712	6762	40.1	IEEE	2712	40.1	ACM-Assoc Comput Mach	1913	28.3
2	International Business Machi	2378	6147	38.7	IEEE	2378	38.7	ACM-Assoc Comput Mach	874	14.2
3	Google Inc.	2107	4231	49.8	IEEE	2107	49.8	ACM-Assoc Comput Mach	524	12.4
4	Apple Inc	1046	1908	54.8	IEEE	1046	54.8	ACM-Assoc Comput Mach	516	27.0
5	Brain Corporation	1010	2372	42.6	IEEE	1010	42.6	MIT Press	418	17.6
6	HRL Laboratories LLC	768	1526	50.3	IEEE	768	50.3	RELX Group (Elsevier)	120	7.9
7	NUMENTA INC	648	2426	26.7	Numenta Inc.	852	35.1	IEEE	648	26.7
8	Adobe Inc. (former Adobe Sy	545	908	60.0	IEEE	545	60.0	ACM-Assoc Comput Mach	244	26.9
9	Qualcomm Inc	503	1245	40.4	IEEE	503	40.4	Springer Nature	106	8.5
10	Siemens Aktiengesellschaft	318	698	45.6	IEEE	318	45.6	RELX Group (Elsevier)	71	10.2
11	Amazon.com Inc.	299	536	55.8	IEEE	299	55.8	ACM-Assoc Comput Mach	96	17.9
12	Xerox Corp	295	806	36.6	IEEE	295	36.6	ACM-Assoc Comput Mach	116	14.4
13	General Electric Company	277	386	71.8	IEEE	277	71.8	RELX Group (Elsevier)	27	7.0
14	Columbia University	266	705	37.7	IEEE	266	37.7	ACM-Assoc Comput Mach	101	14.3
15	NEWVALUEXCHANGE LT	265	434	61.1	IEEE	265	61.1	ACM-Assoc Comput Mach	139	32.0
16	Cisco Systems Inc.	261	479	54.5	IEEE	261	54.5	ACM-Assoc Comput Mach	78	16.3
17	Magic Leap Inc	261	307	85.0	IEEE	261	85.0	ACM-Assoc Comput Mach	18	5.9
18	University of Alabama	257	312	82.4	IEEE	257	82.4	RELX Group (Elsevier)	13	4.2
19	Samsung Electronics Co Ltd	233	396	58.8	IEEE	233	58.8	ACM-Assoc Comput Mach	32	8.1
20	Intel Corporation	214	395	54.2	IEEE	214	54.2	ACM-Assoc Comput Mach	44	11.1
21	NEC Corp	214	450	47.6	IEEE	214	47.6	ACM-Assoc Comput Mach	49	10.9
22	Fujitsu Limited	193	451	42.8	IEEE	193	42.8	Joint IEEE and ACM	84	18.6
23	SAS Institute	190	466	40.8	IEEE	190	40.8	RELX Group (Elsevier)	54	11.6
24	Twitter Inc	190	229	83.0	IEEE	190	83.0	ACM-Assoc Comput Mach	13	5.7
25	Cortica Ltd	186	258	72.1	IEEE	186	72.1	ACM-Assoc Comput Mach	23	8.9
26	University of Tennessee Rese	186	300	62.0	IEEE	186	62.0	RELX Group (Elsevier)	18	6.0
27	Omni Ai Inc. Inc (formerly B	172	204	84.3	IEEE	172	84.3	International Association for Pattern Recognition (IAPR)	22	10.8
28	Battelle Memorial Institute	171	215	79.5	IEEE	171	79.5	IEEE/RSJ	6	2.8
29	Baidu Inc	164	255	64.3	IEEE	164	64.3	International Machine Learning Society (IMLS)	24	9.4
30	Arizona State University	159	208	76.4	IEEE	159	76.4	ACM-Assoc Comput Mach	16	7.7
31	Sony Corp	152	325	46.8	IEEE	152	46.8	ACM-Assoc Comput Mach	36	11.1
32	Honda Motor Co. Ltd.(Honda	143	252	56.7	IEEE	143	56.7	RELX Group (Elsevier)	18	7.1
33	IP RESERVOIR LLC	140	223	62.8	IEEE	140	62.8	ACM-Assoc Comput Mach	36	16.1
34	United States Navy	133	236	56.4	IEEE	133	56.4	RELX Group (Elsevier)	33	14.0
35	Oracle Corporation	128	470	27.2	IEEE	128	27.2	ACM-Assoc Comput Mach	120	25.5
36	ICOSYSTEM CORP	127	174	73.0	IEEE	127	73.0	RELX Group (Elsevier)	9	5.2
37	Ohio State University	125	133	94.0	IEEE	125	94.0	American Automatic Control Council (AACC)	6	4.5
38	Raytheon Co.	125	272	46.0	IEEE	125	46.0	SPIE-Int Soc Opt Engineering	19	7.0
39	eBay Inc	123	162	75.9	IEEE	123	75.9	ACM-Assoc Comput Mach	14	8.6

Appendix B: Top 100 Organizations That Cite IEEE; (2001-2020 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
40	AT&T Inc	119	327	36.4	IEEE	119	36.4	ACM-Assoc Comput Mach	90	27.5
41	Nuance Communications Inc	117	228	51.3	IEEE	117	51.3	ACM-Assoc Comput Mach	30	13.2
42	Massachusetts Institute of Te	116	383	30.3	IEEE	116	30.3	Springer Nature	48	12.5
43	Boeing Co. (The)	112	306	36.6	IEEE	112	36.6	RELX Group (Elsevier)	46	15.0
44	FireEye Inc	112	306	36.6	IEEE	112	36.6	ACM-Assoc Comput Mach	53	17.3
45	NEURALA INC	111	192	57.8	IEEE	111	57.8	MIT Press	25	13.0
46	Facebook Inc	107	265	40.4	IEEE	107	40.4	ACM-Assoc Comput Mach	89	33.6
47	University of California	106	1055	10.0	Oxford University Press	148	14.0	Springer Nature	142	13.5
48	Accenture Ltd.	105	404	26.0	IEEE	105	26.0	ACM-Assoc Comput Mach	78	19.3
49	Aerospace Corp.	104	302	34.4	IEEE	104	34.4	RELX Group (Elsevier)	96	31.8
50	Cornell University	104	607	17.1	IEEE	104	17.1	RELX Group (Elsevier)	88	14.5
51	University of Illinois	104	251	41.4	IEEE	104	41.4	ACM-Assoc Comput Mach	30	12.0
52	GYRFALCON TECHNOLO	102	131	77.9	IEEE	102	77.9	American Institute of Physics	18	13.7
53	Bosch (Robert) GmbH	101	137	73.7	IEEE	101	73.7	Joint IEEE and ACM	8	5.8
54	Verizon Communications Inc	101	488	20.7	ACM-Assoc Comput Mach	197	40.4	IEEE	101	20.7
55	Micron Technology Inc.	98	134	73.1	IEEE	98	73.1	ACM-Assoc Comput Mach	7	5.2
56	PRIMAL FUSION INC	96	188	51.1	IEEE	96	51.1	ACM-Assoc Comput Mach	35	18.6
57	TuSimple	96	107	89.7	IEEE	96	89.7	ACM-Assoc Comput Mach	8	7.5
58	Zebra Technologies Corp.	95	119	79.8	IEEE	95	79.8	RFID Journal/YGS Group	12	10.1
59	VIA ALLIANCE SEMICON	93	326	28.5	IEEE	93	28.5	Joint IEEE and ACM	88	27.0
60	Lockheed Martin Corp.	91	135	67.4	IEEE	91	67.4	RELX Group (Elsevier)	11	8.1
61	Toyota Motor Corp	86	117	73.5	IEEE	86	73.5	RELX Group (Elsevier)	6	5.1
62	Boston Scientific Corp.	85	224	37.9	IEEE	85	37.9	RELX Group (Elsevier)	38	17.0
63	Marvell Technology Group Lt	85	144	59.0	IEEE	85	59.0	ACM-Assoc Comput Mach	42	29.2
64	Xperi Corporation (Formerly	85	121	70.2	IEEE	85	70.2	ACM-Assoc Comput Mach	8	6.6
65	Mitsubishi Electric Corp	84	145	57.9	IEEE	84	57.9	ACM-Assoc Comput Mach	6	4.1
66	Nokia Corp	84	177	47.5	IEEE	84	47.5	ACM-Assoc Comput Mach	37	20.9
67	Motorola Solutions Inc.	83	93	89.2	IEEE	83	89.2	International Association for Pattern Recognition (IAPR)	6	6.5
68	23ANDME INC	80	133	60.2	IEEE	80	60.2	Joint IEEE and ACM	12	9.0
69	ALOFT MEDIA LLC	79	147	53.7	IEEE	79	53.7	Institute for Operations Research and the Management Science	24	16.3
70	HP Inc	79	280	28.2	IEEE	79	28.2	ACM-Assoc Comput Mach	63	22.5
71	Sap SE	79	236	33.5	IEEE	79	33.5	ACM-Assoc Comput Mach	52	22.0
72	INDIVIDUAL PATENTER	77	173	44.5	IEEE	77	44.5	ACM-Assoc Comput Mach	32	18.5
73	University of South Florida	75	99	75.8	IEEE	75	75.8	American Automatic Control Council (AACC)	5	5.1
74	SalesforceCom Inc	74	135	54.8	IEEE	74	54.8	ACL - Association for Computational Linguistics	28	20.7
75	EXEGY INC	73	147	49.7	IEEE	73	49.7	ACM-Assoc Comput Mach	27	18.4
76	California Institute of Techno	72	226	31.9	IEEE	72	31.9	ACM-Assoc Comput Mach	18	8.0
77	Purdue University	68	112	60.7	IEEE	68	60.7	ACM-Assoc Comput Mach	22	19.6
78	ConvergeOne Inc	67	156	42.9	IEEE	67	42.9	ACM-Assoc Comput Mach	30	19.2
79	Canon Inc	64	126	50.8	IEEE	64	50.8	RELX Group (Elsevier)	12	9.5
80	Khalifa University of Science	64	91	70.3	IEEE	64	70.3	Computers in Cardiology, Inc.	12	13.2

Appendix B: Top 100 Organizations That Cite IEEE; (2001-2020 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	Dell Technologies Inc	62	162	38.3	IEEE	62	38.3	ACM-Assoc Comput Mach	32	19.8
82	CENTRIPETAL NETWORK	61	143	42.7	IEEE	61	42.7	ACM-Assoc Comput Mach	32	22.4
83	KNOWMTECH LLC	61	231	26.4	IEEE	61	26.4	American Institute of Physics	58	25.1
84	Norton Lifelock (formerly Sy	61	200	30.5	IEEE	61	30.5	ACM-Assoc Comput Mach	48	24.0
85	Conduent Inc	60	120	50.0	IEEE	60	50.0	ACM-Assoc Comput Mach	15	12.5
86	FACENSE LTD	60	72	83.3	IEEE	60	83.3	ACM-Assoc Comput Mach	8	11.1
87	Causam Energy Inc	59	67	88.1	IEEE	59	88.1	RELX Group (Elsevier)	3	4.5
88	INCEPTION INSTITUTE OF	58	65	89.2	IEEE	58	89.2	ACM-Assoc Comput Mach	5	7.7
89	Toshiba Corp	57	90	63.3	IEEE	57	63.3	ACM-Assoc Comput Mach	6	6.7
90	Walt Disney Co.	57	105	54.3	IEEE	57	54.3	ACM-Assoc Comput Mach	23	21.9
91	PEGASYSYSTEMS INC	56	108	51.9	IEEE	56	51.9	ACM-Assoc Comput Mach	19	17.6
92	Drexel University	55	97	56.7	IEEE	55	56.7	ASME-Am Soc Mech Eng	10	10.3
93	Honeywell International Inc.	55	144	38.2	IEEE	55	38.2	RELX Group (Elsevier)	33	22.9
94	Nielsen Holdings Plc	55	244	22.5	IEEE	55	22.5	RELX Group (Elsevier)	32	13.1
95	Commissariat A L'Energie At	54	70	77.1	IEEE	54	77.1	RELX Group (Elsevier)	5	7.1
96	Huawei Technologies Compa	54	117	46.2	IEEE	54	46.2	ACM-Assoc Comput Mach	18	15.4
97	PINDROP SECURITY INC	54	64	84.4	IEEE	54	84.4	Joint IEEE and ACM	4	6.3
98	ASAPP INC	53	180	29.4	IEEE	53	29.4	MIT Press	37	20.6
99	Rag Foundation	51	80	63.8	IEEE	51	63.8	RELX Group (Elsevier)	12	15.0
100	Rockwell Automation Inc	51	105	48.6	IEEE	51	48.6	RELX Group (Elsevier)	17	16.2

Appendix B: Top 100 Organizations That Cite IEEE; (2001-2020 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
<i>Autonomous Vehicles</i>										
1	Irobot Corp	1545	2445	63.2	IEEE	1545	63.2	IEEE/RSJ	236	9.7
2	Amazon.com Inc.	437	549	79.6	IEEE	437	79.6	IEEE/RSJ	36	6.6
3	TuSimple	192	218	88.1	IEEE	192	88.1	ACM-Assoc Comput Mach	18	8.3
4	Aptiv Plc (former Delphi Aut	186	263	70.7	IEEE	186	70.7	American Automatic Control Council (AACC)	17	6.5
5	WALMART APOLLO LLC	171	231	74.0	IEEE	171	74.0	IEEE/RSJ	27	11.7
6	Google Inc.	168	291	57.7	IEEE	168	57.7	IEEE/RSJ	20	6.9
7	Nio Co. Ltd	142	194	73.2	IEEE	142	73.2	ACM-Assoc Comput Mach	21	10.8
8	Brain Corporation	132	246	53.7	IEEE	132	53.7	MIT Press	25	10.2
9	State Farm Mutual Automobi	100	298	33.6	IEEE	100	33.6	Intelligent Systems Design and Applications (ISDA)	41	13.8
10	Uber Technologies Inc	96	126	76.2	IEEE	96	76.2	Joint IEEE and ACM	9	7.1
11	Siemens Aktiengesellschaft	94	119	79.0	IEEE	94	79.0	ISIF/IEEE	11	9.2
12	International Business Machi	81	221	36.7	IEEE	81	36.7	IP.Com	28	12.7
13	IFLIGHT Innovation Technol	62	100	62.0	IEEE	62	62.0	ISIF/IEEE	7	7.0
14	Intel Corporation	62	101	61.4	IEEE	62	61.4	MIT Press	6	5.9
15	NURO INC	61	80	76.3	IEEE	61	76.3	IEEE/RSJ	5	6.3
16	Toyota Motor Corp	61	85	71.8	IEEE	61	71.8	IEEE/RSJ	10	11.8
17	INTOUCH HEALTH INC	60	120	50.0	IEEE	60	50.0	IEEE/RSJ	10	8.3
18	California Institute of Techno	58	111	52.3	IEEE	58	52.3	American Automatic Control Council (AACC)	6	5.4
19	Boeing Co. (The)	56	99	56.6	IEEE	56	56.6	IEEE/RSJ	5	5.1
20	SPHERO INC	56	59	94.9	IEEE	56	94.9	American Automatic Control Council (AACC)	3	5.1
21	HRL Laboratories LLC	53	77	68.8	IEEE	53	68.8	IEEE/RSJ	13	16.9
22	PELTON TECHNOLOGY I	51	81	63.0	IEEE	51	63.0	American Automatic Control Council (AACC)	11	13.6
23	Ford Motor Co.	50	77	64.9	IEEE	50	64.9	IET/IEE	5	6.5
24	APEX ARTIFICIAL INTELL	47	54	87.0	IEEE	47	87.0	MIT Press	7	13.0
25	University of Pennsylvania	44	55	80.0	IEEE	44	80.0	IEEE/RSJ	6	10.9
26	Baidu Inc	40	53	75.5	IEEE	40	75.5	SAE-Society of Automobile Engineers	4	7.5
27	Nissan Motor Co. Ltd.	36	42	85.7	IEEE	36	85.7	SAGE Publications Ltd	2	4.8
28	Digimarc Corp.	33	62	53.2	IEEE	33	53.2	ACM-Assoc Comput Mach	12	19.4
29	Walmart Stores Inc	32	46	69.6	IEEE	32	69.6	IEEE/RSJ	6	13.0
30	TRIFO INC	29	32	90.6	IEEE	29	90.6	SAGE Publications Ltd	3	9.4
31	Renault SA	27	28	96.4	IEEE	27	96.4	Cambridge University Press	1	3.6
32	Deere & Co.	26	46	56.5	IEEE	26	56.5	AMER SOC AGRICULTURAL & BIOLOGICAL ENGINEER	3	6.5
33	FedEx Corp	24	32	75.0	IEEE	24	75.0	RELX Group (Elsevier)	2	6.3
34	General Motors Corp	24	36	66.7	IEEE	24	66.7	IEEE/RSJ	2	5.6
35	Oshkosh Corporation	23	30	76.7	IEEE	23	76.7	SAE-Society of Automobile Engineers	2	6.7
36	UATC LLC	23	32	71.9	IEEE	23	71.9	IEEE/RSJ	7	21.9
37	Toshiba Corp	22	23	95.7	IEEE	22	95.7	ACM-Assoc Comput Mach	1	4.3
38	Garrett Motion (formerly Gar	21	27	77.8	IEEE	21	77.8	American Automatic Control Council (AACC)	5	18.5
39	NONEND INVENTIONS N	20	21	95.2	IEEE	20	95.2	The International Association for Computers and Communicati	1	4.8

Appendix B: Top 100 Organizations That Cite IEEE; (2001-2020 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
40	DeepMap Inc.	18	29	62.1	IEEE	18	62.1	ACM-Assoc Comput Mach	4	13.8
41	Zebra Technologies Corp.	18	26	69.2	IEEE	18	69.2	ACM-Assoc Comput Mach	4	15.4
42	Aviation Industry Corporatio	17	28	60.7	IEEE	17	60.7	SAE-Society of Automobile Engineers	10	35.7
43	EPISYS SCIENCE INC	17	23	73.9	IEEE	17	73.9	IEEE/RSJ	3	13.0
44	Battelle Memorial Institute	16	24	66.7	IEEE	16	66.7	IEEE/RSJ	6	25.0
45	Lockheed Martin Corp.	15	51	29.4	American Institute of Physics	29	56.9	IEEE	15	29.4
46	Qualcomm Inc	15	20	75.0	IEEE	15	75.0	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	2	10.0
47	AUTONOMOUS SOLUTIO	14	30	46.7	IEEE	14	46.7	American Automatic Control Council (AACC)	9	30.0
48	BRIAN CORP	14	17	82.4	IEEE	14	82.4	MIT Press	3	17.6
49	Honda Motor Co. Ltd.(Honda	14	24	58.3	IEEE	14	58.3	RELX Group (Elsevier)	3	12.5
50	Bosch (Robert) GmbH	13	20	65.0	IEEE	13	65.0	ISIF/IEEE	2	10.0
51	Walt Disney Co.	13	13	100.0	IEEE	13	100.0			
52	Mitsubishi Electric Corp	12	14	85.7	IEEE	12	85.7	American Automatic Control Council (AACC)	2	14.3
53	ZYTEK COMMUNICATIO	12	44	27.3	IEEE	12	27.3	COMPANY OF BIOLOGISTS LTD	6	13.6
54	Fujitsu Limited	11	11	100.0	IEEE	11	100.0			
55	PERRONE ROBOTICS INC	11	18	61.1	IEEE	11	61.1	IEEE/RSJ	4	22.2
56	Raytheon Co.	11	23	47.8	IEEE	11	47.8	RELX Group (Elsevier)	3	13.0
57	X Development Llc	11	17	64.7	IEEE	11	64.7	Informa/CRC Press/Taylor & Francis	2	11.8
58	King Fahd University of Petr	10	13	76.9	IEEE	10	76.9	Springer Nature	1	7.7
59	PERCEPTIN SHENZHEN L	10	11	90.9	IEEE	10	90.9	SAGE Publications Ltd	1	9.1
60	Samsung Electronics Co Ltd	10	10	100.0	IEEE	10	100.0			
61	Wipro Ltd	10	11	90.9	IEEE	10	90.9	RELX Group (Elsevier)	1	9.1
62	Porsche Automobil Holding S	9	10	90.0	IEEE	9	90.0	ASME-Am Soc Mech Eng	1	10.0
63	AURORA INNOVATION IN	8	8	100.0	IEEE	8	100.0			
64	Casio Computer	8	8	100.0	IEEE	8	100.0			
65	Leidos Holdings Inc	8	10	80.0	IEEE	8	80.0	ISIF/IEEE	2	20.0
66	University of South Florida	8	9	88.9	IEEE	8	88.9	ACM-Assoc Comput Mach	1	11.1
67	Veoneer Inc.	8	8	100.0	IEEE	8	100.0			
68	Allstate Corp	7	22	31.8	ACM-Assoc Comput Mach	8	36.4	IEEE	7	31.8
69	BAE Systems Plc.	7	12	58.3	IEEE	7	58.3	IEEE/RSJ	3	25.0
70	HANGZHOU ZERO ZERO	7	7	100.0	IEEE	7	100.0			
71	Here Global BV	7	8	87.5	IEEE	7	87.5	Science X Network	1	12.5
72	PERCEPTLN SHENZHEN L	7	8	87.5	IEEE	7	87.5	Society for Industrial and Applied Mathematics	1	12.5
73	STRADVISION INC	7	9	77.8	IEEE	7	77.8	RELX Group (Elsevier)	2	22.2
74	Aerospace Corp.	6	7	85.7	IEEE	6	85.7	American Automatic Control Council (AACC)	1	14.3
75	AFFECTIVA INC	6	6	100.0	IEEE	6	100.0			
76	CRINKLAW FARM SERVI	6	6	100.0	IEEE	6	100.0			
77	Denso Corp	6	9	66.7	IEEE	6	66.7	RELX Group (Elsevier)	2	22.2
78	DRIVE AI INC	6	7	85.7	IEEE	6	85.7	Joint IEEE and ACM	1	14.3
79	Microsoft Corporation	6	10	60.0	IEEE	6	60.0	IEEE/RSJ	2	20.0
80	Nokia Corp	6	8	75.0	IEEE	6	75.0	Massachusetts Institute of Technology	1	12.5

Appendix B: Top 100 Organizations That Cite IEEE; (2001-2020 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	NXP Semiconductors NV	6	8	75.0	IEEE	6	75.0	IET/IEE	1	12.5
82	University of Arkansas	6	6	100.0	IEEE	6	100.0			
83	Arizona State University	5	10	50.0	IEEE	5	50.0	Joint IEEE and ACM	3	30.0
84	BEIJING INSTITUTE OF TE	5	5	100.0	IEEE	5	100.0			
85	Commonwealth Scientific an	5	9	55.6	IEEE	5	55.6	American Society of Civil Engineers	1	11.1
86	Flir Systems AB	5	7	71.4	IEEE	5	71.4	ACM-Assoc Comput Mach	1	14.3
87	Hon Hai Precision Industry C	5	8	62.5	IEEE	5	62.5	RELX Group (Elsevier)	2	25.0
88	LUMINAR TECHNOLOGIE	5	5	100.0	IEEE	5	100.0			
89	NEC Corp	5	5	100.0	IEEE	5	100.0			
90	Omron Corp.	5	14	35.7	IEEE	5	35.7	RELX Group (Elsevier)	4	28.6
91	Western Digital Corp.	5	5	100.0	IEEE	5	100.0			
92	ACTIVE KNOWLEDGE LT	4	4	100.0	IEEE	4	100.0			
93	Charles Stark Draper Laborat	4	4	100.0	IEEE	4	100.0			
94	Crown Equipment Corporatio	4	9	44.4	IEEE	4	44.4	IEICE-Inst Elec Info Comm Eng	3	33.3
95	DELTA SUBSEA LLC	4	4	100.0	IEEE	4	100.0			
96	GoPro Inc	4	8	50.0	IEEE	4	50.0	IEEE/Eurasip	2	25.0
97	International Electronic Mach	4	10	40.0	IEEE	4	40.0	RELX Group (Elsevier)	3	30.0
98	LANDING TECHNOLOGIE	4	6	66.7	IEEE	4	66.7	ACM-Assoc Comput Mach	1	16.7
99	OPTIMAL RANGING INC	4	6	66.7	IEEE	4	66.7	RELX Group (Elsevier)	2	33.3
100	PERCEPTIN INC	4	4	100.0	IEEE	4	100.0			

Appendix B: Top 100 Organizations That Cite IEEE; (2001-2020 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
<i>Blockchain/Distributed Ledger</i>										
1	IP RESERVOIR LLC	82	152	53.9	IEEE	82	53.9	ACM-Assoc Comput Mach	26	17.1
2	Cisco Systems Inc.	50	72	69.4	IEEE	50	69.4	ACM-Assoc Comput Mach	6	8.3
3	Juniper Networks Inc.	35	38	92.1	IEEE	35	92.1	IEEE/Eurasip	1	2.6
4	Marvell Technology Group Lt	28	28	100.0	IEEE	28	100.0			
5	International Business Machi	24	62	38.7	IEEE	24	38.7	ACM-Assoc Comput Mach	8	12.9
6	Alibaba Group Holding Ltd	20	33	60.6	IEEE	20	60.6	ACM-Assoc Comput Mach	11	33.3
7	Dell Technologies Inc	19	58	32.8	ACM-Assoc Comput Mach	30	51.7	IEEE	19	32.8
8	Amazon.com Inc.	17	22	77.3	IEEE	17	77.3	ACM-Assoc Comput Mach	5	22.7
9	Accenture Ltd.	13	58	22.4	ACM-Assoc Comput Mach	31	53.4	IEEE	13	22.4
10	Bank of America Corp.	11	31	35.5	New York Times	18	58.1	IEEE	11	35.5
11	FACTOM INC	10	10	100.0	IEEE	10	100.0			
12	Via Technologies Inc.	9	16	56.3	IEEE	9	56.3	RELX Group (Elsevier)	2	12.5
13	AMERICORP INVESTMEN	8	8	100.0	IEEE	8	100.0			
14	BLOCKCHAIN ASICS LLC	8	8	100.0	IEEE	8	100.0			
15	COGNITIVE SCALE INC	8	14	57.1	IEEE	8	57.1	ACM-Assoc Comput Mach	4	28.6
16	LG Electronics Inc.	8	9	88.9	IEEE	8	88.9	World Academy of Science Engineering and Technology	1	11.1
17	ANTHURIUM SOLUTIONS	7	42	16.7	ACM-Assoc Comput Mach	15	35.7	IEEE	7	16.7
18	Broadcom Ltd	7	8	87.5	IEEE	7	87.5	ACM-Assoc Comput Mach	1	12.5
19	FORCEPOINT LLC	5	5	100.0	IEEE	5	100.0			
20	MILESTONE ENTERTAIN	5	15	33.3	IEEE	5	33.3	Joint IEEE and ACM	2	13.3
21	Sap SE	5	12	41.7	IEEE	5	41.7	ACM-Assoc Comput Mach	2	16.7
22	ESHARD	4	8	50.0	IEEE	4	50.0	IET/IEE	4	50.0
23	MASSACHUSETTS MUTU	4	4	100.0	IEEE	4	100.0			
24	BT Group PLC	3	5	60.0	IEEE	3	60.0	MIT Press	1	20.0
25	FARMOBILE LLC	3	3	100.0	IEEE	3	100.0			
26	MasterCard Inc	3	9	33.3	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	3	33.3	IEEE	3	33.3
27	Microsoft Corporation	3	17	17.6	ACM-Assoc Comput Mach	7	41.2	IEEE	3	17.6
28	nChain Holdings Ltd	3	3	100.0	IEEE	3	100.0			
29	THE BANK OF NEW YORK	3	3	100.0	IEEE	3	100.0			
30	AT&T Inc	2	2	100.0	IEEE	2	100.0			
31	Atos SE	2	2	100.0	IEEE	2	100.0			
32	BLOCKPOINT SYSTEMS I	2	3	66.7	IEEE	2	66.7	ACM-Assoc Comput Mach	1	33.3
33	CapitalOne	2	9	22.2	Condé Nast	3	33.3	ACM-Assoc Comput Mach	2	22.2
34	CME Group Inc	2	8	25.0	FORBES INC	4	50.0	IEEE	2	25.0
35	Global Foundries Inc	2	4	50.0	IEEE	2	50.0	ACM-Assoc Comput Mach	1	25.0
36	HOVERKEY LTD	2	2	100.0	IEEE	2	100.0			
37	Institute for Information Indu	2	2	100.0	IEEE	2	100.0			
38	Intel Corporation	2	6	33.3	Federal Information Processing Standards Pub	2	33.3	IEEE	2	33.3
39	Johnson Controls Internationa	2	3	66.7	IEEE	2	66.7	Internet Soc/IETF-Internet Eng Task Force	1	33.3

Appendix B: Top 100 Organizations That Cite IEEE; (2001-2020 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
40	National Chiao Tung Univers	2	3	66.7	IEEE	2	66.7	World Wide Web Consortium	1	33.3
41	NEC Corp	2	2	100.0	IEEE	2	100.0			
42	OBOPAY INC	2	4	50.0	IEEE	2	50.0	RELX Group (Elsevier)	1	25.0
43	RS LTD	2	4	50.0	IEEE	2	50.0	ACM-Assoc Comput Mach	2	50.0
44	Square Inc	2	2	100.0	IEEE	2	100.0			
45	SYMBIONT IO INC	2	7	28.6	ACM-Assoc Comput Mach	2	28.6	IEEE	2	28.6
46	TiVo Corp	2	2	100.0	IEEE	2	100.0			
47	TURING TECHNOLOGY IN	2	2	100.0	IEEE	2	100.0			
48	WALMART APOLLO LLC	2	5	40.0	IEEE	2	40.0	Harvard Business School Publishing	1	20.0
49	Workday Inc	2	3	66.7	IEEE	2	66.7	National Institute of Standards and Technology (NIST)	1	33.3
50	ZENTEL JAPAN CORP	2	3	66.7	IEEE	2	66.7	ACM-Assoc Comput Mach	1	33.3
51	ACCELOR LTD	1	1	100.0	IEEE	1	100.0			
52	ALTR SOLUTIONS INC	1	2	50.0	IEEE	1	50.0	ACM-Assoc Comput Mach	1	50.0
53	American Express Co.	1	2	50.0	ACM-Assoc Comput Mach	1	50.0	IEEE	1	50.0
54	AMRICAN EXPRESS TRA	1	2	50.0	IEEE	1	50.0	ACM-Assoc Comput Mach	1	50.0
55	ANONOS INC	1	2	50.0	IEEE/IPSJ	1	50.0	IEEE	1	50.0
56	Chongqing Sokon Industry G	1	1	100.0	IEEE	1	100.0			
57	CYBERARK SOFTWARE L	1	1	100.0	IEEE	1	100.0			
58	ENT TECHNOLOGIES INC	1	1	100.0	IEEE	1	100.0			
59	Fiserv Inc	1	1	100.0	IEEE	1	100.0			
60	Ford Motor Co.	1	1	100.0	IEEE	1	100.0			
61	GLOBAL BONSAI LLC	1	1	100.0	IEEE	1	100.0			
62	GSC SECRYPT LLC	1	17	5.9	ACM-Assoc Comput Mach	16	94.1	IEEE	1	5.9
63	HRL Laboratories LLC	1	5	20.0	ACM-Assoc Comput Mach	3	60.0	IEEE	1	20.0
64	INDIVIDUAL PATENTER	1	2	50.0	Joint IEEE and ACM	1	50.0	IEEE	1	50.0
65	LO3 ENERGY INC	1	1	100.0	IEEE	1	100.0			
66	McAfee Inc	1	2	50.0	IEEE	1	50.0	ACM-Assoc Comput Mach	1	50.0
67	McKesson Corporation	1	4	25.0	ACM-Assoc Comput Mach	2	50.0	IEEE	1	25.0
68	MOCANA CORP	1	1	100.0	IEEE	1	100.0			
69	MYOMEGA SYSTEMS GM	1	1	100.0	IEEE	1	100.0			
70	Nant Holdings IP Llc	1	1	100.0	IEEE	1	100.0			
71	Nokia Corp	1	1	100.0	IEEE	1	100.0			
72	PANJIVA INC	1	1	100.0	IEEE	1	100.0			
73	PayPal Holdings Inc	1	1	100.0	IEEE	1	100.0			
74	REFINITIV US ORGANIZA	1	1	100.0	IEEE	1	100.0			
75	Samsung Electronics Co Ltd	1	1	100.0	IEEE	1	100.0			
76	SKUCHAIN INC	1	2	50.0	IEEE	1	50.0	Internet Soc/IETF-Internet Eng Task Force	1	50.0
77	Sony Corp	1	1	100.0	IEEE	1	100.0			
78	SS8 NETWORKS INC	1	3	33.3	Internet Soc/IETF-Internet Eng Task Force	2	66.7	IEEE	1	33.3
79	Texas Instruments Inc	1	1	100.0	IEEE	1	100.0			
80	THE TORONTO-DOMINIO	1	7	14.3	Imagine Publishing	3	42.9	World Wide Web Consortium	3	42.9

Appendix B: Top 100 Organizations That Cite IEEE; (2001-2020 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	UNIFYVAULT LLC	1	1	100.0	IEEE	1	100.0			
82	Worldline SA	1	1	100.0	IEEE	1	100.0			

Appendix B: Top 100 Organizations That Cite IEEE; (2001-2020 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
<i>Broadcasting</i>										
1	Microsoft Corporation	10764	21663	49.7	IEEE	10764	49.7	ACM-Assoc Comput Mach	2717	12.5
2	Personalized Media Commun	7932	47491	16.7	Society of Motion Picture and Television Engi	14478	30.5	IEEE	7932	16.7
3	Xperi Corporation (Formerly	5853	9514	61.5	IEEE	5853	61.5	ACM-Assoc Comput Mach	884	9.3
4	Qualcomm Inc	4950	19250	25.7	International Telecommunication Union	7203	37.4	IEEE	4950	25.7
5	Google Inc.	4847	11858	40.9	IEEE	4847	40.9	ACM-Assoc Comput Mach	1906	16.1
6	Magna International Inc.	3499	5378	65.1	IEEE	3499	65.1	SAE-Society of Automobile Engineers	264	4.9
7	Sony Corp	3414	8121	42.0	IEEE	3414	42.0	International Telecommunication Union	1293	15.9
8	Apple Inc	2695	6398	42.1	IEEE	2695	42.1	ACM-Assoc Comput Mach	761	11.9
9	Pelican Imaging Corporation	2448	5057	48.4	IEEE	2448	48.4	SPIE-Int Soc Opt Engineering	804	15.9
10	TiVo Corp	2258	8396	26.9	IEEE	2258	26.9	ACM-Assoc Comput Mach	676	8.1
11	Samsung Electronics Co Ltd	2201	6371	34.5	IEEE	2201	34.5	International Telecommunication Union	1298	20.4
12	AT&T Inc	2176	4702	46.3	IEEE	2176	46.3	ACM-Assoc Comput Mach	432	9.2
13	Technicolor SA	2046	4321	47.4	IEEE	2046	47.4	ISO/IEC/JTC/ANSI	285	6.6
14	Cisco Systems Inc.	1957	4796	40.8	IEEE	1957	40.8	ACM-Assoc Comput Mach	395	8.2
15	Broadcom Ltd	1782	2786	64.0	IEEE	1782	64.0	ACM-Assoc Comput Mach	167	6.0
16	LG Electronics Inc.	1741	7225	24.1	IEEE	1741	24.1	ISO/IEC/JTC/ANSI	1197	16.6
17	Dolby Laboratories Inc	1691	4637	36.5	IEEE	1691	36.5	International Telecommunication Union	963	20.8
18	Panasonic Corporation	1536	4696	32.7	IEEE	1536	32.7	International Telecommunication Union	1268	27.0
19	Massachusetts Institute of Te	1406	2085	67.4	IEEE	1406	67.4	ACM-Assoc Comput Mach	213	10.2
20	Intel Corporation	1354	2951	45.9	IEEE	1354	45.9	3GPP General Partnership Project Standards Body	658	22.3
21	Adobe Inc. (former Adobe Sy	1217	2547	47.8	IEEE	1217	47.8	ACM-Assoc Comput Mach	576	22.6
22	Nokia Corp	1183	2724	43.4	IEEE	1183	43.4	International Telecommunication Union	282	10.4
23	Hon Hai Precision Industry C	1166	3445	33.8	IEEE	1166	33.8	International Telecommunication Union	600	17.4
24	Fraunhofer Gesellschaft	1159	2409	48.1	IEEE	1159	48.1	MPEG.org	235	9.8
25	NETWORK-1 TECHNOLOG	1016	2267	44.8	IEEE	1016	44.8	ACM-Assoc Comput Mach	674	29.7
26	International Business Machi	1011	2658	38.0	IEEE	1011	38.0	ACM-Assoc Comput Mach	434	16.3
27	Canon Inc	1005	2583	38.9	IEEE	1005	38.9	International Telecommunication Union	313	12.1
28	InterDigital Inc	946	2110	44.8	IEEE	946	44.8	3GPP General Partnership Project Standards Body	481	22.8
29	Sonos Inc	928	1916	48.4	IEEE	928	48.4	SPIE-Int Soc Opt Engineering	229	12.0
30	General Electric Company	912	1741	52.4	IEEE	912	52.4	International Telecommunication Union	300	17.2
31	Huawei Technologies Compa	876	2554	34.3	IEEE	876	34.3	International Telecommunication Union	783	30.7
32	STMicroelectronics	815	1196	68.1	IEEE	815	68.1	SPIE-Int Soc Opt Engineering	51	4.3
33	Commscope Holding (formerl	787	1670	47.1	IEEE	787	47.1	International Telecommunication Union	84	5.0
34	GoPro Inc	755	1147	65.8	IEEE	755	65.8	ACM-Assoc Comput Mach	152	13.3
35	HP Inc	681	1429	47.7	IEEE	681	47.7	ACM-Assoc Comput Mach	185	12.9
36	INTOUCH HEALTH INC	654	1274	51.3	IEEE	654	51.3	IEEE/RSJ	101	7.9
37	Ricoh Co. Ltd.	649	1377	47.1	IEEE	649	47.1	ACM-Assoc Comput Mach	178	12.9
38	Honeywell International Inc.	604	1218	49.6	IEEE	604	49.6	SPIE-Int Soc Opt Engineering	151	12.4
39	Digimarc Corp.	597	1349	44.3	IEEE	597	44.3	SPIE-Int Soc Opt Engineering	188	13.9

