

Landscape Analysis of Declared 5G Patent Families (as of May 17, 2020)

5G is the fifth-generation of mobile technologies, following the previous generations (4G, 3G and 2G). 5G is set to offer faster speeds and more reliable connections with lower latency on smartphones and other devices than ever before. A range of applications such as smart homes and buildings, smart factories, remote healthcare, and self-driving vehicles will be supported by the emergence of 5G.

We, NGB Corporation, have conducted a landscape analysis of the patent families having at least one patent application or patent that has been declared by a patent holder to the standardization organizations like ETSI (European Telecommunications Standard Institute) as standard essential patents (SEPs) to 5G (herein we call as “declared 5G patent families”). The main purposes of this analysis include (1) to figure out that the number of declared 5G patent families of each patent holder is still increasing, and (2) to figure out the current situation of the number of 5G declared patent families that were also declared to 4G, 3G or 2G (herein we call as “patent families declared both to 5G and 4G/3G/2G”), and the number of 5G declared patent families that have not been declared to 4G, 3G or 2G (i.e., declared 5G patent families where all of Technical Specification(s)/Technical Report(s) (TS/TR(s)) only relate to 5G without any combination with 4G, 3G or 2G, herein we call as “patent families only declared to 5G”), of each patent holder. The information of the declared patent families is still useful to capture the overall trend of 5G standardization activities. The results are reported as below.

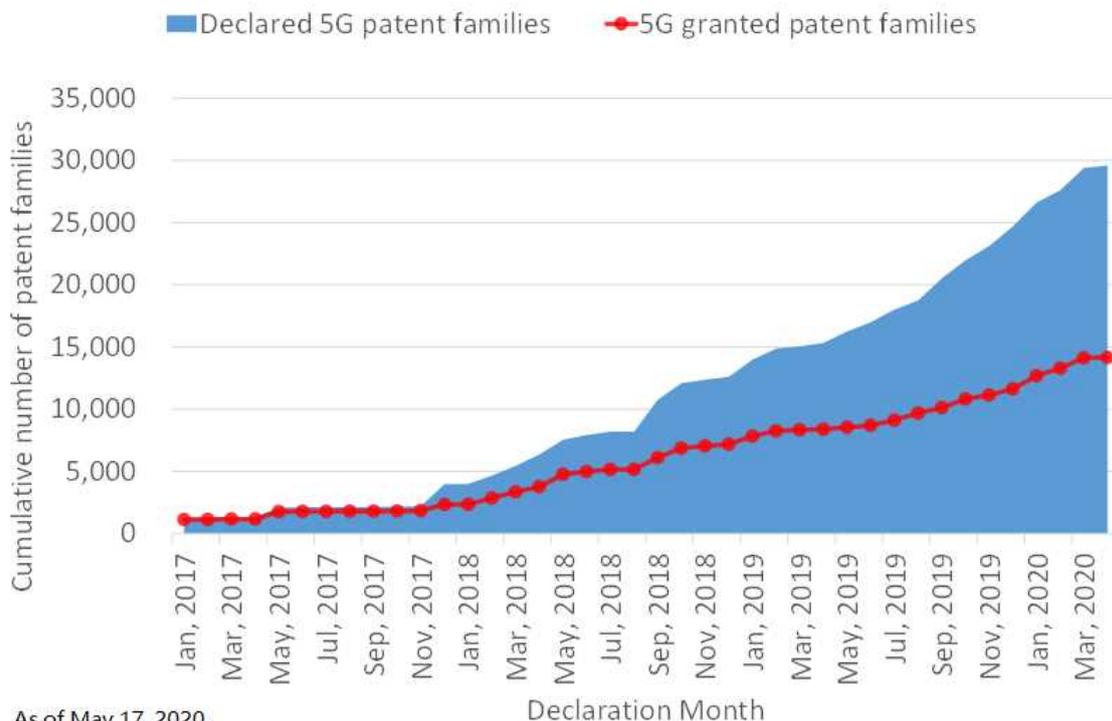
We collected the declared 5G patent family data to be analyzed, which was available as of May 17, 2020 from the IPlytics Platform in view of TS/TR(s) related to 5G. More specifically, we collected the declared 5G patent family data using the IPlytics Platform by selecting “5G”, “5G/4G”, “5G/4G/3G”, or “5G/4G/3G/2G” as Technology Generation, and also determined whether the declared patent families has another generation like “4G”, “4G/3G”, “4G/3G/2G”, “3G”, “3G/2G”, “2G”, to have a data set of the declared 5G patent families. With respect to the “patent families only declared to 5G”, we extracted the patent families wherein all of the TS/TR(s) relate to “5G” only, without “5G/4G”, “5G/4G/3G”, “5G/4G/3G/2G”, “4G”, “4G/3G”, “4G/3G/2G”, “3G”, “3G/2G”, or “2G”.

