Unreasonably-low royalties in top-down FRAND-rate determinations for TCL v. Ericsson

While Ericsson is a leading contributor to mobile communications standards, a US District Court in California has significantly undervalued Ericsson's standard-essential patents (SEPs) by relying heavily on flawed "top-down" valuation analysis that prorates royalties by company for 2G, 3G and 4G based on SEP counting. This analysis applies a series of inaccurate assumptions which whittle down royalty rates from an understated notional maximum in a succession of unreliable steps. The resulting rates derived are a lot lower than those found in a European court's FRAND determination for the same company in the same year (2017) and for the same 2G, 3G, and 4G patent portfolios. The differences between these US and European determinations are irreconcilable.

This paper identifies inherent problems in top-down analysis with patent counting. It also identifies various additional mistakes and inaccuracies in the application of this methodology to the royalty rate determinations in *TCL v. Ericsson*, as compared with the use of a similar methodology in *Huawei v. Unwired Planet*.

1. **Top-down rates versus comparable license rates**

In late 2017, Honourable James V. Selna, Judge of the District Court of the Central District of California, handed down a court-ordered fair, reasonable and non-discriminatory (FRAND) license in *TCL v. Ericsson*.[1] His Court's Decision used a top-down analysis, together with a comparable license analysis as a cross-check, to determine various FRAND rates. This approach might, at first glance, be perceived as similar to the FRAND determination in the UK's *Unwired Planet* decision.[2] However, in that case Honourable Justice Birss centered on Ericsson's comparable licenses and used top-down analysis only as a cross-check. This difference, among others, led to significantly different results.

In TCL v. Ericsson, the Court's tasks were to determine:
- Whether Ericsson met its FRAND obligation,
- Whether Ericsson's final offers before litigation, Offer A and Offer B, satisfy FRAND,
- What terms are material to a FRAND license, and then supply the FRAND terms.

The Court was presented with two principal schemes for determining the proper royalty rates. TCL advocated a "top-down" approach which begins with an aggregate royalty for all patents encompassed in a standard, then determines a firm's portion of that aggregate. Ericsson used its existing licenses with similarly situated licensees (i.e. comparable licenses) to determine the appropriate rates. Ericsson also offered an *"ex ante,"* or ex-Standard, approach which seeks to measure in absolute terms the value which Ericsson's patents add to a product by asking consumers how much they value certain product capabilities such as improved battery life.

My critique here focuses on the use of top-down analysis adopted by the court in the TCL v. Ericsson case, with reference to some metrics used in the UK Unwired Planet decision. One reason for doing so is that both courts were presented almost identical evidence, but each judge chose a different approach, leading to the US District Court granting rates for the Ericsson portfolio that are less than half the rates determined by the UK High Court. I have been critical of top-down methodologies as the key element to determine FRAND royalties in various articles for more than a decade.[3] This

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[1] http://images.law.com/contrib/content/uploads/documents/1/TCL-v.-Ericsson.Decision-part-1.pdf
[2] *Huawei v Unwired Planet*, [2017] EWHC 711 (Pat), 5.April 2017 https://www.judiciary.gov.uk/wp-content/uploads/2017/04/unwired-planet-v-huawei-20170405.pdf
[3] http://www.wiseharbor.com/wp-content/uploads/2018/01/Ezine-article-on-royalty-caps-April-2008.pdf, http://www.rcrwireless.com/article/20111116/opinion/analyst-angle-no-consensus-on-which-patents-are-

paper is the latest in this series. It also follows my work as a testifying expert witness on behalf of Ericsson in the US case.

Top-down apportionments are almost invariably based on the notions of a fixed royalty rate aggregate or cap and royalty-rate proportionality based on patent counts rather than patent value. Unlike in patent cases, where courts definitively determine validity, infringement and essentiality patent-by-patent; no such determinations were made by the Court on Ericsson's patents, or on the larger universe of all patents declared by their owners to be possibly essential to the cellular standards.

Therefore, any ostensible exactitude in the top-down figures derived is spurious. The Court notes that "The search for precision and absolute certainty is a doomed undertaking." (Decision, page14). I agree: no methodology can provide that in FRAND-rate setting. For example, it is impractical in terms of time or money to conduct —on hundreds or thousands of patents in SEP portfolios —the kind of patent-by-patent analysis typically carried out on no more than a handful of patents in patent infringement and validity litigation.

However, many comparable licenses, with the prices in these firmly established by several years of commerce with billions of dollars in licensing payments already made, can provide the most accurate and reliable basis to establish FRAND licensing rates. The inaccuracies there are in interpreting and adjusting figures and terms so that comparisons can be made among licenses on an apples-to-apples basis. Comparable licenses are widely accepted pricing benchmarks in patent cases around the globe, including those involving SEPs.[4] There is also much to comment upon with respect to the (lack of) rigor and accuracy in the Court's analysis and findings based on Ericsson's existing licenses: for example, how cross-licenses were "unpacked" to derive "one-way" licensing rates.

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essential-to-lte/, http://www.ip.finance/2013/11/absurd-frand-licensing-rate.html (Click through to full article, page 21) and http://www.ip.finance/2017/05/do-not-count-on-accuracy-in-third-party.html

[4] See some examples: (1) U.S.: a) The Court of Appeals for the Federal Circuit has found that "actual licences to the patented technology are highly probative as to what constitutes a reasonably royalty for those patent rights because such actual licences most clearly reflect the economic value of the patented technology in the marketplace." *Laser Dynamics, Inc. v. Quanta Comp., Inc*., 694 F.3d 51, 79 (Fed. Cir. 2012). b) In *ActiveVideo Networks, Inc. v. Verizon Comm., Inc*., 694 F.3d 1312, 1333 (Fed. Cir. 2012) the Federal Circuit recognized that observing royalties determined in comparable licenses is generally a reliable methodology to calculate patent damages. In *Ericsson v D-Link*, the jury accepted Ericsson's expert witness on damages, which relied on comparable licenses to calculate the RAND royalty rate. c) In *Microsoft v. Motorola*, Judge Robart only applied a different methodology in view of the absence of comparable licenses. See *Microsoft Corp. v Motorola et al*, US District Court WD of Washington, Case No C10-183JLR at https://essentialpatentblog.lexblogplatform.com/wp-content/uploads/sites/64/2013/04/2013.04.25-D.E.-681-Findings-of-Fact-and-Conclusions-of-Law-setting-RAND-royalty1.pdf. 2) In Germany: The more licensing agreements implementing comparable terms the SEP proprietor has already concluded, the stronger is the presumption that these conditions are FRAND. In fact, comparable licensing agreements "represent an important indicator of the adequacy of the license terms offered, See *Saint Lawrence v Vodafone*, District Court Düsseldorf, 4a O 73/14, 31 March 2016. 3) In the UK, Judge Birss used comparable agreements as basis for the FRAND calculation. See *Huawei v Unwired Planet*, [2017] EWHC 711 (Pat), 5 April 2017. 4) In China: In March 2017, the Beijing Intellectual Property Court ruled for the plaintiff in a case involving SEP licensing, *IWNCOMM v. Sony*, using comparable agreements to determine FRAND. See more at https://ei.com/economists-ink/summer-2017/iwncomm-v-sony-recent-development-frand-litigation-china/ 5) In India: In *Ericsson v Micromax*, the court based its calculation on comparable licences that Ericsson had signed, See also *Telefonaktiebolaget LM Ericsson v. Mercury Elecs. & Another,* Interim Application No. 3825 of 2013 and Interim Application No. 4694 of 2013 in Civil Suit (Original Side) No. 442 of 2013}} 1–4, High Ct. of Delhi (12 November 2014), available at http://lobis.nic.in/ddir/dhc/GSS/judgement/17-11-2014/GSS12112014S4422013.pdf.

Nevertheless, I am leaving this and the Court's rejection of Ericsson's ex-standard valuation method for others to analyze in detail right now, or for me to do so elsewhere in due course.

Following my review of the courts' decisions in both abovementioned cases, I continue to conclude that top-down valuation methodologies are subject to various shortcomings including inaccuracy (i.e. true error rates in determinations are unknown), unreliability (i.e. results are not reproducible consistently) and susceptibility to significant bias (because determinations are so subjective and devoid of an audit trail on how determinations are made). Centering on a top-down methodology that is largely based on only cursory standard-essentiality determinations, as the primary means of apportioning FRAND rates is untrustworthy.

2. Top-down fallacies

The Decision notes that "the Court has some reservations about the top down analysis," (Decision, page 50). However, it "finds some merit in applying a top down approach" (Decision, page 25) since "a top down approach […] prevents royalty stacking." (Decision, page 14). In other words, a top down approach prevents a cumulative royalty rate being charged by all SEP holders that exceeds a reasonable royalty for all of those SEPs.

