

Large differences in FRAND rates and royalty payments are legitimate and pro-competitive

Cellular technology companies with substantial device businesses — including Huawei and Samsung today, and Nokia until it sold its handset business in 2014 — generate no more than modest net licensing revenues, despite the significant Standard-Essential Patent (SEP) portfolio sizes they have declared. Crucially, they must also cross license their manufactures against infringement of other companies' patents. Companies without significant device businesses, including Qualcomm and InterDigital, have no such overriding need to barter their intellectual property. Instead, their businesses are focused on licensing cellular and smartphone patents for cash, upon which their technology developments crucially depend.

Exhibit 1: Many licensing deals are largely barter, with reduced or no cash payments

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"I'm not sure I can afford quid pro quo. How much for some tit for tat?"

SEP licensors do the costly technology developments that make new generations of standards including 3G, 4G and 5G openly available to all Original Equipment Manufacturers (OEMs): however, since 2011, if not earlier, none of the former has received, in licensing revenues, even as much as an average of \$4.50 per phone or a few percent of global wholesale handset sales revenues, for example, totalling \$398 billion in 2018. Aggregate royalties paid to all licensors have averaged less than five percent. In contrast, Apple has taken up to 43 percent revenue share with its iPhone sales and other leaders Samsung and Huawei are also currently in double digits.

FRAND rates and net payments in cash

The question of what levels of royalty rates should be deemed Fair Reasonable and Non-Discriminatory (FRAND) for licensing SEPs in cellular technologies has loomed large in commentary on the recent *US Federal Trade Commission (FTC) v. Qualcomm* antitrust trial in the Northern District of California. Witness Huawei claimed 80% to 90% of its SEP royalty payments are made to Qualcomm. Apple previously claimed Qualcomm charged it at least five times more in payments than all other cellular patent licensors combined.¹ That was until Apple unilaterally withheld all such

¹ <https://www.theinquirer.net/inquirer/news/3065257/qualcomm-claims-apple-owes-it-55-billion-quid>

payments a couple of years ago. Notwithstanding the April 2019 settlement of all litigation between Qualcomm and Apple and with resumption of licensing payments to Qualcomm, including a catchup payment of between \$4.5 billion to \$4.7 Billion,² the court's decision in the above case is imminent.

It should be expected that some companies net much higher licensing rates and generate much more licensing income than most others. It should not be considered untoward or a violation of FRAND or antitrust requirements. FRAND *rates* negotiated bilaterally or multilaterally, let alone licensing *payments* made after netting off parties' charges, may vary substantially from case to case due to different business models, patent holdings cross-licensed, payment timing and disparate trade flows of products licensed, manufactured and sold among SEP licensees. Substantial differences in net rates and payments can therefore be quite legitimate due to various quid pro quos, as well as differences in patent portfolio sizes and strengths.

Antitrust authorities, including the FTC, should not be price setters. Instead of adjusting established royalty rates—underpinned by hundreds of licenses and billions of dollars in payments over many years—applicable questions for these organizations are: is the market competitive, efficient and maximizing consumer welfare? Copious evidence shows that it is: with relentless market entry and disruption to incumbents,³ ever-improving quality⁴ and declining prices.⁵ The unintended consequences of price regulation would harmfully disincentivise new-technology investments in standard-essential technologies that could be exploited by the entire ecosystem of suppliers and consumers at very low incremental costs in comparison to product and service prices.

Fair pricing for all

A significant question in SEP licensing is whether only a single rate is consistent with FRAND requirements, or if a range, and even a wide range, of rates can all be FRAND?

The market price paid per item or for a given quantity of various commodities (e.g. of specific US Treasury bonds, of foreign currencies or of precious metals) is generally rather similar and in proportion no matter who is buying or selling in a simple one off-exchange. This simplicity does not apply with patents or with FRAND rates between or among licensors and licensees because licensing agreements reflect many considerations besides patents, as well as the cross-licensing of patents.

I explained why rates paid often differ significantly from licensors' headline rates offered in an article I published in August 2015.⁶ Reasons given, including footnotes and associated citations, were as follows:

- *Cross licensing so that licensors who also produce products have freedom to operate as licensees in implementing patented technology owned by other licensors*⁷
- *Prospective licensees negotiating-down the patent fees of some licensors for various other reasons including identification of weak, invalid, not infringed or not essential patents*⁸

² <https://www.nytimes.com/2019/05/01/technology/qualcomm-apple-payment.html>

³ <https://ieeexplore.ieee.org/document/7084756?reload=true&arnumber=7084756>

⁴ <http://www.wisearbor.com/wp-content/uploads/2016/12/Mallinson-FINAL.pdf>

⁵ Ibid.

⁶ <http://www.wisearbor.com/pdfs/Mallinson%20on%20cumulative%20mobile%20SEP%20royalties%20for%20IP%20Finance%202015Aug19.pdf>

⁷ *Cross licensing commonly eliminates patent licensing fees entirely among companies with similar profiles in terms of development and implementation of technologies*

⁸ *Some licensors have shown that their SEP licensing agreements are non-discriminatory with terms which are consistent with their publicly-disclosed rates; but this is not universally the case*

- *Court rulings which impose significantly lower royalty rates than those requested or paid elsewhere*⁹
- *Rate caps on devices with relatively high prices such as premium smartphones*
- *Caps on total royalty fees paid each year or during the entire term of a patent-licensing agreement*¹⁰
- *Prospective licensees delaying payments, refusing to pay or threatening not to pay absent litigation*
- *Difficulties in establishing royalty-generating licenses in jurisdictions with poor patent protection*
- *Devices selling at higher wholesale prices than those upon which licensing rates are based*
- *Under-reporting of sales figures (of units or of price) to licensors by handset producers*¹¹

This new article further explains how some licensors legitimately generate rather more licensing income than others. Net royalty rates charged, and cash payments received, by the same licensor may vary substantially from licensee to licensee without violating FRAND obligations.

Cross licensing reduces rates for some counterparties

As indicated above, where parties have substantial downstream business in manufacture and sales of products that are licensed most significantly for financial consideration, such as smartphone devices,¹² bilaterally and multilaterally netting off implicit charges in cross licensing will typically and substantially reduce or even eliminate net royalty-rate charges and cash payments in many cases.

For example, in the early years of commercial 2G GSM in the 1990s, no more than small amounts were paid in licensing fees among an oligopoly of leading OEMs who were also the major SEP owners. Therefore, average rates, weighted by handset vendor market shares were also small. But outsiders with no IP to trade purportedly faced aggregate rates exceeding 30 percent.¹³ There is no evidence that anywhere near such high rates were sustained in 2G or ever applied in 3G or 4G. To the contrary, evidence is that aggregate rates paid are typically nearly an order of magnitude lower, as indicated subsequently in this article.

Major OEMs would rather limit rates to minimize out-payments than maximize royalties received

Companies with predominantly downstream business models as device OEMs, that implement numerous SEP technologies, tend to benefit from generally low royalty rates, even if they have

⁹ For example, whereas InterDigital's royalty yield across the entire market is 0.1% as indicated in the next section (so most licensees must be paying at least this figure), a Chinese court awarded it only 0.019% in its litigation with Huawei:

http://www.americanbar.org/content/dam/aba/publications/antitrust_law/at315000_tidbits_20130405.auth_checkdam.pdf

¹⁰ Many patent licensing agreements have no volume caps. However, for those that do, it is not uncommon for the effective royalty rate paid to be reduced to a small proportion of the headline rate with larger than expected device sales. For example, if 250 million units are sold after a royalty cap has been set at 50 million units the effective royalty rate will shrink to one fifth the headline royalty rate

¹¹ A recent report by Invotex IP indicated that 87% of audited licensees underreport and underpay royalties: <http://nebula.wsimg.com/5edbbeb9790a7f547ecfc3ef42cf398d?AccessKeyId=2ACC09671B2FE74DD41F&disposition=0&alloworigi=1>

¹² It is longstanding industry consensus and almost universal practice that mobile phone patents should be and are licensed, and any royalties are paid, at the device level and not at the component level:

<https://cpip.gmu.edu/2015/10/07/busting-smartphone-patent-licensing-myths/>

¹³ <http://www.ip.finance/2011/06/patent-licensing-fees-modest-in-total.html> citing INTUG

substantial patent holdings themselves. Many device OEMs have tended to advocate licensing regimes that cram down royalty charges by capping aggregate royalty rates.¹⁴ As I have explained in my publications for more than a decade,¹⁵ SEP owners with large device businesses prefer to limit rates, even though that limits them to generating only modest licensing fees, because low rates also minimise their royalty out-payments on those devices.

