

Cyber Creative Institute Co. Ltd.

Evaluation of LTE essential patents declared to ETSI

Version 1.0

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Version 1.0

1 Objectives

In Japan, an instance of LTE (Long Term Evolution) services¹ was launched in December, 2010, by NTT DOCOMO under the name of Xi (pronounced “Crossy”) to pave the way to the 4th generation mobile communication services, which will succeed the 3rd generation services that are currently widely deployed.

In implementing the 3rd generation mobile communication systems, different technical standards, such as W-CDMA and cdma2000, have been adopted by different carriers, resulting in incompatibility problems. The deployment of LTE is expected to remedy such problems by enforcing a single international standard.

Standardization of LTE, as was the case with that of W-CDMA, has been being carried out in 3GPP (Third Generation Partnership Project), an international standards development project organized by the standards developing organizations in various countries, such as ETSI (European Telecommunications Standards Institute) in Europe and ARIB (Association of Radio Industries and Businesses) in Japan. During the course of their standardization activities, telecom companies may acquire related patents. In order for a patented technology to be adopted in a standard, its holder has to declare to the organizations in each country its willingness to make licenses available to all third parties under fair, reasonable and non-discriminatory (FRAND) terms². The patents (including patent applications) to be studied in this survey are those declared to ETSI as being essential to LTE.

Although ETSI is a European standards developing organization, not only European companies but many non-European ones have declared LTE-essential patents to ETSI, because Europe has long been a large telecom market and has fostered many prominent

¹ Trial/commercial LTE services have been launched or are planned by Telia Sonera (in December, 2009), NTT DOCOMO (in December, 2010), Vodafone (in 2010), Verizon Wireless (in 2010), Softbank(after 2011), AT&T (in 2011), Telecom Italia (in 2011~2012), KDDI (in 2012), T-Mobile (in2012) and Orange (in 2012)..

² When declaring an essential patent to standards developing organizations such as ETSI or ARIB, the holder is requested to choose one of the following three licensing options:

- (1) Grant licenses free of charge (or disclaim patent rights)
- (2) Grant licenses to other parties on a fair, reasonable and non-discriminatory terms and conditions.
- (3) Others (choose neither of the above)

The second option above is called the FRAND condition.

1. Objectives

companies. As such, it should be reasonable to regard the number of LTE-essential patents, declared to ETSI by each company, as one of important indicators of the “patenting power” of that company.

In order to evaluate true “patenting power”, the simple count of LTE-essential patents, as have been declared to and listed by ETSI, is not a good measure, due to the following two reasons.

- Duplicate count of patents

A single invention may appear multiple times in the declaration list, as separate patents, if the following types of applications are issued: provisional applications in the U.S., divisional applications, or applications to foreign countries. With divisional applications, there may be such cases that individual applications should be counted separately provided that the scopes of the applications are different from each other, but, in most cases, it is more appropriate to count them as a single patent family.

- Difference in declaration policy of each company

Decision whether a particular patent is essential or not is solely at a company’s discretion. ETSI does not confirm or deny that the declared patents are, in fact, essential or potentially essential. As a result, patents of similar importance may be declared by one company but not by another, resulting in considerable difference in the number of the declarations made by each company.

Based on these observations, this survey aims at estimating the number of truly “essential” patents held by each company, taking the following processes:

- to identify effective number of declared patents by grouping related patents as a family to remove duplications from the declared patent list,
- to derive the number of “essential” patents by determining the relevance of each declared patent to the standards, applying a common evaluation criteria.

2 Survey results

2.1 Derivation of patents subject to survey

The list of essential, or potentially essential, IPRs as declared to ETSI (hereinafter referred to as “original list”) was obtained from the ETSI website³ in July, 2011. The beginning part of this list is cited in Appendix 1.

The original list simply lists the information notified by companies as provided. As a result, the numbering format for the patents is not consistent. This fact introduces such deficiencies: a group of patents, that are derived from a single invention or applied in different countries, are listed as separate entities; or undisclosed patents, such as provisional applications⁴ in the U.S., are also included in the list. Therefore, it is difficult to meaningfully compare the number of patents held by each company based on the original list.

To overcome these deficiencies, we have sorted out the original list so that we can count the effective number of patents (including patent applications⁵) by counting them on a patent family-basis. This approach makes it possible to count the number of declared patents without being affected by such procedural factors as applications to foreign countries, divisional applications⁶ or continuation applications⁷.

³ http://www.etsi.org/deliver/etsi_sr/000300_000399/000314/

⁴ A “provisional application” is an application made on the assumption that a formal patent application will be made at a later time. It was introduced in the U.S. in 1995 in order to entitle inventors to the right of priority for national patent. In the provisional application system, formal patent claims are not required because there is no intention to claim any patent rights. In order to mature it into an issued patent the applicant must file or request a formal patent application within one year. Otherwise, the provisional application is considered to have been abandoned.

⁵ Not only registered patents but also patent applications are studied in this survey to set the proper scope of work. In a legal sense, “patents”, as stated in the title of this paper, legally refer only to those already registered.

⁶ A “divisional application” refers to an application where a parent application describing more than one invention is split into one or more applications each claiming only a single invention. By utilizing this procedure the applicant can obtain rights for each divisional application which may facilitate the quicker granting of patent rights for certain applications.

⁷ A “continuation application” refers to an application that is based on an original patent application (often referred to as a parent application), and has the same priority date and specification as the parent. Continuation applications are often filed so that an applicant may pursue claims to inventions that were disclosed but not allowed in the parent application or may want to pursue additional claims to the parent application. It is a US specific system where the filing date of the parent application can be kept provided that no additional statements are made. In Japanese patent system, this is included in the divisional application category.

2. Survey results

Specifically, patents to be surveyed have been obtained by processing the original list in the following manner:

- (a) Deleting patents that do not contain the term “LTE” in the “Essential to projects” column.
- (b) Tidying up patents having the same application number or publication number.
- (c) Deleting patents that were not disclosed as of August, 2011.
- (d) Identifying patent families using a commercial patent database for each patent that survived the above processes of (a) to (c).
- (e) Counting the patents belonging to the same family as one patent.

PatBase⁸, which is a commercial patent database developed jointly by RWS and Minesoft, was used for the above processing⁹. As the result, 2,999 patents, or patent families to be exact, have been identified.

⁸ PatBase: <http://www.rws.com/EN/PatBase.html>
<http://www.iac-academy.co.jp/patbase/index.html>

⁹ Patents in PatBase having a common Patent Family Number and a common priority number (including the VLF number), associated with the earliest priority date, are considered to belong to a same patent family, and therefore they were grouped into one. VLF (Very Large Family) number refers to the identification number given to a certain portion of a large family (with more than 130 patents) to indicate that it is a portion of the family that has been split.

2. Survey results

2.2 Application trends

(1) Numbers of patents declared by individual companies

The numbers of patents (counted on a patent-family-basis; the same applies to the following figures) declared by individual companies on a declaration-year-basis are shown in Figure 1. Years of declaration were derived from the “Declaration Dates” column in the original list. The names of the companies making the declarations were taken from the “Declaring Companies” column and translated to effective names, as shown in Table 1. Related company names were mapped to a common effective name. There were a total of 32 companies that made declarations.

Some of the companies started to make declarations as early as 2007 when the standards were still being developed. However, on the whole, the number of declaring companies started to rise after 2009 when specifications were fixed and the developmental work for commercialization got into full swing, and the numbers of patents declared by each company also sharply increased. The reason behind this is that companies regard the number of declarations as an index indicating their R&D and IPR powers related to LTE, and see the declared patent database as good means to appeal their power to the public. This benefit is considered to compensate the drawback that a company has to grant FRAND terms to standards developing organizations in order for a patented technology to be used in the implementation of a standard. Companies are promoting patent declarations having the strategic intention of making most of their IPR in mind.