The problem with the Court's justification is that the underlying concern is merely theoretical. I am not aware of any evidence that royalty stacking ever actually occurs or how significant the alleged problem is, let alone of any such evidence being admitted to any court or of there being any finding of problematic royalty stacking there. In fact, the data provided so far by academia and market analysts shows no such effect.[5] In the absence of any evidence of hold-up and royalty stacking problems, comparable licenses act as a true benchmark of the market rate for a license to a portfolio of patents. Accordingly, top-down determinations are, at best, unnecessary and are, at worst, a means of contriving rates significantly below the market prices and fair values which are necessary to adequately reward patent owners for risky and costly investments, and to incentivize them to further improve the standards.[6] Therefore, top-down determinations deviating from market prices can have serious negative effects on innovation.

Top-down determinations suffer not just from their lack of justification but also from their misguided application. In TCL, the Court applied its top-down methodology in two steps:

1. Set a maximum aggregate royalty rate based on various public statements by Ericsson and others since 2002,
2. Derive rates for individual licensors in proportion to the number of judged-essential patents each owns.

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[5] See Julio Bezerra et al, Boston Consulting Group, The Mobile Revolution: How Mobile Technologies drive a trillion-dollar Impact; Damien Geradin et al., The Complements Problem Within Standard Setting: Assessing the Evidence on Royalty Stacking, 14 B.U. J. SCI. & TECH. L. 144 (2008); See, e.g., Douglas H. Ginsburg et al., Enjoining Injunctions: The Case Against Antitrust Liability for Standard Essential Patent Holders Who Seek Injunctions, 14 Antitrust Source, no. 1, Oct. 2014, at 1; James Ratliff & Daniel L. Rubinfeld, The Use and Threat of Injunctions in the RAND Con- text, 9 J. COMPETITION L. & ECON. 1, 20–21 (2013); Alexander Galetovic and Stephen Haber, The Fallacies of Patent Hold-up Theory, 7. October 2016 at https://cpip.gmu.edu/wp-content/uploads/sites/31/2016/10/Haber-Steve-Panel-4.pdf; Alexander Galetovic and Kirti Gupta, Royalty Stacking and SEPs, April 2015, at http://www.law.northwestern.edu/research-faculty/searlecenter/events/innovation/documents/Galetovic_Royalty_stacking_060416_GG.pdf

The percentage royalty rate is therefore the number of Ericsson SEPs (in the numerator) divided by the total number of SEPs (in the denominator) x 100%. This calculation was performed for 2G (i.e. GSM/EDGE), 3G (i.e. WCDMA/HSPA) and 4G (i.e. LTE) technology standards.

However, the Court's methodology is based on the defective notions that:

A. The total value added to a standard by patented inventions is a set percentage, below a maximum percentage, of the price of the products in which it is incorporated, regardless of how much patented value is introduced to the standard at the outset or later as it is further developed before being superseded by another standard or standards,

B. All SEPs are of equal value: "The Court adopts a simple patent counting system which treats every patent as possessing identical value."[7] (Decision, page 16)

This approach is inconsistent with the widely-held view that licensing should compensate for the incremental value added to the standards by the SEP technologies.[8] Royalty-rate allocations based on "simple" top-down methodology, such as the Court's, is dysfunctional because it undermines economic incentives for innovation on this basis.[9]

3. Methodological errors in detail

The Court deemed a top-down methodology appropriate in this case 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: "essential patents for W-CDMA [should be] licensed at rates that are proportional to the number of essential patents owned by each company" and for 4G based on "relative patent strength." (Decision, pages 20 and 22) The Court also applied a series of reductions that, in combination, resulted in very much lower final rates.

The Court whittled the rates down in several ways:

I.   Regarding company and aggregate single-mode rates as multimode rates,
II.   Using inaccurate, unreliable and likely biased patent assessments in apportionment of the aggregate rate to Ericsson with:
   a.   inflated patent counts in the denominator,
   b.   deflated patent counts in the numerator,
III. Regarding announced rates, including aggregate rates, as US rates rather than global rates,
IV.   Discounting indicated rates based on patent expirations, even though indicated rates were based on certain expectations for these expirations,
V.   Disregarding the value of standard-essential improvements and Ericsson's share of these.

The Court concluded that its estimated final rates were sufficiently below Ericsson's "Offer A" and "Offer B" that neither option was FRAND. Nevertheless, a top-down analysis without all these decrements would have put the rates near or between Offer A and Offer B rates, which means that at least one of those offers (i.e. for 4G in Option A) would be FRAND. In other words, Ericsson's offer

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[7] The Court did consider the possibility of adjusting SEP counts based on quality ratings by TCL's experts, but rejected all this concluding the analysis was flawed for various reasons (Decision page 41-43)
[8] http://businessinnovation.berkeley.edu/wp-content/uploads/2017/04/Tusher-Center-Working-Paper-No.-21.pdf
[9] http://www.wiseharbor.com/wp-content/uploads/2018/01/Ezine-article-on-royalty-caps-April-2008.pdf

to TCL *was* FRAND according to the Court's top-down methodology, but for the Court's erroneous decrements.

The rest of my analysis follows the Court's evaluations: factor-by-factor and adjustment-by-adjustment.

3.1   Single-mode versus multi-mode rate mistake

The Court has misinterpreted statements by Ericsson and others, believing they were indications of multimode rates (i.e. among 2G to 4G) instead of single-mode rates (e.g. for 4G only).

The Decision reproduces the following quotes as evidence of how Ericsson should be bound in setting the maximum aggregate rate in top-down analysis.

> '1. 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 holder s 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.' (Decision, page 20, emphasis removed)

In the same press release, Nokia endorsed a 5% figure and NTT DoCoMo advocated for "keeping cumulative royalty rate below 5%."

And:

> '2. 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 .... 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.' (Decision, page 22, citations omitted)

These statements, targeted at sophisticated licensing professionals (i.e. in licensee companies), including "cumulative royalty rate for W-CDMA to be at a modest single digit level" and "aggregate royalty level for LTE essential IPR in handsets is a single digit percentage of the sales price" clearly indicate these disclosures are all single-mode rates and are not multimode rates.

Notwithstanding the above, handsets are always defined by the latest-generation technology they include, and these are almost invariably multimode devices including previous standard generations. In other words, 3G devices also include 2G standardized technology, and 4G devices include 3G and 2G.

It was widely recognized in the industry, including by licensee professionals, that LTE handsets would be multimode devices and subject to additional royalties for other standards and that the individual LTE licensing rates being announced by many companies, including those identified above, were single-mode rates. It was also understood that devices would be subject to additional royalties for previous-generation technologies including 2G and 3G. This was indicated, for example, in an extensively-cited article, also in evidence in this case, published by Eric Stasik in September 2010:[10]

> 'Both Nokia and Qualcomm made clear in their announcements that a different, higher royalty rate should be charged for end-user devices employing more than one standard.[23]'

> 'multi-mode, end-user devices which employ the LTE standard and other standards will likely see higher royalties than those displayed'

> '23. Nokia Press Release (undated), "When multiple wireless standards are used in the same end product… Nokia will not charge more than 2.0 percent [versus 1.5% for LTE] from the sales price of an end-user device…"
> Qualcomm Press Release (December 2008) "Qualcomm [indicating a 3.25% rate for LTE] expects that it will not charge a royalty rate on such multi-mode devices… that is greater than Qualcomm's standard 3G CDMA royalty rate…" Qualcomm Press Release (December 2008) On June 3, 2009 during a Global Technology Conference sponsored by Merrill Lynch, Qualcomm COO Len Lauer suggested that Qualcomm normally charges 4 percent-5 percent as royalty for 3G shipments."'

The Court identifies the issue of multi-mode versus single-mode rates, but its analysis and interpretation are defective. The Court makes its top-down assessments based on maximum aggregate rates of 6% and 10% for 4G and of 5% for 3G, but it incorrectly regards these as aggregate multimode rates including previous technology-generation standards. The Court's top-down rates are therefore inconsistent with and not directly comparable with the rates it derives from Ericsson's Option A and Option B, and from "unpacking" other licenses, which all include multimode royalty rates.

Regarding Ericsson's announced rates as multi-mode rates (and not single-mode rates) on the basis that Ericsson and others needed to announce multimode rates to compete with WiMAX is without foundation and is also incorrect.