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
40	California Institute of Techno	595	1086	54.8	IEEE	595	54.8	SPIE-Int Soc Opt Engineering	79	7.3
41	Columbia University	534	958	55.7	IEEE	534	55.7	ACM-Assoc Comput Mach	167	17.4
42	Wisteria Trading Inc	520	1010	51.5	IEEE	520	51.5	SPIE-Int Soc Opt Engineering	104	10.3
43	Mitsubishi Electric Corp	506	1121	45.1	IEEE	506	45.1	International Telecommunication Union	134	12.0
44	Xerox Corp	504	1163	43.3	IEEE	504	43.3	SPIE-Int Soc Opt Engineering	160	13.8
45	Blackberry Ltd.	493	995	49.5	IEEE	493	49.5	3GPP General Partnership Project Standards Body	146	14.7
46	Koninklijke Philips N.V.	484	1019	47.5	IEEE	484	47.5	ACM-Assoc Comput Mach	90	8.8
47	PixelWorks Inc	470	705	66.7	IEEE	470	66.7	SPIE-Int Soc Opt Engineering	61	8.7
48	Toshiba Corp	442	1130	39.1	IEEE	442	39.1	International Telecommunication Union	257	22.7
49	Verance Corp	436	857	50.9	IEEE	436	50.9	SPIE-Int Soc Opt Engineering	106	12.4
50	Ericsson	433	1401	30.9	IEEE	433	30.9	International Telecommunication Union	191	13.6
51	Nippon Telegraph & Telepho	427	1172	36.4	IEEE	427	36.4	International Telecommunication Union	242	20.6
52	Motorola Solutions Inc.	423	634	66.7	IEEE	423	66.7	ACM-Assoc Comput Mach	44	6.9
53	ACACIA MEDIA TECHNO	408	738	55.3	IEEE	408	55.3	ACM-Assoc Comput Mach	66	8.9
54	Walt Disney Co.	393	981	40.1	IEEE	393	40.1	ACM-Assoc Comput Mach	347	35.4
55	Industrial Technology Researc	382	570	67.0	IEEE	382	67.0	SPIE-Int Soc Opt Engineering	37	6.5
56	Fuji Film Holdings Corp	377	1128	33.4	IEEE	377	33.4	ACM-Assoc Comput Mach	274	24.3
57	Amazon.com Inc.	365	752	48.5	IEEE	365	48.5	ACM-Assoc Comput Mach	161	21.4
58	EchoStar Corp	364	714	51.0	IEEE	364	51.0	RELX Group (Elsevier)	56	7.8
59	Semiconductor Energy Labor	363	2743	13.2	SID-Society for Information Display	801	29.2	American Institute of Physics	566	20.6
60	Electronics and Telecommuni	360	1178	30.6	International Telecommunication Union	451	38.3	IEEE	360	30.6
61	Marvell Technology Group Lt	346	419	82.6	IEEE	346	82.6	SPIE-Int Soc Opt Engineering	8	1.9
62	On Semiconductor Corporati	339	471	72.0	IEEE	339	72.0	SPIE-Int Soc Opt Engineering	42	8.9
63	Texas Instruments Inc	334	1022	32.7	International Telecommunication Union	500	48.9	IEEE	334	32.7
64	NEC Corp	322	696	46.3	IEEE	322	46.3	International Telecommunication Union	66	9.5
65	Nielsen Holdings Plc	322	1668	19.3	IEEE	322	19.3	RELX Group (Elsevier)	197	11.8
66	SUN PATENT TRUST	319	2066	15.4	International Telecommunication Union	1299	62.9	IEEE	319	15.4
67	ECOLE DE TECHBOLOGIE	302	451	67.0	IEEE	302	67.0	3GPP General Partnership Project Standards Body	40	8.9
68	Omnivision Technologies Inc	301	477	63.1	IEEE	301	63.1	SPIE-Int Soc Opt Engineering	62	13.0
69	REARDEN LLC	291	403	72.2	IEEE	291	72.2	Optical Society of America	21	5.2
70	Intellectual Ventures Manage	290	939	30.9	IEEE	290	30.9	ACM-Assoc Comput Mach	134	14.3
71	Cortica Ltd	287	373	76.9	IEEE	287	76.9	ACM-Assoc Comput Mach	34	9.1
72	NVIDIA Corp.	265	613	43.2	IEEE	265	43.2	ACM-Assoc Comput Mach	114	18.6
73	University of Minnesota (The	260	298	87.2	IEEE	260	87.2	IEEE/RSJ	12	4.0
74	Micron Technology Inc.	256	436	58.7	IEEE	256	58.7	SPIE-Int Soc Opt Engineering	55	12.6
75	BLACK HILLS MEDIA LLC	255	1058	24.1	Open Connectivity Foundation	513	48.5	IEEE	255	24.1
76	EUCLID DISCOVERIES LL	255	471	54.1	IEEE	255	54.1	RELX Group (Elsevier)	103	21.9
77	Twitter Inc	246	336	73.2	IEEE	246	73.2	ACM-Assoc Comput Mach	30	8.9
78	BT Group PLC	245	443	55.3	IEEE	245	55.3	RELX Group (Elsevier)	34	7.7
79	ARC DEVICES LTD	240	838	28.6	ACM-Assoc Comput Mach	390	46.5	IEEE	240	28.6
80	CONVERGENT MEDIA SO	240	954	25.2	ACM-Assoc Comput Mach	257	26.9	IEEE	240	25.2

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	United States Navy	237	486	48.8	IEEE	237	48.8	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	58	11.9
82	Eastman Kodak Company	235	707	33.2	IEEE	235	33.2	SPIE-Int Soc Opt Engineering	81	11.5
83	Mediatek Inc.	234	545	42.9	IEEE	234	42.9	International Telecommunication Union	203	37.2
84	Comcast Corp	231	831	27.8	IEEE	231	27.8	ACM-Assoc Comput Mach	196	23.6
85	University of California	228	494	46.2	IEEE	228	46.2	ACM-Assoc Comput Mach	36	7.3
86	Seiko Epson Corporation	223	443	50.3	IEEE	223	50.3	ACM-Assoc Comput Mach	38	8.6
87	FACENSE LTD	222	273	81.3	IEEE	222	81.3	ACM-Assoc Comput Mach	29	10.6
88	Siemens Aktiengesellschaft	216	451	47.9	IEEE	216	47.9	International Telecommunication Union	33	7.3
89	Sigma Corp	215	272	79.0	IEEE	215	79.0	SPIE-Int Soc Opt Engineering	37	13.6
90	Stanford University	213	560	38.0	IEEE	213	38.0	ACM-Assoc Comput Mach	108	19.3
91	Kofax Inc	211	516	40.9	IEEE	211	40.9	ACM-Assoc Comput Mach	78	15.1
92	University of North Carolina	211	482	43.8	IEEE	211	43.8	ACM-Assoc Comput Mach	137	28.4
93	Witricity Corp	211	285	74.0	IEEE	211	74.0	American Institute of Physics	18	6.3
94	Ford Motor Co.	209	335	62.4	IEEE	209	62.4	IEEE/RSJ	25	7.5
95	INTERVAL RESEARCH CO	208	431	48.3	IEEE	208	48.3	ACM-Assoc Comput Mach	29	6.7
96	Raytheon Co.	208	451	46.1	IEEE	208	46.1	SPIE-Int Soc Opt Engineering	69	15.3
97	IMAX Corp	207	407	50.9	IEEE	207	50.9	SPIE-Int Soc Opt Engineering	84	20.6
98	Avid Technology Inc.	204	451	45.2	IEEE	204	45.2	ACM-Assoc Comput Mach	147	32.6
99	Orange	193	310	62.3	IEEE	193	62.3	SPIE-Int Soc Opt Engineering	15	4.8
100	Thermo Fisher Scientific Inc	193	597	32.3	IEEE	193	32.3	RELX Group (Elsevier)	187	31.3

Appendix B: Top 100 Organizations That Cite IEEE; (2001-2020 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
<i>Computer Hardware</i>										
1	International Business Machi	17717	57119	31.0	IEEE	17717	31.0	ACM-Assoc Comput Mach	14288	25.0
2	Microsoft Corporation	15549	56760	27.4	ACM-Assoc Comput Mach	20937	36.9	IEEE	15549	27.4
3	Apple Inc	11493	31553	36.4	IEEE	11493	36.4	ACM-Assoc Comput Mach	10329	32.7
4	Intel Corporation	9547	19933	47.9	IEEE	9547	47.9	Joint IEEE and ACM	2657	13.3
5	Oracle Corporation	4611	16798	27.4	ACM-Assoc Comput Mach	6020	35.8	IEEE	4611	27.4
6	Google Inc.	4558	14438	31.6	IEEE	4558	31.6	ACM-Assoc Comput Mach	4223	29.2
7	Broadcom Ltd	4032	7034	57.3	IEEE	4032	57.3	ACM-Assoc Comput Mach	607	8.6
8	Immersion Corp.	3653	9924	36.8	IEEE	3653	36.8	ACM-Assoc Comput Mach	1082	10.9
9	Samsung Electronics Co Ltd	3516	8907	39.5	IEEE	3516	39.5	SID-Society for Information Display	949	10.7
10	Cadence Design Systems Inc	3451	8614	40.1	IEEE	3451	40.1	Joint IEEE and ACM	3087	35.8
11	Qualcomm Inc	3345	7876	42.5	IEEE	3345	42.5	ACM-Assoc Comput Mach	593	7.5
12	Sony Corp	3139	7241	43.4	IEEE	3139	43.4	ACM-Assoc Comput Mach	1082	14.9
13	Ricoh Co. Ltd.	2415	5074	47.6	IEEE	2415	47.6	ACM-Assoc Comput Mach	888	17.5
14	Canon Inc	2317	5730	40.4	IEEE	2317	40.4	RELX Group (Elsevier)	503	8.8
15	HP Inc	2149	7113	30.2	IEEE	2149	30.2	ACM-Assoc Comput Mach	1532	21.5
16	Nokia Corp	2137	5200	41.1	IEEE	2137	41.1	ACM-Assoc Comput Mach	766	14.7
17	Fujitsu Limited	1907	4829	39.5	IEEE	1907	39.5	ACM-Assoc Comput Mach	576	11.9
18	Siemens Aktiengesellschaft	1883	3923	48.0	IEEE	1883	48.0	Joint IEEE and ACM	539	13.7
19	MicroUnity Systems Enginee	1857	3051	60.9	IEEE	1857	60.9	Joint IEEE and ACM	267	8.8
20	AT&T Inc	1716	4376	39.2	IEEE	1716	39.2	ACM-Assoc Comput Mach	908	20.7
21	Cisco Systems Inc.	1705	5147	33.1	IEEE	1705	33.1	Internet Soc/IETF-Internet Eng Task Force	801	15.6
22	Xilinx Inc.	1683	4206	40.0	IEEE	1683	40.0	ACM-Assoc Comput Mach	1362	32.4
23	Micron Technology Inc.	1629	2884	56.5	IEEE	1629	56.5	ACM-Assoc Comput Mach	238	8.3
24	Personalized Media Commun	1607	10379	15.5	Society of Motion Picture and Television Engi	3113	30.0	IEEE	1607	15.5
25	Commvault Systems Inc.	1577	2397	65.8	IEEE	1577	65.8	ACM-Assoc Comput Mach	392	16.4
26	Panasonic Corporation	1568	3847	40.8	IEEE	1568	40.8	International Telecommunication Union	306	8.0
27	Rambus Inc.	1560	2199	70.9	IEEE	1560	70.9	JEDEC Semiconductor Standards Organization	100	4.5
28	Infineon Technologies AG	1537	2580	59.6	IEEE	1537	59.6	Joint IEEE and ACM	304	11.8
29	Dell Technologies Inc	1468	4794	30.6	ACM-Assoc Comput Mach	1496	31.2	IEEE	1468	30.6
30	Honeywell International Inc.	1444	3689	39.1	IEEE	1444	39.1	RELX Group (Elsevier)	278	7.5
31	Ignis Innovation Inc	1346	1644	81.9	IEEE	1346	81.9	SID-Society for Information Display	137	8.3
32	Synopsys Inc.	1345	3455	38.9	IEEE	1345	38.9	Joint IEEE and ACM	768	22.2
33	NEC Corp	1312	3110	42.2	IEEE	1312	42.2	ACM-Assoc Comput Mach	431	13.9
34	Columbia University	1293	4457	29.0	IEEE	1293	29.0	ACM-Assoc Comput Mach	1018	22.8
35	Toshiba Corp	1221	2847	42.9	IEEE	1221	42.9	ACM-Assoc Comput Mach	217	7.6
36	PACT XPP TECHNOLOGIE	1186	2013	58.9	IEEE	1186	58.9	ACM-Assoc Comput Mach	192	9.5
37	Sap SE	1171	4562	25.7	ACM-Assoc Comput Mach	1522	33.4	IEEE	1171	25.7
38	Advanced Micro Devices Inc	1163	2912	39.9	IEEE	1163	39.9	Joint IEEE and ACM	536	18.4
39	Semiconductor Energy Labor	1143	11522	9.9	SID-Society for Information Display	4009	34.8	American Institute of Physics	2184	19.0

Appendix B: Top 100 Organizations That Cite IEEE; (2001-2020 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
40	IP RESERVOIR LLC	1136	2118	53.6	IEEE	1136	53.6	ACM-Assoc Comput Mach	376	17.8
41	Marvell Technology Group Lt	1132	1656	68.4	IEEE	1132	68.4	ACM-Assoc Comput Mach	109	6.6
42	Seiko Epson Corporation	1089	3070	35.5	IEEE	1089	35.5	Joint IEEE and ACM	399	13.0
43	Xperi Corporation (Formerly	1082	1691	64.0	IEEE	1082	64.0	RELX Group (Elsevier)	111	6.6
44	STMicroelectronics	1075	1871	57.5	IEEE	1075	57.5	ACM-Assoc Comput Mach	112	6.0
45	Blackberry Ltd.	1021	2572	39.7	IEEE	1021	39.7	ACM-Assoc Comput Mach	359	14.0
46	Xerox Corp	1020	4024	25.3	ACM-Assoc Comput Mach	1082	26.9	IEEE	1020	25.3
47	Amazon.com Inc.	1003	3351	29.9	ACM-Assoc Comput Mach	1141	34.0	IEEE	1003	29.9
48	Adobe Inc. (former Adobe Sy	965	3247	29.7	ACM-Assoc Comput Mach	1386	42.7	IEEE	965	29.7
49	Fraunhofer Gesellschaft	961	1566	61.4	IEEE	961	61.4	Audio Eng Soc	109	7.0
50	Huawei Technologies Compa	939	2723	34.5	IEEE	939	34.5	3GPP General Partnership Project Standards Body	338	12.4
51	Hitachi Ltd	936	3460	27.1	IEEE	936	27.1	ACM-Assoc Comput Mach	607	17.5
52	Softbank Corp	900	1906	47.2	IEEE	900	47.2	Joint IEEE and ACM	279	14.6
53	Technicolor SA	889	1579	56.3	IEEE	889	56.3	ACM-Assoc Comput Mach	143	9.1
54	Tabula Inc	873	2330	37.5	IEEE	873	37.5	ACM-Assoc Comput Mach	864	37.1
55	NVIDIA Corp.	845	2103	40.2	IEEE	845	40.2	ACM-Assoc Comput Mach	535	25.4
56	P4TENTS1 LLC	824	1417	58.2	IEEE	824	58.2	ACM-Assoc Comput Mach	234	16.5
57	Massachusetts Institute of Te	820	1830	44.8	IEEE	820	44.8	ACM-Assoc Comput Mach	331	18.1
58	SRC Computers Inc.	811	907	89.4	IEEE	811	89.4	ACM-Assoc Comput Mach	30	3.3
59	Texas Instruments Inc	808	1452	55.6	IEEE	808	55.6	Joint IEEE and ACM	129	8.9
60	Sonos Inc	797	1511	52.7	IEEE	797	52.7	SPIE-Int Soc Opt Engineering	148	9.8
61	Intellectual Ventures Manage	787	3042	25.9	IEEE	787	25.9	ACM-Assoc Comput Mach	486	16.0
62	FireEye Inc	783	1890	41.4	IEEE	783	41.4	ACM-Assoc Comput Mach	361	19.1
63	Imagination Technologies Gr	772	2388	32.3	IEEE	772	32.3	ACM-Assoc Comput Mach	452	18.9
64	Hon Hai Precision Industry C	760	3258	23.3	IEEE	760	23.3	SID-Society for Information Display	465	14.3
65	Brain Corporation	714	1830	39.0	IEEE	714	39.0	MIT Press	354	19.3
66	NXP Semiconductors NV	711	1220	58.3	IEEE	711	58.3	Joint IEEE and ACM	175	14.3
67	Hewlett Packard Enterprises	710	2220	32.0	IEEE	710	32.0	ACM-Assoc Comput Mach	691	31.1
68	LG Electronics Inc.	702	2358	29.8	IEEE	702	29.8	Audio Eng Soc	340	14.4
69	Tela Innovations inc	699	1860	37.6	IEEE	699	37.6	SPIE-Int Soc Opt Engineering	538	28.9
70	Western Digital Corp.	697	1895	36.8	IEEE	697	36.8	ACM-Assoc Comput Mach	259	13.7
71	Fuji Film Holdings Corp	681	1991	34.2	IEEE	681	34.2	ACM-Assoc Comput Mach	502	25.2
72	Texas A&M University	680	774	87.9	IEEE	680	87.9	IET/IEE	14	1.8
73	University of California	671	3161	21.2	IEEE	671	21.2	RELX Group (Elsevier)	383	12.1
74	ConvergeOne Inc	651	1949	33.4	IEEE	651	33.4	Joint IEEE and ACM	636	32.6
75	General Electric Company	651	1604	40.6	IEEE	651	40.6	RELX Group (Elsevier)	157	9.8
76	Netapp Inc	645	3120	20.7	ACM-Assoc Comput Mach	1313	42.1	IEEE	645	20.7
77	Mitsubishi Electric Corp	635	1413	44.9	IEEE	635	44.9	ACM-Assoc Comput Mach	237	16.8
78	Citrix Systems Inc	623	1841	33.8	IEEE	623	33.8	ACM-Assoc Comput Mach	271	14.7
79	Koninklijke Philips N.V.	621	1587	39.1	IEEE	621	39.1	RELX Group (Elsevier)	141	8.9
80	Ericsson	610	1947	31.3	IEEE	610	31.3	3GPP General Partnership Project Standards Body	310	15.9

Appendix B: Top 100 Organizations That Cite IEEE; (2001-2020 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	Conversant Intellectual Prope	589	819	71.9	IEEE	589	71.9	Joint IEEE and ACM	54	6.6
82	Silverbrook Pty Ltd	588	1485	39.6	IEEE	588	39.6	RELX Group (Elsevier)	292	19.7
83	Raytheon Co.	586	1569	37.3	IEEE	586	37.3	ACM-Assoc Comput Mach	137	8.7
84	HRL Laboratories LLC	579	1224	47.3	IEEE	579	47.3	ACM-Assoc Comput Mach	162	13.2
85	Irobot Corp	573	1123	51.0	IEEE	573	51.0	SPIE-Int Soc Opt Engineering	231	20.6
86	Math Works Inc (The)	566	1316	43.0	IEEE	566	43.0	ACM-Assoc Comput Mach	302	22.9
87	National Instruments Corp.	554	1026	54.0	IEEE	554	54.0	ACM-Assoc Comput Mach	118	11.5
88	Industrial Technology Researc	541	994	54.4	IEEE	541	54.4	ACM-Assoc Comput Mach	92	9.3
89	Verizon Communications Inc	539	2947	18.3	ACM-Assoc Comput Mach	828	28.1	IEEE	539	18.3
90	Washington University in St.	536	1208	44.4	IEEE	536	44.4	ACM-Assoc Comput Mach	137	11.3
91	Murata Manufacturing Co. Lt	527	685	76.9	IEEE	527	76.9	RELX Group (Elsevier)	23	3.4
92	Arizona State University	522	874	59.7	IEEE	522	59.7	ACM-Assoc Comput Mach	91	10.4
93	Electronics and Telecommuni	518	1105	46.9	IEEE	518	46.9	ACM-Assoc Comput Mach	123	11.1
94	CREATIVE KINGDOMS LL	505	1674	30.2	IEEE	505	30.2	ACM-Assoc Comput Mach	447	26.7
95	ABB Ltd	501	769	65.1	IEEE	501	65.1	IVI Foundation/SCPI Consortium	93	12.1
96	RPX Corp	498	1301	38.3	IEEE	498	38.3	Internet Soc/IETF-Internet Eng Task Force	144	11.1
97	INDIVIDUAL PATENTER	491	2290	21.4	IEEE	491	21.4	RELX Group (Elsevier)	296	12.9
98	Digimarc Corp.	480	1304	36.8	IEEE	480	36.8	ACM-Assoc Comput Mach	211	16.2
99	Facebook Inc	479	1490	32.1	IEEE	479	32.1	ACM-Assoc Comput Mach	437	29.3
100	Norton Lifelock (formerly Sy	475	1856	25.6	IEEE	475	25.6	ACM-Assoc Comput Mach	403	21.7

Appendix B: Top 100 Organizations That Cite IEEE; (2001-2020 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
<i>Computer Software</i>										
1	Microsoft Corporation	28461	82048	34.7	IEEE	28461	34.7	ACM-Assoc Comput Mach	23200	28.3
2	Apple Inc	17931	39881	45.0	IEEE	17931	45.0	ACM-Assoc Comput Mach	9245	23.2
3	International Business Machi	15703	50987	30.8	IEEE	15703	30.8	ACM-Assoc Comput Mach	11785	23.1
4	Google Inc.	9087	24992	36.4	IEEE	9087	36.4	ACM-Assoc Comput Mach	6696	26.8
5	Oracle Corporation	4136	15875	26.1	ACM-Assoc Comput Mach	5356	33.7	IEEE	4136	26.1
6	Xperi Corporation (Formerly	3556	5841	60.9	IEEE	3556	60.9	ACM-Assoc Comput Mach	453	7.8
7	Qualcomm Inc	3297	6477	50.9	IEEE	3297	50.9	ACM-Assoc Comput Mach	376	5.8
8	Siemens Aktiengesellschaft	3209	7541	42.6	IEEE	3209	42.6	SPIE-Int Soc Opt Engineering	904	12.0
9	Intel Corporation	3146	6848	45.9	IEEE	3146	45.9	ACM-Assoc Comput Mach	1339	19.6
10	Adobe Inc. (former Adobe Sy	3066	7256	42.3	IEEE	3066	42.3	ACM-Assoc Comput Mach	2458	33.9
11	AT&T Inc	2524	6058	41.7	IEEE	2524	41.7	ACM-Assoc Comput Mach	855	14.1
12	Xerox Corp	2518	7267	34.6	IEEE	2518	34.6	ACM-Assoc Comput Mach	1570	21.6
13	Cisco Systems Inc.	2443	7576	32.2	IEEE	2443	32.2	ACM-Assoc Comput Mach	1488	19.6
14	Dolby Laboratories Inc	2326	4088	56.9	IEEE	2326	56.9	Audio Eng Soc	636	15.6
15	HP Inc	2256	5884	38.3	IEEE	2256	38.3	ACM-Assoc Comput Mach	1309	22.2
16	Ricoh Co. Ltd.	2172	4623	47.0	IEEE	2172	47.0	ACM-Assoc Comput Mach	772	16.7
17	Amazon.com Inc.	2083	7874	26.5	ACM-Assoc Comput Mach	2195	27.9	IEEE	2083	26.5
18	Sap SE	2047	9634	21.2	ACM-Assoc Comput Mach	3514	36.5	IEEE	2047	21.2
19	Koninklijke Philips N.V.	2029	6234	32.5	IEEE	2029	32.5	RELX Group (Elsevier)	650	10.4
20	Nokia Corp	1868	4812	38.8	IEEE	1868	38.8	ACM-Assoc Comput Mach	503	10.5
21	Cadence Design Systems Inc	1817	3765	48.3	IEEE	1817	48.3	Joint IEEE and ACM	1065	28.3
22	Broadcom Ltd	1742	3601	48.4	IEEE	1742	48.4	ACM-Assoc Comput Mach	346	9.6
23	Digimarc Corp.	1724	4202	41.0	IEEE	1724	41.0	SPIE-Int Soc Opt Engineering	585	13.9
24	Sony Corp	1694	3501	48.4	IEEE	1694	48.4	ACM-Assoc Comput Mach	580	16.6
25	Synopsys Inc.	1674	5438	30.8	IEEE	1674	30.8	SPIE-Int Soc Opt Engineering	1275	23.4
26	Commvault Systems Inc.	1637	2461	66.5	IEEE	1637	66.5	ACM-Assoc Comput Mach	400	16.3
27	Cognex Corp.	1624	3687	44.0	IEEE	1624	44.0	RELX Group (Elsevier)	691	18.7
28	Nuance Communications Inc	1592	3590	44.3	IEEE	1592	44.3	ACM-Assoc Comput Mach	408	11.4
29	General Electric Company	1588	3381	47.0	IEEE	1588	47.0	RELX Group (Elsevier)	299	8.8
30	Irobot Corp	1430	2510	57.0	IEEE	1430	57.0	SPIE-Int Soc Opt Engineering	375	14.9
31	Verizon Communications Inc	1384	7282	19.0	ACM-Assoc Comput Mach	1813	24.9	IEEE	1384	19.0
32	Honeywell International Inc.	1368	2491	54.9	IEEE	1368	54.9	RELX Group (Elsevier)	200	8.0
33	HRL Laboratories LLC	1321	2654	49.8	IEEE	1321	49.8	RELX Group (Elsevier)	229	8.6
34	Magna International Inc.	1313	2069	63.5	IEEE	1313	63.5	SAE-Society of Automobile Engineers	108	5.2
35	Accenture Ltd.	1301	3853	33.8	IEEE	1301	33.8	ACM-Assoc Comput Mach	614	15.9
36	Applied Materials Inc.	1282	2201	58.2	IEEE	1282	58.2	American Institute of Physics	128	5.8
37	NEC Corp	1219	2817	43.3	IEEE	1219	43.3	ACM-Assoc Comput Mach	399	14.2
38	Blackberry Ltd.	1201	3203	37.5	IEEE	1201	37.5	ACM-Assoc Comput Mach	300	9.4
39	Xilinx Inc.	1199	5170	23.2	ACM-Assoc Comput Mach	2598	50.3	IEEE	1199	23.2

Appendix B: Top 100 Organizations That Cite IEEE; (2001-2020 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
40	PHOENIX SOLUTIONS INC	1070	3195	33.5	IEEE	1070	33.5	ISCA (International Speech Communication Association)	422	13.2
41	Intellectual Ventures Manage	1039	5158	20.1	IEEE	1039	20.1	RELX Group (Elsevier)	554	10.7
42	Raytheon Co.	1031	2286	45.1	IEEE	1031	45.1	SPIE-Int Soc Opt Engineering	168	7.3
43	NVIDIA Corp.	1020	3494	29.2	ACM-Assoc Comput Mach	1307	37.4	IEEE	1020	29.2
44	Honda Motor Co. Ltd.(Honda	984	2013	48.9	IEEE	984	48.9	RELX Group (Elsevier)	225	11.2
45	Walt Disney Co.	947	3804	24.9	ACM-Assoc Comput Mach	2049	53.9	IEEE	947	24.9
46	MicroUnity Systems Enginee	941	1523	61.8	IEEE	941	61.8	Joint IEEE and ACM	140	9.2
47	Intuitive Surgical Inc.	932	1459	63.9	IEEE	932	63.9	SAGES-Society of American Gastrointestinal and Endoscopic	71	4.9
48	eBay Inc	916	4713	19.4	IEEE	916	19.4	ACM-Assoc Comput Mach	626	13.3
49	Samsung Electronics Co Ltd	912	2010	45.4	IEEE	912	45.4	ACM-Assoc Comput Mach	192	9.6
50	Facebook Inc	904	3378	26.8	ACM-Assoc Comput Mach	1046	31.0	IEEE	904	26.8
51	Canon Inc	887	1989	44.6	IEEE	887	44.6	ACM-Assoc Comput Mach	181	9.1
52	STMicroelectronics	868	1376	63.1	IEEE	868	63.1	ACM-Assoc Comput Mach	73	5.3
53	Ericsson	865	2716	31.8	IEEE	865	31.8	3GPP General Partnership Project Standards Body	369	13.6
54	Dell Technologies Inc	862	3363	25.6	ACM-Assoc Comput Mach	1208	35.9	IEEE	862	25.6
55	LG Electronics Inc.	857	1876	45.7	IEEE	857	45.7	Audio Eng Soc	139	7.4
56	ParkerVision Inc	792	1713	46.2	IEEE	792	46.2	IET/IEEE	491	28.7
57	Cortica Ltd	785	1011	77.6	IEEE	785	77.6	ACM-Assoc Comput Mach	113	11.2
58	Panasonic Corporation	781	1567	49.8	IEEE	781	49.8	ACM-Assoc Comput Mach	114	7.3
59	Mitsubishi Electric Corp	755	1594	47.4	IEEE	755	47.4	ACM-Assoc Comput Mach	345	21.6
60	Fraunhofer Gesellschaft	748	1519	49.2	IEEE	748	49.2	Audio Eng Soc	137	9.0
61	Boeing Co. (The)	739	2151	34.4	IEEE	739	34.4	RELX Group (Elsevier)	260	12.1
62	Massachusetts Institute of Te	710	2531	28.1	IEEE	710	28.1	RELX Group (Elsevier)	256	10.1
63	Pelican Imaging Corporation	708	1531	46.2	IEEE	708	46.2	SPIE-Int Soc Opt Engineering	266	17.4
64	Motorola Solutions Inc.	706	1045	67.6	IEEE	706	67.6	Springer Nature	38	3.6
65	Fujitsu Limited	680	1784	38.1	IEEE	680	38.1	Joint IEEE and ACM	360	20.2
66	Columbia University	664	1924	34.5	IEEE	664	34.5	ACM-Assoc Comput Mach	360	18.7
67	Tela Innovations inc	657	2040	32.2	SPIE-Int Soc Opt Engineering	697	34.2	IEEE	657	32.2
68	Technicolor SA	637	1276	49.9	IEEE	637	49.9	SPIE-Int Soc Opt Engineering	112	8.8
69	Hon Hai Precision Industry C	631	1370	46.1	IEEE	631	46.1	ACM-Assoc Comput Mach	137	10.0
70	University of California	618	4300	14.4	IEEE	618	14.4	RELX Group (Elsevier)	527	12.3
71	Battelle Memorial Institute	611	854	71.5	IEEE	611	71.5	RELX Group (Elsevier)	65	7.6
72	BT Group PLC	597	1267	47.1	IEEE	597	47.1	ACM-Assoc Comput Mach	120	9.5
73	CenturyLink Inc	596	2436	24.5	ACM-Assoc Comput Mach	687	28.2	IEEE	596	24.5
74	Sonos Inc	587	1298	45.2	IEEE	587	45.2	SPIE-Int Soc Opt Engineering	162	12.5
75	Hewlett Packard Enterprises	581	1852	31.4	IEEE	581	31.4	ACM-Assoc Comput Mach	484	26.1
76	Citrix Systems Inc	566	1794	31.5	IEEE	566	31.5	ACM-Assoc Comput Mach	320	17.8
77	Seiko Epson Corporation	554	1101	50.3	IEEE	554	50.3	Joint IEEE and ACM	129	11.7
78	Texas Instruments Inc	536	785	68.3	IEEE	536	68.3	Joint IEEE and ACM	46	5.9
79	Huawei Technologies Compa	535	1532	34.9	IEEE	535	34.9	3GPP General Partnership Project Standards Body	155	10.1
80	Eastman Kodak Company	527	1177	44.8	IEEE	527	44.8	RELX Group (Elsevier)	109	9.3

Appendix B: Top 100 Organizations That Cite IEEE; (2001-2020 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	Bosch (Robert) GmbH	518	3591	14.4	IEEE	518	14.4	Springer Nature	355	9.9
82	Lockheed Martin Corp.	504	1124	44.8	IEEE	504	44.8	RELX Group (Elsevier)	113	10.1
83	INDIVIDUAL PATENTER	501	2233	22.4	IEEE	501	22.4	ACM-Assoc Comput Mach	341	15.3
84	NOMADIX INC	500	1971	25.4	IEEE	500	25.4	Network Working Group RFC	307	15.6
85	United States Navy	499	1009	49.5	IEEE	499	49.5	SPIE-Int Soc Opt Engineering	73	7.2
86	Math Works Inc (The)	488	1063	45.9	IEEE	488	45.9	ACM-Assoc Comput Mach	195	18.3
87	TiVo Corp	477	1620	29.4	IEEE	477	29.4	ACM-Assoc Comput Mach	255	15.7
88	Marvell Technology Group Lt	464	636	73.0	IEEE	464	73.0	ACM-Assoc Comput Mach	37	5.8
89	Advanced Micro Devices Inc	462	1150	40.2	IEEE	462	40.2	ACM-Assoc Comput Mach	254	22.1
90	Infineon Technologies AG	459	723	63.5	IEEE	459	63.5	Joint IEEE and ACM	88	12.2
91	L3 Harris Technologies (form	458	793	57.8	IEEE	458	57.8	Internet Soc/IETF-Internet Eng Task Force	74	9.3
92	University of North Carolina	456	1173	38.9	IEEE	456	38.9	ACM-Assoc Comput Mach	201	17.1
93	Toshiba Corp	450	990	45.5	IEEE	450	45.5	ACM-Assoc Comput Mach	79	8.0
94	Georgia Institute of Technolo	444	625	71.0	IEEE	444	71.0	ACM-Assoc Comput Mach	45	7.2
95	Hitachi Ltd	444	2138	20.8	IEEE	444	20.8	ACM-Assoc Comput Mach	353	16.5
96	State University of New York	437	930	47.0	IEEE	437	47.0	ACM-Assoc Comput Mach	141	15.2
97	Palantir Technologies Inc	427	1509	28.3	ACM-Assoc Comput Mach	481	31.9	IEEE	427	28.3
98	Eagleview Technologies Inc	422	993	42.5	IEEE	422	42.5	ACM-Assoc Comput Mach	202	20.3
99	JPMorgan	418	4556	9.2	Source Media	950	20.9	ACS-Am Chem Soc	419	9.2
100	Nielsen Holdings Plc	418	2801	14.9	RELX Group (Elsevier)	471	16.8	IEEE	418	14.9

Appendix B: Top 100 Organizations That Cite IEEE; (2001-2020 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
<i>Cybersecurity</i>										
1	Microsoft Corporation	6279	21695	28.9	IEEE	6279	28.9	ACM-Assoc Comput Mach	5464	25.2
2	International Business Machi	4816	17721	27.2	IEEE	4816	27.2	ACM-Assoc Comput Mach	4075	23.0
3	Cisco Systems Inc.	3316	10662	31.1	IEEE	3316	31.1	ACM-Assoc Comput Mach	1794	16.8
4	Intel Corporation	1848	4491	41.1	IEEE	1848	41.1	ACM-Assoc Comput Mach	504	11.2
5	Blackberry Ltd.	1790	6254	28.6	IEEE	1790	28.6	Internet Soc/IETF-Internet Eng Task Force	630	10.1
6	Google Inc.	1765	5453	32.4	IEEE	1765	32.4	ACM-Assoc Comput Mach	1161	21.3
7	FireEye Inc	1631	3851	42.4	IEEE	1631	42.4	ACM-Assoc Comput Mach	758	19.7
8	Oracle Corporation	1509	6495	23.2	IEEE	1509	23.2	ACM-Assoc Comput Mach	1483	22.8
9	Intertrust Technologies Corp	1396	8926	15.6	ACM-Assoc Comput Mach	1596	17.9	IEEE	1396	15.6
10	AT&T Inc	1342	3365	39.9	IEEE	1342	39.9	ACM-Assoc Comput Mach	418	12.4
11	Columbia University	1319	4661	28.3	IEEE	1319	28.3	ACM-Assoc Comput Mach	1012	21.7
12	Wisteria Trading Inc	1266	2509	50.5	IEEE	1266	50.5	SPIE-Int Soc Opt Engineering	280	11.2
13	Massachusetts Institute of Te	1246	1760	70.8	IEEE	1246	70.8	ACM-Assoc Comput Mach	212	12.0
14	Apple Inc	1140	2830	40.3	IEEE	1140	40.3	ACM-Assoc Comput Mach	613	21.7
15	Nokia Corp	1048	4348	24.1	IEEE	1048	24.1	3GPP General Partnership Project Standards Body	969	22.3
16	Citrix Systems Inc	943	2678	35.2	IEEE	943	35.2	ACM-Assoc Comput Mach	321	12.0
17	McAfee Inc	922	3594	25.7	IEEE	922	25.7	ACM-Assoc Comput Mach	729	20.3
18	Verizon Communications Inc	922	3680	25.1	IEEE	922	25.1	Internet Soc/IETF-Internet Eng Task Force	653	17.7
19	Qualcomm Inc	873	3342	26.1	3GPP General Partnership Project Standards B	874	26.2	IEEE	873	26.1
20	Amazon.com Inc.	843	2845	29.6	IEEE	843	29.6	ACM-Assoc Comput Mach	506	17.8
21	X ONE INC	789	1905	41.4	IEEE	789	41.4	ACM-Assoc Comput Mach	367	19.3
22	InterDigital Inc	780	3289	23.7	3GPP General Partnership Project Standards B	2165	65.8	IEEE	780	23.7
23	Digimarc Corp.	753	1989	37.9	IEEE	753	37.9	SPIE-Int Soc Opt Engineering	181	9.1
24	Norton Lifelock (formerly Sy	737	2595	28.4	IEEE	737	28.4	ACM-Assoc Comput Mach	559	21.5
25	Dell Technologies Inc	723	2828	25.6	ACM-Assoc Comput Mach	889	31.4	IEEE	723	25.6
26	Broadcom Ltd	719	2022	35.6	IEEE	719	35.6	Network Working Group RFC	272	13.5
27	Juniper Networks Inc.	678	1422	47.7	IEEE	678	47.7	Internet Soc/IETF-Internet Eng Task Force	268	18.8
28	Headwater Partners 1 LLC	652	1345	48.5	IEEE	652	48.5	ACM-Assoc Comput Mach	287	21.3
29	Ericsson	641	3581	17.9	3GPP General Partnership Project Standards B	1102	30.8	IEEE	641	17.9
30	Marvell Technology Group Lt	625	926	67.5	IEEE	625	67.5	ACM-Assoc Comput Mach	65	7.0
31	Sony Corp	591	1572	37.6	IEEE	591	37.6	ACM-Assoc Comput Mach	178	11.3
32	Xerox Corp	589	1530	38.5	IEEE	589	38.5	ACM-Assoc Comput Mach	548	35.8
33	NOMADIX INC	583	2235	26.1	IEEE	583	26.1	Network Working Group RFC	354	15.8
34	Verance Corp	578	1087	53.2	IEEE	578	53.2	SPIE-Int Soc Opt Engineering	137	12.6
35	Huawei Technologies Compa	573	2656	21.6	3GPP General Partnership Project Standards B	790	29.7	IEEE	573	21.6
36	Raytheon Co.	540	1821	29.7	IEEE	540	29.7	ACM-Assoc Comput Mach	227	12.5
37	VirnetX Holding Corp	532	9118	5.8	Network Working Group RFC	4570	50.1	Internet Soc/IETF-Internet Eng Task Force	1542	16.9
38	IP RESERVOIR LLC	527	932	56.5	IEEE	527	56.5	ACM-Assoc Comput Mach	147	15.8
39	Extreme Networks Inc	520	1124	46.3	IEEE	520	46.3	ACM-Assoc Comput Mach	139	12.4