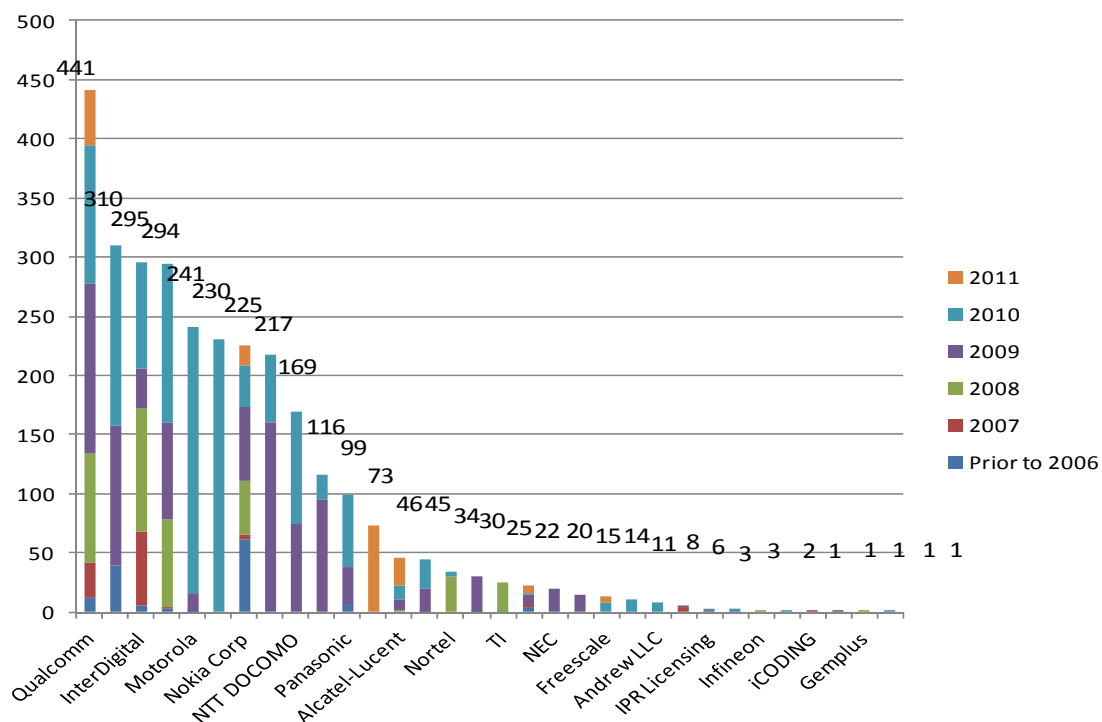


Figure 1 - Declared numbers of patents by company

2.Survey results

Table 1 - Names of declaring companies and their aggregate names

| Declaring company | Aggregate name | Country abbreviation |
|---|-----------------|----------------------|
| ALCATEL-LUCENT | Alcatel-Lucent | FR |
| Andrew LLC | Andrew LLC | US |
| AT&T | AT&T | US |
| Deutsche Telekom AG | DeutscheTelekom | DE |
| Telekom Deutschland GmbH | | |
| Ericsson AB | Ericsson | SE |
| ETRI | ETRI | KR |
| Freescale Semiconductor Inc. | Freescale | US |
| Gemplus SA | Gemplus | FR |
| Hewlett-Packard, Centre de Competences France | HP | FR |
| Huawei Technologies Co., Ltd. | Huawei | CN |
| iCODING Technology Inc. | iCODING | US |
| INFINEON TECHNOLOGIES | Infineon | DE |
| InterDigital Technology Corp. | InterDigital | US |
| InterDigital Patent Holdings Inc. | | |
| IPR Licensing Inc. | IPR Licensing | US |
| Koninklijke KPN N.V. | Koninklijke | NL |
| LG Electronics Inc. | LG | KR |
| Marvell Switzerland S.A.R.L | Marvell | BM |
| Motorola Mobility Inc. | Motorola | US |
| MOTOROLA Inc | | |
| NEC Corporation | NEC | JP |
| NOKIA Corporation | Nokia Corp | FI |
| Nokia Siemens Networks GmbH & Co. KG | Nokia Siemens | FI |
| Nortel Networks Ltd | Nortel | CA |
| NTT DOCOMO, INC | NTT DOCOMO | JP |
| Panasonic Corporation | Panasonic | JP |
| Qualcomm Incorporated | Qualcomm | US |
| Samsung Electronics Co, LTD | Samsung | KR |
| Sharp Corporation | Sharp | JP |
| Siemens AG | Siemens | DE |
| Sony Corporation | Sony | JP |
| Texas Instruments Inc. | TI | US |
| VoiceAge Corporation | VoiceAge | CN |
| ZTE Corporation | ZTE | CN |

NB) Country name is that where the company's head office is located. Abbreviations are as follows:

BM: BERMUDA CN: CHINA CA: CANADA DE: GERMANY

FR: FRANCE FI: FINLAND JP: JAPAN KR: KOREA

NL: NETHERLANDS US: UNITED STATES OF AMERICA

2.Survey results

Figure 2 is a pie chart showing the percentages of declared patents of companies listed in Figure 1. In order to avoid the chart becoming crowded, eight companies with less than four declarations, namely IPR Licensing, VoiceAge, Infineon, AT&T, Gemplus, HP, iCODING and Koninklijke, have been grouped into “Others.”

Qualcomm has the maximum percentage (about 15%) and is followed by Ericsson, InterDigital and Samsung. The figure shows that declarations are not just limited to a few particular companies but many other companies, including Asian companies such as Samsung, ZTE, Huawei, NTT DOCOMO and Panasonic, have also made comparatively similar numbers of declarations.

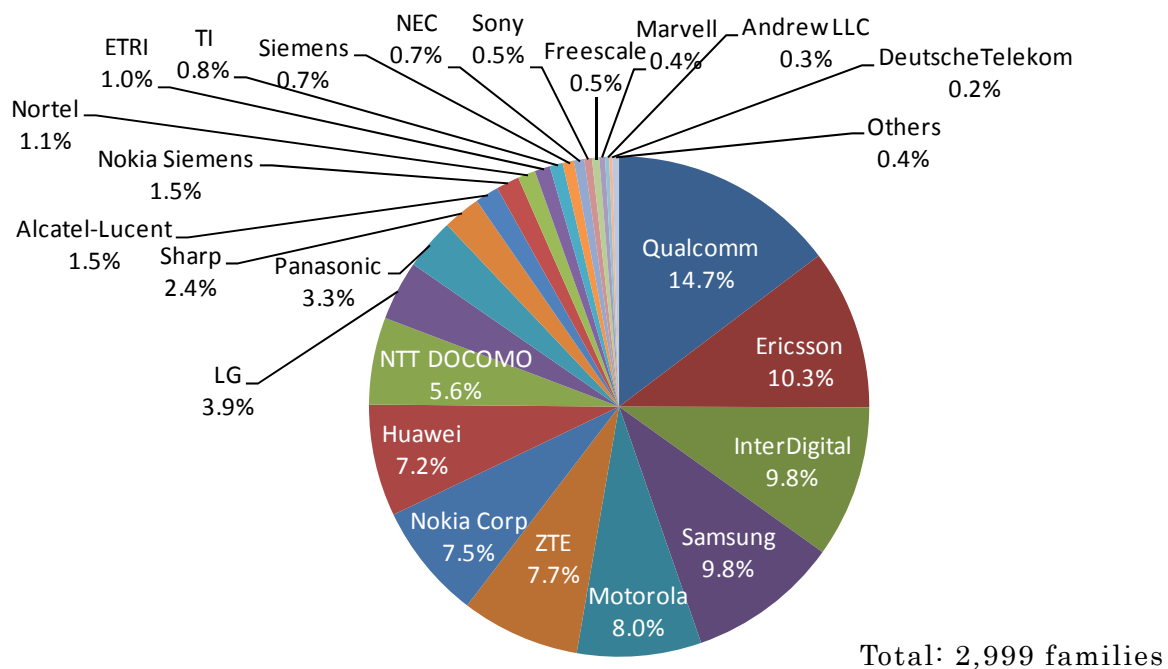


Figure 2 – Percentages of declared patents by company

2.Survey results

(2) Breakdown by the year of application

Figure 3 shows the transition in the numbers of declared patents on an application-year-basis. The horizontal axis shows the earliest priority year (i.e. the year in which the application of particular invention was filed for the first time, irrespective of the country it was filed) and the vertical axis shows the number of families.

