

**“Essentiality Evaluation of SEP Declared 5G Patents” by Cyber Creative Institute
CO. Ltd.**

Results Available for Purchase

-Estimated authentically essential 5G patents – top 6 holders comparable -

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Cyber Creative Institute CO. Ltd.

Cyber Creative Institute Co. Ltd. (“Cyber Creative Institute”, headquarters: Shinagawa, Tokyo, president: Hirohiko Sato), a research and analysis consultant on mobile-wireless and other ICT technologies conducted a patent essentiality evaluation for the 5G essential patents declared by ICT companies to ETSI (declared 5G-SEPs¹) for estimation of the essential 5G-Patents holdings.

As a company in principle can declare what they consider as 5G essential patents to a standardization organization (e.g. ETSI), these declared 5G-SEPs may include the ones not objectively essential to the 5G Standard. Therefore, simple counting of the declared 5G-SEPs has not been enough to understand the real strength of the major SEP owners.

In conducting essentiality evaluation on declared 5G-SEPs, we aim at our evaluation to estimate the “total number and per-company holdings of authentically essential 5G patents”

The analysis is also intended to respond to the questions from the 5G patent holders and the 5G service providers, etc. toward “Trend for Patent Filing Authentically Essential to Standards”

The essentiality evaluation for 5G-SEPs is the first in the world (according to a survey by Cyber Creative Institute).¹

We evaluated 977 patents that are equivalent to approximately 10 % of the 5G-SEPs declared and granted for the core standards . The result shows that the essentiality ratio² is 32% on average, and that top three companies in the order of higher essentiality ratio are NTT DOCOMO (81%) , InterDigital (48%) and Qualcomm (45%) .

With this evaluation, we estimate the total number of authentically essential 5G patents (“authentic 5G-SEPs”) is 6,400 as of the end of June 2020 in multiplying the 5G-SEP

¹ Surveys on LTE were conducted in 2011, 2012 and 2013 by Cyber Creative Institute.

<https://www.cybersoken.com/interview/patentresearch/lte/>

² Essentiality ratio: the numbers of the patents that match the 5G Standards over the evaluation target SEPs declared to ETSI.

declarations by the essentiality ratio.

According to our estimation, the top 10 companies who own authentic 5G-SEPs are Samsung (11.9%) , Qualcomm (11.6%) , Huawei (11.3%) , ZTE (10.9%) , Nokia (including ALU) , (9.7%) , NTT DOCOMO (9.5%) , LG (6.8%) , Ericsson (4.8%) , Sharp (3.0%) and Inter Digital (2.8%) .

Among them, the top 6 holders are almost comparable in their shares at around 10%. This patent essentiality evaluation result is available for purchase.

(1) Purposes and Background of the Evaluation

Our evaluation result in 2013 shows the essentiality ratio as 56% to the total 5,900 declared LTE-SEPs. In the latest 5G-SEP analysis, about 21,000 5G-SEPs were declared as of the end of June 2020, a 3.5-fold increase over 2013.

An evaluation based on the number of declared 5G-SEPs, however, is not objectively appropriate as the declared patents may include non-essential patents when each company may declare their patents on their own under their own criteria. "Some patents declared by companies include those that do not appear to be essential when judged objectively. The number of declared 5G-patents, therefore, does not reflect the real strength of each patent holders".

On the other hand, an essentiality evaluation of the entire declared patents is not practical as it costs a lot of money and time for the huge amount of declared patents.

In view of this as a practical approach, we selected "a sampling approach instead of an exhaustive check, by picking out a certain percentage of the declared patents, obtaining an essential patent ratio and correcting the declared data". This approach is intended to ensure both objectivity and effectiveness of evaluation.

We sampled approximately 10% of the declared patents as the target of the essentiality evaluation. It enabled us to estimate the "total number of real 5G-SEPs and the per-company holdings".

Methodology for Analysis

A) Selection of Patents for Essentiality Evaluation

- We performed an essentiality evaluation for a patent family that contains a granted patent among the declared 5G-SEPs ("Declared Patents").
- With the focus on the 5G Standard compliant patents, we selected the patents

that were declared toward the 5G Radio Access standards (TS 38 series) and the Network Slicing standards (TS 23.501 to TS 23.503) which constitute important elements in the 5G architecture standards (“collectively 5G Core Standards”).

