

VALUING STANDARD ESSENTIAL PATENTS
An Examination of Announced FRAND Royalty Rates for LTE

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Introduction

What is the value of one standard essential patent? What is the value of 300 patents essential to that same standard? Is the value of a single patent the same as the value of 300 patents? One expert has contended that the value of a single standard essential patent can be the same as an entire portfolio of standard essential patents.¹ Others have suggested that the value of 300 standard essential patents may be 300 times the value of a single standard essential patent.² The truth may be that neither is correct, and that the value of a standard essential patent depends on how many patents the patent owner holds.

Background

The emergence of fourth generation mobile communications technology produced the Long Term Evolution standard (LTE). Industry initiatives were undertaken to address issues of transparency and cost regarding royalty rates for licensing the patents essential to this new standard. Starting in late 2008, a number of companies announced royalty rates they would charge for handsets using the LTE standard.³

The following table outlines the royalty rates and the number of LTE standard essential patents owned for eight companies that made declarations.

¹ David J. Teece, Director, Center for Global Strategy and Governance at the University of California, Berkeley, is known to have opined that a single patent claim could be worth as much or more than multiple standard essential patents if it could preclude a company from competing in a market.

² In *Apple v. Samsung*, Apple asserted that the royalty it should pay for the right to use Samsung's two UMTS (3G) standard essential patents should be based on Samsung's share of total UMTS standard essential patents. On this basis, Apple argued that as Samsung holds 103 of 1,889 (5.45%) declared essential patents for 3G, any FRAND royalty due Samsung must represent 5.45% of the full value of all 3G standard essential patents. Following this line of reasoning (that licensing rates should be directly proportional to the number of patents in a portfolio), if Samsung were to double its share of UMTS holdings, it would be entitled to double the royalty rate. In other words, each SEP, whether part of a portfolio of 300 SEPs or the sole SEP held by its owner, contributes exactly the same amount of value in terms of establishing a reasonable royalty. Therefore, 300 SEPs would be worth 300 times the value of a single SEP. Apple's Trial Brief, *Apple Inc. v. Samsung Electronics Co., LTD, et al.*, AAA Case No. 11-cv-01846-LHK, July 30, 2012, p. 50.

³ Stasik, Eric, "Royalty Rates and Licensing Strategies for Essential Patents on LTE (4G) Telecommunication Standards," *les Nouvelles*, September 2010, pp. 115-116.

Company	Announced LTE Rates	No. of Essential LTE Patents
1. Qualcomm	3.3%	350
2. Huawei	1.5%	182
3. Ericsson	1.5%	146
4. Nokia	1.5%	142
5. Nortel	1.0%	46
6. Siemens	0.8%	32
7. Motorola	2.3%	16
8. Alcatel	2.0%	9

Source: Stasik, Eric, "Royalty Rates and Licensing Strategies for Essential Patents on LTE (4G) Telecommunication Standards," *les Nouvelles*, September 2010, p. 116.

Discussion

Three things stand out:

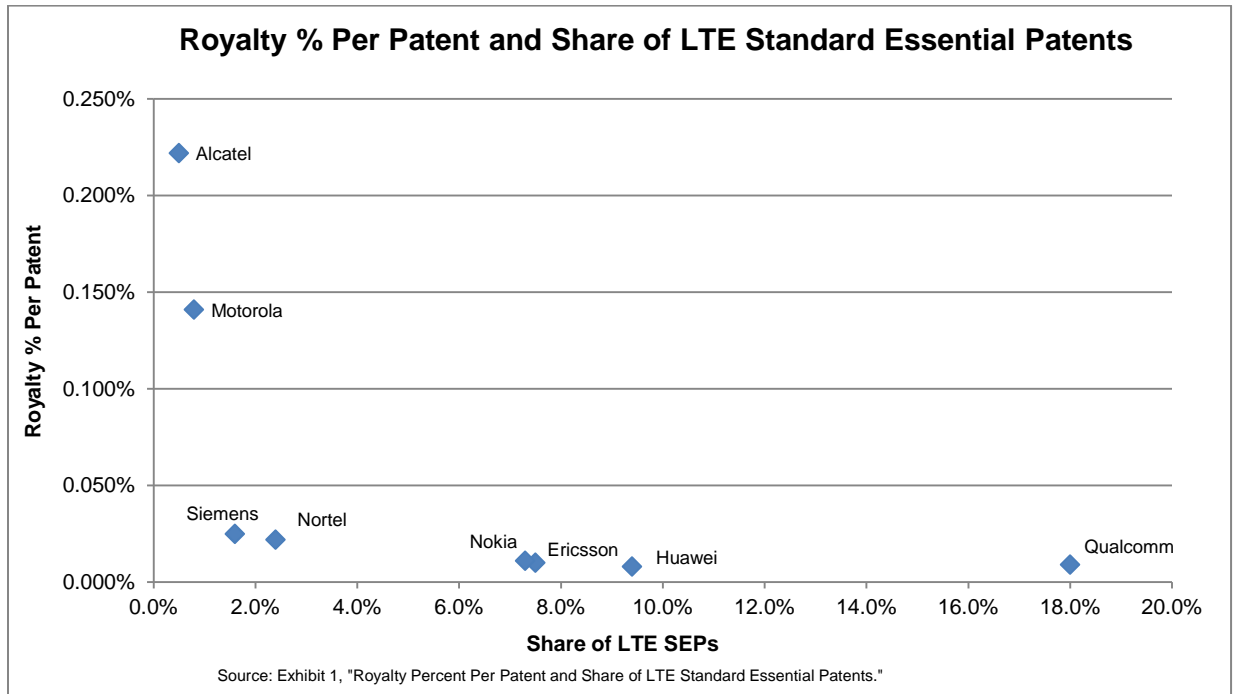
- 1) Excluding Motorola and Alcatel, there appears to be a positive relationship between a company's announced royalty rate and the number of standard essential patents in its LTE portfolio.
- 2) The relationship between LTE portfolio size and associated announced royalty rate is not linear.
- 3) Compared to the other companies, Motorola and Alcatel seem to be asking for a high rate relative to the size of their LTE portfolio.

To determine whether a pattern exists with respect to the pricing policies of the eight companies, each proposed royalty rate was divided by the number of standard essential patents in each entity's LTE portfolio. This yields the implied per-patent cost (or offering price) for each individual standard essential patent in each company's LTE portfolio. Each company's share of total LTE patents also was calculated (total LTE standard essential patents at the time were believed to be 1,941).⁴ The results are set forth in the following table as well as in Exhibit 1.

Company	Royalty Rate Per Patent	Share of LTE Patents
Qualcomm	0.009%	18.0%
Huawei	0.008%	9.4%
Ericsson	0.010%	7.5%
Nokia	0.011%	7.3%
Nortel	0.022%	2.4%
Siemens	0.025%	1.6%
Motorola	0.141%	0.8%
Alcatel	0.222%	0.5%

⁴ Stasik, op. cit. p. 116, citing ETSI 2010 data.

To examine the relationship between standard essential portfolio size and pricing, the data points were plotted. The following chart shows the per-patent royalty rate and LTE patent share for each company.



Finally, regression analysis was employed to understand the relationship between the royalty rate per patent (the dependent variable) and the share of total LTE patents (the independent variable).

Exhibit 2 summarizes the regression results.⁵ They indicate that different shares of standard essential patents command different levels of per-patent pricing.⁶ Other things equal, the greater the share of patents, the lower the per-patent royalty. This is not surprising and corresponds with what we would expect – adding a standard essential patent to a company’s portfolio will increase the total licensing rate that can be charged, but by less than the increase associated with the previous patent added to the portfolio.⁷ It appears that the law of diminishing marginal returns applies to the ownership of standard essential patents.

⁵ We found that the natural log of LTE share is negatively correlated with changes in the natural log of royalty rate.