Market leaders in cellular handsets, including Nokia 12 years ago, Apple, Huawei and Samsung today, invariably have much larger market shares in featurephone or smartphone sales than they have shares of SEPs reading on the cellular standards. They are therefore far more financially exposed as licensees than they stand to gain as licensors — particularly in negotiating licensing agreements with other SEP owners that have no downstream device business in need of licensing.¹⁶ Even though some of the above companies are also major patent owners, their royalty incomes were and are modest in comparison to comparable-sized patent owners without downstream operations producing or selling devices.

Patent pools

Patent pools provide notable evidence of this downstream effect with their rates tending to be much lower than bilaterally negotiated rates.¹⁷ Patent pools are typically dominated by leading implementers of the applicable standard and that may also own many SEPs reading on that standard. For example, MPEG LA lists Apple, HP, Panasonic, Samsung, Sharp, Sony, Toshiba and ZTE among its many licensors for the very popular AVC/H.264 video standard that is employed in smartphones and TVs.¹⁸ Its maximum rate is around \$0.20 per unit sold including smartphones, PCs and TVs.

Royalty-free joint licensing, very similar to pooling in many ways but without the need to check patent essentiality or collect and distribute royalties, is an extreme case of this downstream effect. As further discussed subsequently in this article, the Bluetooth Special Interest Group allows its members royalty-free implementation of this popular standard so long as they also commit to license their patents on that basis.

Some joint licensing arrangements, also very similar to pools, are not dominated by the applicable standard's implementers. Major SEP licensors in Avanci are companies that do not manufacture automotive products including Ericsson, InterDigital, Nokia and Qualcomm. It was telling, and quite self-serving, that the Huawei speaker at a recent conference on patent pools asserted that Avanci's cellular-SEP licensing charges [of \$3 to \$15 per car]¹⁹ are too high.²⁰

¹⁴ Whereas the numbers of patents and patent applications, that have been declared by their owners as possibly essential to standards, can easily be counted, determining the numbers of these that are actually essential is very contentious. <http://www.ip.finance/2017/05/do-not-count-on-accuracy-in-third-party.html>. Using the alternative approach of allocating royalty rates in proportion to numbers of contributions to standard-setting organizations is even more contentious. <http://www.ip.finance/2018/06/cellular-inventions-trigger-avalanche.html>

¹⁵ <http://www.wiseharbor.com/wp-content/uploads/2018/01/Ezine-article-on-royalty-caps-April-2008.pdf>

¹⁶ I modelled the effect of reducing aggregate royalties in Exhibits 2a and 2b of an article for IP Finance on this issue and patent pooling in 2011: <http://www.wiseharbor.com/wp-content/uploads/2019/05/Wiseharbor-for-IP-Finance-on-patent-pools-4July2011.pdf> Unfortunately, the exhibits have disappeared from the blog posting: <http://www.ip.finance/2011/07/fixing-ip-prices-with-royalty-rate-caps.html>

¹⁷ <http://www.ip.finance/2013/11/absurd-frand-licensing-rate.html> (click through to full analysis, page 11)

¹⁸ <https://www.mpegla.com/programs/avc-h-264/licensors/>

¹⁹ <https://www.iam-media.com/frandseps/avanci-announces-pricing-auto-sector-range-3-15-car>

²⁰ Dylan Lee of Huawei speaking at the TILEC conference on patent pools in Brussels on 26th April 2019.

Patent pool benchmarks were, at first, presented by TCL in its FRAND licensing rate litigation versus Ericsson in the Central District of California. But the dynamics of patent pools were totally inapplicable to this dispute about bilateral rates. Patent pool licensing rates were never even considered by the Court because these, following my expert rebuttal report, did not even make it into direct testimony at trial.

Proportional allocations

SEP owners with major downstream operations commonly also contrive for apportionment so that, for example, owners of only few SEPs can command no more than very low rates. This action was, among other reasons, to counter some OEMs with small patent portfolios punching way above their weight in cross-licensing negotiations with large SEP holders who were also seeking freedom to operate with low patent infringement risk as major device OEMs.²¹ For example, Nokia had a \$50 billion handset business in its heyday approaching and including 2008. The threat of litigation from small patent holders against such a large amount of trade made it impossible to achieve anywhere near Qualcomm's rates when Nokia sought to license them for use of Nokia's SEP technology. In contrast, Qualcomm exited the handset business many years earlier around the turn of the millennium.

Top-down determinations combine caps with proportionality

Coordinated public statements by several companies have sought, with mechanisms described above, to limit a standard's worth in SEP licensing to no more than a pre-set aggregate royalty; and allocate this among licensees in proportion to patent holdings. While there is probably no reason why they should not constrain themselves in such a way, there is no legal or economic justification for other companies, who did not sign up, also to be bound by this value-reducing restriction.²²

Judge Selna deemed a "top-down" methodology appropriate in his *TCL v. Ericsson* Decision because of public statements made by Ericsson and others 10-15 years ago, and the expectations the Court believed Ericsson sought to set about how much device manufacturers would have to pay in aggregate for SEP royalties, and proportionately to Ericsson and other licensors.

²¹ <http://www.wisearbor.com/wp-content/uploads/2018/01/Ezine-article-on-royalty-caps-April-2008.pdf>

²² Qualcomm stated publicly in December 2008 that it was against such a formulaic approach because it "would arbitrarily limit the value of standards essential patents, discourage innovation, encourage the filing of marginal patents, complicate and delay the standardization process, and be impossible to implement in practice:" <https://www.qualcomm.com/media/documents/files/lte-wimax-patent-licensing-statement.pdf>

According to the TCL v. Ericsson Decision (page 20-22):

2G/3G.

Beginning in at least 2002, Ericsson endorsed the concept of an aggregate maximum royalty. In a joint press release with other companies in the industry, Ericsson told the market:

Industry leaders NTT DoCoMo, Ericsson, Nokia and Siemens today reached a mutual understanding to introduce licensing arrangements whereby essential patents for W-CDMA are licensed at rates that are proportional to the number of essential patents owned by each company. The intention is to set a benchmark for all patent holders of the W-CDMA technology to achieve fair and reasonable royalty rates.

The companies together own the clear majority of the essential Intellectual Property Rights (IPR) relevant to the W-CDMA standard selected already by about 110 operators worldwide. This arrangement would enable the cumulative royalty rate for W-CDMA to be at a modest single digit level.

In the same press release, Nokia endorsed a 5% figure and NTT DoCoMo advocated for "keeping cumulative royalty rate below 5%." Equally important is the fact that these companies advocated a licensing system based on a proportional number of SEPs owned by each company which treated each patent equally...

The Court finds that on this record 5% is an appropriate number to use for the total aggregate royalty for 2G and 3G. While outside groups not a part of this press release may have expected higher rates, Ericsson advocated and expected a rate close to 5%. Ericsson may feel that such a rate for its 3G SEPs would undercompensate it now, but it has not shown that its desire for a higher rate today is fair, reasonable, or sufficient to ignore the commitment it made that successfully induced manufacturers to adopt the 3G W-CDMA standard.²³

4G/LTE.