Appendix B: Top 100 Organizations That Cite IEEE; (2001-2020 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
40	ONETRUST LLC	486	1899	25.6	ACM-Assoc Comput Mach	1122	59.1	IEEE	486	25.6
41	Samsung Electronics Co Ltd	468	1261	37.1	IEEE	468	37.1	3GPP General Partnership Project Standards Body	268	21.3
42	HP Inc	455	1721	26.4	IEEE	455	26.4	ACM-Assoc Comput Mach	283	16.4
43	Commvault Systems Inc.	424	648	65.4	IEEE	424	65.4	ACM-Assoc Comput Mach	107	16.5
44	L3 Harris Technologies (form	416	701	59.3	IEEE	416	59.3	RELX Group (Elsevier)	54	7.7
45	Fortinet Inc	402	766	52.5	IEEE	402	52.5	ACM-Assoc Comput Mach	146	19.1
46	Assa Abloy AB	375	1958	19.2	IEEE	375	19.2	International Association for Cryptologic Research (IACR)	372	19.0
47	Ricoh Co. Ltd.	370	940	39.4	IEEE	370	39.4	ACM-Assoc Comput Mach	210	22.3
48	Security First Corp	342	1073	31.9	IEEE	342	31.9	ACM-Assoc Comput Mach	319	29.7
49	Arizona State University	324	729	44.4	IEEE	324	44.4	ACM-Assoc Comput Mach	222	30.5
50	CENTRIPETAL NETWORK	322	717	44.9	IEEE	322	44.9	ACM-Assoc Comput Mach	158	22.0
51	DAMBALLA INC	316	1199	26.4	IEEE	316	26.4	ACM-Assoc Comput Mach	297	24.8
52	LG Electronics Inc.	314	1119	28.1	3GPP General Partnership Project Standards B	476	42.5	IEEE	314	28.1
53	Motorola Solutions Inc.	300	638	47.0	IEEE	300	47.0	Network Working Group RFC	60	9.4
54	Fujitsu Limited	296	923	32.1	IEEE	296	32.1	ACM-Assoc Comput Mach	131	14.2
55	Silverbrook Pty Ltd	293	564	52.0	IEEE	293	52.0	RELX Group (Elsevier)	150	26.6
56	NXP Semiconductors NV	291	477	61.0	IEEE	291	61.0	ACM-Assoc Comput Mach	39	8.2
57	NEC Corp	290	1384	21.0	3GPP General Partnership Project Standards B	381	27.5	IEEE	290	21.0
58	Sap SE	286	1063	26.9	ACM-Assoc Comput Mach	348	32.7	IEEE	286	26.9
59	Toshiba Corp	285	1360	21.0	AACS-Advanced Access Content System	299	22.0	IEEE	285	21.0
60	NXGEN PARTNERS IP LLC	284	411	69.1	IEEE	284	69.1	Optical Society of America	65	15.8
61	ConvergeOne Inc	275	868	31.7	IEEE	275	31.7	ACM-Assoc Comput Mach	178	20.5
62	Xilinx Inc.	260	1286	20.2	ACM-Assoc Comput Mach	643	50.0	Joint IEEE and ACM	264	20.5
63	Duchossois Group Inc	258	724	35.6	IEEE	258	35.6	International Association for Cryptologic Research (IACR)	109	15.1
64	Softbank Corp	256	795	32.2	IEEE	256	32.2	Virus Bulletin Ltd	145	18.2
65	Rambus Inc.	248	832	29.8	IEEE	248	29.8	International Association for Cryptologic Research (IACR)	215	25.8
66	BLUERISC INC	246	666	36.9	IEEE	246	36.9	ACM-Assoc Comput Mach	150	22.5
67	Nippon Telegraph & Telepho	245	1689	14.5	International Association for Cryptologic Rese	381	22.6	IEEE	245	14.5
68	CONVERGENT MEDIA SO	240	954	25.2	ACM-Assoc Comput Mach	257	26.9	IEEE	240	25.2
69	Comcast Corp	237	473	50.1	IEEE	237	50.1	3GPP General Partnership Project Standards Body	152	32.1
70	Panasonic Corporation	230	908	25.3	IEEE	230	25.3	Internet Soc/IETF-Internet Eng Task Force	143	15.7
71	Commscope Holding (formerl	229	435	52.6	IEEE	229	52.6	3GPP General Partnership Project Standards Body	45	10.3
72	BLACK HILLS MEDIA LLC	228	878	26.0	Open Connectivity Foundation	412	46.9	IEEE	228	26.0
73	Hewlett Packard Enterprises	217	779	27.9	IEEE	217	27.9	Internet Soc/IETF-Internet Eng Task Force	211	27.1
74	New T-Mobile (former T-Mo	217	686	31.6	IEEE	217	31.6	ACM-Assoc Comput Mach	62	9.0
75	Intellectual Ventures Manage	213	862	24.7	IEEE	213	24.7	ACM-Assoc Comput Mach	112	13.0
76	Quest Software Inc	213	438	48.6	IEEE	213	48.6	ACM-Assoc Comput Mach	88	20.1
77	Witricity Corp	211	285	74.0	IEEE	211	74.0	American Institute of Physics	18	6.3
78	Facebook Inc	207	851	24.3	ACM-Assoc Comput Mach	267	31.4	IEEE	207	24.3
79	Western Digital Corp.	204	664	30.7	IEEE	204	30.7	ACM-Assoc Comput Mach	79	11.9
80	West Corp	195	408	47.8	IEEE	195	47.8	Springer Nature	51	12.5

Appendix B: Top 100 Organizations That Cite IEEE; (2001-2020 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	Electronics and Telecommuni	190	403	47.1	IEEE	190	47.1	ACM-Assoc Comput Mach	37	9.2
82	PRISM TECHNOLOGIES L	190	1053	18.0	IEEE	190	18.0	Internet Soc/IETF-Internet Eng Task Force	183	17.4
83	JPMorgan	186	960	19.4	IEEE	186	19.4	Source Media	87	9.1
84	Adobe Inc. (former Adobe Sy	185	452	40.9	IEEE	185	40.9	ACM-Assoc Comput Mach	77	17.0
85	TRILLIANT NETWORKS IN	183	274	66.8	IEEE	183	66.8	Internet Soc/IETF-Internet Eng Task Force	17	6.2
86	RPX Corp	182	742	24.5	Internet Soc/IETF-Internet Eng Task Force	208	28.0	IEEE	182	24.5
87	Canon Inc	181	455	39.8	IEEE	181	39.8	ACM-Assoc Comput Mach	52	11.4
88	VerintSys	181	939	19.3	ACM-Assoc Comput Mach	224	23.9	International Data Group	198	21.1
89	ODYSSEY WIRELESS INC	180	207	87.0	IEEE	180	87.0	AMER TELEPHONE TELEGRAPH CO, 550 MADISON AV	5	2.4
90	Palo Alto Networks	178	378	47.1	IEEE	178	47.1	ACM-Assoc Comput Mach	73	19.3
91	WEST VIEW RESEARCH L	177	386	45.9	IEEE	177	45.9	SAE-Society of Automobile Engineers	36	9.3
92	Siemens Aktiengesellschaft	176	579	30.4	IEEE	176	30.4	Internet Soc/IETF-Internet Eng Task Force	82	14.2
93	Lockheed Martin Corp.	175	327	53.5	IEEE	175	53.5	ACM-Assoc Comput Mach	21	6.4
94	Via Technologies Inc.	175	302	57.9	IEEE	175	57.9	Joint IEEE and ACM	34	11.3
95	Accenture Ltd.	172	487	35.3	IEEE	172	35.3	ACM-Assoc Comput Mach	159	32.6
96	Adidas AG	171	201	85.1	IEEE	171	85.1	RELX Group (Elsevier)	9	4.5
97	A10 Networks Inc	170	317	53.6	IEEE	170	53.6	ACM-Assoc Comput Mach	64	20.2
98	Global Tel Link Corp	170	269	63.2	IEEE	170	63.2	RELX Group (Elsevier)	14	5.2
99	ARC DEVICES LTD	168	642	26.2	ACM-Assoc Comput Mach	284	44.2	IEEE	168	26.2
100	BT Group PLC	168	363	46.3	IEEE	168	46.3	ACM-Assoc Comput Mach	46	12.7

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
<i>Diagnosis/Surgery/Medical Instruments</i>										
1	Medtronic Inc	10617	1E+05	8.4	RELX Group (Elsevier)	21004	16.6	Wolters Kluwer	15874	12.6
2	Boston Scientific Corp.	5233	73860	7.1	RELX Group (Elsevier)	20229	27.4	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	9071	12.3
3	Dexcom Inc	4547	65695	6.9	RELX Group (Elsevier)	16584	25.2	American Diabetes Association	6800	10.4
4	Intuitive Surgical Inc.	4090	8072	50.7	IEEE	4090	50.7	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	521	6.5
5	Abbott Laboratories	3772	78014	4.8	RELX Group (Elsevier)	18938	24.3	ACS-Am Chem Soc	7595	9.7
6	Johnson & Johnson	3075	44880	6.9	RELX Group (Elsevier)	8786	19.6	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	4713	10.5
7	Partners HealthCare Systems	2060	23592	8.7	Optical Society of America	6314	26.8	RELX Group (Elsevier)	3527	14.9
8	Intellectual Ventures Manage	1899	12162	15.6	IEEE	1899	15.6	RELX Group (Elsevier)	1400	11.5
9	Massachusetts Institute of Te	1721	5868	29.3	IEEE	1721	29.3	RELX Group (Elsevier)	1103	18.8
10	Koninklijke Philips N.V.	1701	10388	16.4	IEEE	1701	16.4	RELX Group (Elsevier)	1360	13.1
11	Masimo Corp	1393	2718	51.3	IEEE	1393	51.3	Wolters Kluwer	206	7.6
12	Stryker Corp.	1194	8726	13.7	RELX Group (Elsevier)	1487	17.0	IEEE	1194	13.7
13	GUIDED THERAPY SYSTE	1189	2892	41.1	IEEE	1189	41.1	RELX Group (Elsevier)	387	13.4
14	Siemens Aktiengesellschaft	1101	3717	29.6	IEEE	1101	29.6	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	445	12.0
15	Smith & Nephew Plc.	1018	14816	6.9	RELX Group (Elsevier)	3017	20.4	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	1406	9.5
16	University of California	957	7472	12.8	RELX Group (Elsevier)	1445	19.3	IEEE	957	12.8
17	LivaNova Plc	928	12406	7.5	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	2642	21.3	RELX Group (Elsevier)	2468	19.9
18	General Electric Company	912	4624	19.7	IEEE	912	19.7	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	679	14.7
19	Otto Bock Holding GmbH &	874	1653	52.9	IEEE	874	52.9	RELX Group (Elsevier)	219	13.2
20	Vanderbilt University	843	2428	34.7	IEEE	843	34.7	RELX Group (Elsevier)	333	13.7
21	VIVAQUANT LLC	785	1255	62.5	IEEE	785	62.5	RELX Group (Elsevier)	102	8.1
22	Stanford University	729	11072	6.6	RELX Group (Elsevier)	1789	16.2	Springer Nature	1473	13.3
23	Columbia University	712	2457	29.0	IEEE	712	29.0	RELX Group (Elsevier)	489	19.9
24	Mevion Medical Systems Inc	663	1270	52.2	IEEE	663	52.2	RELX Group (Elsevier)	168	13.2
25	Google Inc.	626	1359	46.1	IEEE	626	46.1	RELX Group (Elsevier)	131	9.6
26	Sotera Wireless	619	1122	55.2	IEEE	619	55.2	Springer Nature	175	15.6
27	Ossur hf	592	1435	41.3	IEEE	592	41.3	RELX Group (Elsevier)	272	19.0
28	University of Nebraska	582	2072	28.1	IEEE	582	28.1	Springer Nature	299	14.4
29	University of Illinois	500	5314	9.4	American Institute of Physics	813	15.3	ACS-Am Chem Soc	710	13.4
30	Valencell Inc	500	858	58.3	IEEE	500	58.3	Springer Nature	43	5.0
31	Maui Diagnostic Imaging	499	602	82.9	IEEE	499	82.9	RELX Group (Elsevier)	33	5.5
32	BUTTERFLY NETWORKS I	494	555	89.0	IEEE	494	89.0	Acoustical Society of America	28	5.0
33	Cleveland Clinic (and Founda	483	2800	17.3	RELX Group (Elsevier)	572	20.4	IEEE	483	17.3
34	MIRAMAR LABS INC	472	1123	42.0	IEEE	472	42.0	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	125	11.1
35	Johns Hopkins University	423	2150	19.7	IEEE	423	19.7	RELX Group (Elsevier)	326	15.2
36	University of Michigan	419	4483	9.3	RELX Group (Elsevier)	1172	26.1	IEEE	419	9.3
37	University of Minnesota (The	413	2026	20.4	RELX Group (Elsevier)	419	20.7	IEEE	413	20.4
38	University of Texas	404	4920	8.2	RELX Group (Elsevier)	932	18.9	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	546	11.1
39	Virginia Tech University	393	1496	26.3	IEEE	393	26.3	RELX Group (Elsevier)	271	18.1

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
40	BIO CONTROL MEDICAL (383	1410	27.2	IEEE	383	27.2	Wolters Kluwer	222	15.7
41	University of Washington	381	3204	11.9	RELX Group (Elsevier)	598	18.7	IEEE	381	11.9
42	IWALK INC	379	1027	36.9	IEEE	379	36.9	RELX Group (Elsevier)	207	20.2
43	Bonutti Technologies LLC	334	1875	17.8	Springer Nature	428	22.8	IEEE	334	17.8
44	Otsuka Holdings Co Ltd	334	1808	18.5	IEEE	334	18.5	RELX Group (Elsevier)	311	17.2
45	University Health Network	329	747	44.0	IEEE	329	44.0	RELX Group (Elsevier)	100	13.4
46	California Institute of Techno	328	1909	17.2	IEEE	328	17.2	RELX Group (Elsevier)	310	16.2
47	Becton Dickinson and Co.	322	20514	1.6	RELX Group (Elsevier)	3499	17.1	Wolters Kluwer	3220	15.7
48	Nevro Corp	320	2067	15.5	Wolters Kluwer	424	20.5	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	332	16.1
49	BIOSENSORS INTERNATI	304	981	31.0	IEEE	304	31.0	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	141	14.4
50	Nyxoah SA	304	638	47.6	IEEE	304	47.6	RELX Group (Elsevier)	70	11.0
51	Bardy Diagnostics Inc	303	493	61.5	IEEE	303	61.5	RELX Group (Elsevier)	65	13.2
52	Cirrus Logic Inc.	291	408	71.3	IEEE	291	71.3	Acoustical Society of America	40	9.8
53	University of Florida	289	1338	21.6	IEEE	289	21.6	RELX Group (Elsevier)	234	17.5
54	University of Pennsylvania	285	4213	6.8	RELX Group (Elsevier)	650	15.4	American Institute of Physics	505	12.0
55	KONA MEDICAL INC	281	1806	15.6	RELX Group (Elsevier)	476	26.4	IEEE	281	15.6
56	Conformis Inc	279	8017	3.5	Springer Nature	1342	16.7	RELX Group (Elsevier)	996	12.4
57	FACENSE LTD	279	330	84.5	IEEE	279	84.5	ACM-Assoc Comput Mach	35	10.6
58	Medispectra Inc	278	741	37.5	IEEE	278	37.5	RELX Group (Elsevier)	82	11.1
59	University of Pittsburgh	268	2671	10.0	RELX Group (Elsevier)	671	25.1	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	314	11.8
60	HIGHLAND INSTRUMENT	265	490	54.1	IEEE	265	54.1	RELX Group (Elsevier)	46	9.4
61	INDIVIDUAL PATENTER	260	6549	4.0	RELX Group (Elsevier)	1447	22.1	Wolters Kluwer	739	11.3
62	AngioDynamics Inc.	259	2815	9.2	RELX Group (Elsevier)	632	22.5	Springer Nature	299	10.6
63	Samsung Electronics Co Ltd	255	500	51.0	IEEE	255	51.0	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	48	9.6
64	BRAINGATE CO LLC	254	675	37.6	IEEE	254	37.6	RELX Group (Elsevier)	101	15.0
65	Alcon Inc	252	5372	4.7	RELX Group (Elsevier)	1547	28.8	American Medical Association	473	8.8
66	Asahi Kasei Corp.	248	3653	6.8	Wolters Kluwer	828	22.7	RELX Group (Elsevier)	668	18.3
67	Arizona State University	239	454	52.6	IEEE	239	52.6	RELX Group (Elsevier)	56	12.3
68	Varian Medical Systems Inc.	233	2349	9.9	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	632	26.9	RELX Group (Elsevier)	543	23.1
69	United States Department of	225	932	24.1	IEEE	225	24.1	RELX Group (Elsevier)	186	20.0
70	HEMOSONICS LLC	220	431	51.0	IEEE	220	51.0	RELX Group (Elsevier)	45	10.4
71	Case Western Reserve Univer	207	617	33.5	IEEE	207	33.5	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	69	11.2
72	Medrobotics Corp	206	410	50.2	IEEE	206	50.2	Springer Nature	76	18.5
73	Washington University in St.	197	2031	9.7	RELX Group (Elsevier)	288	14.2	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	274	13.5
74	University of South Florida	196	911	21.5	IEEE	196	21.5	RELX Group (Elsevier)	192	21.1
75	BLUEWIND MEDICAL LT	192	288	66.7	IEEE	192	66.7	American Physiological Society	24	8.3
76	Duke University	190	1412	13.5	RELX Group (Elsevier)	216	15.3	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	206	14.6
77	Hologic Inc	190	3172	6.0	RELX Group (Elsevier)	688	21.7	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	540	17.0
78	Victhom Human Bionics Inc	190	376	50.5	IEEE	190	50.5	RELX Group (Elsevier)	86	22.9
79	GEARBOX LLC	189	848	22.3	IEEE	189	22.3	RELX Group (Elsevier)	77	9.1
80	Canon Inc	188	1083	17.4	IEEE	188	17.4	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	132	12.2

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	University of Virginia (and P	178	956	18.6	IEEE	178	18.6	RELX Group (Elsevier)	162	16.9
82	MIRADRY INC	174	252	69.0	IEEE	174	69.0	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	14	5.6
83	Zimmer Biomet Holdings	172	9502	1.8	RELX Group (Elsevier)	1992	21.0	Springer Nature	1229	12.9
84	Hitachi Ltd	170	617	27.6	IEEE	170	27.6	American Institute of Physics	69	11.2
85	Impulse Dynamics N.V.	169	2149	7.9	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	441	20.5	Wolters Kluwer	306	14.2
86	Lockheed Martin Corp.	169	1761	9.6	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	195	11.1	RELX Group (Elsevier)	194	11.0
87	PHYSIOWAVE INC	166	267	62.2	IEEE	166	62.2	Wolters Kluwer	30	11.2
88	Bayer AG	164	1615	10.2	RELX Group (Elsevier)	267	16.5	Wolters Kluwer	208	12.9
89	Mayo Foundation for Medica	163	2412	6.8	RELX Group (Elsevier)	513	21.3	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	342	14.2
90	SRI International	161	277	58.1	IEEE	161	58.1	RELX Group (Elsevier)	24	8.7
91	Northwestern University	159	2095	7.6	RELX Group (Elsevier)	382	18.2	American Institute of Physics	299	14.3
92	Electrocor Llc	158	674	23.4	IEEE	158	23.4	Natl Acad Sciences	116	17.2
93	Nuvasive Inc	158	6064	2.6	Wolters Kluwer	3110	51.3	RELX Group (Elsevier)	719	11.9
94	University of North Carolina	155	1031	15.0	RELX Group (Elsevier)	182	17.7	IEEE	155	15.0
95	CLINICAL DECISION SUPP	152	726	20.9	RELX Group (Elsevier)	159	21.9	IEEE	152	20.9
96	Georgia Institute of Technolo	151	1020	14.8	RELX Group (Elsevier)	191	18.7	IEEE	151	14.8
97	ADVANCED BIO PROSTH	150	517	29.0	IEEE	150	29.0	RELX Group (Elsevier)	116	22.4
98	MC10 Inc	150	1332	11.3	American Institute of Physics	325	24.4	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	161	12.1
99	NEUROVISTA CORP	150	1171	12.8	RELX Group (Elsevier)	335	28.6	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	185	15.8
100	International Business Machi	149	363	41.0	IEEE	149	41.0	RELX Group (Elsevier)	32	8.8

Appendix B: Top 100 Organizations That Cite IEEE; (2001-2020 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
<i>Information Storage</i>										
1	Micron Technology Inc.	15072	30792	48.9	IEEE	15072	48.9	RELX Group (Elsevier)	4665	15.2
2	Western Digital Corp.	6008	11204	53.6	IEEE	6008	53.6	American Institute of Physics	1217	10.9
3	International Business Machi	4700	13222	35.5	IEEE	4700	35.5	ACM-Assoc Comput Mach	2352	17.8
4	ZENO SEMICONDUCTOR I	4668	6104	76.5	IEEE	4668	76.5	IEEE/JPN Soc App Phys	1113	18.2
5	Broadcom Ltd	2504	3096	80.9	IEEE	2504	80.9	ACM-Assoc Comput Mach	135	4.4
6	Macronix International Co. Lt	2454	4298	57.1	IEEE	2454	57.1	IEEE/JPN Soc App Phys	828	19.3
7	Semiconductor Energy Labor	2205	19511	11.3	SID-Society for Information Display	6291	32.2	American Institute of Physics	3129	16.0
8	Conversant Intellectual Prope	2172	2640	82.3	IEEE	2172	82.3	IEEE/JPN Soc App Phys	195	7.4
9	Rambus Inc.	2088	3452	60.5	IEEE	2088	60.5	JEDEC Semiconductor Standards Organization	269	7.8
10	Seagate Technology Plc	1801	4752	37.9	IEEE	1801	37.9	American Institute of Physics	1022	21.5
11	Innovative Silicon SA	1580	1959	80.7	IEEE	1580	80.7	RELX Group (Elsevier)	84	4.3
12	Toshiba Corp	1472	3232	45.5	IEEE	1472	45.5	American Institute of Physics	408	12.6
13	Apple Inc	1440	2911	49.5	IEEE	1440	49.5	American Institute of Physics	251	8.6
14	ATTOPSEMI TECHNOLOG	1438	1819	79.1	IEEE	1438	79.1	IEEE/JPN Soc App Phys	258	14.2
15	Intel Corporation	1400	3259	43.0	IEEE	1400	43.0	Joint IEEE and ACM	550	16.9
16	Infineon Technologies AG	1332	1793	74.3	IEEE	1332	74.3	American Institute of Physics	109	6.1
17	Renesas Electronic Corporati	949	1289	73.6	IEEE	949	73.6	IEEE/JPN Soc App Phys	93	7.2
18	Hitachi Ltd	847	2092	40.5	IEEE	847	40.5	ACM-Assoc Comput Mach	186	8.9
19	Oracle Corporation	754	2522	29.9	ACM-Assoc Comput Mach	1011	40.1	IEEE	754	29.9
20	Microsoft Corporation	716	3217	22.3	ACM-Assoc Comput Mach	1260	39.2	IEEE	716	22.3
21	Samsung Electronics Co Ltd	711	1983	35.9	IEEE	711	35.9	American Institute of Physics	210	10.6
22	TDK Corporation	655	1869	35.0	IEEE	655	35.0	American Institute of Physics	449	24.0
23	Netapp Inc	654	2852	22.9	ACM-Assoc Comput Mach	1212	42.5	IEEE	654	22.9
24	Texas Instruments Inc	627	939	66.8	IEEE	627	66.8	United Business Media/UBM Tech	74	7.9
25	MONOLITHIC 3D INC	612	1075	56.9	IEEE	612	56.9	IEEE/JPN Soc App Phys	118	11.0
26	NXP Semiconductors NV	572	821	69.7	IEEE	572	69.7	Joint IEEE and ACM	69	8.4
27	Commvault Systems Inc.	551	853	64.6	IEEE	551	64.6	ACM-Assoc Comput Mach	150	17.6
28	Qualcomm Inc	544	885	61.5	IEEE	544	61.5	Joint IEEE and ACM	87	9.8
29	Dell Technologies Inc	494	1434	34.4	IEEE	494	34.4	ACM-Assoc Comput Mach	447	31.2
30	Synopsys Inc.	493	957	51.5	IEEE	493	51.5	American Institute of Physics	134	14.0
31	Marvell Technology Group Lt	491	661	74.3	IEEE	491	74.3	ECMA International	34	5.1
32	HP Inc	440	1396	31.5	IEEE	440	31.5	ACM-Assoc Comput Mach	251	18.0
33	Avid Technology Inc.	436	841	51.8	IEEE	436	51.8	ACM-Assoc Comput Mach	270	32.1
34	Microchip Technology Inc.	424	531	79.8	IEEE	424	79.8	IEEE/JPN Soc App Phys	24	4.5
35	Fujitsu Limited	383	718	53.3	IEEE	383	53.3	American Institute of Physics	68	9.5
36	Intellectual Ventures Manage	363	552	65.8	IEEE	363	65.8	Massachusetts Institute of Technology	38	6.9
37	STMicroelectronics	349	550	63.5	IEEE	349	63.5	RELX Group (Elsevier)	38	6.9
38	Boston Scientific Corp.	347	459	75.6	IEEE	347	75.6	IEEE/JPN Soc App Phys	46	10.0
39	Sony Corp	317	823	38.5	IEEE	317	38.5	RELX Group (Elsevier)	50	6.1

Appendix B: Top 100 Organizations That Cite IEEE; (2001-2020 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
40	Softbank Corp	316	600	52.7	IEEE	316	52.7	Joint IEEE and ACM	144	24.0
41	Intertrust Technologies Corp	315	1946	16.2	ACM-Assoc Comput Mach	387	19.9	IEEE	315	16.2
42	Massachusetts Institute of Te	302	535	56.4	IEEE	302	56.4	American Institute of Physics	54	10.1
43	Taiwan Semiconductor Manu	301	411	73.2	IEEE	301	73.2	IEEE/JPN Soc App Phys	53	12.9
44	QST Holdings Llc	290	486	59.7	IEEE	290	59.7	Joint IEEE and ACM	56	11.5
45	NVIDIA Corp.	278	600	46.3	IEEE	278	46.3	Joint IEEE and ACM	142	23.7
46	Crossbar Inc	274	1061	25.8	IEEE	274	25.8	American Institute of Physics	145	13.7
47	Densbits Technologies Ltd	271	502	54.0	IEEE	271	54.0	Springer Nature	78	15.5
48	Advanced Micro Devices Inc	258	733	35.2	IEEE	258	35.2	Joint IEEE and ACM	182	24.8
49	OVONYX MEMORY TECH	254	302	84.1	IEEE	254	84.1	IEEE/JPN Soc App Phys	20	6.6
50	Nantero Inc	250	2268	11.0	ACS-Am Chem Soc	580	25.6	American Institute of Physics	512	22.6
51	Panasonic Corporation	241	735	32.8	IEEE	241	32.8	Institute of Pure and Applied Physics	92	12.5
52	Netlist Inc	239	941	25.4	IP.Com	269	28.6	IEEE	239	25.4
53	Google Inc.	238	564	42.2	IEEE	238	42.2	ACM-Assoc Comput Mach	186	33.0
54	ConvergeOne Inc	232	443	52.4	IEEE	232	52.4	Joint IEEE and ACM	95	21.4
55	Hewlett Packard Enterprises	228	607	37.6	IEEE	228	37.6	ACM-Assoc Comput Mach	170	28.0
56	California Institute of Techno	222	329	67.5	IEEE	222	67.5	AAAS-Am Assoc Advancement Sci	18	5.5
57	Mitsubishi Electric Corp	220	409	53.8	IEEE	220	53.8	ECMA International	85	20.8
58	SK Hynix Inc	189	299	63.2	IEEE	189	63.2	Joint IEEE and ACM	25	8.4
59	NEC Corp	175	474	36.9	IEEE	175	36.9	American Institute of Physics	86	18.1
60	Xilinx Inc.	172	239	72.0	IEEE	172	72.0	Joint IEEE and ACM	21	8.8
61	Global Foundries Inc	171	291	58.8	IEEE	171	58.8	Joint IEEE and ACM	22	7.6
62	Arizona State University	169	272	62.1	IEEE	169	62.1	Joint IEEE and ACM	27	9.9
63	FireEye Inc	162	390	41.5	IEEE	162	41.5	ACM-Assoc Comput Mach	74	19.0
64	Hon Hai Precision Industry C	161	391	41.2	IEEE	161	41.2	American Institute of Physics	59	15.1
65	PACT XPP TECHNOLOGIE	158	275	57.5	IEEE	158	57.5	ACM-Assoc Comput Mach	24	8.7
66	Commissariat A L'Energie At	149	336	44.3	IEEE	149	44.3	American Institute of Physics	60	17.9
67	Kandou	145	151	96.0	IEEE	145	96.0	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	2	1.3
68	Avalanche Technology Inc	144	653	22.1	American Institute of Physics	202	30.9	IEEE	144	22.1
69	INDIVIDUAL PATENTER	132	267	49.4	IEEE	132	49.4	RELX Group (Elsevier)	26	9.7
70	Cisco Systems Inc.	127	275	46.2	IEEE	127	46.2	ACM-Assoc Comput Mach	68	24.7
71	OPTICAL DEVICES LLC	122	220	55.5	IEEE	122	55.5	American Automatic Control Council (AACC)	30	13.6
72	Industrial Techology Researc	120	196	61.2	IEEE	120	61.2	IEEE/JPN Soc App Phys	18	9.2
73	University of California	117	489	23.9	ACS-Am Chem Soc	121	24.7	IEEE	117	23.9
74	Columbia University	115	304	37.8	IEEE	115	37.8	ACM-Assoc Comput Mach	52	17.1
75	Sap SE	114	381	29.9	IEEE	114	29.9	ACM-Assoc Comput Mach	71	18.6
76	Soitec SA	111	140	79.3	IEEE	111	79.3	IET/IEEE	7	5.0
77	Round Rock Research LLC	109	480	22.7	RELX Group (Elsevier)	138	28.8	IEEE	109	22.7
78	Yonsei University	106	173	61.3	IEEE	106	61.3	Joint IEEE and ACM	22	12.7
79	Tela Innovations inc	101	289	34.9	IEEE	101	34.9	SPIE-Int Soc Opt Engineering	87	30.1
80	Nokia Corp	100	255	39.2	IEEE	100	39.2	ACM-Assoc Comput Mach	44	17.3

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	Pioneer Corp.	92	401	22.9	SPIE-Int Soc Opt Engineering	143	35.7	IEEE	92	22.9
82	Integrated Device Technology	90	101	89.1	IEEE	90	89.1	PennWell Publishing Co.	3	3.0
83	United Microelectronics Corp	90	159	56.6	IEEE	90	56.6	American Institute of Physics	30	18.9
84	Glassbridge Enterprises Inc	87	164	53.0	IEEE	87	53.0	SPIE-Int Soc Opt Engineering	13	7.9
85	Amazon.com Inc.	86	218	39.4	IEEE	86	39.4	ACM-Assoc Comput Mach	56	25.7
86	Texas A&M University	84	105	80.0	IEEE	84	80.0	Science Press	5	4.8
87	Spin Memory	83	179	46.4	IEEE	83	46.4	American Institute of Physics	58	32.4
88	Waratek	83	220	37.7	IEEE	83	37.7	ACM-Assoc Comput Mach	55	25.0
89	Purdue University	79	155	51.0	IEEE	79	51.0	Joint IEEE and ACM	17	11.0
90	Carnegie Mellon University	78	140	55.7	IEEE	78	55.7	American Institute of Physics	42	30.0
91	Kioxia Corp (formerly Toshiba)	78	160	48.8	IEEE	78	48.8	IEEE/JPN Soc App Phys	28	17.5
92	PURE Storage Inc	77	258	29.8	ACM-Assoc Comput Mach	82	31.8	IEEE	77	29.8
93	Cirrus Logic Inc.	74	89	83.1	IEEE	74	83.1	ACM-Assoc Comput Mach	3	3.4
94	Huawei Technologies Compa	73	200	36.5	IEEE	73	36.5	Joint IEEE and ACM	55	27.5
95	Interuniversity MicroElectron	73	136	53.7	IEEE	73	53.7	Joint IEEE and ACM	18	13.2
96	McAfee Inc	72	209	34.4	IEEE	72	34.4	ACM-Assoc Comput Mach	60	28.7
97	Honeywell International Inc.	68	116	58.6	IEEE	68	58.6	Springer Nature	8	6.9
98	Koninklijke Philips N.V.	68	171	39.8	IEEE	68	39.8	Institute of Pure and Applied Physics	13	7.6
99	BLUERISC INC	66	194	34.0	IEEE	66	34.0	Joint IEEE and ACM	52	26.8
100	University of Michigan	65	125	52.0	IEEE	65	52.0	Joint IEEE and ACM	36	28.8

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
<i>IOT/Internet of Things</i>										
1	Apple Inc	3186	6556	48.6	IEEE	3186	48.6	ACM-Assoc Comput Mach	1713	26.1
2	SolarEdge Technologies Inc	900	981	91.7	IEEE	900	91.7	Korean Institute of Power Electronics	21	2.1
3	Velatia Group	839	1099	76.3	IEEE	839	76.3	Echelon Corp	81	7.4
4	SIPCO LLC	603	1022	59.0	IEEE	603	59.0	Internet Soc/IETF-Internet Eng Task Force	88	8.6
5	Honeywell International Inc.	306	387	79.1	IEEE	306	79.1	ACM-Assoc Comput Mach	14	3.6
6	AT&T Inc	274	486	56.4	IEEE	274	56.4	ACM-Assoc Comput Mach	27	5.6
7	TRILLIANT NETWORKS IN	239	339	70.5	IEEE	239	70.5	Joint IEEE and ACM	19	5.6
8	Cisco Systems Inc.	237	491	48.3	IEEE	237	48.3	ACM-Assoc Comput Mach	62	12.6
9	Rockwell Automation Inc	232	390	59.5	IEEE	232	59.5	ACM-Assoc Comput Mach	59	15.1
10	ORIGIN WIRELESS INC	231	289	79.9	IEEE	231	79.9	American Institute of Physics	12	4.2
11	LG Electronics Inc.	230	341	67.4	IEEE	230	67.4	3GPP General Partnership Project Standards Body	100	29.3
12	International Business Machi	217	431	50.3	IEEE	217	50.3	ACM-Assoc Comput Mach	29	6.7
13	General Electric Company	194	275	70.5	IEEE	194	70.5	IET/IEE	15	5.5
14	Google Inc.	181	370	48.9	IEEE	181	48.9	ACM-Assoc Comput Mach	83	22.4
15	Microsoft Corporation	178	420	42.4	IEEE	178	42.4	ACM-Assoc Comput Mach	90	21.4
16	EAGLE HARBOR HOLDIN	171	443	38.6	IEEE	171	38.6	SAE-Society of Automobile Engineers	117	26.4
17	Comcast Corp	159	171	93.0	IEEE	159	93.0	SCTE - Society of Cable and Telecom Eng	8	4.7
18	Schneider Electric S.A.	158	1353	11.7	ISA - Instrumentation, Systems & Automation	252	18.6	IEEE	158	11.7
19	Samsung Electronics Co Ltd	155	840	18.5	3GPP General Partnership Project Standards B	563	67.0	IEEE	155	18.5
20	Sonos Inc	153	281	54.4	IEEE	153	54.4	ACM-Assoc Comput Mach	28	10.0
21	ABB Ltd	142	166	85.5	IEEE	142	85.5	IET/IEE	5	3.0
22	Qualcomm Inc	115	279	41.2	IEEE	115	41.2	3GPP General Partnership Project Standards Body	82	29.4
23	Battelle Memorial Institute	112	152	73.7	IEEE	112	73.7	RELX Group (Elsevier)	8	5.3
24	California Institute of Techno	106	110	96.4	IEEE	106	96.4	American Automatic Control Council (AACC)	3	2.7
25	Intel Corporation	106	254	41.7	IEEE	106	41.7	3GPP General Partnership Project Standards Body	97	38.2
26	ASTROLINK INTERNATIO	89	99	89.9	IEEE	89	89.9	IET/IEE	8	8.1
27	DOMINION ENERGY TEC	89	99	89.9	IEEE	89	89.9	IET/IEE	8	8.1
28	EchoStar Corp	81	96	84.4	IEEE	81	84.4	Rajagiri School of Engineering & Technology, Cochin, Kerala,	9	9.4
29	Emerson Electric Co.	78	121	64.5	IEEE	78	64.5	RELX Group (Elsevier)	11	9.1
30	STATSIGNAL SYSTEMS IN	75	132	56.8	IEEE	75	56.8	Internet Soc/IETF-Internet Eng Task Force	14	10.6
31	WALMART APOLLO LLC	75	109	68.8	IEEE	75	68.8	IEEE/RSJ	12	11.0
32	Extreme Networks Inc	74	156	47.4	IEEE	74	47.4	ACM-Assoc Comput Mach	20	12.8
33	Adaptive Computing Enterpri	71	145	49.0	IEEE	71	49.0	ACM-Assoc Comput Mach	26	17.9
34	Alstom	69	81	85.2	IEEE	69	85.2	IET/IEE	8	9.9
35	BORGIA/CUMMINS LLC	69	102	67.6	IEEE	69	67.6	SPIE-Int Soc Opt Engineering	17	16.7
36	Nokia Corp	69	155	44.5	IEEE	69	44.5	3GPP General Partnership Project Standards Body	34	21.9
37	Toyota Motor Corp	66	196	33.7	IEEE	66	33.7	ACM-Assoc Comput Mach	51	26.0
38	AMPT LLC	63	68	92.6	IEEE	63	92.6	IET/IEE	4	5.9
39	Zebra Technologies Corp.	63	82	76.8	IEEE	63	76.8	ACM-Assoc Comput Mach	9	11.0

