



# **Analysis of Patent Referencing to IEEE Papers, Conferences, and Standards 1997-2015**

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## Executive Summary

IEEE engaged 1790 Analytics in this project to assess the impact of IEEE publications on developments in various technologies. This 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 patents issued from January 1, 1997 through December 31, 2015.

The main findings of this report are:

- New technology continues to build upon science, and the dependence is increasing. In this study, the top 40 firms (in 2015) were granted 81,226 patents, which made a total of 569,023 non-patent references (an average of 7.0 non-patent references per patent). Five years prior (2010) the same 40 firms had 62,262 patents which made a total of 291,537 non-patent references (an average of 4.7 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 a large number 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 40 patenting firms in 2015 have referenced over 1,419,000 articles in the last 19 years. About 29% (410,015) of those articles appeared in IEEE journals or IEEE sponsored conferences.
- In this study, we also went beyond the top 40 patenting companies and analyzed all patents from the last 19 years in several technology categories of interest to IEEE members and customers. For example, approximately 33% of all scientific references from Computer Hardware patents go to IEEE publications. The second most referenced publisher is ACM (Association for Computer Machinery) with 16.5% 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 406,000+ references to IEEE articles and conferences represents 44% of all science references from Telecommunications patents since 1997. 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, than almost half of that science base is published in IEEE journals or presented at IEEE sponsored conferences. In addition, the 406,000+ references to IEEE dwarf the combined total of the next 30 publishing organizations in this technology.

- IEEE is referenced a surprising amount in areas which are not central to its mission.
  - For example, almost 7% of the science references from patents in medical devices go to IEEE publications. This ranks IEEE fourth behind RELX and Wolters and Wiley (with 24%, 11%, and 9% respectively). The latter publishers have hundreds of journals in the medical area, whereas IEEE has only a few, so the 7% figure is quite solid for a non-core area.
  - Optics is also somewhat surprising. IEEE publications receive the most references from Optics patents, and IEEE is referenced significantly 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 19% of all references, which is just ahead of the 15% of RELX while, again, RELX has many more journal titles in the space.
  - In the Robotics and Intelligent Manufacturing category, 41% of the patent references are to articles published in IEEE journals or in proceedings of IEEE sponsored conferences. Second place RELX receives less than one-fourth as many references in the category.
  - Patents related to Power Systems and Transmission also reference IEEE publications most frequently. The 28,000+ 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, almost 63% of the scientific references from patents go to IEEE journal or conference papers. The second most referenced publisher is ACM with only 3.9% of all references.
  - A few 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 40% of the references. In solar energy, RELX has a slight lead over IEEE. The RELX lead is not surprising since it 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*.
  - This year we added broadcasting patents to the study for the first time. In this category IEEE leads with 35% of the references, followed by the Society of Motion Pictures and Television Engineers (SMPTE) with 7% of the references.

- 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 fourteen 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 10.79 by 2015 – a 291% increase. These numbers are for all issued US patents and not just those in the fourteen categories covered in this report.<sup>1</sup> 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 40 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 143,218 in 2015 (an 879% increase). Thus science referencing and IEEE referencing have both increased greatly since 1997.

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<sup>1</sup> 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 1997 through December 2015. 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 14 subcategories of Technology where IEEE members and readers are active. Many, but not all are related to Information Technology. The categories (including a new category related to Broadcasting), with patent counts are shown below in Table 1.

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

Category	# Patents 1997-2015
Broadcasting	109697
Computer Hardware	330161
Computer Software	188090
Diagnosis/Surgery/Medical Instruments	171983
Information Storage	118952
Measuring, Testing and Control Devices	178850
Optics/Photography/Electrophotography	139494
Power Systems	86821
Robotics and Intelligent Manufacturing	26206
Semiconductors/Solid-State Devices/Electronics	232653
Smart Grid/Smart Meters/Energy Infrastructure	2961
Solar/Photovoltaic	9100
Telecom and Other Communications	467987
Wind Energy	4426

## II. Methodology

This study is based on referencing patterns from patents to prior art documents. When an inventor files a patent for a new 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 new invention.

As an example, Figure 1 shows the front page of a General Electric patent. 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 40 patenting companies in 2015. 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 fifteen technology categories from all companies, universities, government agencies, and individuals. The fifteen 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 sub-

sequences 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 1,000+ most referenced conferences. These 1,000+ conferences are listed under more than 12,000 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 was relatively easy 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 16,000+ journals covered by the ISI/Thomson Scientific Database. This is not a severe limitation, since these 16,000+ journals include more than 100 IEEE journals, 1400+ RELX/Elsevier journals, and 350+ Wiley journals. In addition, we also identify publishers of about 1,000 non-ISI journals if they appear very frequently in the patent references, but do not appear in the ISI database.

Once restricted to these 17,000+ 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 of these problems, so that we generate an accurate match between the patent references and 17,000+ journals. After



identifying all of the relevant journals, we then used the ISI database and web research to identify the publisher of each journal

### III. Results

#### ***References from Top 40 Patenting Organizations***

Table 3 shows the 40 firms that were granted the largest number of US patents in 2015. 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 of the subsidiary names for each company to ensure that our patent counts are accurate.

We identified the top 40 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 40 firms shown in Table 3. This figure shows that patents issued to the top 40 firms between 1997 and 2015 reference IEEE papers, conferences, and standards more than 410,000 times (compared with 350,000+ last year). This is more than three times as many references as the second placed publisher RELX Group (formerly Elsevier). In addition, if conference publications that are jointly sponsored are counted, such as the conferences jointly sponsored between IEEE and the Japanese Society of Applied Physics, or IEEE and ACM, then the number of references from the top 40 companies to IEEE increases by another 31,000 references.

IEEE receives about 29% of the science references from the patents of the top 40 companies. The next closest publisher (RELX) has 9.6% of the total and IEEE's share of references is about the same as the next seven publishers combined. About 1/3 of the 410,000+ patent references to IEEE are to IEEE sponsored conferences.

Table 4 illustrates the reference distribution of IBM, which is the top patent holder in 2015 (and for the past 15 years). This reference distribution is typical of the top 40 firms. The references from IBM to IEEE are actually to a number of 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 Computer Magazine* and *IEEE Transactions on Electron Devices*.

Notice that a full 25 of the top 50 journals and conferences referenced by IBM patents are published or sponsored by IEEE. Ten of the top 50 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 40 firms, but still IBM references IEEE almost twice as often as ACM as seen in Appendix A-10 (42,797 references to IEEE and 22,700 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 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 3 – Top-Patenting Firms in 2014**

<b>Full Parent Name</b>	<b>2015 Patent Count</b>	<b>1997-2015 Patent Count</b>
International Business Machines Corp	7395	83246
Samsung Electronics Co Ltd	5167	56069
Canon Inc	4378	48567
Google Inc.	3234	10001
Qualcomm Inc	3183	15770
Toshiba Corp	2899	34976
LG Electronics Inc.	2629	19033
Sony Corp	2625	38316
Samsung SDI Co Ltd	2546	10358
Microsoft Corporation	2470	30150
Panasonic Corporation	2456	45086
Intel Corporation	2298	28047
General Electric Company	2106	28559
Apple Inc	1979	10333
Toyota Motor Corp	1937	15982
Fujitsu Limited	1898	31198
Taiwan Semiconductor Manufacturing Co.	1827	10984
Ricoh Co. Ltd.	1676	16376
Medtronic Inc	1635	15521
Seiko Epson Corporation	1623	19509
Hitachi Ltd	1621	35990
Ericsson	1469	13494
Siemens Aktiengesellschaft	1436	22726
Fuji Film Holdings Corp	1433	24692
Hewlett-Packard Co	1409	29842
General Motors Corp	1380	13021
Bosch (Robert) GmbH	1370	15893
Huawei Technologies Company Ltd.	1278	4914
AT&T Inc	1225	14869
Brother Industries Ltd	1220	9314
Ford Motor Co.	1207	9189
Hon Hai Precision Industry Co. Ltd.	1196	17803
Amazon.com Inc.	1192	3523
Semiconductor Energy Laboratory Co. Ltd.	1168	9624
Honeywell International Inc.	1139	15291
Kyocera Corp.	1125	5578
Broadcom Corp.	1122	11092
Blackberry Ltd.	1120	7467
Sharp Corp	1084	15545
Johnson & Johnson	1071	12049

**Table 4 – Reference Distribution from IBM Patents 1997-2014**

References	Journal/Conference/Standard
4450	Misc ACM
2542	<conf> IEEE Int Electron Devices Meeting (IEDM)
2512	IEEE Unseparated
2042	IP.com
1898	APPLIED PHYSICS LETTERS
1852	<conf> Proceedings ACM SIGMOD Symp
1797	ACM SIGPLAN Notices
1756	IBM JOURNAL OF RESEARCH AND DEVELOPMENT
1519	<conf> Int Conf on Very Large Data Bases (VLDB)
1269	IEEE tr ELECTRON DEVICES
1176	Computer (IEEE)
1167	COMMUNICATIONS OF THE ACM
1155	<conf> IEEE/JPN Soc App Phys - symp on VLSI tech
1146	JOURNAL OF APPLIED PHYSICS
1122	<conf> USENIX Conference Proceedings
1089	<conf> ACM/IEEE Design Automation conf
1074	IBM SYSTEMS JOURNAL
1065	Proc SPIE
1046	IEEE JOURNAL OF SOLID-STATE CIRCUITS
964	IEEE tr COMPUTERS
932	<std> IETF Std
889	<conf> IEEE int conf on Data eng (ICDE)
882	IEEE ELECTRON DEVICE LETTERS
774	<conf> ACM/IEEE int symp on comp Architecture (ISCA)
754	<conf> IEEE int conf on Distributed comp sys
735	IEEE tr MAGNETICS
690	J Vac Sci tech
619	<conf> IEEE Int Conf Acous, Speech, and Sig Proc (ICASSP)
618	IEEE tr comp Aided Design of Integrated Circuits and sys
609	SCIENCE
608	ACM SIGOPS
605	IEEE tr Software eng
547	<conf> ACM Conference on Human Factors in Computing Systems (CHI)
516	<conf> IEEE Hawaii Int Conf on Sys Sci (HICSS)
513	IEEE tr KNOWLEDGE AND DATA ENGINEERING
493	Misc SPIE
479	<conf> IEEE/ACM Proceedings on Supercomputing (SUPERCOMP)
479	comp Architecture News
476	<conf> proc IEEE int Solid State Circuits Conf (ISSCC)
472	<conf> Proceedings ACM SIGPLAN Symp
463	ACM comp Surveys CSUR
460	IEEE tr INFORMATION THEORY
456	IEEE tr PARALLEL AND DISTRIBUTED SYSTEMS
448	<conf> IEEE int symp On High Performance comp Architecture (HPCA)
445	<conf> IEEE/ACM int conf on comp Aided Design (ICCAD)
439	PHYSICAL REVIEW LETTERS
435	<conf> IEEE Electronic Components and tech conf
429	ACM tr comp sys TOCS
425	<conf> Proceedings ACM SIGCOMM Symp
415	<conf> IEEE International Parallel and Distributed Processing Symposium

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 Fourteen 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 the leading companies.

As mentioned in the methodology section, we identified all patents in the fourteen 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) 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 fourteen technology areas separately, and the results are summarized in Figures 3-16. The first category shown (in Figure 3) is Broadcasting, which is a new category this year. This category consists of patents in the IPCs for Broadcast Communication and Pictorial Communication (Television). We identified all non-patent references on patents related to this technology issued between 1997 and 2015. 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 Broadcasting related patents than science from any other publisher. Thirty five percent 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 Society of Motion Pictures and Television Engineers (SMPTE) with just over 7% of the references.

Figures 4 and 5 are analogous to Figure 3 except they 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 6 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. When we first started covering this category in our 2005 report, the top publisher in this area was Lippincott Williams and Wilkins, (since acquired by Wolters Kluwer) which publishes more than 100 health and diagnostic related journals, including *Circulation*, *Neurosurgery*, *Investigative Radiology*, *Anesthesiology*, and *Annals of Surgery*. In recent years Lippincott had been surpassed by RELX, which has more than 400 journals in the field, such as *Annals of Thoracic Surgery*, and the *Journal of the American College of Cardiology*. In this report, we see that the RELX lead in references has further increased so that Lippincott/Wolters now has fewer than half as many references as RELX in the category.

The huge increase in references to RELX in this (and other) categories is due to several factors. First, the number of science references in the medical field is much higher for recent patents than for older patents, so a leading publisher in 2006 is likely to have a larger lead in 2015. Secondly, RELX has been rather acquisitive in recent years and continues to acquire other publishers. Finally, RELX has many journal titles, so that as ISI/Thomson has increased the number of journals it covers in its database, RELX has benefited the most. Moreover, 1790 has increased the number of journals identified outside of the ISI set, which also benefits RELX.

Figure 7 shows the results for the information storage category. In this area, IEEE is particularly dominant. 43.9% of all of the science references from patents in information storage are to papers in IEEE journals or conferences. IEEE's 70,448 references in this category are more than six times as many as second place AIP.

Figure 8 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 8. 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 9. This is another area that is slightly outside the IEEE core. IEEE still has a substantial 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 10 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. 33% of science references from patents in this category go to IEEE publications.

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 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 11 it looks like those innovations will build upon ideas published in IEEE journal articles or presented at IEEE conferences. We see in Figure 11 that 41% 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 9% of the science references. In this category, IEEE has more references than the next 15 publishers combined.

Figure 12 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 13, the IEEE provides the bulk of the science base with 63% of all patent references.

Solar and Photovoltaic energy results are contained in Figure 14. This category is led by RELX. 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 the strongest large category for IEEE. There are over four 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 this category in 2008, there were just over 118,000 references to IEEE and last year there were 352,000 references to IEEE papers. Now as we see in Figure 15, there are more than 406,000 references to IEEE for telecommunications patents from 1997-2015. Thus, just one more year of patents added more than 54,000 references to IEEE papers.

Standards documents are referenced increasingly often in Telecommunications patents. Four of the top 11 (5 of the top 16) referenced publishers are standards bodies. Moreover, of the 406,000 references to IEEE, over 20,000 are to various IEEE standards (mostly to the IEEE 802 family of standards).

Another recent category is shown in Figure 16. This chart shows that 40% of all science references from Wind Energy patents go to IEEE journal and conference papers.

Figures 3-16 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 fourteen 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 17 contains the Citation Index for the patents in the fourteen 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 21% to 96% more than expected, while the patents that do not reference IEEE are cited up to 15% less often than expected. 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 1997 and 2015 to the 40 organizations with the largest number of US patents granted in 2015. The second patent set consisted of all US patents granted between 1997 and 2015 patents in fourteen key technologies: broadcasting, computer hardware, software, robotics, semiconductors, solar energy, wind energy, measuring and testing, medical devices, telecommunications, optics, power systems, and information storage. 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

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# Figure 1 – Front Page of Patent # 5,591,372

United States Patent  
Venkataramani, et al.

5,591,372  
January 7, 1997

Piezoelectric composite with anisotropic 3-3 connectivity

## Abstract

A piezoelectric or electrostrictive composite exhibiting anisotropic 3-3 connectivity with a dense ceramic phase and an infiltrate polymer phase. The ceramic phase is an interconnected ceramic lamelli structure that is arranged substantially parallel in one direction. The ceramic lamelli have greater connectivity in the z direction than in the x and y directions, while the connectivity in the x and y directions are essentially equal.

Inventors: **Venkataramani; Venkat S.** (Clifton Park, NY); **Smith; Lowell S.** (Niskayuna, NY)

Assignee: **Generla Electric Company** (Schenectady, NY)

Appl. No.: **531840**

Filed: **September 22, 1995**

**Current U.S. Class:** 252/62.9R; 252/62.9PZ; 501/32; 501/95.2; 501/136; 501/137;  
501/139

**Intern'l Class:** C04B 035/00

**Field of Search:** 252/62.9 R,62.9 PZ 428/260,272,289,290 501/32,134,136,137,95  
264/28

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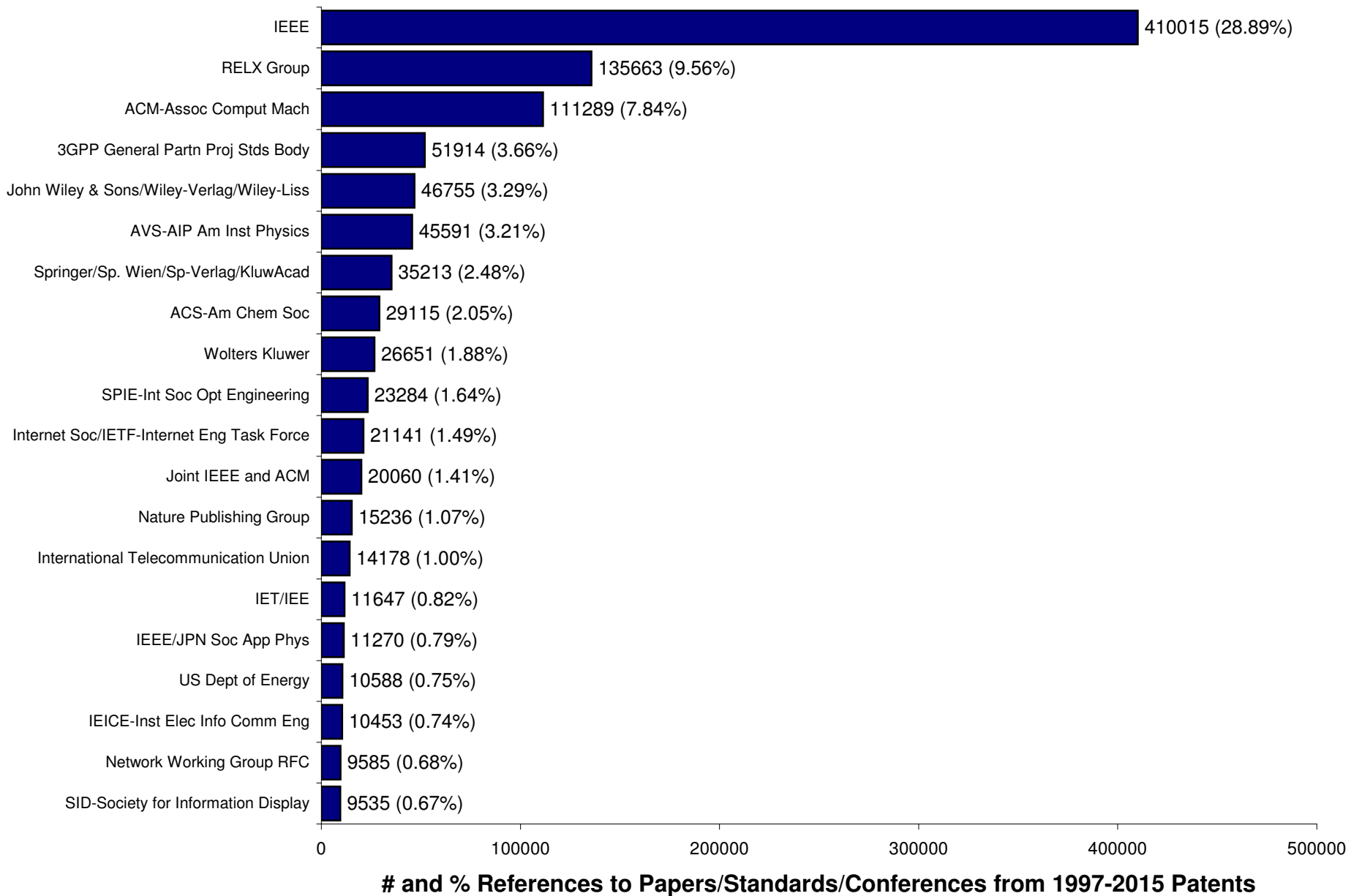
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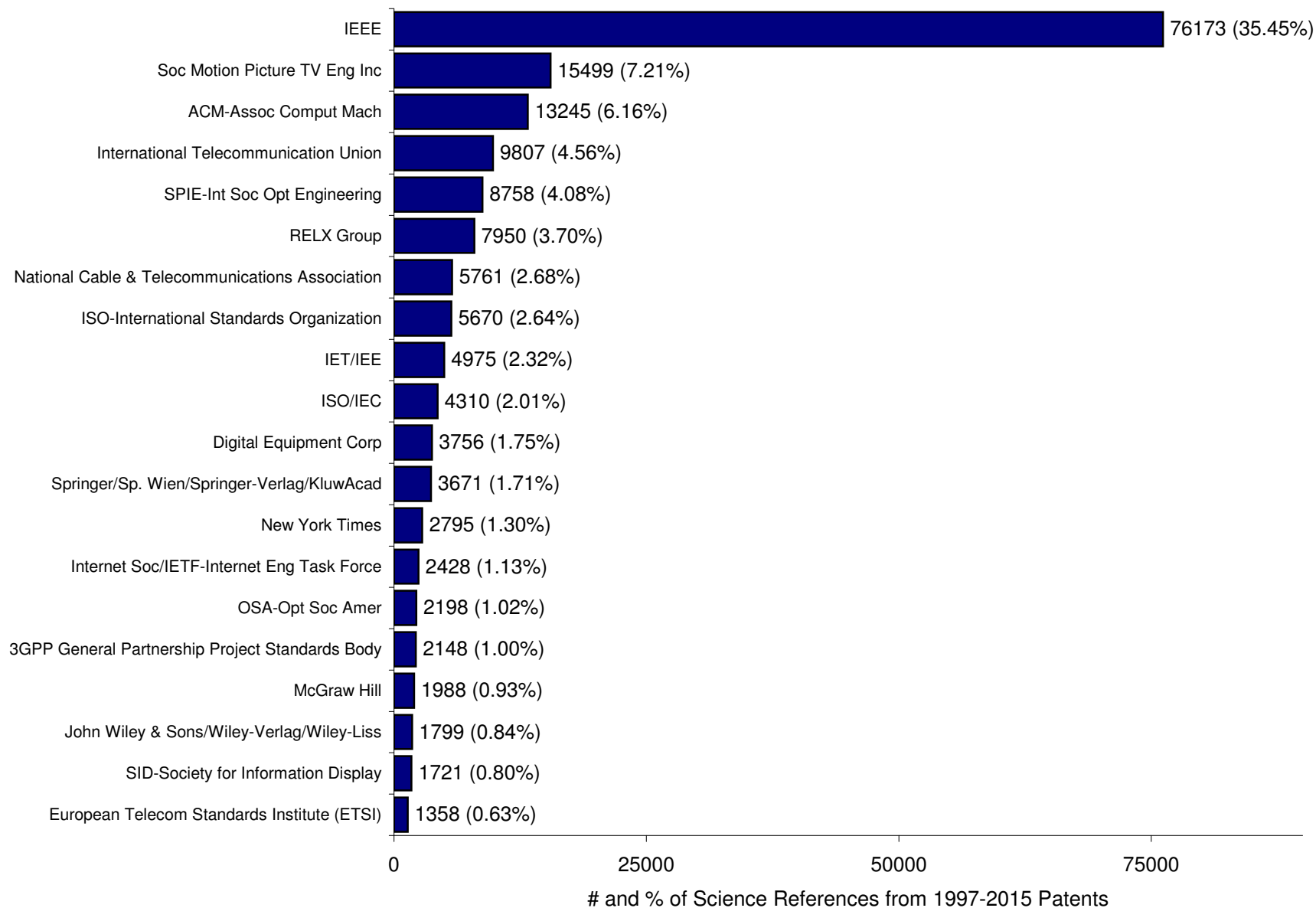
*Primary Examiner:* Bonner; Melissa

*Attorney, Agent or Firm:* Johnson; Noreen C., Pittman; William H.

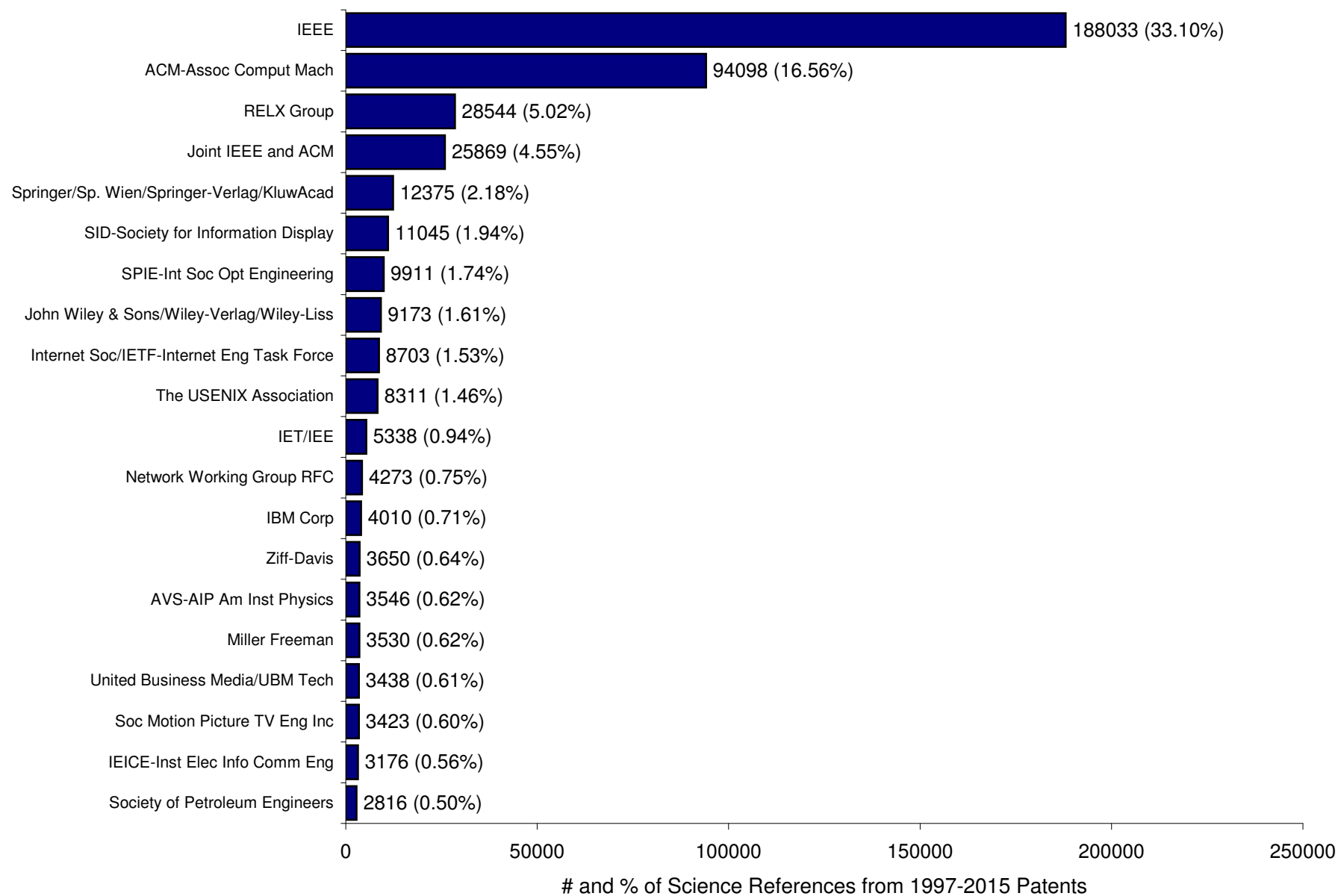
**Figure 2 - # and % of Patent References from Top 40 Companies to Top 20 Journal Publishers**



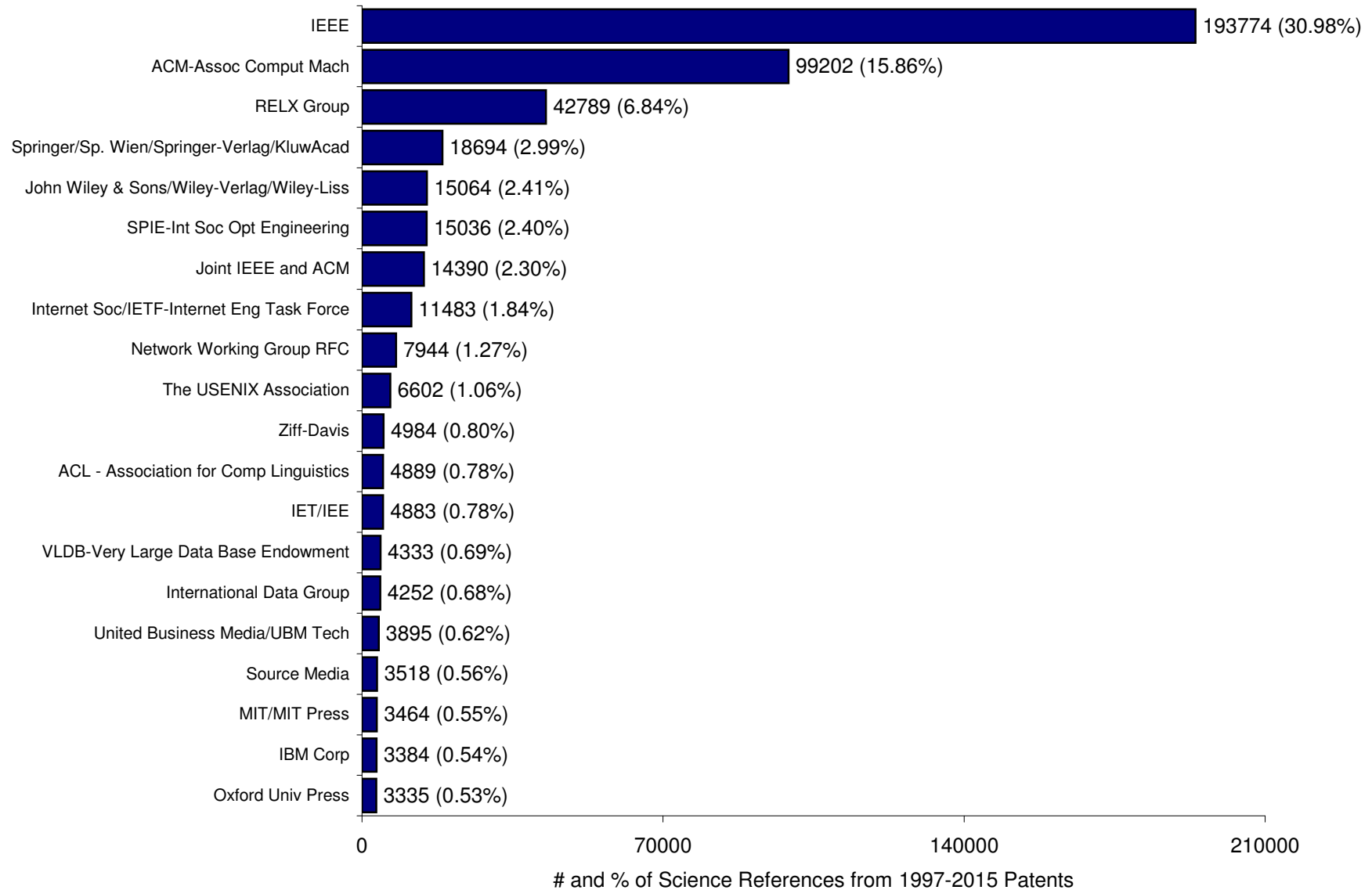
### Figure 3: # and % of Science References from 1997-2015 Broadcasting Patents to Top 20 Publishers, Conference Organizers, and Standards Organizations



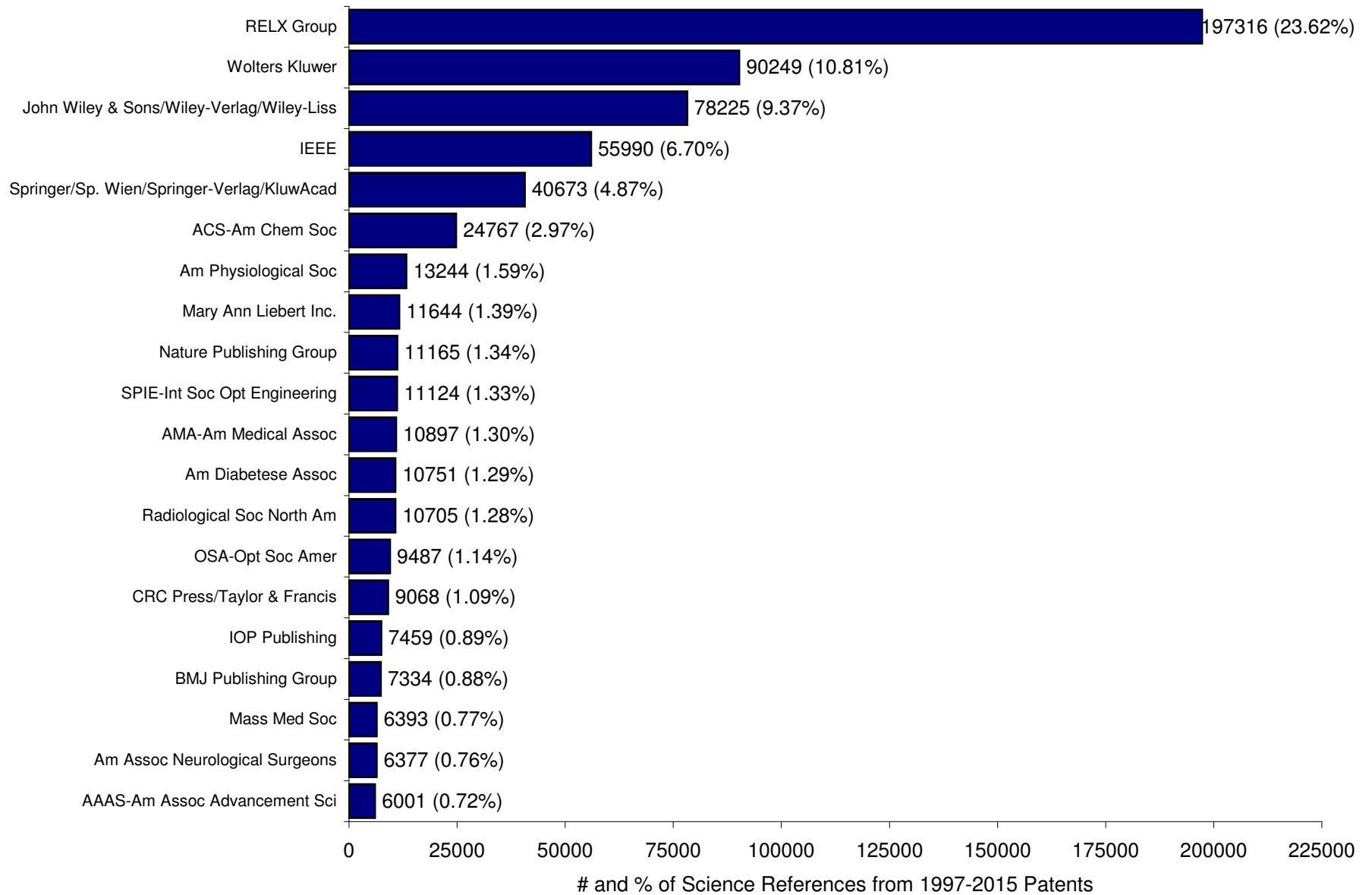
# Figure 4 - # and % of Science References from 1997-2015 Computer Hardware Patents to Top 20 Publishers and Conference Organizers



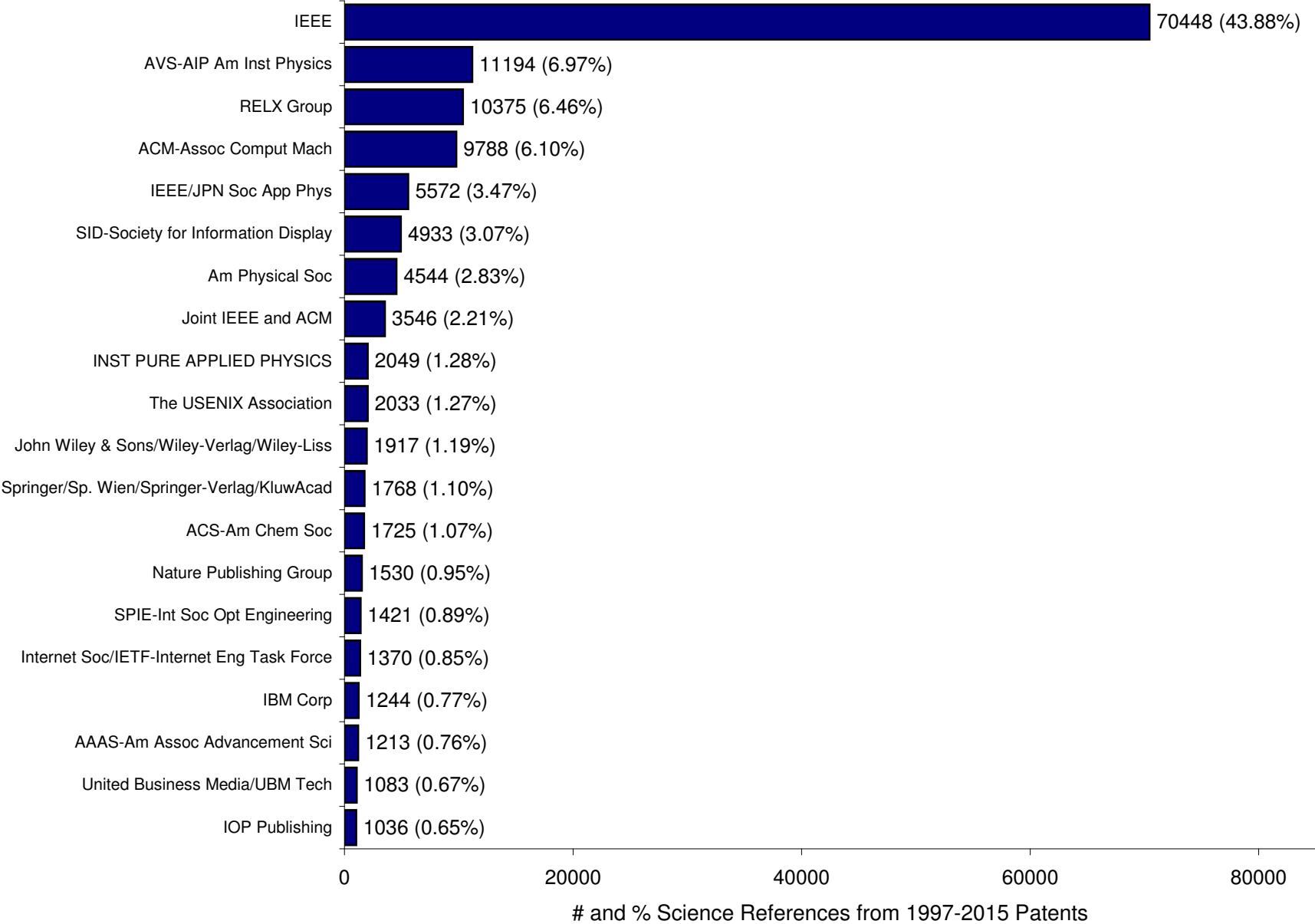
# Figure 5 - # and % of Science References from 1997-2015 Computer Software Patents to Top 20 Publishers, Conference Organizers, and Standards Organizations



# Figure 6 - # and % of Science References from 1997-2015 Medical Device Patents to Top 20 Publishers and Conference Organizers

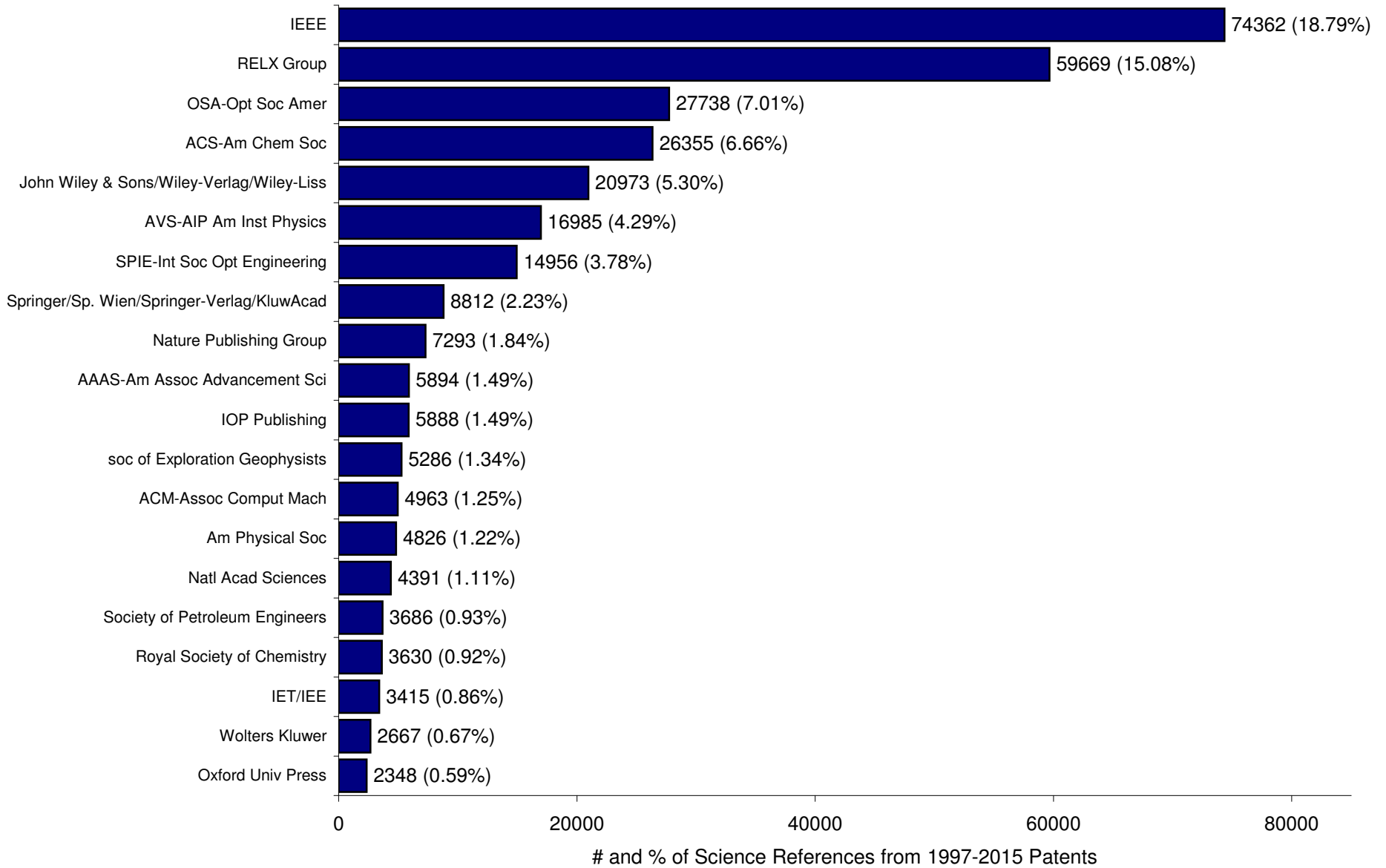


# Figure 7 - # and % of Science References from 1997-2015 Information Storage Patents to Top 20 Publishers and Conference Organizers