In April 2008, Ericsson again stated its commitment to a total aggregate royalty approach. In a posting on its website, Ericsson advised:

... Ericsson expects to hold a relative patent strength of 20-25% of all standard essential [4G] IPR. Ericsson believes the market will drive all players to act in accordance with these principles and to a reasonable maximum aggregate royalty level of 6-8% for handsets. Ericsson's fair royalty rate for LTE is therefore expected to be around 1.5% for handsets.

Ericsson also issued a joint press release with Alcatel-Lucent, NEC, NextWave Wireless, Nokia, Nokia Siemens Networks, and Sony Ericsson that announced:

Specifically, the companies support that a reasonable maximum aggregate royalty level for LTE essential IPR in handsets is a single-digit percentage of the sales price

²³ This is a most significant qualification which distinguishes Ericsson and others from companies who were not party to these announcements, and, in several cases, opposed such restrictions on 3G and 4G licensing rates. The Court finds that Ericsson, and it would presumably regard others who also sought to cap rates and thus manage licensees' rate expectations, should also continue to be bound by these statements. The Court has not indicated that all licensors should be bound by such statements, even though many major industry names made them.

The parties believe the market will drive the LTE licensing regime to be in accordance with these principles and aggregate royalty levels.

This framework balances the prevailing business conditions relevant for the successful widespread adoption of the LTE standard, which continues its progress toward definitive adoption by the industry in the applicable standards forums and organizations.

The press release also invited "all interested parties to join this initiative which is intended to stimulate early adoption of mobile broadband technology across the communications and consumer electronic industries."²⁴

(emphasis added by the Court, citations omitted).

In my analysis of Judge Selna's application of top-down methodology, prorating maximum aggregate royalties based on numbers of SEPs, I showed how, for various reasons, he derived incorrectly and unreasonably low royalty rates; significantly including the fact that he erroneously regarded publicly disclosed 3G and 4G single-mode rates (for individual companies and in expected aggregates including all companies) as being multimode rates.²⁵

Judge Selna then further whittled down the rates by incorrectly adjusting for patent expirations and for varying portfolio patent strengths around the world.²⁶

The way in which aggregate royalty-rate caps and apportionments were applied means that no licensee would ever pay anything close to the levels of the caps, and most licensees would pay a very small proportion of the caps. Average aggregate rates paid end up being a small proportion of the caps —particularly on a market share weighted basis.

Judge Selna made no attempt in his Decision to figure what aggregate rate TCL was paying or would be paying following the Decision's rate determinations. The notion of maximum aggregate rates remains rather theoretical, with no evidence any OEM pays or could conceivably ever pay anywhere near such rates. Instead, actual rates paid are systematically much lower than notional maximums, as empirical research, highlighted in the next section, clearly shows.

Gross or net royalties

Significantly, there are differing views on whether royalty charges that are netted off in cross licensing should be counted gross or net in calculating aggregate royalty rates, as indicated in the following three studies:

Intel/Wilmer Hale (2015)²⁷

A smartphone supplier could "pay" for patent rights through non-monetary payments in the form of a cross-license to its own patents. Entering such cross-licenses would reduce the cash the smartphone supplier would have to spend on licensing. For companies with a strong patent portfolio, this could eliminate cash payments altogether for certain licenses. But

²⁴ There was also significant and immediate resistance to what this announcement proposed:

<https://www.qualcomm.com/media/documents/files/lte-wimax-patent-licensing-statement.pdf>

<http://www.wisearbor.com/wp-content/uploads/2018/01/Ezine-article-on-royalty-caps-April-2008.pdf>

²⁵ <http://www.ip.finance/2018/04/unreasonably-low-royalties-in-top-down.html>

²⁶ Ibid.

²⁷ There was no netting of royalty rates with cross licensing in its calculation of a 30% royalty stack:

<https://www.wilmerhale.com/-/media/ed1be41360634d1fa5c3ab08647e8ada.pdf>

granting non-monetary patent rights is still a form of compensation and, presumably, a licensor would demand equal compensation no matter the form in which it is received.

Mallinson (2016)²⁸

Elimination of cash costs in this way is indeed the elimination of economic and financial accounting costs. Therefore, any cross-licensing value or cost should also be eliminated from any notional stack of aggregated licensing fees. The associated costs including cross licensing should show up only once in economic and accounting analysis—as R&D expensed by the developer—not twice as expensed R&D plus a notional outgoing licensing fee that is not actually paid in cash, but only paid in kind. A company's R&D expenses can generate patented technology value for it in three ways: for its own products, for cross licensing to access rights to others' patented technologies and to generate cash royalties. In the case of cross licensing, the total cost for the company is no more than its own R&D expense. That pays for it to be able to use its own technology plus the rights to use the technology owned by the counter-party. A manufacturer's R&D expenses fully account for its internal rights to use the technologies developed plus the rights to use the external technologies made accessible as a result of the cross license.

Galetovic, Haber & Zaretski (2018)²⁹

[W]e do not add the non-cash value of cross licenses to our estimate of the average cumulative royalty yield. The reason is that cross-licenses reduce running royalties. For example, if firm A and B sign a royalty-free cross licensing agreement and firm B increases production by one unit, its total royalty cost will not increase at all. Hence the non-cash value of a cross license does not affect firm's B marginal cost of producing a mobile phone. By contrast, if firm A charges a running royalty to firm B, and B charges a running royalty to A, and either A or B produces an additional mobile phone, then the firm's royalty payments would increase by the value of the running royalty.

Indeed, there is widespread agreement in the literature that cross licensing mitigates royalty stacking. For example, as Gilbert and Shapiro (1997) explain:

Cross-licenses involving intellectual property for technologies that are complements or are in a blocking relationship serve a procompetitive purpose.

They can help solve the complementary monopolists problem identified long ago by Cournot [...]. Royalty free cross-licenses promote the dissemination of technology. Moreover, as Farrell and Shapiro (2004) argue:

Cross-licenses without running royalties are especially attractive and efficient from an ex post competitive perspective: they permit the diffusion and use of patented technology without elevating the marginal costs of either party. (citations omitted)

So, disagreement is in the meaning of the word “pay,” with its significance in law, accounting and economics. The relatively high aggregate rate figure of 30 percent “paid”, as conjectured by Intel/Wilmer Hale, significantly depends on its assertion here that gross asking-rate royalties should be totalled, even though these are largely not, in fact, actually paid. In contrast, based on my

²⁸<http://www.wisefharbor.com/pdfs/Mallinson%20on%20cumulative%20mobile%20SEP%20royalties%20for%20IP%20Finance%202015Aug19.pdf> (Footnote 15)

²⁹<https://www.sciencedirect.com/science/article/pii/S0308596117302240>

empirical analysis of moneys actually paid in my abovementioned research, I found an aggregate rate of no more than around five percent for all cellular SEPs. Galetovic, Haber & Zaretzki derived an even lower percentage, based on a similar methodology which was derived from mine in their abovementioned research.

In addition to cross-licensing, aggregate rates paid are less than the stacked figures alleged for other reasons. For example, some SEP owners will reduce demands in face of patent holdout or the prospect of litigation. Many companies prefer to use their patents for defensive purposes than to build costly and risky patent licensing and enforcement programmes, or only seek licenses selectively where jurisdictions and other factors make doing so worthwhile.