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[10] Court Ex. 1063 at 3 http://docshare02.docshare.tips/files/16356/163568200.pdf

> 'The joint press release was designed to entice manufacturers to invest in LTE over WiMAX and UMB by promising them that Ericsson and others would use this approach with these expected L TE royalty rates. Ericsson was willing to do this [because] it was invested heavily in LTE, but had not invested at all in WiMAX or UMB.[13] (Decision, page 23)
>
> 13 This reason also requires the Court to find that the announced rates are implicitly for multimode devices. A 4G multi-mode device, for example can use 4G, 3G, or 2G networks. Backwards compatibility is especially important when a standard is first adopted so that carriers and consumers can continue using existing products and gradually transition to newer standards. If the rates Ericsson and others announced in their press release were for single-mode devices, it would undermine an important advantage of LTE over WiMAX and would create obvious stacking issues if these companies actually expected to add the 4G total aggregate royalty to the 3G total aggregate royalty and multiple 2G total aggregate royalties.' (Citations omitted)

For WiMAX to complete with LTE in mobile phones, or to compete in mobile phones at all (e.g. against 3G and 2G phones), WiMAX phones also needed to include the very same 2G and 3G technologies that LTE phones incorporated. For example, Sprint's flagship WiMAX phone the HTC EVO also included 2G/3G CDMA2000 technologies for backward compatibility with Sprint's legacy network and for roaming.[11] WiMAX phones used on other networks had to include GSM and WCDMA/HSPA.[12] That LTE, through technological integration (e.g. on the same chip instead of requiring a separate chip as in above examples) in all but the earliest devices, provided much better backward compatibility with 3G and 2G than WiMAX did not enable WiMAX phones to get away without incorporating any 2G and 3G capabilities at all.

These licensing-rate announcements were therefore to signal to manufacturers how much more they would need to pay in royalties to include the additional 4G LTE technology. The handset market was well established. Nobody was in anything like as good a position to know how much any given OEM would need to pay for 2G and 3G than that OEM itself—based on what it was already paying. Therefore, it was most appropriate only to indicate the additional amount to be paid for 4G (i.e. LTE). In other words, the aggregate rate for a multimode device should be the 2G+3G+4G rates, less any discounts that might be negotiated for overlap and bundling among patent portfolios for these three standards. Based on the 5% (3G), 6-8% (4G) or up to 10% (4G) figures, the projected cumulative rates for 4G multimode devices could be as high as 11%, 13% or even up to 15%. In contrast to the TCL decision, the Unwired Planet decision (Paragraphs 261 & 476) better reflects the real figures, since it recognizes multimode LTE aggregate royalty rates between 8.8% and 13.3%.

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[11] https://www.gsmarena.com/htc_evo_4g-3427.php
[12] https://www.gsmarena.com/htc_max_4g-2605.php and https://www.gsmarena.com/htc_j-4997.php

3.2 An unorthodox and precarious apportionment

The Court derived Ericsson's share of total 2G, 3G and 4G SEPs by dividing the numerator of the number of Ericsson's judged-essential SEPs by the denominator (also referred to by the Court as "the relevant universe") of all SEPs judged essential to each respective standard. Prior to making its final determination of the FRAND rates, the Court made two evaluations per standard. For each standard, one evaluation was based on the count of Ericsson patents Ericsson judged essential (net of 13 patent families the Court eliminated in a Daubert ruling)[13] and the other evaluation was based on a subset of these patents for which TCL's experts Dr Kakaes and Dr Jayant did not dispute the essentiality to the standards. The total number of all deemed-essential patents, for the denominator of both calculations, was based on the essentiality assessments of Concur IP, including small adjustments the Court applied on the basis of geography (i.e. where Ericsson had patents) and by comparing the determinations of Concur IP and Dr Kakaes in 35 instances where they had both assessed the same Ericsson 4G patent and Concur IP was deemed to have "over-declared" essentiality based on Dr Kakaes's judgments.

3.2.1 Rudimentary patent counting with essentiality assessments

As I have shown in my previously published research, patent counting is highly inaccurate and unreliable for a variety of reasons.[14] For example, in comparing several third-party studies cited by one of TCL's expert witnesses in this litigation, I found wildly differing estimated shares of LTE SEPs as indicated in Figure 2.

Figure 2: A Few Among Many Wide Variations in Shares of Found-Essential LTE Patents Among Patent-Counting Studies

	Lowest Estimate	Highest Estimate	Disparity
Huawei	2.9%	23%	8x
LG	0.6%	17%	17x
Nokia	2.3%	54%	23x

The evaluation work undertaken on behalf of TCL by Concur IP, under Dr Ding's close supervision according to that TCL expert, has many of the limitations of various public patent-counting studies, including those that use technical analysis to judge essentiality rather than merely counting declared patents.

TCL's experts undertook patent-counting assessments in which technical analysis was used to evaluate the essentiality of declared patents. For estimating the total number of SEPs for the 2G, 3G and 4G standards, TCL's expert Dr. Ding worked with TCL expert Dr. Kakaes to supervise a team from Ernst & Young of India (E&Y) and Concur IP. The E&Y team who worked on this matter then soon joined Concur IP, a technical consulting firm based out of India. The study analyzed a random sample of one-third of all handset-related patent families declared as *possibly* essential to the 2G, 3G, and 4G telecommunications standards in the ETSI IPR database.[15]

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[13] https://www.essentialpatentblog.com/wp-content/uploads/sites/64/2018/02/2018.02.13-1878-Order-on-Ericsson-Motion-to-Alter-Amend-Judgment.pdf At page 12. This adjustment to the numerator is asymmetric because no patents in the "relevant universe" were subjected to the scrutiny of a Daubert challenge, and so there was no corresponding adjustment to the denominator.

[14] http://www.rcrwireless.com/article/20111116/opinion/analyst-angle-no-consensus-on-which-patents-are-essential-to-lte/and http://www.ip.finance/2017/05/do-not-count-on-accuracy-in-third-party.html

[15] Patent declarations are made to assure implementers that patents are identified and are pledged for licensing on FRAND terms, not for apportioning royalties. ETSI does not police its database of IPR licensing

By using declaration data from the ETSI IPR database, the team created a list of all the patent families declared to ETSI for each of the 2G, 3G, and 4G standards. Next, Concur IP identified the patent families that related to handset (i.e. user equipment (UE)) technology and had an English language patent, and excluded any patent families that did not have an unexpired patent as of January 1, 2009. Concur IP identified the top fifteen owners of declared patents for each standard and randomly selected one-third of the declared patent families owned by those companies for further analysis. Finally, Concur IP randomly selected one-third of all remaining declared patent families and assessed whether those patent families (2,600 in all) are essential to the relevant standard.

Adding a technical analysis to judge whether declared patents are essential does not make patent counting accurate or reliable because such analyses are highly subjective and cost prohibitive to do well. Even the modest essentiality analysis undertaken for a cellular technology patent pool can typically cost $10,000 per patent. The cost of an extensive evaluation is estimated to exceed $23,000 per patent and often many times more.[16]

The essentiality analysis performed by Concur IP is inaccurate and unreliable because it suffers from the same weaknesses as patent-counting studies generally. Critically, the Concur IP team invested only about $100 or 45 minutes on average to evaluate each patent family. As seen in Figure 3, this is a tiny fraction of what other institutions would charge for the essentiality analysis of a patent. Indeed, just reading the one patent can take more than the time that Concur IP spent on its entire essentiality analysis for an entire patent family. By way of comparison, Ericsson spent on average around 50 hours per patent family in preparing claim charts—more than 60 times the time Concur IP spent evaluating each patent family.

The Court agreed with TCL that the sample size was representative, but there was no validation of this. Even relatively large random samples can be unrepresentative—where data is disparate and individual determinations are imprecise—and yield inaccurate results, as has been clearly shown time and time again when pollsters incorrectly predict election and referendum results. This was the case in the last US presidential election and in the UK's Brexit referendum.