⁶ It should be noted that the data examined represent only announced royalty rates. Whether or not the companies are successful in obtaining these rates is another question. It would be reasonable to expect that the actual prices negotiated will be lower.

⁷ This assumes (as does this entire memo) that the quality of each company’s LTE patent portfolio is the same.

Exhibit 3 maps the equation's curve against the plot of the actual data points for the eight companies. There appears to be a very good fit relative to the data points for the eight companies' proposed royalty rates. The results indicate that, other things equal, the per-patent royalty rate falls quickly as a company's portfolio for a particular standard grows beyond a single patent and approaches zero as the portfolio grows above a single digit share of total patents. This is due to the exponential relationship between patent share and per-patent royalty rate in the model.

Questions

- Would companies with more than a few patents essential to a particular standard do well to liquidate their "excess" patents?
- Would entities with fewer patents be willing to pay more to acquire a standard essential patent than those with a greater number of standard essential patents in their portfolios?
- Would both Qualcomm and Alcatel be better off if Qualcomm sold some of its patents to Alcatel?
- Could one infer that Qualcomm, Motorola, and Alcatel are all overpricing their LTE royalty rates while Siemens and Nortel are not pricing their LTE rates high enough?

Caveats

Eight data points may not be sufficient for comprehensive conclusions regarding the pricing of royalty rates. It also is not clear whether the patterns evidenced here apply to standards other than LTE.

Furthermore, the analysis to date has not accounted for patent strength or examined any of the patents held to test just how essential they really are. A further step would be to adjust patent portfolio pricing according to quality to account for the risk that patents are declared non-essential or invalid.

Finally, the model breaks down as it approaches the extreme scenario in which each patent is owned by a different entity. Incorporating a cap on total aggregate royalties or including an independent variable representing the total number of companies that own patents for a particular standard might be a good next step.

Conclusion

The announced royalty rates for LTE standard essential patents can be shown to be related to the relative size of an entity's LTE portfolio - the more patents, the higher the total royalty rate.

Quantity adds value. However, each additional patent adds less marginal value to the portfolio than the previous patent. Consequently, the addition of a new essential patent to a portfolio lowers the average value of all the patents in that portfolio. Therefore, the answer to the initial question, "what is the value of one standard essential patent?" may be "it depends on the relative size of the patent portfolio."

EXHIBIT 1

ROYALTY PERCENT PER PATENT AND SHARE OF TOTAL LTE STANDARD ESSENTIAL PATENTS

Company	Announced LTE Rates	Number of LTE Declared Essential Patents ¹	Royalty Percent Per Patent	Share of LTE Standard Essential Patents ²
(1)	(2)	(3)	(2) / (3) (4)	(5)
1. Qualcomm ³	3.25%	350	0.009%	18.0%
2. Huawei ⁴	1.50%	182	0.008%	9.4%
3. Ericsson ⁵	1.50%	146	0.010%	7.5%
4. Nokia ⁶	1.50%	142	0.011%	7.3%
5. Nortel ⁷	1.00%	46	0.022%	2.4%
6. Siemens ⁸	0.80%	32	0.025%	1.6%
7. Motorola ⁹	2.25%	16	0.141%	0.8%
8. Alcatel ¹⁰	2.00%	9	0.222%	0.5%

Notes: ¹ The total number of LTE standard essential patents was said to be 1,941. Stasik, Eric, "Royalty Rates and Licensing Strategies for Essential Patents on LTE (4G) Telecommunication Standards," *les Nouvelles*, September 2010, p.116, citing ETSI 2010 data.

² Share of LTE Standard Essential Patents is calculated as each company's number of LTE declared essential patents (Column 3) divided by the total number of LTE essential patents (1,941).

³ From an undated Qualcomm press release, available on February 21, 2011 (http://www.qualcomm.com/common/documents/licensing/LTE-WiMax_Patent_Licensing_Statement.pdf).

⁴ From an undated Huawei press release, available on February 21, 2011 (<http://www.huawei.com/ipr2.do>).