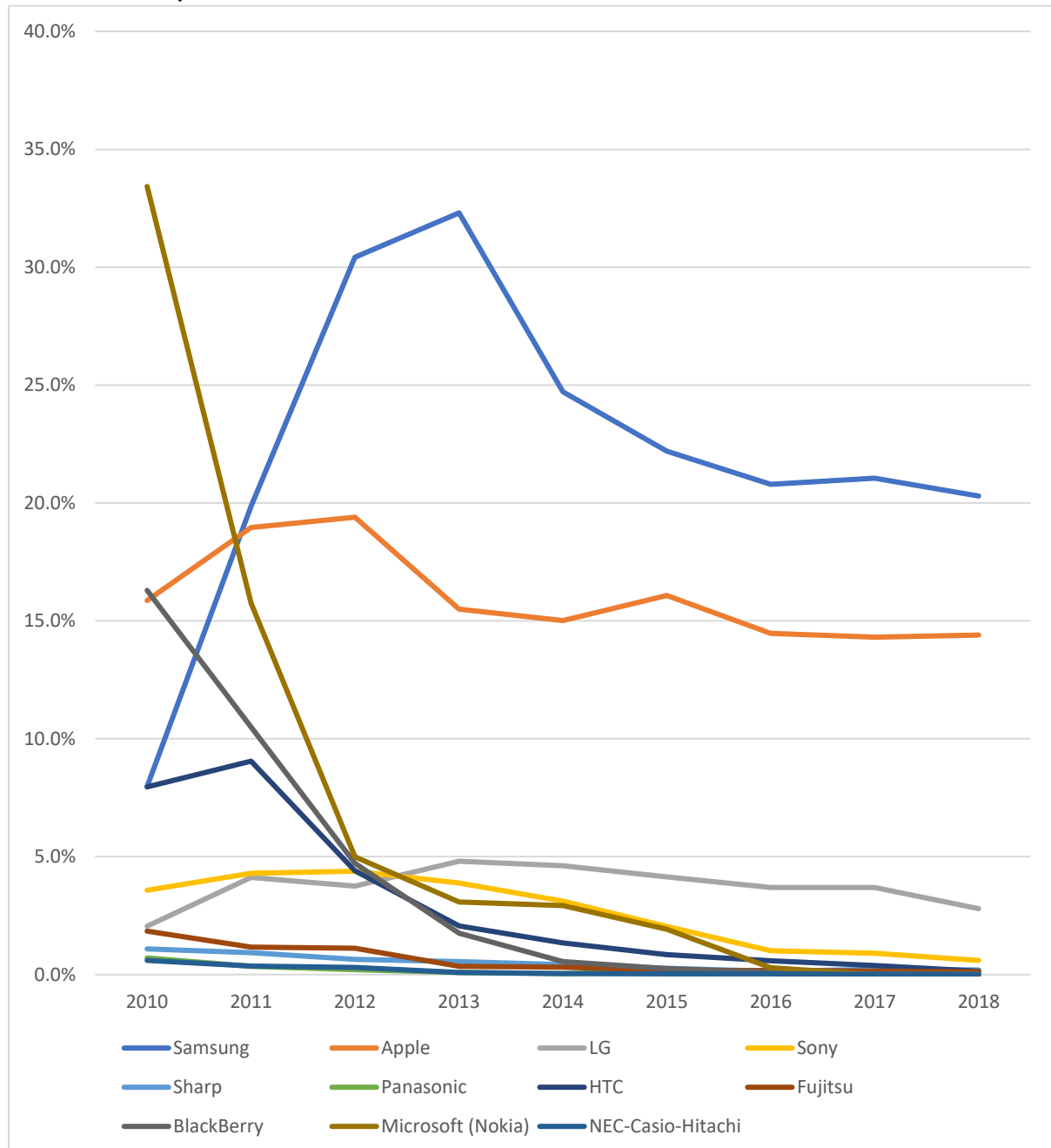
Are rates so high they block market entry for those without SEPs to cross-license?

One might contest that some OEMs without patents to cross license might face such high aggregate charges that market entry, or a sustainable market position, is not possible due to the absolute licensing cost or asymmetry in licensing costs, versus some other OEMs that have patents to cross-license paying a lot less. In other words, it could be argued that high licensing prices might not be paid because they are a harmful barrier that excludes some OEMs and, therefore, an alleged pricing problem would exist, but not be visible in (non-existent) trading figures for the excluded companies.

This hypothesis is that it would be difficult for an OEM, without patents to cross license, to compete if its marginal costs are a lot higher than for companies with patents that can reduce out-payments through cross licensing. Under this hypothesis, even the savings made through not investing in R&D to develop one's own patented technology, for self-use and cross-licensing, might not offset higher marginal costs incurred in licensing the products it manufactured and sold. The asymmetry between high aggregate royalties for outsiders without patents to cross-license, in comparison to lower aggregate royalties for insiders would prevent small and medium-sized enterprises and others without patents from entering or remaining successfully in the market.

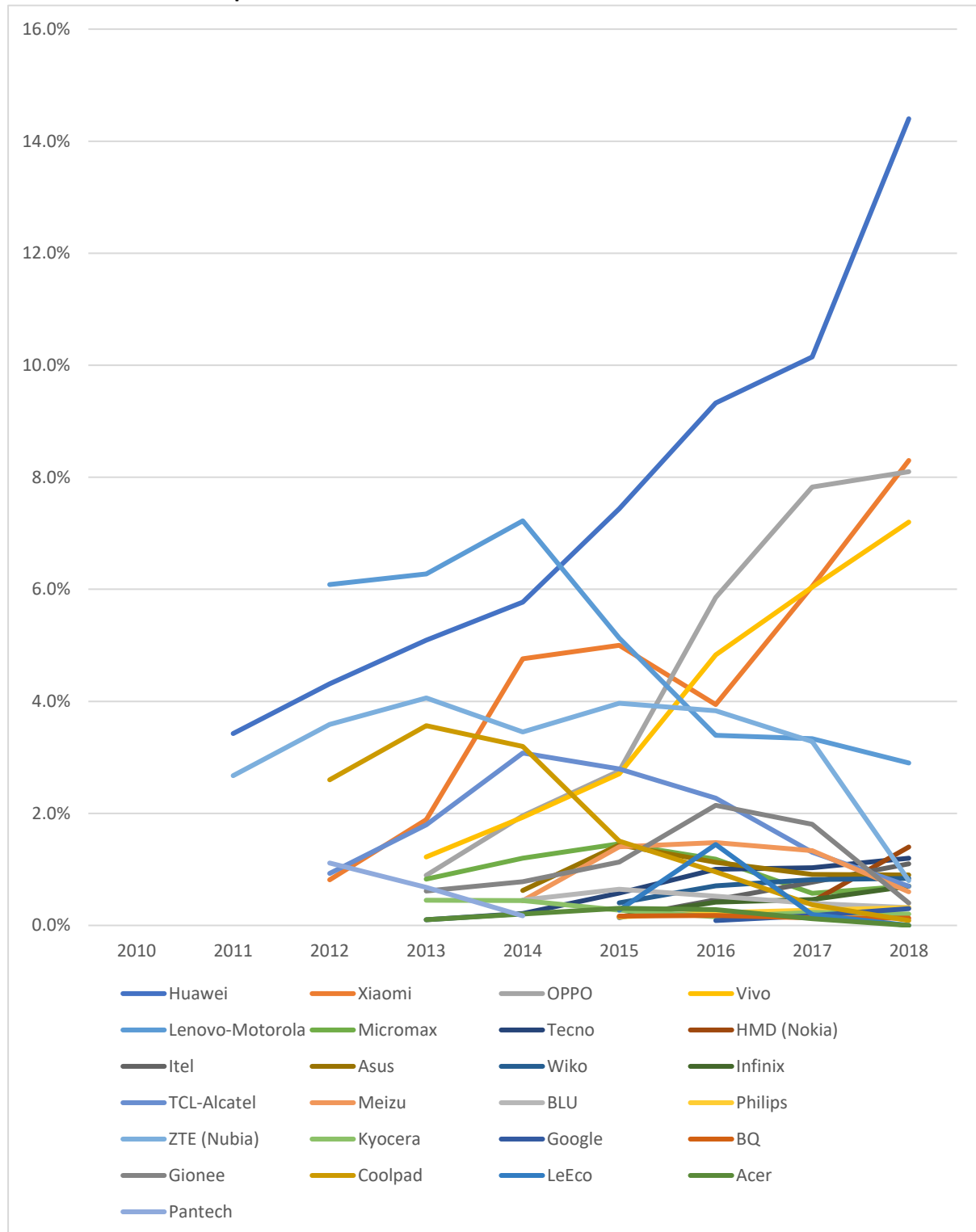
Empirical evidence over many years invalidates this hypothesis. To the contrary, there have been a succession of companies that have successfully entered the smartphone market while owning nothing in the way of SEPs. Meanwhile some formerly major OEMs with many SEPs to cross license have severely declined and then been forced out of the smartphone market. Since the introduction of the iPhone in 2007, there have been massive shifts in handset and smartphone market shares with the demise of former market leaders Nokia and BlackBerry, and with the rise of numerous new market entrants. Exhibits 2 and 3 show how very turbulent the smartphone market is with respect to market shares, market exits and new market entry.