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declarations, which means that it is the sole responsibility of the declaring party to decide whether a patent or application needs to be declared or not. Nor does ETSI carry out any check on declarations after the fact, i.e. there is no official mechanism in place to check whether declared patents are or become, in fact, essential. This means that ETSI members may declare marginally relevant – or entirely irrelevant – patents in the belief that it is best to minimize the possibility that any of their undeclared patents might be or become essential. Alternatively, other ETSI members are anxious not to attract criticism by over-declaring patents or patent applications and thus take a more conservative approach when declaring patents. The key point here is that declaring a patent or patent application to ETSI does not make the patent or patent application essential. And, a patent application may undergo changes while in prosecution, and the ETSI standards are constantly evolving. So, although a company may believe its patent application discloses an invention that is or may become essential when submitting its declaration for the application to ETSI, the patent that eventually issues from that application may not read on the standard. Or the patent application may never issue at all. Or the relevant portion of the standard could change while the application is pending. This results in a declared patent application that is not essential, but that nevertheless remains a declared IPR in ETSI's on-line database.
[16]http://www.ip.finance/2017/05/do-not-count-on-accuracy-in-third-party.html Page 9

Figure 3: Cost of Evaluating Essentiality
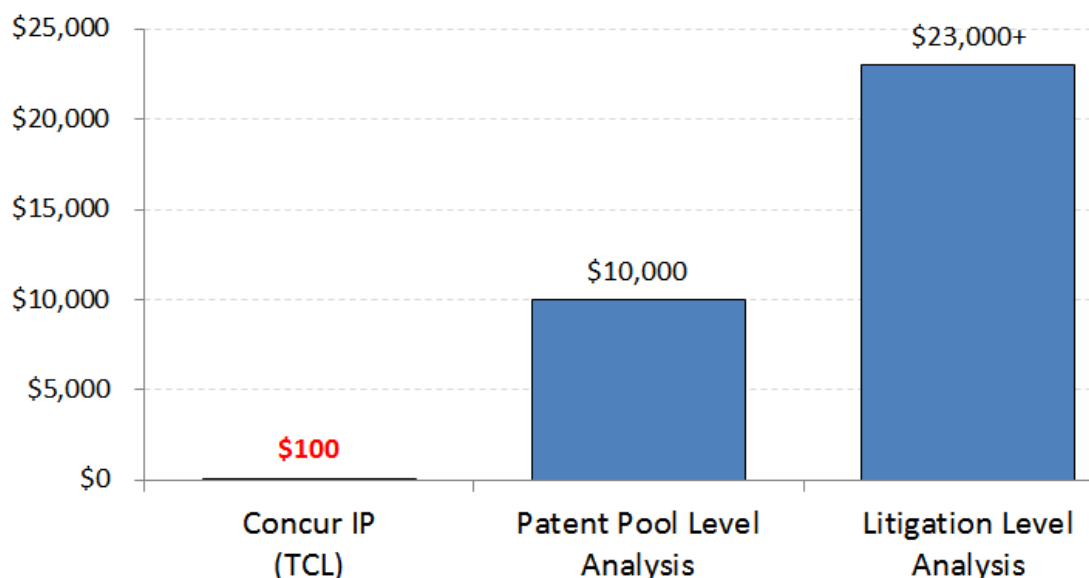
The Court unreliably concludes that a cursory assessment is sufficient for its purposes:

> 'While charging on average only $100 per patent family may be cheap, this process is only intended to provide <u>a workable size of the relevant universe</u> and has no need to be as precise as a licensing pool must be. The Court does not think that the internal procedures used by either patent pools or Ericsson to determine the essentiality of their own patents are fair bench marks for assessing quality of the analysis done by Concur IP. While they are similar tasks, they require very different levels of certainty because the results are being used in very different ways.' (Decision, page 30, emphasis added, footnote omitted)

There was no supporting evidence that such an assessment was sufficiently accurate or reliable. Third-party patent-counting studies, including those that purport to judge essentiality, have extremely wide variations in results, as already indicated. One patent-counting study cited in this case by a TCL expert reports that Ericsson has a 13.3% share of 4G patents found to be essential or probably essential. Another couple of those studies rate Ericsson's share at 9.2% and 9.0%, respectively. In Dr Ding's assessment relying on Concur IP, Ericsson has only 108/1,796=6.0% of 4G UE SEP families.

By seeking only "a workable size of the relevant universe" for the purposes of setting top-down rates for Ericsson it seems the Court presumes that erroneous variations in essential patent determinations per company and across all companies (i.e. false positives and false negatives in judging essentiality) do not matter because these will cancel each other out and that the total patent count per standard will be accurate. There is no evidence this can be reliably assumed. The size of the universe could be substantially inflated or deflated, as well as its composition being significantly distorted in favor of cone company's SEP share, versus that of another.

The Court states without foundation:

> "if prospective licensees discovered that a patent pool included non-essential patents it would undermine the patent pool's entire business model. Patent pools therefore require substantially greater certainty than is necessary or reasonable for counting the number of SEPs in a standard."

But even the more extensive essentiality assessments undertaken to screen patents before they are included in patent pools are not infallible. It is only the courts that can ultimately determine which patents are essential. That is even more costly, as indicated above.

Accurate and reliable patent-essentiality determinations are at least as important in this litigation as they are for patent pools. The economic significance in setting Ericsson's rates is far greater than for any patent pool. Bilateral licensing for cellular standards-based technologies is much more technologically extensive and far more commercially valuable. Most patent pool licensors are motivated more by their downstream interests, including minimizing costs as licensees (i.e. by setting low rates) than they are in income generation as licensors; and patent pools tend not to attract the most valuable patents.[17] This is why patent pool rates are inapplicable benchmarks for bilateral licensing including parties with different interests. For example, the most extensively licensed patent pool is MPEG-LA's AVC/H.264 pool with maximum aggregate royalties of around 20 cents per unit apportioned among more than 30 licensors with 2,500 patents. Some of the FRAND rates set by the Court in this litigation, for Ericsson alone, correspond to higher per-unit payments (e.g. a rate of 0.45% for LTE on a $200 smartphone is equivalent to a royalty charge of 90 cents) than for that entire pool. The rates set in this decision could also become significant FRAND-licensing benchmarks in other licensing negotiations and disputes. The economic significance in numbers and proportions of patents the Court deems standard-essential is therefore greater than for a pool, as derived from the pool's essentiality determinations. By its own logic, the Court should therefore

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[17]Keith Mallinson, *Absurd (F)RAND licensing rate determinations for SEPs* (15th November 2013): Available at IP Finance http://www.ip.finance/2013/11/absurd-frand-licensing-rate.html (click to download full paper), page 12. Jonathan Barnett, *Has the Academy Led Patent Law Astray?* (January 11, 2017), page 37: available at SSRN https://ssrn.com/abstract=2897728. From *Microsoft v. Motorola*, Case No. C10-1823JLR, Findings of Fact and Conclusions of Law, 25th April 2013, paragraph 499: "Based on this extensive testimony, the court agrees as a general matter that patent pools tend to produce lower rates than those that could be achieved through bi-lateral negotiations. Indeed, the uncontroverted trial evidence is that a rate higher than a pool rate could still be RAND. Another problem with using patent pools as the de facto RAND royalty rate is that the patent-counting royalty allocation structure of pools does not consider the importance of a particular SEP to the standard or to the implementer's products as the court's hypothetical negotiation requires. An additional issue with using patent pools as the de facto RAND royalty rate is that patent pools do not use an incremental value approach, an approach that is required in the court's hypothetical negotiation paradigm. In other words, patent pools do not try to determine the incremental value of every patent in the pool compared to alternatives that were available prior to defining the standard. The court also has policy concerns with applying a pool rate as the de facto RAND royalty rate for all SEPs relevant to a given standard. If pool rates were held to be the most appropriate RAND royalty rates, SEP holders with valuable SEPs would be hesitant to participate in standard-setting activities and might instead try to develop proprietary standards. Moreover, since licensing through SSOs under the RAND commitment is, at least for some entities, an important component of profitability, reducing that component would reduce the incentive to innovate and thereby slow the pace of innovation in the economy. Other things remaining the same, the higher the value of an owner's SEPs and the stronger its licensing program, the lower is its incentive to join a patent pool and the less likely it is to join a pool. In sum, on the evidence before it, the court concludes that a pool rate itself does not constitute a RAND royalty rate for an SEP holder who is not a member of the pool." From *Saint Lawrence v Vodafone*, District Court Düsseldorf, 4a O 73/14, 31 March 2016. "Although the comparison with a pool license can be used as an indication of FRAND conformity, its significance is nevertheless limited." And, "In licensing over a larger pool with the property rights of several companies, lower royalties per patent will be paid as a rule than in licensing of the portfolio of only one company, and a lower total number of property rights. One additional protective right in a pool license does not lead to a proportional increase in royalties."

have required no lower level of accuracy and reliability in the essentiality determinations of TCL than is required by patent pools.

Another shortcoming in TCL's patent counting methods is that all TCL's experts and the consultants at Concur IP knew which party they were ultimately working for. This is an obvious source of potential bias. The Court notes that experts on both sides are potentially subject to being biased in favor of their own client. While this is true, some experts have much more scope to exercise bias than others. This is most extreme in the case of the essentiality determinations by Concur IP because these are so much down to personal discretion and because there is no evidentiary trail indicating how each individual essentiality determination was made. In contrast, Ericsson provided substantial backup in its claim charts which were supported by patent prosecution file histories.