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
40	Siemens Aktiengesellschaft	62	115	53.9	IEEE	62	53.9	Internet Soc/IETF-Internet Eng Task Force	9	7.8
41	NETWORK-1 TECHNOLOG	61	111	55.0	IEEE	61	55.0	ARES Conferences	15	13.5
42	University of Maryland	60	62	96.8	IEEE	60	96.8	EPE Association	2	3.2
43	Itron Inc.	58	98	59.2	IEEE	58	59.2	ACM-Assoc Comput Mach	13	13.3
44	Sap SE	57	153	37.3	IEEE	57	37.3	ACM-Assoc Comput Mach	33	21.6
45	SOLAREEDGE TECHNOLO	55	68	80.9	IEEE	55	80.9	WIP-Renewable Energies	7	10.3
46	Irobot Corp	53	89	59.6	IEEE	53	59.6	SPIE-Int Soc Opt Engineering	9	10.1
47	Western Digital Corp.	53	63	84.1	IEEE	53	84.1	RELX Group (Elsevier)	10	15.9
48	Amazon.com Inc.	50	147	34.0	IEEE	50	34.0	ACM-Assoc Comput Mach	34	23.1
49	Deere & Co.	48	72	66.7	IEEE	48	66.7	SPIE-Int Soc Opt Engineering	4	5.6
50	Dexcom Inc	48	348	13.8	RELX Group (Elsevier)	81	23.3	IEEE	48	13.8
51	SMART WIRES INC	48	52	92.3	IEEE	48	92.3	ACM-Assoc Comput Mach	4	7.7
52	Georgia Institute of Technolo	44	115	38.3	ACM-Assoc Comput Mach	60	52.2	IEEE	44	38.3
53	Johnson Controls Internationa	44	77	57.1	IEEE	44	57.1	RELX Group (Elsevier)	7	9.1
54	3M Co	43	61	70.5	IEEE	43	70.5	AIAA-Am Inst Aero Astro	3	4.9
55	AFERO INC	43	51	84.3	IEEE	43	84.3	United Business Media/UBM Tech	5	9.8
56	SmartDrive Systems Inc	40	49	81.6	IEEE	40	81.6	ISIF/IEEE	4	8.2
57	Hello Inc	39	44	88.6	IEEE	39	88.6	ACM-Assoc Comput Mach	5	11.4
58	Ericsson	38	236	16.1	3GPP General Partnership Project Standards B	132	55.9	IEEE	38	16.1
59	University of Minnesota (The	36	36	100.0	IEEE	36	100.0			
60	III HOLDINGS 12 LLC	35	50	70.0	IEEE	35	70.0	ACM-Assoc Comput Mach	6	12.0
61	Boeing Co. (The)	33	56	58.9	IEEE	33	58.9	Springer Nature	3	5.4
62	Witricity Corp	33	37	89.2	IEEE	33	89.2	American Institute of Physics	3	8.1
63	Dell Technologies Inc	32	68	47.1	IEEE	32	47.1	ACM-Assoc Comput Mach	17	25.0
64	Knowles Corp	32	50	64.0	IEEE	32	64.0	RELX Group (Elsevier)	4	8.0
65	Hubbell Inc.	31	34	91.2	IEEE	31	91.2	Research Institute of Intelligent Computer Systems	1	2.9
66	Panasonic Corporation	31	46	67.4	IEEE	31	67.4	Network Working Group RFC	6	13.0
67	Sunpower Corp	31	36	86.1	IEEE	31	86.1	EPE Association	4	11.1
68	Tigo Energy Inc	31	43	72.1	IEEE	31	72.1	WIP-Renewable Energies	9	20.9
69	FedEx Corp	30	71	42.3	IEEE	30	42.3	Healthcare Financial Management Association	6	8.5
70	PTC Inc	29	71	40.8	IEEE	29	40.8	ACM-Assoc Comput Mach	12	16.9
71	Schweitzer Engineering Labo	29	30	96.7	IEEE	29	96.7	IEC-International Electrotechnical Commission	1	3.3
72	Huawei Technologies Compa	28	201	13.9	3GPP General Partnership Project Standards B	80	39.8	Open Mobile Alliance (Standards Org)	60	29.9
73	Koninklijke Philips N.V.	28	164	17.1	IEEE	28	17.1	Springer Nature	25	15.2
74	Continental AG (Germany Fe	27	28	96.4	IEEE	27	96.4	Academy Publisher	1	3.6
75	LS Electric co. Ltd. (formerly	27	31	87.1	IEEE	27	87.1	IET/IEE	3	9.7
76	Massachusetts Institute of Te	27	53	50.9	IEEE	27	50.9	ACS-Am Chem Soc	6	11.3
77	SECURENET SOLUTIONS	27	52	51.9	IEEE	27	51.9	ACM-Assoc Comput Mach	13	25.0
78	Toshiba Corp	27	38	71.1	IEEE	27	71.1	3GPP General Partnership Project Standards Body	2	5.3
79	ENERGY TECHNOLOGY G	26	30	86.7	IEEE	26	86.7	RELX Group (Elsevier)	2	6.7
80	PRODEA SYSTEMS INC	26	26	100.0	IEEE	26	100.0			

Appendix B: Top 100 Organizations That Cite IEEE; (2001-2020 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	THE FLORIDA INTERNATI	26	48	54.2	IEEE	26	54.2	ACM-Assoc Comput Mach	16	33.3
82	Accenture Ltd.	25	37	67.6	IEEE	25	67.6	A B B Corporate Management Services AG	4	10.8
83	Immersion Corp.	25	71	35.2	IEEE	25	35.2	ACM-Assoc Comput Mach	10	14.1
84	Legrand S.A.	25	84	29.8	IEEE	25	29.8	Time Inc.	11	13.1
85	Mitsubishi Electric Corp	25	50	50.0	IEEE	25	50.0	3GPP General Partnership Project Standards Body	18	36.0
86	PELTON TECHNOLOGY I	25	37	67.6	IEEE	25	67.6	IEEE/RSJ	4	10.8
87	InterDigital Inc	24	222	10.8	3GPP General Partnership Project Standards B	133	59.9	European Telecom Standards Institute (ETSI)	34	15.3
88	Blackberry Ltd.	23	41	56.1	IEEE	23	56.1	ACM-Assoc Comput Mach	10	24.4
89	Canon Inc	23	28	82.1	IEEE	23	82.1	ACM-Assoc Comput Mach	2	7.1
90	DELTA ENERGY & COMM	23	36	63.9	IEEE	23	63.9	RELX Group (Elsevier)	4	11.1
91	SPARQ SYSTEMS INC	23	29	79.3	IEEE	23	79.3	RELX Group (Elsevier)	3	10.3
92	AXEDA CORP	22	53	41.5	IEEE	22	41.5	ACM-Assoc Comput Mach	9	17.0
93	Convida Wireless LLC	22	292	7.5	3GPP General Partnership Project Standards B	164	56.2	Internet Soc/IETF-Internet Eng Task Force	52	17.8
94	University of California	22	23	95.7	IEEE	22	95.7	Institution of Engineering and Technology	1	4.3
95	Aeris Communications Inc	21	27	77.8	IEEE	21	77.8	RELX Group (Elsevier)	3	11.1
96	ConvergeOne Inc	21	24	87.5	IEEE	21	87.5	Internet Soc/IETF-Internet Eng Task Force	2	8.3
97	PAXGRID TELEMETRIC S	21	24	87.5	IEEE	21	87.5	International Data Group	1	4.2
98	Sony Corp	21	80	26.3	SID-Society for Information Display	24	30.0	IEEE	21	26.3
99	Taiwan Semiconductor Manu	21	39	53.8	IEEE	21	53.8	Electrostatic Discharge Association	15	38.5
100	CenturyLink Inc	20	81	24.7	IEEE	20	24.7	ACM-Assoc Comput Mach	18	22.2

Appendix B: Top 100 Organizations That Cite IEEE; (2001-2020 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
<i>Measuring, Testing and Control Devices</i>										
1	Thermo Fisher Scientific Inc	3179	14957	21.3	RELX Group (Elsevier)	4729	31.6	IEEE	3179	21.3
2	Siemens Aktiengesellschaft	3131	6763	46.3	IEEE	3131	46.3	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	1331	19.7
3	Partners HealthCare Systems	2912	40250	7.2	Optical Society of America	14576	36.2	RELX Group (Elsevier)	5462	13.6
4	International Business Machi	2285	5587	40.9	IEEE	2285	40.9	ACM-Assoc Comput Mach	316	5.7
5	Irobot Corp	2129	4030	52.8	IEEE	2129	52.8	SPIE-Int Soc Opt Engineering	578	14.3
6	Sanken Electric Co. Ltd.	1952	2383	81.9	IEEE	1952	81.9	RELX Group (Elsevier)	281	11.8
7	Honeywell International Inc.	1916	5049	37.9	IEEE	1916	37.9	RELX Group (Elsevier)	579	11.5
8	FormFactor Inc	1770	3461	51.1	IEEE	1770	51.1	Springer Nature	642	18.5
9	Microsoft Corporation	1712	4422	38.7	IEEE	1712	38.7	ACM-Assoc Comput Mach	1109	25.1
10	Texas Instruments Inc	1651	1996	82.7	IEEE	1651	82.7	Joint IEEE and ACM	71	3.6
11	General Electric Company	1317	6392	20.6	IEEE	1317	20.6	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	925	14.5
12	Illumina Inc.	996	3465	28.7	IEEE	996	28.7	Royal Society of Chemistry	477	13.8
13	Apple Inc	837	1799	46.5	IEEE	837	46.5	ACM-Assoc Comput Mach	235	13.1
14	California Institute of Techno	834	5891	14.2	IEEE	834	14.2	RELX Group (Elsevier)	760	12.9
15	Emerson Electric Co.	814	3327	24.5	IEEE	814	24.5	RELX Group (Elsevier)	399	12.0
16	Infineon Technologies AG	814	1219	66.8	IEEE	814	66.8	RELX Group (Elsevier)	85	7.0
17	ABB Ltd	722	1116	64.7	IEEE	722	64.7	RELX Group (Elsevier)	66	5.9
18	Massachusetts Institute of Te	702	3787	18.5	IEEE	702	18.5	RELX Group (Elsevier)	499	13.2
19	Applied Materials Inc.	694	1455	47.7	IEEE	694	47.7	American Institute of Physics	143	9.8
20	AT&T Inc	684	1148	59.6	IEEE	684	59.6	ACM-Assoc Comput Mach	82	7.1
21	Broadcom Ltd	676	1110	60.9	IEEE	676	60.9	RELX Group (Elsevier)	59	5.3
22	Qualcomm Inc	670	1415	47.3	IEEE	670	47.3	3GPP General Partnership Project Standards Body	224	15.8
23	Intel Corporation	669	1542	43.4	IEEE	669	43.4	3GPP General Partnership Project Standards Body	117	7.6
24	Google Inc.	638	1650	38.7	IEEE	638	38.7	ACM-Assoc Comput Mach	319	19.3
25	Lockheed Martin Corp.	612	4646	13.2	American Institute of Physics	1025	22.1	IEEE	612	13.2
26	University of Minnesota (The	604	1815	33.3	IEEE	604	33.3	RELX Group (Elsevier)	245	13.5
27	NXP Semiconductors NV	602	889	67.7	IEEE	602	67.7	RELX Group (Elsevier)	54	6.1
28	Nokia Corp	598	1537	38.9	IEEE	598	38.9	3GPP General Partnership Project Standards Body	109	7.1
29	Midtronics Inc.	596	1354	44.0	IEEE	596	44.0	RELX Group (Elsevier)	235	17.4
30	Intuitive Surgical Inc.	592	1318	44.9	IEEE	592	44.9	SAGES-Society of American Gastrointestinal and Endoscopic	166	12.6
31	Schlumberger Ltd.	579	8480	6.8	Society of Exploration Geophysicists	1798	21.2	Society of Petroleum Engineers	1451	17.1
32	SolarEdge Technologies Inc	542	627	86.4	IEEE	542	86.4	WIP-Renewable Energies	33	5.3
33	Boeing Co. (The)	538	1785	30.1	IEEE	538	30.1	RELX Group (Elsevier)	210	11.8
34	University of Illinois	533	5285	10.1	American Institute of Physics	899	17.0	RELX Group (Elsevier)	788	14.9
35	CPG TECHNOLOGIES INC	528	648	81.5	IEEE	528	81.5	AMER TELEPHONE TELEGRAPH CO, 550 MADISON AV	35	5.4
36	Synopsys Inc.	510	630	81.0	IEEE	510	81.0	Joint IEEE and ACM	42	6.7
37	INTOUCH HEALTH INC	494	1083	45.6	IEEE	494	45.6	IEEE/RSJ	71	6.6
38	Commissariat A L'Energie At	479	1674	28.6	IEEE	479	28.6	RELX Group (Elsevier)	386	23.1
39	Abbott Laboratories	462	14155	3.3	ACS-Am Chem Soc	3529	24.9	RELX Group (Elsevier)	3325	23.5

Appendix B: Top 100 Organizations That Cite IEEE; (2001-2020 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
40	STMicroelectronics	455	694	65.6	IEEE	455	65.6	RELX Group (Elsevier)	81	11.7
41	Raytheon Co.	449	1428	31.4	IEEE	449	31.4	SPIE-Int Soc Opt Engineering	137	9.6
42	Schneider Electric S.A.	445	2745	16.2	IEEE	445	16.2	RELX Group (Elsevier)	315	11.5
43	Honda Motor Co. Ltd.(Honda	439	1020	43.0	IEEE	439	43.0	RELX Group (Elsevier)	127	12.5
44	Samsung Electronics Co Ltd	430	1089	39.5	IEEE	430	39.5	RELX Group (Elsevier)	104	9.6
45	Analog Devices Inc.	419	562	74.6	IEEE	419	74.6	American Institute of Physics	21	3.7
46	Duke University	417	1745	23.9	IEEE	417	23.9	RELX Group (Elsevier)	210	12.0
47	Koninklijke Philips N.V.	406	2541	16.0	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	709	27.9	Society of Magnetic Resonance in Medicine (SMRM)	439	17.3
48	University of California	404	6482	6.2	RELX Group (Elsevier)	978	15.1	ACS-Am Chem Soc	913	14.1
49	Marvell Technology Group Lt	398	457	87.1	IEEE	398	87.1	Bluetooth Special Interest Group	11	2.4
50	INDIVIDUAL PATENTER	388	1567	24.8	IEEE	388	24.8	Optical Society of America	168	10.7
51	Rockwell Automation Inc	382	630	60.6	IEEE	382	60.6	RELX Group (Elsevier)	66	10.5
52	FARO Technologies Inc.	379	969	39.1	IEEE	379	39.1	SPIE-Int Soc Opt Engineering	156	16.1
53	Industrial Techology Researc	378	779	48.5	IEEE	378	48.5	RELX Group (Elsevier)	122	15.7
54	Amazon.com Inc.	375	576	65.1	IEEE	375	65.1	IEEE/RSJ	38	6.6
55	Advantest Corp.	365	510	71.6	IEEE	365	71.6	American Institute of Physics	26	5.1
56	Agilent Technologies Inc	363	1432	25.3	IEEE	363	25.3	RELX Group (Elsevier)	235	16.4
57	Ericsson	359	889	40.4	IEEE	359	40.4	3GPP General Partnership Project Standards Body	181	20.4
58	HRL Laboratories LLC	349	764	45.7	IEEE	349	45.7	RELX Group (Elsevier)	82	10.7
59	University of Texas	347	2146	16.2	IEEE	347	16.2	RELX Group (Elsevier)	319	14.9
60	Stanford University	343	3144	10.9	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	417	13.3	Optical Society of America	378	12.0
61	ParkerVision Inc	332	531	62.5	IEEE	332	62.5	IET/IEE	50	9.4
62	United States Navy	328	1805	18.2	IEEE	328	18.2	RELX Group (Elsevier)	259	14.3
63	Battelle Memorial Institute	323	1308	24.7	IEEE	323	24.7	RELX Group (Elsevier)	274	20.9
64	Schweitzer Engineering Labo	315	355	88.7	IEEE	315	88.7	RELX Group (Elsevier)	15	4.2
65	Micron Technology Inc.	312	566	55.1	IEEE	312	55.1	RELX Group (Elsevier)	41	7.2
66	HEMOSONICS LLC	311	489	63.6	IEEE	311	63.6	RELX Group (Elsevier)	47	9.6
67	Cisco Systems Inc.	297	1346	22.1	Internet Soc/IETF-Internet Eng Task Force	410	30.5	IEEE	297	22.1
68	Toyota Motor Corp	292	677	43.1	IEEE	292	43.1	ACM-Assoc Comput Mach	83	12.3
69	Bosch (Robert) GmbH	291	868	33.5	IEEE	291	33.5	RELX Group (Elsevier)	120	13.8
70	Brain Corporation	285	504	56.5	IEEE	285	56.5	MIT Press	69	13.7
71	Taiwan Semiconductor Manu	284	437	65.0	IEEE	284	65.0	American Institute of Physics	25	5.7
72	HP Inc	283	1117	25.3	IEEE	283	25.3	ACS-Am Chem Soc	121	10.8
73	Panasonic Corporation	278	983	28.3	IEEE	278	28.3	RELX Group (Elsevier)	208	21.2
74	Intellectual Ventures Manage	276	1465	18.8	IEEE	276	18.8	RELX Group (Elsevier)	154	10.5
75	Xerox Corp	267	1037	25.7	IEEE	267	25.7	American Institute of Physics	99	9.5
76	OMNI MEDSCI INC	266	1280	20.8	Optical Society of America	327	25.5	IEEE	266	20.8
77	Toshiba Corp	264	967	27.3	IEEE	264	27.3	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	196	20.3
78	General Motors Corp	260	516	50.4	IEEE	260	50.4	RELX Group (Elsevier)	53	10.3
79	NEC Corp	260	658	39.5	IEEE	260	39.5	3GPP General Partnership Project Standards Body	34	5.2
80	Teradyne Inc.	259	543	47.7	IEEE	259	47.7	ASME-Am Soc Mech Eng	79	14.5

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	Advanced Micro Devices Inc	258	568	45.4	IEEE	258	45.4	SPIE-Int Soc Opt Engineering	67	11.8
82	University of Southern Califo	258	598	43.1	IEEE	258	43.1	Springer Nature	41	6.9
83	Adaptix	252	374	67.4	IEEE	252	67.4	European Telecom Standards Institute (ETSI)	47	12.6
84	Fujitsu Limited	247	548	45.1	IEEE	247	45.1	RELX Group (Elsevier)	34	6.2
85	Georgia Institute of Technolo	245	864	28.4	IEEE	245	28.4	Optical Society of America	123	14.2
86	Mitsubishi Electric Corp	235	472	49.8	IEEE	235	49.8	RELX Group (Elsevier)	27	5.7
87	Halliburton Co. (Holding)	234	4565	5.1	Society of Petroleum Engineers	1534	33.6	SPWLA-Society of Petrophysicists and Well Log Analysts	650	14.2
88	MACAU UNIVERSITY OF	233	245	95.1	IEEE	233	95.1	IEEE/ASME	4	1.6
89	Nintendo Co. Ltd.	230	833	27.6	IEEE	230	27.6	ACM-Assoc Comput Mach	165	19.8
90	University of Michigan	228	1235	18.5	IEEE	228	18.5	RELX Group (Elsevier)	176	14.3
91	TDK Corporation	224	454	49.3	IEEE	224	49.3	RELX Group (Elsevier)	95	20.9
92	Canon Inc	220	1664	13.2	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	317	19.1	IEEE	220	13.2
93	L3 Harris Technologies (form	220	576	38.2	IEEE	220	38.2	American Institute of Physics	45	7.8
94	Sony Corp	219	568	38.6	IEEE	219	38.6	RELX Group (Elsevier)	43	7.6
95	Purdue University	217	1470	14.8	RELX Group (Elsevier)	281	19.1	ACS-Am Chem Soc	245	16.7
96	Hitachi Ltd	215	1265	17.0	IEEE	215	17.0	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	195	15.4
97	KLA-Tencor Corp.	213	2999	7.1	SPIE-Int Soc Opt Engineering	734	24.5	Optical Society of America	527	17.6
98	Oracle Corporation	213	449	47.4	IEEE	213	47.4	3GPP General Partnership Project Standards Body	37	8.2
99	Fluidigm Corp	212	1517	14.0	ACS-Am Chem Soc	253	16.7	IEEE	212	14.0
100	TROXLER ELECTRONIC L	211	506	41.7	IEEE	211	41.7	AMER SOC TESTING MATERIALS	123	24.3

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
<i>Optics/Photography/Electrophotography</i>										
1	Qualcomm Inc	1838	5102	36.0	IEEE	1838	36.0	SID-Society for Information Display	919	18.0
2	Infinera Corporation	1177	2186	53.8	IEEE	1177	53.8	IET/IEE	356	16.3
3	Partners HealthCare Systems	859	12017	7.1	Optical Society of America	4472	37.2	RELX Group (Elsevier)	1672	13.9
4	IDC Llc	642	1779	36.1	IEEE	642	36.1	SID-Society for Information Display	236	13.3
5	Nikon Corp.	610	4109	14.8	SPIE-Int Soc Opt Engineering	1838	44.7	SEMATECH Consortium	818	19.9
6	II-VI Inc	585	1679	34.8	IEEE	585	34.8	Optical Society of America	286	17.0
7	Corning Inc.	572	3796	15.1	Optical Society of America	797	21.0	IEEE	572	15.1
8	Massachusetts Institute of Te	547	2909	18.8	IEEE	547	18.8	Optical Society of America	458	15.7
9	Google Inc.	508	1251	40.6	IEEE	508	40.6	SPIE-Int Soc Opt Engineering	123	9.8
10	Microsoft Corporation	479	1289	37.2	IEEE	479	37.2	ACM-Assoc Comput Mach	282	21.9
11	Synopsys Inc.	466	3126	14.9	SPIE-Int Soc Opt Engineering	1450	46.4	IEEE	466	14.9
12	NVIDIA Corp.	437	1297	33.7	IEEE	437	33.7	IET/IEE	267	20.6
13	Nokia Corp	428	1843	23.2	IEEE	428	23.2	Optical Society of America	343	18.6
14	YFY Inc	423	4792	8.8	SID-Society for Information Display	1876	39.1	National Symposium on Information Display	473	9.9
15	Hoya Corp	421	1271	33.1	IEEE	421	33.1	American Institute of Physics	261	20.5
16	Intellectual Ventures Manage	403	1712	23.5	IEEE	403	23.5	American Physical Society	230	13.4
17	Xperi Corporation (Formerly	373	711	52.5	IEEE	373	52.5	Optical Society of America	81	11.4
18	Screen Holdings Co Ltd (For	360	1323	27.2	IEEE	360	27.2	RELX Group (Elsevier)	206	15.6
19	Intel Corporation	338	1100	30.7	IEEE	338	30.7	SPIE-Int Soc Opt Engineering	153	13.9
20	International Business Machi	312	1861	16.8	SPIE-Int Soc Opt Engineering	454	24.4	IEEE	312	16.8
21	Ericsson	306	1334	22.9	Optical Society of America	520	39.0	IEEE	306	22.9
22	Cheetah Omni LLC	294	1153	25.5	IEEE	294	25.5	Optical Society of America	274	23.8
23	California Institute of Techno	287	1834	15.6	Optical Society of America	504	27.5	IEEE	287	15.6
24	ASML Holding NV	281	8070	3.5	SPIE-Int Soc Opt Engineering	2823	35.0	American Institute of Physics	1676	20.8
25	University of Arizona	275	930	29.6	IEEE	275	29.6	Optical Society of America	164	17.6
26	Stanford University	244	1560	15.6	Optical Society of America	285	18.3	IEEE	244	15.6
27	Texas Instruments Inc	224	822	27.3	IEEE	224	27.3	American Institute of Physics	145	17.6
28	Adobe Inc. (former Adobe Sy	219	512	42.8	IEEE	219	42.8	ACM-Assoc Comput Mach	127	24.8
29	University of California	207	1470	14.1	IEEE	207	14.1	Optical Society of America	188	12.8
30	3M Co	200	3613	5.5	Optical Society of America	539	14.9	RELX Group (Elsevier)	378	10.5
31	Viavi Solutions Inc	194	796	24.4	IEEE	194	24.4	Optical Society of America	135	17.0
32	Cisco Systems Inc.	191	407	46.9	IEEE	191	46.9	Optical Society of America	74	18.2
33	Lockheed Martin Corp.	191	996	19.2	Optical Society of America	248	24.9	IEEE	191	19.2
34	Osterhout Design Group	187	543	34.4	IEEE	187	34.4	ACM-Assoc Comput Mach	162	29.8
35	Micron Technology Inc.	186	1787	10.4	American Institute of Physics	359	20.1	SPIE-Int Soc Opt Engineering	274	15.3
36	University of Colorado (The	181	1446	12.5	Optical Society of America	503	34.8	IEEE	181	12.5
37	HP Inc	176	868	20.3	IEEE	176	20.3	Optical Society of America	97	11.2
38	Princeton University	173	358	48.3	IEEE	173	48.3	American Institute of Physics	32	8.9
39	Fujitsu Limited	165	779	21.2	IEEE	165	21.2	Optical Society of America	122	15.7

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
40	Prysmian SPA	163	925	17.6	Optical Society of America	206	22.3	IEEE	163	17.6
41	United States of America Dep	163	643	25.3	IEEE	163	25.3	IET/IEE	131	20.4
42	Honeywell International Inc.	156	666	23.4	IEEE	156	23.4	SPIE-Int Soc Opt Engineering	107	16.1
43	Canon Inc	153	1796	8.5	SPIE-Int Soc Opt Engineering	248	13.8	American Institute of Physics	222	12.4
44	Electronics and Telecommuni	153	419	36.5	IEEE	153	36.5	Optical Society of America	59	14.1
45	Pelican Imaging Corporation	139	302	46.0	IEEE	139	46.0	SPIE-Int Soc Opt Engineering	53	17.5
46	CIRREX SYSTEMS LLC	136	607	22.4	IEEE	136	22.4	Optical Society of America	88	14.5
47	University of Texas	136	1057	12.9	American Institute of Physics	188	17.8	Optical Society of America	149	14.1
48	Georgia Institute of Technolo	135	437	30.9	IEEE	135	30.9	Optical Society of America	80	18.3
49	OmniGuide Inc	134	1023	13.1	Optical Society of America	242	23.7	IEEE	134	13.1
50	Emcore Corp.	133	168	79.2	IEEE	133	79.2	IEEE/OSA	11	6.5
51	VASCULAR IMAGING CO	133	281	47.3	IEEE	133	47.3	IET/IEE	80	28.5
52	Huawei Technologies Compa	132	258	51.2	IEEE	132	51.2	Optical Society of America	47	18.2
53	Samsung Electronics Co Ltd	132	1147	11.5	IEEE	132	11.5	ACS-Am Chem Soc	126	11.0
54	ALENTIC MICROSCIENCE	128	301	42.5	IEEE	128	42.5	RELX Group (Elsevier)	29	9.6
55	Cubic Wafer Inc	126	224	56.3	IEEE	126	56.3	SPIE-Int Soc Opt Engineering	42	18.8
56	Xerox Corp	112	1151	9.7	ACS-Am Chem Soc	237	20.6	RELX Group (Elsevier)	155	13.5
57	Furukawa Electric Co. Ltd.	108	801	13.5	Optical Society of America	260	32.5	IEEE	108	13.5
58	Lumentum Holdings Inc	102	408	25.0	IEEE	102	25.0	Optical Society of America	89	21.8
59	PTS Corporation	102	232	44.0	IEEE	102	44.0	Optical Society of America	34	14.7
60	Calient Technologies Inc.	101	200	50.5	IEEE	101	50.5	Optical Society of America	29	14.5
61	Sumitomo Electric Industries	101	963	10.5	Optical Society of America	248	25.8	European Conference on Optical Communication (ECOC) Soc	145	15.1
62	Ostendo Technologies Inc	96	209	45.9	IEEE	96	45.9	ACM-Assoc Comput Mach	49	23.4
63	Nippon Telegraph & Telepho	94	526	17.9	IEEE	94	17.9	IET/IEE	85	16.2
64	Neophotonics Corporation	91	252	36.1	IEEE	91	36.1	Optical Society of America	39	15.5
65	RPX Corp	91	222	41.0	IEEE	91	41.0	IEEE/OSA	30	13.5
66	Broadcom Ltd	90	316	28.5	IEEE	90	28.5	SPIE-Int Soc Opt Engineering	65	20.6
67	Applied Materials Inc.	88	516	17.1	SPIE-Int Soc Opt Engineering	124	24.0	American Institute of Physics	88	17.1
68	Raytheon Co.	88	565	15.6	SPIE-Int Soc Opt Engineering	124	21.9	Optical Society of America	120	21.2
69	NXP Semiconductors NV	85	268	31.7	IEEE	85	31.7	American Institute of Physics	45	16.8
70	OMM INC	85	194	43.8	IEEE	85	43.8	SPIE-Int Soc Opt Engineering	43	22.2
71	Mitsubishi Electric Corp	84	231	36.4	IEEE	84	36.4	ACM-Assoc Comput Mach	38	16.5
72	Siemens Aktiengesellschaft	84	357	23.5	SPIE-Int Soc Opt Engineering	119	33.3	IEEE	84	23.5
73	Eastman Kodak Company	80	1105	7.2	RELX Group (Elsevier)	156	14.1	ACS-Am Chem Soc	145	13.1
74	Industrial Technology Researc	80	339	23.6	IEEE	80	23.6	SPIE-Int Soc Opt Engineering	52	15.3
75	Oracle Corporation	80	146	54.8	IEEE	80	54.8	Optical Society of America	22	15.1
76	Commscope Holding (formerl	78	581	13.4	IEEE/OSA	151	26.0	IEEE	78	13.4
77	Apple Inc	77	562	13.7	Optical Society of America	147	26.2	SPIE-Int Soc Opt Engineering	84	14.9
78	Motorola Solutions Inc.	76	306	24.8	American Institute of Physics	90	29.4	IEEE	76	24.8
79	Oewaves Inc	76	253	30.0	Optical Society of America	100	39.5	IEEE	76	30.0
80	Seiko Epson Corporation	75	280	26.8	IEEE	75	26.8	SID-Society for Information Display	58	20.7

Appendix B: Top 100 Organizations That Cite IEEE; (2001-2020 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	Extreme Networks Inc	72	166	43.4	IEEE	72	43.4	ACM-Assoc Comput Mach	22	13.3
82	Panasonic Corporation	72	524	13.7	SPIE-Int Soc Opt Engineering	90	17.2	IEEE	72	13.7
83	Juniper Networks Inc.	71	104	68.3	IEEE	71	68.3	Optical Society of America	19	18.3
84	DIGILENS INC	70	660	10.6	American Institute of Physics	168	25.5	Optical Society of America	101	15.3
85	HRL Laboratories LLC	70	293	23.9	IEEE	70	23.9	American Institute of Physics	50	17.1
86	AT&T Inc	69	108	63.9	IEEE	69	63.9	RELX Group (Elsevier)	10	9.3
87	NEC Corp	69	444	15.5	IEEE	69	15.5	Technical Association of Photopolymers	46	10.4
88	Fujikara Ltd.	67	602	11.1	Optical Society of America	166	27.6	IEICE-Inst Elec Info Comm Eng	111	18.4
89	Skorpios Technologies Inc	67	110	60.9	IEEE	67	60.9	Optical Society of America	22	20.0
90	University of Washington	67	392	17.1	SPIE-Int Soc Opt Engineering	76	19.4	IEEE	67	17.1
91	Hong Kong University of Sci	66	132	50.0	IEEE	66	50.0	ACS-Am Chem Soc	9	6.8
92	AUGMENTED VISION INC	65	129	50.4	IEEE	65	50.4	ACM-Assoc Comput Mach	37	28.7
93	Cornell University	65	505	12.9	IEEE	65	12.9	RELX Group (Elsevier)	59	11.7
94	Olympus Corp.	63	407	15.5	Optical Society of America	97	23.8	IEEE	63	15.5
95	Carl-Zeiss Stiftung	62	2596	2.4	SPIE-Int Soc Opt Engineering	1040	40.1	Optical Society of America	496	19.1
96	Columbia University	62	474	13.1	ACS-Am Chem Soc	102	21.5	IEEE	62	13.1
97	Hewlett Packard Enterprises	62	106	58.5	IEEE	62	58.5	Optical Society of America	15	14.2
98	Luna Innovations Inc	62	361	17.2	Optical Society of America	110	30.5	IEEE	62	17.2
99	Magic Leap Inc	62	251	24.7	IEEE	62	24.7	Optical Society of America	29	11.6
100	Aisin Seiki Co. Ltd.	61	552	11.1	Optical Society of America	274	49.6	IEEE	61	11.1

Appendix B: Top 100 Organizations That Cite IEEE; (2001-2020 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
<i>Power Systems</i>										
1	Witricity Corp	4067	6552	62.1	IEEE	4067	62.1	American Institute of Physics	563	8.6
2	SolarEdge Technologies Inc	3995	4562	87.6	IEEE	3995	87.6	WIP-Renewable Energies	236	5.2
3	CPG TECHNOLOGIES INC	2600	3369	77.2	IEEE	2600	77.2	AMER TELEPHONE TELEGRAPH CO, 550 MADISON AV	175	5.2
4	Flex Ltd (Formerly Flextronic	1651	1778	92.9	IEEE	1651	92.9	United Business Media/UBM Tech	71	4.0
5	ABB Ltd	1595	2345	68.0	IEEE	1595	68.0	IVI Foundation/SCPI Consortium	94	4.0
6	Cirrus Logic Inc.	1577	1733	91.0	IEEE	1577	91.0	ISO-International Standards Organization	50	2.9
7	Massachusetts Institute of Te	1356	3317	40.9	IEEE	1356	40.9	Electrochemical Society, Inc.	455	13.7
8	Energous Corporation	1323	1660	79.7	IEEE	1323	79.7	The European Association on Antennas and Propagation (Eur	162	9.8
9	Rockwell Automation Inc	1192	1290	92.4	IEEE	1192	92.4	EPE Association	37	2.9
10	Enphase Energy Inc	1178	1301	90.5	IEEE	1178	90.5	IET/IEE	43	3.3
11	General Electric Company	1162	2901	40.1	IEEE	1162	40.1	US Dept of Energy	773	26.6
12	SYNQOR INC	899	1027	87.5	IEEE	899	87.5	Penton/IPC, Inc.	45	4.4
13	Texas Instruments Inc	803	932	86.2	IEEE	803	86.2	RELX Group (Elsevier)	29	3.1
14	Infineon Technologies AG	685	778	88.0	IEEE	685	88.0	EPE Association	14	1.8
15	MOJO MOBILITY INC	616	786	78.4	IEEE	616	78.4	RELX Group (Elsevier)	54	6.9
16	AMPT LLC	611	754	81.0	IEEE	611	81.0	IET/IEE	40	5.3
17	Intel Corporation	586	711	82.4	IEEE	586	82.4	IEEE/JPN Soc App Phys	16	2.3
18	Sunpower Corp	540	588	91.8	IEEE	540	91.8	IET/IEE	18	3.1
19	Vicor Corp	524	609	86.0	IEEE	524	86.0	Center for Power Electronics Systems (Virginia Tech)	39	6.4
20	Murata Manufacturing Co. Lt	506	585	86.5	IEEE	506	86.5	RELX Group (Elsevier)	20	3.4
21	Qualcomm Inc	447	564	79.3	IEEE	447	79.3	RELX Group (Elsevier)	32	5.7
22	Maxim Integrated Products In	444	476	93.3	IEEE	444	93.3	Texas Instruments	12	2.5
23	STMicroelectronics	406	496	81.9	IEEE	406	81.9	RELX Group (Elsevier)	19	3.8
24	NXP Semiconductors NV	398	470	84.7	IEEE	398	84.7	IET/IEE	14	3.0
25	Analog Devices Inc.	378	925	40.9	IEEE	378	40.9	RELX Group (Elsevier)	332	35.9
26	Renesas Electronic Corporati	369	457	80.7	IEEE	369	80.7	IEEE/JPN Soc App Phys	11	2.4
27	Industrial Technology Researc	345	639	54.0	IEEE	345	54.0	RELX Group (Elsevier)	148	23.2
28	Qorvo	333	377	88.3	IEEE	333	88.3	European Microwave Association	14	3.7
29	International Business Machi	331	537	61.6	IEEE	331	61.6	RELX Group (Elsevier)	36	6.7
30	Dialog Semiconductor Plc.	330	371	88.9	IEEE	330	88.9	ONLINE INC	18	4.9
31	Irobot Corp	317	591	53.6	IEEE	317	53.6	SPIE-Int Soc Opt Engineering	92	15.6
32	Alstom	292	384	76.0	IEEE	292	76.0	IET/IEE	24	6.3
33	Tigo Energy Inc	286	389	73.5	IEEE	286	73.5	WIP-Renewable Energies	77	19.8
34	Raytheon Co.	271	894	30.3	IEEE	271	30.3	NASA-National Aeronautics and Space Admin	77	8.6
35	Power Integrations Inc.	266	408	65.2	IEEE	266	65.2	Penton/IPC, Inc.	62	15.2
36	THE FLORIDA INTERNATI	258	272	94.9	IEEE	258	94.9	IET/IEE	8	2.9
37	California Institute of Techno	247	2352	10.5	RELX Group (Elsevier)	778	33.1	Electrochemical Society, Inc.	369	15.7
38	Siemens Aktiengesellschaft	237	366	64.8	IEEE	237	64.8	RELX Group (Elsevier)	28	7.7
39	Eaton Corp.	227	303	74.9	IEEE	227	74.9	RELX Group (Elsevier)	16	5.3