Exhibit 2: Smartphone market shares for incumbents all in decline since 2013



Source: WiseHarbor presenting Strategy Analytics market tracking figures

Exhibit 3: Rise of smartphone market entrants since 2011³⁰



Source: WiseHarbor presenting Strategy Analytics market tracking figures

Whereas the declining smartphone OEMs, including Nokia and BlackBerry, owned significant numbers of SEPs, the vast majority of the new entrants listed in Exhibit 3 own little or nothing in the

³⁰ Lenovo-Motorola is classified as a new entrant because when Motorola was sold by Google to Lenovo in 2014, Motorola's patents were stripped away and retained by Google. HMD started selling Nokia-branded smartphones in 2016. These are manufactured under license from Nokia.

way of cellular SEPs. Exhibit 4 lists all the companies who have made SEP declarations to ETSI's IPR database. Whereas Huawei and Oppo (Guangdong OPPO Mobile Telecom) appear on both listings, there is very little commonality between the two sets of names.

Exhibit 4: Companies declaring to the ETSI IPR online database

3COM Corporation	3G Licensing SA	Acer Incorporated
Adtran Inc	AePONA Ltd	Airbiquity Incorporated
AirTouch Communications	Alcatel	ALCATEL-LUCENT
Alcatel-Lucent Deutschland AG	Alcatel-Lucent Shanghai Bell	ALU
ALU	ALU and ALU Shanghai Bell	ALU PARENT
ALU US	ALU USA	ALU-ALU Shanghai Bell
Alvarion Ltd	Andrew LLC	Andrew Wireless Systems GmbH
Anritsu Corporation	Apple (UK) Limited	Apple Inc.
Ascom Management AG	ASSIA Inc.	ASUSTek Computer Inc.
AT&T	AT&T Intellectual Property II, LLC	Axalto S.A.
BBC	BENQ Corporation	Bijitec Pte Ltd
BlackBerry LTD	BLACKBERRY LTD	BlackBerry UK Limited
Brau Verwaltungsgesellschaft	BROADCOM CORPORATION	BT Cellnet
BT Group Plc	Canon CRF	CASSIDIAN
CATT	CCETT	Cisco Systems Inc.
Coding Technologies AB	Conversant Wireless	Core Wireless Licensing
CP8 Technologies	Daimler AG	DENSO AUTOMOTIVE
DENSO CORPORATION	Deutsche Telekom AG	Digital Theater Systems, Inc.
Digital Voice Systems Inc.	Dilithium Networks, Inc.	DLR
Dolby Laboratories Inc.	e300 Ltd.	Elektrobit AG
Ensemble Communications Inc.	Entrust Ltd.	Ericsson
Ericsson Mobile Communications	ESA	ETRI
Evolium S. A. S	France Brevets	Fraunhofer IIS
Freescale Semiconductor Inc.	Fujitsu Limited	Gemalto S. A.
Gemplus SA	General Dynamics UK Limited	GIESECKE & DEVRIENT GmbH
Golden Bridge Technology Inc.	Grundig E.M.V.	Guangdong OPPO Mobile Telecom.
Hanyang University (IUCF HYU)	HEAD acoustics GmbH	Hewlett-Packard Enterprise
Hitachi Europe Ltd.	Hitachi Ltd.	HTC Corporation
Huawei	HuaWei Technologies Co., Ltd.	Huber + Suhner AG
Hughes Network Systems Inc.	IBM	iCODING Technology Inc.
IDAC Holdings	IDAC Holdings, Inc.	III
INFINEON TECHNOLOGIES	Infineon Technologies Flash	Inmarsat
Innovative Sonic Corp.	Innovative Sonic Ltd.	Innovatron
INRIA	INSIDE Secure SA	Intel Corporation
InterDigital Patent Holdings	InterDigital Patent Holdings, Inc.	InterDigital Technology Corp.
InterDigital Technology Corporation	IPCom GmbH & Co.KG	IPH
IPR Licensing Inc.	Irdeto BV	IRT

ITALTEL SpA	ITC	ITL
ITRAN Communications Ltd.	ITRI	Kapsch TrafficCom AG
Kenwood Corporation	Koninklijke KPN N.V.	KPN N.V.
KT Corp.	Kyocera Corporation	Lab126
LeNouveau	LG Electronics Inc.	Lockheed Martin Corporation
Lucent Technologies Inc	Lupa Finances	MARCONI COMMUNICATIONS
Marvell Switzerland S.A.R.L.	Materna GmbH	Matra
Maxim Integrated Products Inc	Media Farm Inc.	MediaTek Inc.
Microsoft Corp.	Mitsubishi Electric Corp	Mitsubishi Electric Info
Mitsubishi Electric RCE	Mitsubishi Electric Telecom	MML
Morpho Cards GmbH	MOTOROLA Inc	Motorola Mobility Inc.
National Instruments Corp.	NEC Corporation	NET INSIGHT AB
Nexus Telocation Systems, Ltd.	NOA	Nokia Corporation
NOKIA MOBILE PHONES	Nokia Networks	Nokia Networks Oy
Nokia Shanghai Bell	Nokia Technologies Oy	Nortel Networks Ltd
Nortel Northern Telecom Ltd.	NSN	NTT corporation
NTT DOCOMO, INC.	NVIDIA	OBERTHUR TECHNOLOGIES
Oki Electric Industry Co. Ltd.	Omnipoint Corporation	OpenTV
Operax AB	Optis Cellular Technology, LLC	Optis Wireless Technology, LLC
Orange	Orange Personal Communications	OTE SpA- a Finmeccanica
Panasonic Corporation	Panasonic Mobile Communication	Pantech Co., Ltd
Philips	PicoChip Ltd	Polaran
PROD-EL S.p.A	Pulse Electronics Ltd	Qualcomm Atheros, Inc.
QUALCOMM Inc	Qualcomm Incorporated	Raidax Technology SA
Renesas Mobile Corporation	Research in Motion Limited	ROBERT BOSCH GmbH
Rockwell Semiconductor System	ROHDE & SCHWARZ	Rosemount Tank Radar AB
Runcom Technologies Ltd.	Sagemcom Broadband SAS	Salbu Research & Development
Samsung Electronics Co, LTD	SANDISK CORPORATION	Securicor Wireless Technology
Sapura PLC	SES S.A.	Shanghai Langbo Communication Technology Co. Ltd.
Sharp Corporation	Siemens AG	Siemens Aktiengesellschaft
Siemens Home and Office	Sierra Wireless Inc	SIGFOX
Silicon Storage Technology Inc	Sisvel International SA	SKT
Sony Corporation	Sony Europe	Sony United Kingdom Ltd
SPH America LLC	ST MICROELECTRONICS INC	STMicroelectronics
Sun Microsystems, Inc.	Sun Patent Trust	Swisscom Mobile
Tait Limited	Tantivy Communications Inc.	TCL Communication Technology Holdings Limited TDF
TDF	TELCHEMY INCORPORATED	TELECOM ITALIA S.p.A.
TELEFONICA S.A.	TELEFUNKEN Sendertechnik	Telensa Holdings Limited
Telia AB	TERACOM AB	TEXAS Instruments
Texas Instruments Inc.	The Zap Corporation Ltd.	Thomson
THOMSON LICENSING	Thomson-CSF	Tioga Technologies Ltd.