- (a) Many patents that are filed after 2005, the year when standardization activities of LTE began, have been declared. Especially, those that were filed between 2006 and 2008 were significant. This period coincides with the time when LTE specifications had been being developed before the first version of LTE standards were released in March, 2008.
- (b) The number of declared patents filed in around 1999 is not negligible. The reason for this is considered to be the fact that there are common features between the LTE standards and the UMTS (Universal Mobile Telecommunications System) standards that had been studied earlier as 3rd generation mobile communication systems.
- (c) Declaration of patents that were filed in 2010 are few because this survey covers patents disclosed as of August 2011 - in other words, patents whose earliest priority date is earlier than February 2010¹⁰.

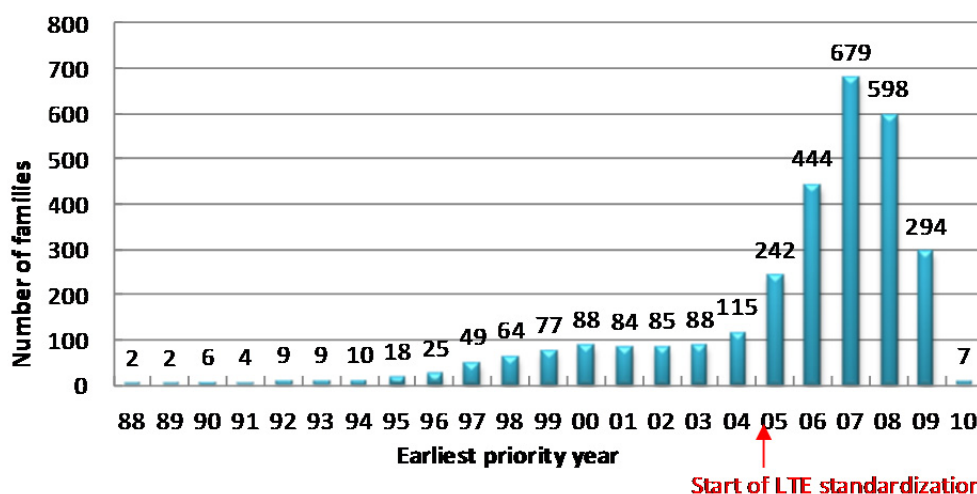


Figure 3 - Breakdown of declared patents by year of application

¹⁰ Laying open of application: Patents are published 18 months after their applications is filed.

2.Survey results

(3) Breakdown by company and application year

Figure 4 shows the number of declared patents by company on an application year-basis. The horizontal axis shows the earliest priority year and the horizontal axis shows the names of the declaring companies. The circle size is proportional to the number of patent families.

The companies can be roughly grouped into four categories:

- Companies that have declared patents whose applications were made over many years, from the 1990's to the present: Qualcomm, Ericsson, InterDigital, Motorola and Nokia
- Companies that have declared patents whose applications were made mainly after 2005, the year when LTE standardization work began: ZTE, Huawei, NTT DOCOMO, Sharp, Alcatel-Lucent, ETRI, NEC, Freescale and Marvell
- Companies that have declared patents whose application were made prior to 2005 but not afterwards: Nortel, Siemens, Sony, IPR Licensing, Voiceage, HP, iCODING and Koninklijke
- None of above.

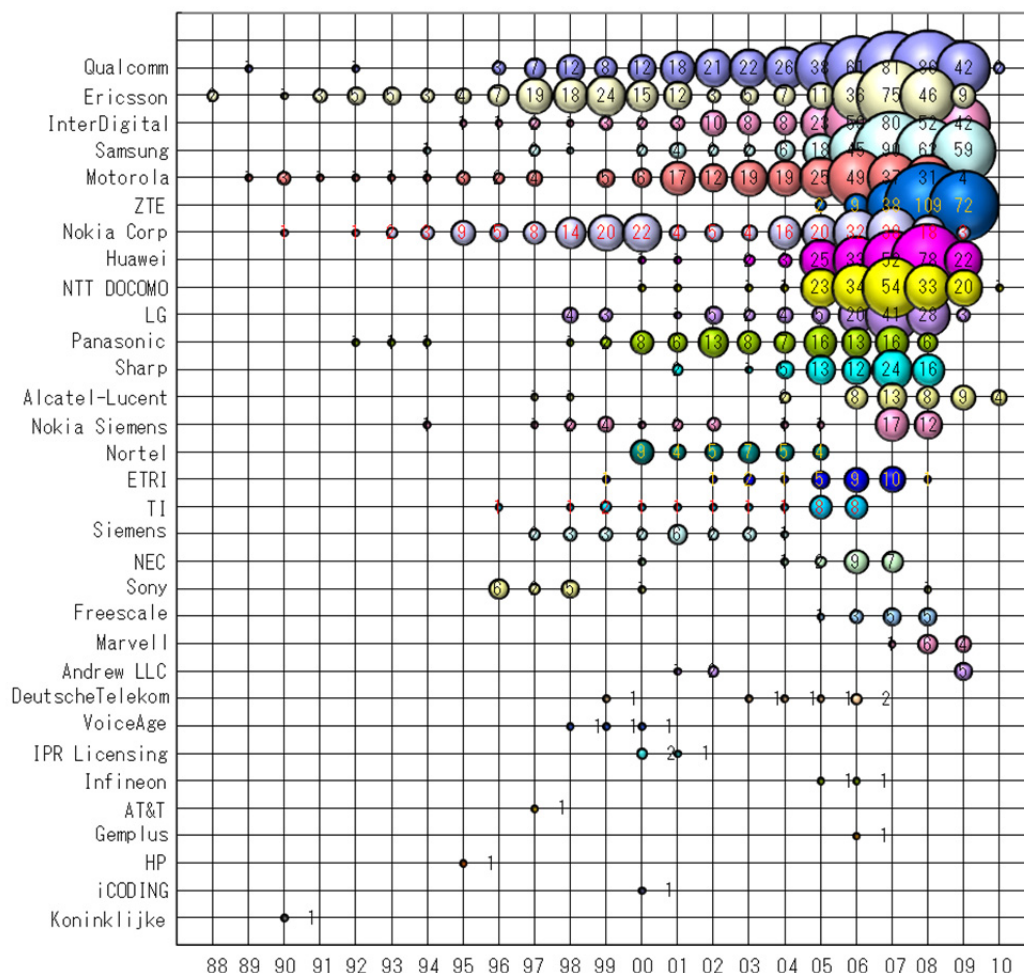


Figure 4 - Analysis of application by company and application year

2. Survey results

(4) Breakdown by application country

Figure 5 shows the number of declared patents by application country. These numbers are obtained by referring to 2,999 patent families in PatBase and by counting patents with the same two-character country codes¹¹ located at the beginning of the application number. The horizontal axis shows the application countries and the vertical axis shows the number of patents.