Figure 1 shows a trend of cumulative number of each patent family over months. The blue area shows a cumulative number of the 5G declared patent families in terms of declaration month.

The red line shows a cumulative number of “5G granted patent families” that have at least one

granted patent as of May 17, 2020. Some of the patent application(s) in the “declared 5G patent families” as of the declaration month become granted patent(s) over times. In each dot in the red line, we determined whether the declared 5G patent families in each declaration month have at least one granted patent as of May 17, 2020, rather than as of each declaration month.

The substantial rise in the declared 5G patent families started from around December, 2017, and the declared 5G patent families keep continuous growth since then.



As of May 17, 2020
Source: IPlytics platform

Figure 1

Table 1 shows the ranking of the top 15 companies in terms of the number of the “declared 5G patent families” (see column A) and the proportion of each company’s patent families based on the total number of the declared 5G patent families (see column B and Figure 2). We integrated Nokia’s data with Alcatel-Lucent’s data as Nokia group’s data.

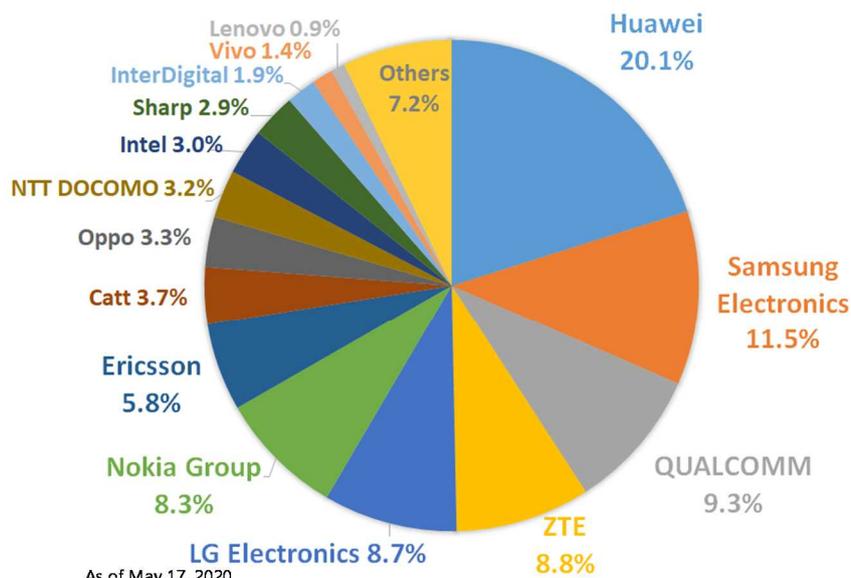
As of May 17, 2020, the total number of the “declared 5G patent families” is 29,586. Huawei (5,947 patent families) is first placed in the ranking and accounts for 20.1% of the total. Other companies having more than 2,000 declared 5G patent families are Samsung (3,392 patent families, 11.5%), QUALCOMM (2,755 patent families, 9.3%), ZTE (2,606 patent families, 8.8%), LG (2,588 patent families, 8.7%), and Nokia Group (2,442 patent families, 8.3%).

Table 1

Declaring company name	A	B
	Number of declared 5G patent families*	Proportion of declared 5G patent families* A / Total(29,586) [%]
Huawei Technologies	5,947	20.1%
Samsung Electronics	3,392	11.5%
QUALCOMM	2,755	9.3%
ZTE	2,606	8.8%
LG Electronics	2,588	8.7%
Nokia Group	2,442	8.3%
Ericsson	1,713	5.8%
Catt	1,108	3.7%
Guangdong Oppo Mobile Telecommunications	980	3.3%
NTT DOCOMO	933	3.2%
Intel	892	3.0%
Sharp	858	2.9%
InterDigital	574	1.9%
Vivo Mobile Communication	409	1.4%
Lenovo	270	0.9%
Others	2,119	7.2%
Total	29,586	100.0%

As of May 17, 2020
Source: IPlytics platform

* Both granted patent families and un-granted patent families



As of May 17, 2020
Source: IPlytics platform

Figure 2

Table 2 shows the number of the “patent families only declared to 5G” (see column C), the proportion of each company’s patent families only declared to 5G based on the total number of the patent families only declared to 5G (see column D and Figure 3, i.e., C/Total(20,152) [%]). We can see that Huawei has nearly a quarter of the total number of the patent families only declared to 5G. Comparing with Table 1, Table 2 shows that the proportion of Huawei is increased by 4.1 points and the proportion of Samsung is decreased by 3.3 points. This indicates that Samsung has more patent families declared both to 5G and 4G/3G/2G.