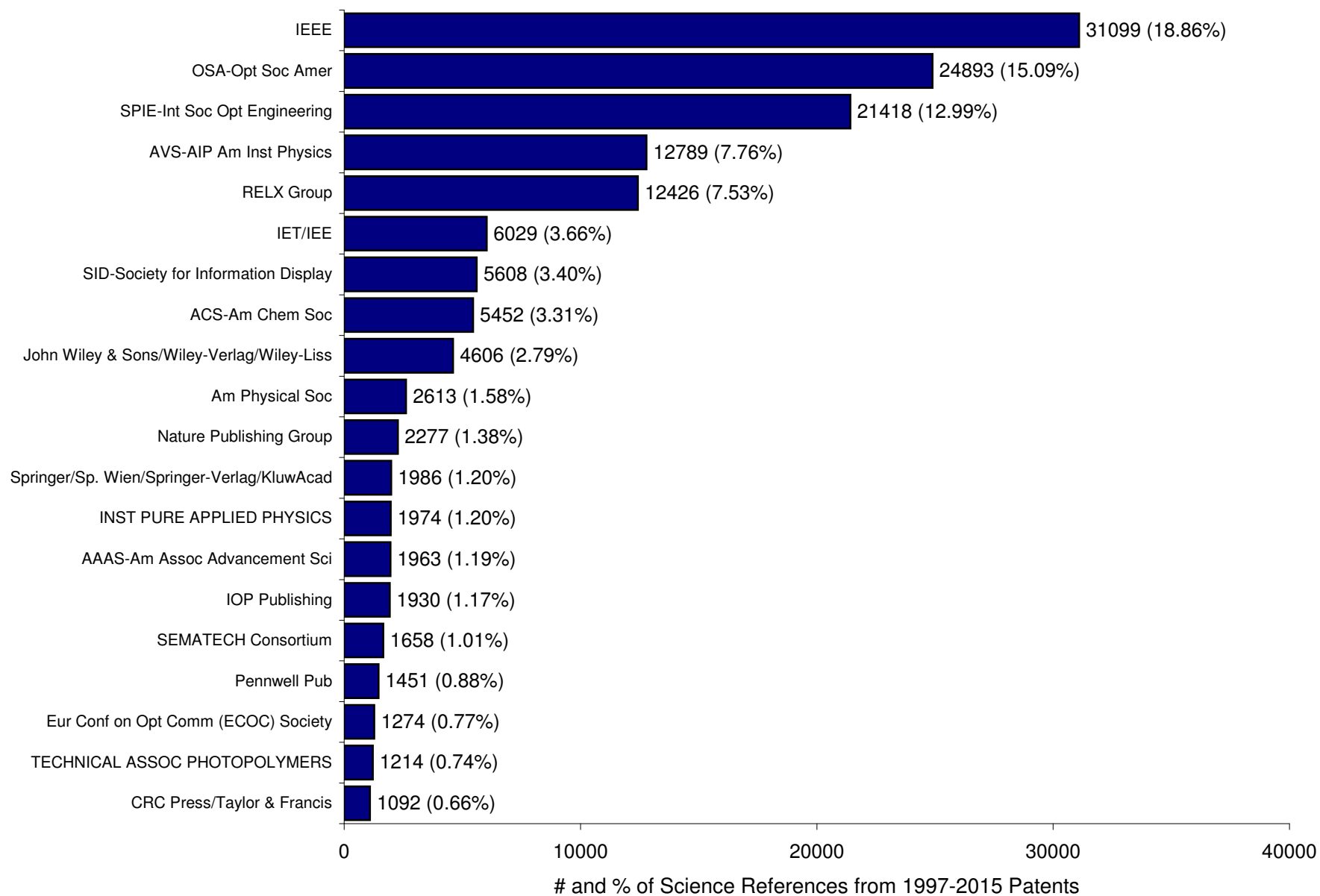




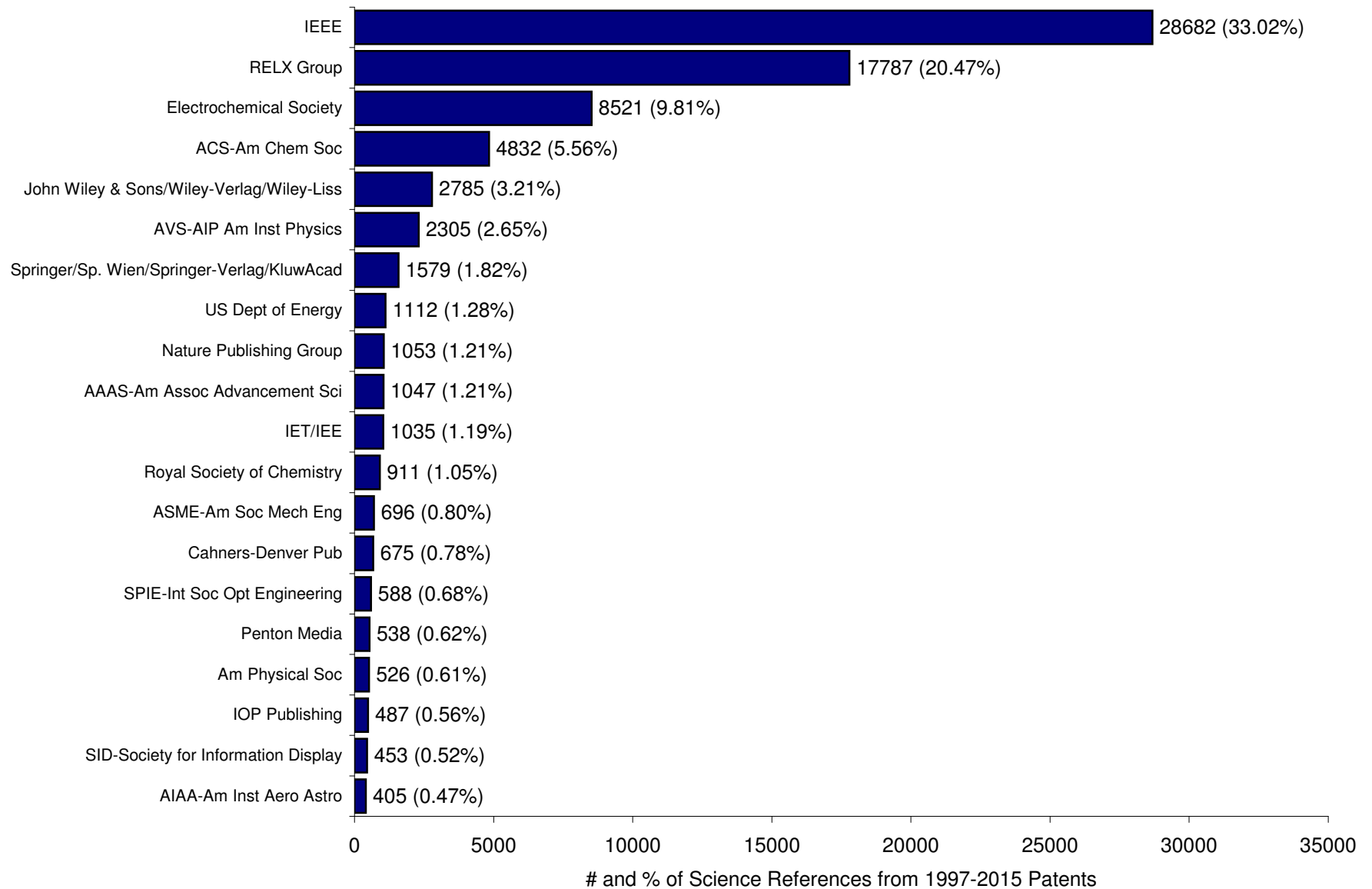
# Figure 8 - # and % of Science References from 1997-2015 Measuring/Testing/Control Patents to Top 20 Publishers and Conference Organizers



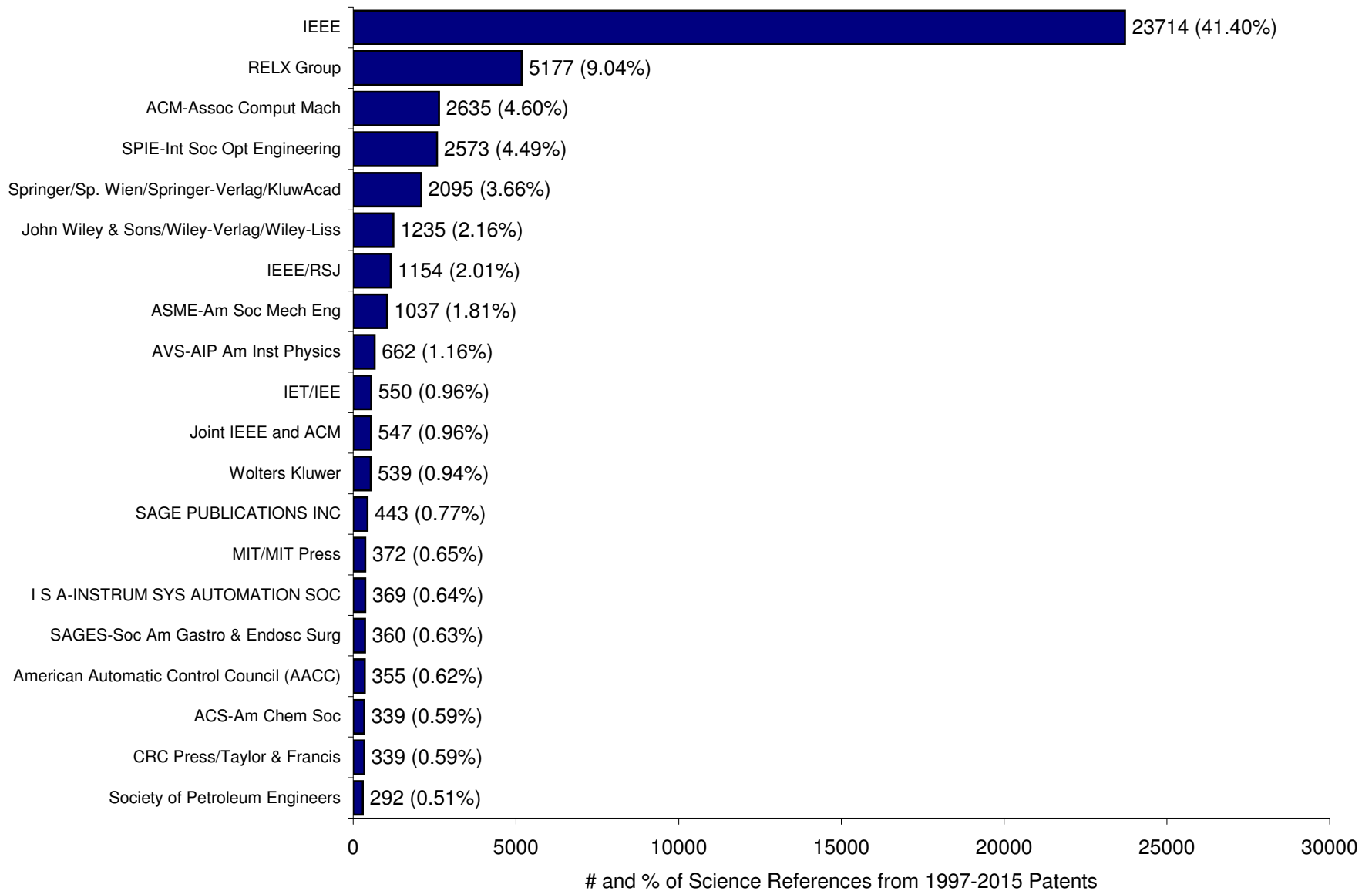
# Figure 9 - # and % of Science References from 1997-2015 Optics Patents to Top 20 Publishers and Conference Organizers



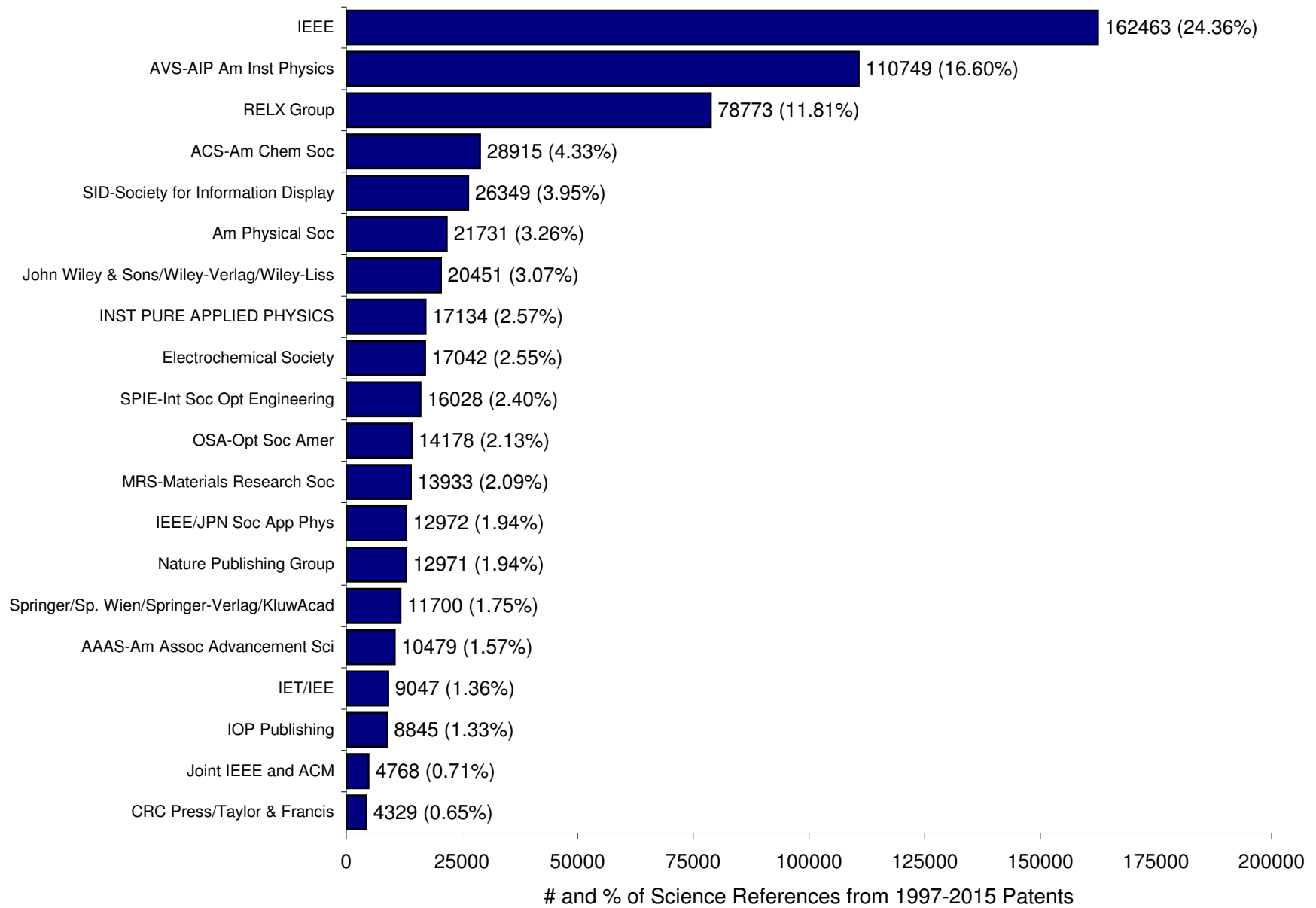
# Figure 10 - # and % of Science References from 1997-2015 Power Systems Patents to Top 20 Publishers and Conference Organizers



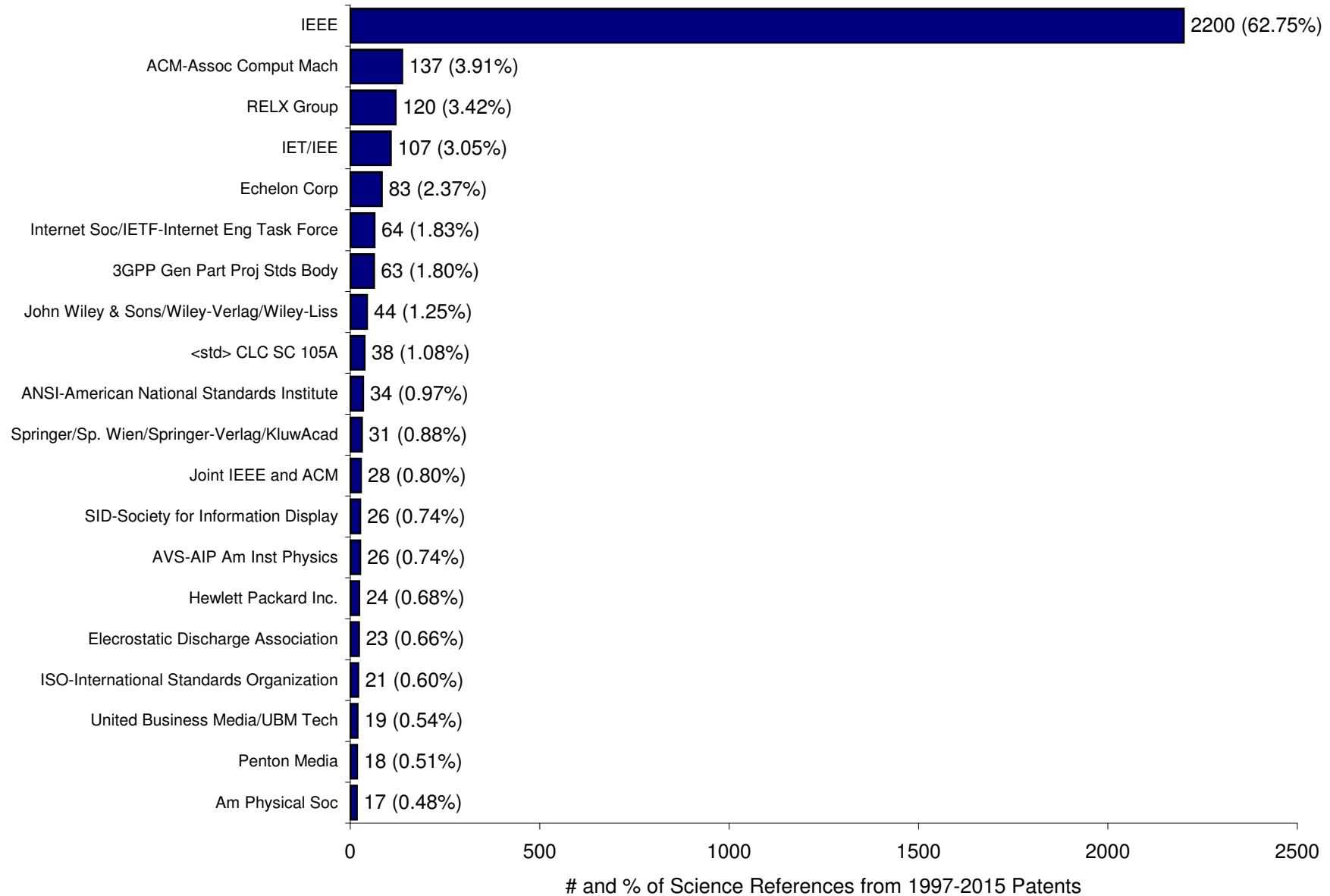
# Figure 11 - # and % of Science References from 1997-2015 Robotics and Intelligent Mfg Patents to Top 20 Publishers and Conference Organizers



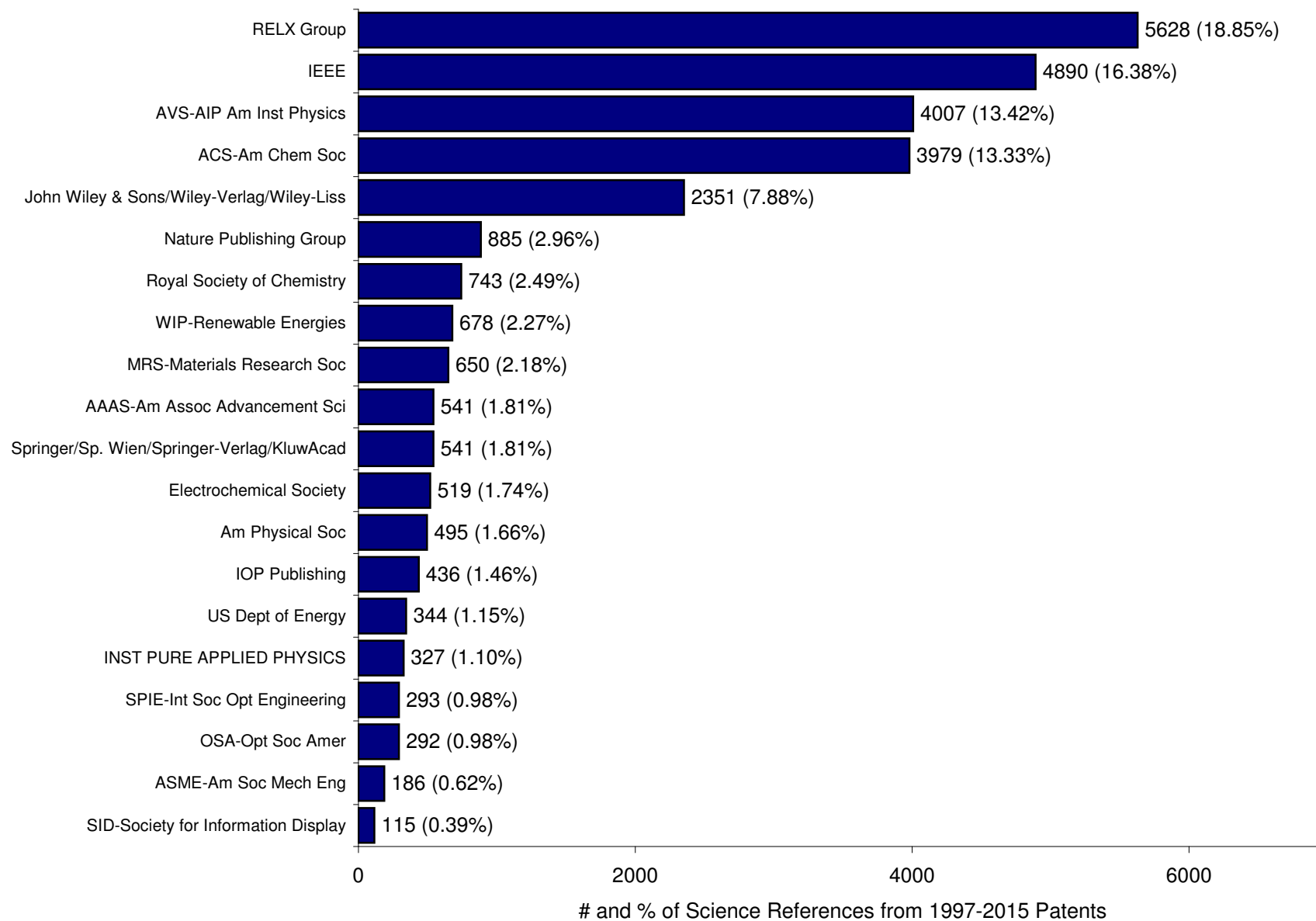
# Figure 12 - # and % of Science References from 1997-2015 Semiconductor Patents to Top 20 Publishers and Conference Organizers



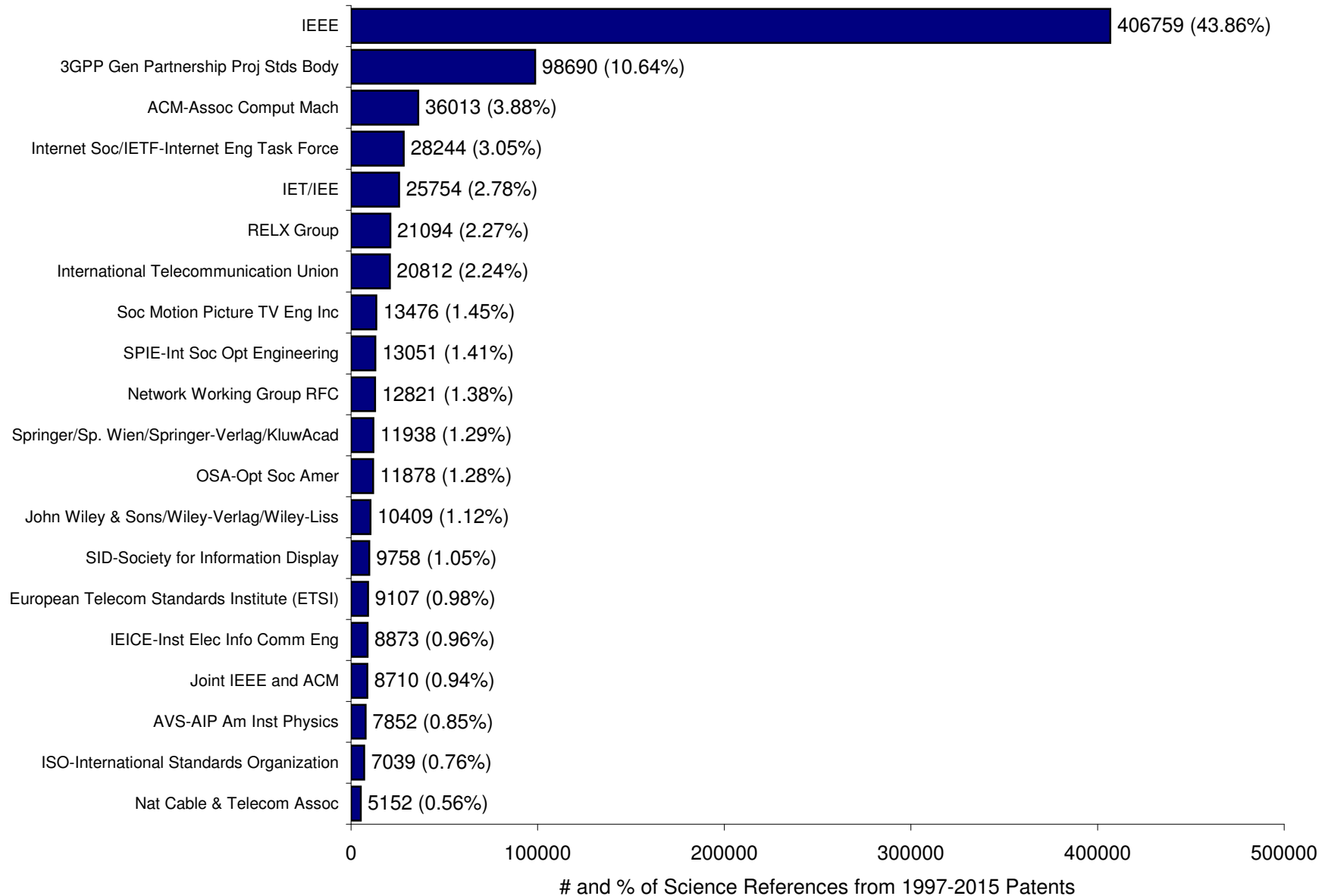
**Figure 13 - # and % of Science References from 1997-2015 Smart Meter/Smart Grid Patents to Top 20 Publishers, Conference Organizers, and Standards Organizations**



# Figure 14 - # and % of Science References from 1997-2015 Solar/Photovoltaic Patents to Top 20 Publishers, Conference Organizers, and Standards Organizations

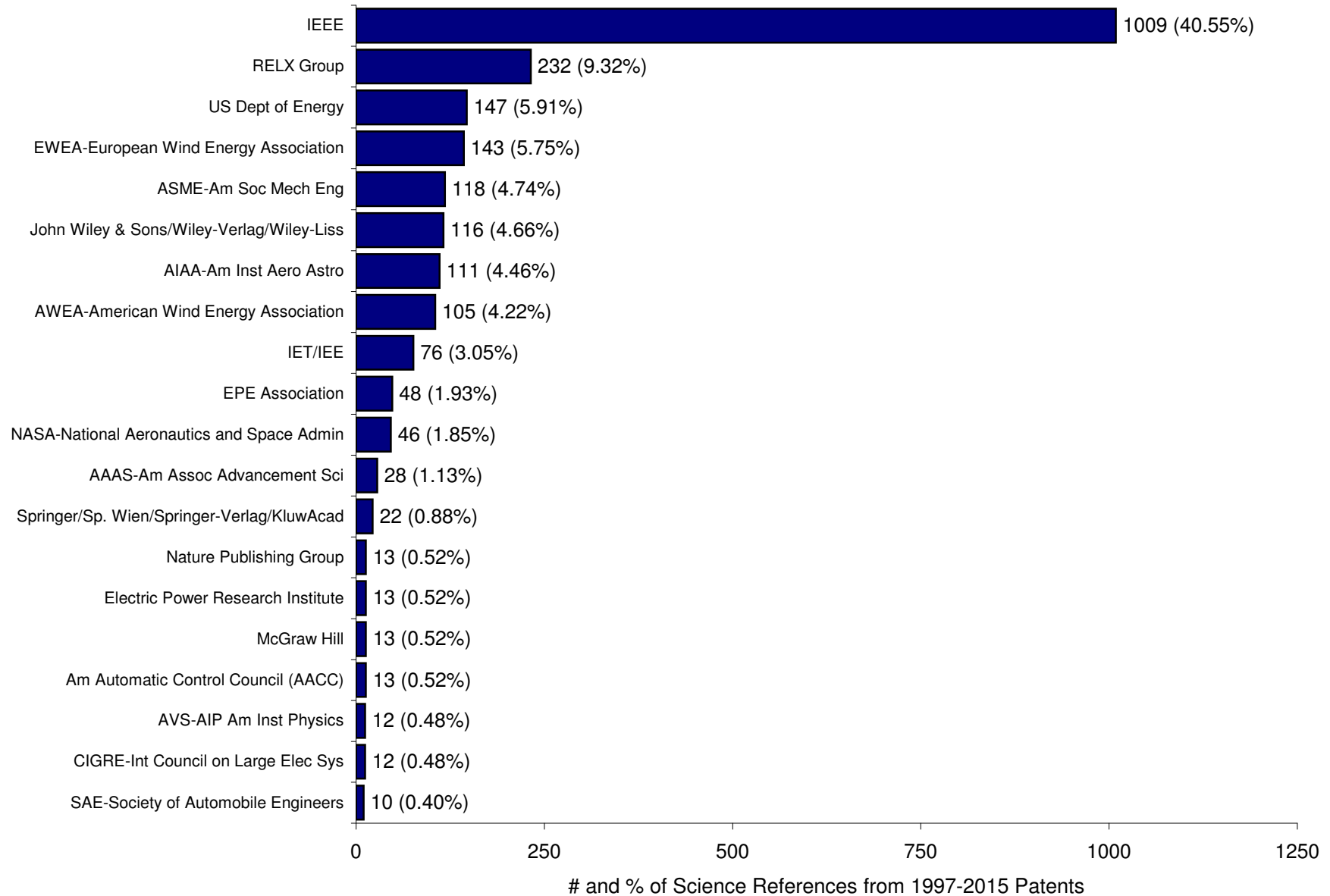


# Figure 15 - # and % of Science References from 1997-2015 Telecommunications Patents to Top 20 Publishers, Conference Organizers, and Standards Organizations

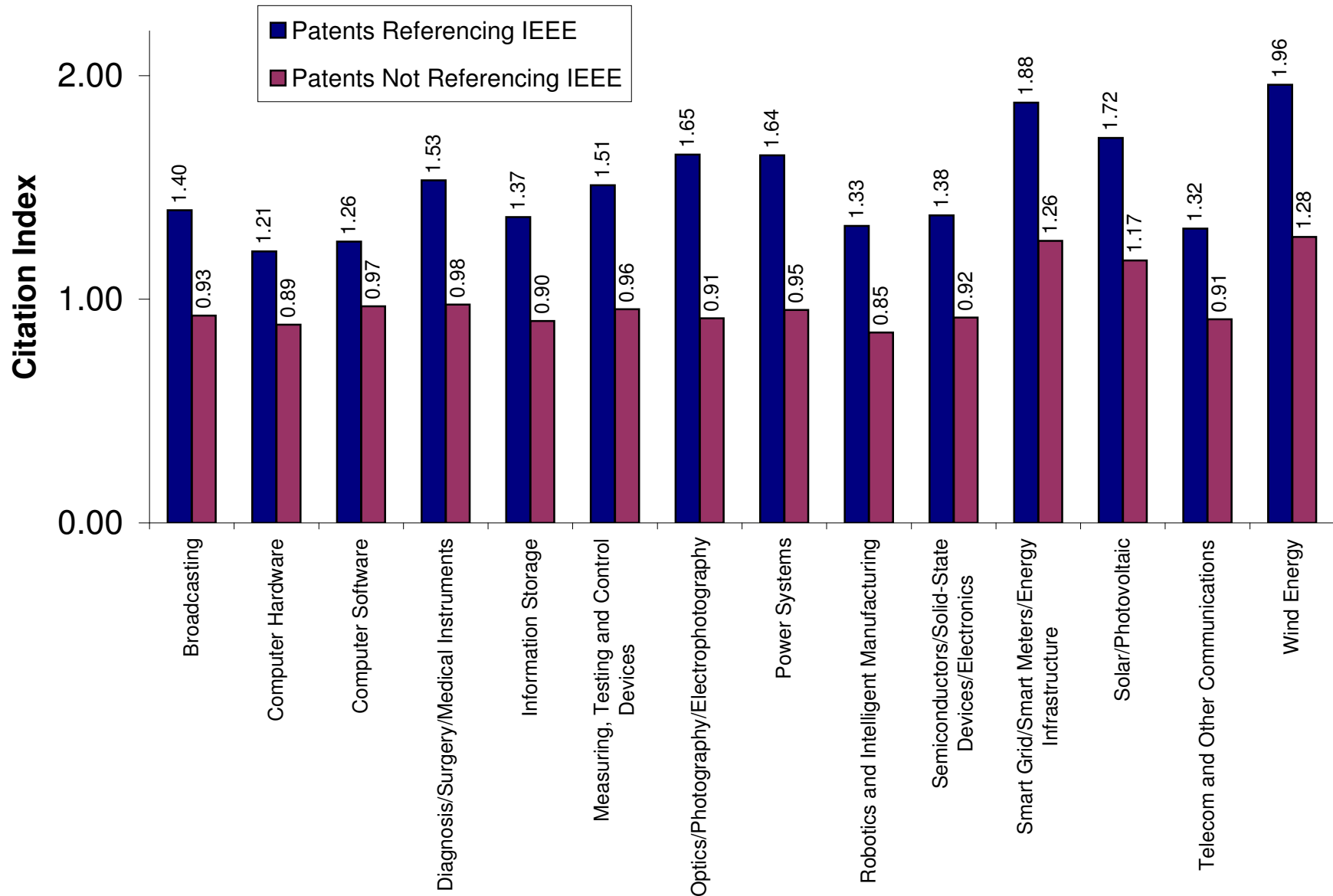




# Figure 16 - # and % of Science References from 1997-2015 Wind Energy Patents to Top 20 Publishers, Conference Organizers, and Standards Organizations



**Figure 17 - 1997-2015 Citation Index of Patents Referencing IEEE Papers and Conferences Versus Patents not Referencing IEEE for 16 Categories**



## 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	44898	137495	32.7	IEEE	44898	32.7	ACM-Assoc Comput Mach	38054	27.7
2	International Business Machin	41396	116426	35.6	IEEE	41396	35.6	ACM-Assoc Comput Mach	21832	18.8
3	Micron Technology Inc.	39681	118295	33.5	IEEE	39681	33.5	RELX Group	20109	17.0
4	Qualcomm Inc	26764	60047	44.6	IEEE	26764	44.6	3GPP General Partnership Project Standards Body	11288	18.8
5	Avago Technologies Ltd	26208	42250	62.0	IEEE	26208	62.0	International Telecommunication Union	1242	2.9
6	Intel Corporation	25193	51423	49.0	IEEE	25193	49.0	ACM-Assoc Comput Mach	4593	8.9
7	Nokia Corp	18037	44241	40.8	IEEE	18037	40.8	3GPP General Partnership Project Standards Body	5860	13.2
8	Apple Inc	15161	39736	38.2	IEEE	15161	38.2	ACM-Assoc Comput Mach	8341	21.0
9	Marvell Technology Group Lt	14206	18994	74.8	IEEE	14206	74.8	3GPP General Partnership Project Standards Body	2918	15.4
10	Texas Instruments Inc	11081	17649	62.8	IEEE	11081	62.8	AVS-AIP Am Inst Physics	764	4.3
11	ParkerVision Inc	11023	21753	50.7	IEEE	11023	50.7	IET/IEEE	5283	24.3
12	Oracle Corporation	10780	38029	28.3	ACM-Assoc Comput Mach	12033	31.6	IEEE	10780	28.3
13	Ericsson	10705	26238	40.8	IEEE	10705	40.8	3GPP General Partnership Project Standards Body	6544	24.9
14	Sony Corp	10236	22228	46.1	IEEE	10236	46.1	ACM-Assoc Comput Mach	1929	8.7
15	Samsung Electronics Co Ltd	10107	24274	41.6	IEEE	10107	41.6	3GPP General Partnership Project Standards Body	1941	8.0
16	Google Inc.	9726	32157	30.2	IEEE	9726	30.2	ACM-Assoc Comput Mach	8261	25.7
17	InterDigital Inc	9180	30044	30.6	3GPP General Partnership Project Standards Bo	16644	55.4	IEEE	9180	30.6
18	Semiconductor Energy Labora	9148	112012	8.2	SID-Society for Information Display	37027	33.1	AVS-AIP Am Inst Physics	16245	14.5
19	Panasonic Corporation	9146	27558	33.2	IEEE	9146	33.2	3GPP General Partnership Project Standards Body	3238	11.7
20	Fujitsu Limited	9034	21761	41.5	IEEE	9034	41.5	3GPP General Partnership Project Standards Body	1668	7.7
21	Hewlett-Packard Co	8592	27367	31.4	IEEE	8592	31.4	ACM-Assoc Comput Mach	4050	14.8
22	Personalized Media Communi	8534	50455	16.9	Soc Motion Picture TV Eng Inc	15691	31.1	IEEE	8534	16.9
23	Cisco Systems Inc.	8347	27115	30.8	IEEE	8347	30.8	Internet Soc/IETF-Internet Eng Task Force	5234	19.3
24	Medtronic Inc	8329	103611	8.0	RELX Group	20280	19.6	Lippincott Williams & Wilkins	15760	15.2
25	AT&T Inc	8102	19472	41.6	IEEE	8102	41.6	ACM-Assoc Comput Mach	2016	10.4
26	Massachusetts Institute of Tec	7821	28938	27.0	IEEE	7821	27.0	RELX Group	3461	12.0
27	Toshiba Corp	7763	19085	40.7	IEEE	7763	40.7	AVS-AIP Am Inst Physics	1327	7.0
28	NEC Corp	7421	18180	40.8	IEEE	7421	40.8	3GPP General Partnership Project Standards Body	1717	9.4
29	Siemens Aktiengesellschaft	7414	19714	37.6	IEEE	7414	37.6	RELX Group	2006	10.2
30	MONOLITHIC 3D INC	7089	12772	55.5	IEEE	7089	55.5	IEEE/JPN Soc App Phys	1397	10.9
31	SanDisk Corp.	7011	12784	54.8	IEEE	7011	54.8	IEEE/JPN Soc App Phys	921	7.2
32	LG Electronics Inc.	6670	26803	24.9	3GPP General Partnership Project Standards Bo	11671	43.5	IEEE	6670	24.9
33	Macronix International Co. Lt	6655	12066	55.2	IEEE	6655	55.2	IEEE/JPN Soc App Phys	2043	16.9
34	Partners HealthCare Systems I	6403	72290	8.9	OSA-Opt Soc Amer	25311	35.0	RELX Group	10836	15.0
35	Taiwan Semiconductor Manuf	6292	17222	36.5	IEEE	6292	36.5	AVS-AIP Am Inst Physics	4386	25.5
36	STMicroelectronics	6230	10382	60.0	IEEE	6230	60.0	RELX Group	802	7.7
37	Motorola Solutions Inc.	6037	11930	50.6	IEEE	6037	50.6	AVS-AIP Am Inst Physics	1055	8.8
38	Conversant Intellectual Proper	5910	9221	64.1	IEEE	5910	64.1	IEEE/JPN Soc App Phys	226	2.5
39	Rambus Inc.	5877	8998	65.3	IEEE	5877	65.3	JEDEC Semiconductor Standards Organization	414	4.6
40	NXP Semiconductors NV	5796	9958	58.2	IEEE	5796	58.2	AVS-AIP Am Inst Physics	800	8.0

## 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
41	Koninklijke Philips N.V.	5776	21844	26.4	IEEE	5776	26.4	RELX Group	2220	10.2
42	Cadence Design Systems Inc	5734	13328	43.0	IEEE	5734	43.0	Joint IEEE and ACM	4240	31.8
43	Honeywell International Inc.	5381	14419	37.3	IEEE	5381	37.3	RELX Group	1496	10.4
44	Rockstar Consortium (Nortel	5356	10174	52.6	IEEE	5356	52.6	OSA-Opt Soc Amer	739	7.3
45	Hitachi Ltd	5238	17195	30.5	IEEE	5238	30.5	ACM-Assoc Comput Mach	1089	6.3
46	Tessera Technologies Inc.	5222	9402	55.5	IEEE	5222	55.5	RELX Group	779	8.3
47	Mitsubishi Electric Corp	5217	10913	47.8	IEEE	5217	47.8	ACM-Assoc Comput Mach	809	7.4
48	Blackberry Ltd.	5065	18111	28.0	3GPP General Partnership Project Standards Bo	6541	36.1	IEEE	5065	28.0
49	Ricoh Co. Ltd.	4956	11036	44.9	IEEE	4956	44.9	ACM-Assoc Comput Mach	1723	15.6
50	University of California	4922	36256	13.6	RELX Group	5056	13.9	IEEE	4922	13.6
51	Tela Innovations inc	4904	16338	30.0	SPIE-Int Soc Opt Engineering	5812	35.6	IEEE	4904	30.0
52	Infineon Technologies AG	4765	8608	55.4	IEEE	4765	55.4	AVS-AIP Am Inst Physics	715	8.3
53	Advanced Micro Devices Inc	4735	10534	44.9	IEEE	4735	44.9	ACM-Assoc Comput Mach	734	7.0
54	Nippon Telegraph & Telephon	4734	13287	35.6	IEEE	4734	35.6	3GPP General Partnership Project Standards Body	2945	22.2
55	General Electric Company	4709	21576	21.8	IEEE	4709	21.8	US Dept of Energy	3109	14.4
56	Synopsys Inc.	4657	13961	33.4	IEEE	4657	33.4	SPIE-Int Soc Opt Engineering	3140	22.5
57	Irobot Corp	4646	8457	54.9	IEEE	4646	54.9	SPIE-Int Soc Opt Engineering	1450	17.1
58	Raytheon Co.	4535	9537	47.6	IEEE	4535	47.6	SPIE-Int Soc Opt Engineering	527	5.5
59	Canon Inc	4486	16433	27.3	IEEE	4486	27.3	AVS-AIP Am Inst Physics	1836	11.2
60	Xerox Corp	4403	16623	26.5	IEEE	4403	26.5	ACM-Assoc Comput Mach	2707	16.3
61	Immersion Corp.	4387	11384	38.5	IEEE	4387	38.5	ACM-Assoc Comput Mach	1206	10.6
62	Cypress Semiconductor Corp.	4382	6428	68.2	IEEE	4382	68.2	Joint IEEE and ACM	430	6.7
63	Adaptix	4290	6339	67.7	IEEE	4290	67.7	European Telecom Standards Institute (ETSI)	730	11.5
64	Digimarc Corp.	4093	10217	40.1	IEEE	4093	40.1	SPIE-Int Soc Opt Engineering	1230	12.0
65	Fractus SA	4082	7069	57.7	IEEE	4082	57.7	IET/IEE	1000	14.1
66	Applied Materials Inc.	3983	16353	24.4	IEEE	3983	24.4	AVS-AIP Am Inst Physics	3022	18.5
67	Electronics and Telecommunic	3953	7183	55.0	IEEE	3953	55.0	3GPP General Partnership Project Standards Body	502	7.0
68	California Institute of Technol	3913	20846	18.8	IEEE	3913	18.8	RELX Group	3234	15.5
69	Verizon Communications Inc	3885	11213	34.6	IEEE	3885	34.6	Internet Soc/IETF-Internet Eng Task Force	1688	15.1
70	Sharp Corp	3848	15048	25.6	IEEE	3848	25.6	3GPP General Partnership Project Standards Body	2329	15.5
71	Xilinx Inc.	3643	5253	69.4	IEEE	3643	69.4	Joint IEEE and ACM	552	10.5
72	Huawei Technologies Compan	3565	14769	24.1	3GPP General Partnership Project Standards Bo	5296	35.9	IEEE	3565	24.1
73	Columbia University	3482	13819	25.2	IEEE	3482	25.2	AVS-AIP Am Inst Physics	1448	10.5
74	Cree Inc.	3465	9930	34.9	IEEE	3465	34.9	AVS-AIP Am Inst Physics	2143	21.6
75	Adobe Systems Inc.	3384	9066	37.3	IEEE	3384	37.3	ACM-Assoc Comput Mach	3069	33.9
76	Murata Manufacturing Co. Lt	3336	4771	69.9	IEEE	3336	69.9	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	180	3.8
77	Dexcom Inc	3292	57614	5.7	RELX Group	16482	28.6	Am Diabetese Assoc	6032	10.5
78	University of Minnesota (The	3291	6482	50.8	IEEE	3291	50.8	RELX Group	654	10.1
79	HRL Laboratories LLC	3261	6284	51.9	IEEE	3261	51.9	AVS-AIP Am Inst Physics	411	6.5
80	Boston Scientific Corp.	3155	62320	5.1	RELX Group	21381	34.3	Lippincott Williams & Wilkins	5840	9.4