There were 55 countries in which patents were filed but, due to lack of space, countries with less than five applications have been omitted (CZ, PH, TR, GR, BG, RO, CL, EG, PE, NL, EE, SK, HR, CH, IE and GE)¹².

The result shows that US scored the largest number followed by Patent Cooperation Treaty (WO¹³), European Patent Office (EP), China (CN), Japan (JP) and Korea (KR). This indicates that the filing of applications have been done in countries where major companies are located as well as where big mobile communication markets exist.

¹¹ Country names and their abbreviations are shown below in descending order of the number of applications:

US: UNITED STATES OF AMERICA, WO: PATENT COOPERATION TREATY
EP: EUROPEAN PATENT OFFICE, CN: CHINA, JP: JAPAN,
KR: KR KOREA (REPUBLIC OF), IN: INDIA, AU: AUSTRALIA, MX: MEXICO,
AT: AUSTRIA, TW: TAIWAN, PROVINCE OF CHINA, CA: CANADA, DE: GERMANY, BR:
BRAZIL, RU: RUSSIAN FEDERATION, IL: ISRAEL, AR: ARGENTINA,
ES: SPAIN, HK: HONG KONG, NO: NORWAY, ZA: SOUTH AFRICA,
FI: FINLAND, GB: UNITED KINGDOM, SG: SINGAPORE, DK: DENMARK,
NZ: NEW ZEALAND, PT: PORTUGAL, EA: EURASIAN PATENT OFFICE,
SE: SWEDEN, ID: INDONESIA, UA: UKRAINE, MA: MOROCCO, FR: FRANCE,
HU: HUNGARY, IT: ITALY, AP: AFRICAN REGIONAL INDUSTRIAL PROPERTY
ORGANIZATION, SI: SLOVENIA, CO: COLOMBIA, PL: POLAND,

¹² CZ: CZECH REPUBLIC, PH: THE PHILIPPINES, TR: TURKEY, GR: GREECE,
BG: BULGARIA, RO: ROMANIA, CL: CHILE, EG: EGYPT, PE: PERU,
NL: NETHERLANDS, EE: ESTONIA, SK: SLOVAKIA, HR: CROATIA,
CH: SWITZERLAND, IE: IRELAND, GE: GEORGIA

¹³ A "WO patent" is an international application filed under the Patent Cooperation Treaty (PCT) of the World Intellectual Property Organization (WIPO). Making a PCT application has the same effect as filing the same application in all PCT member countries. WO patents are internationally unexamined patents and only the publication before examination is made. After making the international application and then submitting the translated texts to the patent office in the respective country, registered patent publication will be issued after successful completion of examinations in each country.

2.Survey results

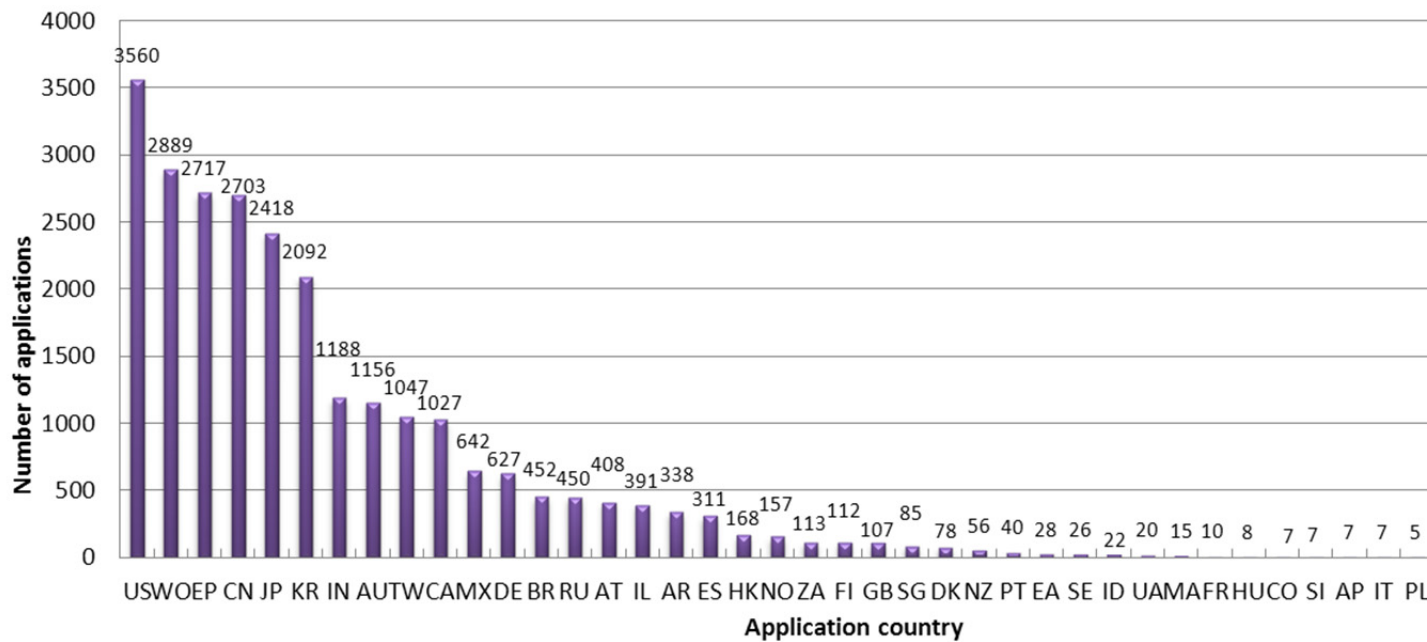


Figure 5- Breakdown by country of application

2.Survey results

(5) Breakdown by company and application country

Figure 6 shows the breakdown by application country for each company. Due to lack of space, only those countries with no less than 100 applications are shown.

- (a) Among the top ranking companies, US and European companies, such as Qualcomm, Ericsson, InterDigital, Motorola and Nokia in particular, are filing applications worldwide.
- (b) Japanese and Korean companies' activities are not so strong as those seen in (a) but they are filing applications to foreign countries in a balanced manner, including BRICs.
- (c) ZTE and Huawei of China file applications in a limited number of countries (CN, WO, EP and US) and application countries are almost common for the two companies. In addition, as noted in Section 2.3 (4), a high proportion of their applications are still pending.