We used the same order of the top 15 companies in Table 1 and Figure 2, when generating Tables 2 to 4 and Figures 3 to 5, respectively.

Table 2

Declaring company name	C	D
	Number of patent families* only declared to 5G	Proportion of patent families* only declared to 5G E / Total(20,152) [%]
Huawei Technologies	4,880	24.2%
Samsung Electronics	1,639	8.1%
QUALCOMM	1,818	9.0%
ZTE	1,970	9.8%
LG Electronics	1,792	8.9%
Nokia Group	1,486	7.4%
Ericsson	1,035	5.1%
Catt	931	4.6%
Guangdong Oppo Mobile Telecommunications	917	4.6%
NTT DOCOMO	574	2.8%
Intel	768	3.8%
Sharp	329	1.6%
InterDigital	254	1.3%
Vivo Mobile Communication	409	2.0%
Lenovo	233	1.2%
Others	1,117	5.5%
Total	20,152	100.0%

As of May 17, 2020
Source: IPlytics platform

* Both granted patent families and un-granted patent families



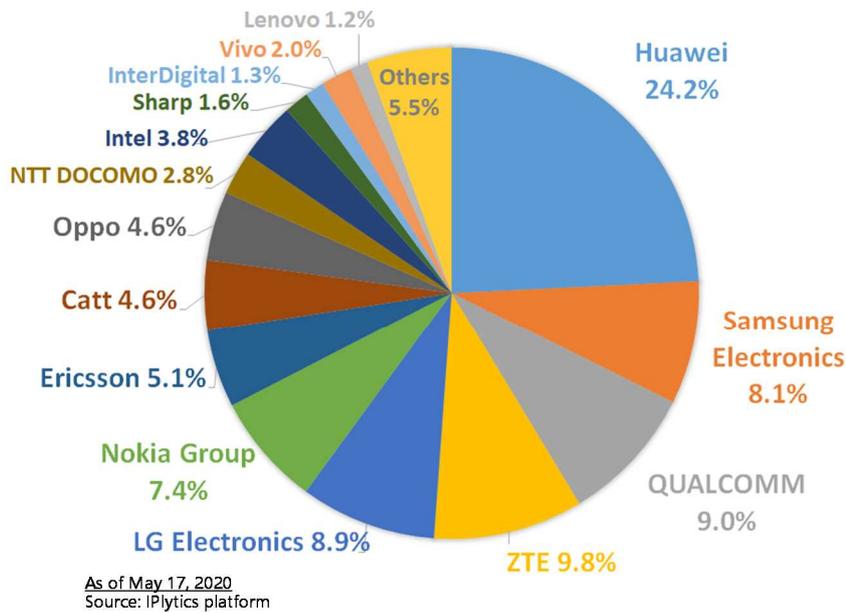


Figure 3

Table 3 shows, for the top 15 companies, the number of the “5G granted patent families” (see column E) and the proportion of each company’s 5G granted patent families based on the total number of the 5G granted patent families (see column F and Figure 4). While Huawei (2,796 granted patent families) is still first placed in the ranking, Samsung (2,134 granted patent families) in second place closes the gap with Huawei compared with the situation in Table 1 (Huawei: 5947 patent families, Samsung: 3,392 patent families). Comparing with Table 1, Table 3 shows that the proportion of Huawei is decreased by 0.4 points and the proportion of Samsung is increased by 3.6 points. ZTE, Catt, Oppo, Intel, Vivo, and Lenovo have a less proportion of the 5G granted patent families when compared with the situation in Table 1. It is likely that these companies have more patent families having pending application under examination.