The lack of reliability in the data produced by TCL was well understood by the UK High Court in Unwired Planet v. Huawei. Where presented with similar evidence in the UK court found that the top down analysis proposed by Dr. Kakaes "produce[s] the wrong answer" of total essential patents (1,812), which "is much too high. […] Standing back, about 800 is fair and in my judgment an appropriate figure for the pool of 4G/LTE patents." (¶377) "In his reports Dr Kakaes had emphasized that the analysis was not a rigorous and thorough assessment of essentiality of all declared SEP families in the relevant group, since carrying that out was not plausible without employing vast resources. The exercise was based on what he called a "relatively quick assessment"." (¶345) "However as an absolute value, the numbers from the HPA over-estimate the true number of essential patents. In other words, if a number derived from the HPA is used as the denominator in a fraction in which the numerator is a number derived by considering the patents in more detail, the result will understate the significance of Unwired Planet's patents." (¶361).

A difference by a factor of 1.85 between the total of 1,481 industry-wide 4G/LTE patents deemed essential in the Unwired Planet decision versus only 800 in the TCL decision is highly significant because this count acts as the denominator in determining Ericsson's share of essential patents. It therefore affects the royalty rate derived by the same factor.

3.3 Disparities between Dr Ding and Concur IP

Dr. Ding and the group of assessors from Concur IP that he was overseeing disagreed in a significant number of instances on which patents were and which patents were not standard essential. Given that Dr Ding claims he was coordinating closely with and supervising the work of Concur IP, it is only to be expected that they would tend to produce the same results. On the other hand, producing exactly the same results would have made it very clear that Concur IP's initial determinations were not made independently of Dr Ding.

The Court states:

> 'Dr. Ding sampled and checked 442 (or 17%) of Concur IP's essentiality determinations for accuracy. When Dr. Ding was in agreement with Concur IP, he recorded the determination as accurate. When he identified a discrepancy, he and Concur IP reexamined the claims and if Concur IP's original essentiality determination was changed, Dr. Ding recorded the original determination as inaccurate, and noted the direction of the error. The overall error rate for Concur IP was only 9.5%. The error rate regarding whether patents were essential went in both directions, and thus the small number of errors largely balanced each other out over the course of the study. Specifically, out of the 442 patent families that Dr. Ding reviewed, 36 out of 305 patent families (or 11.8%) were changed from non-essential to essential, and 6

out of 137 patent families (or 4.4%) were changed from essential to non-essential.' (Decision page 28, citations removed and emphasis added)

As the overseer, Dr Ding marked Concur IP's homework,[18] but did so without a pre-existing answer sheet or any independent moderation. Accordingly, while the internal cross-checking was quite possibly a useful internal quality control procedure toward doing a better job overall and would certainly reduce the number of disagreements,[19] Dr Ding's judgments are not definitive of what is actually standard essential. It is therefore misleading for the Court to use the term "error rate" since (1) the correct answers are not known; (2) Dr Ding's determinations could have been significantly influenced by the preexisting determinations of Concur IP, and (3) Concur IP was discussing many patents with Dr Ding in advance of Concur IP making its determinations. Percentage agreement or disagreement rates between the essentiality determinations of Dr Ding and Concur IP are therefore not meaningful or reliable indicators of absolute accuracy in determining essentiality.

The Court also errs by reassuring itself with the following:

> 'The error rate regarding whether patents were essential went in both directions, and thus the small number of errors largely balanced each other out over the course of the study. Specifically, out of the 442 patent families that Dr. Ding reviewed, 36 out of 305 patent families (or 11.8%) were changed from non-essential to essential, and 6 out of 137 patent families (or 4.4%) were changed from essential to non-essential.' (Decision, page 28, emphasis added)

To the contrary, the above figures indicate that disagreements do *not* largely balance each other out. Moreover, this test does not deal with the fact that disagreement rates vary on the patents owned by one company versus another. This is also significant because, as explained below, the Court uses an "error rate" based only on Ericsson's patents to adjust the size of the denominator in its apportionment calculation.

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[18] According to Dr Ding, randomly sampling 442 (17%) of the patent families that Concur IP analyzed.
[19] In instances when reviewers had any doubt about any aspect of the essentiality analysis, such cases were marked for my review and discussed during regular conference calls.

3.4 Disparities between Dr Kakaes and Concur IP

Separately, Dr. Kakaes and TCL expert Dr Jayant evaluated all the 192 Ericsson patent families for which Ericsson produced a claim chart in this litigation; and provided their opinion on whether each patent is essential to the relevant standards. These patents are a subset of the 235 patent families Ericsson contends are essential to 2G, 3G and 4G standards. And these are a very small subset of total patent families evaluated by Concur IP.

It would also have been no surprise if Dr Kakaes' essentiality determinations of Ericsson patents had closely matched those of the Concur IP team, supervised by Dr Ding, because Dr Ding and Dr Kakaes also indicated they were in close coordination. However, notwithstanding their efforts to coordinate, there were significant differences between these Court-qualified testifying experts' work product, indicating the inaccuracy and unreliability in their essentiality assessments.

According to the Court:

> 'Dr. Kakaes and Dr. Jayant also conducted an essentiality analysis on Ericsson's patents to determine the appropriate numerator. This led to 55 patent families that were analyzed both by Dr. Kakaes and Dr. Jayant for the numerator, and Concur IP for the denominator. This therefore provides a useful cross-check on Concur IP' s results. Of the 55 patent families that were analyzed twice, everyone reached the same conclusion on 41 of them, meaning they initially agreed roughly 75% of the time. Of those 14 families where they disagreed, Dr. Kakaes provides an explanation for 4 of the disagreements that are unrelated to the substance of Concur IP' s analysis. One of them was explained because Ericsson's claim chart is broader than the declaration it submitted to ETSI, one was because of an inconsistency related to ETSI's database, and two errors were because Dr. Kakaes examined the file history, which showed that the patents were not essential. Of the remaining ten disagreements, seven occurred when Dr. Kakaes or Dr. Jayant found the patent essential and Concur IP did not, and three where Concur IP found the patent essential and Dr. Kakaes or Dr. Jayant did not. This provides an error rate for Concur of 7 /51 (13.7%) in favor of non-essentiality, and 3/51 (5.8%) in favor of essentiality. These results are remarkably similar to Dr. Ding's, who checked 442 of Concur IP' s assessments and found error results of 11.8% and 4.4% respectively.' (Footnote 17, references omitted)

As explained in the previous section, seemingly small disagreement percentages between experts who were evidently coordinating should be taken with a pinch of salt. It is misleading to describe the differences between evaluations as "errors" by Concur IP because Dr Kakaes, like Dr Ding, had significant incentives to minimize differences in favor of TCL.

The disagreements between Concur IP and Dr Kakaes in instances where they assessed the same patents are significant and greater then they might seem at first glance. Although Concur IP and Dr Kakaes may look fairly closely aligned with *only* 25% of determinations in disagreement, their judgments are much more disparate than the figure suggests. If Concur IP and Dr Kakaes made their assessments totally randomly: for example, without even looking at the patents, one could expect them to agree in around half of their determinations. With that baseline of 50%, at 75% they are only half way from what one should expect with no skill or effort to being completely aligned with 100% agreement.

The 50% baseline can be illustrated with the absurd example of determining essentiality by nothing more than a coin toss – heads (H) for essential and tails (T) for not essential. Two different coin-tossing assessors evaluating the same stack of patents separately can be expected to agree with each other in 50% of their determinations. Possible results of the coin toss for every patent

evaluation are with four permutations.

1. H, H —agree
2. H, T —disagree
3. T, H —disagree
4. T, T —agree

For the purposes of this hypothetical comparison, it is reasonable to assume that very approximately 50% of patents are actually essential. For example, Concur IP's determinations yield an average essentiality rate of 37.3%. Even if the coins were loaded somehow so that the probability of heads versus tails, or vice versa, was 37:63 instead of 50:50 it would not dramatically change the result that a very substantial percentage of agreements would result purely by chance.

With so little time spent in evaluation by Concur IP, it is unsurprising that the percentage of agreements in essentiality determination are only around halfway between from what would occur purely by chance to 100% agreement. Nobody knows how much more wildly apart they might have been without coordination.

The Court's four disagreement explanations (as underlined above) illustrate why Concur IP's cursory analysis spending only 20 minutes per patent, and not, for example, reviewing claim charts or prosecution histories (as is the norm in determining essentiality in licensing negotiations or before admitting patents to a patent pool), is not fit for purpose.