2. Survey results

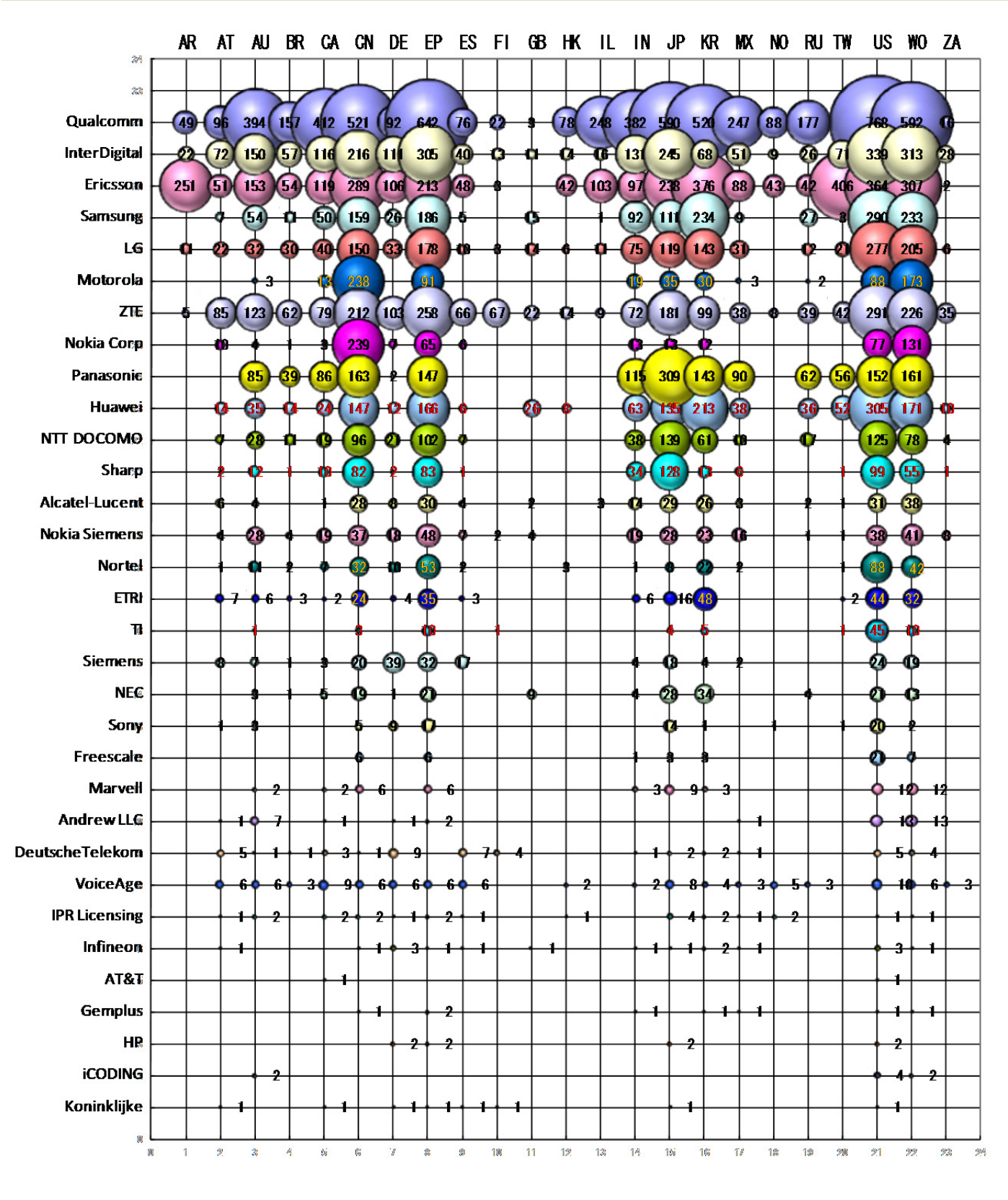


Figure 6 - Breakdown by application country and company

2. Survey results

2.3 Evaluation of essentiality to standards

Because declaration of patents is done voluntarily by each company, no indications are made whether they are really essential in conforming to standards or they are supplementary in the sense that they simply facilitate implementation. Furthermore, the criteria to decide whether a particular patent is essential or not is up to each company, and the decision is made based on the company's own IPR strategy, to make the most of its IPR assets. In addition to these, ETSI does not check the appropriateness of the declarations nor evaluate the relevance of the declared patents to the standards. Due to these reasons, the numbers of patents shown in Section 2.2 do not reflect the truly "essential" patents held by each company, and do not meet our survey purpose.

To overcome this difficulty, this survey applies a common set of criteria to see the relevance of each declared patent to standard specifications. In this way, we can derive the number of truly "essential" patents based on objective evaluations rather than subjective evaluation done by applicant companies.

(1) Evaluation method

- (i) For each patent family, a representative patent (a patent that represents a declared patent family) was identified and checked against the standards.
- (ii) In selecting a representative patent, Japanese patent was preferred, followed by US patent, and EP or WO patent (in the order of preference).
- (iii) If the representative patent was registered one, claims in the registered patent were evaluated. If it was still pending¹⁴, the latest claim at the time of evaluation was used. In the latter case, the latest claim after amendments was obtained from respective patent information websites (in case of Japan: <http://www.ipdl.inpit.go.jp/Tokujitu/pfwj.ipdl?N0000=118>).
- (iv) If a patent has multiple claims, a single claim that has the broadest scope was chosen.
- (v) The standards to be checked against were, in principle, the ones indicated in the "Essential to standards YES to ETSI FRAND license" column of the original list. However, other standards were also referred to for additional information.
- (vi) Regarding the versions of the standards for comparison, in principle, Release 9 (end of March, 2010 version) was used regardless of the version indicated in the "Essential to standards YES to ETSI FRAND license" column of the original list. Additionally, Release 10 (end of March, 2011 version) was also used as a supplement.
- (vii) Evaluation was conducted by classifying patents into A, B and C categories according to their essentiality. The definition of A, B and C is as follows:
 - A: The invention contained in the patent matches the standards.

¹⁴ Pending means that the application is being processed in the patent office and neither decision nor trial decision has been reached. For instance, until a trial decision of rejection is made, the application is pending at the patent office but, if revocation of the trial decision is launched and the patent is in litigation, the application is not pending at the patent office (pending litigation). Furthermore, if the trial decision of rejection is cancelled by the court decision, the application will again be pending at the patent office.

2.Survey results

B: The invention contained partially matches the standards.

C: The invention contained does not match the standards.

(viii) Whether the status of the invention is mandatory or optional in the standards was not taken into consideration.

The evaluation work was conducted by technical people, who recorded the respective specifications in the standards and the reasoning for their evaluations. The evaluation results of the technical people were checked with each other, on a sample basis, to assure the quality of evaluation. Attention was paid so that each evaluator was to cover different companies to prevent evaluation variations introduced by individual evaluators.

It must be noted, however, that 100% accuracy of the results cannot be guaranteed, due to the intrinsic limitation introduced by the above evaluation methods and limited time available.

2.Survey results

(2) Selection of patents for evaluation

Because of limited evaluation time available, it was not possible to evaluate all of the 2,999 representative patents. So patents for evaluation were selected according to the following criteria:

- As many companies as possible are to be selected, unless their declarations were made too late.
- As for companies that have made numerous declarations, around 50 patents each are to be selected.
- Those patents whose specifications are written in Japanese or English are to be selected. If this is not possible, specifications in other languages (e.g. Chinese) are used and evaluations are done based on their English abstract.