Appendix B: Top 100 Organizations That Cite IEEE; (2001-2020 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
40	Broadcom Ltd	225	285	78.9	IEEE	225	78.9	RELX Group (Elsevier)	10	3.5
41	Schneider Electric S.A.	222	290	76.6	IEEE	222	76.6	IEEE/DOE/JPL	9	3.1
42	University of Illinois	209	942	22.2	RELX Group (Elsevier)	350	37.2	IEEE	209	22.2
43	Toshiba Corp	208	760	27.4	RELX Group (Elsevier)	267	35.1	IEEE	208	27.4
44	Microchip Technology Inc.	204	241	84.6	IEEE	204	84.6	IEICE-Inst Elec Info Comm Eng	9	3.7
45	University of California	190	1092	17.4	RELX Group (Elsevier)	197	18.0	IEEE	190	17.4
46	Apple Inc	189	653	28.9	IEEE	189	28.9	RELX Group (Elsevier)	104	15.9
47	Midtronics Inc.	184	462	39.8	IEEE	184	39.8	RELX Group (Elsevier)	77	16.7
48	Semiconductor Energy Labor	183	2760	6.6	SID-Society for Information Display	634	23.0	American Institute of Physics	379	13.7
49	Honeywell International Inc.	171	501	34.1	IEEE	171	34.1	RELX Group (Elsevier)	128	25.5
50	Powermat Technologies Ltd	170	175	97.1	IEEE	170	97.1	American Institute of Physics	4	2.3
51	Delta Electronics Inc	164	188	87.2	IEEE	164	87.2	Korean Institute of Power Electronics	12	6.4
52	On Semiconductor Corporati	158	187	84.5	IEEE	158	84.5	Penton/IPC, Inc.	8	4.3
53	R2 SEMICONDUCTOR INC	158	161	98.1	IEEE	158	98.1	European Microwave Association	2	1.2
54	Microsoft Corporation	157	352	44.6	IEEE	157	44.6	ACM-Assoc Comput Mach	61	17.3
55	Samsung Electronics Co Ltd	157	1179	13.3	RELX Group (Elsevier)	347	29.4	ACS-Am Chem Soc	162	13.7
56	Hong Kong University of Sci	156	251	62.2	IEEE	156	62.2	RELX Group (Elsevier)	34	13.5
57	Marvell Technology Group Lt	155	188	82.4	IEEE	155	82.4	Texas Instruments	16	8.5
58	General Motors Corp	153	926	16.5	RELX Group (Elsevier)	285	30.8	IEEE	153	16.5
59	O2Micro International Ltd.	152	232	65.5	IEEE	152	65.5	Texas Instruments	33	14.2
60	Micron Technology Inc.	149	213	70.0	IEEE	149	70.0	IEEE/JPN Soc App Phys	18	8.5
61	Advanced Energy Industries I	146	158	92.4	IEEE	146	92.4	IET/IEE	3	1.9
62	Huawei Technologies Compa	145	164	88.4	IEEE	145	88.4	IET/IEE	3	1.8
63	Koch Industries Inc	145	191	75.9	IEEE	145	75.9	RELX Group (Elsevier)	12	6.3
64	Boeing Co. (The)	142	357	39.8	IEEE	142	39.8	RELX Group (Elsevier)	49	13.7
65	Silicon Laboratories Inc	141	159	88.7	IEEE	141	88.7	SAE-Society of Automobile Engineers	12	7.5
66	Vertiv Corp	136	148	91.9	IEEE	136	91.9	EPE Association	3	2.0
67	Tesla Motors Inc	134	153	87.6	IEEE	134	87.6	China Electrochemical Society	5	3.3
68	University of Wisconsin	134	184	72.8	IEEE	134	72.8	ACS-Am Chem Soc	10	5.4
69	Western Digital Corp.	134	162	82.7	IEEE	134	82.7	McGraw Hill	16	9.9
70	Koninklijke Philips N.V.	132	179	73.7	IEEE	132	73.7	IET/IEE	11	6.1
71	INFINITE POWER SOLUTI	130	1398	9.3	RELX Group (Elsevier)	317	22.7	American Institute of Physics	309	22.1
72	Mitsubishi Electric Corp	127	191	66.5	IEEE	127	66.5	IET/IEE	24	12.6
73	SRI International	124	705	17.6	SPIE-Int Soc Opt Engineering	152	21.6	IEEE	124	17.6
74	Arizona State University	123	615	20.0	RELX Group (Elsevier)	142	23.1	IEEE	123	20.0
75	Conversant Intellectual Prope	120	144	83.3	IEEE	120	83.3	Joint IEEE and ACM	12	8.3
76	Panasonic Corporation	117	1188	9.8	RELX Group (Elsevier)	351	29.5	Electrochemical Society, Inc.	314	26.4
77	MOTOR EXCELLENCE LL	111	125	88.8	IEEE	111	88.8	IEEE/ASME	14	11.2
78	University of Alabama	111	121	91.7	IEEE	111	91.7	IET/IEE	7	5.8
79	Utah State University	109	124	87.9	IEEE	109	87.9	IET/IEE	6	4.8
80	FYRE STORM INC	105	110	95.5	IEEE	105	95.5	FUJITSU LTD	2	1.8

Appendix B: Top 100 Organizations That Cite IEEE; (2001-2020 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	TDK Corporation	105	253	41.5	IEEE	105	41.5	RELX Group (Elsevier)	56	22.1
82	Schweitzer Engineering Labo	104	106	98.1	IEEE	104	98.1	IET/IEE	1	0.9
83	University of Colorado (The	102	111	91.9	IEEE	102	91.9	RELX Group (Elsevier)	3	2.7
84	University of Texas	101	757	13.3	RELX Group (Elsevier)	193	25.5	Electrochemical Society, Inc.	120	15.9
85	Lenovo Group Ltd	100	124	80.6	IEEE	100	80.6	RELX Group (Elsevier)	9	7.3
86	Google Inc.	99	143	69.2	IEEE	99	69.2	ACM-Assoc Comput Mach	12	8.4
87	University of Michigan	97	306	31.7	IEEE	97	31.7	Electrochemical Society, Inc.	64	20.9
88	Commissariat A L'Energie At	96	523	18.4	RELX Group (Elsevier)	189	36.1	IEEE	96	18.4
89	Intellectual Ventures Manage	96	189	50.8	IEEE	96	50.8	RELX Group (Elsevier)	38	20.1
90	Causam Energy Inc	95	124	76.6	IEEE	95	76.6	Springer Nature	16	12.9
91	University of Maryland	95	257	37.0	IEEE	95	37.0	RELX Group (Elsevier)	54	21.0
92	Alticor Inc	94	121	77.7	IEEE	94	77.7	RELX Group (Elsevier)	9	7.4
93	Bosch (Robert) GmbH	92	814	11.3	Electrochemical Society, Inc.	191	23.5	RELX Group (Elsevier)	175	21.5
94	DRAYSON TECHNOLOGIE	92	104	88.5	IEEE	92	88.5	The European Association on Antennas and Propagation (Eur	4	3.8
95	NEC Corp	92	253	36.4	IEEE	92	36.4	RELX Group (Elsevier)	57	22.5
96	ENECSYS LTD	91	101	90.1	IEEE	91	90.1	WIP-Renewable Energies	5	5.0
97	Hitachi Ltd	91	264	34.5	IEEE	91	34.5	IET/IEE	45	17.0
98	Emerson Electric Co.	89	146	61.0	IEEE	89	61.0	SAE-Society of Automobile Engineers	15	10.3
99	IDEAL POWER INC	87	106	82.1	IEEE	87	82.1	EPE Association	15	14.2
100	TechnipFMC	87	120	72.5	IEEE	87	72.5	ASME-Am Soc Mech Eng	12	10.0

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
<i>Robotics and Intelligent Manufacturing</i>										
1	Irobot Corp	5689	9919	57.4	IEEE	5689	57.4	SPIE-Int Soc Opt Engineering	1271	12.8
2	Intuitive Surgical Inc.	5107	8625	59.2	IEEE	5107	59.2	SAGES-Society of American Gastrointestinal and Endoscopic	380	4.4
3	Applied Materials Inc.	1598	2707	59.0	IEEE	1598	59.0	American Institute of Physics	156	5.8
4	INTOUCH HEALTH INC	1406	2852	49.3	IEEE	1406	49.3	IEEE/RSJ	211	7.4
5	Brain Corporation	776	1431	54.2	IEEE	776	54.2	MIT Press	232	16.2
6	Honda Motor Co. Ltd.(Honda	685	1568	43.7	IEEE	685	43.7	RELX Group (Elsevier)	188	12.0
7	Massachusetts Institute of Te	629	1471	42.8	IEEE	629	42.8	RELX Group (Elsevier)	209	14.2
8	Microsoft Corporation	628	1707	36.8	IEEE	628	36.8	ACM-Assoc Comput Mach	346	20.3
9	University of Nebraska	583	1999	29.2	IEEE	583	29.2	Springer Nature	292	14.6
10	International Business Machi	546	1524	35.8	IEEE	546	35.8	ACM-Assoc Comput Mach	177	11.6
11	Stryker Corp.	525	1383	38.0	IEEE	525	38.0	Springer Nature	202	14.6
12	Vanderbilt University	469	616	76.1	IEEE	469	76.1	IEEE/RSJ	45	7.3
13	Sony Corp	383	534	71.7	IEEE	383	71.7	IEEE/RSJ	43	8.1
14	Siemens Aktiengesellschaft	375	827	45.3	IEEE	375	45.3	SPIE-Int Soc Opt Engineering	76	9.2
15	PDF Solutions	369	464	79.5	IEEE	369	79.5	SPIE-Int Soc Opt Engineering	61	13.1
16	X Development Llc	309	435	71.0	IEEE	309	71.0	IEEE/RSJ	51	11.7
17	Google Inc.	294	525	56.0	IEEE	294	56.0	ACM-Assoc Comput Mach	85	16.2
18	Samsung Electronics Co Ltd	270	410	65.9	IEEE	270	65.9	IEEE/RSJ	33	8.0
19	Immersion Corp.	269	689	39.0	IEEE	269	39.0	ASME-Am Soc Mech Eng	58	8.4
20	HRL Laboratories LLC	267	438	61.0	IEEE	267	61.0	SPIE-Int Soc Opt Engineering	26	5.9
21	Amazon.com Inc.	254	332	76.5	IEEE	254	76.5	IEEE/RSJ	20	6.0
22	Otto Bock Holding GmbH &	239	399	59.9	IEEE	239	59.9	RELX Group (Elsevier)	43	10.8
23	SIPCO LLC	238	414	57.5	IEEE	238	57.5	Internet Soc/IETF-Internet Eng Task Force	35	8.5
24	Johnson & Johnson	237	1088	21.8	IEEE	237	21.8	RELX Group (Elsevier)	186	17.1
25	MACAU UNIVERSITY OF	234	245	95.5	IEEE	234	95.5	IEEE/ASME	3	1.2
26	Medrobotics Corp	231	482	47.9	IEEE	231	47.9	Springer Nature	95	19.7
27	Johns Hopkins University	220	371	59.3	IEEE	220	59.3	RELX Group (Elsevier)	21	5.7
28	Advanced Micro Devices Inc	205	431	47.6	IEEE	205	47.6	RELX Group (Elsevier)	51	11.8
29	Cadence Design Systems Inc	194	454	42.7	IEEE	194	42.7	Joint IEEE and ACM	158	34.8
30	General Electric Company	182	326	55.8	IEEE	182	55.8	RELX Group (Elsevier)	20	6.1
31	Boeing Co. (The)	181	453	40.0	IEEE	181	40.0	RELX Group (Elsevier)	86	19.0
32	Emerson Electric Co.	180	671	26.8	IEEE	180	26.8	RELX Group (Elsevier)	91	13.6
33	Cimpres NV	179	435	41.1	IEEE	179	41.1	RELX Group (Elsevier)	121	27.8
34	SRI International	174	399	43.6	IEEE	174	43.6	SPIE-Int Soc Opt Engineering	56	14.0
35	WALMART APOLLO LLC	160	219	73.1	IEEE	160	73.1	IEEE/RSJ	26	11.9
36	L3 Harris Technologies (form	154	221	69.7	IEEE	154	69.7	Society of Petroleum Engineers	16	7.2
37	ICOSYSTEM CORP	150	198	75.8	IEEE	150	75.8	IET/IEE	10	5.1
38	Bonutti Technologies LLC	147	539	27.3	IEEE	147	27.3	Springer Nature	141	26.2
39	ABB Ltd	146	214	68.2	IEEE	146	68.2	RELX Group (Elsevier)	19	8.9

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
40	Honeywell International Inc.	140	291	48.1	IEEE	140	48.1	RELX Group (Elsevier)	36	12.4
41	Battelle Memorial Institute	135	196	68.9	IEEE	135	68.9	IEEE/RSJ	28	14.3
42	Koch Industries Inc	131	175	74.9	IEEE	131	74.9	RELX Group (Elsevier)	12	6.9
43	University of Southern Califo	130	206	63.1	IEEE	130	63.1	Springer Nature	16	7.8
44	IWALK INC	126	262	48.1	IEEE	126	48.1	RELX Group (Elsevier)	38	14.5
45	Broadcom Ltd	124	209	59.3	IEEE	124	59.3	RELX Group (Elsevier)	38	18.2
46	MONOLITHIC 3D INC	124	222	55.9	IEEE	124	55.9	IEEE/JPN Soc App Phys	24	10.8
47	Rockwell Automation Inc	124	231	53.7	IEEE	124	53.7	RELX Group (Elsevier)	27	11.7
48	ROY-G-BIV CORP	123	385	31.9	IEEE	123	31.9	ISO-International Standards Organization	67	17.4
49	INDIVIDUAL PATENTER	120	258	46.5	IEEE	120	46.5	ACM-Assoc Comput Mach	10	3.9
50	Xerox Corp	120	276	43.5	IEEE	120	43.5	ACM-Assoc Comput Mach	37	13.4
51	Fanuc Ltd.	119	196	60.7	IEEE	119	60.7	RELX Group (Elsevier)	18	9.2
52	Walt Disney Co.	118	281	42.0	IEEE	118	42.0	ACM-Assoc Comput Mach	83	29.5
53	University of Washington	117	240	48.8	IEEE	117	48.8	IEEE/RSJ	18	7.5
54	Align Technology Inc	114	589	19.4	IEEE	114	19.4	JCO - Journal of Clinical Orthodontics	93	15.8
55	Taiwan Semiconductor Manu	112	209	53.6	IEEE	112	53.6	SPIE-Int Soc Opt Engineering	18	8.6
56	University of Minnesota (The	111	160	69.4	IEEE	111	69.4	IEEE/RSJ	13	8.1
57	University of Pennsylvania	111	137	81.0	IEEE	111	81.0	IEEE/RSJ	15	10.9
58	Toshiba Corp	102	165	61.8	IEEE	102	61.8	RELX Group (Elsevier)	6	3.6
59	Tokyo Electron Limited	98	243	40.3	IEEE	98	40.3	RELX Group (Elsevier)	26	10.7
60	University of California	97	147	66.0	IEEE	97	66.0	IEEE/RSJ	10	6.8
61	University of South Florida	97	154	63.0	IEEE	97	63.0	ACM-Assoc Comput Mach	15	9.7
62	American Express Co.	96	343	28.0	IEEE	96	28.0	The USENIX Association	39	11.4
63	SPHERO INC	96	98	98.0	IEEE	96	98.0	American Automatic Control Council (AACC)	2	2.0
64	Toyota Motor Corp	96	197	48.7	IEEE	96	48.7	ACM-Assoc Comput Mach	20	10.2
65	Intellectual Ventures Manage	95	409	23.2	IEEE	95	23.2	RELX Group (Elsevier)	51	12.5
66	Panasonic Corporation	95	192	49.5	IEEE	95	49.5	RSJ-Robotics Society of Japan	12	6.3
67	Tela Innovations inc	94	207	45.4	IEEE	94	45.4	Joint IEEE and ACM	52	25.1
68	Canon Inc	93	204	45.6	IEEE	93	45.6	SPIE-Int Soc Opt Engineering	20	9.8
69	NEURALA INC	87	142	61.3	IEEE	87	61.3	MIT Press	20	14.1
70	Lockheed Martin Corp.	85	214	39.7	IEEE	85	39.7	RELX Group (Elsevier)	16	7.5
71	3D Systems Corp.	84	191	44.0	IEEE	84	44.0	ACM-Assoc Comput Mach	40	20.9
72	Teradyne Inc.	83	181	45.9	IEEE	83	45.9	ASME-Am Soc Mech Eng	23	12.7
73	ALOFT MEDIA LLC	82	102	80.4	IEEE	82	80.4	ASCE-AMER SOC CIVIL ENGINEERS	6	5.9
74	ARCHI CON DES INVENTI	82	408	20.1	ACM-Assoc Comput Mach	115	28.2	IEEE	82	20.1
75	HP Inc	82	203	40.4	IEEE	82	40.4	ACM-Assoc Comput Mach	26	12.8
76	Caterpillar Inc.	81	221	36.7	IEEE	81	36.7	SAE-Society of Automobile Engineers	35	15.8
77	Sap SE	81	283	28.6	IEEE	81	28.6	RELX Group (Elsevier)	45	15.9
78	Rag Foundation	76	123	61.8	IEEE	76	61.8	RELX Group (Elsevier)	16	13.0
79	Raytheon Co.	76	224	33.9	IEEE	76	33.9	RELX Group (Elsevier)	25	11.2
80	HURCO COMPANIES INC	72	168	42.9	IEEE	72	42.9	Springer Nature	19	11.3

Appendix B: Top 100 Organizations That Cite IEEE; (2001-2020 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	Midea Group Co Ltd	72	103	69.9	IEEE	72	69.9	IEEE/RSJ	10	9.7
82	Fujitsu Limited	71	137	51.8	IEEE	71	51.8	RELX Group (Elsevier)	13	9.5
83	General Motors Corp	71	178	39.9	IEEE	71	39.9	RELX Group (Elsevier)	19	10.7
84	Harvard University	71	171	41.5	IEEE	71	41.5	IEEE/RSJ	25	14.6
85	MKS Instruments Inc.	71	175	40.6	IEEE	71	40.6	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	27	15.4
86	Health Discovery Corp	70	282	24.8	IEEE	70	24.8	IWDM Org	24	8.5
87	NEC Corp	70	139	50.4	IEEE	70	50.4	ACM-Assoc Comput Mach	12	8.6
88	Softbank Corp	69	132	52.3	IEEE	69	52.3	IEEE/RSJ	30	22.7
89	AUREON LABORATORIES	67	273	24.5	IEEE	67	24.5	RELX Group (Elsevier)	35	12.8
90	Arizona State University	65	106	61.3	IEEE	65	61.3	RELX Group (Elsevier)	7	6.6
91	Ecole Polytechnique Federale	65	94	69.1	IEEE	65	69.1	IEEE/RSJ	6	6.4
92	Amada Holdings Co. Ltd.	64	183	35.0	IEEE	64	35.0	RELX Group (Elsevier)	45	24.6
93	Procter & Gamble Co.	64	119	53.8	IEEE	64	53.8	RELX Group (Elsevier)	13	10.9
94	Magic Leap Inc	63	67	94.0	IEEE	63	94.0	ACM-Assoc Comput Mach	3	4.5
95	Oracle Corporation	63	119	52.9	IEEE	63	52.9	ACM-Assoc Comput Mach	17	14.3
96	Brooks Automation Inc.	60	133	45.1	IEEE	60	45.1	RELX Group (Elsevier)	11	8.3
97	TEST ADVANTAGE INC	60	71	84.5	IEEE	60	84.5	SPIE-Int Soc Opt Engineering	4	5.6
98	United States Navy	59	109	54.1	IEEE	59	54.1	IEEE/RSJ	8	7.3
99	Johnson Controls Internationa	58	137	42.3	IEEE	58	42.3	RELX Group (Elsevier)	19	13.9
100	Deere & Co.	57	110	51.8	IEEE	57	51.8	RELX Group (Elsevier)	11	10.0

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
<i>Semiconductors/Solid-State Devices/Electronics</i>										
1	Micron Technology Inc.	22827	83417	27.4	IEEE	22827	27.4	RELX Group (Elsevier)	15303	18.3
2	Semiconductor Energy Labor	12013	1E+05	9.9	SID-Society for Information Display	35105	28.9	American Institute of Physics	24979	20.6
3	MONOLITHIC 3D INC	10365	17534	59.1	IEEE	10365	59.1	IEEE/JPN Soc App Phys	1936	11.0
4	International Business Machi	9401	20941	44.9	IEEE	9401	44.9	American Institute of Physics	3305	15.8
5	Taiwan Semiconductor Manu	7684	22687	33.9	IEEE	7684	33.9	American Institute of Physics	7184	31.7
6	Tela Innovations inc	4829	15121	31.9	SPIE-Int Soc Opt Engineering	5066	33.5	IEEE	4829	31.9
7	Macronix International Co. Lt	4629	8809	52.5	IEEE	4629	52.5	IEEE/JPN Soc App Phys	1688	19.2
8	Intel Corporation	4412	8310	53.1	IEEE	4412	53.1	American Institute of Physics	1004	12.1
9	Qorvo	4173	4856	85.9	IEEE	4173	85.9	American Institute of Physics	358	7.4
10	Cree Inc.	4127	11137	37.1	IEEE	4127	37.1	American Institute of Physics	2533	22.7
11	Western Digital Corp.	3900	7802	50.0	IEEE	3900	50.0	American Institute of Physics	996	12.8
12	Infineon Technologies AG	3683	6877	53.6	IEEE	3683	53.6	American Institute of Physics	878	12.8
13	Chipbond Technology Corp	2885	3613	79.9	IEEE	2885	79.9	RELX Group (Elsevier)	266	7.4
14	On Semiconductor Corporati	2641	3604	73.3	IEEE	2641	73.3	RELX Group (Elsevier)	277	7.7
15	NXP Semiconductors NV	2462	4945	49.8	IEEE	2462	49.8	American Institute of Physics	784	15.9
16	Amberwave Inc	2337	6843	34.2	IEEE	2337	34.2	American Institute of Physics	2045	29.9
17	University of Illinois	2216	19286	11.5	American Institute of Physics	4767	24.7	ACS-Am Chem Soc	2800	14.5
18	Applied Materials Inc.	2150	12182	17.6	American Institute of Physics	2714	22.3	IEEE	2150	17.6
19	Murata Manufacturing Co. Lt	2118	2742	77.2	IEEE	2118	77.2	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	78	2.8
20	Broadcom Ltd	2096	6187	33.9	IEEE	2096	33.9	SMTA-Surface Mount Technology Association	1017	16.4
21	Texas Instruments Inc	2089	3661	57.1	IEEE	2089	57.1	American Institute of Physics	363	9.9
22	Toshiba Corp	1991	4986	39.9	IEEE	1991	39.9	American Institute of Physics	822	16.5
23	PDF Solutions	1915	2397	79.9	IEEE	1915	79.9	SPIE-Int Soc Opt Engineering	340	14.2
24	Global Foundries Inc	1605	3032	52.9	IEEE	1605	52.9	American Institute of Physics	433	14.3
25	ASM International N.V.	1415	8718	16.2	American Institute of Physics	2306	26.5	RELX Group (Elsevier)	1598	18.3
26	Samsung Electronics Co Ltd	1375	7879	17.5	American Institute of Physics	1853	23.5	IEEE	1375	17.5
27	Renesas Electronic Corporati	1335	2386	56.0	IEEE	1335	56.0	IEEE/JPN Soc App Phys	295	12.4
28	University of California	1311	13381	9.8	American Institute of Physics	3650	27.3	RELX Group (Elsevier)	1751	13.1
29	STMicroelectronics	1292	2938	44.0	IEEE	1292	44.0	RELX Group (Elsevier)	417	14.2
30	California Institute of Techno	1271	7166	17.7	IEEE	1271	17.7	American Institute of Physics	1197	16.7
31	Qualcomm Inc	1261	2488	50.7	IEEE	1261	50.7	American Institute of Physics	217	8.7
32	Advanced Micro Devices Inc	1258	2329	54.0	IEEE	1258	54.0	American Institute of Physics	250	10.7
33	Xperi Corporation (Formerly	1217	3407	35.7	IEEE	1217	35.7	American Institute of Physics	835	24.5
34	II-VI Inc	1180	3482	33.9	IEEE	1180	33.9	American Institute of Physics	647	18.6
35	Transphorm Inc	1171	2272	51.5	IEEE	1171	51.5	American Institute of Physics	449	19.8
36	HRL Laboratories LLC	1031	2036	50.6	IEEE	1031	50.6	American Institute of Physics	375	18.4
37	Massachusetts Institute of Te	1014	6675	15.2	American Institute of Physics	1538	23.0	IEEE	1014	15.2
38	Commissariat A L'Energie At	985	4957	19.9	American Institute of Physics	1173	23.7	IEEE	985	19.9
39	ZENO SEMICONDUCTOR I	979	1258	77.8	IEEE	979	77.8	IEEE/JPN Soc App Phys	215	17.1

Appendix B: Top 100 Organizations That Cite IEEE; (2001-2020 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
40	Panasonic Corporation	945	4412	21.4	IEEE	945	21.4	American Institute of Physics	783	17.7
41	Fujitsu Limited	931	2490	37.4	IEEE	931	37.4	American Institute of Physics	313	12.6
42	United Microelectronics Corp	901	1730	52.1	IEEE	901	52.1	American Institute of Physics	276	16.0
43	Motorola Solutions Inc.	865	2883	30.0	IEEE	865	30.0	American Institute of Physics	773	26.8
44	Synopsys Inc.	811	1746	46.4	IEEE	811	46.4	American Institute of Physics	311	17.8
45	Crossbar Inc	696	2349	29.6	IEEE	696	29.6	American Institute of Physics	351	14.9
46	Lam Research Corp.	692	4037	17.1	American Institute of Physics	1167	28.9	IEEE	692	17.1
47	Mevion Medical Systems Inc	686	2052	33.4	IEEE	686	33.4	RELX Group (Elsevier)	389	19.0
48	Mitsubishi Electric Corp	628	1255	50.0	IEEE	628	50.0	American Institute of Physics	110	8.8
49	Analog Devices Inc.	624	938	66.5	IEEE	624	66.5	RELX Group (Elsevier)	66	7.0
50	Unisantis Electronics Ltd	604	711	85.0	IEEE	604	85.0	RELX Group (Elsevier)	36	5.1
51	Apple Inc	585	1308	44.7	IEEE	585	44.7	American Institute of Physics	194	14.8
52	Hon Hai Precision Industry C	585	3143	18.6	American Institute of Physics	830	26.4	IEEE	585	18.6
53	Hitachi Ltd	564	1862	30.3	IEEE	564	30.3	American Institute of Physics	378	20.3
54	Michigan State University	548	6960	7.9	Optical Society of America	1527	21.9	American Institute of Physics	1087	15.6
55	Thermo Fisher Scientific Inc	528	2487	21.2	RELX Group (Elsevier)	794	31.9	IEEE	528	21.2
56	Industrial Technology Researc	509	1494	34.1	IEEE	509	34.1	RELX Group (Elsevier)	239	16.0
57	Hong Kong University of Sci	502	938	53.5	IEEE	502	53.5	American Institute of Physics	204	21.7
58	Soraa Inc	501	5520	9.1	American Institute of Physics	1947	35.3	Institute of Pure and Applied Physics	911	16.5
59	NEC Corp	492	1392	35.3	IEEE	492	35.3	American Institute of Physics	247	17.7
60	Interuniversity MicroElectron	487	1480	32.9	IEEE	487	32.9	American Institute of Physics	263	17.8
61	AMS AG	476	3094	15.4	American Institute of Physics	883	28.5	IEEE	476	15.4
62	Nantero Inc	464	7057	6.6	ACS-Am Chem Soc	2087	29.6	American Institute of Physics	1547	21.9
63	Aisin Seiki Co. Ltd.	461	3134	14.7	Optical Society of America	1108	35.4	IEEE	461	14.7
64	Innovative Silicon SA	453	556	81.5	IEEE	453	81.5	RELX Group (Elsevier)	24	4.3
65	Maxim Integrated Products In	451	554	81.4	IEEE	451	81.4	Joint IEEE and ACM	19	3.4
66	Power Integrations Inc.	450	669	67.3	IEEE	450	67.3	Institute of Pure and Applied Physics	59	8.8
67	Sulvolta Inc	448	930	48.2	IEEE	448	48.2	American Institute of Physics	139	14.9
68	SK Hynix Inc	439	884	49.7	IEEE	439	49.7	American Institute of Physics	115	13.0
69	Partners HealthCare Systems	433	6073	7.1	Optical Society of America	2222	36.6	RELX Group (Elsevier)	833	13.7
70	Cubic Corporation	415	507	81.9	IEEE	415	81.9	IET/IEEE	19	3.7
71	United States Navy	406	1983	20.5	American Institute of Physics	581	29.3	IEEE	406	20.5
72	SolAero Technologies Corp	403	598	67.4	IEEE	403	67.4	American Institute of Physics	94	15.7
73	General Electric Company	402	1386	29.0	IEEE	402	29.0	American Institute of Physics	229	16.5
74	Electronics and Telecommuni	398	1143	34.8	IEEE	398	34.8	American Institute of Physics	237	20.7
75	ACORN TECHNOLOGIES I	380	1423	26.7	American Institute of Physics	516	36.3	IEEE	380	26.7
76	Georgia Institute of Technolo	376	1080	34.8	IEEE	376	34.8	American Institute of Physics	146	13.5
77	Xtera Communications Inc.	375	1111	33.8	IEEE	375	33.8	Optical Society of America	263	23.7
78	University of Wisconsin	370	1512	24.5	American Institute of Physics	463	30.6	IEEE	370	24.5
79	Jiangsu ChangJiang Electroni	365	457	79.9	IEEE	365	79.9	International Microelectronics And Packaging Society	40	8.8
80	Sony Corp	365	1692	21.6	IEEE	365	21.6	American Institute of Physics	357	21.1

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	Lockheed Martin Corp.	362	1966	18.4	American Institute of Physics	393	20.0	IEEE	362	18.4
82	Soitec SA	358	1832	19.5	American Institute of Physics	506	27.6	IEEE	358	19.5
83	Xerox Corp	352	2014	17.5	American Institute of Physics	566	28.1	IEEE	352	17.5
84	Vishay Intertechnology Inc.	337	510	66.1	IEEE	337	66.1	RELX Group (Elsevier)	32	6.3
85	Honeywell International Inc.	334	2236	14.9	ACS-Am Chem Soc	433	19.4	IEEE	334	14.9
86	Canon Inc	331	3246	10.2	American Institute of Physics	807	24.9	RELX Group (Elsevier)	459	14.1
87	Seoul Semiconductor Co Ltd	330	2477	13.3	American Institute of Physics	1074	43.4	IEEE	330	13.3
88	Columbia University	322	4149	7.8	American Institute of Physics	1509	36.4	MRS-Materials Research Soc	436	10.5
89	Sanken Electric Co. Ltd.	322	415	77.6	IEEE	322	77.6	American Institute of Physics	41	9.9
90	Silicon Genesis Corporation	322	1509	21.3	IEEE	322	21.3	American Institute of Physics	309	20.5
91	Bosch (Robert) GmbH	318	554	57.4	IEEE	318	57.4	RELX Group (Elsevier)	93	16.8
92	SiOnyx Inc	317	1575	20.1	American Institute of Physics	598	38.0	IEEE	317	20.1
93	TDK Corporation	317	1263	25.1	American Institute of Physics	343	27.2	IEEE	317	25.1
94	Sanan Optoelectronics Techn	315	1256	25.1	American Institute of Physics	561	44.7	IEEE	315	25.1
95	Microchip Technology Inc.	313	500	62.6	IEEE	313	62.6	American Institute of Physics	31	6.2
96	Seiko Epson Corporation	308	1357	22.7	IEEE	308	22.7	American Institute of Physics	261	19.2
97	Sunpower Corp	307	484	63.4	IEEE	307	63.4	WIP-Renewable Energies	45	9.3
98	Viavi Solutions Inc	306	760	40.3	IEEE	306	40.3	American Institute of Physics	175	23.0
99	Raytheon Co.	304	1246	24.4	IEEE	304	24.4	American Institute of Physics	202	16.2
100	University of Michigan	298	1522	19.6	American Institute of Physics	393	25.8	IEEE	298	19.6

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
<i>Smart Grid/Smart Meters/Energy Infrastructure</i>										
1	SolarEdge Technologies Inc	900	981	91.7	IEEE	900	91.7	Korean Institute of Power Electronics	21	2.1
2	Velatia Group	839	1099	76.3	IEEE	839	76.3	Echelon Corp	81	7.4
3	Honeywell International Inc.	234	284	82.4	IEEE	234	82.4	American Library Association	12	4.2
4	TRILLIANT NETWORKS IN	227	320	70.9	IEEE	227	70.9	Internet Soc/IETF-Internet Eng Task Force	18	5.6
5	SIPCO LLC	156	270	57.8	IEEE	156	57.8	Internet Soc/IETF-Internet Eng Task Force	27	10.0
6	General Electric Company	140	198	70.7	IEEE	140	70.7	IET/IEE	11	5.6
7	ABB Ltd	127	147	86.4	IEEE	127	86.4	IET/IEE	5	3.4
8	Battelle Memorial Institute	112	151	74.2	IEEE	112	74.2	RELX Group (Elsevier)	8	5.3
9	California Institute of Techno	106	110	96.4	IEEE	106	96.4	American Automatic Control Council (AACC)	3	2.7
10	ASTROLINK INTERNATIO	89	99	89.9	IEEE	89	89.9	IET/IEE	8	8.1
11	DOMINION ENERGY TEC	89	99	89.9	IEEE	89	89.9	IET/IEE	8	8.1
12	Alstom	69	81	85.2	IEEE	69	85.2	IET/IEE	8	9.9
13	International Business Machi	64	95	67.4	IEEE	64	67.4	ACM-Assoc Comput Mach	6	6.3
14	AMPT LLC	63	68	92.6	IEEE	63	92.6	IET/IEE	4	5.9
15	University of Maryland	60	62	96.8	IEEE	60	96.8	EPE Association	2	3.2
16	SOLAREEDGE TECHNOLO	55	68	80.9	IEEE	55	80.9	WIP-Renewable Energies	7	10.3
17	Itron Inc.	52	86	60.5	IEEE	52	60.5	ACM-Assoc Comput Mach	13	15.1
18	SMART WIRES INC	48	52	92.3	IEEE	48	92.3	ACM-Assoc Comput Mach	4	7.7
19	Qualcomm Inc	44	75	58.7	IEEE	44	58.7	3GPP General Partnership Project Standards Body	10	13.3
20	3M Co	43	51	84.3	IEEE	43	84.3	AIAA-Am Inst Aero Astro	3	5.9
21	University of Minnesota (The	36	36	100.0	IEEE	36	100.0			
22	Witricity Corp	33	37	89.2	IEEE	33	89.2	American Institute of Physics	3	8.1
23	Hubbell Inc.	31	34	91.2	IEEE	31	91.2	Research Institute of Intelligent Computer Systems	1	2.9
24	Siemens Aktiengesellschaft	31	44	70.5	IEEE	31	70.5	IET/IEE	2	4.5
25	Sunpower Corp	31	36	86.1	IEEE	31	86.1	EPE Association	4	11.1
26	Microsoft Corporation	29	61	47.5	IEEE	29	47.5	ACM-Assoc Comput Mach	11	18.0
27	Georgia Institute of Technolo	28	84	33.3	ACM-Assoc Comput Mach	47	56.0	IEEE	28	33.3
28	Rockwell Automation Inc	27	37	73.0	IEEE	27	73.0	IET/IEE	3	8.1
29	Schweitzer Engineering Labo	27	28	96.4	IEEE	27	96.4	IEC-International Electrotechnical Commission	1	3.6
30	ENERGY TECHNOLOGY G	26	30	86.7	IEEE	26	86.7	RELX Group (Elsevier)	2	6.7
31	Tigo Energy Inc	24	32	75.0	IEEE	24	75.0	WIP-Renewable Energies	6	18.8
32	SPARQ SYSTEMS INC	23	29	79.3	IEEE	23	79.3	RELX Group (Elsevier)	3	10.3
33	LS Electric co. Ltd. (formerly	22	26	84.6	IEEE	22	84.6	IET/IEE	3	11.5
34	Taiwan Semiconductor Manu	21	39	53.8	IEEE	21	53.8	Electrostatic Discharge Association	15	38.5
35	Schneider Electric S.A.	20	103	19.4	ANSI-American National Standards Institute	27	26.2	IEEE	20	19.4
36	TEMPORAL POWER LTD	20	20	100.0	IEEE	20	100.0			
37	ConvergeOne Inc	19	22	86.4	IEEE	19	86.4	Internet Soc/IETF-Internet Eng Task Force	2	9.1
38	Commscope Holding (formerl	18	18	100.0	IEEE	18	100.0			
39	Electro Industries Gauge Tec	18	30	60.0	IEEE	18	60.0	ACM-Assoc Comput Mach	7	23.3

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40	Intellectual Ventures Manage	18	33	54.5	IEEE	18	54.5	RELX Group (Elsevier)	6	18.2
41	Mitsubishi Electric Corp	18	19	94.7	IEEE	18	94.7	Hindawi Publishing Corporation	1	5.3
42	DELTA ENERGY & COMM	17	21	81.0	IEEE	17	81.0	ACM-Assoc Comput Mach	4	19.0
43	New Jersey Institute of Techn	17	17	100.0	IEEE	17	100.0			
44	Massachusetts Institute of Te	16	22	72.7	IEEE	16	72.7	AMER SOC NAVAL ENG INC	4	18.2
45	Causam Energy Inc	14	17	82.4	IEEE	14	82.4	Springer Nature	3	17.6
46	Accenture Ltd.	13	18	72.2	IEEE	13	72.2	A B B Corporate Management Services AG	4	22.2
47	Sony Corp	13	45	28.9	SID-Society for Information Display	24	53.3	IEEE	13	28.9
48	STEM INC	13	13	100.0	IEEE	13	100.0			
49	Panasonic Corporation	12	15	80.0	IEEE	12	80.0	IEICE-Inst Elec Info Comm Eng	2	13.3
50	Toshiba Corp	12	17	70.6	IEEE	12	70.6	Internet Soc/IETF-Internet Eng Task Force	2	11.8
51	University of California	12	13	92.3	IEEE	12	92.3	Institution of Engineering and Technology	1	7.7
52	ENEDYM INC	11	13	84.6	IEEE	11	84.6	IET/IEE	1	7.7
53	Google Inc.	11	22	50.0	IEEE	11	50.0	ACM-Assoc Comput Mach	4	18.2
54	THE DETROIT EDISON CO	11	11	100.0	IEEE	11	100.0			
55	THE FLORIDA INTERNATI	11	14	78.6	IEEE	11	78.6	Joint IEEE and ACM	2	14.3
56	BRITISH COLUMBIA HYD	10	10	100.0	IEEE	10	100.0			
57	Enphase Energy Inc	10	10	100.0	IEEE	10	100.0			
58	Nokia Corp	10	17	58.8	IEEE	10	58.8	Joint IEEE and ACM	2	11.8
59	Roche Holding Ltd.	10	10	100.0	IEEE	10	100.0			
60	Signify NV	10	11	90.9	IEEE	10	90.9	IEEE/OSA	1	9.1
61	Cisco Systems Inc.	9	14	64.3	IEEE	9	64.3	Internet Soc/IETF-Internet Eng Task Force	5	35.7
62	Eaton Corp.	9	13	69.2	IEEE	9	69.2	Mcgraw Hill	2	15.4
63	Hon Hai Precision Industry C	9	34	26.5	ACM-Assoc Comput Mach	16	47.1	IEEE	9	26.5
64	INTERNATIONAL BROAD	9	17	52.9	IEEE	9	52.9	ISO-International Standards Organization	6	35.3
65	University of Missouri	9	10	90.0	IEEE	9	90.0	Summit Technical Media	1	10.0
66	University of Texas	9	14	64.3	IEEE	9	64.3	American Institute of Physics	4	28.6
67	Energous Corporation	8	10	80.0	IEEE	8	80.0	Rajagiri School of Engineering & Technology, Cochin, Kerala,	1	10.0
68	AT&T Inc	7	10	70.0	IEEE	7	70.0	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	1	10.0
69	CLEAN POWER RESEARC	7	8	87.5	IEEE	7	87.5	Institution of Engineering and Technology	1	12.5
70	Clemson University	7	9	77.8	IEEE	7	77.8	American Institute of Physics	1	11.1
71	CURRENT GRID LLC	7	11	63.6	IEEE	7	63.6	Echelon Corp	2	18.2
72	CURRENT TECHNOLOGIE	7	12	58.3	IEEE	7	58.3	Hewlett-Packard Company	2	16.7
73	Danfoss A/S	7	7	100.0	IEEE	7	100.0			
74	Nth Degree Technologies Wo	7	13	53.8	IEEE	7	53.8	American Institute of Physics	6	46.2
75	POWER TAGGING TECHN	7	8	87.5	IEEE	7	87.5	IET/IEE	1	12.5
76	TACTILIS SDN BHD	7	7	100.0	IEEE	7	100.0			
77	UNIVERSITI BRUNEI DAR	7	8	87.5	IEEE	7	87.5	RELX Group (Elsevier)	1	12.5
78	Boeing Co. (The)	6	12	50.0	IEEE	6	50.0	Trans Tech Publications Ltd.	1	8.3
79	Digimarc Corp.	6	6	100.0	IEEE	6	100.0			
80	EMPOWER MICRO SYSTE	6	6	100.0	IEEE	6	100.0			