## 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	Mentor Graphics Corp.	3046	5251	58.0	IEEE	3046	58.0	Joint IEEE and ACM	820	15.6
82	Innovative Network Corporati	3017	4984	60.5	IEEE	3017	60.5	IEEE/JPN Soc App Phys	418	8.4
83	Industrial Technology Research	3012	5635	53.5	IEEE	3012	53.5	RELX Group	420	7.5
84	Chipbond Technology Corp	2941	3552	82.8	IEEE	2941	82.8	RELX Group	272	7.7
85	The Invention Science Fund I	2941	19348	15.2	IEEE	2941	15.2	RELX Group	2012	10.4
86	Cirrus Logic Inc.	2928	3670	79.8	IEEE	2928	79.8	Audio Eng Soc	101	2.8
87	Sap SE	2926	12589	23.2	ACM-Assoc Comput Mach	4474	35.5	IEEE	2926	23.2
88	University of Illinois	2916	25619	11.4	AVS-AIP Am Inst Physics	4071	15.9	ACS-Am Chem Soc	3617	14.1
89	Lockheed Martin Corp.	2909	10901	26.7	IEEE	2909	26.7	RELX Group	1048	9.6
90	Tabula Inc	2900	7622	38.0	IEEE	2900	38.0	ACM-Assoc Comput Mach	2899	38.0
91	Western Digital Corp.	2810	5575	50.4	IEEE	2810	50.4	AVS-AIP Am Inst Physics	950	17.0
92	Seagate Technology Plc	2756	6598	41.8	IEEE	2756	41.8	AVS-AIP Am Inst Physics	1242	18.8
93	MicroUnity Systems Engineeri	2672	4274	62.5	IEEE	2672	62.5	Joint IEEE and ACM	388	9.1
94	Seiko Epson Corporation	2660	7438	35.8	IEEE	2660	35.8	ACM-Assoc Comput Mach	640	8.6
95	Abbott Laboratories	2624	70838	3.7	RELX Group	21443	30.3	ACS-Am Chem Soc	11366	16.0
96	Technicolor SA	2576	5547	46.4	IEEE	2576	46.4	ISO-International Standards Organization	347	6.3
97	Thermo Fisher Scientific Inc	2519	16228	15.5	RELX Group	5599	34.5	IEEE	2519	15.5
98	ABB Ltd	2478	4027	61.5	IEEE	2478	61.5	IVI Foundation/SCPI Consortium	202	5.0
99	Analog Devices Inc.	2463	3371	73.1	IEEE	2463	73.1	RELX Group	121	3.6
100	Harris Corp.	2382	4329	55.0	IEEE	2382	55.0	Internet Soc/IETF-Internet Eng Task Force	317	7.3
101	Amberwave Inc	2365	6797	34.8	IEEE	2365	34.8	AVS-AIP Am Inst Physics	1788	26.3
102	Boeing Co. (The)	2352	7651	30.7	IEEE	2352	30.7	AIAA-Am Inst Aero Astro	861	11.3
103	Fraunhofer Gesellschaft	2308	5138	44.9	IEEE	2308	44.9	RELX Group	368	7.2
104	Silicon Laboratories Inc	2288	2902	78.8	IEEE	2288	78.8	Cahners-Denver Pub	122	4.2
105	Finisar Corp	2242	5059	44.3	IEEE	2242	44.3	IET/IEE	740	14.6
106	DIRECTV Group Inc. (The)	2163	3335	64.9	IEEE	2163	64.9	Elettronica e Telecomunicazioni	161	4.8
107	Intuitive Surgical Inc.	2145	4632	46.3	IEEE	2145	46.3	SAGES-Society of American Gastrointestinal and Endoscopic Su	491	10.6
108	Microsemi Corp	2094	3152	66.4	IEEE	2094	66.4	Cahners-Denver Pub	113	3.6
109	Fairchild Semiconductor Inter	2065	2744	75.3	IEEE	2065	75.3	RELX Group	228	8.3
110	Stanford University	2034	16356	12.4	RELX Group	2082	12.7	IEEE	2034	12.4
111	Innovative Silicon SA	2033	2515	80.8	IEEE	2033	80.8	RELX Group	108	4.3
112	TE Connectivity Ltd	2027	3446	58.8	IEEE	2027	58.8	IET/IEE	149	4.3
113	United States Navy	2007	7037	28.5	IEEE	2007	28.5	RELX Group	823	11.7
114	INDIVIDUAL PATENTER	1999	12965	15.4	IEEE	1999	15.4	RELX Group	1796	13.9
115	PACT XPP TECHNOLOGIE	1958	3441	56.9	IEEE	1958	56.9	ACM-Assoc Comput Mach	334	9.7
116	EMC Corp.	1949	7838	24.9	ACM-Assoc Comput Mach	2600	33.2	IEEE	1949	24.9
117	BT Group PLC	1948	4205	46.3	IEEE	1948	46.3	ACM-Assoc Comput Mach	302	7.2
118	Georgia Institute of Technolog	1948	4981	39.1	IEEE	1948	39.1	RELX Group	488	9.8
119	NVIDIA Corp.	1940	5079	38.2	IEEE	1940	38.2	ACM-Assoc Comput Mach	1458	28.7
120	Commvault Systems Inc.	1884	2715	69.4	IEEE	1884	69.4	ACM-Assoc Comput Mach	416	15.3

## 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
121	Qorvo	1884	2528	74.5	IEEE	1884	74.5	AVS-AIP Am Inst Physics	122	4.8
122	Pelican Imaging Corporation	1882	4080	46.1	IEEE	1882	46.1	SPIE-Int Soc Opt Engineering	800	19.6
123	Netapp Inc	1824	8459	21.6	ACM-Assoc Comput Mach	3490	41.3	IEEE	1824	21.6
124	Emerson Electric Co.	1819	6414	28.4	IEEE	1819	28.4	RELX Group	688	10.7
125	Cognex Corp.	1807	3949	45.8	IEEE	1807	45.8	RELX Group	699	17.7
126	Softbank Corp	1782	6904	25.8	International Telecommunication Union	1887	27.3	IEEE	1782	25.8
127	Cascade Microtech Inc.	1780	3262	54.6	IEEE	1780	54.6	Nature Publishing Group	648	19.9
128	Rovi Corporation	1759	6480	27.1	IEEE	1759	27.1	ACM-Assoc Comput Mach	454	7.0
129	SRI International	1703	4892	34.8	IEEE	1703	34.8	RELX Group	462	9.4
130	Intellectual Ventures Manage	1694	3554	47.7	IEEE	1694	47.7	ACM-Assoc Comput Mach	528	14.9
131	Bosch (Robert) GmbH	1693	7276	23.3	IEEE	1693	23.3	RELX Group	618	8.5
132	Juniper Networks Inc.	1683	4319	39.0	IEEE	1683	39.0	Internet Soc/IETF-Internet Eng Task Force	810	18.8
133	Fuji Film Holdings Corp	1666	7469	22.3	IEEE	1666	22.3	ACM-Assoc Comput Mach	1097	14.7
134	Interuniversity MicroElectroni	1613	3477	46.4	IEEE	1613	46.4	AVS-AIP Am Inst Physics	272	7.8
135	Honda Motor Co. Ltd.(Honda	1605	3650	44.0	IEEE	1605	44.0	RELX Group	505	13.8
136	Lenovo Group Ltd	1601	4343	36.9	3GPP General Partnership Project Standards Bo	1764	40.6	IEEE	1601	36.9
137	Intersil Corp.	1593	2215	71.9	IEEE	1593	71.9	IET/IEE	148	6.7
138	Dolby Laboratories Inc	1586	4082	38.9	IEEE	1586	38.9	International Telecommunication Union	449	11.0
139	Corning Inc.	1580	5798	27.3	IEEE	1580	27.3	OSA-Opt Soc Amer	1026	17.7
140	Comcast Corp	1563	3088	50.6	IEEE	1563	50.6	ACM-Assoc Comput Mach	253	8.2
141	Witricity Corp	1556	3061	50.8	IEEE	1556	50.8	AVS-AIP Am Inst Physics	298	9.7
142	Total SA	1555	1967	79.1	IEEE	1555	79.1	WIP-Renewable Energies	84	4.3
143	University of Texas	1542	11004	14.0	RELX Group	1873	17.0	IEEE	1542	14.0
144	Flextronics International LTD	1536	2080	73.8	IEEE	1536	73.8	CBS Interactive	190	9.1
145	Texas A&M University	1535	2784	55.1	IEEE	1535	55.1	RELX Group	199	7.1
146	University of Michigan	1510	7888	19.1	IEEE	1510	19.1	RELX Group	1260	16.0
147	Infinera Corporation	1497	2447	61.2	IEEE	1497	61.2	IET/IEE	358	14.6
148	Northrop Grumman Corp	1433	3225	44.4	IEEE	1433	44.4	AVS-AIP Am Inst Physics	277	8.6
149	SIPCO LLC	1412	2514	56.2	IEEE	1412	56.2	Internet Soc/IETF-Internet Eng Task Force	199	7.9
150	Intertrust Technologies Corp	1398	9201	15.2	ACM-Assoc Comput Mach	1701	18.5	IEEE	1398	15.2
151	Eastman Kodak Company	1387	5497	25.2	IEEE	1387	25.2	RELX Group	462	8.4
152	L-3 Communications Holdings	1384	1909	72.5	IEEE	1384	72.5	SPIE-Int Soc Opt Engineering	95	5.0
153	Accenture Ltd.	1373	4296	32.0	IEEE	1373	32.0	ACM-Assoc Comput Mach	853	19.9
154	Nuance Communications Inc	1334	4043	33.0	IEEE	1334	33.0	ACM-Assoc Comput Mach	667	16.5
155	Amazon.com Inc.	1293	6499	19.9	ACM-Assoc Comput Mach	1951	30.0	IEEE	1293	19.9
156	Deutsche Telekom AG	1288	2491	51.7	IEEE	1288	51.7	ACM-Assoc Comput Mach	143	5.7
157	QST Holdings Llc	1282	2167	59.2	IEEE	1282	59.2	Joint IEEE and ACM	249	11.5
158	Commscope Inc.	1278	1568	81.5	IEEE	1278	81.5	IET/IEE	136	8.7
159	Wisteria Trading Inc	1274	2426	52.5	IEEE	1274	52.5	SPIE-Int Soc Opt Engineering	306	12.6
160	Citrix Systems Inc	1252	4113	30.4	IEEE	1252	30.4	ACM-Assoc Comput Mach	760	18.5

## Appendix C: Top Organizations from All Categories Combined

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161	Commissariat A L'Energie Ato	1249	5304	23.5	IEEE	1249	23.5	RELX Group	968	18.3
162	Agilent Technologies Inc	1241	3872	32.1	IEEE	1241	32.1	RELX Group	406	10.5
163	ZENO SEMICONDUCTOR I	1209	1587	76.2	IEEE	1209	76.2	IEEE/JPN Soc App Phys	302	19.0
164	Mediatek Inc.	1207	1730	69.8	IEEE	1207	69.8	3GPP General Partnership Project Standards Body	262	15.1
165	Rockwell Automation Inc	1206	1997	60.4	IEEE	1206	60.4	RELX Group	153	7.7
166	University of Southern Califor	1203	6837	17.6	IEEE	1203	17.6	ACS-Am Chem Soc	957	14.0
167	Orange	1192	2320	51.4	IEEE	1192	51.4	IET/IEE	133	5.7
168	PHOENIX SOLUTIONS INC	1191	3541	33.6	IEEE	1191	33.6	ISCA (International Speech Communication Association)	478	13.5
169	Kyocera Corp.	1182	2285	51.7	IEEE	1182	51.7	3GPP General Partnership Project Standards Body	209	9.1
170	University of Wisconsin	1180	6685	17.7	IEEE	1180	17.7	RELX Group	616	9.2
171	Velatia Group	1180	1499	78.7	IEEE	1180	78.7	Echelon Corp	113	7.5
172	BAE Systems Plc.	1179	1959	60.2	IEEE	1179	60.2	SPIE-Int Soc Opt Engineering	129	6.6
173	Level 3 Communications	1173	3895	30.1	IEEE	1173	30.1	ACM-Assoc Comput Mach	813	20.9
174	University of Washington	1114	6448	17.3	IEEE	1114	17.3	RELX Group	915	14.2
175	SK Hynix Inc	1104	2034	54.3	IEEE	1104	54.3	IEEE/JPN Soc App Phys	110	5.4
176	JDS Uniphase Corp	1092	3238	33.7	IEEE	1092	33.7	AVS-AIP Am Inst Physics	570	17.6
177	REARDEN LLC	1053	1250	84.2	IEEE	1053	84.2	OSA-Opt Soc Amer	53	4.2
178	WI-Lan Inc	1052	1572	66.9	IEEE	1052	66.9	3GPP General Partnership Project Standards Body	100	6.4
179	North American Communicati	1040	3275	31.8	IEEE	1040	31.8	Joint IEEE and ACM	591	18.0
180	Schneider Electric S.A.	1040	5815	17.9	IEEE	1040	17.9	I S A-INSTRUM SYS AUTOMATION SOC	711	12.2
181	IDC Llc	1039	2746	37.8	IEEE	1039	37.8	SID-Society for Information Display	444	16.2
182	National Instruments Corp.	1039	1825	56.9	IEEE	1039	56.9	ACM-Assoc Comput Mach	189	10.4
183	Extreme Networks Inc	1038	2169	47.9	IEEE	1038	47.9	ACM-Assoc Comput Mach	249	11.5
184	Arm Holdings Plc	1036	1756	59.0	IEEE	1036	59.0	Joint IEEE and ACM	267	15.2
185	SRC Computers Inc.	1016	1148	88.5	IEEE	1016	88.5	ACM-Assoc Comput Mach	41	3.6
186	Michigan State University	1013	10358	9.8	OSA-Opt Soc Amer	2093	20.2	AVS-AIP Am Inst Physics	1518	14.7
187	Imagination Technologies Gro	984	2930	33.6	IEEE	984	33.6	ACM-Assoc Comput Mach	664	22.7
188	Johnson & Johnson	974	27342	3.6	RELX Group	6976	25.5	Lippincott Williams & Wilkins	3139	11.5
189	TDK Corporation	961	2965	32.4	IEEE	961	32.4	AVS-AIP Am Inst Physics	657	22.2
190	Avaya Inc	935	3491	26.8	IEEE	935	26.8	Network Working Group RFC	565	16.2
191	Silicon Graphics International	930	2518	36.9	IEEE	930	36.9	ACM-Assoc Comput Mach	717	28.5
192	Maxim Integrated Products Inc	919	1099	83.6	IEEE	919	83.6	Texas Instruments	18	1.6
193	Pioneer Corp.	909	1812	50.2	IEEE	909	50.2	SPIE-Int Soc Opt Engineering	288	15.9
194	Hong Kong University of Scie	903	1707	52.9	IEEE	903	52.9	AVS-AIP Am Inst Physics	204	12.0
195	General Motors Corp	900	3090	29.1	IEEE	900	29.1	RELX Group	744	24.1
196	United States Army	896	3739	24.0	IEEE	896	24.0	RELX Group	391	10.5
197	Smith & Nephew Plc.	889	10152	8.8	RELX Group	2480	24.4	Lippincott Williams & Wilkins	1193	11.8
198	SYNQOR INC	876	1005	87.2	IEEE	876	87.2	Penton Media	45	4.5
199	Purdue University	875	5766	15.2	RELX Group	1023	17.7	IEEE	875	15.2
200	St. Jude Medical Inc.	867	17517	4.9	RELX Group	4322	24.7	Lippincott Williams & Wilkins	2751	15.7

## 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
201	Thales	864	1628	53.1	IEEE	864	53.1	RELX Group	104	6.4
202	MAGNACOM LTD	859	910	94.4	IEEE	859	94.4	Alcatel-Lucent	51	5.6
203	Global Foundries Inc	851	1929	44.1	IEEE	851	44.1	AVS-AIP Am Inst Physics	173	9.0
204	Washington University in St. L	845	3666	23.0	IEEE	845	23.0	RELX Group	522	14.2
205	Arizona State University	839	2714	30.9	IEEE	839	30.9	RELX Group	382	14.1
206	3M Co	806	9503	8.5	RELX Group	1389	14.6	ACS-Am Chem Soc	905	9.5
207	Transphorm Inc	804	1652	48.7	IEEE	804	48.7	AVS-AIP Am Inst Physics	281	17.0
208	YFY Inc	803	8957	9.0	SID-Society for Information Display	4740	52.9	IEEE	803	9.0
209	Midtronics Inc.	790	1827	43.2	IEEE	790	43.2	RELX Group	342	18.7
210	Toyota Motor Corp	787	2546	30.9	IEEE	787	30.9	RELX Group	511	20.1
211	Agency for Science Technolog	777	2035	38.2	IEEE	777	38.2	RELX Group	260	12.8
212	eBay Inc	761	4675	16.3	IEEE	761	16.3	ACM-Assoc Comput Mach	582	12.4
213	Carnegie Mellon University	760	2843	26.7	IEEE	760	26.7	RELX Group	310	10.9
214	Walt Disney Co.	752	3405	22.1	ACM-Assoc Comput Mach	1703	50.0	IEEE	752	22.1
215	Round Rock Research LLC	750	2345	32.0	IEEE	750	32.0	RELX Group	344	14.7
216	Verance Corp	748	1398	53.5	IEEE	748	53.5	SPIE-Int Soc Opt Engineering	197	14.1
217	Solarflare Communications In	747	5232	14.3	ACM-Assoc Comput Mach	3057	58.4	Joint IEEE and ACM	1028	19.6
218	ARRIS Group Inc	742	1661	44.7	IEEE	742	44.7	International Telecommunication Union	116	7.0
219	Masimo Corp	740	1767	41.9	IEEE	740	41.9	Lippincott Williams & Wilkins	178	10.1
220	Synergy Microwave Corp	737	882	83.6	IEEE	737	83.6	HORIZON HOUSE PUBLICATIONS INC	66	7.5
221	Teledyne Technologies Incorp	737	1512	48.7	IEEE	737	48.7	SPIE-Int Soc Opt Engineering	149	9.9
222	Cornell University	736	4151	17.7	IEEE	736	17.7	RELX Group	528	12.7
223	Ruckus Wireless Inc	733	980	74.8	IEEE	733	74.8	Hitachi Ltd	64	6.5
224	Magna International Inc.	727	1955	37.2	IEEE	727	37.2	SAE-Society of Automobile Engineers	221	11.3
225	Hoya Corp	726	1796	40.4	IEEE	726	40.4	AVS-AIP Am Inst Physics	344	19.2
226	Brocade Communciation Syste	720	2077	34.7	IEEE	720	34.7	Internet Soc/IETF-Internet Eng Task Force	339	16.3
227	Illumina Inc.	717	4001	17.9	IEEE	717	17.9	RELX Group	542	13.5
228	HTC Corporation	715	2395	29.9	3GPP General Partnership Project Standards Bo	1184	49.4	IEEE	715	29.9
229	Math Works Inc (The)	714	1593	44.8	IEEE	714	44.8	ACM-Assoc Comput Mach	340	21.3
230	INTOUCH TECHNOLOGIE	713	1589	44.9	IEEE	713	44.9	RELX Group	117	7.4
231	Dell Inc	709	2275	31.2	IEEE	709	31.2	ACM-Assoc Comput Mach	606	26.6
232	Symantec Corp.	706	3116	22.7	ACM-Assoc Comput Mach	807	25.9	IEEE	706	22.7
233	Yahoo Inc	700	4968	14.1	ACM-Assoc Comput Mach	1534	30.9	IEEE	700	14.1
234	Schlumberger Ltd.	696	9530	7.3	Society of Petroleum Engineers	2240	23.5	soc of Exploration Geophysists	1712	18.0
235	Avid Technology Inc.	695	1691	41.1	IEEE	695	41.1	ACM-Assoc Comput Mach	616	36.4
236	MULTI-TECH SYSTEMS IN	691	1088	63.5	IEEE	691	63.5	International Telecommunication Union	81	7.4
237	General Dynamics Corp	690	1849	37.3	IEEE	690	37.3	Am Physical Soc	248	13.4
238	Rockwell Collins Inc.	689	1291	53.4	IEEE	689	53.4	RELX Group	78	6.0
239	Silverbrook Pty Ltd	679	1929	35.2	IEEE	679	35.2	Springer/Sp. Wien/Springer-Verlag/Kluwer	440	22.8
240	Technion - Israel Institute of T	679	1546	43.9	IEEE	679	43.9	RELX Group	149	9.6



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rank	assignee	# IEEE	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
241	New Jersey Institute of Techno	675	1492	45.2	IEEE	675	45.2	RELX Group	182	12.2
242	TRILLIANT NETWORKS I	670	1042	64.3	IEEE	670	64.3	Internet Soc/IETF-Internet Eng Task Force	77	7.4
243	University of South Florida	670	2844	23.6	IEEE	670	23.6	RELX Group	416	14.6
244	Battelle Memorial Institute	668	4163	16.0	RELX Group	832	20.0	IEEE	668	16.0
245	CA Inc	666	1753	38.0	IEEE	666	38.0	ACM-Assoc Comput Mach	316	18.0
246	RPX Corp	660	1998	33.0	IEEE	660	33.0	Internet Soc/IETF-Internet Eng Task Force	298	14.9
247	Conexant Systems Inc.	654	1005	65.1	IEEE	654	65.1	International Telecommunication Union	49	4.9
248	SOLAREEDGE TECHNOLO	650	814	79.9	IEEE	650	79.9	WIP-Renewable Energies	116	14.3
249	Voxer Llc	641	993	64.6	IEEE	641	64.6	Internet Soc/IETF-Internet Eng Task Force	75	7.6
250	Nikon Corp.	640	4024	15.9	SPIE-Int Soc Opt Engineering	1632	40.6	SEMATECH Consortium	646	16.1
251	Sanken Electric Co. Ltd.	638	878	72.7	IEEE	638	72.7	RELX Group	136	15.5
252	Ciena Corp	637	1289	49.4	IEEE	637	49.4	OSA-Opt Soc Amer	237	18.4
253	Viasat	637	1015	62.8	IEEE	637	62.8	RELX Group	42	4.1
254	Lam Research Corp.	633	3319	19.1	AVS-AIP Am Inst Physics	816	24.6	IEEE	633	19.1
255	COMMISSARIAT A L'ENER	631	2158	29.2	IEEE	631	29.2	RELX Group	394	18.3
256	Oki Electric Industry Co. Ltd.	620	1412	43.9	IEEE	620	43.9	IEICE-Inst Elec Info Comm Eng	161	11.4
257	Sulvolta Inc	620	1299	47.7	IEEE	620	47.7	AVS-AIP Am Inst Physics	200	15.4
258	Xtera Communications Inc.	618	1516	40.8	IEEE	618	40.8	IET/IEE	358	23.6
259	IP RESERVOIR LLC	617	1265	48.8	IEEE	617	48.8	ACM-Assoc Comput Mach	244	19.3
260	Power Integrations Inc.	616	932	66.1	IEEE	616	66.1	Penton Media	68	7.3
261	Princeton University	614	5001	12.3	AVS-AIP Am Inst Physics	1040	20.8	ACS-Am Chem Soc	632	12.6
262	University of Florida	614	2810	21.9	IEEE	614	21.9	RELX Group	486	17.3
263	BTG Plc.	612	2079	29.4	IEEE	612	29.4	RELX Group	278	13.4
264	Sumitomo Electric Industries	612	3426	17.9	IEEE	612	17.9	AVS-AIP Am Inst Physics	475	13.9
265	Facebookl Inc	611	2460	24.8	ACM-Assoc Comput Mach	693	28.2	IEEE	611	24.8
266	Coriant	607	1236	49.1	IEEE	607	49.1	Internet Soc/IETF-Internet Eng Task Force	180	14.6
267	Advantest Corp.	606	838	72.3	IEEE	606	72.3	AVS-AIP Am Inst Physics	34	4.1
268	Cleveland Clinic (and Foundat	605	3228	18.7	RELX Group	717	22.2	IEEE	605	18.7
269	Aisin Seiki Co. Ltd.	603	3734	16.1	OSA-Opt Soc Amer	1482	39.7	IEEE	603	16.1
270	REALTIME DATA LLC	602	2281	26.4	IEEE	602	26.4	Network Working Group RFC	379	16.6
271	Mellanox Technologies Ltd	594	1363	43.6	IEEE	594	43.6	IET/IEE	287	21.1
272	Micro Focus International PL	593	1658	35.8	IEEE	593	35.8	ACM-Assoc Comput Mach	422	25.5
273	Lawrence Livermore National	591	2268	26.1	IEEE	591	26.1	RELX Group	368	16.2
274	JPMorgan	585	5499	10.6	Source Media	1081	19.7	IEEE	585	10.6
275	NOMADIX INC	582	2281	25.5	IEEE	582	25.5	Network Working Group RFC	391	17.1
276	Cheetah Omni LLC	581	1847	31.5	IEEE	581	31.5	OSA-Opt Soc Amer	445	24.1
277	Microchip Technology Inc.	581	765	75.9	IEEE	581	75.9	IEEE/JPN Soc App Phys	50	6.5
278	Airbus Group SAS	578	1431	40.4	IEEE	578	40.4	RELX Group	164	11.5
279	LibertyMedia	575	858	67.0	IEEE	575	67.0	3GPP General Partnership Project Standards Body	149	17.4
280	Ignis Innovation Inc	574	774	74.2	IEEE	574	74.2	SID-Society for Information Display	84	10.9

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
281	Danaher Corp.	572	3978	14.4	RELX Group	691	17.4	IEEE	572	14.4
282	Screen Holdings Co Ltd (Form	567	2113	26.8	IEEE	567	26.8	RELX Group	313	14.8
283	Nantero Inc	566	9329	6.1	ACS-Am Chem Soc	2798	30.0	AVS-AIP Am Inst Physics	1741	18.7
284	ASM International N.V.	555	5323	10.4	RELX Group	1271	23.9	AVS-AIP Am Inst Physics	1112	20.9
285	Emcore Corp.	555	1121	49.5	IEEE	555	49.5	AVS-AIP Am Inst Physics	144	12.8
286	NCR Corp.	553	1738	31.8	IEEE	553	31.8	ACM-Assoc Comput Mach	358	20.6
287	Virgin Islands Microsystems	548	2251	24.3	IEEE	548	24.3	AVS-AIP Am Inst Physics	418	18.6
288	Crossbar Inc	542	2130	25.4	IEEE	542	25.4	RELX Group	304	14.3
289	Charles Stark Draper Laborato	540	1756	30.8	IEEE	540	30.8	RELX Group	252	14.4
290	Nintendo Co. Ltd.	540	2779	19.4	ACM-Assoc Comput Mach	726	26.1	IEEE	540	19.4
291	CREATIVE KINGDOMS LL	537	1601	33.5	IEEE	537	33.5	ACM-Assoc Comput Mach	437	27.3
292	Knowles Corp	537	1141	47.1	IEEE	537	47.1	RELX Group	152	13.3
293	Duke University	536	3254	16.5	IEEE	536	16.5	RELX Group	473	14.5
294	ViXS Systems Inc	536	845	63.4	IEEE	536	63.4	SPIE-Int Soc Opt Engineering	95	11.2
295	Johns Hopkins University	519	3496	14.8	RELX Group	557	15.9	IEEE	519	14.8
296	Pulse Link Inc	516	630	81.9	IEEE	516	81.9	Sci American Inc	24	3.8
297	Qinetiq Group Ltd	513	1422	36.1	IEEE	513	36.1	RELX Group	130	9.1
298	ASML Holding NV	512	10840	4.7	SPIE-Int Soc Opt Engineering	3692	34.1	AVS-AIP Am Inst Physics	2310	21.3
299	State University of New York	509	2915	17.5	IEEE	509	17.5	RELX Group	424	14.5
300	GUIDED THERAPY SYSTE	504	1311	38.4	IEEE	504	38.4	RELX Group	207	15.8
301	Aptina Imaging Corp	499	842	59.3	IEEE	499	59.3	SPIE-Int Soc Opt Engineering	77	9.1
302	Headwater Partners 1 LLC	499	1108	45.0	IEEE	499	45.0	3GPP General Partnership Project Standards Body	227	20.5
303	The Nielsen Co BV	496	4035	12.3	RELX Group	740	18.3	IEEE	496	12.3
304	BANDSPEED INC	494	754	65.5	IEEE	494	65.5	Bluetooth Special Interest Group	188	24.9
305	EXEGY INC	494	978	50.5	IEEE	494	50.5	ACM-Assoc Comput Mach	173	17.7
306	Furukawa Electric Co. Ltd.	494	1732	28.5	IEEE	494	28.5	OSA-Opt Soc Amer	407	23.5
307	University of North Carolina	493	2425	20.3	IEEE	493	20.3	RELX Group	344	14.2
308	Lightsmyth Technologies Inc	491	1012	48.5	IEEE	491	48.5	OSA-Opt Soc Amer	234	23.1
309	University of Pennsylvania	491	5706	8.6	RELX Group	931	16.3	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	518	9.1
310	Skyhook Wireless Inc	487	931	52.3	IEEE	487	52.3	ACM-Assoc Comput Mach	93	10.0
311	The National Aeronautical and	487	2225	21.9	IEEE	487	21.9	RELX Group	193	8.7
312	Via Technologies Inc.	486	1022	47.6	IEEE	486	47.6	Joint IEEE and ACM	137	13.4
313	Medispectra Inc	482	1273	37.9	IEEE	482	37.9	RELX Group	269	21.1
314	Fortinet Inc	478	812	58.9	IEEE	478	58.9	ACM-Assoc Comput Mach	83	10.2
315	Safran S.A.	478	1353	35.3	IEEE	478	35.3	RELX Group	117	8.6
316	Soitec SA	476	1831	26.0	IEEE	476	26.0	AVS-AIP Am Inst Physics	409	22.3
317	University of Nebraska	476	2244	21.2	IEEE	476	21.2	RELX Group	345	15.4
318	Denso Corp	472	1116	42.3	IEEE	472	42.3	RELX Group	105	9.4
319	National Chiao Tung Universi	472	881	53.6	IEEE	472	53.6	AVS-AIP Am Inst Physics	88	10.0
320	Oewaves Inc	469	1390	33.7	OSA-Opt Soc Amer	536	38.6	IEEE	469	33.7

## 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
321	Northwestern University	467	4263	11.0	RELX Group	589	13.8	ACS-Am Chem Soc	548	12.9
322	Sensable Technologies Inc	467	978	47.8	IEEE	467	47.8	ACM-Assoc Comput Mach	250	25.6
323	United Technologies Corp	467	1714	27.2	IEEE	467	27.2	RELX Group	187	10.9
324	North Carolina State Universit	463	3489	13.3	AVS-AIP Am Inst Physics	748	21.4	RELX Group	580	16.6
325	Oclaro Inc	461	1153	40.0	IEEE	461	40.0	OSA-Opt Soc Amer	265	23.0
326	CIRREX SYSTEMS LLC	459	1321	34.7	IEEE	459	34.7	OSA-Opt Soc Amer	208	15.7
327	Lightsquared Company	457	834	54.8	IEEE	457	54.8	Springer/Sp. Wien/Springer-Verlag/Kluwer	135	16.2
328	On Semiconductor Corporatio	454	608	74.7	IEEE	454	74.7	SPIE-Int Soc Opt Engineering	27	4.4
329	MEVION MEDICAL SYSTE	451	1574	28.7	IEEE	451	28.7	RELX Group	337	21.4
330	Caterpillar Inc.	450	1179	38.2	IEEE	450	38.2	SAE-Society of Automobile Engineers	156	13.2
331	Olympus Corp.	449	2344	19.2	IEEE	449	19.2	RELX Group	430	18.3
332	KLA-Tencor Corp.	445	5203	8.6	SPIE-Int Soc Opt Engineering	1558	29.9	AVS-AIP Am Inst Physics	803	15.4
333	ALOFT MEDIA LLC	443	647	68.5	IEEE	443	68.5	3GPP General Partnership Project Standards Body	105	16.2
334	Ford Motor Co.	441	1636	27.0	IEEE	441	27.0	SAE-Society of Automobile Engineers	383	23.4
335	NUMENTA INC	440	2119	20.8	Numenta Inc.	755	35.6	IEEE	440	20.8
336	Tel Aviv Univiversity	440	1734	25.4	IEEE	440	25.4	RELX Group	295	17.0
337	ST-Ericsson SA (Patents split	438	616	71.1	IEEE	438	71.1	3GPP General Partnership Project Standards Body	67	10.9
338	Zebra Technologies Corp.	436	997	43.7	IEEE	436	43.7	OSA-Opt Soc Amer	66	6.6
339	Stryker Corp.	435	4285	10.2	RELX Group	814	19.0	Lippincott Williams & Wilkins	517	12.1
340	Tokyo Electron Limited	434	3327	13.0	RELX Group	493	14.8	IEEE	434	13.0
341	University of Colorado ( The	434	2791	15.5	OSA-Opt Soc Amer	763	27.3	IEEE	434	15.5
342	SAIC Inc	427	2593	16.5	SPIE-Int Soc Opt Engineering	563	21.7	IEEE	427	16.5
343	ICOSYSTEM CORP	426	559	76.2	IEEE	426	76.2	RELX Group	33	5.9
344	Korea Advanced Institute for S	426	1065	40.0	IEEE	426	40.0	RELX Group	94	8.8
345	University of Maryland	426	2678	15.9	RELX Group	429	16.0	IEEE	426	15.9
346	University of Central Florida	425	2049	20.7	IEEE	425	20.7	OSA-Opt Soc Amer	262	12.8
347	MicroStrategy Inc.	424	1592	26.6	IEEE	424	26.6	ACM-Assoc Comput Mach	277	17.4
348	Linear Technology Corp.	421	1079	39.0	IEEE	421	39.0	Cahners-Denver Pub	407	37.7
349	DENSBITS TECHNOLOGIE	414	767	54.0	IEEE	414	54.0	RELX Group	60	7.8
350	Prysmian SPA	412	1223	33.7	IEEE	412	33.7	OSA-Opt Soc Amer	260	21.3
351	IPCO LLC	411	729	56.4	IEEE	411	56.4	ACM-Assoc Comput Mach	54	7.4
352	United States of America Depa	411	1541	26.7	IEEE	411	26.7	AVS-AIP Am Inst Physics	212	13.8
353	ACACIA MEDIA TECHNOL	410	722	56.8	IEEE	410	56.8	ACM-Assoc Comput Mach	66	9.1
354	Tangis Corp	407	596	68.3	IEEE	407	68.3	ACM-Assoc Comput Mach	105	17.6
355	Ygomi LLC	407	443	91.9	IEEE	407	91.9	SPIE-Int Soc Opt Engineering	15	3.4
356	ITT Corp	405	859	47.1	IEEE	405	47.1	Internet Soc/IETF-Internet Eng Task Force	63	7.3
357	Assa Abloy AB	404	2670	15.1	IEEE	404	15.1	International Association for Cryptologic Research (IACR)	402	15.1
358	Coherent Inc.	403	2582	15.6	OSA-Opt Soc Amer	527	20.4	AVS-AIP Am Inst Physics	484	18.7
359	Unisantis Electronics Ltd	403	469	85.9	IEEE	403	85.9	RELX Group	33	7.0
360	CenturyLink Inc	402	939	42.8	IEEE	402	42.8	International Telecommunication Union	132	14.1

## 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
361	Centre National De La Recher	399	4023	9.9	RELX Group	1112	27.6	IEEE	399	9.9
362	Harvard University	398	6764	5.9	ACS-Am Chem Soc	1036	15.3	Nature Publishing Group	784	11.6
363	F5 Networks Inc	397	2048	19.4	IEEE	397	19.4	ACM-Assoc Comput Mach	329	16.1
364	Melrose Industries PLC	396	470	84.3	IEEE	396	84.3	Joint IEEE and ACM	18	3.8
365	Realtek Semiconductor Corp.	393	474	82.9	IEEE	393	82.9	Springer/Springer Wien/Springer-Verlag/Kluwer	14	3.0
366	M/A-COM Technology Soluti	391	660	59.2	IEEE	391	59.2	International Telecommunication Union	53	8.0
367	MOJO MOBILITY INC	391	514	76.1	IEEE	391	76.1	RELX Group	42	8.2
368	Synaptics Inc.	391	848	46.1	IEEE	391	46.1	ACM-Assoc Comput Mach	85	10.0
369	AVISTAR COMMUNICATI	390	758	51.5	IEEE	390	51.5	ACM-Assoc Comput Mach	228	30.1
370	Spectrum Dynamics Llc	389	1185	32.8	IEEE	389	32.8	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	116	9.8
371	Eaton Corp.	387	559	69.2	IEEE	387	69.2	RELX Group	25	4.5
372	Lattice Semiconductor Corp.	387	573	67.5	IEEE	387	67.5	Joint IEEE and ACM	34	5.9
373	Sotera Wireless	384	778	49.4	IEEE	384	49.4	Springer/Sp. Wien/Springer-Verlag/Kluwer	157	20.2
374	BIOCONTROL MEDICAL L	383	1399	27.4	IEEE	383	27.4	Lippincott Williams & Wilkins	225	16.1
375	Vestas Wind Systems A/S	383	789	48.5	IEEE	383	48.5	AWEA-American Wind Energy Association	98	12.4
376	YANICKLO TECHNOLOG	383	2155	17.8	ACM-Assoc Comput Mach	852	39.5	IEEE	383	17.8
377	ECOLE DE TECHNOLOGIE	380	575	66.1	IEEE	380	66.1	3GPP General Partnership Project Standards Body	52	9.0
378	Atmel Corp.	379	645	58.8	IEEE	379	58.8	ACM-Assoc Comput Mach	54	8.4
379	United Microelectronics Corp	377	715	52.7	IEEE	377	52.7	IEEE/JPN Soc App Phys	76	10.6
380	ON-RAMP WIRELESS INC	375	518	72.4	IEEE	375	72.4	IET/IEE	38	7.3
381	Delphi Automotive Plc	373	795	46.9	IEEE	373	46.9	RELX Group	104	13.1
382	ACORN TECHNOLOGIES I	371	1095	33.9	IEEE	371	33.9	AVS-AIP Am Inst Physics	242	22.1
383	Teradyne Inc.	370	718	51.5	IEEE	370	51.5	ASME-Am Soc Mech Eng	91	12.7
384	Halliburton Co. (Holding)	365	7529	4.8	Society of Petroleum Engineers	3133	41.6	SPWLA-Society of Petrophysicists and Well Log Analysts	606	8.0
385	Atos SE	361	836	43.2	IEEE	361	43.2	Internet Soc/IETF-Internet Eng Task Force	91	10.9
386	BIOSENSORS INTERNATI	361	1309	27.6	IEEE	361	27.6	Soc Nucl Med	186	14.2
387	Sigma Corp	359	476	75.4	IEEE	359	75.4	SPIE-Int Soc Opt Engineering	69	14.5
388	Avalanche Technology Inc	357	1577	22.6	AVS-AIP Am Inst Physics	482	30.6	IEEE	357	22.6
389	Sorin SPA	356	5939	6.0	RELX Group	1632	27.5	Blackwell Futura	799	13.5
390	Johnson Controls Inc	353	1105	31.9	IEEE	353	31.9	RELX Group	204	18.5
391	MC10 INC	351	4015	8.7	AVS-AIP Am Inst Physics	677	16.9	ACS-Am Chem Soc	614	15.3
392	National Taiwan University	351	555	63.2	IEEE	351	63.2	AVS-AIP Am Inst Physics	37	6.7
393	Pennsylvania State University	348	2684	13.0	RELX Group	473	17.6	IEEE	348	13.0
394	University of Pittsburgh	348	2580	13.5	RELX Group	495	19.2	IEEE	348	13.5
395	Communications Research Ce	345	544	63.4	IEEE	345	63.4	IET/IEE	43	7.9
396	MIRAMAR LABS INC	344	958	35.9	IEEE	344	35.9	IOP Publishing	118	12.3
397	COLLABORATION PROPE	343	480	71.5	IEEE	343	71.5	ACM-Assoc Comput Mach	70	14.6
398	Cray Inc	342	1344	25.4	ACM-Assoc Comput Mach	520	38.7	IEEE	342	25.4
399	Fuji Electric Holdings Co. Ltd.	342	674	50.7	IEEE	342	50.7	AVS-AIP Am Inst Physics	82	12.2
400	Japan Science and Technology	341	3504	9.7	AVS-AIP Am Inst Physics	948	27.1	RELX Group	510	14.6