TIP Communications LLC	Toshiba Corporation	TruePosition Inc.
UBIQUISYS LIMITED	University of Oulu	UPInt
UPIP	VEGA Grieshaber KG	Verizon Communications, Inc.
Viatis Satellite Radio	VID SCALE, INC.	Vimatix
VirnetX, Inc.	Vodafone IP Licensing Limited	Vodafone Libertel BV
VODAFONE LTD	VoiceAge Corporation	Volkswagen AG
Vringo Infrastructure, Inc	Wi-Fi One, LLC	Wi-LAN Inc.
ZTE Corporation		

Source: ETSI IPR database,³¹ as of January 2019

Comparing “comparable” licensing rates

Gross and net royalty rates and payments are not always proportionate to the number of patents held. For example, as already indicated above, owners of relatively few SEPs have, since more than a decade ago, been able to punch way above their weight in cross-licensing negotiations with major SEP owners who are also leading OEMs.³² Nevertheless, SEP-counting proportionality is sometimes employed in licensing negotiations and in disputes even when analysing “comparable licenses.”

Attempts to derive effective “one-way” rates seek to disaggregate the effects of cross-licensing in many or most actual agreements, but methods are fraught with difficulties. The commonly used “unpacking” formula, as used with agreement by both parties in *TCL v. Ericsson*, was described in that case judgment (page 42) and is reproduced almost word-for-word, with citations omitted, as follows:

The unpacking formula starts with the basic premise:

$$\text{Value of a license} = \text{Licensor One-way Rate} \times \text{Licensee Revenues}$$

Thus, if a licensor's one-way rate was 10%, and the licensee made \$500 selling products that required a license, the value to the licensee, or what it would have to pay, would be \$50. In the case of a cross-license, both sides receive value from the license provided by the other party, and the party which receives less value will have to give cash or other consideration to make up the difference. This cash difference is called a net balancing payment. Using Ericsson as an example, this formula is expressed as:

$$\text{Net Balancing Payment} = [\text{Ericsson One-way Rate} \times \text{Licensee Revenues}] - [\text{Licensee One-Way Rate} \times \text{Ericsson Revenues}]$$

This equation has two unknown variables. In order to make this equation solvable, both sides used a Portfolio Strength Ration (PSR) to state a licensee's one-way rate as a ratio of Ericsson's one-way rate:

$$PSR = \frac{\text{Ericsson One-way Rate}}{\text{Licensee One-way Rate}}$$

³¹ <https://ipr.etsi.org>

³² <http://www.wisearbor.com/wp-content/uploads/2018/01/Ezine-article-on-royalty-caps-April-2008.pdf>

The PSR assumes that each party's one-way license rate reflects the relative strength of its patent portfolio. Using a PSR, the unpacking formula can be stated as:

$$\text{Ericsson One-way Rate} = \frac{\text{Net Balancing Payment}}{\text{Licensee Revenues} - \frac{\text{Ericsson Revenues}}{\text{PSR}}}$$

Importantly, the net balancing payments and revenues must be stated in dollars of the same year, which generally requires determining the net present value of past and future payments and revenue. In addition, because the unpacking formula calculates a royalty rate, it can only be used for one standard at a time. This is not a problem for the revenue inputs or the PSR, which can be determined individually for each standard, but it is a problem if the licensee paid Ericsson a single lump sum that covers multiple standards.

Some bizarre results can follow with application of these formulae. “Unpacking” one cross-licensing agreement in TCL vs. Ericsson to determine Ericsson’s equivalent “one-way” (i.e. without any cross-licensing) royalty rate derived a nonsensical negative royalty rate figure. The culprit was the PSR which, in solving the equations to derive Ericsson’s One-way Rate, was taken to be the ratio of SEPs counted for each of the two parties to a licensing agreement. These formulae should be used with great care because sensitivity analysis around certain conditions also reveals that it is also quite possible to derive absurdly high royalty rates (e.g. of thousands of percent positive or negative).

This formula assumes inverse proportionality. Like the graph of $y=1/x$, where y is undefined (i.e. seemingly infinitely large positively or negatively) when x is infinitesimally close to zero. This is how some absurdly large or negative royalty rates can be derived from real-world licensing data. For example, if Ericsson Revenues divided by the PSR are close to equalling Licensees’ Revenues, the denominator of the right-hand side of the last equation will be close to zero, possibly negative and the implied one-way rate would be very large, and possibly a negative percentage.

Bargaining positions among licensors and licensees reflects business models

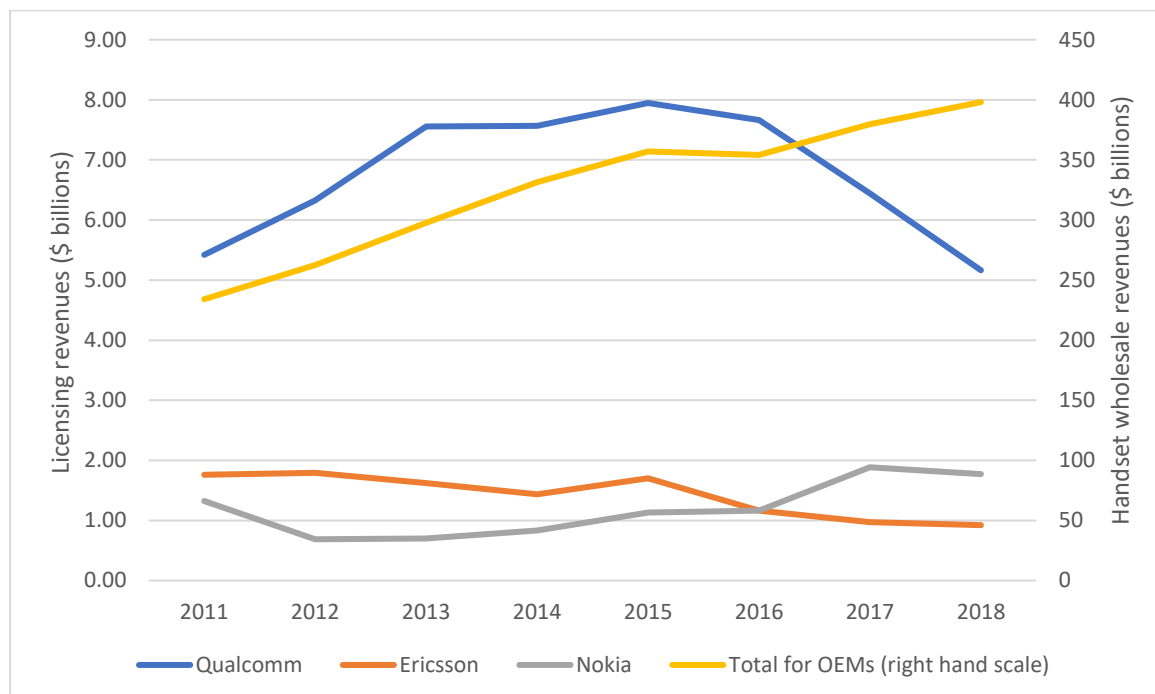
Ericsson and Nokia have very different commercial profiles today than up until at least 2010. They have both subsequently completed the sale of their handset businesses, in 2012 and 2014, respectively. In its hey-day, up until around 2008, Nokia had between 40% market share in mobile phones.³³ Nobody has ever claimed that one patent owner has ever had such a large share of all the all the SEPs or all the SEP value of any 3GPP standard. Therefore, Nokia was far more financially exposed to licensing demands from other patent owners than it could generate in income as a licensor. It is also, therefore, unsurprising and inevitable that Qualcomm was motivated and able to negotiate significantly higher net royalties in 3G WCDMA (commencing commercially around 2003)³⁴ and 4G LTE (commencing commercially around 2010) than either Ericsson or Nokia (both arguing for aggregate caps and patent-counting proportionality), regardless of differences in the significant numbers and strengths of the SEPs owned among these three companies.