Appendix B: Top 100 Organizations That Cite IEEE; (2001-2020 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	King Fahd University of Petr	6	9	66.7	IEEE	6	66.7	United Business Media/UBM Tech	3	33.3
82	Oracle Corporation	6	6	100.0	IEEE	6	100.0			
83	Samsung Electronics Co Ltd	6	21	28.6	IEEE	6	28.6	ACM-Assoc Comput Mach	4	19.0
84	STMicroelectronics	6	11	54.5	IEEE	6	54.5	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	3	27.3
85	TAE TECHNOLOGIES INC	6	124	4.8	American Institute of Physics	59	47.6	American Physical Society	21	16.9
86	University of Oxford	6	6	100.0	IEEE	6	100.0			
87	UT-Battelle LLC	6	68	8.8	Electrochemical Society, Inc.	23	33.8	RELX Group (Elsevier)	22	32.4
88	Vestas Wind Systems A/S	6	8	75.0	IEEE	6	75.0	Institution of Engineering and Technology	1	12.5
89	Wayne State University (Detr	6	6	100.0	IEEE	6	100.0			
90	Xtrion NV	6	10	60.0	IEEE	6	60.0	American Institute of Physics	3	30.0
91	Bosch (Robert) GmbH	5	6	83.3	IEEE	5	83.3	American Institute of Physics	1	16.7
92	Broadcom Ltd	5	6	83.3	IEEE	5	83.3	IET/IEE	1	16.7
93	DGI CREATIONS LLC	5	5	100.0	IEEE	5	100.0			
94	D-Wave Systems Inc.	5	29	17.2	American Physical Society	9	31.0	American Institute of Physics	5	17.2
95	Electric Power Research Insti	5	12	41.7	Electric Power Research Institute	6	50.0	IEEE	5	41.7
96	Korea Electrotechnology Res	5	5	100.0	IEEE	5	100.0			
97	On Semiconductor Corporati	5	5	100.0	IEEE	5	100.0			
98	OPEN ACCESS TECHNOL	5	5	100.0	IEEE	5	100.0			
99	State University of New York	5	6	83.3	IEEE	5	83.3	RELX Group (Elsevier)	1	16.7
100	University of Alberta	5	8	62.5	IEEE	5	62.5	IET/IEE	1	12.5

Appendix B: Top 100 Organizations That Cite IEEE; (2001-2020 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
<i>Solar/Photovoltaic</i>										
1	SolarEdge Technologies Inc	2268	2554	88.8	IEEE	2268	88.8	WIP-Renewable Energies	119	4.7
2	Sunpower Corp	444	641	69.3	IEEE	444	69.3	WIP-Renewable Energies	49	7.6
3	SolAero Technologies Corp	419	618	67.8	IEEE	419	67.8	American Institute of Physics	96	15.5
4	University of Illinois	381	3440	11.1	American Institute of Physics	823	23.9	ACS-Am Chem Soc	562	16.3
5	Tigo Energy Inc	356	468	76.1	IEEE	356	76.1	WIP-Renewable Energies	84	17.9
6	AMPT LLC	354	400	88.5	IEEE	354	88.5	IET/IEE	22	5.5
7	Taiwan Semiconductor Manu	316	1193	26.5	American Institute of Physics	541	45.3	IEEE	316	26.5
8	Sanan Optoelectronics Techn	258	610	42.3	IEEE	258	42.3	US Dept of Energy	246	40.3
9	International Business Machi	251	982	25.6	IEEE	251	25.6	American Institute of Physics	209	21.3
10	Emcore Corp.	247	489	50.5	IEEE	247	50.5	US Dept of Energy	76	15.5
11	California Institute of Techno	184	658	28.0	American Institute of Physics	200	30.4	IEEE	184	28.0
12	Hanergy Holding Group Ltd	170	445	38.2	IEEE	170	38.2	American Institute of Physics	76	17.1
13	Xtrion NV	157	885	17.7	American Institute of Physics	306	34.6	IEEE	157	17.7
14	Xerox Corp	152	491	31.0	IEEE	152	31.0	RELX Group (Elsevier)	93	18.9
15	SEMPRIUS INC	150	1692	8.9	American Institute of Physics	319	18.9	ACS-Am Chem Soc	307	18.1
16	Beamreach Solar Inc	132	558	23.7	RELX Group (Elsevier)	180	32.3	IEEE	132	23.7
17	Solar Junction Corp	126	550	22.9	American Institute of Physics	193	35.1	IEEE	126	22.9
18	Enphase Energy Inc	111	120	92.5	IEEE	111	92.5	IET/IEE	4	3.3
19	Tesla Motors Inc	104	140	74.3	IEEE	104	74.3	American Institute of Physics	8	5.7
20	Alliance for Sustainable Ener	87	602	14.5	American Institute of Physics	170	28.2	RELX Group (Elsevier)	112	18.6
21	Advanced Energy Industries I	84	91	92.3	IEEE	84	92.3	IET/IEE	4	4.4
22	Massachusetts Institute of Te	81	372	21.8	IEEE	81	21.8	American Institute of Physics	72	19.4
23	Applied Materials Inc.	79	241	32.8	IEEE	79	32.8	WIP-Renewable Energies	51	21.2
24	CLEAN POWER RESEARC	79	126	62.7	IEEE	79	62.7	RELX Group (Elsevier)	31	24.6
25	Stion Corp	77	671	11.5	RELX Group (Elsevier)	225	33.5	American Institute of Physics	146	21.8
26	TESLA INC	74	170	43.5	IEEE	74	43.5	American Institute of Physics	52	30.6
27	Witricity Corp	71	106	67.0	IEEE	71	67.0	American Institute of Physics	9	8.5
28	Solyndra Inc	68	361	18.8	RELX Group (Elsevier)	117	32.4	IEEE	68	18.8
29	Lockheed Martin Corp.	65	248	26.2	IEEE	65	26.2	American Institute of Physics	48	19.4
30	Canon Inc	64	177	36.2	IEEE	64	36.2	American Institute of Physics	29	16.4
31	Nanosolar Inc	61	873	7.0	RELX Group (Elsevier)	248	28.4	Electrochemical Society, Inc.	107	12.3
32	LG Electronics Inc.	58	167	34.7	IEEE	58	34.7	American Institute of Physics	43	25.7
33	Texas Instruments Inc	57	68	83.8	IEEE	57	83.8	Electrochemical Society, Inc.	4	5.9
34	Boeing Co. (The)	56	138	40.6	IEEE	56	40.6	RELX Group (Elsevier)	22	15.9
35	First Solar Inc	56	228	24.6	RELX Group (Elsevier)	93	40.8	IEEE	56	24.6
36	General Electric Company	54	309	17.5	ACS-Am Chem Soc	83	26.9	IEEE	54	17.5
37	United States Navy	52	169	30.8	IEEE	52	30.8	American Institute of Physics	30	17.8
38	ZENA TECHNOLOGIES IN	49	120	40.8	IEEE	49	40.8	American Institute of Physics	35	29.2
39	Dartmouth College	48	60	80.0	IEEE	48	80.0	RELX Group (Elsevier)	4	6.7

Appendix B: Top 100 Organizations That Cite IEEE; (2001-2020 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
40	SUNIVA INC	45	88	51.1	IEEE	45	51.1	WIP-Renewable Energies	12	13.6
41	Ignis Innovation Inc	43	55	78.2	IEEE	43	78.2	SID-Society for Information Display	8	14.5
42	Azur Space Solar Power Gmb	42	101	41.6	IEEE	42	41.6	RELX Group (Elsevier)	21	20.8
43	Hon Hai Precision Industry C	41	190	21.6	IEEE	41	21.6	RELX Group (Elsevier)	36	18.9
44	Arizona State University	37	184	20.1	American Institute of Physics	47	25.5	IEEE	37	20.1
45	ENEOS Group (formerly JXT	37	121	30.6	IEEE	37	30.6	RELX Group (Elsevier)	29	24.0
46	University of Toledo	37	142	26.1	RELX Group (Elsevier)	82	57.7	IEEE	37	26.1
47	Honeywell International Inc.	36	1048	3.4	ACS-Am Chem Soc	403	38.5	RELX Group (Elsevier)	189	18.0
48	University of Minnesota (The	36	92	39.1	IEEE	36	39.1	American Institute of Physics	25	27.2
49	Commissariat A L'Energie At	35	207	16.9	RELX Group (Elsevier)	84	40.6	IEEE	35	16.9
50	Ostendo Technologies Inc	35	89	39.3	IEEE	35	39.3	RELX Group (Elsevier)	23	25.8
51	4POWER LLC	34	66	51.5	IEEE	34	51.5	American Institute of Physics	18	27.3
52	DuPont de Nemours Inc.	34	201	16.9	RELX Group (Elsevier)	64	31.8	IEEE	34	16.9
53	University of California	34	698	4.9	American Institute of Physics	123	17.6	ACS-Am Chem Soc	116	16.6
54	Solarworld Industries GmbH	32	82	39.0	IEEE	32	39.0	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	16	19.5
55	Semiconductor Energy Labor	31	431	7.2	SID-Society for Information Display	151	35.0	American Institute of Physics	80	18.6
56	Industrial Techology Researc	30	169	17.8	RELX Group (Elsevier)	45	26.6	IEEE	30	17.8
57	Panasonic Corporation	29	181	16.0	American Institute of Physics	50	27.6	RELX Group (Elsevier)	33	18.2
58	GTAT Corp (AT Advanced T	28	127	22.0	IEEE	28	22.0	American Institute of Physics	25	19.7
59	AMI RESAERCH & DEVEL	27	65	41.5	IEEE	27	41.5	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	8	12.3
60	EVERGREEN SOLAR INC	27	55	49.1	IEEE	27	49.1	ACS-Am Chem Soc	24	43.6
61	Koch Industries Inc	27	311	8.7	RELX Group (Elsevier)	120	38.6	American Institute of Physics	84	27.0
62	The National Aeronautical an	27	195	13.8	Springer Nature	29	14.9	IEEE	27	13.8
63	Teijin Ltd.	26	66	39.4	IEEE	26	39.4	WIP-Renewable Energies	14	21.2
64	Hanwha Solutions (Hhanwha	25	67	37.3	IEEE	25	37.3	American Institute of Physics	18	26.9
65	Imperial College	25	81	30.9	IEEE	25	30.9	American Institute of Physics	23	28.4
66	Compagnie de Saint-Gobain	24	146	16.4	SPIE-Int Soc Opt Engineering	40	27.4	RELX Group (Elsevier)	32	21.9
67	Interuniversity MicroElectron	23	102	22.5	IEEE	23	22.5	RELX Group (Elsevier)	22	21.6
68	Precursor Energetics Inc	23	1095	2.1	ACS-Am Chem Soc	481	43.9	RELX Group (Elsevier)	237	21.6
69	Qualcomm Inc	23	66	34.8	IEEE	23	34.8	SID-Society for Information Display	11	16.7
70	Shin-Etsu Chemical Co. Ltd.	23	58	39.7	IEEE	23	39.7	RELX Group (Elsevier)	9	15.5
71	Solopower Inc	23	213	10.8	RELX Group (Elsevier)	101	47.4	American Institute of Physics	43	20.2
72	University of Michigan	23	270	8.5	American Institute of Physics	78	28.9	ACS-Am Chem Soc	41	15.2
73	Nth Degree Technologies Wo	22	167	13.2	Springer Nature	29	17.4	IEEE	22	13.2
74	City University of Hong Kon	21	38	55.3	IEEE	21	55.3	IET/IEE	12	31.6
75	Fraunhofer Gesellschaft	21	81	25.9	IEEE	21	25.9	RELX Group (Elsevier)	19	23.5
76	Total SA	21	59	35.6	IEEE	21	35.6	RELX Group (Elsevier)	11	18.6
77	INDIVIDUAL PATENTER	20	131	15.3	American Institute of Physics	23	17.6	IEEE	20	15.3
78	Toyota Motor Corp	20	68	29.4	IEEE	20	29.4	RELX Group (Elsevier)	14	20.6
79	Toshiba Corp	19	122	15.6	ACS-Am Chem Soc	25	20.5	IEEE	19	15.6
80	ATHENAEUM LLC	18	104	17.3	RELX Group (Elsevier)	30	28.8	IEEE	18	17.3

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	Laird Ltd	18	63	28.6	IEEE	18	28.6	American Institute of Physics	16	25.4
82	Mitsubishi Electric Corp	18	43	41.9	IEEE	18	41.9	WIP-Renewable Energies	8	18.6
83	New Jersey Institute of Techn	18	24	75.0	IEEE	18	75.0	RELX Group (Elsevier)	3	12.5
84	SMA Solar Technology AG	18	19	94.7	IEEE	18	94.7	IET/IEE	1	5.3
85	ASCENT SOLAR TECHNO	17	43	39.5	IEEE	17	39.5	RELX Group (Elsevier)	11	25.6
86	China National Chemical Cor	17	34	50.0	IEEE	17	50.0	WIP-Renewable Energies	7	20.6
87	1366 TECHNOLOGIES INC	16	90	17.8	RELX Group (Elsevier)	47	52.2	IEEE	16	17.8
88	AT&T Inc	16	27	59.3	IEEE	16	59.3	AIAA-Am Inst Aero Astro	4	14.8
89	Catholic University Leuven	16	45	35.6	IEEE	16	35.6	RELX Group (Elsevier)	10	22.2
90	PLANT PV INC	16	41	39.0	IEEE	16	39.0	RELX Group (Elsevier)	8	19.5
91	Rensselaer Polytechnic Instit	16	39	41.0	IEEE	16	41.0	American Institute of Physics	12	30.8
92	VERLIY LIFE SCIENCES L	16	17	94.1	IEEE	16	94.1	IEEE/OSA	1	5.9
93	BEIJING APOLLO DING R	15	42	35.7	IEEE	15	35.7	American Institute of Physics	11	26.2
94	Fujitsu Limited	15	25	60.0	IEEE	15	60.0	RELX Group (Elsevier)	5	20.0
95	Intevac Inc	15	72	20.8	American Institute of Physics	24	33.3	IEEE	15	20.8
96	Solfocus Inc	15	59	25.4	RELX Group (Elsevier)	15	25.4	IEEE	15	25.4
97	University of New Mexico	15	32	46.9	IEEE	15	46.9	Optical Society of America	7	21.9
98	ARCHITECTURAL GLASS	14	42	33.3	IEEE	14	33.3	RELX Group (Elsevier)	14	33.3
99	Ecole Polytechnique Federale	14	119	11.8	ACS-Am Chem Soc	37	31.1	RELX Group (Elsevier)	16	13.4
100	FLISOM AG	14	48	29.2	IEEE	14	29.2	RELX Group (Elsevier)	13	27.1

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
<i>Telecom and Other Communications</i>										
1	AT&T Inc	27900	47275	59.0	IEEE	27900	59.0	ACM-Assoc Comput Mach	2229	4.7
2	Qualcomm Inc	27697	67786	40.9	IEEE	27697	40.9	3GPP General Partnership Project Standards Body	17051	25.2
3	Marvell Technology Group Lt	21293	26417	80.6	IEEE	21293	80.6	3GPP General Partnership Project Standards Body	3061	11.6
4	Broadcom Ltd	18420	27866	66.1	IEEE	18420	66.1	International Telecommunication Union	1166	4.2
5	Microsoft Corporation	16272	35739	45.5	IEEE	16272	45.5	ACM-Assoc Comput Mach	5801	16.2
6	InterDigital Inc	11882	48790	24.4	3GPP General Partnership Project Standards B	31658	64.9	IEEE	11882	24.4
7	Nokia Corp	11787	31902	36.9	IEEE	11787	36.9	3GPP General Partnership Project Standards Body	9350	29.3
8	Intel Corporation	11642	25071	46.4	IEEE	11642	46.4	3GPP General Partnership Project Standards Body	7287	29.1
9	Ericsson	11162	38393	29.1	3GPP General Partnership Project Standards B	16972	44.2	IEEE	11162	29.1
10	Cisco Systems Inc.	9978	30944	32.2	IEEE	9978	32.2	Internet Soc/IETF-Internet Eng Task Force	4860	15.7
11	ParkerVision Inc	9718	19021	51.1	IEEE	9718	51.1	IET/IEE	4417	23.2
12	Huawei Technologies Compa	8752	30469	28.7	3GPP General Partnership Project Standards B	13408	44.0	IEEE	8752	28.7
13	Samsung Electronics Co Ltd	8195	25859	31.7	3GPP General Partnership Project Standards B	11679	45.2	IEEE	8195	31.7
14	International Business Machi	7869	19232	40.9	IEEE	7869	40.9	ACM-Assoc Comput Mach	3031	15.8
15	LG Electronics Inc.	7283	37656	19.3	3GPP General Partnership Project Standards B	23002	61.1	IEEE	7283	19.3
16	Apple Inc	6991	14555	48.0	IEEE	6991	48.0	ACM-Assoc Comput Mach	1431	9.8
17	Personalized Media Commun	6925	40121	17.3	Society of Motion Picture and Television Engi	12252	30.5	IEEE	6925	17.3
18	Sony Corp	6101	14081	43.3	IEEE	6101	43.3	3GPP General Partnership Project Standards Body	1978	14.0
19	REARDEN LLC	5918	6532	90.6	IEEE	5918	90.6	IET/IEE	200	3.1
20	Massachusetts Institute of Te	5851	9520	61.5	IEEE	5851	61.5	ACM-Assoc Comput Mach	466	4.9
21	Panasonic Corporation	5752	16093	35.7	IEEE	5752	35.7	3GPP General Partnership Project Standards Body	4890	30.4
22	Google Inc.	5456	13841	39.4	IEEE	5456	39.4	ACM-Assoc Comput Mach	1724	12.5
23	Fractus SA	5247	8820	59.5	IEEE	5247	59.5	IET/IEE	1329	15.1
24	Commscope Holding (formerl	5127	8130	63.1	IEEE	5127	63.1	3GPP General Partnership Project Standards Body	438	5.4
25	Blackberry Ltd.	4459	17922	24.9	3GPP General Partnership Project Standards B	8799	49.1	IEEE	4459	24.9
26	Adaptix	4356	6333	68.8	IEEE	4356	68.8	European Telecom Standards Institute (ETSI)	683	10.8
27	Fujitsu Limited	4220	11756	35.9	IEEE	4220	35.9	3GPP General Partnership Project Standards Body	2817	24.0
28	Nippon Telegraph & Telepho	3973	12326	32.2	3GPP General Partnership Project Standards B	4435	36.0	IEEE	3973	32.2
29	Rambus Inc.	3784	5278	71.7	IEEE	3784	71.7	IEEE/JPN Soc App Phys	248	4.7
30	Xperi Corporation (Formerly	3600	6007	59.9	IEEE	3600	59.9	ACM-Assoc Comput Mach	617	10.3
31	RPX Corp	3454	8178	42.2	IEEE	3454	42.2	IEEE/OSA	829	10.1
32	Texas Instruments Inc	3417	5282	64.7	IEEE	3417	64.7	3GPP General Partnership Project Standards Body	544	10.3
33	Murata Manufacturing Co. Lt	3388	4325	78.3	IEEE	3388	78.3	IEICE-Inst Elec Info Comm Eng	112	2.6
34	Raytheon Co.	3369	5720	58.9	IEEE	3369	58.9	IET/IEE	222	3.9
35	University of Minnesota (The	3354	3776	88.8	IEEE	3354	88.8	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	52	1.4
36	NXP Semiconductors NV	3260	4242	76.9	IEEE	3260	76.9	3GPP General Partnership Project Standards Body	109	2.6
37	Electronics and Telecommuni	3257	5808	56.1	IEEE	3257	56.1	3GPP General Partnership Project Standards Body	844	14.5
38	NEC Corp	3249	11341	28.6	3GPP General Partnership Project Standards B	5011	44.2	IEEE	3249	28.6
39	L3 Harris Technologies (form	3114	4913	63.4	IEEE	3114	63.4	Internet Soc/IETF-Internet Eng Task Force	242	4.9

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
40	Conversant Intellectual Prope	2989	5639	53.0	IEEE	2989	53.0	Primedia Business Magazines & Media Inc.	216	3.8
41	Comcast Corp	2863	10620	27.0	3GPP General Partnership Project Standards B	6209	58.5	IEEE	2863	27.0
42	Columbia University	2816	4467	63.0	IEEE	2816	63.0	ACM-Assoc Comput Mach	486	10.9
43	CPG TECHNOLOGIES INC	2799	3610	77.5	IEEE	2799	77.5	AMER TELEPHONE TELEGRAPH CO, 550 MADISON AV	190	5.3
44	STMicroelectronics	2788	3793	73.5	IEEE	2788	73.5	RELX Group (Elsevier)	80	2.1
45	Motorola Solutions Inc.	2683	4554	58.9	IEEE	2683	58.9	3GPP General Partnership Project Standards Body	358	7.9
46	Toshiba Corp	2590	4790	54.1	IEEE	2590	54.1	International Telecommunication Union	315	6.6
47	Industrial Techology Researc	2483	3666	67.7	IEEE	2483	67.7	3GPP General Partnership Project Standards Body	385	10.5
48	Technicolor SA	2451	4802	51.0	IEEE	2451	51.0	ISO/IEC/JTC/ANSI	270	5.6
49	Verizon Communications Inc	2307	6633	34.8	IEEE	2307	34.8	Internet Soc/IETF-Internet Eng Task Force	1246	18.8
50	Mitsubishi Electric Corp	2279	5437	41.9	IEEE	2279	41.9	3GPP General Partnership Project Standards Body	1283	23.6
51	Honeywell International Inc.	2274	3905	58.2	IEEE	2274	58.2	RELX Group (Elsevier)	153	3.9
52	Analog Devices Inc.	2273	2826	80.4	IEEE	2273	80.4	IET/IEE	74	2.6
53	Corning Inc.	2185	3530	61.9	IEEE	2185	61.9	IET/IEE	326	9.2
54	Infineon Technologies AG	2180	3146	69.3	IEEE	2180	69.3	3GPP General Partnership Project Standards Body	89	2.8
55	Silicon Laboratories Inc	2080	2649	78.5	IEEE	2080	78.5	RELX Group (Elsevier)	119	4.5
56	Digimarc Corp.	2067	5054	40.9	IEEE	2067	40.9	SPIE-Int Soc Opt Engineering	575	11.4
57	Semiconductor Energy Labor	2015	17084	11.8	SID-Society for Information Display	5695	33.3	American Institute of Physics	3122	18.3
58	SIPCO LLC	1997	3247	61.5	IEEE	1997	61.5	ACM-Assoc Comput Mach	254	7.8
59	University of California	1936	3193	60.6	IEEE	1936	60.6	American Institute of Physics	133	4.2
60	Xilinx Inc.	1853	4668	39.7	IEEE	1853	39.7	ACM-Assoc Comput Mach	1763	37.8
61	TiVo Corp	1851	6694	27.7	IEEE	1851	27.7	ACM-Assoc Comput Mach	516	7.7
62	Micron Technology Inc.	1828	2929	62.4	IEEE	1828	62.4	IEEE/JPN Soc App Phys	163	5.6
63	Pelican Imaging Corporation	1773	3609	49.1	IEEE	1773	49.1	SPIE-Int Soc Opt Engineering	555	15.4
64	Fraunhofer Gesellschaft	1734	3359	51.6	IEEE	1734	51.6	MPEG.org	265	7.9
65	SUN PATENT TRUST	1712	5807	29.5	3GPP General Partnership Project Standards B	2262	39.0	IEEE	1712	29.5
66	HRL Laboratories LLC	1703	2809	60.6	IEEE	1703	60.6	IET/IEE	239	8.5
67	Mediatek Inc.	1661	2904	57.2	IEEE	1661	57.2	3GPP General Partnership Project Standards Body	777	26.8
68	Intellectual Ventures Manage	1642	3715	44.2	IEEE	1642	44.2	ACM-Assoc Comput Mach	166	4.5
69	Koninklijke Philips N.V.	1617	3340	48.4	IEEE	1617	48.4	3GPP General Partnership Project Standards Body	294	8.8
70	Renesas Electronic Corporati	1610	2772	58.1	IEEE	1610	58.1	IEEE/OSA	216	7.8
71	Qorvo	1608	1994	80.6	IEEE	1608	80.6	European Microwave Association	84	4.2
72	Juniper Networks Inc.	1593	4841	32.9	IEEE	1593	32.9	Network Working Group RFC	1308	27.0
73	Quarterhill Inc	1579	2339	67.5	IEEE	1579	67.5	3GPP General Partnership Project Standards Body	110	4.7
74	Hon Hai Precision Industry C	1571	10124	15.5	3GPP General Partnership Project Standards B	5706	56.4	IEEE	1571	15.5
75	Oracle Corporation	1562	6123	25.5	IEEE	1562	25.5	3GPP General Partnership Project Standards Body	835	13.6
76	Dolby Laboratories Inc	1547	4183	37.0	IEEE	1547	37.0	International Telecommunication Union	927	22.2
77	New T-Mobile (former T-Mo	1532	5880	26.1	IEEE	1532	26.1	International Telecommunication Union	1290	21.9
78	California Institute of Techno	1412	2763	51.1	IEEE	1412	51.1	Optical Society of America	200	7.2
79	Viasat	1389	1973	70.4	IEEE	1389	70.4	European Microwave Association	77	3.9
80	Cubic Corporation	1341	1650	81.3	IEEE	1341	81.3	IET/IEE	71	4.3

Appendix B: Top 100 Organizations That Cite IEEE; (2001-2020 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	HP Inc	1334	3749	35.6	IEEE	1334	35.6	ACM-Assoc Comput Mach	375	10.0
82	Kandou	1322	1365	96.8	IEEE	1322	96.8	IEEE/JPN Soc App Phys	16	1.2
83	Tabula Inc	1316	3547	37.1	ACM-Assoc Comput Mach	1337	37.7	IEEE	1316	37.1
84	LibertyMedia	1293	2261	57.2	IEEE	1293	57.2	ACM-Assoc Comput Mach	159	7.0
85	Canon Inc	1274	2965	43.0	IEEE	1274	43.0	International Telecommunication Union	305	10.3
86	General Electric Company	1271	2491	51.0	IEEE	1271	51.0	International Telecommunication Union	307	12.3
87	Microchip Technology Inc.	1264	1904	66.4	IEEE	1264	66.4	International Telecommunication Union	94	4.9
88	Siemens Aktiengesellschaft	1245	2620	47.5	IEEE	1245	47.5	3GPP General Partnership Project Standards Body	223	8.5
89	Amazon.com Inc.	1243	3631	34.2	IEEE	1243	34.2	ACM-Assoc Comput Mach	655	18.0
90	ORIGIN WIRELESS INC	1209	1514	79.9	IEEE	1209	79.9	American Institute of Physics	60	4.0
91	Boeing Co. (The)	1176	2329	50.5	IEEE	1176	50.5	SPIE-Int Soc Opt Engineering	84	3.6
92	Xerox Corp	1159	2701	42.9	IEEE	1159	42.9	ACM-Assoc Comput Mach	740	27.4
93	Wisteria Trading Inc	1154	2289	50.4	IEEE	1154	50.4	SPIE-Int Soc Opt Engineering	257	11.2
94	Hitachi Ltd	1104	3259	33.9	IEEE	1104	33.9	IEICE-Inst Elec Info Comm Eng	270	8.3
95	MONOLITHIC 3D INC	1085	1921	56.5	IEEE	1085	56.5	IEEE/JPN Soc App Phys	206	10.7
96	Lenovo Group Ltd	1077	3747	28.7	3GPP General Partnership Project Standards B	2066	55.1	IEEE	1077	28.7
97	NETWORK-1 TECHNOLOG	1061	2315	45.8	IEEE	1061	45.8	ACM-Assoc Comput Mach	642	27.7
98	Lockheed Martin Corp.	1048	2735	38.3	IEEE	1048	38.3	Optical Society of America	228	8.3
99	NVIDIA Corp.	1028	2065	49.8	IEEE	1028	49.8	Joint IEEE and ACM	168	8.1
100	University of Washington	1022	1739	58.8	IEEE	1022	58.8	ACM-Assoc Comput Mach	227	13.1

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
<i>Virtual/Augmented Reality</i>										
1	Microsoft Corporation	3028	7014	43.2	IEEE	3028	43.2	ACM-Assoc Comput Mach	1747	24.9
2	Immersion Corp.	1339	3664	36.5	IEEE	1339	36.5	ACM-Assoc Comput Mach	416	11.4
3	Apple Inc	765	1834	41.7	IEEE	765	41.7	ACM-Assoc Comput Mach	359	19.6
4	Google Inc.	696	1716	40.6	IEEE	696	40.6	ACM-Assoc Comput Mach	522	30.4
5	Sony Corp	395	872	45.3	IEEE	395	45.3	ACM-Assoc Comput Mach	167	19.2
6	Magic Leap Inc	298	681	43.8	IEEE	298	43.8	ACM-Assoc Comput Mach	53	7.8
7	Qualcomm Inc	293	628	46.7	IEEE	293	46.7	ACM-Assoc Comput Mach	110	17.5
8	Intellectual Ventures Manage	234	528	44.3	IEEE	234	44.3	ACM-Assoc Comput Mach	126	23.9
9	Facebook Inc	191	490	39.0	IEEE	191	39.0	ACM-Assoc Comput Mach	149	30.4
10	Osterhout Design Group	189	561	33.7	IEEE	189	33.7	ACM-Assoc Comput Mach	175	31.2
11	3D Systems Corp.	179	392	45.7	IEEE	179	45.7	ACM-Assoc Comput Mach	100	25.5
12	Lincoln Electric Holdings Inc	171	490	34.9	ACM-Assoc Comput Mach	226	46.1	IEEE	171	34.9
13	International Business Machi	166	519	32.0	IEEE	166	32.0	ACM-Assoc Comput Mach	118	22.7
14	P4TENTS1 LLC	156	258	60.5	IEEE	156	60.5	ACM-Assoc Comput Mach	38	14.7
15	University of North Carolina	156	355	43.9	IEEE	156	43.9	ACM-Assoc Comput Mach	118	33.2
16	AT&T Inc	149	340	43.8	IEEE	149	43.8	ACM-Assoc Comput Mach	95	27.9
17	Massachusetts Institute of Te	149	286	52.1	IEEE	149	52.1	ACM-Assoc Comput Mach	52	18.2
18	Intel Corporation	146	278	52.5	IEEE	146	52.5	ACM-Assoc Comput Mach	68	24.5
19	Xperi Corporation (Formerly	138	232	59.5	IEEE	138	59.5	ACM-Assoc Comput Mach	29	12.5
20	BRAINGATE CO LLC	120	308	39.0	IEEE	120	39.0	RELX Group (Elsevier)	45	14.6
21	Ultrahaptics Ltd.	116	266	43.6	IEEE	116	43.6	ACM-Assoc Comput Mach	56	21.1
22	University of Arizona	111	399	27.8	IEEE	111	27.8	Optical Society of America	76	19.0
23	Nokia Corp	104	211	49.3	IEEE	104	49.3	ACM-Assoc Comput Mach	39	18.5
24	Samsung Electronics Co Ltd	103	246	41.9	IEEE	103	41.9	ACM-Assoc Comput Mach	58	23.6
25	Digimarc Corp.	101	201	50.2	IEEE	101	50.2	ACM-Assoc Comput Mach	35	17.4
26	Medtronic Inc	100	149	67.1	IEEE	100	67.1	Springer Nature	7	4.7
27	Walt Disney Co.	85	225	37.8	IEEE	85	37.8	ACM-Assoc Comput Mach	70	31.1
28	ConvergeOne Inc	84	198	42.4	IEEE	84	42.4	ACM-Assoc Comput Mach	24	12.1
29	ONPOINT MEDICAL INC	75	178	42.1	IEEE	75	42.1	ACM-Assoc Comput Mach	30	16.9
30	Tobii Ab	74	135	54.8	IEEE	74	54.8	ACM-Assoc Comput Mach	36	26.7
31	TANGIS CORP	70	470	14.9	Joint IEEE and ACM	261	55.5	ACM-Assoc Comput Mach	81	17.2
32	HRL Laboratories LLC	67	145	46.2	IEEE	67	46.2	ACM-Assoc Comput Mach	16	11.0
33	AUGMENTED VISION INC	65	129	50.4	IEEE	65	50.4	ACM-Assoc Comput Mach	37	28.7
34	Canon Inc	63	202	31.2	IEEE	63	31.2	Joint IEEE and ACM	41	20.3
35	Cortica Ltd	62	75	82.7	IEEE	62	82.7	ACM-Assoc Comput Mach	10	13.3
36	Amazon.com Inc.	61	200	30.5	ACM-Assoc Comput Mach	83	41.5	IEEE	61	30.5
37	Ostendo Technologies Inc	61	175	34.9	IEEE	61	34.9	ACM-Assoc Comput Mach	43	24.6
38	Honda Motor Co. Ltd.(Honda	59	101	58.4	IEEE	59	58.4	RELX Group (Elsevier)	9	8.9
39	Adobe Inc. (former Adobe Sy	57	144	39.6	ACM-Assoc Comput Mach	72	50.0	IEEE	57	39.6

Appendix B: Top 100 Organizations That Cite IEEE; (2001-2020 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
40	ELECTRONIC SCRIPTING	55	105	52.4	IEEE	55	52.4	Joint IEEE and ACM	24	22.9
41	California Institute of Techno	54	141	38.3	IEEE	54	38.3	American Physiological Society	18	12.8
42	APPLIED RESEARCH ASS	52	89	58.4	IEEE	52	58.4	MIT/MIT Press	9	10.1
43	BUTTERFLY NETWORKS I	52	60	86.7	IEEE	52	86.7	Acoustical Society of America	4	6.7
44	Nant Holdings IP Llc	52	74	70.3	IEEE	52	70.3	International Association for Pattern Recognition (IAPR)	6	8.1
45	GoPro Inc	50	79	63.3	IEEE	50	63.3	ACM-Assoc Comput Mach	12	15.2
46	Autodesk Inc.	49	325	15.1	ACM-Assoc Comput Mach	219	67.4	IEEE	49	15.1
47	ORCAM TECHNOLOGIES	49	58	84.5	IEEE	49	84.5	Springer Nature	4	6.9
48	Stanford University	49	81	60.5	IEEE	49	60.5	Joint IEEE and ACM	8	9.9
49	INDIVIDUAL PATENTER	48	86	55.8	IEEE	48	55.8	ACM-Assoc Comput Mach	7	8.1
50	Technicolor SA	46	63	73.0	IEEE	46	73.0	ACM-Assoc Comput Mach	5	7.9
51	Bosch (Robert) GmbH	45	62	72.6	IEEE	45	72.6	ACM-Assoc Comput Mach	4	6.5
52	Lockheed Martin Corp.	44	209	21.1	IEEE	44	21.1	SPIE-Int Soc Opt Engineering	27	12.9
53	Siemens Aktiengesellschaft	44	114	38.6	IEEE	44	38.6	Joint IEEE and ACM	31	27.2
54	Johnson & Johnson	42	133	31.6	IEEE	42	31.6	RELX Group (Elsevier)	38	28.6
55	Ohio State University	40	60	66.7	IEEE	40	66.7	RELX Group (Elsevier)	6	10.0
56	Harvard University	39	76	51.3	IEEE	39	51.3	American Institute of Physics	11	14.5
57	Surefire LLC	38	49	77.6	IEEE	38	77.6	IEEE/OSA	11	22.4
58	Nintendo Co. Ltd.	36	211	17.1	Nintendo of America	109	51.7	IEEE	36	17.1
59	Cisco Systems Inc.	35	80	43.8	IEEE	35	43.8	Internet Soc/IETF-Internet Eng Task Force	10	12.5
60	Toyota Motor Corp	34	92	37.0	IEEE	34	37.0	ACM-Assoc Comput Mach	31	33.7
61	Acuity Brands Inc.	33	41	80.5	IEEE	33	80.5	Springer Nature	7	17.1
62	HP Inc	33	83	39.8	IEEE	33	39.8	ACM-Assoc Comput Mach	28	33.7
63	Intuitive Surgical Inc.	33	44	75.0	IEEE	33	75.0	Springer Nature	2	4.5
64	GlowPoint Inc.	32	48	66.7	IEEE	32	66.7	ACM-Assoc Comput Mach	16	33.3
65	Fujitsu Limited	31	68	45.6	IEEE	31	45.6	ACM-Assoc Comput Mach	11	16.2
66	L3 Harris Technologies (form	31	58	53.4	IEEE	31	53.4	Joint IEEE and ACM	6	10.3
67	Oracle Corporation	31	73	42.5	IEEE	31	42.5	ACM-Assoc Comput Mach	24	32.9
68	Panasonic Corporation	31	62	50.0	IEEE	31	50.0	RELX Group (Elsevier)	5	8.1
69	North Carolina State Universi	30	36	83.3	IEEE	30	83.3	Joint IEEE and ACM	2	5.6
70	Pelican Imaging Corporation	30	37	81.1	IEEE	30	81.1	ACM-Assoc Comput Mach	5	13.5
71	Rag Foundation	30	41	73.2	IEEE	30	73.2	RELX Group (Elsevier)	6	14.6
72	BERTEC CORP	29	40	72.5	IEEE	29	72.5	BioMed Central	4	10.0
73	Nio Co. Ltd	29	42	69.0	IEEE	29	69.0	ACM-Assoc Comput Mach	11	26.2
74	ZSPACE INC	29	114	25.4	IEEE	29	25.4	ACM-Assoc Comput Mach	23	20.2
75	Drexel University	28	31	90.3	IEEE	28	90.3	International Association for Pattern Recognition (IAPR)	1	3.2
76	Uber Technologies Inc	28	46	60.9	IEEE	28	60.9	Joint IET and IEEE	11	23.9
77	University of South Florida	28	56	50.0	IEEE	28	50.0	RELX Group (Elsevier)	10	17.9
78	Boeing Co. (The)	27	62	43.5	IEEE	27	43.5	ACM-Assoc Comput Mach	10	16.1
79	NVIDIA Corp.	27	125	21.6	ACM-Assoc Comput Mach	44	35.2	IEEE	27	21.6
80	InterDigital Inc	26	72	36.1	ACM-Assoc Comput Mach	28	38.9	IEEE	26	36.1