⁵ From an undated Ericsson press release, available on March 8, 2010 (http://www.ericsson.com/technology/licensing_programs/index.shtml).

⁶ From an undated Nokia press release, available on March 8, 2010 (<http://www.nokia.com/A4993368>).

⁷ From a Nortel press release, May 5, 2009 (http://www.nortel.com/corporate/technology_new/patents.html).

⁸ From an undated Nokia-Siemens Networks press release, available on October 9, 2009 (http://www.nokiasiemensnetworks.com/global/IndustryThemes/network_efficiency/ip-centric/Licensing+policy+on+Long+Term+Evolution+and+System+Architecture+Evolution.htm?languagecode=en).

⁹ From an undated Motorola press release, available on July 21, 2009 (<http://www.motorola.com/content.jsp?globalObjectId=8827>).

¹⁰ From an undated Alcatel Lucent press release, available on February 21, 2011 (http://www.alcatel-lucent.com/wps/portal/!ut/p/kcxml/04_Sj9SPykssy0xPLMnMz0vM0Y_QjzKLd4x39PbRL8h2VAQA88rhg!!?LMSG_CABINET=Innovation&LMSG_CONTENT_FILE=Innovation_Overview/lte_licensing.xml).

Source: To the IP and Growth Review Team, Response submitted by *Research In Motion*, concerning Call for Evidence, Independent Review of Intellectual Property and Growth, March 4, 2011, pp. 3-4.

EXHIBIT 2

REGRESSION RESULTS DEPENDENT VARIABLE: LOG OF ROYALTY RATE PER PATENT

Independent Variable	Parameter Estimate	t-Statistic
(1)	(2)	(3)
1. Log of LTE Share	-0.95	-6.76

Adj. R-squared = 0.86
Relevant Equation: $\ln(Y) = -11.536 + [-0.947 * \ln(X)]$

Parameter Estimate

A parameter estimate indicates the "direction" (positive or negative) of correlation between an explanatory (or independent) variable and the dependent variable. Here, the parameter estimate of -0.95 indicates that the Log of LTE Share is negatively correlated with the Log of Royalty Rate per

t-Statistic

A t-statistic indicates whether the relationship between an explanatory and a dependent variable is significant (i.e., the value of the parameter estimate is different from zero). Typically, a t-statistic with an absolute value greater than two specifies that the correlation is significant at the 95% confidence level (i.e., if $|t| > 2$, then the parameter estimate is significant at the 95% confidence level).