- We selected around 10 % of the patents registered by each company in the target of essentiality evaluation in order to secure fairness among companies.
 - We impartially selected 10 % of the granted patents in each company as of the end of March 2020, in the order of earlier priority dates until it reached the target number (higher priority on the newest patents).
 - The total number of patents selected for evaluation is 977 patents.
- B) Setting the Population
- We selected the essentiality declared patents at the 5G Core Standards as of the end of June 2020.
 - Number of families of the Declared Patents: 20,780
 - Number of families granted among the above: 10,770
- C) Method to Evaluate the Essentiality Ratio
- Evaluate one patent per family
 - Select an “independent claim” with the least limitation and seemingly broadest scope of rights for evaluation.
 - In principle, use ETSI declared standards for the comparison analysis.
 - Use only 5G-related standards for the comparison analysis even when searching for standards outside the declarations. (i.e. No patent is evaluated as essential even if it matches any TS 36 series or TR standard.)
- D) Evaluation Details
- Target standards and clauses
 - Grounds for evaluation
 - Points of inventions
- E) Essentiality Evaluation
- A : The invention matches a standard.
 - B : Part of elements of the invention matches a standard.
 - C : The invention doesn’t match a standard.
- Only the patent with the A evaluation is classified as an authentic 5G-SEP.

(2) Results of Essentiality Evaluation

We selected 977 patents for the essentiality evaluation from 10,770 granted patents, which is equivalent to 9.1% of the entire granted patents.

The number of companies who made declarations was 52. Among them, for a per-company evaluation we selected 11 companies who hold 100 or more granted patents each (10 or more patents evaluated). In addition, we separately analyzed for 3 Japanese companies who hold 5 or more applicable patents.

The results of essentiality evaluation are given in Figure 1.

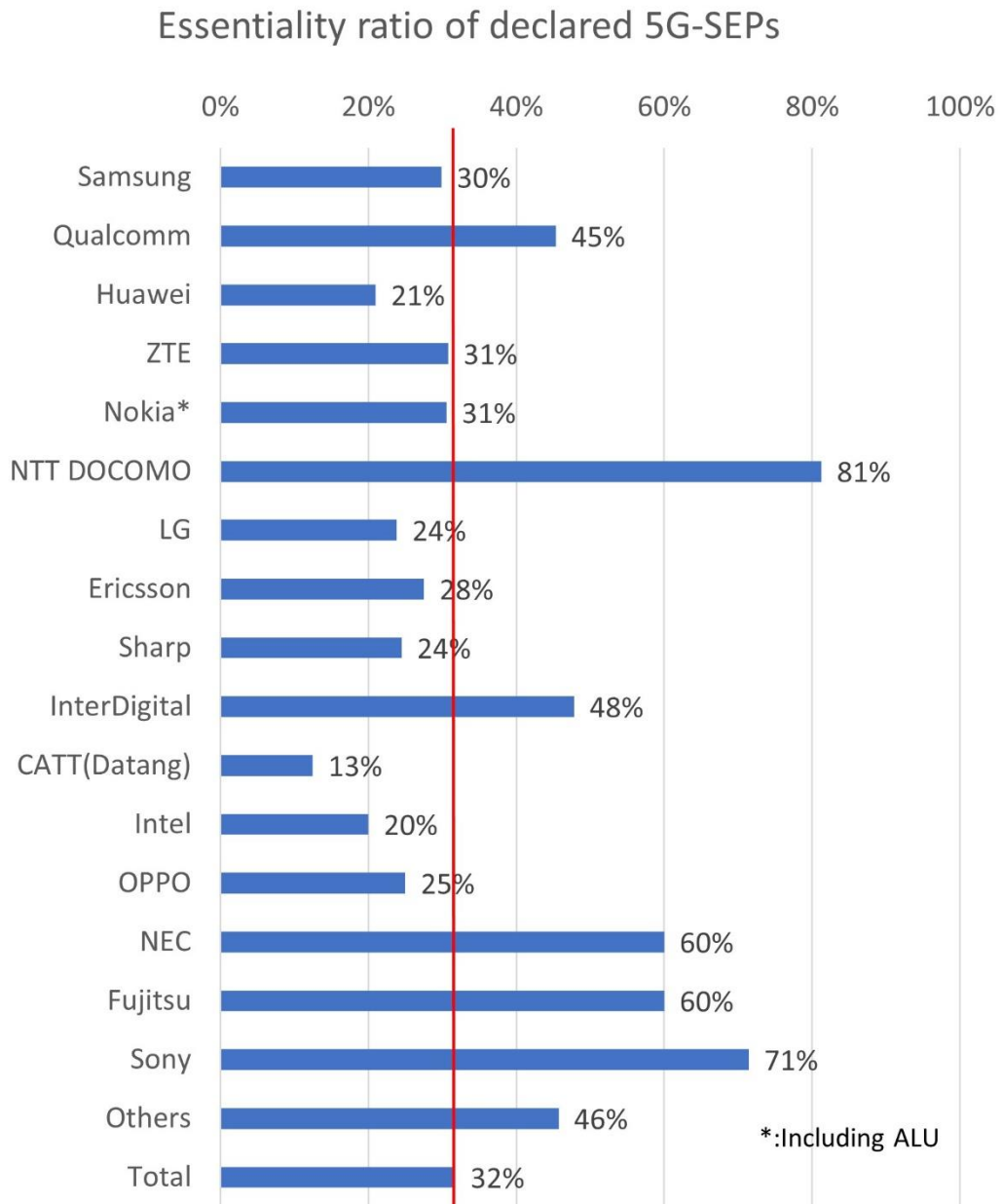


Figure 1 Essentiality ratio of declared 5G-SEPs

The average essentiality ratio is 32 % as shown by the red line.