## 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
401	TRACBEAM LLC	341	714	47.8	IEEE	341	47.8	ACM-Assoc Comput Mach	106	14.8
402	Omnivision Technologies Inc	340	943	36.1	IEEE	340	36.1	OSA-Opt Soc Amer	280	29.7
403	TELECOMMUNICATIONS	340	475	71.6	IEEE	340	71.6	IET/IEEE	41	8.6
404	Telecom Italia SPA	339	877	38.7	IEEE	339	38.7	3GPP General Partnership Project Standards Body	136	15.5
405	University of Connecticut	338	1449	23.3	IEEE	338	23.3	RELX Group	209	14.4
406	Council of Scientific and Indus	335	785	42.7	IEEE	335	42.7	RELX Group	105	13.4
407	Hexagon AB	335	994	33.7	IEEE	335	33.7	ACM-Assoc Comput Mach	116	11.7
408	RONALD A KATZ TECHN	332	2178	15.2	IEEE	332	15.2	International Data Group	222	10.2
409	Ohio State University	330	1991	16.6	RELX Group	406	20.4	IEEE	330	16.6
410	Unisys Corp.	330	727	45.4	IEEE	330	45.4	ACM-Assoc Comput Mach	170	23.4
411	CBF NETWORKS INC	329	489	67.3	IEEE	329	67.3	IET/IEEE	28	5.7
412	Aerospace Corp.	328	837	39.2	IEEE	328	39.2	RELX Group	130	15.5
413	Harman International Industrie	326	658	49.5	IEEE	326	49.5	Audio Eng Soc	150	22.8
414	United States Air Force	324	1117	29.0	IEEE	324	29.0	AVS-AIP Am Inst Physics	141	12.6
415	Fluidigm Corp	323	2437	13.3	ACS-Am Chem Soc	356	14.6	RELX Group	352	14.4
416	EchoStar Corp	322	632	50.9	IEEE	322	50.9	RELX Group	56	8.9
417	Polycom Inc.	322	508	63.4	IEEE	322	63.4	International Telecommunication Union	55	10.8
418	Searete LLC	322	1948	16.5	IEEE	322	16.5	AVS-AIP Am Inst Physics	159	8.2
419	Rohm Co. Ltd.	320	3024	10.6	AVS-AIP Am Inst Physics	849	28.1	RELX Group	433	14.3
420	TROXLER ELECTRONIC L	320	711	45.0	IEEE	320	45.0	AMER SOC TESTING MATERIALS	173	24.3
421	ZENA TECHNOLOGIES IN	319	1467	21.7	IEEE	319	21.7	ACS-Am Chem Soc	296	20.2
422	Schweitzer Engineering Labor	318	376	84.6	IEEE	318	84.6	RELX Group	11	2.9
423	SercoNet Ltd	317	608	52.1	IEEE	317	52.1	INTERTEC PUBL CORP PRIMEDIA CO	41	6.7
424	Leonhard Kurz Stiftung & Co	316	1363	23.2	AVS-AIP Am Inst Physics	325	23.8	IEEE	316	23.2
425	Autodesk Inc.	311	2138	14.5	ACM-Assoc Comput Mach	1273	59.5	IEEE	311	14.5
426	ZTE Corp.	311	1450	21.4	3GPP General Partnership Project Standards Bo	849	58.6	IEEE	311	21.4
427	Proteus Biomedical Inc	310	1440	21.5	IEEE	310	21.5	RELX Group	284	19.7
428	IWALK INC	308	931	33.1	IEEE	308	33.1	RELX Group	218	23.4
429	Lexmark International Inc.	308	881	35.0	IEEE	308	35.0	ACM-Assoc Comput Mach	116	13.2
430	Exar Corp.	307	395	77.7	IEEE	307	77.7	Joint IEEE and ACM	25	6.3
431	Logitech International SA	306	626	48.9	IEEE	306	48.9	ACM-Assoc Comput Mach	142	22.7
432	University of New Mexico	304	1484	20.5	IEEE	304	20.5	AVS-AIP Am Inst Physics	163	11.0
433	VIVAQUANT LLC	302	589	51.3	IEEE	302	51.3	RELX Group	83	14.1
434	Skyworks Solutions Inc	299	418	71.5	IEEE	299	71.5	AVS-AIP Am Inst Physics	14	3.3
435	Catholic University Leuven	298	717	41.6	IEEE	298	41.6	AVS-AIP Am Inst Physics	85	11.9
436	University of Utah	296	1834	16.1	IEEE	296	16.1	RELX Group	240	13.1
437	UT-Battelle LLC	295	2558	11.5	RELX Group	417	16.3	AVS-AIP Am Inst Physics	388	15.2
438	VerintSys	294	4278	6.9	International Data Group	1304	30.5	ACM-Assoc Comput Mach	795	18.6
439	VIRNETX INC	292	7541	3.9	Network Working Group RFC	3982	52.8	Internet Soc/IETF-Internet Eng Task Force	1402	18.6
440	DIGITAL VOICE SYSTEMS	289	307	94.1	IEEE	289	94.1	RELX Group	12	3.9

## 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
441	PerkinElmer Inc.	289	4127	7.0	ACS-Am Chem Soc	1063	25.8	RELX Group	660	16.0
442	National University of Singap	288	959	30.0	IEEE	288	30.0	RELX Group	98	10.2
443	Tilera Corp	288	627	45.9	IEEE	288	45.9	Joint IEEE and ACM	204	32.5
444	Virginia Tech University	288	1169	24.6	IEEE	288	24.6	RELX Group	158	13.5
445	Vanderbilt University	287	2465	11.6	RELX Group	448	18.2	IEEE	287	11.6
446	William Marsh Rice Universit	287	1874	15.3	IEEE	287	15.3	ACS-Am Chem Soc	234	12.5
447	Fitbit Inc	286	782	36.6	IEEE	286	36.6	CAMBRIDGE UNIV PRESS	118	15.1
448	NUVOTRONICS LLC	285	342	83.3	IEEE	285	83.3	AVS-AIP Am Inst Physics	21	6.1
449	Iowa State University	284	1304	21.8	IEEE	284	21.8	ACS-Am Chem Soc	170	13.0
450	Asahi Kasei Corp.	283	3321	8.5	RELX Group	856	25.8	Lippincott Williams & Wilkins	543	16.4
451	Silicon Genesis Corporation	282	1421	19.8	RELX Group	317	22.3	AVS-AIP Am Inst Physics	295	20.8
452	Red Hat Inc	280	929	30.1	IEEE	280	30.1	ACM-Assoc Comput Mach	260	28.0
453	EICES RESEARCH INC	278	443	62.8	IEEE	278	62.8	3GPP General Partnership Project Standards Body	52	11.7
454	Promos Technologies Inc.	276	369	74.8	IEEE	276	74.8	IEEE/JPN Soc App Phys	69	18.7
455	ROY-G-BIV CORP	275	943	29.2	IEEE	275	29.2	ISO-International Standards Organization	198	21.0
456	Tensorcomm Inc	275	312	88.1	IEEE	275	88.1	IET/IEE	13	4.2
457	Duchossois Industries Inc.	274	778	35.2	IEEE	274	35.2	International Association for Cryptologic Research (IACR)	120	15.4
458	X ONE INC	274	703	39.0	IEEE	274	39.0	ACM-Assoc Comput Mach	126	17.9
459	Adaptive Spectrum & Signal	273	524	52.1	IEEE	273	52.1	ANSI-American National Standards Institute	176	33.6
460	AMPT LLC	271	372	72.8	IEEE	271	72.8	RELX Group	31	8.3
461	CRESTCOM INC	271	306	88.6	IEEE	271	88.6	HORIZON HOUSE PUBLICATIONS INC	9	2.9
462	Tigo Energy Inc	271	422	64.2	IEEE	271	64.2	WIP-Renewable Energies	113	26.8
463	Cleversafe Inc	269	3953	6.8	Internet Soc/IETF-Internet Eng Task Force	2737	69.2	ACM-Assoc Comput Mach	690	17.5
464	VASCULAR IMAGING CO	269	548	49.1	IEEE	269	49.1	IET/IEE	160	29.2
465	Enablence Technologies Inc	267	587	45.5	IEEE	267	45.5	IET/IEE	59	10.1
466	INLINE CONNECTION CO	267	403	66.3	IEEE	267	66.3	INTERTEC PUBL CORP PRIMEDIA CO	35	8.7
467	National Institute of Informati	267	726	36.8	IEEE	267	36.8	IEICE-Inst Elec Info Comm Eng	137	18.9
468	KT Corp.	265	415	63.9	IEEE	265	63.9	3GPP General Partnership Project Standards Body	44	10.6
469	Carl-Zeiss Stiftung	264	5805	4.5	SPIE-Int Soc Opt Engineering	1290	22.2	OSA-Opt Soc Amer	990	17.1
470	TELEBUYER LLC	264	761	34.7	IEEE	264	34.7	IFIP - International Federation for Information Processing	66	8.7
471	MegaChips Corp	263	412	63.8	IEEE	263	63.8	MRS-Materials Research Soc	41	10.0
472	Xcerra Corp	260	500	52.0	IEEE	260	52.0	AVS-AIP Am Inst Physics	74	14.8
473	New York University	259	2251	11.5	OSA-Opt Soc Amer	297	13.2	IEEE	259	11.5
474	Hillcrest Laboratories	258	502	51.4	IEEE	258	51.4	ACM-Assoc Comput Mach	69	13.7
475	Airbiquity Inc	257	384	66.9	IEEE	257	66.9	3GPP General Partnership Project Standards Body	54	14.1
476	CLINICAL DECISION SUPP	257	1206	21.3	RELX Group	301	25.0	IEEE	257	21.3
477	Concornis Inc	255	7929	3.2	Lippincott Williams & Wilkins	1126	14.2	RELX Group	1100	13.9
478	Vishay Intertechnology Inc.	255	410	62.2	IEEE	255	62.2	RELX Group	28	6.8
479	BRAIN CORP	254	1118	22.7	IEEE	254	22.7	MIT/MIT Press	226	20.2
480	Vicor Corp	254	360	70.6	IEEE	254	70.6	Center for Power Electronics Systems (Virginia Tech)	45	12.5

## 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
481	Amkor Technology Inc.	253	594	42.6	IEEE	253	42.6	Penton Media	91	15.3
482	PTS Corporation	253	450	56.2	IEEE	253	56.2	OSA-Opt Soc Amer	43	9.6
483	National University of Ireland	252	542	46.5	IEEE	252	46.5	RELX Group	51	9.4
484	BRAINGATE CO LLC	251	663	37.9	IEEE	251	37.9	RELX Group	101	15.2
485	Fujikara Ltd.	250	841	29.7	IEEE	250	29.7	OSA-Opt Soc Amer	174	20.7
486	KONA MEDICAL INC	250	1650	15.2	RELX Group	460	27.9	IEEE	250	15.2
487	Brown University Research Fo	249	1652	15.1	AVS-AIP Am Inst Physics	348	21.1	IEEE	249	15.1
488	Jiangsu ChangJiang Electronic	249	332	75.0	IEEE	249	75.0	International Microelectronics And Packaging Society	42	12.7
489	Novartis AG	249	3931	6.3	RELX Group	905	23.0	OSA-Opt Soc Amer	279	7.1
490	Ecole Polytechnique Federale	248	995	24.9	IEEE	248	24.9	RELX Group	91	9.1
491	Baker Hughes Inc.	246	2310	10.6	Society of Petroleum Engineers	648	28.1	soc of Exploration Geophysists	301	13.0
492	Cubic Wafer Inc	245	372	65.9	IEEE	245	65.9	SPIE-Int Soc Opt Engineering	70	18.8
493	Dassault Systemes SA	245	2746	8.9	RELX Group	608	22.1	ACS-Am Chem Soc	456	16.6
494	Alacritech Inc	243	523	46.5	IEEE	243	46.5	United Business Media/UBM Tech	113	21.6
495	Alstom	243	480	50.6	IEEE	243	50.6	ASME-Am Soc Mech Eng	61	12.7
496	Bonutti Technologies LLC	243	1448	16.8	Lippincott Williams & Wilkins	313	21.6	IEEE	243	16.8
497	United States Health & Huma	243	3066	7.9	RELX Group	606	19.8	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	315	10.3
498	Infosys Ltd	242	593	40.8	IEEE	242	40.8	ACM-Assoc Comput Mach	133	22.4
499	Rutgers University	241	1067	22.6	IEEE	241	22.6	RELX Group	189	17.7
500	BEHAVIORAL RECOGNITI	240	278	86.3	IEEE	240	86.3	International Association for Pattern Recognition (IAPR)	30	10.8

## Appendix B: Top 100 Organizations That Cite IEEE; (1997-2015 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	Personalized Media Commun	7264	43133	16.8	Soc Motion Picture TV Eng Inc	13472	31.2	IEEE	7264	16.8
2	Microsoft Corporation	6549	14192	46.1	IEEE	6549	46.1	ACM-Assoc Comput Mach	1561	11.0
3	Sony Corp	2571	5298	48.5	IEEE	2571	48.5	ACM-Assoc Comput Mach	431	8.1
4	Qualcomm Inc	2377	6735	35.3	IEEE	2377	35.3	International Telecommunication Union	1640	24.4
5	Tessera Technologies Inc.	2110	3249	64.9	IEEE	2110	64.9	RELX Group	253	7.8
6	Google Inc.	1887	5795	32.6	IEEE	1887	32.6	ACM-Assoc Comput Mach	944	16.3
7	Pelican Imaging Corporation	1745	3771	46.3	IEEE	1745	46.3	SPIE-Int Soc Opt Engineering	734	19.5
8	Avago Technologies Ltd	1643	2531	64.9	IEEE	1643	64.9	ACM-Assoc Comput Mach	143	5.6
9	Apple Inc	1510	3656	41.3	IEEE	1510	41.3	ISO/IEC	476	13.0
10	Cisco Systems Inc.	1416	3519	40.2	IEEE	1416	40.2	Internet Soc/IETF-Internet Eng Task Force	273	7.8
11	Rovi Corporation	1406	5424	25.9	IEEE	1406	25.9	National Cable & Telecommunications Association	364	6.7
12	Panasonic Corporation	1302	4302	30.3	IEEE	1302	30.3	International Telecommunication Union	1127	26.2
13	LG Electronics Inc.	1260	5112	24.6	IEEE	1260	24.6	ISO-International Standards Organization	1249	24.4
14	Technicolor SA	1201	2988	40.2	IEEE	1201	40.2	ISO/IEC	318	10.6
15	Sharp Corp	1168	3109	37.6	IEEE	1168	37.6	International Telecommunication Union	393	12.6
16	Samsung Electronics Co Ltd	1094	2584	42.3	IEEE	1094	42.3	International Telecommunication Union	358	13.9
17	Fraunhofer Gesellschaft	883	1907	46.3	IEEE	883	46.3	MPEG.org	233	12.2
18	Adobe Systems Inc.	816	1825	44.7	IEEE	816	44.7	ACM-Assoc Comput Mach	412	22.6
19	DIRECTV Group Inc. (The)	739	1372	53.9	IEEE	739	53.9	Elettronica e Telecomunicazioni	161	11.7
20	Canon Inc	690	1633	42.3	IEEE	690	42.3	SPIE-Int Soc Opt Engineering	107	6.6
21	Nokia Corp	671	1723	38.9	IEEE	671	38.9	3GPP General Partnership Project Standards Body	160	9.3
22	Magna International Inc.	655	1198	54.7	IEEE	655	54.7	SAE-Society of Automobile Engineers	105	8.8
23	Hewlett-Packard Co	644	1385	46.5	IEEE	644	46.5	ACM-Assoc Comput Mach	150	10.8
24	International Business Machi	631	1291	48.9	IEEE	631	48.9	ACM-Assoc Comput Mach	164	12.7
25	STMicroelectronics	612	906	67.5	IEEE	612	67.5	RELX Group	51	5.6
26	California Institute of Techno	564	859	65.7	IEEE	564	65.7	SPIE-Int Soc Opt Engineering	95	11.1
27	Dolby Laboratories Inc	552	1920	28.8	IEEE	552	28.8	International Telecommunication Union	420	21.9
28	Intel Corporation	511	1095	46.7	IEEE	511	46.7	3GPP General Partnership Project Standards Body	94	8.6
29	Ricoh Co. Ltd.	500	1061	47.1	IEEE	500	47.1	ACM-Assoc Comput Mach	138	13.0
30	AT&T Inc	470	1427	32.9	IEEE	470	32.9	ISO/IEC	178	12.5
31	Mitsubishi Electric Corp	413	911	45.3	IEEE	413	45.3	ACM-Assoc Comput Mach	98	10.8
32	ACACIA MEDIA TECHNO	410	722	56.8	IEEE	410	56.8	ACM-Assoc Comput Mach	66	9.1
33	Koninklijke Philips N.V.	409	827	49.5	IEEE	409	49.5	SPIE-Int Soc Opt Engineering	68	8.2
34	Xerox Corp	373	1014	36.8	IEEE	373	36.8	SPIE-Int Soc Opt Engineering	123	12.1
35	InterDigital Inc	367	753	48.7	IEEE	367	48.7	3GPP General Partnership Project Standards Body	350	46.5
36	Toshiba Corp	364	978	37.2	IEEE	364	37.2	International Telecommunication Union	175	17.9
37	Massachusetts Institute of Te	332	584	56.8	IEEE	332	56.8	ACM-Assoc Comput Mach	57	9.8
38	Fuji Film Holdings Corp	327	1005	32.5	IEEE	327	32.5	ACM-Assoc Comput Mach	223	22.2
39	Blackberry Ltd.	325	672	48.4	IEEE	325	48.4	3GPP General Partnership Project Standards Body	131	19.5



## Appendix B: Top 100 Organizations That Cite IEEE; (1997-2015 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
40	Columbia University	303	542	55.9	IEEE	303	55.9	ACM-Assoc Comput Mach	55	10.1
41	Nippon Telegraph & Telepho	300	779	38.5	IEEE	300	38.5	International Telecommunication Union	94	12.1
42	ARRIS Group Inc	298	697	42.8	IEEE	298	42.8	ISO/IEC	39	5.6
43	ViXS Systems Inc	298	471	63.3	IEEE	298	63.3	SPIE-Int Soc Opt Engineering	55	11.7
44	Digimarc Corp.	289	700	41.3	IEEE	289	41.3	SPIE-Int Soc Opt Engineering	115	16.4
45	Wisteria Trading Inc	289	556	52.0	IEEE	289	52.0	SPIE-Int Soc Opt Engineering	73	13.1
46	Hitachi Ltd	279	854	32.7	IEEE	279	32.7	ISO-International Standards Organization	87	10.2
47	Verance Corp	267	487	54.8	IEEE	267	54.8	SPIE-Int Soc Opt Engineering	68	14.0
48	INTOUCH TECHNOLOGIE	263	605	43.5	IEEE	263	43.5	RELX Group	46	7.6
49	Eastman Kodak Company	262	768	34.1	IEEE	262	34.1	SPIE-Int Soc Opt Engineering	74	9.6
50	NEC Corp	261	505	51.7	IEEE	261	51.7	IEICE-Inst Elec Info Comm Eng	39	7.7
51	Huawei Technologies Compa	248	836	29.7	International Telecommunication Union	262	31.3	IEEE	248	29.7
52	CONVERGENT MEDIA SO	240	919	26.1	ACM-Assoc Comput Mach	246	26.8	IEEE	240	26.1
53	Marvell Technology Group Lt	230	294	78.2	IEEE	230	78.2	SPIE-Int Soc Opt Engineering	8	2.7
54	Micron Technology Inc.	229	393	58.3	IEEE	229	58.3	SPIE-Int Soc Opt Engineering	47	12.0
55	Sigma Corp	229	289	79.2	IEEE	229	79.2	SPIE-Int Soc Opt Engineering	40	13.8
56	Raytheon Co.	227	404	56.2	IEEE	227	56.2	SPIE-Int Soc Opt Engineering	46	11.4
57	BT Group PLC	223	410	54.4	IEEE	223	54.4	RELX Group	37	9.0
58	Aptina Imaging Corp	220	298	73.8	IEEE	220	73.8	SPIE-Int Soc Opt Engineering	25	8.4
59	Honeywell International Inc.	218	507	43.0	IEEE	218	43.0	SPIE-Int Soc Opt Engineering	62	12.2
60	Industrial Techology Researc	211	335	63.0	IEEE	211	63.0	SPIE-Int Soc Opt Engineering	30	9.0
61	Texas Instruments Inc	211	476	44.3	IEEE	211	44.3	International Telecommunication Union	120	25.2
62	Avid Technology Inc.	204	490	41.6	IEEE	204	41.6	ACM-Assoc Comput Mach	159	32.4
63	Electronics and Telecommuni	201	424	47.4	IEEE	201	47.4	International Telecommunication Union	36	8.5
64	Ericsson	199	566	35.2	IEEE	199	35.2	3GPP General Partnership Project Standards Body	67	11.8
65	Seiko Epson Corporation	193	398	48.5	IEEE	193	48.5	ACM-Assoc Comput Mach	35	8.8
66	SRI International	187	290	64.5	IEEE	187	64.5	RELX Group	23	7.9
67	Logitech International SA	182	369	49.3	IEEE	182	49.3	ACM-Assoc Comput Mach	106	28.7
68	EchoStar Corp	181	351	51.6	IEEE	181	51.6	RELX Group	36	10.3
69	Omnivision Technologies Inc	181	319	56.7	IEEE	181	56.7	SPIE-Int Soc Opt Engineering	59	18.5
70	BE HERE CORP	173	493	35.1	IEEE	173	35.1	ACM-Assoc Comput Mach	59	12.0
71	Nant Holdings IP Llc	173	695	24.9	ACM-Assoc Comput Mach	217	31.2	Joint IEEE and ACM	179	25.8
72	Siemens Aktiengesellschaft	171	400	42.8	IEEE	171	42.8	RELX Group	32	8.0
73	NVIDIA Corp.	166	383	43.3	IEEE	166	43.3	RELX Group	62	16.2
74	INTERVAL LICENSING LL	163	341	47.8	IEEE	163	47.8	ACM-Assoc Comput Mach	24	7.0
75	ECOLE DE TECHNOLOGIE	151	265	57.0	IEEE	151	57.0	3GPP General Partnership Project Standards Body	38	14.3
76	TE Connectivity Ltd	150	239	62.8	IEEE	150	62.8	National Cable & Telecommunications Association	16	6.7
77	The Nielsen Co BV	150	800	18.8	IEEE	150	18.8	RELX Group	109	13.6
78	Fujitsu Limited	148	443	33.4	IEEE	148	33.4	ISO-International Standards Organization	53	12.0
79	ObjectVideo Inc	148	219	67.6	IEEE	148	67.6	ACM-Assoc Comput Mach	11	5.0
80	University of California	146	265	55.1	IEEE	146	55.1	ACM-Assoc Comput Mach	30	11.3

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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	Verizon Communications Inc	144	371	38.8	IEEE	144	38.8	Internet Soc/IETF-Internet Eng Task Force	30	8.1
82	IMAX Corp	140	305	45.9	IEEE	140	45.9	SPIE-Int Soc Opt Engineering	79	25.9
83	EUCLID DISCOVERIES LL	135	274	49.3	IEEE	135	49.3	RELX Group	70	25.5
84	Motorola Solutions Inc.	135	217	62.2	IEEE	135	62.2	3GPP General Partnership Project Standards Body	20	9.2
85	University of Minnesota (The	135	177	76.3	IEEE	135	76.3	SPIE-Int Soc Opt Engineering	10	5.6
86	Intellectual Ventures Manage	133	359	37.0	IEEE	133	37.0	ACM-Assoc Comput Mach	75	20.9
87	Stanford University	133	341	39.0	IEEE	133	39.0	ACM-Assoc Comput Mach	92	27.0
88	PERSONALIZED MEDIA P	129	657	19.6	Soc Motion Picture TV Eng Inc	206	31.4	IEEE	129	19.6
89	MONOLITHIC 3D INC	127	222	57.2	IEEE	127	57.2	IEEE/JPN Soc App Phys	24	10.8
90	TELEBUYER LLC	127	388	32.7	IEEE	127	32.7	SAGE PUBLICATIONS INC	35	9.0
91	Advanced Micro Devices Inc	126	275	45.8	IEEE	126	45.8	ISO-International Standards Organization	29	10.5
92	TiVo Inc	122	353	34.6	IEEE	122	34.6	ISO-International Standards Organization	88	24.9
93	NXP Semiconductors NV	121	211	57.3	IEEE	121	57.3	International Telecommunication Union	25	11.8
94	OL2 INC	121	183	66.1	IEEE	121	66.1	RELX Group	18	9.8
95	Mediatek Inc.	120	172	69.8	IEEE	120	69.8	International Telecommunication Union	30	17.4
96	Semiconductor Energy Labor	120	1263	9.5	SID-Society for Information Display	443	35.1	AVS-AIP Am Inst Physics	149	11.8
97	COLLABORATION PROPE	119	167	71.3	IEEE	119	71.3	ACM-Assoc Comput Mach	24	14.4
98	Orange	119	184	64.7	IEEE	119	64.7	RELX Group	11	6.0
99	Lexmark International Inc.	118	372	31.7	IEEE	118	31.7	ACM-Assoc Comput Mach	63	16.9
100	CLEARPLAY INC	114	392	29.1	ACM-Assoc Comput Mach	258	65.8	IEEE	114	29.1

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<i>Computer Hardware</i>										
1	International Business Machi	12179	38270	31.8	IEEE	12179	31.8	ACM-Assoc Comput Mach	9985	26.1
2	Microsoft Corporation	10384	41019	25.3	ACM-Assoc Comput Mach	15073	36.7	IEEE	10384	25.3
3	Intel Corporation	7539	16080	46.9	IEEE	7539	46.9	ACM-Assoc Comput Mach	2157	13.4
4	Oracle Corporation	4563	16056	28.4	ACM-Assoc Comput Mach	5736	35.7	IEEE	4563	28.4
5	Apple Inc	4249	15469	27.5	ACM-Assoc Comput Mach	5346	34.6	IEEE	4249	27.5
6	Immersion Corp.	3642	9582	38.0	IEEE	3642	38.0	ACM-Assoc Comput Mach	1041	10.9
7	Avago Technologies Ltd	3506	5717	61.3	IEEE	3506	61.3	ACM-Assoc Comput Mach	398	7.0
8	Cadence Design Systems Inc	3465	8707	39.8	IEEE	3465	39.8	Joint IEEE and ACM	3095	35.5
9	Sony Corp	2957	6424	46.0	IEEE	2957	46.0	ACM-Assoc Comput Mach	925	14.4
10	Hewlett-Packard Co	2655	8758	30.3	IEEE	2655	30.3	ACM-Assoc Comput Mach	1785	20.4
11	Ricoh Co. Ltd.	2411	4959	48.6	IEEE	2411	48.6	ACM-Assoc Comput Mach	871	17.6
12	Qualcomm Inc	2279	5702	40.0	IEEE	2279	40.0	SID-Society for Information Display	426	7.5
13	Samsung Electronics Co Ltd	2040	5475	37.3	IEEE	2040	37.3	SID-Society for Information Display	912	16.7
14	Google Inc.	1997	8169	24.4	ACM-Assoc Comput Mach	2748	33.6	IEEE	1997	24.4
15	Nokia Corp	1948	4766	40.9	IEEE	1948	40.9	ACM-Assoc Comput Mach	670	14.1
16	Canon Inc	1911	5046	37.9	IEEE	1911	37.9	RELX Group	505	10.0
17	Fujitsu Limited	1786	4530	39.4	IEEE	1786	39.4	ACM-Assoc Comput Mach	526	11.6
18	MicroUnity Systems Enginee	1726	2765	62.4	IEEE	1726	62.4	Joint IEEE and ACM	247	8.9
19	Panasonic Corporation	1696	4066	41.7	IEEE	1696	41.7	International Telecommunication Union	268	6.6
20	Personalized Media Commun	1426	8866	16.1	Soc Motion Picture TV Eng Inc	2756	31.1	IEEE	1426	16.1
21	NEC Corp	1349	3019	44.7	IEEE	1349	44.7	ACM-Assoc Comput Mach	322	10.7
22	Rambus Inc.	1346	1918	70.2	IEEE	1346	70.2	IEEE/JPN Soc App Phys	87	4.5
23	Xilinx Inc.	1346	2089	64.4	IEEE	1346	64.4	Joint IEEE and ACM	298	14.3
24	Seiko Epson Corporation	1345	3658	36.8	IEEE	1345	36.8	Joint IEEE and ACM	496	13.6
25	Synopsys Inc.	1292	3220	40.1	IEEE	1292	40.1	Joint IEEE and ACM	779	24.2
26	Advanced Micro Devices Inc	1270	3546	35.8	IEEE	1270	35.8	Joint IEEE and ACM	432	12.2
27	Cisco Systems Inc.	1258	4048	31.1	IEEE	1258	31.1	Internet Soc/IETF-Internet Eng Task Force	735	18.2
28	Toshiba Corp	1217	2832	43.0	IEEE	1217	43.0	ACM-Assoc Comput Mach	225	7.9
29	Micron Technology Inc.	1185	2203	53.8	IEEE	1185	53.8	ACM-Assoc Comput Mach	168	7.6
30	Honeywell International Inc.	1171	3240	36.1	IEEE	1171	36.1	RELX Group	256	7.9
31	Texas Instruments Inc	1144	2102	54.4	IEEE	1144	54.4	Joint IEEE and ACM	137	6.5
32	AT&T Inc	1066	3052	34.9	IEEE	1066	34.9	ACM-Assoc Comput Mach	612	20.1
33	PACT XPP TECHNOLOGIE	1037	1800	57.6	IEEE	1037	57.6	Joint IEEE and ACM	174	9.7
34	STMMicroelectronics	1024	1793	57.1	IEEE	1024	57.1	ACM-Assoc Comput Mach	95	5.3
35	Cypress Semiconductor Corp.	1006	1600	62.9	IEEE	1006	62.9	Joint IEEE and ACM	209	13.1
36	Tessera Technologies Inc.	996	1513	65.8	IEEE	996	65.8	RELX Group	124	8.2
37	Sap SE	979	3755	26.1	ACM-Assoc Comput Mach	1276	34.0	IEEE	979	26.1
38	Hitachi Ltd	978	3109	31.5	IEEE	978	31.5	ACM-Assoc Comput Mach	494	15.9
39	Motorola Solutions Inc.	953	1510	63.1	IEEE	953	63.1	ACM-Assoc Comput Mach	128	8.5

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40	Xerox Corp	951	4050	23.5	ACM-Assoc Comput Mach	1066	26.3	IEEE	951	23.5
41	Mentor Graphics Corp.	912	1587	57.5	IEEE	912	57.5	Joint IEEE and ACM	403	25.4
42	Tabula Inc	873	2280	38.3	ACM-Assoc Comput Mach	875	38.4	IEEE	873	38.3
43	SRC Computers Inc.	815	910	89.6	IEEE	815	89.6	ACM-Assoc Comput Mach	30	3.3
44	Siemens Aktiengesellschaft	773	1939	39.9	IEEE	773	39.9	ACM-Assoc Comput Mach	236	12.2
45	Marvell Technology Group Lt	771	1042	74.0	IEEE	771	74.0	ACM-Assoc Comput Mach	35	3.4
46	Columbia University	767	3014	25.4	IEEE	767	25.4	ACM-Assoc Comput Mach	649	21.5
47	Blackberry Ltd.	764	1992	38.4	IEEE	764	38.4	ACM-Assoc Comput Mach	257	12.9
48	Adobe Systems Inc.	747	2600	28.7	ACM-Assoc Comput Mach	1117	43.0	IEEE	747	28.7
49	EMC Corp.	741	2489	29.8	ACM-Assoc Comput Mach	763	30.7	IEEE	741	29.8
50	Mitsubishi Electric Corp	736	1512	48.7	IEEE	736	48.7	ACM-Assoc Comput Mach	242	16.0
51	Sharp Corp	698	2639	26.4	IEEE	698	26.4	SID-Society for Information Display	498	18.9
52	Commvault Systems Inc.	690	1005	68.7	IEEE	690	68.7	ACM-Assoc Comput Mach	150	14.9
53	Imagination Technologies Gr	683	2050	33.3	IEEE	683	33.3	ACM-Assoc Comput Mach	419	20.4
54	LG Electronics Inc.	660	2094	31.5	IEEE	660	31.5	Audio Eng Soc	328	15.7
55	Fuji Film Holdings Corp	633	1902	33.3	IEEE	633	33.3	ACM-Assoc Comput Mach	465	24.4
56	Netapp Inc	628	2551	24.6	ACM-Assoc Comput Mach	993	38.9	IEEE	628	24.6
57	Koninklijke Philips N.V.	611	1528	40.0	IEEE	611	40.0	RELX Group	135	8.8
58	Massachusetts Institute of Te	591	1545	38.3	IEEE	591	38.3	ACM-Assoc Comput Mach	222	14.4
59	Silverbrook Pty Ltd	581	1468	39.6	IEEE	581	39.6	RELX Group	290	19.8
60	Conversant Intellectual Prope	578	807	71.6	IEEE	578	71.6	Joint IEEE and ACM	52	6.4
61	Irobot Corp	576	1067	54.0	IEEE	576	54.0	SPIE-Int Soc Opt Engineering	231	21.6
62	National Instruments Corp.	576	1048	55.0	IEEE	576	55.0	ACM-Assoc Comput Mach	130	12.4
63	Ericsson	552	1544	35.8	IEEE	552	35.8	3GPP General Partnership Project Standards Body	218	14.1
64	Arm Holdings Plc	546	1003	54.4	IEEE	546	54.4	Joint IEEE and ACM	164	16.4
65	University of California	542	2799	19.4	IEEE	542	19.4	RELX Group	374	13.4
66	CREATIVE KINGDOMS LL	537	1600	33.6	IEEE	537	33.6	ACM-Assoc Comput Mach	437	27.3
67	IP RESERVOIR LLC	516	1068	48.3	IEEE	516	48.3	ACM-Assoc Comput Mach	205	19.2
68	Texas A&M University	515	592	87.0	IEEE	515	87.0	Am Physical Soc	13	2.2
69	General Electric Company	512	1336	38.3	IEEE	512	38.3	RELX Group	121	9.1
70	NVIDIA Corp.	509	1289	39.5	IEEE	509	39.5	ACM-Assoc Comput Mach	404	31.3
71	NXP Semiconductors NV	499	885	56.4	IEEE	499	56.4	Joint IEEE and ACM	145	16.4
72	Tela Innovations inc	494	1317	37.5	IEEE	494	37.5	Joint IEEE and ACM	346	26.3
73	Citrix Systems Inc	483	1577	30.6	IEEE	483	30.6	ACM-Assoc Comput Mach	243	15.4
74	Ignis Innovation Inc	480	641	74.9	IEEE	480	74.9	SID-Society for Information Display	62	9.7
75	Semiconductor Energy Labor	478	7347	6.5	SID-Society for Information Display	2998	40.8	AVS-AIP Am Inst Physics	875	11.9
76	Raytheon Co.	465	1111	41.9	IEEE	465	41.9	ACM-Assoc Comput Mach	88	7.9
77	SRI International	458	923	49.6	IEEE	458	49.6	ACM-Assoc Comput Mach	65	7.0
78	ABB Ltd	442	665	66.5	IEEE	442	66.5	IVI Foundation/SCPI Consortium	93	14.0
79	Digimarc Corp.	417	1180	35.3	IEEE	417	35.3	ACM-Assoc Comput Mach	164	13.9
80	Technicolor SA	414	835	49.6	IEEE	414	49.6	ACM-Assoc Comput Mach	44	5.3

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81	Washington University in St.	414	848	48.8	IEEE	414	48.8	ACM-Assoc Comput Mach	108	12.7
82	EXEGY INC	406	798	50.9	IEEE	406	50.9	ACM-Assoc Comput Mach	141	17.7
83	North American Communicat	406	1306	31.1	Joint IEEE and ACM	499	38.2	IEEE	406	31.1
84	Verizon Communications Inc	379	1443	26.3	IEEE	379	26.3	ACM-Assoc Comput Mach	267	18.5
85	Math Works Inc (The)	370	863	42.9	IEEE	370	42.9	ACM-Assoc Comput Mach	215	24.9
86	QST Holdings Llc	368	617	59.6	IEEE	368	59.6	Joint IEEE and ACM	72	11.7
87	SanDisk Corp.	362	964	37.6	IEEE	362	37.6	ACM-Assoc Comput Mach	99	10.3
88	Symantec Corp.	359	1529	23.5	IEEE	359	23.5	ACM-Assoc Comput Mach	348	22.8
89	Lenovo Group Ltd	356	688	51.7	IEEE	356	51.7	ACM-Assoc Comput Mach	79	11.5
90	Nippon Telegraph & Telepho	356	1150	31.0	IEEE	356	31.0	IEICE-Inst Elec Info Comm Eng	126	11.0
91	Applied Materials Inc.	350	589	59.4	IEEE	350	59.4	RELX Group	40	6.8
92	Electronics and Telecommuni	349	757	46.1	IEEE	349	46.1	ACM-Assoc Comput Mach	89	11.8
93	Dell Inc	348	864	40.3	IEEE	348	40.3	ACM-Assoc Comput Mach	151	17.5
94	Intellectual Ventures Manage	347	948	36.6	IEEE	347	36.6	ACM-Assoc Comput Mach	223	23.5
95	Rovi Corporation	341	1158	29.4	IEEE	341	29.4	ACM-Assoc Comput Mach	79	6.8
96	Lockheed Martin Corp.	340	777	43.8	IEEE	340	43.8	RELX Group	67	8.6
97	INDIVIDUAL PATENTER	338	1784	18.9	IEEE	338	18.9	ACM-Assoc Comput Mach	220	12.3
98	CA Inc	334	823	40.6	IEEE	334	40.6	ACM-Assoc Comput Mach	150	18.2
99	Amazon.com Inc.	332	1439	23.1	ACM-Assoc Comput Mach	477	33.1	IEEE	332	23.1
100	Schneider Electric S.A.	328	2397	13.7	I S A-INSTRUM SYS AUTOMATION SOC	409	17.1	IEEE	328	13.7

## Appendix B: Top 100 Organizations That Cite IEEE; (1997-2015 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	21727	65471	33.2	IEEE	21727	33.2	ACM-Assoc Comput Mach	18073	27.6
2	International Business Machi	11763	36755	32.0	IEEE	11763	32.0	ACM-Assoc Comput Mach	8850	24.1
3	Apple Inc	4712	12079	39.0	IEEE	4712	39.0	ACM-Assoc Comput Mach	2240	18.5
4	Google Inc.	4594	15170	30.3	IEEE	4594	30.3	ACM-Assoc Comput Mach	4387	28.9
5	Oracle Corporation	3629	13379	27.1	ACM-Assoc Comput Mach	4636	34.7	IEEE	3629	27.1
6	Hewlett-Packard Co	2575	6814	37.8	IEEE	2575	37.8	ACM-Assoc Comput Mach	1464	21.5
7	Intel Corporation	2502	6233	40.1	IEEE	2502	40.1	ACM-Assoc Comput Mach	1270	20.4
8	Nokia Corp	2388	5619	42.5	IEEE	2388	42.5	ACM-Assoc Comput Mach	576	10.3
9	Siemens Aktiengesellschaft	2240	4968	45.1	IEEE	2240	45.1	RELX Group	517	10.4
10	Tessera Technologies Inc.	2197	3537	62.1	IEEE	2197	62.1	RELX Group	271	7.7
11	Xerox Corp	2076	6434	32.3	IEEE	2076	32.3	ACM-Assoc Comput Mach	1393	21.7
12	Ricoh Co. Ltd.	2062	4388	47.0	IEEE	2062	47.0	ACM-Assoc Comput Mach	743	16.9
13	AT&T Inc	1862	4874	38.2	IEEE	1862	38.2	ACM-Assoc Comput Mach	663	13.6
14	Qualcomm Inc	1814	3774	48.1	IEEE	1814	48.1	RELX Group	235	6.2
15	Adobe Systems Inc.	1798	4532	39.7	IEEE	1798	39.7	ACM-Assoc Comput Mach	1534	33.8
16	Cadence Design Systems Inc	1774	3703	47.9	IEEE	1774	47.9	Joint IEEE and ACM	1045	28.2
17	Avago Technologies Ltd	1691	2998	56.4	IEEE	1691	56.4	Joint IEEE and ACM	426	14.2
18	Sap SE	1676	7786	21.5	ACM-Assoc Comput Mach	2894	37.2	IEEE	1676	21.5
19	Digimarc Corp.	1617	4030	40.1	IEEE	1617	40.1	SPIE-Int Soc Opt Engineering	534	13.3
20	Koninklijke Philips N.V.	1479	4653	31.8	IEEE	1479	31.8	RELX Group	539	11.6
21	Cognex Corp.	1471	3329	44.2	IEEE	1471	44.2	RELX Group	652	19.6
22	Sony Corp	1470	2984	49.3	IEEE	1470	49.3	ACM-Assoc Comput Mach	445	14.9
23	Synopsys Inc.	1406	4749	29.6	IEEE	1406	29.6	SPIE-Int Soc Opt Engineering	1254	26.4
24	NEC Corp	1362	3009	45.3	IEEE	1362	45.3	ACM-Assoc Comput Mach	381	12.7
25	Applied Materials Inc.	1230	2086	59.0	IEEE	1230	59.0	AVS-AIP Am Inst Physics	170	8.1
26	Irobot Corp	1200	2090	57.4	IEEE	1200	57.4	SPIE-Int Soc Opt Engineering	354	16.9
27	Cisco Systems Inc.	1059	4112	25.8	IEEE	1059	25.8	Internet Soc/IETF-Internet Eng Task Force	851	20.7
28	PHOENIX SOLUTIONS INC	1057	3113	34.0	IEEE	1057	34.0	ISCA (International Speech Communication Association)	422	13.6
29	General Electric Company	1051	2600	40.4	IEEE	1051	40.4	RELX Group	273	10.5
30	Blackberry Ltd.	1039	2805	37.0	IEEE	1039	37.0	ACM-Assoc Comput Mach	247	8.8
31	Honeywell International Inc.	1006	1903	52.9	IEEE	1006	52.9	RELX Group	175	9.2
32	Accenture Ltd.	989	3021	32.7	IEEE	989	32.7	ACM-Assoc Comput Mach	508	16.8
33	MicroUnity Systems Enginee	941	1483	63.5	IEEE	941	63.5	Joint IEEE and ACM	140	9.4
34	Nuance Communications Inc	916	2490	36.8	IEEE	916	36.8	ISCA (International Speech Communication Association)	309	12.4
35	Raytheon Co.	905	1767	51.2	IEEE	905	51.2	SPIE-Int Soc Opt Engineering	148	8.4
36	LG Electronics Inc.	888	1842	48.2	IEEE	888	48.2	Audio Eng Soc	139	7.5
37	Dolby Laboratories Inc	863	1766	48.9	IEEE	863	48.9	Audio Eng Soc	380	21.5
38	Panasonic Corporation	850	1651	51.5	IEEE	850	51.5	ACM-Assoc Comput Mach	108	6.5
39	Commvault Systems Inc.	805	1147	70.2	IEEE	805	70.2	ACM-Assoc Comput Mach	167	14.6