It is unclear why the four explained disagreements should be excluded from the over-declaration adjustment below. Whether or not this reflects any errors of judgment by Concur IP, it does indicate another distorting inconsistency between figures in the denominator and numerator of the apportionment calculations.

3.5   Disparities between numerator and denominator in apportionment calculation

The Court applied an adjustment to the denominator of the apportionment calculation due to the disparities between figures derived for the numerator and denominator.

According to the Court:

> 'The only cross-check on the total presented by Dr. Ding and Concur IP occurred when they examined the same patents as Dr. Kakaes and Dr. Jayant. Excluding 2 families where the disagreement was not caused by the substantive analysis, Concur IP disagreed with Dr. Kakaes on the essentiality of 12 of the 53 overlapping patent families. These 53 patent families represent 6 2G family/standards pairs, 16 for 3G, and 35 for 4G. There were three 4G families that Concur IP said were essential that Dr. Kakaes said were not essential. Giving Ericsson the benefit of the doubt for every dispute between Concur IP and Dr. Kakaes, <u>Concur over-declared 4G patents to be essential four out of thirty-five times, or 11.4%. The Court uses this figure for adjusting the total number of SEPs in each standard downwards.</u> While the Court makes the adjustment because it is warranted, shrinking the denominators favors Ericsson in determining its share of the overall royalty burden.' (Decision, page 32)

This 11.4% figure is a very precarious basis for making an adjustment to the size of the "relevant universe" in the denominator. It significantly hangs on Concur IP's evaluation of 35 patents with only 45 minutes spent per patent family. There is no reliable basis to assume that the Court's "over-declaration" rate on Ericsson patents is representative of Concur IP's over-declaration rate for the entire relevant universe of patents. As indicated previously, my research shows that the proportion

of patents judged essential varies enormously among different assessors.[20] Inadvertent or intentional bias against Ericsson and in favor of other patent holders (e.g. a higher level of essentiality "over-declaration" accepted by Concur IP for the latter) will make this adjustment percentage inaccurately low.

The reliability of this percentage adjustment is also low because four is a small number from a meagre sample of only 35 4G patents examined by both Concur IP and Dr Kakaes. In other words, even purely based on random effects with small numbers, the number of 4 versus 5 or even more from a sample of 35 out of a population of 1,796 is not statistically significant at even a moderate confidence level.

The potential for inaccuracy and bias in the numerator is also substantial. Out of the total of 125 patents Ericsson claims are essential to 4G and for which it produced claim charts, Dr Kakaes deems 51 (i.e. 41%) of them not essential.[21]

According to the Court:

> 'For 2G, Dr. Kakaes and Dr. Jayant gave 29 out of 41 of the patent families an Essentiality Rank of 1, one of the patent families an Essentiality Rank of 2, and 11 of the patent families an Essentiality Rank of 3. For 3G, they gave 33 out of 51 of the patent families an Essentiality Rank of 1, two of the patent families an Essentiality Rank of 2, and 16 of the patent families an Essentiality Rank of 3. For 4G, Dr. Kakaes gave 74 out of 127 of the patent families an Essentiality Rank of 1, seven of the patent families an Essentiality Rank of 2, and 46 of the patent families an Essentiality Rank of 3.' (Decision page 34, references omitted)

The Court notes that royalties are only legally enforceable on valid and infringed patents, which in this context I presume would require standard essentiality. However, this is not a patent case in which the court is ruling on these issues on a patent-by-patent basis. By the Court insisting that all patents included in the numerator of the apportionment calculation have claim charts, Ericsson is being held to a higher standard than all the other patent owners who are implicitly sharing the rest of the aggregate royalty rate pie. Their patent counts made it into the denominator without them having to create claim charts or provide them to anyone.

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[20] Comparing various studies estimating LTE SEP shares, revealed, for example, differences by a factor of 8 for Huawei, 17 for LG and 23 for Nokia http://www.ip.finance/2017/05/do-not-count-on-accuracy-in-third-party.html
[21] This is based on the Court's questionable interpretation (contested by Ericsson and its experts) that an essentiality score of 2 by Dr Kakaes should be regarded as "not essential."

3.6 Whittling-down rates further

The Court further reduces rates by adjusting them based on geography and patent expiration during the licensing term. This is counter to industry practice with most mobile SEP patent licensing deals being worldwide portfolio agreements with rates set for the duration of the agreements, which typically last between 5 and 7 years. That was also explicit or implied in patent holders' royalty rate disclosures, including those for their companies and the indications they gave on aggregate rates.

3.6.1 Geographic scope of licensing rates

The Court significantly reduces the effective global rate by making the US rate the maximum rate. According to the Court "because Ericsson's SEP portfolio is weaker in some countries than others, the Court also had to apply a regional strength ratio." (Decision, page 17). This is despite the obvious that all other SEP owners have weaker SEP portfolios in some countries than others.

Licensing deals are most commonly struck with a single global licensing rate for all technologies or with a global rate by technology (e.g. for 3G and for 4G). If a licensee seeks a lower rate for a particular nation or region, the corresponding rates for some other regions would increase to preserve the globally blended rate. In the case of a global manufacturer such as TCL that sells a substantial proportion of its handsets in America (e.g. under the Alcatel and BlackBerry brand names), there is no reason why its blended rate for total sales globally should be lower than the full rate.

When, for example, patent owners announced maximum rates for LTE, they were implicitly or explicitly referring to blended global rates. It would therefore only be handset vendors that disproportionately or entirely sold handsets outside of the US and other nations where patent numbers and protection are strongest that would be subject to lower rates based on geography of sales.

The nature of the Court's geographical adjustment is substantial and such that no licensee would ever pay anything close to the maximum rate. For example, in 4G, the Rest of World rate is 30% lower than the notional maximum rate, for the US only, of 0.45%.[22] With most of TCL's sales outside the US, this will have the effect of reducing Ericsson's globally blended royalty rate yield by a lot more than 30%.

3.6.2 Effects on licensing rates of new and expired patents

Large mobile technology innovators such as Ericsson have tended to continue to contribute to the standards. In the case of 4G, for example, Ericsson and others have contributed significant additional patented standard-essential technology since LTE was first standardized in 3GPP Release 8 in 2009. This increases the overall value of the standard, and yet with declining average prices for devices, at constant royalty rates, royalties derived per unit sold will decline over the lifecycle of a standard.

The Court incorrectly states without foundation that 'The only feature added to any standard after Ericsson's initial estimates [in 2008] of an appropriate total aggregate royalty is carrier aggregation for 4G.' (Decision, page 19, emphasis added). Nothing could be further from the truth.

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[22] Decision Figure 17.

Exhibit 4 shows how new contributions to the LTE standard have been continuous since Release 8. Subsequent releases were completed as follows:[23] Release 9[24] in March 2010, Release 10[25] in June 2011, Release 11[26] in March 2013 and Release 12[27] in March 2015. Release 10 was particularly significant because that is the first release, with the introduction of LTE Advanced, that met the International Telecommunications Union's performance criteria for 4G compliance.[28] In other words, LTE was not 4G compliant until Release 10 was finished in 2011.[29] Spectral efficiency requirements for 4G (measured in bits per Hz) were met with improvements other than carrier aggregation — carrier aggregation does not improve spectral efficiency. Subsequently, Release 13[30] for LTE Advanced Pro providing gigabit-per second capabilities, with higher-order modulation and LTE in unlicensed spectrum, was frozen in March 2016 with commercial products by 2017.