R-squared

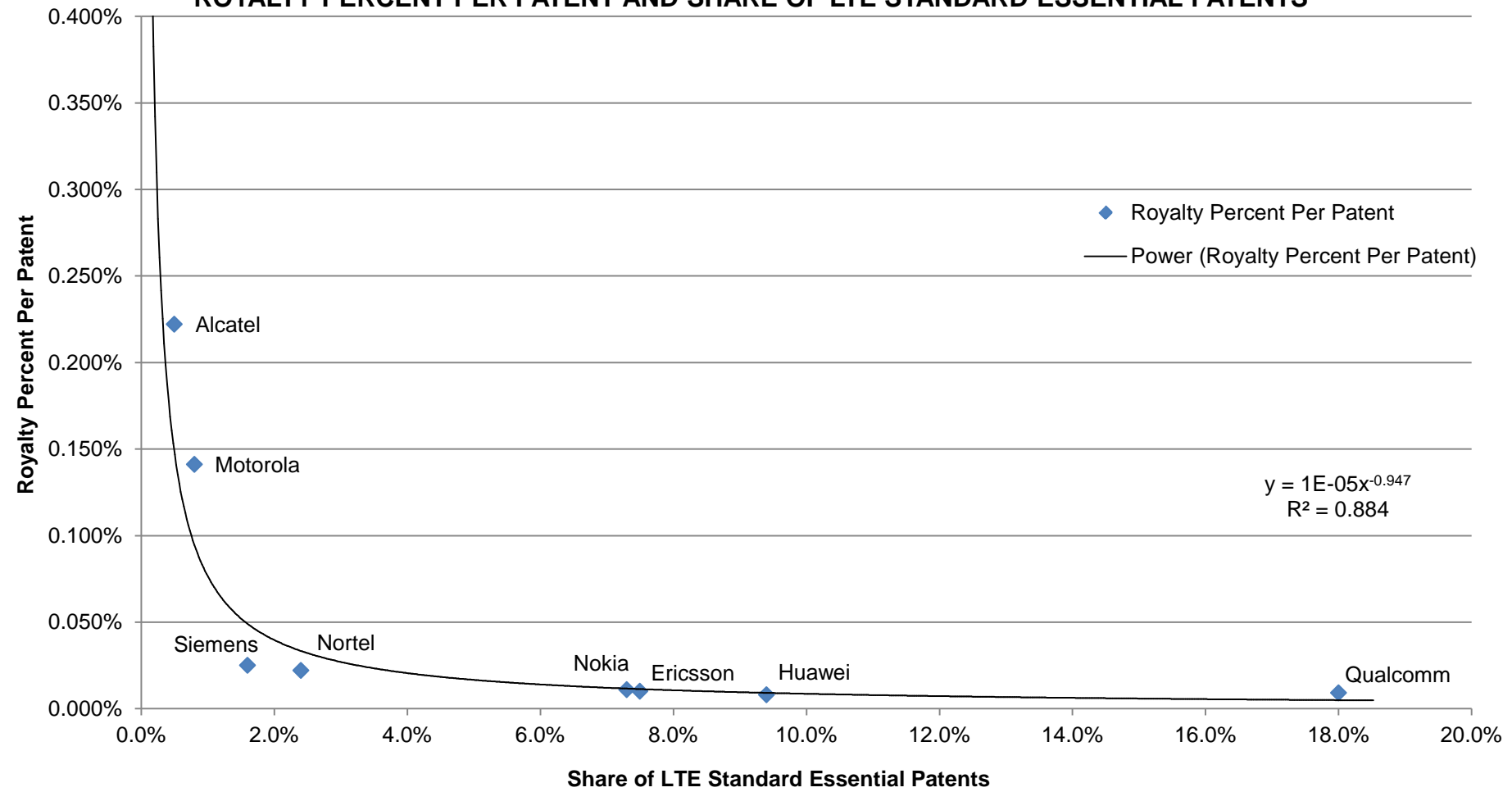
R-squared is a statistical measure of "goodness of fit."

Source: Gujarati, Damodar, *Essentials of Econometrics*, Second Edition, Irwin McGraw-Hill, 1999, p. 172.

Exhibit 1, "Royalty Percent Per Patent and Share of LTE Standard Essential Patents."

EXHIBIT 3

ROYALTY PERCENT PER PATENT AND SHARE OF LTE STANDARD ESSENTIAL PATENTS



Source: Exhibit 1, "Royalty Percent Per Patent and Share of Total LTE Standard Essential Patents."

About the Author

Peter Quies has been engaged in economic research and consulting since 1995. He assists clients with financial modeling and analyses of actual and anticipated performance, the calculation of economic damages, market research, and the collection, tabulation, and analysis of economic, financial, and statistical data. His experience spans many industries including finance, real estate, entertainment, hospitality, pharmaceuticals, insurance, and manufacturing. Mr. Quies received a Bachelor of Arts degree in politics, philosophy, and economics cum laude from Claremont McKenna College, where he was elected to Phi Beta Kappa. He also received a Master of Business Administration with majors in finance and real estate from The Wharton School. At Wharton, he won a John A. Mayer Scholarship and was a Shattuck Fellow.

About Micronomics

Micronomics is an economic research and consulting firm located in Los Angeles, California. Founded in 1988, it specializes in the collection, tabulation, and analysis of various types of economic, financial and statistical data. Areas of expertise include industrial organization, antitrust, intellectual property, the calculation of economic damages, real estate, and employment matters. Clients include law firms, publicly and privately held businesses, and government agencies.

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