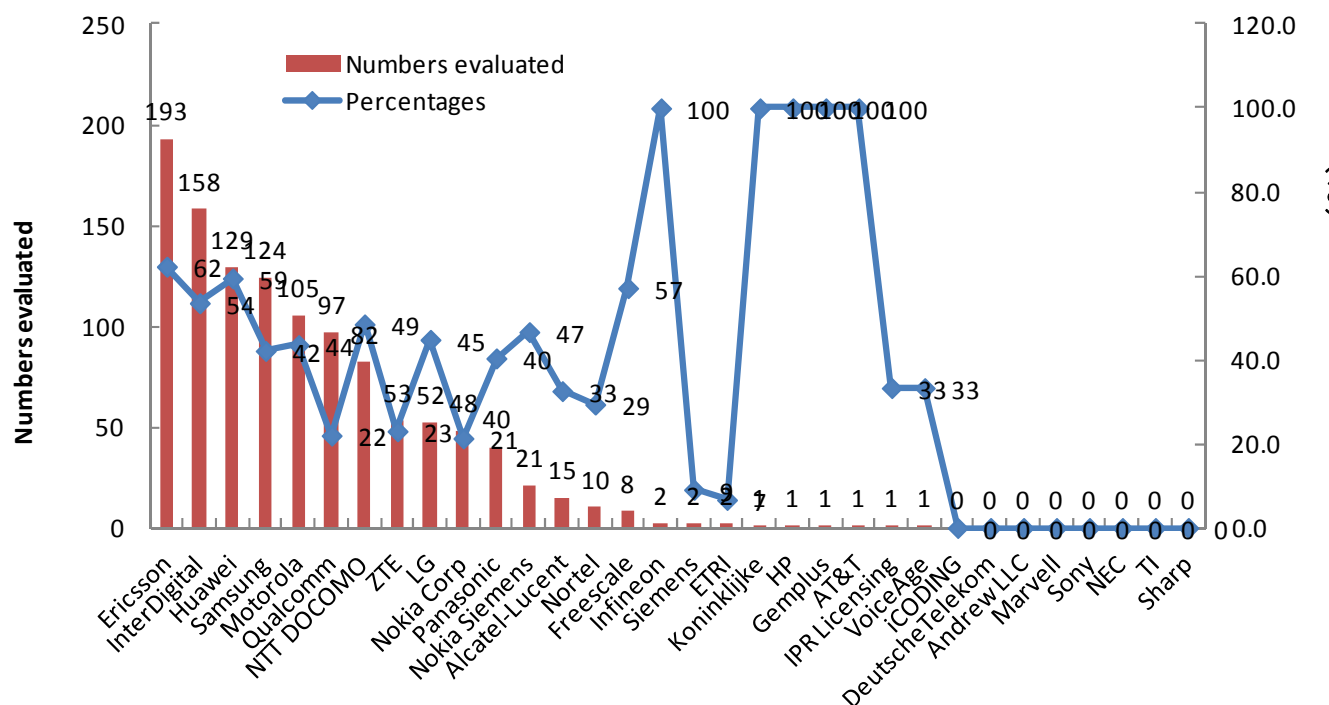


Figure 7 - Numbers and percentages of patents evaluated

In Figure 7 the bar graph shows the numbers of patents selected for evaluation in the study and the line graph shows the ratios of those to the number of declared patents made by respective companies. The horizontal axis shows company names while the scale on the left vertical axis shows the number of patent families and the one on the right shows the ratio in percentage. In the figure, underlined numbers show the percentages and those without underline show the number of patents that have been evaluated.

For companies listed to the left of LG, the criterion (b) has been applied and more than 50 patents have been selected. It should be noted that the percentage evaluated was somewhat low for ZTE and Nokia, because the proportion of ZTE's patents written in Chinese was rather high and Nokia's patents might be owned by NokiaSiemens as well.

Qualcomm shows a smaller percentage because it has declared a very large number of

2.Survey results

patents. Sharp, Marvell, Andrew LLC. DeutscheTelekom made their declarations rather late so were omitted from the current evaluation.

The total number of patents evaluated came to 1,147, which amounted to 38.2% of the declared patents (2,999).

2.Survey results

(3) Essentiality evaluation results

Figure 8 shows the essentiality evaluation results for all 1,147 patents. The percentage of those scored “A”, which is considered to be really essential for the standards, was 55.4%.

Although all patents studied have been declared to be essential, a certain portion of them are evaluated as “B” or “C”. The main reason for this is considered to lie in the difference in each company’s criteria for judging essentiality and its declaration policy. It is likely that those irrelevant patents were declared essential based on the company’s IPR strategy even though those patents may have been internally judged to be somewhat short of being essential.

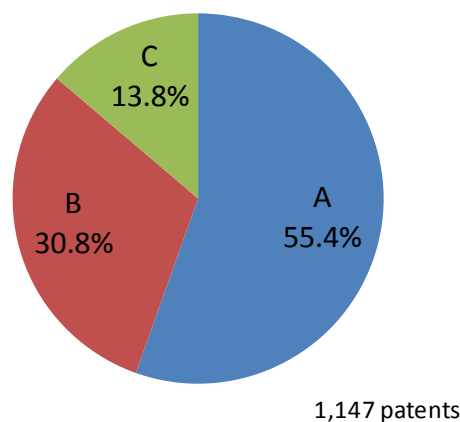


Figure 8 - Essentiality evaluation results

A: The invention contained in the patent matches the standards.

B: The invention contained partially matches the standards.

C: The invention contained does not match the standards.

2.Survey results

(4) Evaluation result for each company

Figure 9 shows the evaluation results for each company. Most of the companies have more “A”s than “B”s or “C”s. In particular, NTT DOCOMO, ZTE, LG, Nokia Siemens and Nortel have relatively high “A” ratios.

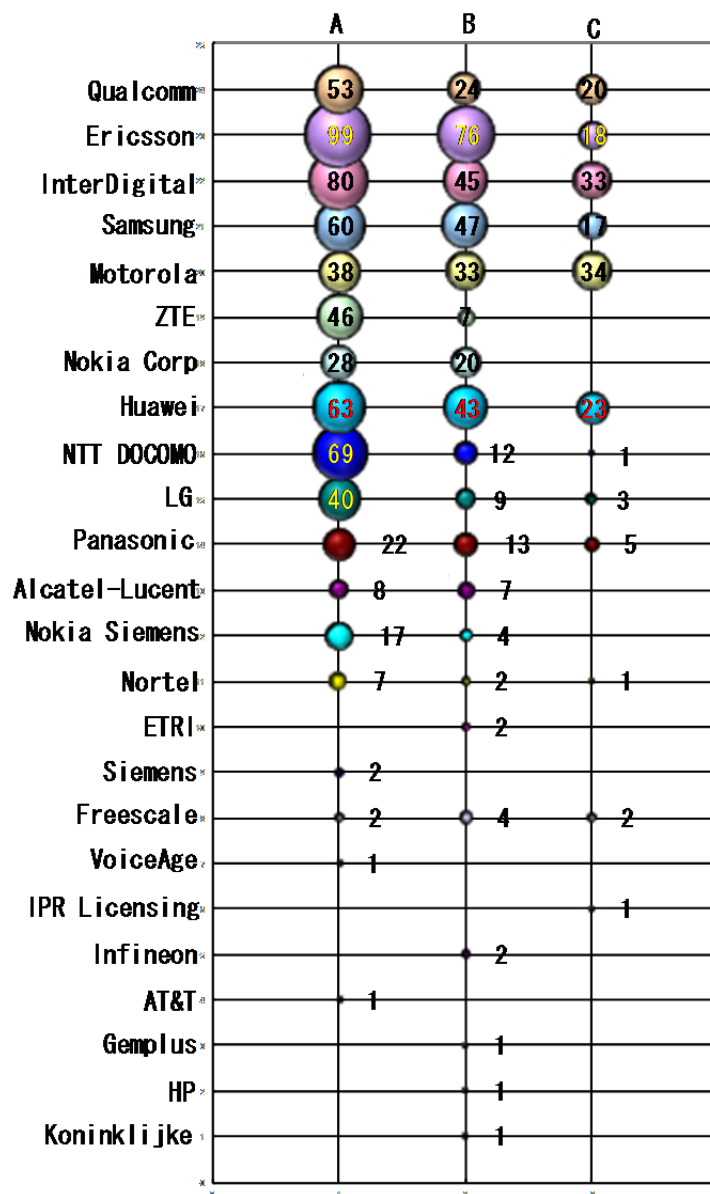


Figure 9 – Essentiality evaluation results for each company

2.Survey results

Figure 10 shows the essentiality ratios (percentage of patents evaluated as “A” to all the patents evaluated) for each company. The horizontal axis shows the essentiality ratio (in percentage) and the vertical axis shows the company names. Due to space limitation, companies with less than 10 declared patents for evaluation were omitted.

Companies such as ZTE, NTT DOCOMO, Nokia Siemens and LG have ratios of around 80% which are higher than the average (55.4%). One of the reasons for this is considered to be the fact that these companies made declarations for relatively new patents, filed after LTE standardization began.