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	Adidas AG	25	87	28.7	IEEE	25	28.7	RELX Group (Elsevier)	12	13.8
82	Honeywell International Inc.	25	61	41.0	IEEE	25	41.0	RELX Group (Elsevier)	5	8.2
83	LEGEND3D INC	25	28	89.3	IEEE	25	89.3	International Association for Pattern Recognition (IAPR)	3	10.7
84	State University of New York	25	47	53.2	IEEE	25	53.2	ACM-Assoc Comput Mach	18	38.3
85	University of Connecticut	25	140	17.9	Optical Society of America	38	27.1	IEEE	25	17.9
86	University of Maryland	25	25	100.0	IEEE	25	100.0			
87	University of Washington	25	54	46.3	IEEE	25	46.3	ACM-Assoc Comput Mach	10	18.5
88	Johns Hopkins University	24	43	55.8	IEEE	24	55.8	Joint IEEE and ACM	4	9.3
89	ULTIMATEPOINTER LLC	24	49	49.0	IEEE	24	49.0	ACM-Assoc Comput Mach	17	34.7
90	UNIVERSIDADE DE COIM	24	41	58.5	IEEE	24	58.5	INRIA Grenoble - Rhône-Alpes	2	4.9
91	Comcast Corp	23	54	42.6	IEEE	23	42.6	SPIE-Int Soc Opt Engineering	17	31.5
92	Huawei Technologies Compa	23	41	56.1	IEEE	23	56.1	ACM-Assoc Comput Mach	8	19.5
93	Koninklijke Philips N.V.	23	68	33.8	IEEE	23	33.8	ACM-Assoc Comput Mach	8	11.8
94	POSITION IMAGING INC	22	22	100.0	IEEE	22	100.0			
95	Seiko Epson Corporation	22	91	24.2	Joint IEEE and ACM	50	54.9	IEEE	22	24.2
96	Cedar Ridge Research LLC	21	34	61.8	IEEE	21	61.8	American Institute of Physics	8	23.5
97	Ford Motor Co.	21	55	38.2	IEEE	21	38.2	ACM-Assoc Comput Mach	17	30.9
98	Toshiba Corp	21	31	67.7	IEEE	21	67.7	ACM-Assoc Comput Mach	3	9.7
99	Queen's University of Kingsto	20	135	14.8	ACM-Assoc Comput Mach	87	64.4	IEEE	20	14.8
100	Columbia University	19	19	100.0	IEEE	19	100.0			

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
<i>Wind Energy</i>										
1	Vestas Wind Systems A/S	442	939	47.1	IEEE	442	47.1	AWEA-American Wind Energy Association	98	10.4
2	General Electric Company	209	542	38.6	IEEE	209	38.6	US Dept of Energy	115	21.2
3	ABB Ltd	147	250	58.8	IEEE	147	58.8	EWEA-European Wind Energy Association	18	7.2
4	University of Nebraska	74	76	97.4	IEEE	74	97.4	Institution of Engineering and Technology	2	2.6
5	Siemens Aktiengesellschaft	61	103	59.2	IEEE	61	59.2	RELX Group (Elsevier)	10	9.7
6	SolarEdge Technologies Inc	61	76	80.3	IEEE	61	80.3	WIP-Renewable Energies	7	9.2
7	Arizona State University	49	55	89.1	IEEE	49	89.1	AMER TELEPHONE TELEGRAPH CO, 550 MADISON AV	3	5.5
8	Ingeteam Corporation SA	46	73	63.0	IEEE	46	63.0	EWEA-European Wind Energy Association	6	8.2
9	Enercon GmbH	38	45	84.4	IEEE	38	84.4	Institution of Engineering and Technology	3	6.7
10	University of Alabama	30	37	81.1	IEEE	30	81.1	IET/IEE	6	16.2
11	Rensselaer Polytechnic Instit	25	27	92.6	IEEE	25	92.6	China Electrochemical Society	1	3.7
12	University of New Brunswick	25	27	92.6	IEEE	25	92.6	IET/IEE	1	3.7
13	Tigo Energy Inc	22	26	84.6	IEEE	22	84.6	WIP-Renewable Energies	3	11.5
14	National Cheng Kung Univer	18	19	94.7	IEEE	18	94.7	IET/IEE	1	5.3
15	UWM Research Foundation	17	19	89.5	IEEE	17	89.5	IET/IEE	1	5.3
16	Senvion SE	15	50	30.0	IEEE	15	30.0	AIAA-Am Inst Aero Astro	10	20.0
17	INDIVIDUAL PATENTER	13	31	41.9	IEEE	13	41.9	ASME-Am Soc Mech Eng	7	22.6
18	Siemens Energy Ag (formerly	13	17	76.5	IEEE	13	76.5	EPE Association	2	11.8
19	TechnipFMC	13	17	76.5	IEEE	13	76.5	Springer Nature	1	5.9
20	Fujitsu Limited	12	13	92.3	IEEE	12	92.3	RELX Group (Elsevier)	1	7.7
21	Nordex SE	12	20	60.0	IEEE	12	60.0	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	4	20.0
22	NRG SYSTEMS INC	12	22	54.5	IEEE	12	54.5	RELX Group (Elsevier)	4	18.2
23	University of Calgary	12	15	80.0	IEEE	12	80.0	China Electrochemical Society	1	6.7
24	UNIVERSITY OF ZAGREB	12	14	85.7	IEEE	12	85.7	EWEA-European Wind Energy Association	1	7.1
25	SPARQ SYSTEMS INC	11	14	78.6	IEEE	11	78.6	IET/IEE	2	14.3
26	Woodward Inc	10	10	100.0	IEEE	10	100.0			
27	Kite Gen Research Srl	9	21	42.9	IEEE	9	42.9	RELX Group (Elsevier)	7	33.3
28	PRENAV INC	9	9	100.0	IEEE	9	100.0			
29	University of South Florida	9	9	100.0	IEEE	9	100.0			
30	ZOND ENERGY SYSTEMS	9	11	81.8	IEEE	9	81.8	RELX Group (Elsevier)	1	9.1
31	US WIND TECHNOLOGY L	8	8	100.0	IEEE	8	100.0			
32	GENEDICS CLEAN ENERG	7	63	11.1	RELX Group (Elsevier)	49	77.8	AAAS-Am Assoc Advancement Sci	7	11.1
33	GENEDICS LLC	6	47	12.8	RELX Group (Elsevier)	35	74.5	IEEE	6	12.8
34	Hitachi Ltd	6	10	60.0	IEEE	6	60.0	Hitachi Ltd.	3	30.0
35	Honeywell International Inc.	6	12	50.0	IEEE	6	50.0	AIAA-Am Inst Aero Astro	2	16.7
36	Imperial College	6	8	75.0	IEEE	6	75.0	IEEE/RSJ	2	25.0
37	Medtronic Inc	6	7	85.7	IEEE	6	85.7	Springer Nature	1	14.3
38	GREEN ENERGY CORP	5	5	100.0	IEEE	5	100.0			
39	LS Electric co. Ltd. (formerly	5	7	71.4	IEEE	5	71.4	IET/IEE	1	14.3

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
40	Mitsubishi Heavy Industries	5	54	9.3	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	27	50.0	ASME-Am Soc Mech Eng	13	24.1
41	NEC Corp	5	6	83.3	IEEE	5	83.3	Institute of Electrical Engineers of Japan	1	16.7
42	RHEINISCH-WESTFALISC	5	5	100.0	IEEE	5	100.0			
43	University of Western Ontari	5	5	100.0	IEEE	5	100.0			
44	X Development Llc	5	11	45.5	IEEE	5	45.5	AIAA-Am Inst Aero Astro	3	27.3
45	Alstom	4	6	66.7	IEEE	4	66.7	A B B Corporate Management Services AG	2	33.3
46	HYPER TECH RESEARCH	4	4	100.0	IEEE	4	100.0			
47	INVENTUS HOLDINGS LL	4	6	66.7	IEEE	4	66.7	American Automatic Control Council (AACC)	1	16.7
48	KK WIND SOLUTIONS A/S	4	4	100.0	IEEE	4	100.0			
49	NORTHERN POWER SYST	4	5	80.0	IEEE	4	80.0	PennWell Publishing Co.	1	20.0
50	UNIVERSIDAD PUBLICA	4	5	80.0	IEEE	4	80.0	Instrument Society of America	1	20.0
51	AB SKF	3	3	100.0	IEEE	3	100.0			
52	COMBINED ENERGIES LL	3	3	100.0	IEEE	3	100.0			
53	Corteva Agriscience(former	3	24	12.5	RELX Group (Elsevier)	7	29.2	Springer Nature	3	12.5
54	Daewoo Shipbuilding & Mari	3	6	50.0	IEEE	3	50.0	ISA - Instrumentation, Systems & Automation Society	1	16.7
55	EMPIRE MAGNETICS INC	3	3	100.0	IEEE	3	100.0			
56	GLOBAL ENERGYCONCE	3	5	60.0	IEEE	3	60.0	AWEA-American Wind Energy Association	1	20.0
57	Intertrust Technologies Corp	3	3	100.0	IEEE	3	100.0			
58	Korea Electric Power Corp	3	7	42.9	RELX Group (Elsevier)	3	42.9	IEEE	3	42.9
59	Nanyang Technological Univ	3	3	100.0	IEEE	3	100.0			
60	NUOVO PIGNONE TECHN	3	3	100.0	IEEE	3	100.0			
61	SAMAYS INNOVACIONES	3	5	60.0	IEEE	3	60.0	BIRKHAUSER VERLAG AG, VIADUKSTRASSE 40-44, PO	1	20.0
62	Schweitzer Engineering Labo	3	3	100.0	IEEE	3	100.0			
63	SIEMANS GAMESA RENE	3	3	100.0	IEEE	3	100.0			
64	University of Florida	3	39	7.7	American Institute of Physics	12	30.8	ACS-Am Chem Soc	6	15.4
65	University of Wisconsin	3	3	100.0	IEEE	3	100.0			
66	UPTAKE TECHNOLOGIES	3	3	100.0	IEEE	3	100.0			
67	ADVANCED MAGNET LA	2	2	100.0	IEEE	2	100.0			
68	Alliance for Sustainable Ener	2	12	16.7	ASME-Am Soc Mech Eng	7	58.3	IEEE	2	16.7
69	Apple Inc	2	2	100.0	IEEE	2	100.0			
70	Bosch (Robert) GmbH	2	2	100.0	IEEE	2	100.0			
71	Consiglio Nazionale Delle Ri	2	2	100.0	IEEE	2	100.0			
72	Dana Holding Corp.	2	3	66.7	IEEE	2	66.7	EVS.org	1	33.3
73	Doosan Holding	2	2	100.0	IEEE	2	100.0			
74	HAWAIIAN ELECTRIC CO	2	4	50.0	IEEE	2	50.0	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	2	50.0
75	IDENTIFLIGHT INTERNAT	2	3	66.7	IEEE	2	66.7	Massachusetts Institute of Technology	1	33.3
76	International Business Machi	2	9	22.2	RELX Group (Elsevier)	6	66.7	IEEE	2	22.2
77	L3 Harris Technologies (form	2	4	50.0	IEEE	2	50.0	RELX Group (Elsevier)	2	50.0
78	Microsoft Corporation	2	2	100.0	IEEE	2	100.0			
79	ONSEMBLE LLC	2	4	50.0	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	2	50.0	IEEE	2	50.0
80	Rockwell Automation Inc	2	2	100.0	IEEE	2	100.0			

Appendix B: Top 100 Organizations That Cite IEEE; (2001-2020 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	Rolls Royce Holdings Plc	2	7	28.6	ASME-Am Soc Mech Eng	4	57.1	IEEE	2	28.6
82	Trevii - Finanziaria Industrial	2	2	100.0	IEEE	2	100.0			
83	Tsinghua University	2	3	66.7	IEEE	2	66.7	American Institute of Physics	1	33.3
84	Airbus SE	1	4	25.0	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	1	25.0	RELX Group (Elsevier)	1	25.0
85	American Superconductor Co	1	1	100.0	IEEE	1	100.0			
86	BASELOAD ENERGY INC	1	2	50.0	Konggansa	1	50.0	IEEE	1	50.0
87	BEIJING GOLDWIND SCIE	1	1	100.0	IEEE	1	100.0			
88	BLUE WATER SHIPPING A	1	1	100.0	IEEE	1	100.0			
89	California Institute of Techno	1	6	16.7	RELX Group (Elsevier)	4	66.7	American Institute of Physics	1	16.7
90	Cisco Systems Inc.	1	1	100.0	IEEE	1	100.0			
91	CLEAN CURRENT LP	1	3	33.3	IEEE	1	33.3	AIAA-Am Inst Aero Astro	1	33.3
92	DOMETIC SWEDEN AB	1	1	100.0	IEEE	1	100.0			
93	Florida State University	1	1	100.0	IEEE	1	100.0			
94	General Motors Corp	1	4	25.0	China Electrochemical Society	2	50.0	IEEE	1	25.0
95	GLOUSTER APPLICATION	1	8	12.5	RELX Group (Elsevier)	6	75.0	AAAS-Am Assoc Advancement Sci	1	12.5
96	Indiana University	1	5	20.0	RELX Group (Elsevier)	2	40.0	IEEE	1	20.0
97	Innio (formerly Jenbacher G	1	1	100.0	IEEE	1	100.0			
98	Institut Francais du Petrole	1	3	33.3	American Automatic Control Council (AACC	2	66.7	IEEE	1	33.3
99	JST LLC	1	2	50.0	Konggansa	1	50.0	IEEE	1	50.0
100	Khalifa University of Science	1	1	100.0	IEEE	1	100.0			

Appendix C: Top Organizations from All Categories Combined

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
1	Microsoft Corporation	64153	185889	34.5	IEEE	64153	34.5	ACM-Assoc Comput Mach	52931	28.5
2	International Business Machi	58722	171815	34.2	IEEE	58722	34.2	ACM-Assoc Comput Mach	31833	18.5
3	Micron Technology Inc.	42554	127572	33.4	IEEE	42554	33.4	RELX Group (Elsevier)	21035	16.5
4	Apple Inc	39714	93719	42.4	IEEE	39714	42.4	ACM-Assoc Comput Mach	21496	22.9
5	Qualcomm Inc	39208	92853	42.2	IEEE	39208	42.2	3GPP General Partnership Project Standards Body	17862	19.2
6	AT&T Inc	33145	59556	55.7	IEEE	33145	55.7	ACM-Assoc Comput Mach	4151	7.0
7	Intel Corporation	31944	67556	47.3	IEEE	31944	47.3	3GPP General Partnership Project Standards Body	7562	11.2
8	Broadcom Ltd	29728	49365	60.2	IEEE	29728	60.2	ACM-Assoc Comput Mach	1632	3.3
9	Marvell Technology Group Lt	24110	30257	79.7	IEEE	24110	79.7	3GPP General Partnership Project Standards Body	3113	10.3
10	Google Inc.	21480	58883	36.5	IEEE	21480	36.5	ACM-Assoc Comput Mach	13275	22.5
11	Semiconductor Energy Labor	17786	174569	10.2	SID-Society for Information Display	52429	30.0	American Institute of Physics	34154	19.6
12	Nokia Corp	17356	47989	36.2	IEEE	17356	36.2	3GPP General Partnership Project Standards Body	10140	21.1
13	Samsung Electronics Co Ltd	15789	52904	29.8	IEEE	15789	29.8	3GPP General Partnership Project Standards Body	11875	22.4
14	Cisco Systems Inc.	14858	45919	32.4	IEEE	14858	32.4	Internet Soc/IETF-Internet Eng Task Force	7100	15.5
15	Massachusetts Institute of Te	13501	48496	27.8	IEEE	13501	27.8	RELX Group (Elsevier)	5679	11.7
16	Ericsson	13350	45503	29.3	3GPP General Partnership Project Standards B	17849	39.2	IEEE	13350	29.3
17	InterDigital Inc	12485	50747	24.6	3GPP General Partnership Project Standards B	32554	64.1	IEEE	12485	24.6
18	MONOLITHIC 3D INC	12296	20920	58.8	IEEE	12296	58.8	IEEE/JPN Soc App Phys	2303	11.0
19	Sony Corp	12182	29043	41.9	IEEE	12182	41.9	ACM-Assoc Comput Mach	2407	8.3
20	Western Digital Corp.	11587	22737	51.0	IEEE	11587	51.0	American Institute of Physics	2289	10.1
21	Siemens Aktiengesellschaft	11508	27374	42.0	IEEE	11508	42.0	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	2358	8.6
22	Oracle Corporation	11467	42167	27.2	ACM-Assoc Comput Mach	13075	31.0	IEEE	11467	27.2
23	Medtronic Inc	11414	132974	8.6	RELX Group (Elsevier)	22548	17.0	Lippincott Williams & Wilkins Ltd.	16246	12.2
24	ParkerVision Inc	11170	21962	50.9	IEEE	11170	50.9	IET/IEEE	5152	23.5
25	Huawei Technologies Compa	10810	35965	30.1	3GPP General Partnership Project Standards B	14010	39.0	IEEE	10810	30.1
26	Infineon Technologies AG	10767	17482	61.6	IEEE	10767	61.6	American Institute of Physics	1091	6.2
27	Xperi Corporation (Formerly	10361	18475	56.1	IEEE	10361	56.1	ACM-Assoc Comput Mach	1186	6.4
28	Texas Instruments Inc	10192	15949	63.9	IEEE	10192	63.9	American Institute of Physics	564	3.5
29	Panasonic Corporation	9870	29862	33.1	IEEE	9870	33.1	3GPP General Partnership Project Standards Body	4988	16.7
30	Taiwan Semiconductor Manu	9335	25554	36.5	IEEE	9335	36.5	American Institute of Physics	7316	28.6
31	Personalized Media Commu	9218	55081	16.7	Society of Motion Picture and Television Engi	16698	30.3	IEEE	9218	16.7
32	LG Electronics Inc.	9149	43328	21.1	3GPP General Partnership Project Standards B	23817	55.0	IEEE	9149	21.1
33	Fujitsu Limited	8675	23300	37.2	IEEE	8675	37.2	3GPP General Partnership Project Standards Body	2895	12.4
34	Toshiba Corp	8376	19977	41.9	IEEE	8376	41.9	American Institute of Physics	1534	7.7
35	NXP Semiconductors NV	8342	13316	62.6	IEEE	8342	62.6	American Institute of Physics	921	6.9
36	Honeywell International Inc.	7951	19963	39.8	IEEE	7951	39.8	RELX Group (Elsevier)	1976	9.9
37	General Electric Company	7922	28244	28.0	IEEE	7922	28.0	US Dept of Energy	3168	11.2
38	Rambus Inc.	7887	11840	66.6	IEEE	7887	66.6	IEEE/JPN Soc App Phys	581	4.9
39	STMicroelectronics	7405	12218	60.6	IEEE	7405	60.6	RELX Group (Elsevier)	846	6.9
40	Koninklijke Philips N.V.	7254	26842	27.0	IEEE	7254	27.0	RELX Group (Elsevier)	2815	10.5

Appendix C: Top Organizations from All Categories Combined

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
41	Macronix International Co. Lt	7245	13389	54.1	IEEE	7245	54.1	IEEE/JPN Soc App Phys	2539	19.0
42	Partners HealthCare Systems	6925	91494	7.6	Optical Society of America	28986	31.7	RELX Group (Elsevier)	13058	14.3
43	HP Inc	6901	22198	31.1	IEEE	6901	31.1	ACM-Assoc Comput Mach	3579	16.1
44	NEC Corp	6866	20766	33.1	IEEE	6866	33.1	3GPP General Partnership Project Standards Body	5098	24.5
45	Blackberry Ltd.	6831	24189	28.2	3GPP General Partnership Project Standards B	9186	38.0	IEEE	6831	28.2
46	Intellectual Ventures Manage	6717	32319	20.8	IEEE	6717	20.8	RELX Group (Elsevier)	3132	9.7
47	University of California	6678	50735	13.2	RELX Group (Elsevier)	6862	13.5	IEEE	6678	13.2
48	Murata Manufacturing Co. Lt	6626	8526	77.7	IEEE	6626	77.7	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	217	2.5
49	Tela Innovations inc	6363	19545	32.6	SPIE-Int Soc Opt Engineering	6481	33.2	IEEE	6363	32.6
50	Qorvo	6274	7437	84.4	IEEE	6274	84.4	American Institute of Physics	409	5.5
51	Raytheon Co.	6250	18072	34.6	IEEE	6250	34.6	RELX Group (Elsevier)	956	5.3
52	Irobot Corp	6230	11067	56.3	IEEE	6230	56.3	SPIE-Int Soc Opt Engineering	1520	13.7
53	REARDEN LLC	6212	6974	89.1	IEEE	6212	89.1	IET/IEE	206	3.0
54	Intuitive Surgical Inc.	6175	11748	52.6	IEEE	6175	52.6	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	597	5.1
55	Columbia University	6171	19752	31.2	IEEE	6171	31.2	ACM-Assoc Comput Mach	1940	9.8
56	Conversant Intellectual Prope	6083	9702	62.7	IEEE	6083	62.7	IEEE/JPN Soc App Phys	257	2.6
57	CPG TECHNOLOGIES INC	6079	7813	77.8	IEEE	6079	77.8	AMER TELEPHONE TELEGRAPH CO, 550 MADISON AV	410	5.2
58	Boston Scientific Corp.	5952	75895	7.8	RELX Group (Elsevier)	20465	27.0	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	9176	12.1
59	Commscope Holding (formerl	5731	9771	58.7	IEEE	5731	58.7	3GPP General Partnership Project Standards Body	489	5.0
60	ZENO SEMICONDUCTOR I	5709	7444	76.7	IEEE	5709	76.7	IEEE/JPN Soc App Phys	1346	18.1
61	Cadence Design Systems Inc	5708	13146	43.4	IEEE	5708	43.4	Joint IEEE and ACM	4222	32.1
62	Xerox Corp	5694	19659	29.0	IEEE	5694	29.0	ACM-Assoc Comput Mach	3500	17.8
63	California Institute of Techno	5653	29437	19.2	IEEE	5653	19.2	RELX Group (Elsevier)	4089	13.9
64	Canon Inc	5582	19802	28.2	IEEE	5582	28.2	American Institute of Physics	1804	9.1
65	Xilinx Inc.	5445	15001	36.3	ACM-Assoc Comput Mach	5754	38.4	IEEE	5445	36.3
66	SolarEdge Technologies Inc	5443	6195	87.9	IEEE	5443	87.9	WIP-Renewable Energies	324	5.2
67	Synopsys Inc.	5413	15514	34.9	IEEE	5413	34.9	SPIE-Int Soc Opt Engineering	3169	20.4
68	Fractus SA	5296	8883	59.6	IEEE	5296	59.6	IET/IEE	1330	15.0
69	HRL Laboratories LLC	5227	10315	50.7	IEEE	5227	50.7	American Institute of Physics	652	6.3
70	Ricoh Co. Ltd.	5188	11860	43.7	IEEE	5188	43.7	ACM-Assoc Comput Mach	1815	15.3
71	Adobe Inc. (former Adobe Sy	5175	13002	39.8	IEEE	5175	39.8	ACM-Assoc Comput Mach	4385	33.7
72	Nippon Telegraph & Telepho	5067	15916	31.8	IEEE	5067	31.8	3GPP General Partnership Project Standards Body	4588	28.8
73	University of Minnesota (The	4984	10015	49.8	IEEE	4984	49.8	RELX Group (Elsevier)	948	9.5
74	Mitsubishi Electric Corp	4983	11151	44.7	IEEE	4983	44.7	3GPP General Partnership Project Standards Body	1308	11.7
75	Motorola Solutions Inc.	4963	10169	48.8	IEEE	4963	48.8	American Institute of Physics	967	9.5
76	Amazon.com Inc.	4950	15954	31.0	IEEE	4950	31.0	ACM-Assoc Comput Mach	4108	25.7
77	Industrial Technology Researc	4909	9369	52.4	IEEE	4909	52.4	RELX Group (Elsevier)	851	9.1
78	Abbott Laboratories	4877	103464	4.7	RELX Group (Elsevier)	24470	23.7	ACS-Am Chem Soc	12461	12.0
79	Renesas Electronic Corporati	4825	8053	59.9	IEEE	4825	59.9	IEEE/JPN Soc App Phys	496	6.2
80	University of Illinois	4798	38013	12.6	American Institute of Physics	7820	20.6	ACS-Am Chem Soc	5032	13.2

Appendix C: Top Organizations from All Categories Combined

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	Electronics and Telecommuni	4724	9497	49.7	IEEE	4724	49.7	3GPP General Partnership Project Standards Body	886	9.3
82	Dexcom Inc	4706	67225	7.0	RELX Group (Elsevier)	16932	25.2	American Diabetes Association	6949	10.3
83	Adaptix	4608	6707	68.7	IEEE	4608	68.7	European Telecom Standards Institute (ETSI)	730	10.9
84	RPX Corp	4579	11329	40.4	IEEE	4579	40.4	Internet Soc/IETF-Internet Eng Task Force	904	8.0
85	Hitachi Ltd	4489	16426	27.3	IEEE	4489	27.3	ACM-Assoc Comput Mach	1267	7.7
86	Dolby Laboratories Inc	4459	9515	46.9	IEEE	4459	46.9	International Telecommunication Union	1005	10.6
87	Witricity Corp	4438	6991	63.5	IEEE	4438	63.5	American Institute of Physics	600	8.6
88	Digimarc Corp.	4434	10859	40.8	IEEE	4434	40.8	SPIE-Int Soc Opt Engineering	1319	12.1
89	Thermo Fisher Scientific Inc	4426	27628	16.0	RELX Group (Elsevier)	7731	28.0	IEEE	4426	16.0
90	Verizon Communications Inc	4408	17375	25.4	IEEE	4408	25.4	ACM-Assoc Comput Mach	3128	18.0
91	Applied Materials Inc.	4371	17535	24.9	IEEE	4371	24.9	American Institute of Physics	3407	19.4
92	Cree Inc.	4336	11526	37.6	IEEE	4336	37.6	American Institute of Physics	2565	22.3
93	Immersion Corp.	4331	11682	37.1	IEEE	4331	37.1	ACM-Assoc Comput Mach	1252	10.7
94	Analog Devices Inc.	4209	6096	69.0	IEEE	4209	69.0	RELX Group (Elsevier)	495	8.1
95	L3 Harris Technologies (form	4160	7079	58.8	IEEE	4160	58.8	RELX Group (Elsevier)	354	5.0
96	Hon Hai Precision Industry C	4092	21769	18.8	3GPP General Partnership Project Standards B	5778	26.5	IEEE	4092	18.8
97	Technicolor SA	4080	7959	51.3	IEEE	4080	51.3	ACM-Assoc Comput Mach	404	5.1
98	Dell Technologies Inc	3948	15430	25.6	ACM-Assoc Comput Mach	5855	37.9	IEEE	3948	25.6
99	Advanced Micro Devices Inc	3926	8701	45.1	IEEE	3926	45.1	Joint IEEE and ACM	901	10.4
100	Fraunhofer Gesellschaft	3911	8020	48.8	IEEE	3911	48.8	RELX Group (Elsevier)	497	6.2
101	Commvault Systems Inc.	3901	5899	66.1	IEEE	3901	66.1	ACM-Assoc Comput Mach	979	16.6
102	NVIDIA Corp.	3772	9793	38.5	IEEE	3772	38.5	ACM-Assoc Comput Mach	2134	21.8
103	On Semiconductor Corporati	3695	5064	73.0	IEEE	3695	73.0	RELX Group (Elsevier)	311	6.1
104	Magna International Inc.	3620	6133	59.0	IEEE	3620	59.0	SAE-Society of Automobile Engineers	364	5.9
105	Sap SE	3608	15815	22.8	ACM-Assoc Comput Mach	5522	34.9	IEEE	3608	22.8
106	Johnson & Johnson	3514	50296	7.0	RELX Group (Elsevier)	9920	19.7	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	5383	10.7
107	Lockheed Martin Corp.	3462	17721	19.5	IEEE	3462	19.5	RELX Group (Elsevier)	2266	12.8
108	Boeing Co. (The)	3433	11323	30.3	IEEE	3433	30.3	RELX Group (Elsevier)	1229	10.9
109	ABB Ltd	3311	5120	64.7	IEEE	3311	64.7	RELX Group (Elsevier)	203	4.0
110	Comcast Corp	3261	11914	27.4	3GPP General Partnership Project Standards B	6210	52.1	IEEE	3261	27.4
111	Corning Inc.	3101	10091	30.7	IEEE	3101	30.7	Optical Society of America	1219	12.1
112	Commissariat A L'Energie At	2968	10805	27.5	IEEE	2968	27.5	RELX Group (Elsevier)	1959	18.1
113	Chipbond Technology Corp	2928	3666	79.9	IEEE	2928	79.9	RELX Group (Elsevier)	270	7.4
114	Tabula Inc	2903	7806	37.2	IEEE	2903	37.2	ACM-Assoc Comput Mach	2878	36.9
115	Cirrus Logic Inc.	2882	3501	82.3	IEEE	2882	82.3	RELX Group (Elsevier)	80	2.3
116	INDIVIDUAL PATENTER	2842	16862	16.9	IEEE	2842	16.9	RELX Group (Elsevier)	2542	15.1
117	Stanford University	2827	22685	12.5	IEEE	2827	12.5	RELX Group (Elsevier)	2736	12.1
118	Seagate Technology Plc	2815	7044	40.0	IEEE	2815	40.0	American Institute of Physics	1353	19.2
119	MicroUnity Systems Enginee	2810	4590	61.2	IEEE	2810	61.2	Joint IEEE and ACM	407	8.9
120	TiVo Corp	2809	10380	27.1	IEEE	2809	27.1	ACM-Assoc Comput Mach	1012	9.7

Appendix C: Top Organizations from All Categories Combined

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
121	United States Navy	2795	9209	30.4	IEEE	2795	30.4	American Institute of Physics	1056	11.5
122	Hewlett Packard Enterprises	2674	7598	35.2	IEEE	2674	35.2	ACM-Assoc Comput Mach	1634	21.5
123	Microchip Technology Inc.	2670	4115	64.9	IEEE	2670	64.9	RELX Group (Elsevier)	176	4.3
124	Pelican Imaging Corporation	2620	5442	48.1	IEEE	2620	48.1	SPIE-Int Soc Opt Engineering	874	16.1
125	Silicon Laboratories Inc	2534	3232	78.4	IEEE	2534	78.4	RELX Group (Elsevier)	137	4.2
126	Global Foundries Inc	2485	4961	50.1	IEEE	2485	50.1	American Institute of Physics	513	10.3
127	II-VI Inc	2421	6567	36.9	IEEE	2421	36.9	IET/IEE	851	13.0
128	Arizona State University	2418	7111	34.0	IEEE	2418	34.0	RELX Group (Elsevier)	805	11.3
129	Seiko Epson Corporation	2404	6889	34.9	IEEE	2404	34.9	ACM-Assoc Comput Mach	548	8.0
130	Sanken Electric Co. Ltd.	2377	2948	80.6	IEEE	2377	80.6	RELX Group (Elsevier)	331	11.2
131	Amberwave Inc	2337	6843	34.2	IEEE	2337	34.2	American Institute of Physics	2045	29.9
132	Juniper Networks Inc.	2288	6727	34.0	IEEE	2288	34.0	Network Working Group RFC	1534	22.8
133	University of Washington	2282	12528	18.2	IEEE	2282	18.2	RELX Group (Elsevier)	1767	14.1
134	University of Michigan	2252	12161	18.5	IEEE	2252	18.5	RELX Group (Elsevier)	2030	16.7
135	Bosch (Robert) GmbH	2226	9212	24.2	IEEE	2226	24.2	RELX Group (Elsevier)	798	8.7
136	Rockwell Automation Inc	2211	3113	71.0	IEEE	2211	71.0	RELX Group (Elsevier)	158	5.1
137	SIPCO LLC	2203	3597	61.2	IEEE	2203	61.2	ACM-Assoc Comput Mach	280	7.8
138	University of Texas	2203	14841	14.8	RELX Group (Elsevier)	2415	16.3	IEEE	2203	14.8
139	ConvergeOne Inc	2202	6669	33.0	IEEE	2202	33.0	Joint IEEE and ACM	996	14.9
140	PDF Solutions	2154	2751	78.3	IEEE	2154	78.3	SPIE-Int Soc Opt Engineering	391	14.2
141	Nuance Communications Inc	2137	5496	38.9	IEEE	2137	38.9	ACM-Assoc Comput Mach	848	15.4
142	Georgia Institute of Technology	2126	6518	32.6	IEEE	2126	32.6	RELX Group (Elsevier)	778	11.9
143	Cognex Corp.	2040	4566	44.7	IEEE	2040	44.7	RELX Group (Elsevier)	773	16.9
144	Innovative Silicon SA	2033	2515	80.8	IEEE	2033	80.8	RELX Group (Elsevier)	108	4.3
145	Cubic Corporation	2027	2582	78.5	IEEE	2027	78.5	IET/IEE	102	4.0
146	Softbank Corp	2001	4043	49.5	IEEE	2001	49.5	Joint IEEE and ACM	498	12.3
147	PACT XPP TECHNOLOGIE	1997	3421	58.4	IEEE	1997	58.4	ACM-Assoc Comput Mach	324	9.5
148	Lenovo Group Ltd	1975	5519	35.8	3GPP General Partnership Project Standards B	2136	38.7	IEEE	1975	35.8
149	Facebook Inc	1973	6486	30.4	IEEE	1973	30.4	ACM-Assoc Comput Mach	1880	29.0
150	Honda Motor Co. Ltd.(Honda	1969	4693	42.0	IEEE	1969	42.0	RELX Group (Elsevier)	643	13.7
151	New T-Mobile (former T-Mo	1967	7307	26.9	IEEE	1967	26.9	International Telecommunication Union	1314	18.0
152	Mediatek Inc.	1962	3357	58.4	IEEE	1962	58.4	3GPP General Partnership Project Standards Body	802	23.9
153	Accenture Ltd.	1915	5705	33.6	IEEE	1915	33.6	ACM-Assoc Comput Mach	1085	19.0
154	BT Group PLC	1891	4060	46.6	IEEE	1891	46.6	ACM-Assoc Comput Mach	357	8.8
155	Flex Ltd (Formerly Flextronic	1879	2559	73.4	IEEE	1879	73.4	CBS Interactive	274	10.7
156	Interuniversity MicroElectron	1840	4106	44.8	IEEE	1840	44.8	American Institute of Physics	396	9.6
157	Netapp Inc	1826	9619	19.0	ACM-Assoc Comput Mach	4086	42.5	IEEE	1826	19.0
158	SUN PATENT TRUST	1818	6141	29.6	3GPP General Partnership Project Standards B	2268	36.9	IEEE	1818	29.6
159	Texas A&M University	1815	3715	48.9	IEEE	1815	48.9	RELX Group (Elsevier)	289	7.8
160	FormFactor Inc	1803	3546	50.8	IEEE	1803	50.8	Springer Nature	648	18.3

Appendix C: Top Organizations from All Categories Combined

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
161	Fuji Film Holdings Corp	1796	7960	22.6	IEEE	1796	22.6	ACM-Assoc Comput Mach	1223	15.4
162	INTOUCH HEALTH INC	1792	3635	49.3	IEEE	1792	49.3	IEEE/RSJ	270	7.4
163	Emerson Electric Co.	1753	6484	27.0	IEEE	1753	27.0	RELX Group (Elsevier)	716	11.0
164	CenturyLink Inc	1744	5505	31.7	IEEE	1744	31.7	ACM-Assoc Comput Mach	1009	18.3
165	Quarterhill Inc	1680	2495	67.3	IEEE	1680	67.3	3GPP General Partnership Project Standards Body	121	4.8
166	FireEye Inc	1677	3986	42.1	IEEE	1677	42.1	ACM-Assoc Comput Mach	781	19.6
167	TDK Corporation	1665	4638	35.9	IEEE	1665	35.9	American Institute of Physics	874	18.8
168	IP RESERVOIR LLC	1654	2985	55.4	IEEE	1654	55.4	ACM-Assoc Comput Mach	531	17.8
169	Wisteria Trading Inc	1627	3206	50.7	IEEE	1627	50.7	SPIE-Int Soc Opt Engineering	359	11.2
170	Citrix Systems Inc	1623	4849	33.5	IEEE	1623	33.5	ACM-Assoc Comput Mach	844	17.4
171	Walt Disney Co.	1599	5906	27.1	ACM-Assoc Comput Mach	2883	48.8	IEEE	1599	27.1
172	Kandou	1590	1642	96.8	IEEE	1590	96.8	IEEE/JPN Soc App Phys	20	1.2
173	BAE Systems Plc.	1577	2776	56.8	IEEE	1577	56.8	SPIE-Int Soc Opt Engineering	153	5.5
174	SRI International	1565	4570	34.2	IEEE	1565	34.2	SPIE-Int Soc Opt Engineering	446	9.8
175	University of Southern Califo	1557	7999	19.5	IEEE	1557	19.5	ACS-Am Chem Soc	1031	12.9
176	Toyota Motor Corp	1544	5049	30.6	IEEE	1544	30.6	RELX Group (Elsevier)	1005	19.9
177	Sonos Inc	1542	3210	48.0	IEEE	1542	48.0	SPIE-Int Soc Opt Engineering	412	12.8
178	University of South Florida	1521	5178	29.4	IEEE	1521	29.4	RELX Group (Elsevier)	793	15.3
179	ASM International N.V.	1515	9126	16.6	American Institute of Physics	2448	26.8	RELX Group (Elsevier)	1638	17.9
180	Energous Corporation	1514	1900	79.7	IEEE	1514	79.7	The European Association on Antennas and Propagation (Eur	186	9.8
181	Infinera Corporation	1503	3012	49.9	IEEE	1503	49.9	IET/IEE	392	13.0
182	Ignis Innovation Inc	1500	1860	80.6	IEEE	1500	80.6	SID-Society for Information Display	175	9.4
183	Mevion Medical Systems Inc	1497	3712	40.3	IEEE	1497	40.3	RELX Group (Elsevier)	628	16.9
184	Intertrust Technologies Corp	1469	9438	15.6	ACM-Assoc Comput Mach	1686	17.9	IEEE	1469	15.6
185	Stryker Corp.	1450	9883	14.7	RELX Group (Elsevier)	1684	17.0	IEEE	1450	14.7
186	ATTOPSEMI TECHNOLOG	1438	1819	79.1	IEEE	1438	79.1	IEEE/JPN Soc App Phys	258	14.2
187	Northrop Grumman Corp	1438	3025	47.5	IEEE	1438	47.5	American Institute of Physics	196	6.5
188	Brain Corporation	1424	3160	45.1	IEEE	1424	45.1	MIT Press	560	17.7
189	Battelle Memorial Institute	1422	6207	22.9	IEEE	1422	22.9	RELX Group (Elsevier)	1123	18.1
190	Masimo Corp	1421	2809	50.6	IEEE	1421	50.6	Lippincott Williams & Wilkins Ltd.	212	7.5
191	Viasat	1416	2083	68.0	IEEE	1416	68.0	RELX Group (Elsevier)	83	4.0
192	Transphorm Inc	1402	2697	52.0	IEEE	1402	52.0	American Institute of Physics	507	18.8
193	Illumina Inc.	1392	5955	23.4	IEEE	1392	23.4	RELX Group (Elsevier)	650	10.9
194	Imagination Technologies Gr	1374	3856	35.6	IEEE	1374	35.6	ACM-Assoc Comput Mach	864	22.4
195	Purdue University	1368	9002	15.2	RELX Group (Elsevier)	1507	16.7	IEEE	1368	15.2
196	Orange	1362	2591	52.6	IEEE	1362	52.6	Internet Soc/IETF-Internet Eng Task Force	157	6.1
197	Enphase Energy Inc	1336	1478	90.4	IEEE	1336	90.4	IET/IEE	47	3.2
198	University of Wisconsin	1326	9252	14.3	IEEE	1326	14.3	ACS-Am Chem Soc	1215	13.1
199	LibertyMedia	1323	2367	55.9	IEEE	1323	55.9	ACM-Assoc Comput Mach	167	7.1
200	QST Holdings Llc	1280	2189	58.5	IEEE	1280	58.5	Joint IEEE and ACM	241	11.0