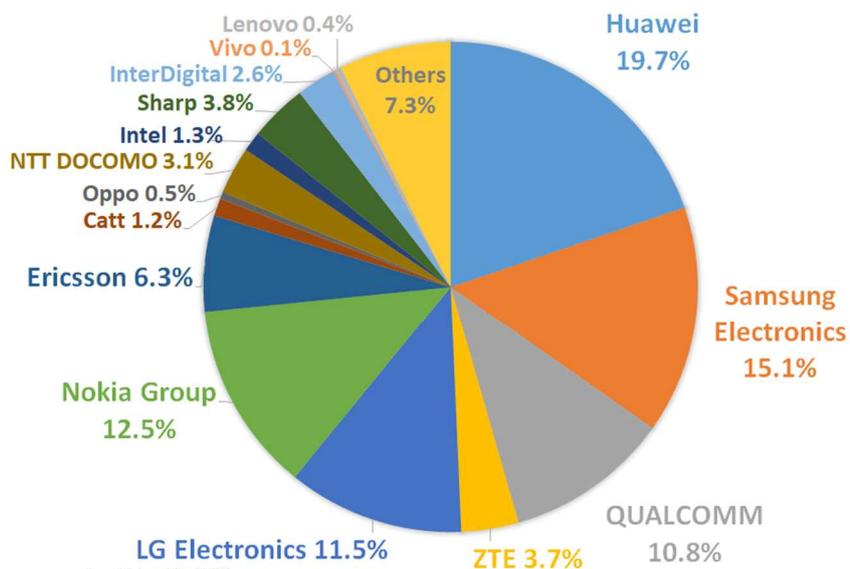
Table 3

Declaring company name	E Number of 5G granted patent families*	F Proportion of 5G granted patent families* C / Total(14,166) [%]
Huawei Technologies	2,796	19.7%
Samsung Electronics	2,134	15.1%
QUALCOMM	1,526	10.8%
ZTE	531	3.7%
LG Electronics	1,633	11.5%
Nokia Group	1,776	12.5%
Ericsson	898	6.3%
Catt	163	1.2%
Guangdong Oppo Mobile Telecommunications	66	0.5%
NTT DOCOMO	441	3.1%
Intel	187	1.3%
Sharp	534	3.8%
InterDigital	363	2.6%
Vivo Mobile Communication	19	0.1%
Lenovo	58	0.4%
Others	1,041	7.3%
Total	14,166	100.0%

As of May 17, 2020

* including at least one granted patent

Source: IPlytics platform



As of May 17, 2020
Source: IPlytics platform

Figure 4

Table 4 shows the number of “granted patent families only declared to 5G” (see column G), the proportion of each company’s granted patent families only declared to 5G based on the total number of granted patent families only declared to 5G (see column H and Figure 5, i.e., $G/Total(6,863)[\%]$). The “granted patent families only declared to 5G” means the “patent families only declared to 5G” having at least one granted patent as of May 17, 2020. We can see that Huawei has more than 30% of the total number of the granted patent families only declared to 5G. Comparing with Table 1, Table 4 shows that the proportion of Huawei is increased by 11.4 points, which is the largest increase among all companies.

Table 4

Declaring company name	G	H
	Number of granted patent families* only declared to 5G	Proportion of granted patent families* only declared to 5G G / Total(6,863) [%]
Huawei Technologies	2,162	31.5%
Samsung Electronics	670	9.8%
QUALCOMM	722	10.5%
ZTE	189	2.8%
LG Electronics	900	13.1%
Nokia Group	964	14.0%
Ericsson	299	4.4%
Catt	115	1.7%
Guangdong Oppo Mobile Telecommunications	44	0.6%
NTT DOCOMO	96	1.4%
Intel	96	1.4%
Sharp	120	1.7%
InterDigital	77	1.1%
Vivo Mobile Communication	19	0.3%
Lenovo	32	0.5%
Others	358	5.2%
Total	6,863	100.0%

As of May 17, 2020

* including at least one granted patent

Source: IPlytics platform



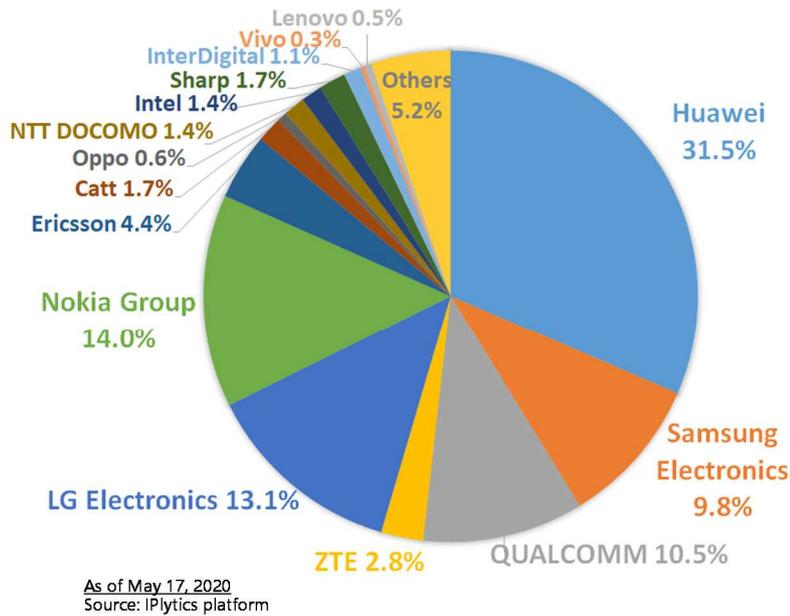


Figure 5

As shown in above, we can see a remarkable increase in the number of declared 5G patent families, and would expect that more and more patent families show up in the record if we take data in the future so that it may possibly change the current trend significantly. We would update this report especially when we see such a significant trend change.

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May 29, 2020