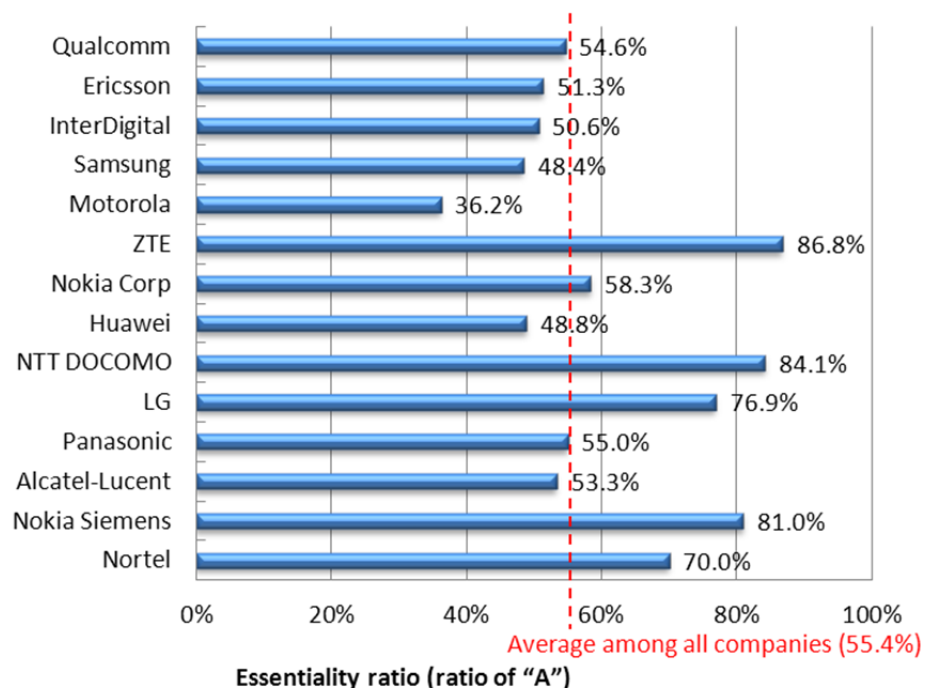


Figure 10 – Evaluation results by company (essentiality ratio)

In considering the essentiality of the patents, it is necessary also to take into account whether the patents under study have been already registered or not. Figure 11 shows the percentage of registered patents to the total number of patents under evaluation for each company. Only those companies with no less than 10 patents for evaluation are shown.

In Figure 11, patent counts were made by referring to the examination status of the patents in the application country as of the survey period. Therefore, it must be noted that the result does not reflect the examination status as of present nor does it reflect the examination status in those countries pertinent to ETSI declarations. For example, as described in Section 2.3 (1)(ii), in most of the cases, examination status is derived from Japanese patent, if a patent family includes a Japanese one, or from US patent, if the family does not include a Japanese one, so even for US-based Qualcomm, about 30% of the evaluations were based on the filings made in Japan. In the case where the evaluated were PCT patents, they were treated as non-registered. With companies whose registration ratio

2.Survey results

was high, it is reasonable to assume that most of their patents have been already approved and the evaluated score would not change; whereas with those whose registration ratio was low, their score may degrade as their claims are examined and their scopes become narrower.

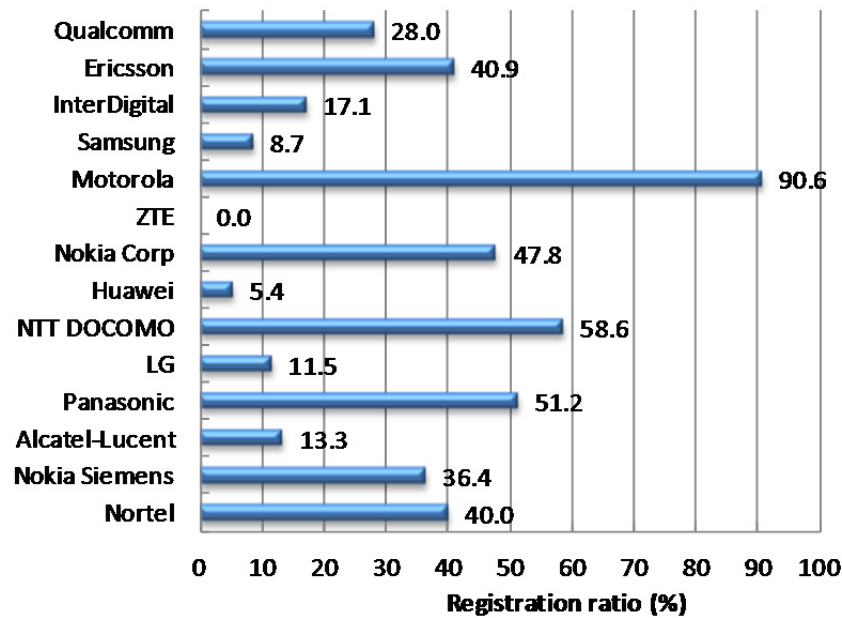


Figure 11 -Registration ratios of patents evaluated

3. Estimation of the numbers of essential patents

3. Estimation of the numbers of essential patents

The number of “essential” patents held by each company (on a patent family basis) has been estimated by multiplying the number of declared patent families (see Table 1 or Figure 1) by the essentiality ratio (Figure 10).

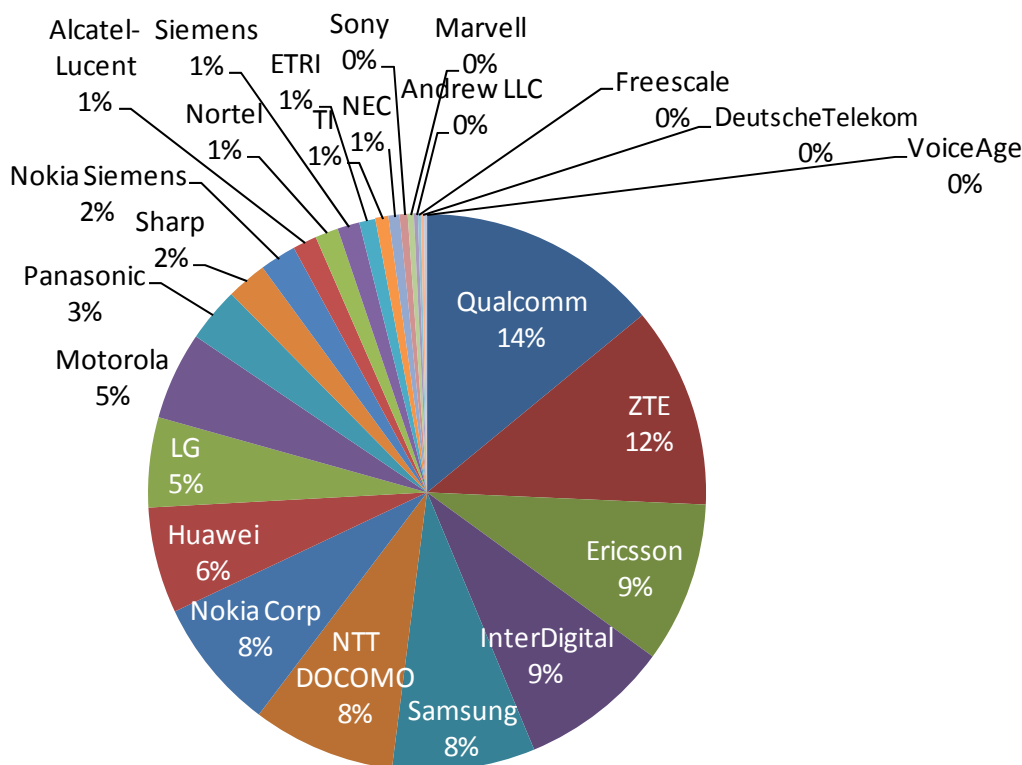


Figure 12 - Percentages of “essential” patents by company

The result is shown in Figure 12. For those companies (Sharp, ETRI, TI, NEC, Sony, Marvell, Andrew LLC and Deutsche Telekom) with which essentiality ratio was not available, because of the fact that evaluation was not conducted in this survey or the number of evaluated patents was small, the average value of 55% has been applied.