Appendix C: Top Organizations from All Categories Combined

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
201	Schneider Electric S.A.	1266	6395	19.8	IEEE	1266	19.8	ISA - Instrumentation, Systems & Automation Society	681	10.6
202	University of North Carolina	1265	6577	19.2	IEEE	1265	19.2	RELX Group (Elsevier)	763	11.6
203	United States of America Dep	1262	6677	18.9	IEEE	1262	18.9	RELX Group (Elsevier)	1244	18.6
204	Hong Kong University of Sci	1256	2610	48.1	IEEE	1256	48.1	American Institute of Physics	293	11.2
205	ORIGIN WIRELESS INC	1256	1561	80.5	IEEE	1256	80.5	American Institute of Physics	60	3.8
206	Maxim Integrated Products In	1251	1495	83.7	IEEE	1251	83.7	Joint IEEE and ACM	21	1.4
207	Synaptics Inc.	1219	2224	54.8	IEEE	1219	54.8	ACM-Assoc Comput Mach	125	5.6
208	Agilent Technologies Inc	1214	4194	28.9	IEEE	1214	28.9	RELX Group (Elsevier)	515	12.3
209	Vanderbilt University	1213	5350	22.7	IEEE	1213	22.7	RELX Group (Elsevier)	779	14.6
210	Extreme Networks Inc	1211	2637	45.9	IEEE	1211	45.9	ACM-Assoc Comput Mach	293	11.1
211	PHOENIX SOLUTIONS INC	1206	3635	33.2	IEEE	1206	33.2	ISCA (International Speech Communication Association)	478	13.1
212	United Microelectronics Corp	1206	2269	53.2	IEEE	1206	53.2	American Institute of Physics	362	16.0
213	SK Hynix Inc	1194	2129	56.1	IEEE	1194	56.1	American Institute of Physics	134	6.3
214	Avaya Inc	1192	4023	29.6	IEEE	1192	29.6	Internet Soc/IETF-Internet Eng Task Force	650	16.2
215	GUIDED THERAPY SYSTE	1189	2892	41.1	IEEE	1189	41.1	RELX Group (Elsevier)	387	13.4
216	United States Army	1185	4641	25.5	IEEE	1185	25.5	American Institute of Physics	494	10.6
217	Align Technology Inc	1182	4111	28.8	IEEE	1182	28.8	JCO - Journal of Clinical Orthodontics	518	12.6
218	Velatia Group	1182	1535	77.0	IEEE	1182	77.0	Echelon Corp	113	7.4
219	Norton Lifelock (formerly Sy	1172	4275	27.4	IEEE	1172	27.4	ACM-Assoc Comput Mach	1031	24.1
220	eBay Inc	1166	5918	19.7	IEEE	1166	19.7	ACM-Assoc Comput Mach	844	14.3
221	Kyocera Corp.	1131	3781	29.9	3GPP General Partnership Project Standards B	1558	41.2	IEEE	1131	29.9
222	NETWORK-1 TECHNOLOG	1122	2440	46.0	IEEE	1122	46.0	ACM-Assoc Comput Mach	682	28.0
223	University of Florida	1119	4602	24.3	IEEE	1119	24.3	RELX Group (Elsevier)	724	15.7
224	Eastman Kodak Company	1117	4898	22.8	IEEE	1117	22.8	RELX Group (Elsevier)	471	9.6
225	Cortica Ltd	1116	1440	77.5	IEEE	1116	77.5	ACM-Assoc Comput Mach	149	10.3
226	National Instruments Corp.	1111	1958	56.7	IEEE	1111	56.7	ACM-Assoc Comput Mach	178	9.1
227	Nielsen Holdings Plc	1110	6851	16.2	IEEE	1110	16.2	RELX Group (Elsevier)	1025	15.0
228	Washington University in St.	1101	6051	18.2	IEEE	1101	18.2	RELX Group (Elsevier)	818	13.5
229	Smith & Nephew Plc.	1096	15110	7.3	RELX Group (Elsevier)	3077	20.4	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	1431	9.5
230	Math Works Inc (The)	1091	2441	44.7	IEEE	1091	44.7	ACM-Assoc Comput Mach	501	20.5
231	Headwater Partners 1 LLC	1088	2213	49.2	IEEE	1088	49.2	ACM-Assoc Comput Mach	452	20.4
232	Ford Motor Co.	1068	2737	39.0	IEEE	1068	39.0	SAE-Society of Automobile Engineers	332	12.1
233	Thales	1068	2085	51.2	IEEE	1068	51.2	RELX Group (Elsevier)	121	5.8
234	General Motors Corp	1064	3018	35.3	IEEE	1064	35.3	RELX Group (Elsevier)	469	15.5
235	Agency for Science Technolo	1062	3364	31.6	IEEE	1062	31.6	RELX Group (Elsevier)	469	13.9
236	REALTIME DATA LLC	1053	3591	29.3	IEEE	1053	29.3	IBM Corp.	473	13.2
237	Michigan State University	1049	11070	9.5	Optical Society of America	2120	19.2	American Institute of Physics	1551	14.0
238	Verance Corp	1049	1974	53.1	IEEE	1049	53.1	SPIE-Int Soc Opt Engineering	248	12.6
239	Johns Hopkins University	1042	6355	16.4	RELX Group (Elsevier)	1062	16.7	IEEE	1042	16.4
240	IDC Llc	1040	2900	35.9	IEEE	1040	35.9	SID-Society for Information Display	391	13.5

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
241	Crossbar Inc	1028	3592	28.6	IEEE	1028	28.6	American Institute of Physics	522	14.5
242	Carnegie Mellon University	1021	3885	26.3	IEEE	1021	26.3	RELX Group (Elsevier)	418	10.8
243	University of Nebraska	1014	3861	26.3	IEEE	1014	26.3	Springer Nature	471	12.2
244	SRC Computers Inc.	1012	1145	88.4	IEEE	1012	88.4	ACM-Assoc Comput Mach	41	3.6
245	New Jersey Institute of Techn	991	2515	39.4	IEEE	991	39.4	RELX Group (Elsevier)	551	21.9
246	BUTTERFLY NETWORKS I	987	1057	93.4	IEEE	987	93.4	Acoustical Society of America	32	3.0
247	McAfee Inc	987	3928	25.1	IEEE	987	25.1	ACM-Assoc Comput Mach	785	20.0
248	P4TENTS1 LLC	973	1670	58.3	IEEE	973	58.3	ACM-Assoc Comput Mach	249	14.9
249	III HOLDINGS 1 LLC	965	1535	62.9	IEEE	965	62.9	ACM-Assoc Comput Mach	175	11.4
250	Sunpower Corp	963	1220	78.9	IEEE	963	78.9	WIP-Renewable Energies	61	5.0
251	LivaNova Plc	950	12552	7.6	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	2664	21.2	RELX Group (Elsevier)	2505	20.0
252	GoPro Inc	949	1431	66.3	IEEE	949	66.3	ACM-Assoc Comput Mach	172	12.0
253	Schlumberger Ltd.	946	13569	7.0	Society of Petroleum Engineers	3094	22.8	Society of Exploration Geophysicists	2121	15.6
254	TRILLIANT NETWORKS IN	944	1393	67.8	IEEE	944	67.8	Internet Soc/IETF-Internet Eng Task Force	93	6.7
255	Skyworks Solutions Inc	940	1264	74.4	IEEE	940	74.4	Summit Technical Media	52	4.1
256	KLA-Tencor Corp.	938	6769	13.9	SPIE-Int Soc Opt Engineering	1934	28.6	American Institute of Physics	1054	15.6
257	Nantero Inc	929	11252	8.3	ACS-Am Chem Soc	3296	29.3	American Institute of Physics	2368	21.0
258	Cornell University	926	6710	13.8	RELX Group (Elsevier)	975	14.5	IEEE	926	13.8
259	Northwestern University	923	12223	7.6	ACS-Am Chem Soc	2739	22.4	RELX Group (Elsevier)	1511	12.4
260	YFY Inc	908	10252	8.9	SID-Society for Information Display	3812	37.2	National Symposium on Information Display	1096	10.7
261	Fortinet Inc	901	1565	57.6	IEEE	901	57.6	ACM-Assoc Comput Mach	215	13.7
262	Midtronics Inc.	900	2095	43.0	IEEE	900	43.0	RELX Group (Elsevier)	357	17.0
263	SYNQOR INC	899	1027	87.5	IEEE	899	87.5	Penton/IPC, Inc.	45	4.4
264	3M Co	897	22327	4.0	RELX Group (Elsevier)	3229	14.5	Lippincott Williams & Wilkins Ltd.	2097	9.4
265	Otto Bock Holding GmbH &	882	1665	53.0	IEEE	882	53.0	RELX Group (Elsevier)	220	13.2
266	X ONE INC	871	2060	42.3	IEEE	871	42.3	ACM-Assoc Comput Mach	401	19.5
267	Duke University	870	5012	17.4	IEEE	870	17.4	RELX Group (Elsevier)	620	12.4
268	Teledyne Technologies Incor	866	1682	51.5	IEEE	866	51.5	SPIE-Int Soc Opt Engineering	149	8.9
269	Nikon Corp.	858	5005	17.1	SPIE-Int Soc Opt Engineering	2042	40.8	IEEE	858	17.1
270	BIOSENSORS INTERNATI	856	2662	32.2	IEEE	856	32.2	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	372	14.0
271	Cleveland Clinic (and Founda	852	4249	20.1	IEEE	852	20.1	RELX Group (Elsevier)	810	19.1
272	Zebra Technologies Corp.	840	1648	51.0	IEEE	840	51.0	ACM-Assoc Comput Mach	81	4.9
273	Technion - Israel Institute of	837	2407	34.8	IEEE	837	34.8	RELX Group (Elsevier)	268	11.1
274	University of Maryland	836	4410	19.0	IEEE	836	19.0	RELX Group (Elsevier)	680	15.4
275	State University of New York	833	4169	20.0	IEEE	833	20.0	RELX Group (Elsevier)	600	14.4
276	Lam Research Corp.	817	4479	18.2	American Institute of Physics	1317	29.4	IEEE	817	18.2
277	Synergy Microwave Corp	817	985	82.9	IEEE	817	82.9	Horizon House Publications	66	6.7
278	HTC Corporation	815	3707	22.0	3GPP General Partnership Project Standards B	2146	57.9	IEEE	815	22.0
279	University of Pennsylvania	797	7379	10.8	RELX Group (Elsevier)	1081	14.6	American Institute of Physics	816	11.1
280	Ecole Polytechnique Federale	796	2514	31.7	IEEE	796	31.7	RELX Group (Elsevier)	237	9.4

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
281	Harvard University	785	11722	6.7	Springer Nature	1566	13.4	ACS-Am Chem Soc	1505	12.8
282	VIVAQUANT LLC	785	1255	62.5	IEEE	785	62.5	RELX Group (Elsevier)	102	8.1
283	Voxer Llc	779	1274	61.1	IEEE	779	61.1	Internet Soc/IETF-Internet Eng Task Force	93	7.3
284	Airbus SE	774	1865	41.5	IEEE	774	41.5	RELX Group (Elsevier)	216	11.6
285	Charles Stark Draper Laborat	771	2397	32.2	IEEE	771	32.2	RELX Group (Elsevier)	283	11.8
286	Knowles Corp	771	1525	50.6	IEEE	771	50.6	RELX Group (Elsevier)	172	11.3
287	Integrated Device Technology	768	1011	76.0	IEEE	768	76.0	Joint IEEE and ACM	27	2.7
288	PixelWorks Inc	768	1170	65.6	IEEE	768	65.6	SPIE-Int Soc Opt Engineering	109	9.3
289	AMS AG	764	3642	21.0	American Institute of Physics	931	25.6	IEEE	764	21.0
290	Princeton University	762	6055	12.6	American Institute of Physics	1391	23.0	IEEE	762	12.6
291	Power Integrations Inc.	759	1148	66.1	IEEE	759	66.1	Penton/IPC, Inc.	66	5.7
292	Viavi Solutions Inc	742	2310	32.1	IEEE	742	32.1	American Institute of Physics	271	11.7
293	Palantir Technologies Inc	739	2629	28.1	ACM-Assoc Comput Mach	781	29.7	IEEE	739	28.1
294	JPMorgan	730	6137	11.9	Source Media	1135	18.5	IEEE	730	11.9
295	Round Rock Research LLC	725	2229	32.5	IEEE	725	32.5	RELX Group (Elsevier)	352	15.8
296	M/A-COM Technology Solut	719	1483	48.5	IEEE	719	48.5	American Institute of Physics	192	12.9
297	Aisin Seiki Co. Ltd.	716	5038	14.2	Optical Society of America	1735	34.4	IEEE	716	14.2
298	ZTE Microelectronics Techno	715	3462	20.7	3GPP General Partnership Project Standards B	1849	53.4	IEEE	715	20.7
299	NUMENTA INC	710	2671	26.6	Numenta Inc.	919	34.4	IEEE	710	26.6
300	Virginia Tech University	701	2237	31.3	IEEE	701	31.3	RELX Group (Elsevier)	313	14.0
301	ASML Holding NV	699	13290	5.3	SPIE-Int Soc Opt Engineering	4555	34.3	American Institute of Physics	2938	22.1
302	NXGEN PARTNERS IP LLC	698	1424	49.0	IEEE	698	49.0	Optical Society of America	354	24.9
303	Ciena Corp	697	2147	32.5	IEEE	697	32.5	Optical Society of America	327	15.2
304	BANDSPEED INC	696	1050	66.3	IEEE	696	66.3	Bluetooth Special Interest Group	262	25.0
305	Yageo Corporation	696	993	70.1	IEEE	696	70.1	IET/IEE	186	18.7
306	Silverbrook Pty Ltd	691	1966	35.1	IEEE	691	35.1	Springer Nature	447	22.7
307	GENGHISCOMM HOLDIN	687	758	90.6	IEEE	687	90.6	Joint IEEE and ACM	28	3.7
308	Tel Aviv University	685	4112	16.7	IEEE	685	16.7	RELX Group (Elsevier)	639	15.5
309	Centre National De La Reche	684	6307	10.8	RELX Group (Elsevier)	1596	25.3	IEEE	684	10.8
310	Advantest Corp.	682	961	71.0	IEEE	682	71.0	American Institute of Physics	41	4.3
311	EchoStar Corp	680	1238	54.9	IEEE	680	54.9	RELX Group (Elsevier)	78	6.3
312	NOMADIX INC	667	2567	26.0	IEEE	667	26.0	Network Working Group RFC	409	15.9
313	North Carolina State Universi	667	4152	16.1	American Institute of Physics	739	17.8	IEEE	667	16.1
314	Avid Technology Inc.	652	1542	42.3	IEEE	652	42.3	ACM-Assoc Comput Mach	571	37.0
315	General Dynamics Corp	650	1532	42.4	IEEE	650	42.4	American Physical Society	248	16.2
316	Schweitzer Engineering Labo	650	776	83.8	IEEE	650	83.8	ACM-Assoc Comput Mach	20	2.6
317	Korea Advanced Institute for	648	1876	34.5	IEEE	648	34.5	RELX Group (Elsevier)	182	9.7
318	Johnson Controls Internationa	640	1693	37.8	IEEE	640	37.8	RELX Group (Elsevier)	244	14.4
319	New York University	638	3240	19.7	IEEE	638	19.7	Optical Society of America	316	9.8
320	Sotera Wireless	633	1187	53.3	IEEE	633	53.3	Springer Nature	182	15.3

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
321	University of Arizona	633	2443	25.9	IEEE	633	25.9	Optical Society of America	436	17.8
322	National Chiao Tung Univers	624	1196	52.2	IEEE	624	52.2	American Institute of Physics	101	8.4
323	Sulvolta Inc	620	1301	47.7	IEEE	620	47.7	American Institute of Physics	200	15.4
324	Global Tel Link Corp	619	846	73.2	IEEE	619	73.2	IEEE/Eurasip	47	5.6
325	Ohio State University	617	2932	21.0	IEEE	617	21.0	RELX Group (Elsevier)	470	16.0
326	MOJO MOBILITY INC	616	786	78.4	IEEE	616	78.4	RELX Group (Elsevier)	54	6.9
327	ACORN TECHNOLOGIES I	613	1729	35.5	IEEE	613	35.5	American Institute of Physics	516	29.8
328	AMPT LLC	611	754	81.0	IEEE	611	81.0	IET/IEE	40	5.3
329	Soraa Inc	609	6273	9.7	American Institute of Physics	2256	36.0	Institute of Pure and Applied Physics	1028	16.4
330	Unisantis Electronics Ltd	608	720	84.4	IEEE	608	84.4	RELX Group (Elsevier)	38	5.3
331	University of Alabama	605	3453	17.5	RELX Group (Elsevier)	741	21.5	IEEE	605	17.5
332	VerintSys	603	4646	13.0	International Data Group	1318	28.4	ACM-Assoc Comput Mach	952	20.5
333	Otsuka Holdings Co Ltd	601	3104	19.4	IEEE	601	19.4	RELX Group (Elsevier)	547	17.6
334	Fastback Networks Inc	596	837	71.2	IEEE	596	71.2	IET/IEE	57	6.8
335	MULTI-TECH SYSTEMS IN	596	923	64.6	IEEE	596	64.6	ACM-Assoc Comput Mach	44	4.8
336	Maui Diagnostic Imaging	593	719	82.5	IEEE	593	82.5	RELX Group (Elsevier)	40	5.6
337	Ossur hf	592	1438	41.2	IEEE	592	41.2	RELX Group (Elsevier)	272	18.9
338	Micro Focus International PL	586	1661	35.3	IEEE	586	35.3	ACM-Assoc Comput Mach	373	22.5
339	Halliburton Co. (Holding)	585	8983	6.5	Society of Petroleum Engineers	3321	37.0	RELX Group (Elsevier)	718	8.0
340	Vicor Corp	581	684	84.9	IEEE	581	84.9	Center for Power Electronics Systems (Virginia Tech)	42	6.1
341	University of Virginia (and P	580	2315	25.1	IEEE	580	25.1	RELX Group (Elsevier)	313	13.5
342	EXEGY INC	577	1124	51.3	IEEE	577	51.3	ACM-Assoc Comput Mach	184	16.4
343	Maxlinear Inc	573	774	74.0	IEEE	573	74.0	ACM-Assoc Comput Mach	41	5.3
344	Denso Corp	570	1205	47.3	IEEE	570	47.3	RELX Group (Elsevier)	100	8.3
345	Nintendo Co. Ltd.	570	3389	16.8	ACM-Assoc Comput Mach	751	22.2	IEEE	570	16.8
346	THE FLORIDA INTERNATI	568	1278	44.4	IEEE	568	44.4	RELX Group (Elsevier)	142	11.1
347	Soitec SA	567	2116	26.8	IEEE	567	26.8	American Institute of Physics	513	24.2
348	MegaChips Corp	555	832	66.7	IEEE	555	66.7	American Physical Society	51	6.1
349	University of Pittsburgh	554	4390	12.6	RELX Group (Elsevier)	894	20.4	IEEE	554	12.6
350	Valencell Inc	552	998	55.3	IEEE	552	55.3	Springer Nature	53	5.3
351	3D Systems Corp.	550	1281	42.9	IEEE	550	42.9	ACM-Assoc Comput Mach	309	24.1
352	FARO Technologies Inc.	550	1330	41.4	IEEE	550	41.4	SPIE-Int Soc Opt Engineering	208	15.6
353	Virgin Islands Microsystems	549	2251	24.4	IEEE	549	24.4	American Institute of Physics	461	20.5
354	Comtech Telecommunication	548	1096	50.0	IEEE	548	50.0	3GPP General Partnership Project Standards Body	218	19.9
355	Screen Holdings Co Ltd (For	548	2060	26.6	IEEE	548	26.6	RELX Group (Elsevier)	306	14.9
356	Magic Leap Inc	547	1061	51.6	IEEE	547	51.6	ACM-Assoc Comput Mach	74	7.0
357	Eaton Corp.	545	773	70.5	IEEE	545	70.5	RELX Group (Elsevier)	34	4.4
358	Aerospace Corp.	542	1292	42.0	IEEE	542	42.0	RELX Group (Elsevier)	167	12.9
359	The National Aeronautical an	541	2762	19.6	IEEE	541	19.6	AIAA-Am Inst Aero Astro	284	10.3
360	Realtek Semiconductor Corp.	540	647	83.5	IEEE	540	83.5	IET/IEE	17	2.6

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
361	ECOLE DE TECHBOLOGIE	539	776	69.5	IEEE	539	69.5	3GPP General Partnership Project Standards Body	54	7.0
362	City University of Hong Kon	534	1301	41.0	IEEE	534	41.0	RELX Group (Elsevier)	112	8.6
363	IDEMIA	532	1278	41.6	IEEE	532	41.6	RELX Group (Elsevier)	95	7.4
364	VirnetX Holding Corp	532	9118	5.8	Network Working Group RFC	4570	50.1	Internet Soc/IETF-Internet Eng Task Force	1542	16.9
365	HEMOSONICS LLC	531	920	57.7	IEEE	531	57.7	RELX Group (Elsevier)	92	10.0
366	Pennsylvania State University	528	3230	16.3	RELX Group (Elsevier)	555	17.2	IEEE	528	16.3
367	PLUSN LLC	527	709	74.3	IEEE	527	74.3	IET/IEE	68	9.6
368	Eagleview Technologies Inc	526	1421	37.0	IEEE	526	37.0	ACM-Assoc Comput Mach	255	17.9
369	ONETRUST LLC	526	2048	25.7	ACM-Assoc Comput Mach	1206	58.9	IEEE	526	25.7
370	SAS Institute	523	1599	32.7	IEEE	523	32.7	RELX Group (Elsevier)	192	12.0
371	Dassault Systemes SA	521	3545	14.7	RELX Group (Elsevier)	696	19.6	IEEE	521	14.7
372	Sumitomo Electric Industries	521	3425	15.2	IEEE	521	15.2	American Institute of Physics	437	12.8
373	Omnivision Technologies Inc	518	1218	42.5	IEEE	518	42.5	Optical Society of America	289	23.7
374	Xtera Communications Inc.	518	1530	33.9	IEEE	518	33.9	IET/IEE	358	23.4
375	Assa Abloy AB	516	3121	16.5	IEEE	516	16.5	International Association for Cryptologic Research (IACR)	403	12.9
376	Pulse Link Inc	516	630	81.9	IEEE	516	81.9	Scientific American Inc.	24	3.8
377	Via Technologies Inc.	516	1108	46.6	IEEE	516	46.6	Joint IEEE and ACM	150	13.5
378	Hoya Corp	512	1717	29.8	IEEE	512	29.8	American Institute of Physics	339	19.7
379	Emcore Corp.	511	1136	45.0	IEEE	511	45.0	American Institute of Physics	163	14.3
380	MACAU UNIVERSITY OF	511	667	76.6	IEEE	511	76.6	ACM-Assoc Comput Mach	29	4.3
381	University of Utah	511	3074	16.6	IEEE	511	16.6	RELX Group (Elsevier)	415	13.5
382	Vestas Wind Systems A/S	509	1025	49.7	IEEE	509	49.7	AWEA-American Wind Energy Association	98	9.6
383	University of Central Florida	508	3872	13.1	RELX Group (Elsevier)	533	13.8	IEEE	508	13.1
384	MC10 Inc	507	5486	9.2	American Institute of Physics	1070	19.5	ACS-Am Chem Soc	812	14.8
385	CREATIVE KINGDOMS LL	505	1675	30.1	IEEE	505	30.1	ACM-Assoc Comput Mach	447	26.7
386	University of Colorado (The	501	3393	14.8	Optical Society of America	781	23.0	IEEE	501	14.8
387	Nant Holdings IP Llc	499	2361	21.1	Joint IEEE and ACM	843	35.7	ACM-Assoc Comput Mach	550	23.3
388	ST-Ericsson SA (Patents split	497	701	70.9	IEEE	497	70.9	3GPP General Partnership Project Standards Body	83	11.8
389	Oki Electric Industry Co. Ltd.	491	1155	42.5	IEEE	491	42.5	IEICE-Inst Elec Info Comm Eng	130	11.3
390	Olympus Corp.	488	2421	20.2	IEEE	488	20.2	RELX Group (Elsevier)	331	13.7
391	EDGE 3 TECHNOLOGIES I	483	717	67.4	IEEE	483	67.4	International Association for Pattern Recognition (IAPR)	51	7.1
392	Tigo Energy Inc	483	662	73.0	IEEE	483	73.0	WIP-Renewable Energies	134	20.2
393	ZENA TECHNOLOGIES IN	480	1830	26.2	IEEE	480	26.2	American Institute of Physics	393	21.5
394	Medispectra Inc	479	1279	37.5	IEEE	479	37.5	RELX Group (Elsevier)	145	11.3
395	Cheetah Omni LLC	478	1876	25.5	IEEE	478	25.5	Optical Society of America	445	23.7
396	Dialog Semiconductor Plc.	477	549	86.9	IEEE	477	86.9	ONLINE INC	18	3.3
397	ETA DEVICES INC	476	545	87.3	IEEE	476	87.3	IET/IEE	20	3.7
398	Tokyo Electron Limited	475	3693	12.9	American Institute of Physics	518	14.0	RELX Group (Elsevier)	517	14.0
399	F5 Networks Inc	474	2555	18.6	IEEE	474	18.6	ACM-Assoc Comput Mach	414	16.2
400	MIRAMAR LABS INC	472	1123	42.0	IEEE	472	42.0	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	125	11.1

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
401	UT-Battelle LLC	471	3967	11.9	RELX Group (Elsevier)	717	18.1	American Institute of Physics	508	12.8
402	Autodesk Inc.	469	3347	14.0	ACM-Assoc Comput Mach	2157	64.4	IEEE	469	14.0
403	Qinetiq Group Ltd	469	1546	30.3	IEEE	469	30.3	American Institute of Physics	167	10.8
404	National Taiwan University	468	929	50.4	IEEE	468	50.4	American Institute of Physics	78	8.4
405	Lumentum Holdings Inc	467	1589	29.4	IEEE	467	29.4	Optical Society of America	370	23.3
406	University of Notre Dame Du	467	813	57.4	IEEE	467	57.4	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	38	4.7
407	CONSTELLATION DESIGN	466	506	92.1	IEEE	466	92.1	IET/IEE	16	3.2
408	Tellabs Inc.	465	1032	45.1	IEEE	465	45.1	Internet Soc/IETF-Internet Eng Task Force	172	16.7
409	Carl-Zeiss Stiftung	463	8716	5.3	SPIE-Int Soc Opt Engineering	1663	19.1	Optical Society of America	1393	16.0
410	Here Global BV	463	897	51.6	IEEE	463	51.6	ACM-Assoc Comput Mach	128	14.3
411	PME IP PTY LTD	462	840	55.0	IEEE	462	55.0	ACM-Assoc Comput Mach	215	25.6
412	MicroStrategy Inc.	460	1842	25.0	IEEE	460	25.0	United Business Media/UBM Tech	359	19.5
413	FACENSE LTD	457	548	83.4	IEEE	457	83.4	ACM-Assoc Comput Mach	58	10.6
414	SalesforceCom Inc	457	1091	41.9	IEEE	457	41.9	ACM-Assoc Comput Mach	276	25.3
415	TRACBEAM LLC	456	852	53.5	IEEE	456	53.5	ACM-Assoc Comput Mach	113	13.3
416	Fortive Corporation	454	1061	42.8	IEEE	454	42.8	RELX Group (Elsevier)	119	11.2
417	William Marsh Rice Universi	454	3912	11.6	ACS-Am Chem Soc	755	19.3	RELX Group (Elsevier)	516	13.2
418	Ligado Networks (formerly Li	453	846	53.5	IEEE	453	53.5	Baltzer Science Publishers B.V.	130	15.4
419	Teradyne Inc.	453	855	53.0	IEEE	453	53.0	ASME-Am Soc Mech Eng	98	11.5
420	Commonwealth Scientific an	451	1037	43.5	IEEE	451	43.5	RELX Group (Elsevier)	115	11.1
421	Asahi Kasei Corp.	450	6428	7.0	RELX Group (Elsevier)	1473	22.9	Lippincott Williams & Wilkins Ltd.	841	13.1
422	ALOFT MEDIA LLC	448	678	66.1	IEEE	448	66.1	3GPP General Partnership Project Standards Body	105	15.5
423	Lattice Semiconductor Corp.	447	644	69.4	IEEE	447	69.4	Joint IEEE and ACM	40	6.2
424	Oewaves Inc	447	1412	31.7	Optical Society of America	537	38.0	IEEE	447	31.7
425	Drexel University	438	3837	11.4	RELX Group (Elsevier)	880	22.9	American Institute of Physics	729	19.0
426	National University of Ireland	437	853	51.2	IEEE	437	51.2	RELX Group (Elsevier)	61	7.2
427	University of Connecticut	436	2347	18.6	IEEE	436	18.6	RELX Group (Elsevier)	416	17.7
428	Telecom Italia SPA	433	1065	40.7	IEEE	433	40.7	3GPP General Partnership Project Standards Body	150	14.1
429	University of New Mexico	433	2183	19.8	IEEE	433	19.8	American Institute of Physics	248	11.4
430	A10 Networks Inc	430	706	60.9	IEEE	430	60.9	Joint IEEE and ACM	101	14.3
431	ICOSYSTEM CORP	429	580	74.0	IEEE	429	74.0	RELX Group (Elsevier)	27	4.7
432	PURE Storage Inc	429	1966	21.8	Internet Soc/IETF-Internet Eng Task Force	708	36.0	ACM-Assoc Comput Mach	650	33.1
433	Hexagon AB	423	1143	37.0	IEEE	423	37.0	ACM-Assoc Comput Mach	115	10.1
434	HMD Global	423	839	50.4	IEEE	423	50.4	3GPP General Partnership Project Standards Body	92	11.0
435	NEWRACOM Inc	422	430	98.1	IEEE	422	98.1	International Telecommunication Union	4	0.9
436	Alstom	421	693	60.8	IEEE	421	60.8	ASME-Am Soc Mech Eng	55	7.9
437	Becton Dickinson and Co.	421	22946	1.8	RELX Group (Elsevier)	3855	16.8	Wolters Kluwer	3234	14.1
438	SolAero Technologies Corp	419	618	67.8	IEEE	419	67.8	American Institute of Physics	96	15.5
439	IPCO LLC	417	732	57.0	IEEE	417	57.0	ACM-Assoc Comput Mach	54	7.4
440	AB Initio Technology LLC	416	1289	32.3	ACM-Assoc Comput Mach	447	34.7	IEEE	416	32.3

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441	Densbits Technologies Ltd	414	767	54.0	IEEE	414	54.0	Springer Nature	119	15.5
442	Ceva Inc.	413	768	53.8	IEEE	413	53.8	ACM-Assoc Comput Mach	84	10.9
443	Continental AG (Germany Fe	413	791	52.2	IEEE	413	52.2	RELX Group (Elsevier)	52	6.6
444	SiOnyx Inc	411	2034	20.2	American Institute of Physics	764	37.6	IEEE	411	20.2
445	University of Tennessee Rese	410	1961	20.9	IEEE	410	20.9	RELX Group (Elsevier)	313	16.0
446	ACACIA MEDIA TECHNO	408	738	55.3	IEEE	408	55.3	ACM-Assoc Comput Mach	66	8.9
447	Deutsche Telekom AG	407	1204	33.8	IEEE	407	33.8	ACM-Assoc Comput Mach	153	12.7
448	Catholic University Leuven	404	1095	36.9	IEEE	404	36.9	American Institute of Physics	129	11.8
449	SAIC Inc	404	2535	15.9	SPIE-Int Soc Opt Engineering	567	22.4	IEEE	404	15.9
450	Khalifa University of Science	403	533	75.6	IEEE	403	75.6	Computers in Cardiology, Inc.	19	3.6
451	HeartFlow Inc	401	2285	17.5	Springer Nature	546	23.9	RELX Group (Elsevier)	435	19.0
452	OMNI MEDSCI INC	400	2539	15.8	Optical Society of America	679	26.7	IEEE	400	15.8
453	Ygomi LLC	399	436	91.5	IEEE	399	91.5	SPIE-Int Soc Opt Engineering	14	3.2
454	Seoul National University	397	1518	26.2	IEEE	397	26.2	ACS-Am Chem Soc	178	11.7
455	BLUERISC INC	396	1095	36.2	IEEE	396	36.2	Joint IEEE and ACM	259	23.7
456	Omni Ai Inc. Inc (formerly B	396	461	85.9	IEEE	396	85.9	International Association for Pattern Recognition (IAPR)	51	11.1
457	University of Rochester	396	2671	14.8	IEEE	396	14.8	Optical Society of America	334	12.5
458	X Development Llc	396	653	60.6	IEEE	396	60.6	IEEE/RSJ	58	8.9
459	Kofax Inc	391	928	42.1	IEEE	391	42.1	ACM-Assoc Comput Mach	142	15.3
460	Roche Holding Ltd.	391	7903	4.9	RELX Group (Elsevier)	1744	22.1	ACS-Am Chem Soc	918	11.6
461	AVISTAR COMMUNICATI	390	777	50.2	IEEE	390	50.2	ACM-Assoc Comput Mach	228	29.3
462	ON-RAMP WIRELESS INC	389	569	68.4	IEEE	389	68.4	IET/IEE	48	8.4
463	YANICKLO TECHNOLOG	389	2414	16.1	ACM-Assoc Comput Mach	854	35.4	IEEE	389	16.1
464	Fuji Electric Holdings Co. Lt	388	851	45.6	IEEE	388	45.6	American Institute of Physics	126	14.8
465	Furukawa Electric Co. Ltd.	388	1915	20.3	Optical Society of America	430	22.5	IEEE	388	20.3
466	Yonsei University	387	964	40.1	IEEE	387	40.1	RELX Group (Elsevier)	100	10.4
467	Swiss Federal Institute of Tec	386	1516	25.5	ACM-Assoc Comput Mach	442	29.2	IEEE	386	25.5
468	United States of America Dep	386	1917	20.1	IEEE	386	20.1	American Institute of Physics	330	17.2
469	Communications Research C	385	592	65.0	IEEE	385	65.0	IET/IEE	37	6.3
470	BIO CONTROL MEDICAL (383	1410	27.2	IEEE	383	27.2	Lippincott Williams & Wilkins Ltd.	222	15.7
471	Inphi Corp	383	601	63.7	IEEE	383	63.7	IEEE/OSA	93	15.5
472	Open Text Corp	382	1149	33.2	IEEE	382	33.2	ACM-Assoc Comput Mach	216	18.8
473	Atos SE	380	905	42.0	IEEE	380	42.0	Internet Soc/IETF-Internet Eng Task Force	132	14.6
474	ITT Corp	379	842	45.0	IEEE	379	45.0	Internet Soc/IETF-Internet Eng Task Force	63	7.5
475	IWALK INC	379	1027	36.9	IEEE	379	36.9	RELX Group (Elsevier)	207	20.2
476	Japan Science and Technolog	378	4139	9.1	American Institute of Physics	1157	28.0	RELX Group (Elsevier)	542	13.1
477	SYNTROPY SYSTEMS LLC	376	417	90.2	IEEE	376	90.2	Springer Nature	18	4.3
478	Conformis Inc	375	10891	3.4	Springer Nature	1734	15.9	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	1452	13.3
479	OVONYX MEMORY TECH	375	472	79.4	IEEE	375	79.4	IEEE/JPN Soc App Phys	46	9.7
480	Pioneer Corp.	375	940	39.9	IEEE	375	39.9	SPIE-Int Soc Opt Engineering	162	17.2

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481	Rohm Co. Ltd.	372	3203	11.6	American Institute of Physics	896	28.0	RELX Group (Elsevier)	440	13.7
482	Varian Medical Systems Inc.	372	3114	11.9	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	755	24.2	RELX Group (Elsevier)	675	21.7
483	University Health Network	369	1103	33.5	IEEE	369	33.5	RELX Group (Elsevier)	162	14.7
484	PerkinElmer Inc.	368	4578	8.0	ACS-Am Chem Soc	958	20.9	RELX Group (Elsevier)	669	14.6
485	Quest Software Inc	368	975	37.7	IEEE	368	37.7	ACM-Assoc Comput Mach	289	29.6
486	Coherent Inc.	366	2577	14.2	Optical Society of America	507	19.7	American Institute of Physics	470	18.2
487	Jiangsu ChangJiang Electroni	365	457	79.9	IEEE	365	79.9	International Microelectronics And Packaging Society	40	8.8
488	Caterpillar Inc.	364	1074	33.9	IEEE	364	33.9	SAE-Society of Automobile Engineers	136	12.7
489	Seoul Semiconductor Co Ltd	364	2715	13.4	American Institute of Physics	1098	40.4	IEEE	364	13.4
490	United States Air Force	361	1521	23.7	IEEE	361	23.7	American Institute of Physics	159	10.5
491	Vishay Intertechnology Inc.	361	551	65.5	IEEE	361	65.5	RELX Group (Elsevier)	36	6.5
492	Avalanche Technology Inc	359	1597	22.5	American Institute of Physics	499	31.2	IEEE	359	22.5
493	Hologic Inc	359	4085	8.8	RELX Group (Elsevier)	818	20.0	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	651	15.9
494	University of Massachusetts	357	2989	11.9	ACS-Am Chem Soc	424	14.2	IEEE	357	11.9
495	Rohde & Schwarz GmbH &	356	751	47.4	IEEE	356	47.4	ATSC Std	211	28.1
496	Council of Scientific and Ind	353	1394	25.3	IEEE	353	25.3	RELX Group (Elsevier)	307	22.0
497	National University of Singap	353	1406	25.1	IEEE	353	25.1	American Institute of Physics	190	13.5
498	BorgWarner Inc.	350	803	43.6	IEEE	350	43.6	RELX Group (Elsevier)	111	13.8
499	Nanyang Technological Univ	349	2996	11.6	RELX Group (Elsevier)	586	19.6	ACS-Am Chem Soc	541	18.1
500	Fluidigm Corp	348	2983	11.7	ACS-Am Chem Soc	454	15.2	RELX Group (Elsevier)	449	15.1