The companies with higher essentiality ratio are NTT DOCOMO (81%) , InterDigital (48%) and Qualcomm (45%) . Other higher ranking companies shows below-average essentiality ratio.

Among Japanese companies, those with higher essentiality rates are NEC (60 %), Fujitsu (69 %) and Sony (71 %).

Most of the Japanese companies are found to have higher essentiality ratio.

(3) Number of Authentic 5G-SEPs Estimated and Their Owners

The estimated number of authentically essential 5G-SEPs in total is approximately 6,400 as of the end of June 2020 by applying the essentiality ratio to the target families of Declared Patents (20,780 families). The names of the top ranking companies who are estimated to hold authentically essential 5G-SEPs and their shares are shown in Figure 2.

Distribution of Estimated Authentic 5G-SEPs Holdings

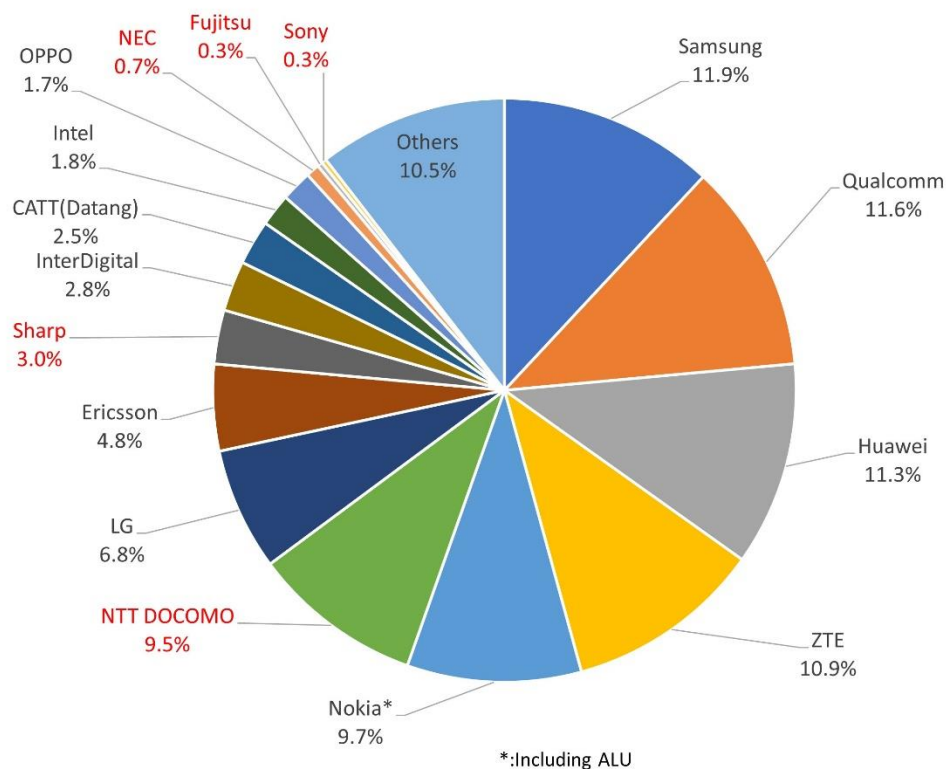


Figure 2 Distribution of Estimated Authentic 5G-SEPs Holdings

The top 10 companies who are estimated to own authentic 5G-SEPs are Samsung (11.9%) , Qualcomm (11.6%) , Huawei (11.3%) , ZTE (10.9%) , Nokia (including ALU) (9.7%) , NTT DOCOMO (9.5%) , LG (6.8%) , Ericsson (4.8%) , Sharp (3.0%) and InterDigital (2.8%) .

Number of authentic 5G SEPs holding ratio among the top 6 companies are approximately 10% each and is almost comparable.

Japanese companies such as NTT DOCOMO ranks 6th and sharp 9th.

■ Corporate Information

(1) Corporate Name : Cyber Creative Institute Co. Ltd. (<http://www.cybersoken.com/en>)

(2) President : Hirohiko Sato

(3) Headquarters : 5th Floor, Gotanda First Bldg. 2-8-1, Nishi-Gotanda, Shinagawa-ku,
Tokyo, 141-0031, JAPAN

(4) Established : April 2001

(5) Client Service : Cyber Creative Institute provides the following services related to ICT.

1. Research & survey services
2. Patent services
3. Engineering services
4. Education & training services
5. Support services for Japanese ICT market access

■ Contact point for this article

Cyber Creative Institute Co. Ltd.

Patent Services Group

Kenji Nakanishi (Mr.)

Tel : +81-3-3490-3186

Email : contacts@cybersoken.com