³³ <https://ieeexplore.ieee.org/document/7084756?reload=true&arnumber=7084756>

³⁴ WCDMA was first introduced commercially in Japan in 2001, but other nations did not follow for a couple of years.

Licensing revenues for the top mobile SEP licensors are very small in comparison to handset revenues. Exhibit 5 compares total licensing income for Qualcomm,³⁵ Ericsson and Nokia to total sales revenues for all handset OEMs.

Exhibit 5: Leaders' technology licensing³⁶ and OEMs' total handset sales revenues in cellular



Revenues (billions)	2011	2012	2013	2014	2015	2016	2017	2018
Qualcomm licensing	\$5.42	\$6.33	\$7.55	\$7.57	\$7.95	\$7.66	\$6.45	\$5.16
Ericsson licensing	\$1.76	\$1.79	\$1.62	\$1.43	\$1.70	\$1.16	\$0.97	\$0.92
Nokia licensing ³⁷	\$1.32	\$0.69	\$0.70	\$0.83	\$1.13	\$1.16	\$1.88	\$1.77
Total OEM handset sales ³⁸	\$234	\$263	\$298	\$332	\$357	\$354	\$380	\$398

³⁵ Whereas Qualcomm's licensing revenue and royalty yield declined substantially during its two-year dispute with Apple and its contract manufacturers, this trend will be largely reversed with the recent settlement of all litigation including licensing payments of around \$4.6 billion to Qualcomm for previous Apple sales, plus ongoing payments for future sales over at least six years in a new agreement: <https://www.nytimes.com/2019/05/01/technology/qualcomm-apple-payment.html>

³⁶ Annual royalty figures fluctuate for a variety of reasons and so trends should be assessed with caution. For example, whereas accounting practices may defer revenue recognition of up-front lump sum royalty payments, settlement payment revenues following disputes over several years will typically be taken immediately to catch up. Exchange rate effects can be significant. Figures make no adjustments for non-SEP licensing. Non-SEP and non-patent licensing income is a relatively small proportion of licensing income and so tends to have only modest effect on overall figures. However, other types of licensing income are becoming increasingly significant, as the example of Nokia illustrates.

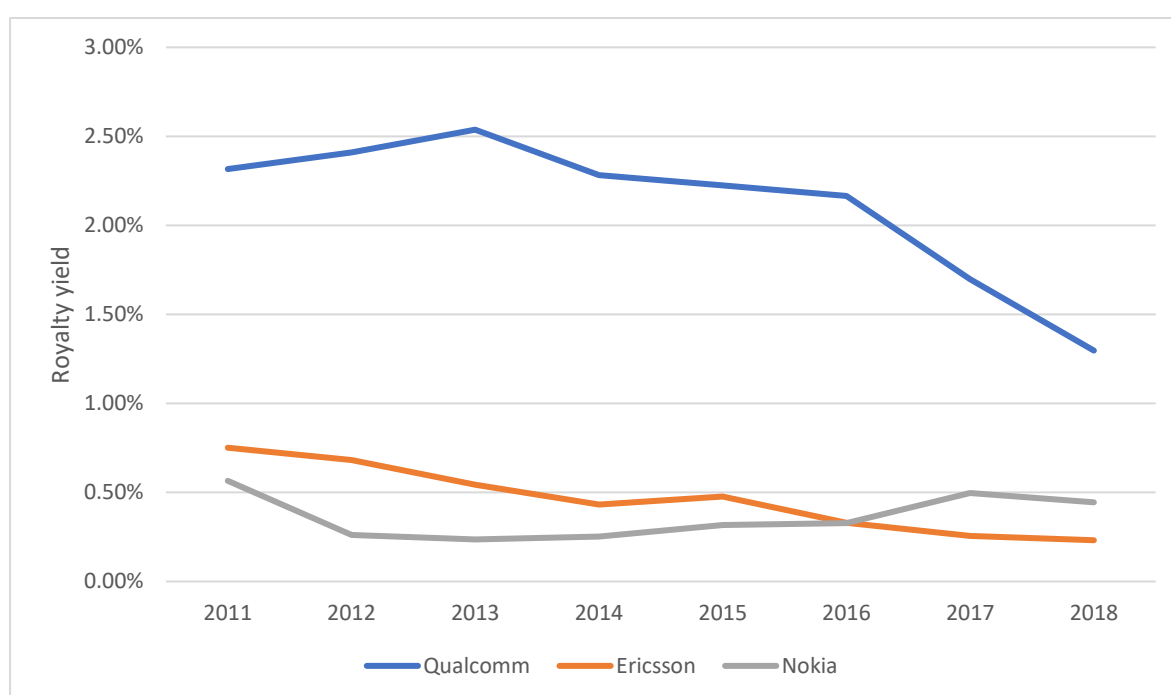
³⁷ Nokia receives licensing fees on the sales of Nokia-branded phones produced by HMD. According to Strategy Analytics, sales of these grew from nothing in 2016 to 41 million units at an average selling price of \$44 in 2017. On the unsubstantiated assumption (i.e. my educated guesstimate) that the confidential royalty rate for branding and technology transfer licensing was 5%, this would account for \$90 million in 2017. That would be around 5% of Nokia's total technology-licensing income and 12.5% of its growth there that year.

³⁸ Wholesale revenues for all handset sales tracked by Strategy Analytics.

Source: WiseHarbor using companies' annual public financial statements and Strategy Analytics' figures for handset revenues

Following the completed sale of Nokia's handset business to Microsoft in April 2014,³⁹ I was retained later that year by a hedge fund to forecast the pace and extent to which Nokia could "un-roll" its old licensing terms in new agreements and increase its royalty yield over 10 years.⁴⁰ Nokia substantially cross-licensed SEPs and kept its non-SEPs unlicensed for defensive purposes. Expectations and Nokia's desires were that it could, henceforth, generate more in cash royalties, instead of seeking to cross-license substantially to reduce royalty outpayments on handset manufactures. Hitherto, Nokia sought also to license the patents of other owners at minimal cost to benefit of its handset business. Three years later, the growth trend in Nokia's royalty yield, as shown in Exhibit 6, is in line with that long-term outlook and my forecast back then.

Exhibit 6: Leading cellular SEP licensor royalty yields⁴¹



	2011	2012	2013	2014	2015	2016	2017	2018
Qualcomm	2.32%	2.41%	2.54%	2.28%	2.23%	2.16%	1.70%	1.30%
Ericsson	0.75%	0.68%	0.54%	0.43%	0.48%	0.33%	0.26%	0.23%
Nokia	0.57%	0.26%	0.24%	0.25%	0.32%	0.33%	0.50%	0.45%

Source: WiseHarbor using companies' public financial statements and Strategy Analytics figures for handset revenues

It was a significant challenge for Nokia to overturn the legacy it had purposefully created to protect and minimise the licensing out-payments of its market-leading handset business. Nokia's royalty yield had declined in 2012 and 2013 under cross-licensing pressures and following receipt of catch-

³⁹ <https://www.businessinsider.com/microsoft-closes-nokia-acquisition-2014-4?r=US&IR=T>

⁴⁰ A licensor's royalty yield is its total cash royalty revenues divided by total revenues from sales of all phones by all manufacturers. The aggregate royalty yield is total cash royalty revenues for all licensors divided by total (wholesale) revenues from sales of all phones by all manufacturers.