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
40	Honda Motor Co. Ltd.(Honda	805	1722	46.7	IEEE	805	46.7	RELX Group	212	12.3
41	ParkerVision Inc	792	1700	46.6	IEEE	792	46.6	IET/IEE	488	28.7
42	Verizon Communications Inc	759	3050	24.9	IEEE	759	24.9	ACM-Assoc Comput Mach	485	15.9
43	Amazon.com Inc.	757	4369	17.3	ACM-Assoc Comput Mach	1312	30.0	IEEE	757	17.3
44	HRL Laboratories LLC	749	1550	48.3	IEEE	749	48.3	RELX Group	165	10.6
45	Motorola Solutions Inc.	735	1064	69.1	IEEE	735	69.1	Joint IEEE and ACM	38	3.6
46	STMicroelectronics	733	1182	62.0	IEEE	733	62.0	RELX Group	68	5.8
47	NVIDIA Corp.	703	2487	28.3	ACM-Assoc Comput Mach	951	38.2	IEEE	703	28.3
48	Mitsubishi Electric Corp	675	1497	45.1	IEEE	675	45.1	ACM-Assoc Comput Mach	345	23.0
49	Canon Inc	668	1569	42.6	IEEE	668	42.6	ACM-Assoc Comput Mach	185	11.8
50	Fujitsu Limited	660	1657	39.8	IEEE	660	39.8	Joint IEEE and ACM	298	18.0
51	BT Group PLC	656	1337	49.1	IEEE	656	49.1	RELX Group	112	8.4
52	Ericsson	654	1899	34.4	IEEE	654	34.4	Internet Soc/IETF-Internet Eng Task Force	225	11.8
53	Texas Instruments Inc	645	928	69.5	IEEE	645	69.5	Joint IEEE and ACM	47	5.1
54	Eastman Kodak Company	642	1451	44.2	IEEE	642	44.2	RELX Group	158	10.9
55	eBay Inc	601	3781	15.9	IEEE	601	15.9	ACM-Assoc Comput Mach	429	11.3
56	Advanced Micro Devices Inc	600	1289	46.5	IEEE	600	46.5	ACM-Assoc Comput Mach	217	16.8
57	Sharp Corp	583	1244	46.9	IEEE	583	46.9	ACM-Assoc Comput Mach	126	10.1
58	Columbia University	571	1726	33.1	IEEE	571	33.1	ACM-Assoc Comput Mach	272	15.8
59	Pelican Imaging Corporation	570	1246	45.7	IEEE	570	45.7	SPIE-Int Soc Opt Engineering	249	20.0
60	Boeing Co. (The)	551	1572	35.1	IEEE	551	35.1	RELX Group	207	13.2
61	Seiko Epson Corporation	532	1046	50.9	IEEE	532	50.9	ACM-Assoc Comput Mach	116	11.1
62	Massachusetts Institute of Te	515	2190	23.5	IEEE	515	23.5	RELX Group	246	11.2
63	Citrix Systems Inc	512	1663	30.8	IEEE	512	30.8	ACM-Assoc Comput Mach	297	17.9
64	Xilinx Inc.	509	790	64.4	IEEE	509	64.4	Joint IEEE and ACM	133	16.8
65	Level 3 Communications	499	2118	23.6	ACM-Assoc Comput Mach	624	29.5	IEEE	499	23.6
66	Intellectual Ventures Manage	494	1190	41.5	IEEE	494	41.5	ACM-Assoc Comput Mach	193	16.2
67	Toshiba Corp	492	1256	39.2	IEEE	492	39.2	ACM-Assoc Comput Mach	143	11.4
68	Silicon Graphics Internationa	488	1540	31.7	IEEE	488	31.7	ACM-Assoc Comput Mach	454	29.5
69	Hitachi Ltd	487	1881	25.9	IEEE	487	25.9	ACM-Assoc Comput Mach	297	15.8
70	Lockheed Martin Corp.	476	1078	44.2	IEEE	476	44.2	RELX Group	114	10.6
71	Samsung Electronics Co Ltd	473	1117	42.3	IEEE	473	42.3	ACM-Assoc Comput Mach	120	10.7
72	EMC Corp.	466	1751	26.6	ACM-Assoc Comput Mach	532	30.4	IEEE	466	26.6
73	University of California	461	3042	15.2	IEEE	461	15.2	RELX Group	399	13.1
74	Tela Innovations inc	454	1583	28.7	SPIE-Int Soc Opt Engineering	595	37.6	IEEE	454	28.7
75	Georgia Institute of Technolo	449	612	73.4	IEEE	449	73.4	ACM-Assoc Comput Mach	44	7.2
76	Mentor Graphics Corp.	449	1550	29.0	SPIE-Int Soc Opt Engineering	656	42.3	IEEE	449	29.0
77	NOMADIX INC	449	1749	25.7	IEEE	449	25.7	Network Working Group RFC	288	16.5
78	Yahoo Inc	449	3330	13.5	ACM-Assoc Comput Mach	992	29.8	IEEE	449	13.5
79	Intuitive Surgical Inc.	409	793	51.6	IEEE	409	51.6	SAGES-Society of American Gastrointestinal and Endoscopic	61	7.7
80	Technicolor SA	400	913	43.8	IEEE	400	43.8	SPIE-Int Soc Opt Engineering	97	10.6

## Appendix B: Top 100 Organizations That Cite IEEE; (1997-2015 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	Walt Disney Co.	399	2041	19.5	ACM-Assoc Comput Mach	1146	56.1	IEEE	399	19.5
82	AVISTAR COMMUNICATI	386	754	51.2	IEEE	386	51.2	ACM-Assoc Comput Mach	228	30.2
83	Bosch (Robert) GmbH	384	3083	12.5	IEEE	384	12.5	Springer/Sp. Wien/Springer-Verlag/Kluwer	279	9.0
84	JPMorgan	381	4200	9.1	Source Media	909	21.6	ACS-Am Chem Soc	419	10.0
85	Netapp Inc	381	2778	13.7	ACM-Assoc Comput Mach	1329	47.8	The USENIX Association	512	18.4
86	INDIVIDUAL PATENTER	373	1559	23.9	IEEE	373	23.9	ACM-Assoc Comput Mach	224	14.4
87	Harris Corp.	372	659	56.4	IEEE	372	56.4	Internet Soc/IETF-Internet Eng Task Force	74	11.2
88	Fraunhofer Gesellschaft	363	840	43.2	IEEE	363	43.2	Audio Eng Soc	143	17.0
89	PACT XPP TECHNOLOGIE	361	633	57.0	IEEE	361	57.0	Joint IEEE and ACM	65	10.3
90	Tabula Inc	356	985	36.1	IEEE	356	36.1	ACM-Assoc Comput Mach	340	34.5
91	Facebookl Inc	354	1533	23.1	ACM-Assoc Comput Mach	449	29.3	IEEE	354	23.1
92	United States Navy	340	717	47.4	IEEE	340	47.4	SPIE-Int Soc Opt Engineering	64	8.9
93	National Instruments Corp.	331	590	56.1	IEEE	331	56.1	ACM-Assoc Comput Mach	58	9.8
94	Math Works Inc (The)	321	691	46.5	IEEE	321	46.5	ACM-Assoc Comput Mach	124	17.9
95	The Invention Science Fund	319	3067	10.4	RELX Group	412	13.4	IEEE	319	10.4
96	Cypress Semiconductor Corp.	314	476	66.0	IEEE	314	66.0	Joint IEEE and ACM	68	14.3
97	YANICKLO TECHNOLOG	306	1705	17.9	ACM-Assoc Comput Mach	673	39.5	IEEE	306	17.9
98	SRI International	303	626	48.4	IEEE	303	48.4	RELX Group	43	6.9
99	Fuji Film Holdings Corp	300	1213	24.7	ACM-Assoc Comput Mach	420	34.6	IEEE	300	24.7
100	Magna International Inc.	295	485	60.8	IEEE	295	60.8	SAE-Society of Automobile Engineers	27	5.6



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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>Diagnosis/Surgery/Medical Instruments</i>										
1	Medtronic Inc	7789	98119	7.9	RELX Group	18895	19.3	Lippincott Williams & Wilkins	15400	15.7
2	Dexcom Inc	3186	56037	5.7	RELX Group	16011	28.6	Am Diabetese Assoc	5879	10.5
3	Boston Scientific Corp.	3032	61855	4.9	RELX Group	21298	34.4	Lippincott Williams & Wilkins	5803	9.4
4	Abbott Laboratories	2031	48680	4.2	RELX Group	15608	32.1	ACS-Am Chem Soc	6645	13.7
5	The Invention Science Fund	1555	10233	15.2	IEEE	1555	15.2	RELX Group	1218	11.9
6	Siemens Aktiengesellschaft	1291	4242	30.4	IEEE	1291	30.4	RELX Group	548	12.9
7	Intuitive Surgical Inc.	1175	2684	43.8	IEEE	1175	43.8	SAGES-Society of American Gastrointestinal and Endoscopic	291	10.8
8	Partners HealthCare Systems	1124	14763	7.6	OSA-Opt Soc Amer	3893	26.4	RELX Group	2433	16.5
9	Massachusetts Institute of Te	927	4659	19.9	RELX Group	1104	23.7	IEEE	927	19.9
10	General Electric Company	921	4816	19.1	IEEE	921	19.1	RELX Group	733	15.2
11	Smith & Nephew Plc.	867	9956	8.7	RELX Group	2423	24.3	Lippincott Williams & Wilkins	1172	11.8
12	Koninklijke Philips N.V.	849	7350	11.6	Lippincott Williams & Wilkins	1263	17.2	RELX Group	899	12.2
13	Johnson & Johnson	787	24721	3.2	RELX Group	6400	25.9	Lippincott Williams & Wilkins	3085	12.5
14	St. Jude Medical Inc.	739	16974	4.4	RELX Group	4165	24.5	Lippincott Williams & Wilkins	2733	16.1
15	Masimo Corp	720	1707	42.2	IEEE	720	42.2	Lippincott Williams & Wilkins	177	10.4
16	GUIDED THERAPY SYSTE	504	1311	38.4	IEEE	504	38.4	RELX Group	207	15.8
17	Cleveland Clinic (and Found	390	2216	17.6	RELX Group	534	24.1	IEEE	390	17.6
18	BIOCONTROL MEDICAL L	383	1399	27.4	IEEE	383	27.4	Lippincott Williams & Wilkins	225	16.1
19	Sotera Wireless	370	749	49.4	IEEE	370	49.4	Springer/Sp. Wien/Springer-Verlag/Kluwer	151	20.2
20	University of California	345	5553	6.2	RELX Group	1126	20.3	Lippincott Williams & Wilkins	531	9.6
21	MIRAMAR LABS INC	344	958	35.9	IEEE	344	35.9	IOP Publishing	118	12.3
22	Stanford University	337	7708	4.4	RELX Group	1344	17.4	Lippincott Williams & Wilkins	632	8.2
23	Stryker Corp.	331	3666	9.0	RELX Group	717	19.6	Lippincott Williams & Wilkins	424	11.6
24	Sorin SPA	328	5760	5.7	RELX Group	1586	27.5	Blackwell Futura	779	13.5
25	IWALK INC	308	931	33.1	IEEE	308	33.1	RELX Group	218	23.4
26	VIVAQUANT LLC	302	589	51.3	IEEE	302	51.3	RELX Group	83	14.1
27	Medispectra Inc	281	755	37.2	IEEE	281	37.2	RELX Group	158	20.9
28	University of Nebraska	255	1204	21.2	IEEE	255	21.2	RELX Group	192	15.9
29	BRAINGATE CO LLC	251	663	37.9	IEEE	251	37.9	RELX Group	101	15.2
30	KONA MEDICAL INC	250	1650	15.2	RELX Group	460	27.9	IEEE	250	15.2
31	University of Illinois	245	3928	6.2	ACS-Am Chem Soc	593	15.1	RELX Group	510	13.0
32	Bonutti Technologies LLC	243	1447	16.8	Lippincott Williams & Wilkins	313	21.6	IEEE	243	16.8
33	University of Texas	231	4431	5.2	RELX Group	896	20.2	Lippincott Williams & Wilkins	505	11.4
34	BUTTERFLY NETWORK I	212	270	78.5	IEEE	212	78.5	Acoust Soc Amer/Amer Inst Physics	28	10.4
35	University of Washington	208	2194	9.5	RELX Group	380	17.3	IEEE	208	9.5
36	Concormis Inc	207	6420	3.2	Lippincott Williams & Wilkins	982	15.3	RELX Group	868	13.5
37	NYXOAH SA	199	521	38.2	IEEE	199	38.2	RELX Group	61	11.7
38	SRI International	196	308	63.6	IEEE	196	63.6	RELX Group	25	8.1
39	Columbia University	191	1378	13.9	RELX Group	334	24.2	IEEE	191	13.9

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40	Novartis AG	189	2427	7.8	RELX Group	605	24.9	OSA-Opt Soc Amer	198	8.2
41	Google Inc.	188	389	48.3	IEEE	188	48.3	RELX Group	50	12.9
42	St. Louis University	185	1195	15.5	Lippincott Williams & Wilkins	241	20.2	Am Assoc Neurological Surgeons	202	16.9
43	INDIVIDUAL PATENTER	183	5507	3.3	RELX Group	1021	18.5	Lippincott Williams & Wilkins	774	14.1
44	Ossur hf	181	622	29.1	IEEE	181	29.1	RELX Group	176	28.3
45	University of Pennsylvania	177	3370	5.3	RELX Group	571	16.9	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	371	11.0
46	CLINICAL DECISION SUPP	176	819	21.5	RELX Group	202	24.7	IEEE	176	21.5
47	HIGHLAND INSTRUMENT	175	279	62.7	IEEE	175	62.7	RELX Group	19	6.8
48	Proteus Biomedical Inc	170	734	23.2	IEEE	170	23.2	RELX Group	151	20.6
49	California Institute of Techno	167	1478	11.3	RELX Group	273	18.5	IEEE	167	11.3
50	University of Florida	165	1070	15.4	RELX Group	235	22.0	IEEE	165	15.4
51	Lockheed Martin Corp.	164	1642	10.0	RELX Group	185	11.3	IEEE	164	10.0
52	University of Michigan	163	3499	4.7	RELX Group	839	24.0	Lippincott Williams & Wilkins	285	8.1
53	NEUROVISTA CORP	150	1120	13.4	RELX Group	335	29.9	Blackwell Futura	152	13.6
54	Spectrum Dynamics Llc	146	429	34.0	IEEE	146	34.0	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	43	10.0
55	Impulse Dynamics N.V.	145	1957	7.4	RELX Group	393	20.1	Lippincott Williams & Wilkins	289	14.8
56	Hitachi Ltd	143	596	24.0	IEEE	143	24.0	RELX Group	63	10.6
57	Asahi Kasei Corp.	142	1596	8.9	Lippincott Williams & Wilkins	543	34.0	RELX Group	342	21.4
58	Cynosure Inc	142	2198	6.5	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	387	17.6	SPIE-Int Soc Opt Engineering	335	15.2
59	Cirrus Logic Inc.	140	227	61.7	IEEE	140	61.7	Acoust Soc Amer/Amer Inst Physics	33	14.5
60	Johns Hopkins University	138	1264	10.9	RELX Group	220	17.4	IEEE	138	10.9
61	University of Pittsburgh	138	1274	10.8	RELX Group	330	25.9	IEEE	138	10.8
62	ELECTROCORE LLC	137	484	28.3	IEEE	137	28.3	RELX Group	58	12.0
63	Sonova Holding AG	137	790	17.3	IEEE	137	17.3	RELX Group	130	16.5
64	ALGODYNE LTD	136	248	54.8	IEEE	136	54.8	Springer/Sp. Wien/Springer-Verlag/Kluwer	40	16.1
65	AngioDynamics Inc.	133	1902	7.0	RELX Group	422	22.2	Lippincott Williams & Wilkins	168	8.8
66	University of Wisconsin	133	1814	7.3	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	247	13.6	RELX Group	201	11.1
67	BIOSENSORS INTERNATI	130	494	26.3	IEEE	130	26.3	Soc Nucl Med	56	11.3
68	University Health Network	130	295	44.1	IEEE	130	44.1	RELX Group	43	14.6
69	Georgia Institute of Technolo	129	883	14.6	RELX Group	167	18.9	IEEE	129	14.6
70	Vanderbilt University	121	989	12.2	RELX Group	180	18.2	IEEE	121	12.2
71	University of Minnesota (The	120	1246	9.6	RELX Group	301	24.2	Lippincott Williams & Wilkins	168	13.5
72	Duke University	119	969	12.3	RELX Group	199	20.5	IEEE	119	12.3
73	Bosch (Robert) GmbH	116	1177	9.9	IEEE	116	9.9	Springer/Sp. Wien/Springer-Verlag/Kluwer	112	9.5
74	Purdue University	115	1432	8.0	RELX Group	343	24.0	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	157	11.0
75	Nevro Corp	112	1194	9.4	Lippincott Williams & Wilkins	294	24.6	Blackwell Futura	179	15.0
76	Varian Medical Systems Inc.	110	1424	7.7	RELX Group	326	22.9	Am Assoc Physicists Med/Am Inst Physics	269	18.9
77	Mindray Medical Internation	109	148	73.6	IEEE	109	73.6	RELX Group	12	8.1
78	Washington University in St.	109	1289	8.5	RELX Group	235	18.2	Lippincott Williams & Wilkins	156	12.1
79	Case Western Reserve Univer	108	430	25.1	IEEE	108	25.1	Lippincott Williams & Wilkins	66	15.3
80	International Business Machi	108	206	52.4	IEEE	108	52.4	RELX Group	11	5.3

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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	Fuji Film Holdings Corp	105	358	29.3	IEEE	105	29.3	RELX Group	60	16.8
82	Nuvasive Inc	104	4162	2.5	Lippincott Williams & Wilkins	2741	65.9	RELX Group	571	13.7
83	Virginia Tech University	102	644	15.8	RELX Group	128	19.9	IEEE	102	15.8
84	Mayo Foundation for Medica	101	1495	6.8	RELX Group	413	27.6	Lippincott Williams & Wilkins	187	12.5
85	Bard (C.R.) Inc	98	12422	0.8	Lippincott Williams & Wilkins	3394	27.3	RELX Group	3254	26.2
86	HEMOSONICS LLC	98	208	47.1	IEEE	98	47.1	RELX Group	30	14.4
87	Bayer AG	96	1320	7.3	RELX Group	276	20.9	Lippincott Williams & Wilkins	209	15.8
88	Northwestern University	95	1485	6.4	RELX Group	301	20.3	ACS-Am Chem Soc	194	13.1
89	Abiomed Inc	92	331	27.8	Lippincott Williams & Wilkins	97	29.3	IEEE	92	27.8
90	SICEL TECHNOLOGIES IN	92	539	17.1	RELX Group	137	25.4	IEEE	92	17.1
91	North Carolina State Universi	89	630	14.1	RELX Group	169	26.8	IEEE	89	14.1
92	DUNE MEDICAL DEVICES	88	150	58.7	IEEE	88	58.7	RELX Group	18	12.0
93	TEAM MEDICAL LLC	88	150	58.7	IEEE	88	58.7	SIAM PUBLICATIONS	16	10.7
94	Hewlett-Packard Co	87	225	38.7	IEEE	87	38.7	RELX Group	44	19.6
95	Olympus Corp.	87	1035	8.4	RELX Group	323	31.2	IEEE	87	8.4
96	MAUI IMAGING INC	86	162	53.1	IEEE	86	53.1	RELX Group	31	19.1
97	MEVION MEDICAL SYSTE	86	309	27.8	IEEE	86	27.8	RELX Group	69	22.3
98	Lawrence Livermore National	83	121	68.6	IEEE	83	68.6	RELX Group	12	9.9
99	Cochlear Ltd	81	483	16.8	Lippincott Williams & Wilkins	116	24.0	RELX Group	82	17.0
100	Toshiba Corp	81	573	14.1	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	112	19.5	IEEE	81	14.1

## Appendix B: Top 100 Organizations That Cite IEEE; (1997-2015 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.	13367	28364	47.1	IEEE	13367	47.1	RELX Group	4602	16.2
2	International Business Machi	3454	8528	40.5	IEEE	3454	40.5	ACM-Assoc Comput Mach	1408	16.5
3	SanDisk Corp.	3201	5213	61.4	IEEE	3201	61.4	IEEE/JPN Soc App Phys	472	9.1
4	Avago Technologies Ltd	2364	2884	82.0	IEEE	2364	82.0	ACM-Assoc Comput Mach	121	4.2
5	Western Digital Corp.	2285	4635	49.3	IEEE	2285	49.3	AVS-AIP Am Inst Physics	878	18.9
6	Macronix International Co. L	2259	3821	59.1	IEEE	2259	59.1	IEEE/JPN Soc App Phys	665	17.4
7	Conversant Intellectual Prope	2141	2593	82.6	IEEE	2141	82.6	IEEE/JPN Soc App Phys	177	6.8
8	Seagate Technology Plc	1849	4496	41.1	IEEE	1849	41.1	AVS-AIP Am Inst Physics	924	20.6
9	Rambus Inc.	1681	2879	58.4	IEEE	1681	58.4	JEDEC Semiconductor Standards Organization	236	8.2
10	Toshiba Corp	1622	3408	47.6	IEEE	1622	47.6	AVS-AIP Am Inst Physics	403	11.8
11	Innovative Silicon SA	1580	1959	80.7	IEEE	1580	80.7	RELX Group	84	4.3
12	Semiconductor Energy Labor	1280	13801	9.3	SID-Society for Information Display	4851	35.1	AVS-AIP Am Inst Physics	1706	12.4
13	Apple Inc	1220	1874	65.1	IEEE	1220	65.1	Joint IEEE and ACM	105	5.6
14	Texas Instruments Inc	1194	1711	69.8	IEEE	1194	69.8	United Business Media/UBM Tech	137	8.0
15	Intel Corporation	1152	2519	45.7	IEEE	1152	45.7	ACM-Assoc Comput Mach	345	13.7
16	ZENO SEMICONDUCTOR I	1074	1411	76.1	IEEE	1074	76.1	IEEE/JPN Soc App Phys	270	19.1
17	Hitachi Ltd	1036	2425	42.7	IEEE	1036	42.7	ACM-Assoc Comput Mach	193	8.0
18	Cypress Semiconductor Corp.	980	1205	81.3	IEEE	980	81.3	AVS-AIP Am Inst Physics	64	5.3
19	Innovative Network Corporat	883	1198	73.7	IEEE	883	73.7	IEEE/JPN Soc App Phys	84	7.0
20	Oracle Corporation	770	2698	28.5	ACM-Assoc Comput Mach	1068	39.6	IEEE	770	28.5
21	Netapp Inc	694	2642	26.3	ACM-Assoc Comput Mach	1096	41.5	IEEE	694	26.3
22	Samsung Electronics Co Ltd	567	1493	38.0	IEEE	567	38.0	AVS-AIP Am Inst Physics	193	12.9
23	Hewlett-Packard Co	511	1573	32.5	IEEE	511	32.5	ACM-Assoc Comput Mach	286	18.2
24	Fujitsu Limited	491	905	54.3	IEEE	491	54.3	AVS-AIP Am Inst Physics	83	9.2
25	Mitsubishi Electric Corp	490	834	58.8	IEEE	490	58.8	ECMA International	105	12.6
26	TDK Corporation	488	1417	34.4	IEEE	488	34.4	AVS-AIP Am Inst Physics	379	26.7
27	STMicroelectronics	484	699	69.2	IEEE	484	69.2	RELX Group	41	5.9
28	Microsoft Corporation	480	2236	21.5	ACM-Assoc Comput Mach	807	36.1	IEEE	480	21.5
29	MONOLITHIC 3D INC	475	857	55.4	IEEE	475	55.4	IEEE/JPN Soc App Phys	93	10.9
30	Infineon Technologies AG	439	692	63.4	IEEE	439	63.4	IEEE/JPN Soc App Phys	72	10.4
31	Synopsys Inc.	423	861	49.1	IEEE	423	49.1	AVS-AIP Am Inst Physics	129	15.0
32	Sony Corp	405	923	43.9	IEEE	405	43.9	INST PURE APPLIED PHYSICS	56	6.1
33	Avid Technology Inc.	401	770	52.1	IEEE	401	52.1	ACM-Assoc Comput Mach	247	32.1
34	BTG Plc.	388	513	75.6	IEEE	388	75.6	IEEE/JPN Soc App Phys	52	10.1
35	Commvault Systems Inc.	375	543	69.1	IEEE	375	69.1	ACM-Assoc Comput Mach	94	17.3
36	NXP Semiconductors NV	373	543	68.7	IEEE	373	68.7	Joint IEEE and ACM	32	5.9
37	Marvell Technology Group Lt	356	483	73.7	IEEE	356	73.7	ECMA International	33	6.8
38	Qualcomm Inc	314	458	68.6	IEEE	314	68.6	Joint IEEE and ACM	26	5.7
39	EMC Corp.	304	1011	30.1	IEEE	304	30.1	ACM-Assoc Comput Mach	250	24.7

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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	Intertrust Technologies Corp	304	1861	16.3	ACM-Assoc Comput Mach	387	20.8	IEEE	304	16.3
41	Cirrus Logic Inc.	299	364	82.1	IEEE	299	82.1	RELX Group	12	3.3
42	NEC Corp	298	681	43.8	IEEE	298	43.8	AVS-AIP Am Inst Physics	96	14.1
43	QST Holdings Llc	280	469	59.7	IEEE	280	59.7	Joint IEEE and ACM	56	11.9
44	Microchip Technology Inc.	278	327	85.0	IEEE	278	85.0	Penton Media	21	6.4
45	DENSBITS TECHNOLOGIE	271	502	54.0	IEEE	271	54.0	Springer/Springer Wien/Springer-Verlag/Kluwer	39	7.8
46	Panasonic Corporation	269	926	29.0	IEEE	269	29.0	INST PURE APPLIED PHYSICS	104	11.2
47	Advanced Micro Devices Inc	258	716	36.0	IEEE	258	36.0	Joint IEEE and ACM	76	10.6
48	Taiwan Semiconductor Manu	229	312	73.4	IEEE	229	73.4	IEEE/JPN Soc App Phys	45	14.4
49	Xilinx Inc.	217	294	73.8	IEEE	217	73.8	Joint IEEE and ACM	27	9.2
50	Arm Holdings Plc	213	347	61.4	IEEE	213	61.4	Joint IEEE and ACM	56	16.1
51	Sharp Corp	209	509	41.1	IEEE	209	41.1	AVS-AIP Am Inst Physics	63	12.4
52	Pioneer Corp.	205	688	29.8	SPIE-Int Soc Opt Engineering	231	33.6	IEEE	205	29.8
53	NETLIST INC	173	797	21.7	IP.Com	251	31.5	JEDEC Semiconductor Standards Organization	206	25.8
54	Massachusetts Institute of Te	170	375	45.3	IEEE	170	45.3	AVS-AIP Am Inst Physics	49	13.1
55	SK Hynix Inc	170	227	74.9	IEEE	170	74.9	IEEE/JPN Soc App Phys	21	9.3
56	California Institute of Techno	169	283	59.7	IEEE	169	59.7	AAAS-Am Assoc Advancement Sci	18	6.4
57	Nantero Inc	168	2036	8.3	ACS-Am Chem Soc	552	27.1	AVS-AIP Am Inst Physics	393	19.3
58	Google Inc.	165	413	40.0	IEEE	165	40.0	ACM-Assoc Comput Mach	144	34.9
59	Crossbar Inc	163	647	25.2	IEEE	163	25.2	RELX Group	91	14.1
60	Intellectual Ventures Manage	163	171	95.3	IEEE	163	95.3	SPIE-Int Soc Opt Engineering	3	1.8
61	Microsemi Corp	161	216	74.5	IEEE	161	74.5	Cahners-Denver Pub	13	6.0
62	Nokia Corp	153	350	43.7	IEEE	153	43.7	ACM-Assoc Comput Mach	60	17.1
63	PACT XPP TECHNOLOGIE	152	265	57.4	IEEE	152	57.4	ACM-Assoc Comput Mach	24	9.1
64	Avalanche Technology Inc	142	645	22.0	AVS-AIP Am Inst Physics	197	30.5	IEEE	142	22.0
65	INDIVIDUAL PATENTER	126	248	50.8	IEEE	126	50.8	RELX Group	23	9.3
66	Cisco Systems Inc.	114	248	46.0	IEEE	114	46.0	ACM-Assoc Comput Mach	61	24.6
67	Soitec SA	109	136	80.1	IEEE	109	80.1	IET/IEE	7	5.1
68	Round Rock Research LLC	108	473	22.8	RELX Group	136	28.8	IEEE	108	22.8
69	NVIDIA Corp.	106	176	60.2	IEEE	106	60.2	ACM-Assoc Comput Mach	31	17.6
70	Tilera Corp	104	246	42.3	IEEE	104	42.3	Joint IEEE and ACM	93	37.8
71	Columbia University	100	270	37.0	IEEE	100	37.0	ACM-Assoc Comput Mach	47	17.4
72	Carnegie Mellon University	90	184	48.9	IEEE	90	48.9	AVS-AIP Am Inst Physics	69	37.5
73	Imation Corp.	90	209	43.1	IEEE	90	43.1	RELX Group	21	10.0
74	Industrial Technology Researc	90	154	58.4	IEEE	90	58.4	IEEE/JPN Soc App Phys	14	9.1
75	University of California	90	486	18.5	ACS-Am Chem Soc	125	25.7	IEEE	90	18.5
76	Koninklijke Philips N.V.	86	232	37.1	IEEE	86	37.1	AVS-AIP Am Inst Physics	17	7.3
77	Sap SE	83	246	33.7	IEEE	83	33.7	ACM-Assoc Comput Mach	27	11.0
78	Texas A&M University	83	104	79.8	IEEE	83	79.8	RELX Group	6	5.8
79	OPTICAL DEVICES LLC	82	165	49.7	IEEE	82	49.7	RELX Group	27	16.4
80	Cleversafe Inc	81	1122	7.2	Internet Soc/IETF-Internet Eng Task Force	770	68.6	ACM-Assoc Comput Mach	198	17.6

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	Motorola Solutions Inc.	81	136	59.6	IEEE	81	59.6	ACM-Assoc Comput Mach	7	5.1
82	Arizona State University	77	161	47.8	IEEE	77	47.8	RELX Group	17	10.6
83	Interuniversity MicroElectron	75	117	64.1	IEEE	75	64.1	Joint IEEE and ACM	7	6.0
84	Waratek	74	195	37.9	IEEE	74	37.9	ACM-Assoc Comput Mach	54	27.7
85	Siemens Aktiengesellschaft	72	142	50.7	IEEE	72	50.7	AVS-AIP Am Inst Physics	24	16.9
86	Kilopass Technologies Inc	70	70	100.0	IEEE	70	100.0			
87	Monolithic System Technolo	70	93	75.3	IEEE	70	75.3	SLDRAM Consortium	8	8.6
88	The Invention Science Fund	68	209	32.5	IEEE	68	32.5	MIT/MIT Press	38	18.2
89	BLUERISC INC	62	180	34.4	IEEE	62	34.4	Joint IEEE and ACM	50	27.8
90	Commissariat A L'Energie At	62	169	36.7	IEEE	62	36.7	AVS-AIP Am Inst Physics	31	18.3
91	Honeywell International Inc.	62	97	63.9	IEEE	62	63.9	Springer/Sp. Wien/Springer-Verlag/Kluwer	9	9.3
92	INVOICE TECHNOLOGY I	60	65	92.3	IEEE	60	92.3	AVS-AIP Am Inst Physics	5	7.7
93	Cadence Design Systems Inc	58	96	60.4	IEEE	58	60.4	Penton Media	20	20.8
94	Fuji Electric Holdings Co. Lt	58	145	40.0	IEEE	58	40.0	AVS-AIP Am Inst Physics	34	23.4
95	Hutchinson Technology Inc.	58	191	30.4	IEEE	58	30.4	RELX Group	39	20.4
96	Silicon Graphics Internationa	58	106	54.7	IEEE	58	54.7	ACM-Assoc Comput Mach	25	23.6
97	Seiko Epson Corporation	57	147	38.8	IEEE/JPN Soc App Phys	68	46.3	IEEE	57	38.8
98	Sulvolta Inc	52	115	45.2	IEEE	52	45.2	AVS-AIP Am Inst Physics	20	17.4
99	BAE Systems Plc.	49	51	96.1	IEEE	49	96.1	Joint IEEE and ACM	1	2.0
100	Intersil Corp.	49	58	84.5	IEEE	49	84.5	Springer/Sp. Wien/Springer-Verlag/Kluwer	6	10.3

## Appendix B: Top 100 Organizations That Cite IEEE; (1997-2015 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	Partners HealthCare Systems	3323	36869	9.0	OSA-Opt Soc Amer	13863	37.6	RELX Group	5381	14.6
2	Thermo Fisher Scientific Inc	1884	10371	18.2	RELX Group	3838	37.0	IEEE	1884	18.2
3	Cascade Microtech Inc.	1771	3242	54.6	IEEE	1771	54.6	Nature Publishing Group	642	19.8
4	Irobot Corp	1663	3157	52.7	IEEE	1663	52.7	SPIE-Int Soc Opt Engineering	544	17.2
5	Mentor Graphics Corp.	1609	1919	83.8	IEEE	1609	83.8	Joint IEEE and ACM	175	9.1
6	International Business Machi	1500	3790	39.6	IEEE	1500	39.6	ACM-Assoc Comput Mach	233	6.1
7	Microsoft Corporation	1278	3191	40.1	IEEE	1278	40.1	ACM-Assoc Comput Mach	758	23.8
8	Honeywell International Inc.	1146	3301	34.7	IEEE	1146	34.7	RELX Group	430	13.0
9	Texas Instruments Inc	1082	1412	76.6	IEEE	1082	76.6	Joint IEEE and ACM	54	3.8
10	Emerson Electric Co.	769	3315	23.2	IEEE	769	23.2	RELX Group	431	13.0
11	Siemens Aktiengesellschaft	731	2612	28.0	IEEE	731	28.0	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	476	18.2
12	General Electric Company	708	4905	14.4	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	796	16.2	US Dept of Energy	761	15.5
13	Applied Materials Inc.	700	1470	47.6	IEEE	700	47.6	AVS-AIP Am Inst Physics	168	11.4
14	Nokia Corp	677	1586	42.7	IEEE	677	42.7	3GPP General Partnership Project Standards Body	79	5.0
15	llumina Inc.	664	2949	22.5	IEEE	664	22.5	Royal Society of Chemistry	477	16.2
16	California Institute of Techno	613	5304	11.6	RELX Group	775	14.6	IEEE	613	11.6
17	Intel Corporation	567	1328	42.7	IEEE	567	42.7	RELX Group	89	6.7
18	ABB Ltd	566	853	66.4	IEEE	566	66.4	RELX Group	52	6.1
19	Avago Technologies Ltd	539	822	65.6	IEEE	539	65.6	Joint IEEE and ACM	44	5.4
20	Midtronics Inc.	516	1164	44.3	IEEE	516	44.3	RELX Group	225	19.3
21	Massachusetts Institute of Te	514	3109	16.5	IEEE	514	16.5	RELX Group	419	13.5
22	Qualcomm Inc	504	1148	43.9	IEEE	504	43.9	3GPP General Partnership Project Standards Body	195	17.0
23	Sanken Electric Co. Ltd.	490	662	74.0	IEEE	490	74.0	RELX Group	117	17.7
24	Apple Inc	488	982	49.7	IEEE	488	49.7	ACM-Assoc Comput Mach	121	12.3
25	University of Illinois	476	4906	9.7	AVS-AIP Am Inst Physics	729	14.9	RELX Group	725	14.8
26	Honda Motor Co. Ltd.(Honda	414	934	44.3	IEEE	414	44.3	RELX Group	109	11.7
27	Synopsys Inc.	414	514	80.5	IEEE	414	80.5	SPIE-Int Soc Opt Engineering	28	5.4
28	Schlumberger Ltd.	402	5987	6.7	soc of Exploration Geophysists	1445	24.1	Society of Petroleum Engineers	1034	17.3
29	Boeing Co. (The)	400	1314	30.4	IEEE	400	30.4	RELX Group	152	11.6
30	Intuitive Surgical Inc.	392	865	45.3	IEEE	392	45.3	SAGES-Society of American Gastrointestinal and Endoscopic	146	16.9
31	Cypress Semiconductor Corp.	388	539	72.0	IEEE	388	72.0	Joint IEEE and ACM	39	7.2
32	Stanford University	380	2720	14.0	IEEE	380	14.0	OSA-Opt Soc Amer	369	13.6
33	Agilent Technologies Inc	374	1326	28.2	IEEE	374	28.2	RELX Group	179	13.5
34	Hewlett-Packard Co	374	1410	26.5	IEEE	374	26.5	SPIE-Int Soc Opt Engineering	130	9.2
35	Schneider Electric S.A.	370	2556	14.5	IEEE	370	14.5	I S A-INSTRUM SYS AUTOMATION SOC	312	12.2
36	Marvell Technology Group Lt	358	407	88.0	IEEE	358	88.0	Bluetooth Special Interest Group	11	2.7
37	Koninklijke Philips N.V.	345	1748	19.7	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	379	21.7	IEEE	345	19.7
38	Ericsson	344	792	43.4	IEEE	344	43.4	3GPP General Partnership Project Standards Body	110	13.9
39	NXP Semiconductors NV	340	563	60.4	IEEE	340	60.4	RELX Group	49	8.7

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40	Abbott Laboratories	333	12701	2.6	RELX Group	3577	28.2	ACS-Am Chem Soc	3482	27.4
41	NEC Corp	331	730	45.3	IEEE	331	45.3	IEICE-Inst Elec Info Comm Eng	41	5.6
42	ParkerVision Inc	331	510	64.9	IEEE	331	64.9	IET/IEEE	50	9.8
43	Advantest Corp.	315	436	72.2	IEEE	315	72.2	AVS-AIP Am Inst Physics	23	5.3
44	Samsung Electronics Co Ltd	312	610	51.1	IEEE	312	51.1	RELX Group	54	8.9
45	Duke University	311	1444	21.5	IEEE	311	21.5	RELX Group	195	13.5
46	Infineon Technologies AG	309	472	65.5	IEEE	309	65.5	RELX Group	49	10.4
47	Lockheed Martin Corp.	307	1617	19.0	IEEE	307	19.0	RELX Group	191	11.8
48	Micron Technology Inc.	304	563	54.0	IEEE	304	54.0	AVS-AIP Am Inst Physics	38	6.7
49	University of Texas	303	2173	13.9	RELX Group	332	15.3	IEEE	303	13.9
50	Advanced Micro Devices Inc	293	647	45.3	IEEE	293	45.3	SPIE-Int Soc Opt Engineering	69	10.7
51	University of California	289	5673	5.1	RELX Group	869	15.3	ACS-Am Chem Soc	824	14.5
52	Georgia Institute of Technolo	288	930	31.0	IEEE	288	31.0	OSA-Opt Soc Amer	123	13.2
53	STMicronics	275	405	67.9	IEEE	275	67.9	RELX Group	49	12.1
54	Panasonic Corporation	273	947	28.8	IEEE	273	28.8	RELX Group	201	21.2
55	Cisco Systems Inc.	272	1237	22.0	Internet Soc/IETF-Internet Eng Task Force	388	31.4	IEEE	272	22.0
56	United States Navy	258	1615	16.0	IEEE	258	16.0	RELX Group	243	15.0
57	Fujitsu Limited	245	521	47.0	IEEE	245	47.0	Internet Soc/IETF-Internet Eng Task Force	31	6.0
58	Adaptix	244	363	67.2	IEEE	244	67.2	European Telecom Standards Institute (ETSI)	47	12.9
59	Analog Devices Inc.	240	362	66.3	IEEE	240	66.3	RELX Group	14	3.9
60	Nintendo Co. Ltd.	238	778	30.6	IEEE	238	30.6	ACM-Assoc Comput Mach	164	21.1
61	Rockwell Automation Inc	237	461	51.4	IEEE	237	51.4	RELX Group	67	14.5
62	Hitachi Ltd	234	1199	19.5	IEEE	234	19.5	RELX Group	171	14.3
63	HRL Laboratories LLC	233	554	42.1	IEEE	233	42.1	RELX Group	72	13.0
64	INDIVIDUAL PATENTER	230	1066	21.6	IEEE	230	21.6	RELX Group	112	10.5
65	General Motors Corp	227	452	50.2	IEEE	227	50.2	SAE-Society of Automobile Engineers	42	9.3
66	Schweitzer Engineering Labo	226	257	87.9	IEEE	226	87.9	RELX Group	9	3.5
67	Raytheon Co.	225	762	29.5	IEEE	225	29.5	SPIE-Int Soc Opt Engineering	94	12.3
68	INTOUCH TECHNOLOGIE	224	503	44.5	IEEE	224	44.5	RELX Group	36	7.2
69	Toshiba Corp	223	1009	22.1	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	240	23.8	IEEE	223	22.1
70	Teradyne Inc.	220	482	45.6	IEEE	220	45.6	ASME-Am Soc Mech Eng	78	16.2
71	Google Inc.	219	682	32.1	IEEE	219	32.1	ACM-Assoc Comput Mach	151	22.1
72	Xerox Corp	219	815	26.9	IEEE	219	26.9	RELX Group	81	9.9
73	Immersion Corp.	215	483	44.5	IEEE	215	44.5	ASME-Am Soc Mech Eng	42	8.7
74	University of Southern Califo	215	494	43.5	IEEE	215	43.5	ACS-Am Chem Soc	35	7.1
75	Mitsubishi Electric Corp	211	422	50.0	IEEE	211	50.0	ACM-Assoc Comput Mach	24	5.7
76	TROXLER ELECTRONIC L	211	482	43.8	IEEE	211	43.8	AMER SOC TESTING MATERIALS	122	25.3
77	Fluidigm Corp	209	1410	14.8	ACS-Am Chem Soc	234	16.6	IEEE	209	14.8
78	Sony Corp	197	465	42.4	IEEE	197	42.4	RELX Group	36	7.7
79	AT&T Inc	196	444	44.1	IEEE	196	44.1	Internet Soc/IETF-Internet Eng Task Force	56	12.6
80	Xcerra Corp	187	328	57.0	IEEE	187	57.0	AVS-AIP Am Inst Physics	43	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
81	Xilinx Inc.	187	222	84.2	IEEE	187	84.2	Joint IEEE and ACM	12	5.4
82	Bosch (Robert) GmbH	185	609	30.4	IEEE	185	30.4	RELX Group	83	13.6
83	Cadence Design Systems Inc	185	329	56.2	IEEE	185	56.2	Joint IEEE and ACM	67	20.4
84	Motorola Solutions Inc.	182	531	34.3	IEEE	182	34.3	ACS-Am Chem Soc	73	13.7
85	University of Michigan	180	870	20.7	IEEE	180	20.7	RELX Group	139	16.0
86	Battelle Memorial Institute	178	933	19.1	RELX Group	215	23.0	IEEE	178	19.1
87	Taiwan Semiconductor Manu	178	264	67.4	IEEE	178	67.4	AVS-AIP Am Inst Physics	19	7.2
88	FARO Technologies Inc.	176	534	33.0	IEEE	176	33.0	SPIE-Int Soc Opt Engineering	117	21.9
89	Michigan State University	176	1533	11.5	OSA-Opt Soc Amer	279	18.2	AVS-AIP Am Inst Physics	196	12.8
90	Velatia Group	176	233	75.5	IEEE	176	75.5	Echelon Corp	19	8.2
91	KLA-Tencor Corp.	174	2920	6.0	SPIE-Int Soc Opt Engineering	706	24.2	OSA-Opt Soc Amer	536	18.4
92	Verizon Communications Inc	169	376	44.9	IEEE	169	44.9	Internet Soc/IETF-Internet Eng Task Force	61	16.2
93	Teledyne Technologies Incor	168	323	52.0	IEEE	168	52.0	RELX Group	15	4.6
94	NANONEXUS INC	164	236	69.5	IEEE	164	69.5	AVS-AIP Am Inst Physics	21	8.9
95	Commissariat A L'Energie At	156	651	24.0	IEEE	156	24.0	RELX Group	147	22.6
96	Halliburton Co. (Holding)	156	3517	4.4	Society of Petroleum Engineers	1349	38.4	SPWLA-Society of Petrophysicists and Well Log Analysts	589	16.7
97	Purdue University	156	1103	14.1	RELX Group	212	19.2	ACS-Am Chem Soc	185	16.8
98	Industrial Techology Researc	153	438	34.9	IEEE	153	34.9	RELX Group	80	18.3
99	ICOSYSTEM CORP	150	190	78.9	IEEE	150	78.9	IET/IEE	10	5.3
100	Oracle Corporation	146	322	45.3	IEEE	146	45.3	3GPP General Partnership Project Standards Body	37	11.5