Figure 4. 3GPP Approved Submissions for LTE Release 8 through Release 12 – by release (2007 – June 2014)[31]
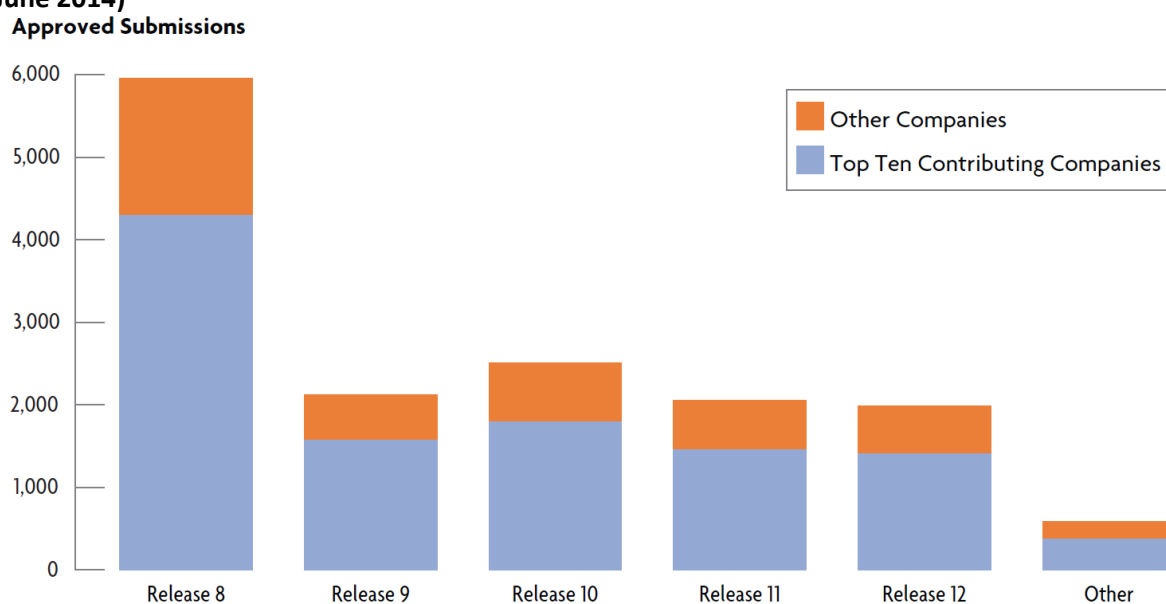
Source: Signals Research Group

The Court, relying on a TCL expert, also gives a simplistic and incorrect impression which significantly understates how much further innovative work and value there was beyond of 3G in adding carrier aggregation to LTE:

> 'Carrier aggregation itself was a part of 3G, and given its participation in 3GPP Ericsson certainly should have anticipated that carrier aggregation, along with other valuable

[23] http://www.3gpp.org/specifications/releases

[24] http://www.3gpp.org/specifications/releases/71-release-9

[25] http://www.3gpp.org/technologies/keywords-acronyms/97-lte-advanced

[26] http://www.3gpp.org/IMG/pdf/lte_africa_2013_3gpp_lte_release_12.pdf

[27] http://www.3gpp.org/specifications/releases/68-release-12

[28] http://www.itu.int/net/pressoffice/press_releases/2010/40.aspx#.WnBoyghl-Uk

[29] Elsewhere in this paper I have followed the convention, adopted by everyone working on this case, of regarding LTE and 4G as synonymous. Here, I am making the point that LTE was not actually a 4G technology at introduction in Release 8 and until LTE Advanced was introduced more than two years later with Release 10.

[30] http://www.3gpp.org/news-events/3gpp-news/1745-lte-advanced_pro

[31] http://signalsresearch.com/issue/the-essentials-of-intellectual-property-part-two-5/

features, would be added to 4G. (Kakaes Decl. ¶ 389 (describing 4G carrier aggregation as "a simple extension of well-known techniques, plus a bit of common sense.").)'

Innovations in carrier aggregation for LTE deal with various additional complexities: in aggregating TDD with FDD duplexing modes and with numerous frequency band combinations that even include unlicensed spectrum with Licensed-Assisted Access in Release 13.

Exhibit 5 shows that Ericsson among others have issued or acquired for more patents then they have disposed of in recent years.[32]

Figure 5: Worldwide newly issued/acquired vs. expired patents
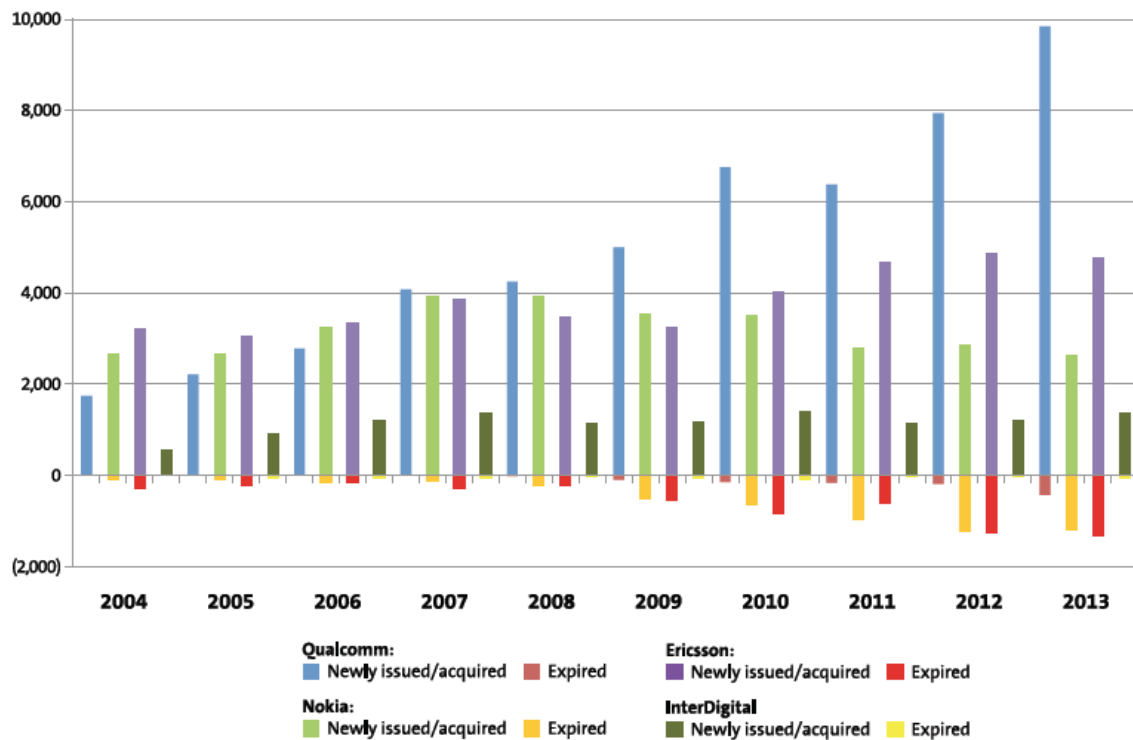
Source: Thomson Innovation.

It is therefore reasonable that FRAND rates overall, including LTE as well as 2G and 3G, should increase rather than decline given the numerous improvements including the generational shift to true 4G and the additional value derived by implementers and consumers. This is regardless of how quickly handset prices decline and any expectations for that.

When licenses are agreed it is clearly understood by licensor and licensee that patents expire during the term of the licensing agreement. Which patents expire and when it is very predictable, as the Court shows. Royalty rates agreed in executed licenses— typically the same rate throughout the term— therefore, reflect patent expirations.

The Court maintains that royalties must reduce over time based on expirations, as indicated by citing Brulotte v. Thys Co., 379 U.S. 29, 32 (1964) '("we conclude that a patentee's use of a royalty agreement that projects beyond the expiration date of the patent is unlawful per se.") However, that is at odds with top-down apportionment based on a cap, in which the applicable factors are the aggregate rate indicated —even if patents are collectively worth more than the aggregate, but most

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[32] https://cpip.gmu.edu/2015/10/07/busting-smartphone-patent-licensing-myths/ at page 8

importantly only so long as they are altogether worth no less than aggregate— and the applicable share of patents. The maximum aggregate royalty guidance is indefinite in its duration. Even if there is a larger relevant universe of patents initially than later, the offer or the expectation set explicitly or implicitly is that the aggregate figure will persist. Alternatively, if patents are not altogether worth the aggregate, it would be down to another valuation methodology to challenge legitimacy of the maximum rate or measure the deficit.[33]

If a company's share of SEPs remains constant as expirations occur across the entire universe there would generally be no reason for that company's royalty rate to decline. Top-down apportionment could, for expediency, be justifiably based on the initial number or on the average number of unexpired patents over the licensing term, depending on the expectations set when indicating aggregate-rate apportionment in the first place. So long as there is sufficient value in the SEP universe to justify the aggregate rate and so long as individual patent holders retain sufficient patented value under another valuation methodology (e.g. patents have not all expired) there is no justification for reducing rates.

Patents pools employ sophisticated allocations based on new and expiring patents because they have the ongoing need in their multilateral operations and have the administrative systems to do so. That does not prevent the Court from using simpler methods with an appropriately looser interpretation of what was meant when the aggregate rate guidance was given 10-15 years ago.

4.   Key top-down figures

In summarization of much of the above and the whittling-down effects on royalty rates, I have prepared two tables to show how SEP counts have been used to derive Ericsson's share of SEPs rates based on the broad patent-counting analysis by Concur IP, as supervised by Dr Ding, with the claim-charted patents presented by Ericsson and with the patent-essentiality assessments made on these by Dr Kakeas and Dr Jayant. The first, Figure 6, uses 4G (i.e. LTE) as an example to show how royalty rate apportionment between Ericsson and other SEP holders can vary with various assumptions and adjustments.