⁴¹ Includes non-SEP income from other patents and branding.

up payments with resolution in 2011 of a two-year licensing dispute with Apple.⁴² Nokia's then CEO, Stephen Elop was in a desperate financial position and was willing to make concessions on the effective royalty rate it obtained in order to boost income and receive cash up-front. After many years of stellar financial performance, the company made an operating loss of Euro 1.1 billion in 2011 and Euro 2.3 billion in 2012. When I asked Nokia's current, CEO Rajeev Suri, in September 2018, about progress in increasing Nokia's royalty rates (i.e. its royalty yield), he said he was pleased with Nokia's performance. Nokia's royalty yield on sales of all mobile phones has doubled from its nadir of 0.24% in 2013 to 0.50% in 2017.

SEP licensors do the costly technology developments that make new generations of standards including 3G, 4G and 5G openly available to all OEMs: however, since 2011, if not earlier, none of the former has received, in licensing revenue, even as much as an average of \$4.50 per phone or a few percent of global wholesale handset sales revenues, for example, totalling \$398 billion in 2018. Aggregate royalties paid to all licensors have averaged less than five percent. In contrast, Apple has taken up to 43 percent revenue share with its smartphone sales and other leaders Samsung and Huawei are also currently in double digits.

That most OEMs demand or conspire for low rates does not make other rates supra-FRAND

Many OEMs and other interested parties including cellular operators have self-servingly welcomed attempts to cap aggregate cellular royalty rates and allocate them proportionally based on SEP counts.

But that does not mean that the relatively small numbers of others, including those who do not have significant downstream device businesses in need of licensing from other SEP licensors, and who, for rational reasons, sought higher cellular handset royalties instead, have obtained supra-FRAND rates. Rates among other terms are negotiated based on commercial positions as patent owners and downstream manufacturers – particularly of devices. Business profiles, business models and licensing strategies legitimately and pro-competitively differ among companies.

Ex-ante and ex-poste rate calculations vary with lump sum payments

Up-front lump payments for “paid-up” licenses can also account for major variations in royalty rates implied, versus rates in those agreements based entirely on running royalties. Many agreements are hybrids between these two extremes. Payment of lump sums shifts financial risk from licensee to licensor. Cash in advance versus waiting for an uncertain follow of running royalties over several years is likely to result in a lower implied royalty rate, depending upon the difference between expected and actual sales of licensed products. Whereas lump sums might be based on sales volume forecasts “agreed” between parties ex-ante to the execution of bilateral licensing agreements, if the sales forecast is, for example, exceeded 10-fold, then the implicit rate calculated ex-post will be one tenth of what was implied ex-ante, and vice versa. I once testified as an expert in a case in arbitration where the handset sales forecast, on which a standalone-licensing agreement with a total royalty payment cap was based, was also exceeded by a very substantial multiplier.

Nokia's 2014 licensing agreement with Microsoft is another example of this. Nokia sold its devices division to Microsoft for Euro 5.4 billion (\$7.2 billion) in a bundled deal including the devices and services business, and with 10 years of licensing valued on the books at Euro 1.65 billion.⁴³ Nokia's

⁴² <https://www.bbc.co.uk/news/business-13759612>

⁴³ One should always be wary of value allocations for the component parts in bundled transactions; particularly here, since Nokia was seeking to establish value benchmarks for its changed intellectual property licensing programme.

mobile phone sales revenues were \$9.7 billion that year. If Nokia is assumed to take the licensing income at a rate of Euro 165 million per year, that is equivalent to a running royalty rate of 2.3% that year. No doubt the parties agreed on expectations that the mobile phone business' fortunes would recover significantly. Nokia had handset revenues of more than \$51 billion in 2008. At that level of sales revenues, the licensing rate would be less than 0.5%. However, with the total failure of Microsoft's foray into mobile phones (e.g. only \$1.4 billion sales in 2016) before exiting in 2017, the implicit licensing rates ex-poste went to 16% in 2016, and then through the roof thereafter.

Implications of royalty-free being consistent with FRAND conditions

Licensing permitted under standard-setting organisation patent policies encompasses bilateral licensing, multilateral agreements including pooling, FRAND and royalty-free arrangements. Associated terms and differences in trading flows can result in wide-ranges in nominal and resulting rates, let alone net payments among licensees.

For example, the Bluetooth Special Interest Group operates under a joint licensing agreement that has virtually all the characteristics of a patent pool, except there is no mechanism or need for determination of patent essentialities, royalty rates or the collection and distribution for such fees. Participation is, therefore, on a royalty-free basis, subject to certain conditions. If you are to benefit from members' SEPs royalty-free you must allow members to implement the Bluetooth standard free of royalties from of any SEPs you have that read on the Bluetooth standard.⁴⁴ This voluntary arrangement is rational, pro-competitive and successful, but it reflects a certain kind of business model that others may not wish to pursue for Bluetooth or for other standards. Members are clearly much more interested in promoting use of the standard and growing the product markets than in generating cash royalties for themselves. So long as participation is voluntary there is no harm in that.

Patent policies, such as those of IEEE and ETSI also allow royalty-free licensing, as well as reasonable royalties. For example, according to Clause 6 of IEEE's Bylaws (Q1 2015)⁴⁵

the Submitter will make available a license for Essential Patent Claims to an unrestricted number of Applicants on a worldwide basis without compensation or under Reasonable Rates, with other reasonable terms and conditions that are demonstrably free of any unfair discrimination to make, have made, use, sell, offer to sell, or import any Compliant Implementation that practices the Essential Patent Claims for use in conforming with the IEEE Standard. (emphasis added)

According to ETSI's IPR Policy Guide (2013):⁴⁶

The basic principle of the ETSI IPR regime remains FRAND with no specific preference for any licensing model.

As in the case of the Bluetooth SIG, royalty-free arrangements are generally reciprocal. If one seeks entry to the royalty-free club, one must also agree to commit one's own patents on the basis. That can be rather like cross-licensing, multilaterally, where net royalties are zero. That royalty-free, as well as certain non-zero rates, are deemed consistent with FRAND obligations implies that there

⁴⁴ <https://www.bluetooth.com/~media/downloads/pcla%20esign%20version%20version%2011.ashx?la=en>

⁴⁵ <http://standards.ieee.org/develop/policies/bylaws/approved-changes.pdf>

⁴⁶ <https://www.etsi.org/images/files/IPR/etsi-guide-on-ipr.pdf>

must be an acceptable range of rates. For example, if 0% and 1% are both FRAND rates, then surely every rate in-between 0% and 1% must also be FRAND and permissible, depending on other conditions in the licensing agreement?

FRAND rates and payments differ with variations in other licensing terms and trading volumes

FRAND licensing must accommodate a wide variety of factors. Rates and payments can vary substantially among different pairs of licensors and licensees – even for the same patent portfolios – because other contractual terms and trade flows for licensing vary so much (i.e. how many handsets manufactured and at what prices sold by each party). But that does not mean that anything goes. The words fair, reasonable and non-discriminatory still have meaning— it is just that the detail with various offsets and other factors is devilish and can account for major differences in apparent royalty rates and actual payments – particularly between licensors that are predominantly that, and those that are largely major implementors and patent licensees as device OEMs.

About this publication and its author

This article was originally published in RCR Wireless and then on the IP Finance blog in May 2019.

[Keith Mallinson](#) is founder of [WiseHarbor](#), providing expert commercial consultancy since 2007 to technology and service businesses in wired and wireless telecommunications, media and entertainment serving consumer and professional markets. He is an industry expert and consultant with 25 years of experience and extensive knowledge of the ICT industries and markets, including the IP-rich 2G/3G/4G mobile communications sector. His clients include several major companies in ICT. He is often engaged as a testifying expert witness in patent licensing agreement disputes and in other litigation including asset valuations, damages assessments and in antitrust cases. He is also a [regular columnist](#) with [RCR Wireless](#) and [IP Finance](#) – “where money issues meet intellectual property rights.”

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