## Appendix B: Top 100 Organizations That Cite IEEE; (1997-2015 Patents by Category)

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	1782	4893	36.4	IEEE	1782	36.4	SID-Society for Information Display	1004	20.5
2	Infinera Corporation	1344	2123	63.3	IEEE	1344	63.3	IET/IEE	345	16.3
3	Partners HealthCare Systems	1191	12595	9.5	OSA-Opt Soc Amer	4768	37.9	RELX Group	1859	14.8
4	Nokia Corp	726	2407	30.2	IEEE	726	30.2	OSA-Opt Soc Amer	407	16.9
5	Corning Inc.	656	2906	22.6	OSA-Opt Soc Amer	675	23.2	IEEE	656	22.6
6	IDC Llc	642	1685	38.1	IEEE	642	38.1	SID-Society for Information Display	272	16.1
7	Hoya Corp	595	1318	45.1	IEEE	595	45.1	AVS-AIP Am Inst Physics	262	19.9
8	Massachusetts Institute of Te	589	2609	22.6	IEEE	589	22.6	OSA-Opt Soc Amer	397	15.2
9	Nikon Corp.	484	3228	15.0	SPIE-Int Soc Opt Engineering	1436	44.5	SEMATECH Consortium	640	19.8
10	Ericsson	483	1436	33.6	OSA-Opt Soc Amer	532	37.0	IEEE	483	33.6
11	Lightsmyth Technologies Inc	462	951	48.6	IEEE	462	48.6	OSA-Opt Soc Amer	219	23.0
12	Mellanox Technologies Ltd	445	1029	43.2	IEEE	445	43.2	IET/IEE	262	25.5
13	Synopsys Inc.	439	3068	14.3	SPIE-Int Soc Opt Engineering	1444	47.1	INST PURE APPLIED PHYSICS	462	15.1
14	Intel Corporation	398	1016	39.2	IEEE	398	39.2	SPIE-Int Soc Opt Engineering	170	16.7
15	YFY Inc	396	4227	9.4	SID-Society for Information Display	2239	53.0	IEEE	396	9.4
16	The Invention Science Fund	394	1641	24.0	IEEE	394	24.0	Am Physical Soc	228	13.9
17	Screen Holdings Co Ltd (For	374	1381	27.1	IEEE	374	27.1	RELX Group	215	15.6
18	Cheetah Omni LLC	337	1133	29.7	IEEE	337	29.7	OSA-Opt Soc Amer	274	24.2
19	JDS Uniphase Corp	323	961	33.6	IEEE	323	33.6	OSA-Opt Soc Amer	195	20.3
20	Stanford University	296	1557	19.0	OSA-Opt Soc Amer	322	20.7	IEEE	296	19.0
21	Prysmian SPA	292	880	33.2	IEEE	292	33.2	OSA-Opt Soc Amer	204	23.2
22	Google Inc.	291	630	46.2	IEEE	291	46.2	RELX Group	61	9.7
23	3M Co	274	3664	7.5	OSA-Opt Soc Amer	579	15.8	RELX Group	341	9.3
24	Finisar Corp	249	652	38.2	IEEE	249	38.2	SPIE-Int Soc Opt Engineering	102	15.6
25	International Business Machi	242	1746	13.9	SPIE-Int Soc Opt Engineering	446	25.5	IEEE	242	13.9
26	Texas Instruments Inc	235	884	26.6	IEEE	235	26.6	AVS-AIP Am Inst Physics	151	17.1
27	University of California	232	1323	17.5	IEEE	232	17.5	OSA-Opt Soc Amer	171	12.9
28	STEYPHI SERVICES DE LL	231	459	50.3	IEEE	231	50.3	OSA-Opt Soc Amer	104	22.7
29	Siemens Aktiengesellschaft	228	546	41.8	IEEE	228	41.8	Springer/Springer Wien/Springer-Verlag/Kluwer	43	7.9
30	Fujitsu Limited	225	935	24.1	IEEE	225	24.1	OSA-Opt Soc Amer	144	15.4
31	Adobe Systems Inc.	219	498	44.0	IEEE	219	44.0	ACM-Assoc Comput Mach	127	25.5
32	United States of America De	215	662	32.5	IEEE	215	32.5	IET/IEE	131	19.8
33	Electronics and Telecommuni	196	394	49.7	IEEE	196	49.7	IET/IEE	41	10.4
34	California Institute of Techno	189	1362	13.9	OSA-Opt Soc Amer	434	31.9	IEEE	189	13.9
35	Nippon Telegraph & Telepho	189	619	30.5	IEEE	189	30.5	IET/IEE	111	17.9
36	CIRREX SYSTEMS LLC	185	545	33.9	IEEE	185	33.9	OSA-Opt Soc Amer	79	14.5
37	Sumitomo Electric Industries	182	963	18.9	OSA-Opt Soc Amer	240	24.9	IEEE	182	18.9
38	Princeton University	178	385	46.2	IEEE	178	46.2	AVS-AIP Am Inst Physics	44	11.4
39	Hewlett-Packard Co	175	854	20.5	IEEE	175	20.5	OSA-Opt Soc Amer	102	11.9

## Appendix B: Top 100 Organizations That Cite IEEE; (1997-2015 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
40	Furukawa Electric Co. Ltd.	174	751	23.2	OSA-Opt Soc Amer	245	32.6	IEEE	174	23.2
41	Micron Technology Inc.	170	1789	9.5	SPIE-Int Soc Opt Engineering	339	18.9	AVS-AIP Am Inst Physics	323	18.1
42	OMNIGUIDE COMMUNIC	168	489	34.4	IEEE	168	34.4	OSA-Opt Soc Amer	95	19.4
43	University of Colorado ( The	160	1300	12.3	OSA-Opt Soc Amer	479	36.8	IEEE	160	12.3
44	LIGHTCHIP INC	159	467	34.0	IEEE	159	34.0	OSA-Opt Soc Amer	93	19.9
45	Rockstar Consortium (Nortel	159	338	47.0	IEEE	159	47.0	OSA-Opt Soc Amer	60	17.8
46	Emcore Corp.	144	163	88.3	IEEE	144	88.3	IET/IEE	8	4.9
47	Georgia Institute of Technolo	144	417	34.5	IEEE	144	34.5	OSA-Opt Soc Amer	79	18.9
48	NEC Corp	142	738	19.2	IEEE	142	19.2	AVS-AIP Am Inst Physics	76	10.3
49	Honeywell International Inc.	141	561	25.1	IEEE	141	25.1	SPIE-Int Soc Opt Engineering	96	17.1
50	Lockheed Martin Corp.	141	823	17.1	OSA-Opt Soc Amer	254	30.9	IEEE	141	17.1
51	Tessera Technologies Inc.	138	300	46.0	IEEE	138	46.0	OSA-Opt Soc Amer	86	28.7
52	Xerox Corp	135	1198	11.3	ACS-Am Chem Soc	225	18.8	RELX Group	154	12.9
53	Microsoft Corporation	134	524	25.6	ACM-Assoc Comput Mach	160	30.5	IEEE	134	25.6
54	ASML Holding NV	125	6141	2.0	SPIE-Int Soc Opt Engineering	2191	35.7	AVS-AIP Am Inst Physics	1146	18.7
55	Cubic Wafer Inc	125	223	56.1	IEEE	125	56.1	SPIE-Int Soc Opt Engineering	42	18.8
56	PTS Corporation	125	232	53.9	IEEE	125	53.9	OSA-Opt Soc Amer	34	14.7
57	University of Texas	123	933	13.2	AVS-AIP Am Inst Physics	155	16.6	IEEE	123	13.2
58	KOTUSA INC	118	236	50.0	IEEE	118	50.0	IET/IEE	51	21.6
59	VASCULAR IMAGING CO	116	240	48.3	IEEE	116	48.3	IET/IEE	70	29.2
60	Koninklijke Philips N.V.	115	630	18.3	SPIE-Int Soc Opt Engineering	184	29.2	IEEE	115	18.3
61	Calient Technologies Inc.	111	179	62.0	IEEE	111	62.0	OSA-Opt Soc Amer	27	15.1
62	TE Connectivity Ltd	111	221	50.2	IEEE	111	50.2	IWCS Inc.	31	14.0
63	Canon Inc	109	1562	7.0	SPIE-Int Soc Opt Engineering	249	15.9	AVS-AIP Am Inst Physics	211	13.5
64	Neophotonics Corporation	106	281	37.7	IEEE	106	37.7	OSA-Opt Soc Amer	49	17.4
65	Pelican Imaging Corporation	104	229	45.4	IEEE	104	45.4	SPIE-Int Soc Opt Engineering	50	21.8
66	Panasonic Corporation	100	612	16.3	SPIE-Int Soc Opt Engineering	114	18.6	IEEE	100	16.3
67	Avago Technologies Ltd	98	297	33.0	IEEE	98	33.0	SPIE-Int Soc Opt Engineering	69	23.2
68	Applied Materials Inc.	97	497	19.5	SPIE-Int Soc Opt Engineering	111	22.3	IEEE	97	19.5
69	Eastman Kodak Company	97	1207	8.0	ACS-Am Chem Soc	154	12.8	SPIE-Int Soc Opt Engineering	131	10.9
70	Mitsubishi Electric Corp	96	298	32.2	IEEE	96	32.2	SPIE-Int Soc Opt Engineering	51	17.1
71	Motorola Solutions Inc.	91	346	26.3	AVS-AIP Am Inst Physics	93	26.9	IEEE	91	26.3
72	Fujikara Ltd.	89	494	18.0	OSA-Opt Soc Amer	142	28.7	IEICE-Inst Elec Info Comm Eng	103	20.9
73	Northrop Grumman Corp	86	270	31.9	IEEE	86	31.9	OSA-Opt Soc Amer	63	23.3
74	OMM INC	86	194	44.3	IEEE	86	44.3	SPIE-Int Soc Opt Engineering	43	22.2
75	NANOOPTO CORP	84	327	25.7	AVS-AIP Am Inst Physics	115	35.2	IEEE	84	25.7
76	Oewaves Inc	83	253	32.8	OSA-Opt Soc Amer	100	39.5	IEEE	83	32.8
77	Columbia University	81	373	21.7	ACS-Am Chem Soc	93	24.9	IEEE	81	21.7
78	Analog Devices Inc.	77	141	54.6	IEEE	77	54.6	RELX Group	21	14.9
79	Oclaro Inc	74	239	31.0	IEEE	74	31.0	OSA-Opt Soc Amer	54	22.6
80	Extreme Networks Inc	72	156	46.2	IEEE	72	46.2	ACM-Assoc Comput Mach	22	14.1

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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	United States Navy	72	385	18.7	IEEE	72	18.7	OSA-Opt Soc Amer	72	18.7
82	Hitachi Ltd	70	374	18.7	IEEE	70	18.7	OSA-Opt Soc Amer	39	10.4
83	Olympus Corp.	70	386	18.1	OSA-Opt Soc Amer	109	28.2	IEEE	70	18.1
84	Cisco Systems Inc.	69	139	49.6	IEEE	69	49.6	OSA-Opt Soc Amer	34	24.5
85	Seiko Epson Corporation	69	278	24.8	IEEE	69	24.8	SID-Society for Information Display	59	21.2
86	Hong Kong University of Sci	67	105	63.8	IEEE	67	63.8	ACS-Am Chem Soc	5	4.8
87	HRL Laboratories LLC	66	230	28.7	IEEE	66	28.7	AVS-AIP Am Inst Physics	35	15.2
88	Cornell University	65	426	15.3	IEEE	65	15.3	ACS-Am Chem Soc	56	13.1
89	Iowa State University	64	146	43.8	IEEE	64	43.8	AVS-AIP Am Inst Physics	13	8.9
90	OSTERHOUT GROUP INC	64	206	31.1	IEEE	64	31.1	SPIE-Int Soc Opt Engineering	54	26.2
91	OMNIGUIDE INC	63	475	13.3	OSA-Opt Soc Amer	134	28.2	IEEE	63	13.3
92	Velatia Group	61	76	80.3	IEEE	61	80.3	Echelon Corp	7	9.2
93	Agilent Technologies Inc	60	281	21.4	IEEE	60	21.4	OSA-Opt Soc Amer	49	17.4
94	Industrial Technology Researc	60	269	22.3	IEEE	60	22.3	SPIE-Int Soc Opt Engineering	38	14.1
95	General Electric Company	59	416	14.2	ACS-Am Chem Soc	62	14.9	OSA-Opt Soc Amer	61	14.7
96	Ohio State University	59	228	25.9	OSA-Opt Soc Amer	71	31.1	IEEE	59	25.9
97	Samsung Electronics Co Ltd	58	607	9.6	ACS-Am Chem Soc	69	11.4	IEEE	58	9.6
98	Evans & Sutherland Compute	57	244	23.4	ACM-Assoc Comput Mach	139	57.0	IEEE	57	23.4
99	GENERAL PHOTONICS CO	57	166	34.3	OSA-Opt Soc Amer	61	36.7	IEEE	57	34.3
100	MICRON OPTICS INC	57	160	35.6	IEEE	57	35.6	OSA-Opt Soc Amer	44	27.5

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
<i>Power Systems</i>										
1	Witricity Corp	1529	3008	50.8	IEEE	1529	50.8	AVS-AIP Am Inst Physics	293	9.7
2	Cirrus Logic Inc.	1495	1648	90.7	IEEE	1495	90.7	ISO-International Standards Organization	50	3.0
3	Flextronics International LTD	1340	1458	91.9	IEEE	1340	91.9	United Business Media/UBM Tech	67	4.6
4	Total SA	1130	1250	90.4	IEEE	1130	90.4	IET/IEE	44	3.5
5	ABB Ltd	1100	1773	62.0	IEEE	1100	62.0	IVI Foundation/SCPI Consortium	94	5.3
6	SYNQOR INC	876	1005	87.2	IEEE	876	87.2	Penton Media	45	4.5
7	Texas Instruments Inc	636	747	85.1	IEEE	636	85.1	IET/IEE	24	3.2
8	SOLAREEDGE TECHNOLO	493	617	79.9	IEEE	493	79.9	WIP-Renewable Energies	86	13.9
9	Intel Corporation	491	575	85.4	IEEE	491	85.4	IEEE/JPN Soc App Phys	19	3.3
10	Massachusetts Institute of Te	457	1786	25.6	IEEE	457	25.6	Electrochemical Society	355	19.9
11	General Electric Company	438	1856	23.6	US Dept of Energy	773	41.6	IEEE	438	23.6
12	MOJO MOBILITY INC	391	514	76.1	IEEE	391	76.1	RELX Group	42	8.2
13	Rockwell Automation Inc	374	394	94.9	IEEE	374	94.9	EPE Association	9	2.3
14	Irobot Corp	319	560	57.0	IEEE	319	57.0	SPIE-Int Soc Opt Engineering	92	16.4
15	Emerson Electric Co.	318	404	78.7	IEEE	318	78.7	IET/IEE	21	5.2
16	AMPT LLC	271	372	72.8	IEEE	271	72.8	RELX Group	31	8.3
17	Maxim Integrated Products In	268	300	89.3	IEEE	268	89.3	Texas Instruments	14	4.7
18	Nokia Corp	240	309	77.7	IEEE	240	77.7	RELX Group	13	4.2
19	NXP Semiconductors NV	228	274	83.2	IEEE	228	83.2	IET/IEE	9	3.3
20	University of Wisconsin	221	280	78.9	IEEE	221	78.9	RELX Group	12	4.3
21	Power Integrations Inc.	215	340	63.2	IEEE	215	63.2	Penton Media	62	18.2
22	Avago Technologies Ltd	213	263	81.0	IEEE	213	81.0	AVS-AIP Am Inst Physics	10	3.8
23	Siemens Aktiengesellschaft	209	461	45.3	IEEE	209	45.3	AIAA-Am Inst Aero Astro	68	14.8
24	Vicor Corp	205	293	70.0	IEEE	205	70.0	Center for Power Electronics Systems (Virginia Tech)	42	14.3
25	Toshiba Corp	204	475	42.9	IEEE	204	42.9	RELX Group	123	25.9
26	STMicroelectronics	203	267	76.0	IEEE	203	76.0	RELX Group	16	6.0
27	University of Illinois	198	804	24.6	RELX Group	315	39.2	IEEE	198	24.6
28	Exar Corp.	189	200	94.5	IEEE	189	94.5	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	3	1.5
29	SOLAREEDGE LTD	184	241	76.3	IEEE	184	76.3	WIP-Renewable Energies	45	18.7
30	Intersil Corp.	183	232	78.9	IEEE	183	78.9	Cahners-Denver Pub	7	3.0
31	Midtronics Inc.	181	440	41.1	IEEE	181	41.1	Springer/Sp. Wien/Springer-Verlag/Kluwer	79	18.0
32	Alstom	171	238	71.8	IEEE	171	71.8	ASME-Am Soc Mech Eng	22	9.2
33	INFINITE POWER SOLUTI	166	1359	12.2	AVS-AIP Am Inst Physics	309	22.7	RELX Group	305	22.4
34	Infineon Technologies AG	164	190	86.3	IEEE	164	86.3	PCIM (Power Conversion, Intelligent Motion)	6	3.2
35	Linear Technology Corp.	159	753	21.1	Cahners-Denver Pub	396	52.6	IEEE	159	21.1
36	Qorvo	159	231	68.8	IEEE	159	68.8	Cahners-Denver Pub	27	11.7
37	General Motors Corp	157	1421	11.0	RELX Group	581	40.9	Electrochemical Society	230	16.2
38	Eaton Corp.	156	199	78.4	IEEE	156	78.4	Electrochemical Society	13	6.5
39	International Business Machi	155	226	68.6	IEEE	155	68.6	Joint IEEE and ACM	9	4.0

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40	Industrial Technology Researc	153	243	63.0	IEEE	153	63.0	RELX Group	45	18.5
41	Micron Technology Inc.	152	219	69.4	IEEE	152	69.4	IEEE/JPN Soc App Phys	22	10.0
42	O2Micro International Ltd.	152	232	65.5	IEEE	152	65.5	Texas Instruments	33	14.2
43	Qualcomm Inc	150	217	69.1	IEEE	150	69.1	RELX Group	23	10.6
44	Schneider Electric S.A.	144	181	79.6	IEEE	144	79.6	IEEE/DOE/JPL	9	5.0
45	Tigo Energy Inc	142	221	64.3	IEEE	142	64.3	WIP-Renewable Energies	59	26.7
46	Silicon Laboratories Inc	129	144	89.6	IEEE	129	89.6	SAE-Society of Automobile Engineers	12	8.3
47	SRI International	122	715	17.1	SPIE-Int Soc Opt Engineering	149	20.8	IEEE	122	17.1
48	Analog Devices Inc.	120	141	85.1	IEEE	120	85.1	United Business Media/UBM Tech	4	2.8
49	Conversant Intellectual Prope	120	144	83.3	IEEE	120	83.3	Joint IEEE and ACM	12	8.3
50	POWERMAT TECHNOLOG	116	119	97.5	IEEE	116	97.5	AVS-AIP Am Inst Physics	3	2.5
51	Mitsubishi Electric Corp	114	173	65.9	IEEE	114	65.9	IET/IEE	22	12.7
52	Marvell Technology Group Lt	113	146	77.4	IEEE	113	77.4	Texas Instruments	16	11.0
53	Apple Inc	112	216	51.9	IEEE	112	51.9	ACM-Assoc Comput Mach	30	13.9
54	Dialog Semiconductor Plc.	109	140	77.9	IEEE	109	77.9	ONLINE INC	18	12.9
55	Delta Electronics Inc	108	117	92.3	IEEE	108	92.3	Texas Instruments	2	1.7
56	Advanced Energy Industries I	105	110	95.5	IEEE	105	95.5	IET/IEE	3	2.7
57	R2 SEMICONDUCTOR INC	105	106	99.1	IEEE	105	99.1	IET/IEE	1	0.9
58	SanDisk Corp.	101	127	79.5	IEEE	101	79.5	McGraw Hill	16	12.6
59	Lockheed Martin Corp.	99	329	30.1	IEEE	99	30.1	RELX Group	80	24.3
60	MOTOR EXCELLENCE LL	97	111	87.4	IEEE	97	87.4	IEEE/ASME	14	12.6
61	United Technologies Corp	97	200	48.5	IEEE	97	48.5	SAE-Society of Automobile Engineers	40	20.0
62	Koninklijke Philips N.V.	95	171	55.6	IEEE	95	55.6	RELX Group	7	4.1
63	Panasonic Corporation	94	1061	8.9	RELX Group	341	32.1	Electrochemical Society	292	27.5
64	Raytheon Co.	90	118	76.3	IEEE	90	76.3	AIAA-Am Inst Aero Astro	8	6.8
65	Innovative Network Corporat	89	119	74.8	IEEE	89	74.8	IEEE/JPN Soc App Phys	11	9.2
66	University of Colorado ( The	89	91	97.8	IEEE	89	97.8	<conf> Int Conf Phys Semi (ICPS)	2	2.2
67	Cypress Semiconductor Corp.	86	99	86.9	IEEE	86	86.9	IEEE/JPN Soc App Phys	5	5.1
68	Hong Kong University of Sci	86	147	58.5	IEEE	86	58.5	RELX Group	29	19.7
69	FMC Technologies Inc.	85	118	72.0	IEEE	85	72.0	ASME-Am Soc Mech Eng	12	10.2
70	Semiconductor Energy Labor	84	1381	6.1	SID-Society for Information Display	412	29.8	AVS-AIP Am Inst Physics	158	11.4
71	ENECSYS LTD	82	92	89.1	IEEE	82	89.1	WIP-Renewable Energies	5	5.4
72	CPG TECHNOLOGIES LLC	81	192	42.2	IEEE	81	42.2	Am Physical Soc	18	9.4
73	Microsemi Corp	81	102	79.4	IEEE	81	79.4	CRC Press/Taylor & Francis	4	3.9
74	Honeywell International Inc.	80	278	28.8	RELX Group	89	32.0	IEEE	80	28.8
75	INI POWER SYSTEMS INC	80	810	9.9	RELX Group	301	37.2	Electrochemical Society	148	18.3
76	Arizona State University	77	318	24.2	IEEE	77	24.2	ACS-Am Chem Soc	66	20.8
77	Alticor Inc	75	98	76.5	IEEE	75	76.5	RELX Group	9	9.2
78	TDK Corporation	75	157	47.8	IEEE	75	47.8	RELX Group	35	22.3
79	Hitachi Ltd	71	257	27.6	IEEE	71	27.6	IET/IEE	44	17.1
80	University of California	70	697	10.0	RELX Group	125	17.9	Electrochemical Society	114	16.4

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81	Atmel Corp.	68	79	86.1	IEEE	68	86.1	IEICE-Inst Elec Info Comm Eng	9	11.4
82	Sony Corp	67	270	24.8	IEEE	67	24.8	RELX Group	58	21.5
83	Toyota Motor Corp	62	740	8.4	RELX Group	243	32.8	ACS-Am Chem Soc	95	12.8
84	Velatia Group	61	73	83.6	IEEE	61	83.6	Echelon Corp	4	5.5
85	Ericsson	59	84	70.2	IEEE	59	70.2	RELX Group	8	9.5
86	Virginia Tech University	58	67	86.6	IEEE	58	86.6	MRS-Materials Research Soc	2	3.0
87	California Institute of Techno	57	1899	3.0	RELX Group	722	38.0	Electrochemical Society	335	17.6
88	Cameron International Corp.	55	55	100.0	IEEE	55	100.0			
89	Cree Inc.	55	68	80.9	IEEE	55	80.9	SID-Society for Information Display	6	8.8
90	FLYBACK ENERGY INC	55	58	94.8	IEEE	55	94.8	ACM-Assoc Comput Mach	3	5.2
91	KOLO TECHNOLOGIES IN	55	65	84.6	IEEE	55	84.6	KOREAN PHYSICAL SOC	4	6.2
92	Samsung Electronics Co Ltd	55	432	12.7	RELX Group	127	29.4	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	74	17.1
93	Fujitsu Limited	53	116	45.7	IEEE	53	45.7	Electrochemical Society	10	8.6
94	University of Texas	53	440	12.0	RELX Group	129	29.3	Electrochemical Society	85	19.3
95	BOARD OF REGENTS OF T	52	64	81.3	IEEE	52	81.3	IET/IEE	12	18.8
96	Huawei Technologies Compa	51	54	94.4	IEEE	51	94.4	Audio Eng Soc	3	5.6
97	IDEAL POWER CONVERT	51	58	87.9	IEEE	51	87.9	EPE Association	7	12.1
98	American Superconductor Co	50	62	80.6	IEEE	50	80.6	IET/IEE	7	11.3
99	Xerox Corp	50	151	33.1	IEEE	50	33.1	RELX Group	29	19.2
100	Fairchild Semiconductor Inte	49	65	75.4	IEEE	49	75.4	Penton Media	8	12.3

## Appendix B: Top 100 Organizations That Cite IEEE; (1997-2015 Patents by Category)

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	4169	7431	56.1	IEEE	4169	56.1	SPIE-Int Soc Opt Engineering	1202	16.2
2	Applied Materials Inc.	1568	2637	59.5	IEEE	1568	59.5	AVS-AIP Am Inst Physics	196	7.4
3	Intuitive Surgical Inc.	1548	3002	51.6	IEEE	1548	51.6	SAGES-Society of American Gastrointestinal and Endoscopic	340	11.3
4	Honda Motor Co. Ltd.(Honda	657	1422	46.2	IEEE	657	46.2	RELX Group	167	11.7
5	INTOUCH TECHNOLOGIE	549	1204	45.6	IEEE	549	45.6	RELX Group	87	7.2
6	Microsoft Corporation	513	1390	36.9	IEEE	513	36.9	ACM-Assoc Comput Mach	311	22.4
7	International Business Machi	446	1183	37.7	IEEE	446	37.7	ACM-Assoc Comput Mach	157	13.3
8	Sony Corp	391	510	76.7	IEEE	391	76.7	IEEE/RSJ	23	4.5
9	Immersion Corp.	312	749	41.7	IEEE	312	41.7	ACM-Assoc Comput Mach	76	10.1
10	University of Nebraska	272	1135	24.0	IEEE	272	24.0	Springer/Sp. Wien/Springer-Verlag/Kluwer	173	15.2
11	Massachusetts Institute of Te	249	758	32.8	IEEE	249	32.8	RELX Group	121	16.0
12	Advanced Micro Devices Inc	244	489	49.9	IEEE	244	49.9	RELX Group	62	12.7
13	SIPCO LLC	237	411	57.7	IEEE	237	57.7	Internet Soc/IETF-Internet Eng Task Force	35	8.5
14	Siemens Aktiengesellschaft	223	499	44.7	IEEE	223	44.7	RELX Group	67	13.4
15	Samsung Electronics Co Ltd	194	318	61.0	IEEE	194	61.0	IEEE/RSJ	31	9.7
16	Cadence Design Systems Inc	179	416	43.0	IEEE	179	43.0	Joint IEEE and ACM	143	34.4
17	Cimpres NV	179	435	41.1	IEEE	179	41.1	RELX Group	170	39.1
18	HRL Laboratories LLC	171	297	57.6	IEEE	171	57.6	RELX Group	18	6.1
19	SRI International	171	386	44.3	IEEE	171	44.3	SPIE-Int Soc Opt Engineering	55	14.2
20	ICOSYSTEM CORP	150	190	78.9	IEEE	150	78.9	IET/IEE	10	5.3
21	Caterpillar Inc.	147	316	46.5	IEEE	147	46.5	SAE-Society of Automobile Engineers	38	12.0
22	Battelle Memorial Institute	129	177	72.9	IEEE	129	72.9	IEEE/RSJ	19	10.7
23	Emerson Electric Co.	125	550	22.7	IEEE	125	22.7	RELX Group	68	12.4
24	ROY-G-BIV CORP	123	374	32.9	IEEE	123	32.9	ISO-International Standards Organization	67	17.9
25	University of Southern Califo	120	177	67.8	IEEE	120	67.8	Springer/Sp. Wien/Springer-Verlag/Kluwer	15	8.5
26	Fanuc Ltd.	118	161	73.3	IEEE	118	73.3	RELX Group	8	5.0
27	Harris Corp.	112	137	81.8	IEEE	112	81.8	IOP Publishing	10	7.3
28	Stryker Corp.	112	449	24.9	IEEE	112	24.9	Springer/Sp. Wien/Springer-Verlag/Kluwer	86	19.2
29	Fujitsu Limited	110	178	61.8	IEEE	110	61.8	RELX Group	13	7.3
30	ABB Ltd	108	162	66.7	IEEE	108	66.7	RELX Group	17	10.5
31	Toshiba Corp	108	173	62.4	IEEE	108	62.4	RELX Group	7	4.0
32	Boeing Co. (The)	107	313	34.2	IEEE	107	34.2	RELX Group	71	22.7
33	Taiwan Semiconductor Manu	107	185	57.8	IEEE	107	57.8	RELX Group	18	9.7
34	Amada Co. Ltd.	104	291	35.7	IEEE	104	35.7	RELX Group	56	19.2
35	Xerox Corp	102	226	45.1	IEEE	102	45.1	ACM-Assoc Comput Mach	27	11.9
36	INDIVIDUAL PATENTER	100	211	47.4	IEEE	100	47.4	Lippincott Williams & Wilkins	10	4.7
37	American Express Co.	96	320	30.0	IEEE	96	30.0	The USENIX Association	39	12.2
38	Rockwell Automation Inc	96	198	48.5	IEEE	96	48.5	RELX Group	26	13.1
39	General Electric Company	95	187	50.8	IEEE	95	50.8	RELX Group	14	7.5



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40	NEC Corp	95	166	57.2	IEEE	95	57.2	ACM-Assoc Comput Mach	12	7.2
41	Lockheed Martin Corp.	94	223	42.2	IEEE	94	42.2	RELX Group	18	8.1
42	Walt Disney Co.	94	214	43.9	IEEE	94	43.9	ACM-Assoc Comput Mach	48	22.4
43	CA Inc	92	158	58.2	IEEE	92	58.2	RELX Group	37	23.4
44	Panasonic Corporation	90	174	51.7	IEEE	90	51.7	IEICE-Inst Elec Info Comm Eng	11	6.3
45	Hewlett-Packard Co	85	216	39.4	IEEE	85	39.4	ACM-Assoc Comput Mach	25	11.6
46	Honeywell International Inc.	84	215	39.1	IEEE	84	39.1	RELX Group	33	15.3
47	ALOFT MEDIA LLC	82	102	80.4	IEEE	82	80.4	ASCE-AMER SOC CIVIL ENGINEERS	6	5.9
48	Tokyo Electron Limited	82	226	36.3	IEEE	82	36.3	RELX Group	26	11.5
49	Sensable Technologies Inc	80	157	51.0	IEEE	80	51.0	ACM-Assoc Comput Mach	40	25.5
50	ARCHI CON DES INVENTI	76	362	21.0	ACM-Assoc Comput Mach	115	31.8	IEEE	76	21.0
51	Sap SE	73	253	28.9	IEEE	73	28.9	RELX Group	44	17.4
52	HURCO COMPANIES INC	72	166	43.4	IEEE	72	43.4	Springer/Sp. Wien/Springer-Verlag/Kluwer	19	11.4
53	Cirrus Logic Inc.	69	87	79.3	IEEE	69	79.3	RELX Group	10	11.5
54	Health Discovery Corp	69	266	25.9	IEEE	69	25.9	IWDM Org	24	9.0
55	AUREON LABORATORIES	67	263	25.5	IEEE	67	25.5	RELX Group	43	16.3
56	General Motors Corp	67	163	41.1	IEEE	67	41.1	RELX Group	19	11.7
57	Google Inc.	67	145	46.2	IEEE	67	46.2	ACM-Assoc Comput Mach	34	23.4
58	Texas Instruments Inc	67	121	55.4	IEEE	67	55.4	Penton Media	13	10.7
59	United Technologies Corp	64	91	70.3	IEEE	64	70.3	EPE Association	7	7.7
60	University of Washington	64	153	41.8	IEEE	64	41.8	RELX Group	14	9.2
61	IWALK INC	63	188	33.5	IEEE	63	33.5	RELX Group	42	22.3
62	Oracle Corporation	63	111	56.8	IEEE	63	56.8	ACM-Assoc Comput Mach	17	15.3
63	Ford Motor Co.	60	159	37.7	IEEE	60	37.7	Winter Simulation Conference Board of Directors	24	15.1
64	Nokia Corp	59	104	56.7	IEEE	59	56.7	IET/IEE	7	6.7
65	Procter & Gamble Co.	58	90	64.4	IEEE	58	64.4	RELX Group	8	8.9
66	TEST ADVANTAGE INC	58	69	84.1	IEEE	58	84.1	SPIE-Int Soc Opt Engineering	3	4.3
67	Motorola Solutions Inc.	57	81	70.4	IEEE	57	70.4	ISCA (International Speech Communication Association)	4	4.9
68	Delphi Automotive Plc	56	122	45.9	IEEE	56	45.9	RELX Group	40	32.8
69	The Invention Science Fund	56	297	18.9	IEEE	56	18.9	RELX Group	43	14.5
70	Brooks Automation Inc.	54	116	46.6	IEEE	54	46.6	ASME-Am Soc Mech Eng	10	8.6
71	KNOWMTECH LLC	54	494	10.9	ACS-Am Chem Soc	92	18.6	AVS-AIP Am Inst Physics	84	17.0
72	Kuka AG	54	66	81.8	IEEE	54	81.8	IEEE/RSJ	2	3.0
73	Georgia Institute of Technolo	52	104	50.0	IEEE	52	50.0	American Automatic Control Council (AACC)	22	21.2
74	University of California	51	102	50.0	IEEE	51	50.0	RELX Group	11	10.8
75	INTUITION INTELLIGENC	50	60	83.3	IEEE	50	83.3	Springer/Sp. Wien/Springer-Verlag/Kluwer	3	5.0
76	Eaton Corp.	49	52	94.2	IEEE	49	94.2	IET/IEE	2	3.8
77	University of Minnesota (The	49	88	55.7	IEEE	49	55.7	Emerald Group Publishing	9	10.2
78	Arizona State University	48	69	69.6	IEEE	48	69.6	RELX Group	4	5.8
79	Bonutti Technologies LLC	48	186	25.8	IEEE	48	25.8	Lippincott Williams & Wilkins	46	24.7
80	Micron Technology Inc.	47	82	57.3	IEEE	47	57.3	AVS-AIP Am Inst Physics	11	13.4

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81	Schneider Electric S.A.	47	189	24.9	IEEE	47	24.9	I S A-INSTRUM SYS AUTOMATION SOC	22	11.6
82	Johns Hopkins University	46	123	37.4	IEEE	46	37.4	RELX Group	16	13.0
83	Raytheon Co.	46	146	31.5	IEEE	46	31.5	SAGE PUBLICATIONS INC	19	13.0
84	University of Michigan	46	137	33.6	IEEE	46	33.6	RELX Group	25	18.2
85	Agilent Technologies Inc	45	71	63.4	IEEE	45	63.4	Amer Assoc Clin Chem	4	5.6
86	Deere & Co.	45	93	48.4	IEEE	45	48.4	RELX Group	11	11.8
87	ROBOTICVISIONTECH LL	44	60	73.3	IEEE	44	73.3	RELX Group	5	8.3
88	California Institute of Techno	43	69	62.3	IEEE	43	62.3	Am Physical Soc	5	7.2
89	Intel Corporation	43	75	57.3	IEEE	43	57.3	IEEE/JPN Soc App Phys	7	9.3
90	Accenture Ltd.	42	147	28.6	IEEE	42	28.6	ACM-Assoc Comput Mach	34	23.1
91	AT&T Inc	42	86	48.8	IEEE	42	48.8	Bellcore	13	15.1
92	FTL SYSTEMS INC	42	50	84.0	IEEE	42	84.0	ACM-Assoc Comput Mach	7	14.0
93	BRAIN CORP	41	184	22.3	IEEE	41	22.3	MIT/MIT Press	37	20.1
94	RETHINK ROBOTICS INC	41	87	47.1	IEEE	41	47.1	RELX Group	12	13.8
95	The National Aeronautical an	41	89	46.1	IEEE	41	46.1	NASA-National Aeronautics and Space Admin	19	21.3
96	Toyota Motor Corp	41	86	47.7	IEEE	41	47.7	RELX Group	11	12.8
97	Fuji Film Holdings Corp	40	80	50.0	IEEE	40	50.0	CRC Press/Taylor & Francis	5	6.3
98	Mitsubishi Electric Corp	40	93	43.0	IEEE	40	43.0	ACM-Assoc Comput Mach	13	14.0
99	MKS Instruments Inc.	40	122	32.8	IEEE	40	32.8	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	24	19.7
100	ASML Holding NV	39	173	22.5	SPIE-Int Soc Opt Engineering	121	69.9	IEEE	39	22.5

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<i>Semiconductors/Solid-State Devices/Electronics</i>										
1	Micron Technology Inc.	22533	81652	27.6	IEEE	22533	27.6	RELX Group	15052	18.4
2	International Business Machi	7397	16680	44.3	IEEE	7397	44.3	AVS-AIP Am Inst Physics	2416	14.5
3	Semiconductor Energy Labor	6293	77478	8.1	SID-Society for Information Display	24244	31.3	AVS-AIP Am Inst Physics	12063	15.6
4	MONOLITHIC 3D INC	5669	10228	55.4	IEEE	5669	55.4	IEEE/JPN Soc App Phys	1119	10.9
5	Taiwan Semiconductor Manu	5269	15454	34.1	IEEE	5269	34.1	AVS-AIP Am Inst Physics	4306	27.9
6	Macronix International Co. L	4267	8007	53.3	IEEE	4267	53.3	IEEE/JPN Soc App Phys	1359	17.0
7	Intel Corporation	4015	7421	54.1	IEEE	4015	54.1	AVS-AIP Am Inst Physics	789	10.6
8	Tela Innovations inc	3892	13202	29.5	SPIE-Int Soc Opt Engineering	4791	36.3	IEEE	3892	29.5
9	Cree Inc.	3310	9610	34.4	IEEE	3310	34.4	AVS-AIP Am Inst Physics	2111	22.0
10	SanDisk Corp.	3148	5917	53.2	IEEE	3148	53.2	AVS-AIP Am Inst Physics	710	12.0
11	Chipbond Technology Corp	2898	3501	82.8	IEEE	2898	82.8	RELX Group	268	7.7
12	Texas Instruments Inc	2556	4778	53.5	IEEE	2556	53.5	AVS-AIP Am Inst Physics	545	11.4
13	Amberwave Inc	2365	6797	34.8	IEEE	2365	34.8	AVS-AIP Am Inst Physics	1788	26.3
14	Infineon Technologies AG	2228	4524	49.2	IEEE	2228	49.2	AVS-AIP Am Inst Physics	602	13.3
15	Avago Technologies Ltd	2112	6278	33.6	IEEE	2112	33.6	SMTA-Surface Mount Technology Association	1017	16.2
16	NXP Semiconductors NV	2098	4436	47.3	IEEE	2098	47.3	AVS-AIP Am Inst Physics	701	15.8
17	Toshiba Corp	2007	4867	41.2	IEEE	2007	41.2	AVS-AIP Am Inst Physics	729	15.0
18	Fairchild Semiconductor Inte	1930	2549	75.7	IEEE	1930	75.7	RELX Group	225	8.8
19	Applied Materials Inc.	1893	11433	16.6	AVS-AIP Am Inst Physics	2355	20.6	IEEE	1893	16.6
20	Advanced Micro Devices Inc	1610	3030	53.1	IEEE	1610	53.1	AVS-AIP Am Inst Physics	327	10.8
21	Murata Manufacturing Co. Lt	1373	2041	67.3	IEEE	1373	67.3	AVS-AIP Am Inst Physics	111	5.4
22	University of Illinois	1349	12732	10.6	AVS-AIP Am Inst Physics	2742	21.5	ACS-Am Chem Soc	1967	15.4
23	STMicroelectronics	1308	2845	46.0	IEEE	1308	46.0	RELX Group	421	14.8
24	Fujitsu Limited	1260	3089	40.8	IEEE	1260	40.8	AVS-AIP Am Inst Physics	413	13.4
25	University of California	1251	12512	10.0	AVS-AIP Am Inst Physics	3210	25.7	RELX Group	1681	13.4
26	Finisar Corp	1228	3225	38.1	IEEE	1228	38.1	AVS-AIP Am Inst Physics	572	17.7
27	Motorola Solutions Inc.	1168	3509	33.3	IEEE	1168	33.3	AVS-AIP Am Inst Physics	847	24.1
28	Panasonic Corporation	1128	4878	23.1	IEEE	1128	23.1	AVS-AIP Am Inst Physics	889	18.2
29	Samsung Electronics Co Ltd	1087	4221	25.8	IEEE	1087	25.8	AVS-AIP Am Inst Physics	749	17.7
30	California Institute of Techno	1082	6368	17.0	IEEE	1082	17.0	RELX Group	1028	16.1
31	Innovative Network Corporat	1025	1864	55.0	IEEE	1025	55.0	IEEE/JPN Soc App Phys	260	13.9
32	Mitsubishi Electric Corp	955	1974	48.4	IEEE	955	48.4	AVS-AIP Am Inst Physics	224	11.3
33	NEC Corp	923	2406	38.4	IEEE	923	38.4	AVS-AIP Am Inst Physics	387	16.1
34	Massachusetts Institute of Te	869	5902	14.7	AVS-AIP Am Inst Physics	1214	20.6	IEEE	869	14.7
35	Cypress Semiconductor Corp.	858	1417	60.6	IEEE	858	60.6	AVS-AIP Am Inst Physics	118	8.3
36	Qualcomm Inc	836	1793	46.6	IEEE	836	46.6	SID-Society for Information Display	169	9.4
37	HRL Laboratories LLC	738	1520	48.6	IEEE	738	48.6	AVS-AIP Am Inst Physics	258	17.0
38	Hitachi Ltd	661	2191	30.2	IEEE	661	30.2	AVS-AIP Am Inst Physics	409	18.7
39	Sharp Corp	660	3072	21.5	AVS-AIP Am Inst Physics	837	27.2	IEEE	660	21.5