Qualcomm has been estimated to be number one with 240 “essential” patents followed by ZTE (189), Ericsson (159), InterDigital (149), NTT DOCOMO (142), Samsung (142) and Huawei (105).

Regarding ZTE and Huawei, their low registration ratios (see Figure 11) suggest that many of their patents are still in examination phase. Thus, as was mentioned earlier, there may be a possibility that the numbers become smaller due to shrinkage of patent claims as the result of their patent examinations.

Based on the results above, the major features of the high score companies are

3. Estimation of the numbers of essential patents

summarized as follows:

i) Qualcomm

Qualcomm has the maximum number of declared patents. It has continuously made declarations from as early as 2007 up to 2011 and maintains an essentiality ratio higher than average. This makes us believe that Qualcomm is allocating significant resources to continuously analyzing its own patents and to actively declaring patents that have exceeded reasonable criteria. It is foreseen that their declarations will further increase in the future. As a result of their globalization efforts it is highly likely that Qualcomm will be holding many “essential” patents in many countries.

ii) Ericsson

Declaration dates by Ericsson are centered around 2009 and 2010. Their registration ratio is comparatively high and essentiality ratio is average. Because their declared patents were filed between around 1990 and now, it is likely that Ericsson has conducted a comprehensive analysis of their own patents at certain stages and, during these two years, has made declarations for the patents that met their criteria.

iii) InterDigital

InterDigital exhibits similar tendencies to Qualcomm’s. However, it is foreseen that the number of “essential” patents of InterDigital may not increase so much like the case of Qualcomm, because its registration ratio is poorer than that of Qualcomm and there were cases where a patent declared by InterDigital were rejected in examinations.

iv) Samsung

Samsung started to make declarations after 2008 for patents filed after 2005. Because the patents are new, their registration ratio is still low and their essentiality ratio is at an average level. However, because the number of declared patents is large, the number of their “essential” patents is also large. Their policy of actively making declarations is evident but there is a chance that the number of “essential” patents may not increase as much as expected depending on the results of patent examinations. Therefore, a close watch on the examination status of Samsung’s patents is necessary.

v) Motorola

Motorola made declarations in a lump in 2010 covering its patents filed between 1990 and 2007. It is estimated that Motorola has spent some time to make a comprehensive analysis of its patents and selected those patents to be declared. Many of the declared patents were filed before 2005 when LTE standardization began and almost all of the patents evaluated in this survey have been registered.

vi) ZTE

ZTE made declarations in a lump in 2010 covering its patents filed after 2006. In

3. Estimation of the numbers of essential patents

contrast to Motorola, ZTE's salient points are that the declaration was made mainly of those patents that were applied with LTE in mind, and that only unregistered patents were declared. Therefore, depending on the examination results, a certain number of the patents may become non-essential which leads us to suggest that the estimated number of "essential" patents held by ZTE is an overestimate, compared to those of other companies.

vii) Nokia

Nokia exhibits almost the same tendencies as Ericsson.

viii) Huawei

Huawei has comparatively similar tendencies to Samsung's, but the number of declared patents is smaller and consequently the number of "essential" patents is smaller as well. In addition, its ratio of registered patents is low as is the case with ZTE.

ix) NTT DOCOMO

NTT DOCOMO made notifications in 2009 and 2010 for its patents filed after 2005. The ratio of registered patents is high despite their being new applications, and their essentiality ratio is very high. This means that NTT DOCOMO possesses a relatively high number of registered "essential" patents so that, when compared with other companies, NTT DOCOMO needs to be given a higher rank than is actually found in Figure 12 (i.e. 5th place).

x) LG

LG made notifications in a lump in 2009 for its patents filed between 1998 and 2008. The high essentiality ratio suggests that they have made declarations based on relatively strict internal evaluations on their patents.

4 ■ Summary

In this survey, the number of patents for evaluation was first identified to be 2,999. Based on these patents, studies on application trends and the essentiality of the patents have been conducted. The main results are as follows:

- i) By processing the list of essential, or potentially essential IPRs notified to ETSI (original list) obtained from the ETSI website and grouping the declared patents into patent families, a total of 2,999 patents were identified to be subject to this study. This is the effective number of declared patents. The number of companies that made declarations was 32.
- ii) Qualcomm has the largest number of declared patents (441, 14.7%) and is followed by Ericsson (310, 10.3%), InterDigital (295, 9.8%), Samsung (294, 9.8%), Motorola (241, 8.0%) and ZTE (230, 7.7%). There are nine companies that have shares of more than 5% which proves that the declarations are not limited to just several major companies but many companies are making declarations in roughly equal numbers. The nationalities of the companies are also spread across USA, Europe and Asia in a balanced manner.
- iii) Many of the declared patents have been filed after 2005, when LTE standardization work began. In particular, the applications filed between 2006 and 2008 are dominant, while the number of declarations made on the applications filed between 1999 and 2004 are also significant.
- iv) Companies can be classified into four groups, namely, a) those who have made declarations for patents filed during a long period of time from the early days (around 1990) to now, b) those who have made declarations mainly for patents filed after 2005 (the year when LTE standardization started), c) those who have made declarations for early applications but not for applications after 2005, and d) those who do not fall into any of the above categories.
- v) The countries, where the applications were made, were surveyed. Qualcomm, Ericsson, InterDigital, Motorola and Nokia are filing applications in various countries in the world. Japanese and Korean companies are also filing applications in BRICs and other countries in a balanced manner in addition to US and Europe.
- vi) Samples were taken from 2,999 effective patents to apply essentiality evaluation. It has been estimated that 55% of them are “essential” patents conforming to ETSI standards. In terms of the essentiality ratio (i.e. the ratio of “essential” patents to

4.Summary

the total number of patents declared by the subject company), ZTE, NTT DOCOMO and Nokia Siemens have the highest scores which are over 80%.

- vii) The numbers of “essential” patents have been derived based on the numbers of declared patents and the essentiality ratios. Qualcomm is estimated to have the largest number of “essential” patents (240) followed by ZTE (189), Ericsson (159), InterDigital (149), NTT DOCOMO (142), Samsung (142), Nokia (132) and Huawei (105). Regarding companies such as ZTE and Huawei who have many unregistered patents, those numbers may be reduced because of the possible decline of the essentiality ratio.

References

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Appendix 1

Excerpt of ETSI site (http://www.etsi.org/deliver/etsi_sr/000300_000399/000314/)

| ETSI IPR ONLINE DATABASE — DISCLAIMER | | | | | | | | | | | | | |
|--|--------------------|------------------------------------|---------------|---------------------|-----------------------------|--|---|--------------------------|------------------------|-------------------|----------------------------|-----------|-----------|
| IPR in ETSI deliverables | | | | | | | | | | | | | |
| The ETSI IPR DATABASE contains IPRs, particularly patents and patent applications, which have been notified to ETSI as being essential, or potentially essential, to ETSI standards. Unless otherwise specified, all IPRs contained herein have been notified to ETSI, with an undertaking from the owner to grant licenses according to the terms and conditions of Article 6.1 of the ETSI IPR POLICY (Annex 6 of the Rules of Procedure). | | | | | | | | | | | | | |
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| Patent information | | | | | IPR declaration information | | Projects | | Standards | | | | |
| Application number | Publication number | Title | Patent office | Declaring companies | Declaration references | Declaration dates | Essential to project | Non-essential to project | Essential to standards | YES to | Non-essential to standards | | |
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