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[33] Setting an aggregate rate does not necessarily make it per se a reasonable aggregate royalty.

Figure 6: Ericsson's Share of 4G (i.e. LTE) UE Patent Families

Ericsson's patents: TCL v. Ericsson		Universe: TCL v. Ericsson		Share of TCL v. Ericsson Universe	Universe: Unwired Planet		Share of Unwired Planet Universe
Declared by patent owner	311	Declared by patent owner	5,024	6.2%			
Estimated essential by Concur IP	108	Estimated essential by Concur IP	1,796	6.0%			
Estimated essential by Concur IP	108	Adjusted by Dr Leonard for regional differences	1,673	6.5%			
Estimated essential by Concur IP	108	Adjusted by Court for over-declaration by Concur IP	1,481	7.3%	"appropriate figure" in Unwired Planet decision, Paragraph 377	800	13.5%
With claim charts from Ericsson	112	Adjusted by Court for over-declaration by Concur IP	1,481	7.5%	"appropriate figure" in Unwired Planet decision, Paragraph 377	800	13.9%
Essentiality not disputed by TCL's experts	70	Adjusted by Court for over-declaration by Concur IP	1,481	4.7%	"appropriate figure" in Unwired Planet decision, Paragraph 377	800	8.7%

While reductions in the total number of patents in the denominator by the Court modestly lift the derived royalty rates, the differences in derived rates due to disputed essentiality of Ericsson's patents is much greater. The Court indicated its desire for a "workable size of the relevant universe" for the denominator, but derived rates are just as arithmetically sensitive to proportionate changes in the denominator as they are to the same proportionate changes in the numerator.

The difference due to the disputed SEP count in the numerator is several times larger than that arising from reductions in the denominator based on what the Court describes as low "error rates" in disagreements between Dr Ding and the team he closely coordinated with and supervised at Concur IP.[34]

Also included in Figure 6, is the very differently-sized universe used in the aforementioned Unwired Planet decision. As explained above, with the same timeframe and focus on LTE UE patents, Justice Birss computed top-down rates based on a universe of only 800 patents in the denominator. (Unwired Planet decision, paragraph 377). Ericsson's share of SEPs virtually doubles using this figure.

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[34] The Court reduced the size of the LTE denominator by 11% (i.e. from 1,673 to 1,481) for over-declaration. The difference between 311 patents declared essential to LTE by Ericsson versus 70 patents for which LTE essentiality was not disputed by TCL is 77%. The difference between 125 and 112 patents with LTE claim charts versus 70 patents for which LTE essentiality was not disputed by TCL is 44% and 38% respectively.

The disparities highlight the imprecision and perils of mixing inconsistently derived numerators and denominators.

The second table, Figure 7 converts these figures into royalty rates for Ericsson by applying maximum aggregate royalties at 10% and 15% (my figure, as justified previously).

My workings are primarily based on figures in the Decision and from Dr Ding's direct testimony.[35] I was unable to reproduce the Court's results exactly in all cases, but it seems the very small differences in some cases are in rounding or truncation.

Ericsson asked the Court to amend its recitation of the number of SEPs that Ericsson disputed at trial to include patents that were disputed in testimony that was excluded by the Court's Daubert ruling.[36] Ericsson does not dispute that its expert testimony for these 13 patent families was excluded. However, the Court's depiction, for example, that Ericsson claimed 12 undisputed 2G SEPs, could easily be misinterpreted that Ericsson is claiming fewer patent families were essential than it had, including additional disputed 2G SEPs. The Court had stated "For 2G, both parties agreed that Ericsson owns 12 out of 365 essential patent families."[37]

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[35] Witness declaration of Dr Zhi Ding
[36] https://www.essentialpatentblog.com/wp-content/uploads/sites/64/2018/02/2018.02.13-1878-Order-on-Ericsson-Motion-to-Alter-Amend-Judgment.pdf at F., page 12
[37] Decision, page 37

Figure 7: Top-down apportionment and royalty rates for Ericsson in LTE, as indicated by the US Court in TCL v. Ericsson (15% aggregate rate and alternative "universe" based on Unwired Planet decision in UK added by WiseHarbor)

		Concur IP				Kakaes~	Kakaes v. Ericsson	Ericsson¬		Court+	TCL SEP #	Ericsson SEP #
Assessing	Ericsson	Universe*	Ericsson	Ericsson	All SEPs	Ericsson		Ericsson	Ericsson	Universe^	Ericsson	Ericsson
Metric	SEP count	SEP count	Proportion of SEP Universe	Essentiality ratio	Essentiality ratio	SEP count	Disputed #	SEP count	Difference	SEP count	Proportion of SEP Universe^	Proportion of SEP Universe^
4G	108	1,796	6.0%	34.6%	35.7%	69.88	41.63	111.51	37.3%	1,481	4.718%	7.529%
										800	8.735%	13.939%

		Metric:	Ericsson rate							Universe	Ericsson rate	Ericsson rate
Aggregate rate:	15.0%											
4G			0.90%							1,481	0.708%	1.129%
										800	1.310%	2.091%
Aggregate rate:	10.0%											
4G			0.60%							1,481	0.472%	0.753%
										800	0.874%	1.394%

Notes:

* Families by extrapolation by Concur IP

+ 1,481 for the US court and 800 for the UK court

^For US court as in * with Dr Leonard's regional adjustments and 11.4% for "over-declaration"

~ The Court interprets Kakaes's 2 ratings as not essential, in favor of TCL

¬ The Court's depiction: Ericsson made >125 claim charts for 4G

Comparisons with figures derived by the Court (Decision pages 93, 98 and 101)

The rates for 4G are 1.074% in Option A and 1.988% in Option B

The top-down rates are:

	4G	10% aggregate
TCL SEP count		0.472%
Ericsson SEP count		0.753%

5. Conclusions

The top-down approach used in determining FRAND royalty rates in TCL v. Ericsson is significantly flawed. I have critically analyzed the detailed steps, assumptions and specific figures in the Court's analysis and decision. While the methodology could be significantly improved, it would be better to rely on other better-established and more reliable methods for assessing reasonable royalty rates.

Without citing any evidence of the alleged royalty-stacking and hold-up problems, or of how to prevent these without killing the goose that lays the golden eggs (i.e. 3GPP standards development is arguably the most successful example of innovation over recent decades),[38] the Court asserts that top-down methods ensure that royalty stacking and hold-up does not occur. There is no evidence of royalty stacking, that aggregate rates paid are even as high as those projected nor is there any cross-check whether the cited notional maximum aggregate royalty costs would actually be approached or exceeded at TCL or other licensees with the rates sought by Ericsson and other prospective licensors. Equally, there is no proof of a systemic problem of hold-up, or any evidence of hold-up cited by the Court in this case.

The patent-counting methods adopted by the Court have not been shown to be accurate (i.e. true error rates in determinations are unknown) or reliable (i.e. reproducible on a properly independent basis). To the contrary, there is plenty of evidence showing that patent-counting studies are in general inaccurate and unreliable — particularly where assessors spend no more than tens of minutes per patent or patent family at a cost of only a hundred or so dollars per determination, as opposed to a much more thorough analysis including claim charts (Ericsson spent approximately 50 hours per patent family preparing these) and file histories at a cost of $10,000 or more per patent family, for example, by patent pools. The scope for significant bias is also enormous because determinations are so subjective, with wildly differing estimates (i.e. by large multiples of more than 10 in some cases) of companies' shares of cellular technology SEPs, from study to study, as the results among third-party studies indicate.

In the case of patent pools, would-be licensees voluntarily opt in, by submitting their patents, claim charts and file histories to independent assessors appointed by the patent pool administrators. This is in marked contrast to the imposition of the cursory patent analysis of TCL's experts, who were not neutral and knew the identity of the parties including their client in this litigation.

The focus of this paper was to evaluate and comment upon the Court's top-down analysis. I have left it for others, or for me later, to examine other more meritorious valuation methods including comparable licenses and ex-standard valuation methods.

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[38] http://www.wiseharbor.com/wp-content/uploads/2016/12/Mallinson-FINAL.pdf

About this publication and its author

This article was originally published in IP Finance and on the SSRN, 30th April 2018.

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."

The author can be contacted at WiseHarbor. His email address is kmallinson@wiseharbor.com and you can also follow him on Twitter at http://twitter.com/WiseHarbor.

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