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40	Transphorm Inc	641	1331	48.2	IEEE	641	48.2	AVS-AIP Am Inst Physics	231	17.4
41	Global Foundries Inc	627	1281	48.9	IEEE	627	48.9	AVS-AIP Am Inst Physics	156	12.2
42	Nokia Corp	605	2700	22.4	IEEE	605	22.4	AVS-AIP Am Inst Physics	525	19.4
43	Synopsys Inc.	601	1441	41.7	IEEE	601	41.7	AVS-AIP Am Inst Physics	249	17.3
44	Michigan State University	570	6820	8.4	OSA-Opt Soc Amer	1505	22.1	AVS-AIP Am Inst Physics	1075	15.8
45	Lam Research Corp.	564	3089	18.3	AVS-AIP Am Inst Physics	764	24.7	IEEE	564	18.3
46	Qorvo	551	800	68.9	IEEE	551	68.9	AVS-AIP Am Inst Physics	112	14.0
47	Commissariat A L'Energie At	545	3337	16.3	AVS-AIP Am Inst Physics	751	22.5	RELX Group	620	18.6
48	ASM International N.V.	540	5250	10.3	RELX Group	1263	24.1	AVS-AIP Am Inst Physics	1095	20.9
49	SK Hynix Inc	540	1025	52.7	IEEE	540	52.7	AVS-AIP Am Inst Physics	96	9.4
50	JDS Uniphase Corp	510	1579	32.3	IEEE	510	32.3	AVS-AIP Am Inst Physics	475	30.1
51	Tessera Technologies Inc.	487	1852	26.3	IEEE	487	26.3	AVS-AIP Am Inst Physics	424	22.9
52	Partners HealthCare Systems	474	5200	9.1	OSA-Opt Soc Amer	1943	37.4	RELX Group	768	14.8
53	Innovative Silicon SA	453	556	81.5	IEEE	453	81.5	RELX Group	24	4.3
54	Xtera Communications Inc.	450	1110	40.5	IEEE	450	40.5	OSA-Opt Soc Amer	262	23.6
55	Sulvolta Inc	448	930	48.2	IEEE	448	48.2	AVS-AIP Am Inst Physics	139	14.9
56	Electronics and Telecommuni	445	1163	38.3	IEEE	445	38.3	AVS-AIP Am Inst Physics	275	23.6
57	Canon Inc	425	3620	11.7	AVS-AIP Am Inst Physics	890	24.6	RELX Group	503	13.9
58	Interuniversity MicroElectron	418	1221	34.2	IEEE	418	34.2	AVS-AIP Am Inst Physics	177	14.5
59	Analog Devices Inc.	417	678	61.5	IEEE	417	61.5	RELX Group	61	9.0
60	Hong Kong University of Sci	412	725	56.8	IEEE	412	56.8	AVS-AIP Am Inst Physics	150	20.7
61	Siemens Aktiengesellschaft	409	1126	36.3	IEEE	409	36.3	AVS-AIP Am Inst Physics	176	15.6
62	Aisin Seiki Co. Ltd.	401	2372	16.9	OSA-Opt Soc Amer	936	39.5	IEEE	401	16.9
63	Industrial Techology Researc	400	1068	37.5	IEEE	400	37.5	AVS-AIP Am Inst Physics	154	14.4
64	Unisantis Electronics Ltd	400	463	86.4	IEEE	400	86.4	RELX Group	31	6.7
65	Xerox Corp	394	2213	17.8	AVS-AIP Am Inst Physics	597	27.0	IEEE	394	17.8
66	Microsemi Corp	383	520	73.7	IEEE	383	73.7	AVS-AIP Am Inst Physics	17	3.3
67	Georgia Institute of Technolo	372	1084	34.3	IEEE	372	34.3	RELX Group	135	12.5
68	Koninklijke Philips N.V.	372	1643	22.6	AVS-AIP Am Inst Physics	432	26.3	IEEE	372	22.6
69	Seiko Epson Corporation	370	1484	24.9	IEEE	370	24.9	AVS-AIP Am Inst Physics	257	17.3
70	Power Integrations Inc.	369	529	69.8	IEEE	369	69.8	INST PURE APPLIED PHYSICS	55	10.4
71	Crossbar Inc	346	1376	25.1	IEEE	346	25.1	RELX Group	199	14.5
72	University of Wisconsin	343	1394	24.6	AVS-AIP Am Inst Physics	382	27.4	IEEE	343	24.6
73	Lockheed Martin Corp.	342	2026	16.9	AVS-AIP Am Inst Physics	454	22.4	IEEE	342	16.9
74	Sony Corp	336	1644	20.4	AVS-AIP Am Inst Physics	353	21.5	IEEE	336	20.4
75	Nantero Inc	333	6568	5.1	ACS-Am Chem Soc	2021	30.8	AVS-AIP Am Inst Physics	1232	18.8
76	Thermo Fisher Scientific Inc	329	1479	22.2	RELX Group	563	38.1	IEEE	329	22.2
77	Maxim Integrated Products In	322	397	81.1	IEEE	322	81.1	Joint IEEE and ACM	16	4.0
78	Hewlett-Packard Co	319	1931	16.5	AVS-AIP Am Inst Physics	435	22.5	IEEE	319	16.5
79	MEVION MEDICAL SYSTE	310	1065	29.1	IEEE	310	29.1	RELX Group	224	21.0
80	Bosch (Robert) GmbH	294	497	59.2	IEEE	294	59.2	RELX Group	89	17.9

## Appendix B: Top 100 Organizations That Cite IEEE; (1997-2015 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	Columbia University	294	3886	7.6	AVS-AIP Am Inst Physics	1370	35.3	MRS-Materials Research Soc	476	12.2
82	Soitec SA	288	1584	18.2	AVS-AIP Am Inst Physics	406	25.6	RELX Group	297	18.8
83	University of Michigan	288	1300	22.2	IEEE	288	22.2	AVS-AIP Am Inst Physics	235	18.1
84	General Electric Company	287	1260	22.8	IEEE	287	22.8	RELX Group	206	16.3
85	MC10 INC	285	3243	8.8	AVS-AIP Am Inst Physics	547	16.9	ACS-Am Chem Soc	500	15.4
86	Honeywell International Inc.	284	1927	14.7	ACS-Am Chem Soc	415	21.5	IEEE	284	14.7
87	Silicon Genesis Corporation	282	1420	19.9	RELX Group	317	22.3	AVS-AIP Am Inst Physics	294	20.7
88	United Microelectronics Corp	282	596	47.3	IEEE	282	47.3	IEEE/JPN Soc App Phys	74	12.4
89	Coherent Inc.	280	2078	13.5	AVS-AIP Am Inst Physics	430	20.7	OSA-Opt Soc Amer	400	19.2
90	Corning Inc.	272	1114	24.4	IEEE	272	24.4	RELX Group	185	16.6
91	United States Navy	264	1575	16.8	AVS-AIP Am Inst Physics	438	27.8	IEEE	264	16.8
92	Northrop Grumman Corp	262	898	29.2	IEEE	262	29.2	AVS-AIP Am Inst Physics	182	20.3
93	Emcore Corp.	252	514	49.0	IEEE	252	49.0	US Dept of Energy	74	14.4
94	Raytheon Co.	252	905	27.8	IEEE	252	27.8	AVS-AIP Am Inst Physics	143	15.8
95	Jiangsu ChangJiang Electroni	249	332	75.0	IEEE	249	75.0	International Microelectronics And Packaging Society	42	12.7
96	Amkor Technology Inc.	248	588	42.2	IEEE	248	42.2	Penton Media	91	15.5
97	Xilinx Inc.	244	362	67.4	IEEE	244	67.4	IEEE/JPN Soc App Phys	24	6.6
98	Promos Technologies Inc.	243	322	75.5	IEEE	243	75.5	IEEE/JPN Soc App Phys	68	21.1
99	Sumitomo Electric Industries	242	1888	12.8	AVS-AIP Am Inst Physics	421	22.3	RELX Group	325	17.2
100	Vishay Intertechnology Inc.	241	384	62.8	IEEE	241	62.8	RELX Group	24	6.3

## Appendix B: Top 100 Organizations That Cite IEEE; (1997-2015 Patents by Category)

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	Velatia Group	839	1072	78.3	IEEE	839	78.3	Echelon Corp	81	7.6
2	Melrose Industries PLC	211	245	86.1	IEEE	211	86.1	Joint IEEE and ACM	9	3.7
3	TRILLIANT NETWORKS I	131	200	65.5	IEEE	131	65.5	Internet Soc/IETF-Internet Eng Task Force	14	7.0
4	SIPCO LLC	84	140	60.0	IEEE	84	60.0	Internet Soc/IETF-Internet Eng Task Force	13	9.3
5	ABB Ltd	70	87	80.5	IEEE	70	80.5	IET/IEE	6	6.9
6	Qualcomm Inc	43	60	71.7	IEEE	43	71.7	Emerald Group Publishing	4	6.7
7	TRILLIANT HOLDINGS IN	42	66	63.6	IEEE	42	63.6	RELX Group	4	6.1
8	3M Co	35	40	87.5	IEEE	35	87.5	ASM INTERNATIONAL	1	2.5
9	Microsoft Corporation	31	62	50.0	IEEE	31	50.0	ACM-Assoc Comput Mach	11	17.7
10	Texas A&M University	28	35	80.0	IEEE	28	80.0	IET/IEE	3	8.6
11	ENERGY TECHNOLOGY G	26	30	86.7	IEEE	26	86.7	RELX Group	2	6.7
12	SOLAREEDGE TECHNOLO	24	32	75.0	IEEE	24	75.0	WIP-Renewable Energies	6	18.8
13	Georgia Institute of Technolo	21	76	27.6	ACM-Assoc Comput Mach	47	61.8	IEEE	21	27.6
14	Taiwan Semiconductor Manu	21	38	55.3	IEEE	21	55.3	Electrostatic Discharge Association	15	39.5
15	Commscope Inc.	18	18	100.0	IEEE	18	100.0			
16	General Electric Company	18	31	58.1	IEEE	18	58.1	IET/IEE	6	19.4
17	Siemens Aktiengesellschaft	17	35	48.6	IEEE	17	48.6	United Business Media/UBM Tech	11	31.4
18	Itron Inc.	16	26	61.5	IEEE	16	61.5	RELX Group	3	11.5
19	Massachusetts Institute of Te	16	22	72.7	IEEE	16	72.7	AMER SOC NAVAL ENG INC	4	18.2
20	ELSTER SOLUTIONS LLC	15	17	88.2	IEEE	15	88.2	ACM-Assoc Comput Mach	1	5.9
21	Schneider Electric S.A.	13	91	14.3	ANSI-American National Standards Institute	27	29.7	ISO-International Standards Organization	14	15.4
22	Sony Corp	13	44	29.5	SID-Society for Information Display	24	54.5	IEEE	13	29.5
23	AT&T Inc	12	14	85.7	IEEE	12	85.7	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	1	7.1
24	Rockwell Automation Inc	12	16	75.0	IEEE	12	75.0	Electric Power Research Institute	2	12.5
25	THE DETROIT EDISON CO	11	11	100.0	IEEE	11	100.0			
26	Johnson Controls Inc	10	10	100.0	IEEE	10	100.0			
27	NORWEB PLC	10	24	41.7	IEEE	10	41.7	Pennwell Pub	5	20.8
28	Roche Holding Ltd.	10	10	100.0	IEEE	10	100.0			
29	Panasonic Corporation	9	12	75.0	IEEE	9	75.0	IEICE-Inst Elec Info Comm Eng	2	16.7
30	RADAR ENGINEERS	9	10	90.0	IEEE	9	90.0	Penton Media	1	10.0
31	Tigo Energy Inc	9	13	69.2	IEEE	9	69.2	WIP-Renewable Energies	3	23.1
32	University of Wisconsin	9	10	90.0	IEEE	9	90.0	MONTANA HISTORICAL SOC	1	10.0
33	Belkin International Inc	8	31	25.8	ACM-Assoc Comput Mach	16	51.6	IEEE	8	25.8
34	Cisco Systems Inc.	8	9	88.9	IEEE	8	88.9	Internet Soc/IETF-Internet Eng Task Force	1	11.1
35	International Business Machi	8	13	61.5	IEEE	8	61.5	ACM-Assoc Comput Mach	2	15.4
36	The Invention Science Fund	8	15	53.3	IEEE	8	53.3	ANSI-American National Standards Institute	4	26.7
37	ASTROLINK INTERNATIO	7	8	87.5	IEEE	7	87.5	IET/IEE	1	12.5
38	CURRENT GRID LLC	7	11	63.6	IEEE	7	63.6	Echelon Corp	2	18.2
39	CURRENT TECHNOLOGIE	7	11	63.6	IEEE	7	63.6	Hewlett Packard Inc.	2	18.2

## Appendix B: Top 100 Organizations That Cite IEEE; (1997-2015 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
40	Cypress Semiconductor Corp.	7	15	46.7	Electrostatic Discharge Association	8	53.3	IEEE	7	46.7
41	DOMINION ENERGY TEC	7	8	87.5	IEEE	7	87.5	IET/IEE	1	12.5
42	Honeywell International Inc.	7	8	87.5	IEEE	7	87.5	IEEE/JPN Soc App Phys	1	12.5
43	INTERNATIONAL BROAD	7	13	53.8	IEEE	7	53.8	ISO-International Standards Organization	4	30.8
44	POWER TAGGING TECHN	7	8	87.5	IEEE	7	87.5	IET/IEE	1	12.5
45	STMicroelectronics	7	12	58.3	IEEE	7	58.3	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	3	25.0
46	Terahop Networks Inc	7	11	63.6	IEEE	7	63.6	Internet Soc/IETF-Internet Eng Task Force	1	9.1
47	Toshiba Corp	7	10	70.0	IEEE	7	70.0	Internet Soc/IETF-Internet Eng Task Force	2	20.0
48	Alstom	6	10	60.0	IEEE	6	60.0	IET/IEE	2	20.0
49	Silver Spring Networks Inc	6	8	75.0	IEEE	6	75.0	RELX Group	1	12.5
50	University of Oxford	6	6	100.0	IEEE	6	100.0			
51	UT-Battelle LLC	6	6	100.0	IEEE	6	100.0			
52	Vacon Oyj	6	6	100.0	IEEE	6	100.0			
53	Battelle Memorial Institute	5	18	27.8	ACM-Assoc Comput Mach	6	33.3	IEEE	5	27.8
54	Boeing Co. (The)	5	10	50.0	IEEE	5	50.0	Springer/Sp. Wien/Springer-Verlag/Kluwer	1	10.0
55	Canon Inc	5	5	100.0	IEEE	5	100.0			
56	COM/ENERGY TECHNOL	5	16	31.3	McGraw Hill	6	37.5	IEEE	5	31.3
57	DGI CREATIONS LLC	5	5	100.0	IEEE	5	100.0			
58	D-Wave Systems Inc.	5	29	17.2	Am Physical Soc	9	31.0	AVS-AIP Am Inst Physics	5	17.2
59	Fujitsu Limited	5	14	35.7	IEEE	5	35.7	ACM-Assoc Comput Mach	4	28.6
60	On Semiconductor Corporati	5	5	100.0	IEEE	5	100.0			
61	University of Alberta	5	8	62.5	IEEE	5	62.5	RELX Group	1	12.5
62	University of Connecticut	5	5	100.0	IEEE	5	100.0			
63	Eaton Corp.	4	6	66.7	IEEE	4	66.7	McGraw Hill	2	33.3
64	HUDSON BAY WIRELESS	4	5	80.0	IEEE	4	80.0	Condé Nast	1	20.0
65	Mitsubishi Electric Corp	4	4	100.0	IEEE	4	100.0			
66	National Instruments Corp.	4	6	66.7	IEEE	4	66.7	RELX Group	2	33.3
67	TX RX SYSTEMS INC	4	4	100.0	IEEE	4	100.0			
68	Walt Disney Co.	4	4	100.0	IEEE	4	100.0			
69	ACEX TECHNOLOGIES IN	3	3	100.0	IEEE	3	100.0			
70	American Superconductor Co	3	8	37.5	RELX Group	5	62.5	IEEE	3	37.5
71	ASOKA USA CORP	3	3	100.0	IEEE	3	100.0			
72	Bayer AG	3	4	75.0	IEEE	3	75.0	International Telecommunication Union	1	25.0
73	Danaher Corp.	3	5	60.0	IEEE	3	60.0	Penton Media	1	20.0
74	Digi International Inc	3	3	100.0	IEEE	3	100.0			
75	Electric Power Research Insti	3	9	33.3	Electric Power Research Institute	6	66.7	IEEE	3	33.3
76	Electro Industries Gauge Tec	3	10	30.0	ACM-Assoc Comput Mach	5	50.0	IEEE	3	30.0
77	Hewlett-Packard Co	3	3	100.0	IEEE	3	100.0			
78	Motorola Solutions Inc.	3	3	100.0	IEEE	3	100.0			
79	NEW YORK STATE ELECT	3	3	100.0	IEEE	3	100.0			
80	Northeastern University (Bost	3	4	75.0	IEEE	3	75.0	Electric Power Research Institute	1	25.0

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	Schweitzer Engineering Labo	3	3	100.0	IEEE	3	100.0			
82	ADVANCED TESTING TEC	2	3	66.7	IEEE	2	66.7	RELX Group	1	33.3
83	ADVANERGY INC	2	2	100.0	IEEE	2	100.0			
84	Amazing Microelectronic Cor	2	2	100.0	IEEE	2	100.0			
85	Avago Technologies Ltd	2	2	100.0	IEEE	2	100.0			
86	BASIC MEASURING INST	2	2	100.0	IEEE	2	100.0			
87	BITRONICS INC	2	4	50.0	IEEE	2	50.0	ABB Group	2	50.0
88	Bosch (Robert) GmbH	2	2	100.0	IEEE	2	100.0			
89	City University of Hong Kon	2	3	66.7	IEEE	2	66.7	Internet Soc/IETF-Internet Eng Task Force	1	33.3
90	Conexant Systems Inc.	2	4	50.0	IEEE	2	50.0	Cahners-Denver Pub	1	25.0
91	CORRIDOR SYSTEMS INC	2	2	100.0	IEEE	2	100.0			
92	DAZHONG MA	2	2	100.0	IEEE	2	100.0			
93	DISTRIBUTION CONTROL	2	2	100.0	IEEE	2	100.0			
94	Electronics and Telecommuni	2	2	100.0	IEEE	2	100.0			
95	ExxonMobil Corp	2	14	14.3	soc of Exploration Geophysists	8	57.1	RELX Group	2	14.3
96	GENSCAPE INC	2	2	100.0	IEEE	2	100.0			
97	HUAGUANG ZHANG	2	2	100.0	IEEE	2	100.0			
98	III HOLDINGS 1 LLC	2	2	100.0	IEEE	2	100.0			
99	INTERNATIONAL BROAD	2	4	50.0	ISO-International Standards Organization	2	50.0	IEEE	2	50.0
100	JIANGUO ZHOU	2	2	100.0	IEEE	2	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>Solar/Photovoltaic</i>										
1	Total SA	377	511	73.8	IEEE	377	73.8	WIP-Renewable Energies	46	9.0
2	Emcore Corp.	230	450	51.1	IEEE	230	51.1	US Dept of Energy	76	16.9
3	SOLAREEDGE TECHNOLO	203	253	80.2	IEEE	203	80.2	WIP-Renewable Energies	32	12.6
4	University of Illinois	178	1946	9.1	AVS-AIP Am Inst Physics	363	18.7	ACS-Am Chem Soc	355	18.2
5	Tigo Energy Inc	150	234	64.1	IEEE	150	64.1	WIP-Renewable Energies	63	26.9
6	Xerox Corp	149	466	32.0	IEEE	149	32.0	RELX Group	83	17.8
7	Solexel Inc	114	532	21.4	RELX Group	180	33.8	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	117	22.0
8	Sanan Optoelectronics Techn	112	351	31.9	US Dept of Energy	168	47.9	IEEE	112	31.9
9	International Business Machi	110	459	24.0	IEEE	110	24.0	RELX Group	81	17.6
10	Hanergy Holding Group Ltd	109	303	36.0	IEEE	109	36.0	RELX Group	50	16.5
11	SEMPRIUS INC	102	1125	9.1	ACS-Am Chem Soc	205	18.2	AVS-AIP Am Inst Physics	199	17.7
12	Taiwan Semiconductor Manu	98	472	20.8	AVS-AIP Am Inst Physics	172	36.4	IEEE	98	20.8
13	SOLAR JUNCTION CORP	91	429	21.2	RELX Group	113	26.3	AVS-AIP Am Inst Physics	107	24.9
14	Canon Inc	88	240	36.7	IEEE	88	36.7	AVS-AIP Am Inst Physics	48	20.0
15	Advanced Energy Industries I	83	89	93.3	IEEE	83	93.3	IET/IEE	4	4.5
16	SOLAERO TECHNOLOGIE	81	152	53.3	IEEE	81	53.3	AVS-AIP Am Inst Physics	23	15.1
17	Applied Materials Inc.	80	239	33.5	IEEE	80	33.5	WIP-Renewable Energies	51	21.3
18	Stion Corp	77	671	11.5	RELX Group	225	33.5	AVS-AIP Am Inst Physics	119	17.7
19	Lockheed Martin Corp.	68	215	31.6	IEEE	68	31.6	AVS-AIP Am Inst Physics	47	21.9
20	Nanosolar Inc	61	853	7.2	RELX Group	238	27.9	Electrochemical Society	107	12.5
21	General Electric Company	50	333	15.0	ACS-Am Chem Soc	83	24.9	IEEE	50	15.0
22	EVERGREEN SOLAR INC	48	96	50.0	IEEE	48	50.0	ACS-Am Chem Soc	44	45.8
23	Texas Instruments Inc	47	59	79.7	IEEE	47	79.7	Electrochemical Society	4	6.8
24	SUNIVA INC	45	88	51.1	IEEE	45	51.1	WIP-Renewable Energies	12	13.6
25	Sharp Corp	43	114	37.7	IEEE	43	37.7	RELX Group	23	20.2
26	SOLYNDRA LLC	43	220	19.5	RELX Group	71	32.3	IEEE	43	19.5
27	Alliance for Sustainable Ener	39	298	13.1	AVS-AIP Am Inst Physics	76	25.5	RELX Group	74	24.8
28	JX CRYSTALS INC	38	110	34.5	IEEE	38	34.5	RELX Group	30	27.3
29	University of Toledo	37	136	27.2	RELX Group	78	57.4	IEEE	37	27.2
30	Witricity Corp	36	66	54.5	IEEE	36	54.5	AVS-AIP Am Inst Physics	5	7.6
31	4POWER LLC	34	66	51.5	IEEE	34	51.5	AVS-AIP Am Inst Physics	18	27.3
32	Panasonic Corporation	31	175	17.7	AVS-AIP Am Inst Physics	47	26.9	RELX Group	34	19.4
33	AMI RESAERCH & DEVEL	30	60	50.0	IEEE	30	50.0	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	8	13.3
34	Boeing Co. (The)	29	96	30.2	IEEE	29	30.2	RELX Group	21	21.9
35	GTAT Corp (AT Advanced T	29	123	23.6	IEEE	29	23.6	RELX Group	22	17.9
36	University of California	29	536	5.4	ACS-Am Chem Soc	93	17.4	AVS-AIP Am Inst Physics	93	17.4
37	AMPT LLC	28	38	73.7	IEEE	28	73.7	RELX Group	3	7.9
38	APOLLO PRECISION FUJI	28	31	90.3	IEEE	28	90.3	AAAS-Am Assoc Advancement Sci	1	3.2
39	Guardian Industries Corp.	27	307	8.8	RELX Group	120	39.1	AVS-AIP Am Inst Physics	81	26.4

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40	The National Aeronautical an	26	191	13.6	Nature Publishing Group	29	15.2	IEEE	26	13.6
41	Imperial College	25	75	33.3	IEEE	25	33.3	AVS-AIP Am Inst Physics	22	29.3
42	Midwest Research Institute	25	93	26.9	RELX Group	26	28.0	IEEE	25	26.9
43	Raytheon Co.	25	48	52.1	IEEE	25	52.1	AVS-AIP Am Inst Physics	6	12.5
44	SOLAREEDGE LTD	25	33	75.8	IEEE	25	75.8	WIP-Renewable Energies	6	18.2
45	Solyndra Inc	25	140	17.9	RELX Group	46	32.9	IEEE	25	17.9
46	Compagnie de Saint-Gobain	23	120	19.2	SPIE-Int Soc Opt Engineering	30	25.0	RELX Group	26	21.7
47	PRECURSOR ENERGETIC	23	1075	2.1	ACS-Am Chem Soc	481	44.7	RELX Group	257	23.9
48	Solopower Inc	23	211	10.9	RELX Group	101	47.9	AVS-AIP Am Inst Physics	38	18.0
49	SOLARWORLD INNOVATI	22	62	35.5	IEEE	22	35.5	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	12	19.4
50	Hanwha Group	21	49	42.9	IEEE	21	42.9	RELX Group	8	16.3
51	Mitsubishi Electric Corp	21	43	48.8	IEEE	21	48.8	WIP-Renewable Energies	6	14.0
52	OSTENDO TECHNOLOGIE	21	56	37.5	IEEE	21	37.5	RELX Group	17	30.4
53	Ignis Innovation Inc	20	22	90.9	IEEE	20	90.9	Emerald Group Publishing	1	4.5
54	Interuniversity MicroElectron	20	74	27.0	IEEE	20	27.0	RELX Group	15	20.3
55	EBARA SOLAR INC	19	34	55.9	IEEE	19	55.9	RELX Group	7	20.6
56	Massachusetts Institute of Te	19	146	13.0	ACS-Am Chem Soc	37	25.3	IEEE	19	13.0
57	Laird Group Plc	18	61	29.5	IEEE	18	29.5	AVS-AIP Am Inst Physics	15	24.6
58	Shin-Etsu Chemical Co. Ltd.	18	48	37.5	IEEE	18	37.5	RELX Group	8	16.7
59	United States of America De	18	51	35.3	IEEE	18	35.3	AVS-AIP Am Inst Physics	13	25.5
60	University of Michigan	17	192	8.9	AVS-AIP Am Inst Physics	46	24.0	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	28	14.6
61	ATHENAEUM LLC	16	96	16.7	RELX Group	30	31.3	AVS-AIP Am Inst Physics	18	18.8
62	California Institute of Techno	16	202	7.9	AVS-AIP Am Inst Physics	58	28.7	MRS-Materials Research Soc	30	14.9
63	Du Pont (E.I.) de Nemours &	16	143	11.2	RELX Group	44	30.8	AVS-AIP Am Inst Physics	19	13.3
64	ENCORE SOLAR POWER I	16	28	57.1	IEEE	16	57.1	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	4	14.3
65	Georgia Institute of Technolo	16	33	48.5	IEEE	16	48.5	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	5	15.2
66	Qualcomm Inc	16	46	34.8	IEEE	16	34.8	SID-Society for Information Display	7	15.2
67	First Solar Inc	15	70	21.4	RELX Group	32	45.7	IEEE	15	21.4
68	Fraunhofer Gesellschaft	15	68	22.1	WIP-Renewable Energies	17	25.0	RELX Group	16	23.5
69	Intevac Inc	15	63	23.8	AVS-AIP Am Inst Physics	21	33.3	IEEE	15	23.8
70	Nth Degree Technologies Wo	15	154	9.7	Nature Publishing Group	29	18.8	OSA-Opt Soc Amer	20	13.0
71	Semiconductor Energy Labor	15	225	6.7	SID-Society for Information Display	72	32.0	AVS-AIP Am Inst Physics	40	17.8
72	Solfocus Inc	15	59	25.4	IEEE	15	25.4	RELX Group	15	25.4
73	Teijin Ltd.	15	52	28.8	IEEE	15	28.8	WIP-Renewable Energies	11	21.2
74	ARCHITECTURAL GLASS	14	42	33.3	IEEE	14	33.3	Sci American Inc	7	16.7
75	City University of Hong Kon	14	27	51.9	IEEE	14	51.9	IET/IEE	8	29.6
76	ROSESTREET LABS ENER	14	44	31.8	AVS-AIP Am Inst Physics	15	34.1	IEEE	14	31.8
77	Showa Shell Sekiyu KK	14	24	58.3	IEEE	14	58.3	Japan Standards Assoc	4	16.7
78	Sony Corp	14	81	17.3	RELX Group	20	24.7	IEEE	14	17.3
79	Commissariat A L'Energie At	13	93	14.0	RELX Group	33	35.5	ACS-Am Chem Soc	19	20.4
80	Industrial Technology Researc	13	121	10.7	RELX Group	43	35.5	ACS-Am Chem Soc	14	11.6

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rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	Kyocera Corp.	12	53	22.6	IEEE	12	22.6	RELX Group	8	15.1
82	LG Electronics Inc.	12	56	21.4	RELX Group	18	32.1	IEEE	12	21.4
83	University of Houston	12	44	27.3	IEEE	12	27.3	McGraw Hill	6	13.6
84	URIEL SOLAR INC	12	36	33.3	AVS-AIP Am Inst Physics	15	41.7	IEEE	12	33.3
85	COGENRA SOLAR INC	11	34	32.4	IEEE	11	32.4	RELX Group	8	23.5
86	Helmholtz Zentrum Berlin for	11	40	27.5	IEEE	11	27.5	RELX Group	10	25.0
87	Honeywell International Inc.	11	975	1.1	ACS-Am Chem Soc	387	39.7	RELX Group	179	18.4
88	Leonhard Kurz Stiftung & Co	11	55	20.0	AVS-AIP Am Inst Physics	14	25.5	RELX Group	12	21.8
89	SILICOR MATERIALS INC	11	21	52.4	IEEE	11	52.4	WIP-Renewable Energies	4	19.0
90	Toyota Motor Corp	11	42	26.2	IEEE	11	26.2	RELX Group	10	23.8
91	University of Arkansas	11	97	11.3	AVS-AIP Am Inst Physics	45	46.4	RELX Group	12	12.4
92	University of Central Florida	11	163	6.7	AVS-AIP Am Inst Physics	22	13.5	RELX Group	21	12.9
93	ZENA TECHNOLOGIES IN	11	55	20.0	ACS-Am Chem Soc	12	21.8	IEEE	11	20.0
94	1366 TECHNOLOGIES INC	10	58	17.2	RELX Group	30	51.7	IEEE	10	17.2
95	Hitachi Ltd	10	19	52.6	IEEE	10	52.6	RELX Group	3	15.8
96	Rensselaer Polytechnic Instit	10	23	43.5	IEEE	10	43.5	AVS-AIP Am Inst Physics	4	17.4
97	Rochester Institute of Techno	10	35	28.6	IEEE	10	28.6	RELX Group	10	28.6
98	Silicon Genesis Corporation	10	65	15.4	AVS-AIP Am Inst Physics	28	43.1	IEEE	10	15.4
99	SUNPREME LTD	10	27	37.0	IEEE	10	37.0	RELX Group	8	29.6
100	United States Navy	10	86	11.6	AVS-AIP Am Inst Physics	15	17.4	RELX Group	14	16.3

## Appendix B: Top 100 Organizations That Cite IEEE; (1997-2015 Patents by Category)

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	Qualcomm Inc	19073	42021	45.4	IEEE	19073	45.4	3GPP General Partnership Project Standards Body	10630	25.3
2	Avago Technologies Ltd	15668	22983	68.2	IEEE	15668	68.2	International Telecommunication Union	1145	5.0
3	Marvell Technology Group Lt	12204	16393	74.4	IEEE	12204	74.4	3GPP General Partnership Project Standards Body	2876	17.5
4	Nokia Corp	11262	26325	42.8	IEEE	11262	42.8	3GPP General Partnership Project Standards Body	5306	20.2
5	Microsoft Corporation	10782	24781	43.5	IEEE	10782	43.5	ACM-Assoc Comput Mach	3355	13.5
6	ParkerVision Inc	9572	18846	50.8	IEEE	9572	50.8	IET/IEE	4551	24.1
7	InterDigital Inc	8905	28977	30.7	3GPP General Partnership Project Standards	15998	55.2	IEEE	8905	30.7
8	Ericsson	8586	20289	42.3	IEEE	8586	42.3	3GPP General Partnership Project Standards Body	5985	29.5
9	Intel Corporation	8490	15881	53.5	IEEE	8490	53.5	3GPP General Partnership Project Standards Body	1993	12.5
10	Personalized Media Commun	6440	37210	17.3	Soc Motion Picture TV Eng Inc	11602	31.2	IEEE	6440	17.3
11	Cisco Systems Inc.	5527	17281	32.0	IEEE	5527	32.0	Internet Soc/IETF-Internet Eng Task Force	3316	19.2
12	Samsung Electronics Co Ltd	5408	9886	54.7	IEEE	5408	54.7	3GPP General Partnership Project Standards Body	1878	19.0
13	AT&T Inc	4854	10855	44.7	IEEE	4854	44.7	ACM-Assoc Comput Mach	709	6.5
14	LG Electronics Inc.	4818	21313	22.6	3GPP General Partnership Project Standards	10991	51.6	IEEE	4818	22.6
15	International Business Machi	4721	10379	45.5	IEEE	4721	45.5	ACM-Assoc Comput Mach	1410	13.6
16	Sony Corp	4669	9100	51.3	IEEE	4669	51.3	3GPP General Partnership Project Standards Body	547	6.0
17	Panasonic Corporation	4642	12926	35.9	IEEE	4642	35.9	3GPP General Partnership Project Standards Body	3152	24.4
18	Rockstar Consortium (Nortel	4413	8052	54.8	IEEE	4413	54.8	OSA-Opt Soc Amer	638	7.9
19	Fujitsu Limited	4287	9872	43.4	IEEE	4287	43.4	3GPP General Partnership Project Standards Body	1596	16.2
20	Apple Inc	4081	8470	48.2	IEEE	4081	48.2	ISO/IEC	573	6.8
21	Adaptix	4046	5976	67.7	IEEE	4046	67.7	European Telecom Standards Institute (ETSI)	683	11.4
22	Fractus SA	4034	7007	57.6	IEEE	4034	57.6	IET/IEE	999	14.3
23	Nippon Telegraph & Telepho	3587	9756	36.8	IEEE	3587	36.8	3GPP General Partnership Project Standards Body	2829	29.0
24	Texas Instruments Inc	3555	4996	71.2	IEEE	3555	71.2	3GPP General Partnership Project Standards Body	329	6.6
25	Blackberry Ltd.	3166	12975	24.4	3GPP General Partnership Project Standards	6250	48.2	IEEE	3166	24.4
26	Massachusetts Institute of Te	3061	5399	56.7	IEEE	3061	56.7	OSA-Opt Soc Amer	328	6.1
27	NEC Corp	2975	7207	41.3	IEEE	2975	41.3	3GPP General Partnership Project Standards Body	1662	23.1
28	Conversant Intellectual Prope	2890	5305	54.5	IEEE	2890	54.5	INTERTEC PUBL CORP PRIMEDIA CO	201	3.8
29	Huawei Technologies Compa	2804	12221	22.9	3GPP General Partnership Project Standards	4918	40.2	IEEE	2804	22.9
30	Motorola Solutions Inc.	2784	4666	59.7	IEEE	2784	59.7	3GPP General Partnership Project Standards Body	303	6.5
31	University of Minnesota (The	2736	2997	91.3	IEEE	2736	91.3	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	55	1.8
32	Electronics and Telecommuni	2611	4026	64.9	IEEE	2611	64.9	3GPP General Partnership Project Standards Body	486	12.1
33	Rambus Inc.	2576	3664	70.3	IEEE	2576	70.3	International Association for Cryptologic Research (IACR)	183	5.0
34	Verizon Communications Inc	2547	6303	40.4	IEEE	2547	40.4	Internet Soc/IETF-Internet Eng Task Force	1144	18.2
35	Raytheon Co.	2453	4121	59.5	IEEE	2453	59.5	IET/IEE	183	4.4
36	Google Inc.	2163	6472	33.4	IEEE	2163	33.4	ACM-Assoc Comput Mach	840	13.0
37	STMicroelectronics	2105	2891	72.8	IEEE	2105	72.8	RELX Group	80	2.8
38	DIRECTV Group Inc. (The)	2027	3084	65.7	IEEE	2027	65.7	Elettronica e Telecomunicazioni	161	5.2
39	NXP Semiconductors NV	2005	2680	74.8	IEEE	2005	74.8	3GPP General Partnership Project Standards Body	95	3.5

## Appendix B: Top 100 Organizations That Cite IEEE; (1997-2015 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
40	Digimarc Corp.	1986	4825	41.2	IEEE	1986	41.2	SPIE-Int Soc Opt Engineering	546	11.3
41	Mitsubishi Electric Corp	1920	4033	47.6	IEEE	1920	47.6	3GPP General Partnership Project Standards Body	491	12.2
42	Silicon Laboratories Inc	1889	2403	78.6	IEEE	1889	78.6	Cahners-Denver Pub	114	4.7
43	Hewlett-Packard Co	1877	5563	33.7	IEEE	1877	33.7	Internet Soc/IETF-Internet Eng Task Force	716	12.9
44	Toshiba Corp	1849	3955	46.8	IEEE	1849	46.8	IEICE-Inst Elec Info Comm Eng	320	8.1
45	Micron Technology Inc.	1717	2810	61.1	IEEE	1717	61.1	IEEE/JPN Soc App Phys	172	6.1
46	TE Connectivity Ltd	1711	2702	63.3	IEEE	1711	63.3	IET/IEE	122	4.5
47	Technicolor SA	1674	3552	47.1	IEEE	1674	47.1	ISO/IEC	296	8.3
48	Harris Corp.	1618	2858	56.6	IEEE	1618	56.6	Internet Soc/IETF-Internet Eng Task Force	239	8.4
49	Murata Manufacturing Co. Lt	1612	2210	72.9	IEEE	1612	72.9	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	91	4.1
50	Industrial Technology Researc	1545	2249	68.7	IEEE	1545	68.7	3GPP General Partnership Project Standards Body	136	6.0
51	University of California	1516	2521	60.1	IEEE	1516	60.1	OSA-Opt Soc Amer	114	4.5
52	Hitachi Ltd	1487	3987	37.3	IEEE	1487	37.3	IEICE-Inst Elec Info Comm Eng	352	8.8
53	Koninklijke Philips N.V.	1465	2945	49.7	IEEE	1465	49.7	3GPP General Partnership Project Standards Body	168	5.7
54	Oracle Corporation	1465	5257	27.9	IEEE	1465	27.9	3GPP General Partnership Project Standards Body	603	11.5
55	Sharp Corp	1457	6566	22.2	3GPP General Partnership Project Standards	2295	35.0	IEEE	1457	22.2
56	Comcast Corp	1435	2672	53.7	IEEE	1435	53.7	Internet Soc/IETF-Internet Eng Task Force	167	6.3
57	Honeywell International Inc.	1433	2610	54.9	IEEE	1433	54.9	RELX Group	122	4.7
58	Softbank Corp	1427	5819	24.5	International Telecommunication Union	1863	32.0	IEEE	1427	24.5
59	Columbia University	1422	2456	57.9	IEEE	1422	57.9	Virus Bulletin Ltd	201	8.2
60	Analog Devices Inc.	1324	1610	82.2	IEEE	1324	82.2	IET/IEE	59	3.7
61	Tabula Inc	1316	3458	38.1	ACM-Assoc Comput Mach	1343	38.8	IEEE	1316	38.1
62	Fraunhofer Gesellschaft	1279	2594	49.3	IEEE	1279	49.3	MPEG.org	263	10.1
63	L-3 Communications Holdin	1251	1567	79.8	IEEE	1251	79.8	IET/IEE	88	5.6
64	Siemens Aktiengesellschaft	1228	2714	45.2	IEEE	1228	45.2	3GPP General Partnership Project Standards Body	229	8.4
65	Commscope Inc.	1225	1484	82.5	IEEE	1225	82.5	IET/IEE	132	8.9
66	SIPCO LLC	1222	2178	56.1	IEEE	1222	56.1	Internet Soc/IETF-Internet Eng Task Force	175	8.0
67	Juniper Networks Inc.	1208	2942	41.1	IEEE	1208	41.1	Internet Soc/IETF-Internet Eng Task Force	648	22.0
68	Pelican Imaging Corporation	1208	2605	46.4	IEEE	1208	46.4	SPIE-Int Soc Opt Engineering	501	19.2
69	California Institute of Techno	1200	1989	60.3	IEEE	1200	60.3	SPIE-Int Soc Opt Engineering	124	6.2
70	HRL Laboratories LLC	1200	1807	66.4	IEEE	1200	66.4	IET/IEE	210	11.6
71	Infineon Technologies AG	1173	1716	68.4	IEEE	1173	68.4	3GPP General Partnership Project Standards Body	88	5.1
72	Rovi Corporation	1139	4436	25.7	IEEE	1139	25.7	ACM-Assoc Comput Mach	301	6.8
73	Intersil Corp.	1099	1532	71.7	IEEE	1099	71.7	IET/IEE	135	8.8
74	Deutsche Telekom AG	1094	1922	56.9	IEEE	1094	56.9	ACM-Assoc Comput Mach	114	5.9
75	Xilinx Inc.	1084	1433	75.6	IEEE	1084	75.6	ACM-Assoc Comput Mach	72	5.0
76	Qorvo	1083	1364	79.4	IEEE	1083	79.4	European Microwave Association	39	2.9
77	Canon Inc	1077	2440	44.1	IEEE	1077	44.1	ACM-Assoc Comput Mach	119	4.9
78	Microsemi Corp	1051	1577	66.6	IEEE	1051	66.6	International Telecommunication Union	71	4.5
79	REARDEN LLC	1048	1185	88.4	IEEE	1048	88.4	IET/IEE	48	4.1
80	Kyocera Corp.	1041	1579	65.9	IEEE	1041	65.9	3GPP General Partnership Project Standards Body	208	13.2

## Appendix B: Top 100 Organizations That Cite IEEE; (1997-2015 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
81	Mediatek Inc.	1003	1452	69.1	IEEE	1003	69.1	3GPP General Partnership Project Standards Body	259	17.8
82	WI-Lan Inc	992	1487	66.7	IEEE	992	66.7	3GPP General Partnership Project Standards Body	91	6.1
83	Tessera Technologies Inc.	957	1547	61.9	IEEE	957	61.9	RELX Group	123	8.0
84	Lockheed Martin Corp.	955	1981	48.2	IEEE	955	48.2	OSA-Opt Soc Amer	190	9.6
85	BT Group PLC	954	1885	50.6	IEEE	954	50.6	Internet Soc/IETF-Internet Eng Task Force	166	8.8
86	Lenovo Group Ltd	914	3069	29.8	3GPP General Partnership Project Standards	1694	55.2	IEEE	914	29.8
87	Wisteria Trading Inc	894	1712	52.2	IEEE	894	52.2	SPIE-Int Soc Opt Engineering	219	12.8
88	Semiconductor Energy Labor	879	10371	8.5	SID-Society for Information Display	3959	38.2	AVS-AIP Am Inst Physics	1241	12.0
89	MAGNACOM LTD	859	910	94.4	IEEE	859	94.4	Alcatel-Lucent	51	5.6
90	Velatia Group	854	1080	79.1	IEEE	854	79.1	Echelon Corp	80	7.4
91	MONOLITHIC 3D INC	824	1469	56.1	IEEE	824	56.1	IEEE/JPN Soc App Phys	162	11.0
92	Texas A&M University	779	877	88.8	IEEE	779	88.8	Am Physical Soc	17	1.9
93	BAE Systems Plc.	769	1007	76.4	IEEE	769	76.4	SPIE-Int Soc Opt Engineering	35	3.5
94	Boeing Co. (The)	754	1533	49.2	IEEE	754	49.2	SPIE-Int Soc Opt Engineering	62	4.0
95	Northrop Grumman Corp	741	1198	61.9	IEEE	741	61.9	SPIE-Int Soc Opt Engineering	54	4.5
96	Cypress Semiconductor Corp.	733	1046	70.1	IEEE	733	70.1	Joint IEEE and ACM	38	3.6
97	Orange	710	1311	54.2	IEEE	710	54.2	Internet Soc/IETF-Internet Eng Task Force	92	7.0
98	Finisar Corp	709	1097	64.6	IEEE	709	64.6	IET/IEE	178	16.2
99	HTC Corporation	704	2272	31.0	3GPP General Partnership Project Standards	1123	49.4	IEEE	704	31.0
100	United States Navy	703	1373	51.2	IEEE	703	51.2	Am Physical Soc	90	6.6

## Appendix B: Top 100 Organizations That Cite IEEE; (1997-2015 Patents by Category)

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	366	766	47.8	IEEE	366	47.8	AWEA-American Wind Energy Association	98	12.8
2	ABB Ltd	112	208	53.8	IEEE	112	53.8	EWEA-European Wind Energy Association	18	8.7
3	General Electric Company	97	339	28.6	US Dept of Energy	116	34.2	IEEE	97	28.6
4	SOLAREEDGE TECHNOLO	58	71	81.7	IEEE	58	81.7	WIP-Renewable Energies	7	9.9
5	Siemens Aktiengesellschaft	27	55	49.1	IEEE	27	49.1	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	7	12.7
6	THE UNIVERSITY OF NE	23	24	95.8	IEEE	23	95.8	IET/IEE	1	4.2
7	INGETEAAM ENERGY SA	19	32	59.4	IEEE	19	59.4	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	3	9.4
8	National Cheng Kung Univer	18	19	94.7	IEEE	18	94.7	IET/IEE	1	5.3
9	University of Alabama	16	19	84.2	IEEE	16	84.2	IET/IEE	3	15.8
10	UWM RESEARCH FOUND	16	18	88.9	IEEE	16	88.9	IET/IEE	1	5.6
11	FMC Technologies Inc.	13	17	76.5	IEEE	13	76.5	Springer/Sp. Wien/Springer-Verlag/Kluwer	1	5.9
12	INGETEAAM POWER TECH	13	22	59.1	IEEE	13	59.1	EWEA-European Wind Energy Association	2	9.1
13	Fujitsu Limited	12	13	92.3	IEEE	12	92.3	RELX Group	1	7.7
14	NRG SYSTEMS INC	12	20	60.0	IEEE	12	60.0	RELX Group	4	20.0
15	Senvion SE	11	29	37.9	IEEE	11	37.9	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	4	13.8
16	UNIVERSITY OF ZAGREB	10	11	90.9	IEEE	10	90.9	EWEA-European Wind Energy Association	1	9.1
17	KITE GEN RESEARCH S L	9	19	47.4	IEEE	9	47.4	RELX Group	7	36.8
18	Woodward Inc	9	9	100.0	IEEE	9	100.0			
19	ZOND ENERGY SYSTEMS	9	11	81.8	IEEE	9	81.8	EPE Association	1	9.1
20	GENEDICS CLEAN ENERG	7	63	11.1	RELX Group	49	77.8	AAAS-Am Assoc Advancement Sci	7	11.1
21	Oregon State University	7	7	100.0	IEEE	7	100.0			
22	GENEDICS LLC	6	47	12.8	RELX Group	35	74.5	AAAS-Am Assoc Advancement Sci	6	12.8
23	INDIVIDUAL PATENTER	6	18	33.3	IEEE	6	33.3	ASME-Am Soc Mech Eng	6	33.3
24	Medtronic Inc	6	8	75.0	IEEE	6	75.0	AMA-Am Medical Assoc	1	12.5
25	GREEN ENERGY CORP	5	5	100.0	IEEE	5	100.0			
26	NEC Corp	5	5	100.0	IEEE	5	100.0			
27	Alstom	4	6	66.7	IEEE	4	66.7	ABB Group	2	33.3
28	INGETEAAM SA	4	7	57.1	IEEE	4	57.1	EPE Association	1	14.3
29	Mitsubishi Heavy Industries	4	52	7.7	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	25	48.1	ASME-Am Soc Mech Eng	13	25.0
30	Nordex SE	4	9	44.4	IEEE	4	44.4	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	3	33.3
31	RHEINISCH-WESTFALISC	4	4	100.0	IEEE	4	100.0			
32	UNIVERSIDAD PUBLICA	4	5	80.0	IEEE	4	80.0	I S A-INSTRUM SYS AUTOMATION SOC	1	20.0
33	Daewoo Shipbuilding & Mari	3	6	50.0	IEEE	3	50.0	I S A-INSTRUM SYS AUTOMATION SOC	1	16.7
34	GLOBAL ENERGYCONCE	3	5	60.0	IEEE	3	60.0	AWEA-American Wind Energy Association	1	20.0
35	SAMAYS INNOVACIONES	3	5	60.0	IEEE	3	60.0	BIRKHAUSER VERLAG AG	1	20.0
36	ADVANCED MAGNET LA	2	2	100.0	IEEE	2	100.0			
37	Alliance for Sustainable Ener	2	10	20.0	ASME-Am Soc Mech Eng	7	70.0	IEEE	2	20.0
38	Dana Holding Corp.	2	3	66.7	IEEE	2	66.7	EVS.org	1	33.3
39	Enercon GmbH	2	2	100.0	IEEE	2	100.0			

## Appendix B: Top 100 Organizations That Cite IEEE; (1997-2015 Patents by Category)

rank	assignee	# IEEE Refs	Total Science Refs	% IEEE Refs	Top Referenced Organization	# Refs	% Refs	2nd Most Referenced Organization	# Refs	% Refs
40	Gamesa Corporacion Tecnolo	2	4	50.0	IEEE	2	50.0	EPE Association	2	50.0
41	Harris Corp.	2	4	50.0	IEEE	2	50.0	RELX Group	2	50.0
42	HAWAIIAN ELECTRIC CO	2	4	50.0	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	2	50.0	IEEE	2	50.0
43	Hitachi Ltd	2	5	40.0	Hitachi Ltd	3	60.0	IEEE	2	40.0
44	Honeywell International Inc.	2	2	100.0	IEEE	2	100.0			
45	NORTHERN POWER SYST	2	3	66.7	IEEE	2	66.7	Pennwell Pub	1	33.3
46	ONSEMBLE LLC	2	4	50.0	IEEE	2	50.0	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	2	50.0
47	Rockwell Automation Inc	2	2	100.0	IEEE	2	100.0			
48	ROCKY RESEARCH	2	4	50.0	IEEE	2	50.0	COMPANY OF BIOLOGISTS LTD	1	25.0
49	Schweitzer Engineering Labo	2	2	100.0	IEEE	2	100.0			
50	Trevii - Finanziaria Industrial	2	2	100.0	IEEE	2	100.0			
51	ACCIONA WINDPOWER S	1	1	100.0	IEEE	1	100.0			
52	American Superconductor Co	1	1	100.0	IEEE	1	100.0			
53	BASELOAD ENERGY INC	1	2	50.0	SPACE MAGAZINE	1	50.0	IEEE	1	50.0
54	Bosch (Robert) GmbH	1	1	100.0	IEEE	1	100.0			
55	California Institute of Techno	1	2	50.0	IEEE	1	50.0	RELX Group	1	50.0
56	Cisco Systems Inc.	1	1	100.0	IEEE	1	100.0			
57	CLEAN CURRENT LP	1	2	50.0	IEEE	1	50.0	PROFESSIONAL ENGINEERING PUBLISHING LTD	1	50.0
58	DCNS Group	1	1	100.0	IEEE	1	100.0			
59	Fiat Chrysler Automobiles N	1	1	100.0	IEEE	1	100.0			
60	FloDesign Wind Turbine Cor	1	20	5.0	AIAA-Am Inst Aero Astro	11	55.0	John Wiley & Sons/Wiley-Verlag/Wiley-Liss	8	40.0
61	General Motors Corp	1	2	50.0	IEEE	1	50.0	American Automatic Control Council (AACC)	1	50.0
62	GLOUSTER APPLICATION	1	8	12.5	RELX Group	6	75.0	IEEE	1	12.5
63	Google Inc.	1	1	100.0	IEEE	1	100.0			
64	Indiana University	1	5	20.0	RELX Group	2	40.0	IEEE	1	20.0
65	International Business Machi	1	4	25.0	RELX Group	2	50.0	IEEE	1	25.0
66	INVENTUS HOLDINGS LL	1	1	100.0	IEEE	1	100.0			
67	JST LLC	1	2	50.0	IEEE	1	50.0	SPACE MAGAZINE	1	50.0
68	Mitsuba Corp.	1	1	100.0	IEEE	1	100.0			
69	POWEROASIS LTD	1	2	50.0	IEEE	1	50.0	RELX Group	1	50.0
70	PV SOLUTIONS LLC	1	1	100.0	IEEE	1	100.0			
71	SATCON TECHNOLOGY C	1	1	100.0	IEEE	1	100.0			
72	Schneider Electric S.A.	1	2	50.0	IEEE	1	50.0	IET/IEE	1	50.0
73	TECHNOLOGY SERVICE C	1	2	50.0	IEEE	1	50.0	IOP Publishing	1	50.0
74	WILIC S AR L	1	1	100.0	IEEE	1	100.0			
75	ZF Friedrichshafen AG (Ger	1	1	100.0	IEEE	1	100.0			



## *Appendix A - Publishers Receiving Most References from Top 40 Companies (Top 40 Companies in terms of 2015 Patent Activity; References from 1997-2015 Patents)*

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
<b>Amazon.com Inc.</b>		
ACM-Assoc Comput Mach	1970	30.2
IEEE	1253	19.2
RELX Group	406	6.2
Internet Soc/IETF-Internet Eng Task Force	290	4.4
International Data Group	181	2.8
Ziff-Davis	144	2.2
Information Processing Society of Japan	143	2.2
CBS Interactive	136	2.1
New York Times	123	1.9
Springer/Sp. Wien/Springer-Verlag/Kluwer	108	1.7
The USENIX Association	109	1.7
Condé Nast	84	1.3
International Association for Cryptologic Research (IACR)	85	1.3
United Business Media/UBM Tech	85	1.3
Winter Simulation Conference Board of Directors	62	1.0
122 others with less than 1% each	1346	19.8
<b>Apple Inc</b>		
IEEE	15121	38.0
ACM-Assoc Comput Mach	8164	20.5
RELX Group	1714	4.3
Springer/Sp. Wien/Springer-Verlag/Kluwer	584	1.5
3GPP General Partnership Project Standards Body	581	1.5
ISO/IEC	597	1.5
Joint IEEE and ACM	521	1.3
OSA-Opt Soc Amer	532	1.3
Ziff-Davis	482	1.2
Association for the Advancement of Artificial Intelligence	421	1.1
Network Working Group RFC	379	1.0
ISCA (International Speech Communication Association)	394	1.0
248 others with less than 1% each	10289	24.8

## *Appendix A - Publishers Receiving Most References from Top 40 Companies (Top 40 Companies in terms of 2015 Patent Activity; References from 1997-2015 Patents)*

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
<b>AT&amp;T Inc</b>		
IEEE	8245	41.4
ACM-Assoc Comput Mach	2106	10.6
Internet Soc/IETF-Internet Eng Task Force	727	3.6
RELX Group	689	3.5
International Telecommunication Union	468	2.3
3GPP General Partnership Project Standards Body	420	2.1
European Telecom Standards Institute (ETSI)	375	1.9
IET/IEE	365	1.8
Springer/Springer Wien/Springer-Verlag/Kluwer	326	1.6
Joint IEEE and ACM	295	1.5
ISCA (International Speech Communication Association)	295	1.5
ISO/IEC	301	1.5
Springer/Sp. Wien/Springer-Verlag/Kluwer	308	1.5
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	272	1.4
Network Working Group RFC	210	1.1
OSA-Opt Soc Amer	212	1.1
231 others with less than 1% each	4310	20.5
<b>Blackberry Ltd.</b>		
3GPP General Partnership Project Standards Body	6557	35.6
IEEE	5164	28.0
Internet Soc/IETF-Internet Eng Task Force	864	4.7
ACM-Assoc Comput Mach	760	4.1
Network Working Group RFC	428	2.3
RELX Group	367	2.0
International Association for Cryptologic Research (IACR)	315	1.7
European Telecom Standards Institute (ETSI)	269	1.5
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	223	1.2
Springer/Sp. Wien/Springer-Verlag/Kluwer	202	1.1
IET/IEE	178	1.0
Ziff-Davis	180	1.0
179 others with less than 1% each	2936	14.5

**Appendix A - Publishers Receiving Most References from Top 40 Companies**  
**(Top 40 Companies in terms of 2015 Patent Activity; References from 1997-2015 Patents)**

*Publisher*

*# Pat Refs to: Percent of Total*

**Bosch (Robert) GmbH**

IEEE	2031	24.5
RELX Group	714	8.6
Springer/Sp. Wien/Springer-Verlag/Kluwer	519	6.3
Amer Thoracic Soc	363	4.4
Am Diabetese Assoc	366	4.4
SAE-Society of Automobile Engineers	222	2.7
SAGE PUBLICATIONS INC	198	2.4
Georg Thiem Verlag KG	186	2.2
Wichtig Editore	175	2.1
Ziff-Davis	164	2.0
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	160	1.9
SPIE-Int Soc Opt Engineering	139	1.7
Lippincott Williams & Wilkins	126	1.5
Assoc Advancement Medical Instrumentation-AAMI	103	1.2
Schattauer GmbH-Verlag Medizin Naturwissenschaften	98	1.2
Molecular Diversity Preservation International	96	1.2
Peter Peregrinus Ltd	92	1.1
AMA-Am Medical Assoc	91	1.1
Soc Science and the Public	91	1.1
AAAS-Am Assoc Advancement Sci	88	1.1
Lancet Ltd	88	1.1
United Business Media/UBM Tech	81	1.0
Miller Freeman	87	1.0
College Amer Pathologists	86	1.0
Australasian Med Publ Co Ltd	87	1.0
Amer Soc Clinical Pathology	87	1.0
Incisive Media	81	1.0
168 others with less than 1% each	1670	18.6

**Broadcom Corp.**

IEEE	16988	57.6
International Telecommunication Union	1192	4.0
SMTA-Surface Mount Technology Association	1067	3.6
ACM-Assoc Comput Mach	883	3.0
IHS Publishing Group	719	2.4
Cahners-Denver Pub	533	1.8
IPC - Institute of Interconnecting and Packaging Electronic Circuits	470	1.6
GSM Association (standards org)	445	1.5
IET/IEE	441	1.5
3GPP General Partnership Project Standards Body	420	1.4
Joint IEEE and ACM	382	1.3
Network Working Group RFC	354	1.2
RELX Group	283	1.0
169 others with less than 1% each	5330	17.1

**Appendix A - Publishers Receiving Most References from Top 40 Companies  
(Top 40 Companies in terms of 2015 Patent Activity; References from 1997-2015 Patents)**

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
<b>Brother Industries Ltd</b>		
IEEE	98	26.3
RELX Group	31	8.3
ACM-Assoc Comput Mach	31	8.3
IEICE-Inst Elec Info Comm Eng	23	6.2
Internet Soc/IETF-Internet Eng Task Force	22	5.9
AVS-AIP Am Inst Physics	21	5.6
ACS-Am Chem Soc	16	4.3
AAAS-Am Assoc Advancement Sci	12	3.2
Information Processing Society of Japan	12	3.2
Nikkei Business Publications, Inc.	11	3.0
SID-Society for Information Display	11	3.0
IOP Publishing	6	1.6
IET/IEE	6	1.6
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	6	1.6
INST PURE APPLIED PHYSICS	6	1.6
Springer/Sp. Wien/Springer-Verlag/Kluwer	5	1.3
37 others with less than 1% each	55	15.2
<b>Canon Inc</b>		
IEEE	5458	20.9
AVS-AIP Am Inst Physics	3649	14.0
RELX Group	3523	13.5
ACS-Am Chem Soc	1364	5.2
SPIE-Int Soc Opt Engineering	1330	5.1
ACM-Assoc Comput Mach	848	3.2
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	822	3.1
Nature Publishing Group	591	2.3
INST PURE APPLIED PHYSICS	563	2.2
OSA-Opt Soc Amer	505	1.9
AAAS-Am Assoc Advancement Sci	391	1.5
SID-Society for Information Display	335	1.3
Electrochemical Society	339	1.3
Am Physical Soc	286	1.1
Springer/Sp. Wien/Springer-Verlag/Kluwer	289	1.1
MRS-Materials Research Soc	259	1.0
IEICE-Inst Elec Info Comm Eng	266	1.0
337 others with less than 1% each	5283	16.6

## *Appendix A - Publishers Receiving Most References from Top 40 Companies (Top 40 Companies in terms of 2015 Patent Activity; References from 1997-2015 Patents)*

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
<b>Ericsson</b>		
IEEE	11136	41.3
3GPP General Partnership Project Standards Body	6607	24.5
Internet Soc/IETF-Internet Eng Task Force	1506	5.6
Network Working Group RFC	866	3.2
OSA-Opt Soc Amer	827	3.1
ACM-Assoc Comput Mach	656	2.4
IET/IEE	602	2.2
European Telecom Standards Institute (ETSI)	535	2.0
International Telecommunication Union	505	1.9
RELX Group	362	1.3
218 others with less than 1% each	3330	10.8
<b>Ford Motor Co.</b>		
SAE-Society of Automobile Engineers	1934	45.7
IEEE	568	13.4
RELX Group	464	11.0
ACS-Am Chem Soc	102	2.4
American Automatic Control Council (AACC)	102	2.4
Society of Automotive Engineers of Japan, Inc. (JSAE)	93	2.2
ASME-Am Soc Mech Eng	91	2.2
ACM-Assoc Comput Mach	78	1.8
Springer/Sp. Wien/Springer-Verlag/Kluwer	60	1.4
Royal Society of Chemistry	46	1.1
Winter Simulation Conference Board of Directors	47	1.1
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	41	1.0
129 others with less than 1% each	604	12.2
<b>Fuji Film Holdings Corp</b>		
IEEE	1883	16.6
ACM-Assoc Comput Mach	1223	10.8
RELX Group	1204	10.6
ACS-Am Chem Soc	745	6.6
SPIE-Int Soc Opt Engineering	627	5.5
AVS-AIP Am Inst Physics	614	5.4
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	475	4.2
Nature Publishing Group	323	2.8
OSA-Opt Soc Amer	248	2.2
Springer/Sp. Wien/Springer-Verlag/Kluwer	203	1.8
IEICE-Inst Elec Info Comm Eng	177	1.6
AAAS-Am Assoc Advancement Sci	171	1.5
INST PURE APPLIED PHYSICS	157	1.4
Royal Society of Chemistry	144	1.3
332 others with less than 1% each	3175	24.7

## *Appendix A - Publishers Receiving Most References from Top 40 Companies (Top 40 Companies in terms of 2015 Patent Activity; References from 1997-2015 Patents)*

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
<b><i>Fujitsu Limited</i></b>		
IEEE	9411	41.2
3GPP General Partnership Project Standards Body	1680	7.4
Joint IEEE and ACM	976	4.3
IEICE-Inst Elec Info Comm Eng	982	4.3
OSA-Opt Soc Amer	970	4.2
ACM-Assoc Comput Mach	884	3.9
RELX Group	816	3.6
AVS-AIP Am Inst Physics	781	3.4
IET/IEE	608	2.7
European Conference on Optical Communication (ECOC) Society	469	2.1
ATM Forum Standards Body	359	1.6
Internet Soc/IETF-Internet Eng Task Force	353	1.5
International Telecommunication Union	289	1.3
IEEE/JPN Soc App Phys	247	1.1
SPIE-Int Soc Opt Engineering	252	1.1
287 others with less than 1% each	3747	14.0
<b><i>General Electric Company</i></b>		
US Dept of Energy	10472	24.5
IEEE	5491	12.8
RELX Group	4959	11.6
General Electric Co.	3433	8.0
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	2422	5.7
ACS-Am Chem Soc	1804	4.2
AVS-AIP Am Inst Physics	978	2.3
Lippincott Williams & Wilkins	736	1.7
SPIE-Int Soc Opt Engineering	584	1.4
Springer/Sp. Wien/Springer-Verlag/Kluwer	569	1.3
Am Physical Soc	507	1.2
Nature Publishing Group	478	1.1
ASME-Am Soc Mech Eng	491	1.1
Society of Magnetic Resonance in Medicine (SMRM)	418	1.0
Radiological Soc North Am	420	1.0
511 others with less than 1% each	9041	17.1

**Appendix A - Publishers Receiving Most References from Top 40 Companies  
(Top 40 Companies in terms of 2015 Patent Activity; References from 1997-2015 Patents)**

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
<b>General Motors Corp</b>		
IEEE	1308	23.3
RELX Group	1079	19.2
SAE-Society of Automobile Engineers	757	13.5
ACS-Am Chem Soc	382	6.8
Electrochemical Society	337	6.0
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	197	3.5
ASME-Am Soc Mech Eng	126	2.2
AVS-AIP Am Inst Physics	111	2.0
Royal Society of Chemistry	109	1.9
Springer/Sp. Wien/Springer-Verlag/Kluwer	97	1.7
Springer/Springer Wien/Springer-Verlag/Kluwer	65	1.2
Automotive Industries	64	1.1
Nature Publishing Group	60	1.1
IET/IEEE	54	1.0
141 others with less than 1% each	866	14.4
<b>Google Inc.</b>		
IEEE	9744	30.0
ACM-Assoc Comput Mach	8387	25.9
RELX Group	1754	5.4
SPIE-Int Soc Opt Engineering	952	2.9
Springer/Sp. Wien/Springer-Verlag/Kluwer	730	2.3
World Wide Web Consortium	714	2.2
International Telecommunication Union	669	2.1
ACL - Association for Computational Linguistics	555	1.7
3GPP General Partnership Project Standards Body	427	1.3
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	436	1.3
I S & T - SOC IMAGING SCIENCE TECHNOLOGY	418	1.3
Springer/Springer Wien/Springer-Verlag/Kluwer	374	1.2
The USENIX Association	334	1.0
Internet Soc/IETF-Internet Eng Task Force	332	1.0
Joint IEEE and ACM	319	1.0
241 others with less than 1% each	6289	18.1

## *Appendix A - Publishers Receiving Most References from Top 40 Companies (Top 40 Companies in terms of 2015 Patent Activity; References from 1997-2015 Patents)*

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
<b>Hewlett-Packard Co</b>		
IEEE	9089	30.8
ACM-Assoc Comput Mach	4243	14.4
RELX Group	1442	4.9
Joint IEEE and ACM	1173	4.0
Internet Soc/IETF-Internet Eng Task Force	1125	3.8
AVS-AIP Am Inst Physics	933	3.2
SPIE-Int Soc Opt Engineering	691	2.3
The USENIX Association	584	2.0
ACS-Am Chem Soc	519	1.8
Springer/Sp. Wien/Springer-Verlag/Kluwer	448	1.5
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	386	1.3
OSA-Opt Soc Amer	361	1.2
Hewlett Packard Inc.	357	1.2
AAAS-Am Assoc Advancement Sci	331	1.1
Am Physical Soc	317	1.1
Network Working Group RFC	319	1.1
378 others with less than 1% each	7175	22.6
<b>Hitachi Ltd</b>		
IEEE	5653	27.4
RELX Group	1453	7.0
AVS-AIP Am Inst Physics	1311	6.3
ACM-Assoc Comput Mach	1195	5.8
IEICE-Inst Elec Info Comm Eng	841	4.1
ACS-Am Chem Soc	527	2.6
Internet Soc/IETF-Internet Eng Task Force	530	2.6
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	427	2.1
Network Working Group RFC	366	1.8
INST PURE APPLIED PHYSICS	344	1.7
International Telecommunication Union	351	1.7
Nikkei Business Publications, Inc.	349	1.7
SID-Society for Information Display	302	1.5
SPIE-Int Soc Opt Engineering	285	1.4
IET/IEE	272	1.3
3GPP General Partnership Project Standards Body	248	1.2
Am Physical Soc	250	1.2
IEEE/JPN Soc App Phys	255	1.2
Nature Publishing Group	219	1.1
Springer/Sp. Wien/Springer-Verlag/Kluwer	216	1.0
OSA-Opt Soc Amer	210	1.0
Joint IEEE and ACM	207	1.0
IBM Corp	203	1.0
352 others with less than 1% each	4637	20.1



## *Appendix A - Publishers Receiving Most References from Top 40 Companies (Top 40 Companies in terms of 2015 Patent Activity; References from 1997-2015 Patents)*

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
<b><i>Hon Hai Precision Industry Co. Ltd.</i></b>		
AAAS-Am Assoc Advancement Sci	355	15.7
ACS-Am Chem Soc	306	13.6
RELX Group	269	11.9
AVS-AIP Am Inst Physics	232	10.3
IEEE	218	9.7
Am Physical Soc	195	8.6
Nature Publishing Group	169	7.5
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	118	5.2
ROYAL SOC LONDON	64	2.8
Sci American Inc	44	1.9
ACM-Assoc Comput Mach	26	1.2
IOP Publishing	25	1.1
Science X Network	24	1.1
71 others with less than 1% each	213	7.8
<b><i>Honeywell International Inc.</i></b>		
IEEE	6070	28.4
RELX Group	3250	15.2
ACS-Am Chem Soc	1645	7.7
SPIE-Int Soc Opt Engineering	1263	5.9
AVS-AIP Am Inst Physics	628	2.9
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	603	2.8
Springer/Sp. Wien/Springer-Verlag/Kluwer	532	2.5
OSA-Opt Soc Amer	475	2.2
Royal Society of Chemistry	385	1.8
ACM-Assoc Comput Mach	338	1.6
MRS-Materials Research Soc	319	1.5
SAE-Society of Automobile Engineers	279	1.3
IET/IEE	255	1.2
SID-Society for Information Display	221	1.0
Springer/Springer Wien/Springer-Verlag/Kluwer	204	1.0
AAAS-Am Assoc Advancement Sci	206	1.0
333 others with less than 1% each	4717	19.3
<b><i>Huawei Technologies Company Ltd.</i></b>		
3GPP General Partnership Project Standards Body	5306	35.8
IEEE	3563	24.1
International Telecommunication Union	1611	10.9
Internet Soc/IETF-Internet Eng Task Force	1584	10.7
Network Working Group RFC	942	6.4
Open Mobile Alliance (Standards Org)	316	2.1
European Telecom Standards Institute (ETSI)	252	1.7
ACM-Assoc Comput Mach	152	1.0
117 others with less than 1% each	1078	5.9

**Appendix A - Publishers Receiving Most References from Top 40 Companies  
(Top 40 Companies in terms of 2015 Patent Activity; References from 1997-2015 Patents)**

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
<b>Intel Corporation</b>		
IEEE	22531	46.6
ACM-Assoc Comput Mach	4197	8.7
Joint IEEE and ACM	2484	5.1
3GPP General Partnership Project Standards Body	2080	4.3
RELX Group	1422	2.9
AVS-AIP Am Inst Physics	1275	2.6
Internet Soc/IETF-Internet Eng Task Force	804	1.7
IET/IEE	666	1.4
SPIE-Int Soc Opt Engineering	677	1.4
The USENIX Association	650	1.3
IEEE/JPN Soc App Phys	588	1.2
ACS-Am Chem Soc	520	1.1
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	489	1.0
Intel Corp	478	1.0
317 others with less than 1% each	9441	17.1
<b>International Business Machines Corp</b>		
IEEE	42797	34.3
ACM-Assoc Comput Mach	22700	18.2
RELX Group	6062	4.9
Joint IEEE and ACM	6102	4.9
AVS-AIP Am Inst Physics	3928	3.1
IBM Corp	2954	2.4
IP.Com	2088	1.7
ACS-Am Chem Soc	2039	1.6
SPIE-Int Soc Opt Engineering	1829	1.5
Springer/Sp. Wien/Springer-Verlag/Kluwer	1845	1.5
The USENIX Association	1791	1.4
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	1665	1.3
Very Large Data Base Endowment Inc. (VLDB Endowment)	1591	1.3
Internet Soc/IETF-Internet Eng Task Force	1282	1.0
IEEE/JPN Soc App Phys	1299	1.0
558 others with less than 1% each	24796	16.1

## *Appendix A - Publishers Receiving Most References from Top 40 Companies (Top 40 Companies in terms of 2015 Patent Activity; References from 1997-2015 Patents)*

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
<b>Johnson &amp; Johnson</b>		
RELX Group	32564	25.0
ACS-Am Chem Soc	8506	6.5
Nature Publishing Group	7668	5.9
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	7740	5.9
Lippincott Williams & Wilkins	6768	5.2
Blackwell Futura	4978	3.8
Springer/Sp. Wien/Springer-Verlag/Kluwer	4043	3.1
Natl Acad Sciences	3735	2.9
Am Soc Biochemistry Molec Biology	3003	2.3
Amer Soc Microbiology	2114	1.6
Amer Soc Pharmacology Experimental Ther	2045	1.6
AAAS-Am Assoc Advancement Sci	2148	1.6
Cell Press	1871	1.4
Mary Ann Liebert Inc.	1366	1.0
AMA-Am Medical Assoc	1257	1.0
SOC NEUROSCIENCE	1275	1.0
533 others with less than 1% each	39399	26.6
 <b>Kyocera Corp.</b>		
IEEE	1262	51.2
3GPP General Partnership Project Standards Body	209	8.5
RELX Group	157	6.4
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	89	3.6
Electrochemical Society	87	3.5
IET/IEE	64	2.6
AVS-AIP Am Inst Physics	52	2.1
ACS-Am Chem Soc	44	1.8
SPIE-Int Soc Opt Engineering	40	1.6
Penton Media	36	1.5
European Microwave Association	36	1.5
IEICE-Inst Elec Info Comm Eng	35	1.4
Springer/Sp. Wien/Springer-Verlag/Kluwer	27	1.1
76 others with less than 1% each	326	12.1
 <b>LG Electronics Inc.</b>		
3GPP General Partnership Project Standards Body	11407	42.4
IEEE	6639	24.7
ISO-International Standards Organization	1872	7.0
International Telecommunication Union	916	3.4
European Telecom Standards Institute (ETSI)	803	3.0
Audio Eng Soc	782	2.9
ISO/IEC	746	2.8
ATSC Std	473	1.8
Internet Soc/IETF-Internet Eng Task Force	280	1.0
130 others with less than 1% each	2982	10.0

***Appendix A - Publishers Receiving Most References from Top 40 Companies  
(Top 40 Companies in terms of 2015 Patent Activity; References from 1997-2015 Patents)***

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
<b><i>Medtronic Inc</i></b>		
RELX Group	22008	19.5
Lippincott Williams & Wilkins	16622	14.7
IEEE	8740	7.7
Springer/Sp. Wien/Springer-Verlag/Kluwer	6797	6.0
Blackwell Futura	6126	5.4
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	3234	2.9
Am Assoc Neurological Surgeons	2952	2.6
Am Physiological Soc	2518	2.2
Radiological Soc North Am	2132	1.9
ACS-Am Chem Soc	1899	1.7
SPIE-Int Soc Opt Engineering	1771	1.6
International Federation of Gynecology and Obstetrics (FIGO)	1385	1.2
KARGER, ALLSCHWILERSTRASSE	1365	1.2
AMA-Am Medical Assoc	1104	1.0
435 others with less than 1% each	34456	28.3
<b><i>Microsoft Corporation</i></b>		
IEEE	48030	32.7
ACM-Assoc Comput Mach	40480	27.6
RELX Group	5554	3.8
The USENIX Association	3359	2.3
Internet Soc/IETF-Internet Eng Task Force	2799	1.9
Joint IEEE and ACM	2610	1.8
Springer/Sp. Wien/Springer-Verlag/Kluwer	2436	1.7
International Telecommunication Union	2197	1.5
SPIE-Int Soc Opt Engineering	1995	1.4
Springer/Springer Wien/Springer-Verlag/Kluwer	1410	1.0
Very Large Data Base Endowment Inc. (VLDB Endowment)	1449	1.0
484 others with less than 1% each	34436	20.3

## *Appendix A - Publishers Receiving Most References from Top 40 Companies (Top 40 Companies in terms of 2015 Patent Activity; References from 1997-2015 Patents)*

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
<b><i>Panasonic Corporation</i></b>		
IEEE	9323	32.0
3GPP General Partnership Project Standards Body	3254	11.2
RELX Group	2015	6.9
IEICE-Inst Elec Info Comm Eng	1505	5.2
International Telecommunication Union	1367	4.7
AVS-AIP Am Inst Physics	1339	4.6
INST PURE APPLIED PHYSICS	930	3.2
ISO-International Standards Organization	555	1.9
Internet Soc/IETF-Internet Eng Task Force	544	1.9
ACM-Assoc Comput Mach	494	1.7
Electrochemical Society	464	1.6
ISO/IEC	412	1.4
SPIE-Int Soc Opt Engineering	403	1.4
ACS-Am Chem Soc	413	1.4
IET/IEE	392	1.3
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	347	1.2
JPN Soc App Phys	318	1.1
319 others with less than 1% each	5086	14.6
<b><i>Qualcomm Inc</i></b>		
IEEE	27406	44.7
3GPP General Partnership Project Standards Body	11335	18.5
International Telecommunication Union	2026	3.3
SID-Society for Information Display	1947	3.2
RELX Group	1481	2.4
Internet Soc/IETF-Internet Eng Task Force	1391	2.3
ACM-Assoc Comput Mach	1164	1.9
SPIE-Int Soc Opt Engineering	1192	1.9
European Telecom Standards Institute (ETSI)	918	1.5
Telecomm Industry assoc-TIA	858	1.4
IET/IEE	821	1.3
Network Working Group RFC	821	1.3
ISO-International Standards Organization	707	1.2
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	709	1.2
AVS-AIP Am Inst Physics	693	1.1
251 others with less than 1% each	7775	11.0

## *Appendix A - Publishers Receiving Most References from Top 40 Companies (Top 40 Companies in terms of 2015 Patent Activity; References from 1997-2015 Patents)*

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
<b><i>Ricoh Co. Ltd.</i></b>		
IEEE	5387	43.5
ACM-Assoc Comput Mach	2082	16.8
SPIE-Int Soc Opt Engineering	775	6.3
RELX Group	645	5.2
International Association for Pattern Recognition (IAPR)	483	3.9
Springer/Sp. Wien/Springer-Verlag/Kluwer	258	2.1
AVS-AIP Am Inst Physics	187	1.5
ISO-International Standards Organization	156	1.3
IEICE-Inst Elec Info Comm Eng	143	1.2
I S & T - SOC IMAGING SCIENCE TECHNOLOGY	126	1.0
165 others with less than 1% each	2144	15.5
<b><i>Samsung Electronics Co Ltd</i></b>		
IEEE	10601	37.9
3GPP General Partnership Project Standards Body	1956	7.0
RELX Group	1791	6.4
AVS-AIP Am Inst Physics	1298	4.6
ACS-Am Chem Soc	1157	4.1
SID-Society for Information Display	1123	4.0
ACM-Assoc Comput Mach	775	2.8
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	720	2.6
International Telecommunication Union	454	1.6
SPIE-Int Soc Opt Engineering	453	1.6
Nature Publishing Group	359	1.3
Am Physical Soc	361	1.3
IET/IEE	314	1.1
ISO-International Standards Organization	312	1.1
IEEE/JPN Soc App Phys	308	1.1
Internet Soc/IETF-Internet Eng Task Force	272	1.0
AAAS-Am Assoc Advancement Sci	274	1.0
338 others with less than 1% each	5438	16.8

**Appendix A - Publishers Receiving Most References from Top 40 Companies  
(Top 40 Companies in terms of 2015 Patent Activity; References from 1997-2015 Patents)**

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
<b>Samsung SDI Co Ltd</b>		
RELX Group	1357	21.8
AVS-AIP Am Inst Physics	1337	21.5
ACS-Am Chem Soc	847	13.6
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	417	6.7
SID-Society for Information Display	361	5.8
Royal Society of Chemistry	238	3.8
IEEE	168	2.7
IEC-International Electrotechnical Commission	152	2.4
Electrochemical Society	140	2.2
INST PURE APPLIED PHYSICS	127	2.0
Am Physical Soc	124	2.0
Chem Soc Japan	108	1.7
Nature Publishing Group	104	1.7
Springer/Sp. Wien/Springer-Verlag/Kluwer	77	1.2
AAAS-Am Assoc Advancement Sci	61	1.0
VCH Publishers	62	1.0
91 others with less than 1% each	547	7.4
<b>Seiko Epson Corporation</b>		
IEEE	2999	34.3
ACM-Assoc Comput Mach	686	7.8
Joint IEEE and ACM	656	7.5
AVS-AIP Am Inst Physics	599	6.8
SID-Society for Information Display	576	6.6
RELX Group	573	6.5
ACS-Am Chem Soc	217	2.5
IEEE/JPN Soc App Phys	181	2.1
INST PURE APPLIED PHYSICS	151	1.7
IBM Corp	149	1.7
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	124	1.4
SPIE-Int Soc Opt Engineering	121	1.4
IEICE-Inst Elec Info Comm Eng	116	1.3
OSA-Opt Soc Amer	87	1.0
Am Physical Soc	91	1.0
IET/IEE	90	1.0
162 others with less than 1% each	1338	13.4

**Appendix A - Publishers Receiving Most References from Top 40 Companies  
(Top 40 Companies in terms of 2015 Patent Activity; References from 1997-2015 Patents)**

*Publisher*

*# Pat Refs to: Percent of Total*

**Semiconductor Energy Laboratory Co. Ltd.**

SID-Society for Information Display	37630	32.7
AVS-AIP Am Inst Physics	16959	14.7
RELX Group	10329	9.0
Am Physical Soc	9491	8.2
IEEE	9305	8.1
Japan Soc Applied Physics/IEEE	5044	4.4
Nature Publishing Group	3345	2.9
INST PURE APPLIED PHYSICS	3147	2.7
Electrochemical Society	3047	2.6
CRC Press/Taylor & Francis	2771	2.4
JPN Soc App Phys	2234	1.9
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	1860	1.6
Korean Information Display Society (KIDS)	1539	1.3
AAAS-Am Assoc Advancement Sci	1491	1.3
Springer/Springer Wien/Springer-Verlag/Kluwer	1398	1.2
Nirim.org	1322	1.1
R OLDENBOURG VERLAG	1320	1.1
84 others with less than 1% each	2899	2.1

**Sharp Corp**

IEEE	4039	25.2
3GPP General Partnership Project Standards Body	2368	14.8
SID-Society for Information Display	1422	8.9
AVS-AIP Am Inst Physics	1222	7.6
ACM-Assoc Comput Mach	703	4.4
RELX Group	685	4.3
ISO/IEC	556	3.5
SPIE-Int Soc Opt Engineering	451	2.8
International Telecommunication Union	415	2.6
INST PURE APPLIED PHYSICS	356	2.2
ACS-Am Chem Soc	319	2.0
IEICE-Inst Elec Info Comm Eng	285	1.8
ISO-International Standards Organization	249	1.6
Internet Soc/IETF-Internet Eng Task Force	263	1.6
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	253	1.6
186 others with less than 1% each	2448	12.8



## *Appendix A - Publishers Receiving Most References from Top 40 Companies (Top 40 Companies in terms of 2015 Patent Activity; References from 1997-2015 Patents)*

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
<b>Siemens Aktiengesellschaft</b>		
IEEE	8348	30.5
RELX Group	3679	13.4
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	1258	4.6
ACM-Assoc Comput Mach	701	2.6
SPIE-Int Soc Opt Engineering	654	2.4
ACS-Am Chem Soc	462	1.7
Springer/Sp. Wien/Springer-Verlag/Kluwer	471	1.7
IOP Publishing	417	1.5
AVS-AIP Am Inst Physics	399	1.5
Lippincott Williams & Wilkins	374	1.4
Springer/Springer Wien/Springer-Verlag/Kluwer	347	1.3
Natl Acad Sciences	345	1.3
Radiological Soc North Am	336	1.2
Acoust Soc Amer/Amer Inst Physics	324	1.2
Nature Publishing Group	338	1.2
Amer Soc Microbiology	295	1.1
Am Assoc Physicists Med/Am Inst Physics	312	1.1
IET/IEE	271	1.0
Amer Assoc Clin Chem	280	1.0
464 others with less than 1% each	7797	25.2
<b>Sony Corp</b>		
IEEE	10775	44.7
ACM-Assoc Comput Mach	2050	8.5
RELX Group	1341	5.6
SPIE-Int Soc Opt Engineering	676	2.8
3GPP General Partnership Project Standards Body	546	2.3
AVS-AIP Am Inst Physics	554	2.3
Internet Soc/IETF-Internet Eng Task Force	392	1.6
IEICE-Inst Elec Info Comm Eng	369	1.5
International Telecommunication Union	336	1.4
IET/IEE	313	1.3
ACS-Am Chem Soc	303	1.3
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	300	1.2
Joint IEEE and ACM	295	1.2
ISO-International Standards Organization	230	1.0
331 others with less than 1% each	5612	20.4

**Appendix A - Publishers Receiving Most References from Top 40 Companies  
(Top 40 Companies in terms of 2015 Patent Activity; References from 1997-2015 Patents)**

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
<b>Taiwan Semiconductor Manufacturing Co.</b>		
IEEE	6426	36.7
AVS-AIP Am Inst Physics	4429	25.3
RELX Group	1745	10.0
Electrochemical Society	681	3.9
IEEE/JPN Soc App Phys	659	3.8
INST PURE APPLIED PHYSICS	405	2.3
SPIE-Int Soc Opt Engineering	391	2.2
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	318	1.8
IOP Publishing	260	1.5
MRS-Materials Research Soc	247	1.4
Am Physical Soc	204	1.2
Springer/Sp. Wien/Springer-Verlag/Kluwer	202	1.2
IET/IEE	191	1.1
101 others with less than 1% each	1353	6.9
<b>Toshiba Corp</b>		
IEEE	8170	39.3
AVS-AIP Am Inst Physics	1499	7.2
RELX Group	1272	6.1
IEEE/JPN Soc App Phys	851	4.1
Am Physical Soc	593	2.9
IEICE-Inst Elec Info Comm Eng	588	2.8
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	588	2.8
ACM-Assoc Comput Mach	543	2.6
SPIE-Int Soc Opt Engineering	466	2.2
INST PURE APPLIED PHYSICS	428	2.1
Internet Soc/IETF-Internet Eng Task Force	337	1.6
International Telecommunication Union	282	1.4
AACS-Advanced Access Content System	298	1.4
ACS-Am Chem Soc	219	1.1
Joint IEEE and ACM	239	1.1
IET/IEE	218	1.0
JPN Soc App Phys	209	1.0
318 others with less than 1% each	4004	16.6

***Appendix A - Publishers Receiving Most References from Top 40 Companies  
(Top 40 Companies in terms of 2015 Patent Activity; References from 1997-2015 Patents)***

<i>Publisher</i>	<i># Pat Refs to:</i>	<i>Percent of Total</i>
<b><i>Toyota Motor Corp</i></b>		
RELX Group	1026	19.6
IEEE	930	17.8
ACS-Am Chem Soc	320	6.1
SAE-Society of Automobile Engineers	221	4.2
John Wiley & Sons/Wiley-Verlag/Wiley-Liss	190	3.6
Amer Soc Plant Biologists	180	3.4
Springer/Sp. Wien/Springer-Verlag/Kluwer	162	3.1
AVS-AIP Am Inst Physics	141	2.7
AAAS-Am Assoc Advancement Sci	123	2.3
Natl Acad Sciences	116	2.2
Am Soc Biochemistry Molec Biology	107	2.0
Blackwell Futura	107	2.0
OSA-Opt Soc Amer	100	1.9
Amer Soc Microbiology	90	1.7
Electrochemical Society	83	1.6
Nature Publishing Group	83	1.6
Oxford Univ Press	57	1.1
Royal Society of Chemistry	59	1.1
Springer/Springer Wien/Springer-Verlag/Kluwer	53	1.0
170 others with less than 1% each	1088	19.2