DISCOVERING OR SETTING AGGREGATE ROYALTIES AND FRAND RATES FOR SEP PORTFOLIOS

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I. INTRODUCTION

Fair Reasonable and Non-Discriminatory (FRAND) licensing[1] for Standard-Essential Patents (SEPs)[2] has worked well in communications technologies that have provided soaring performance and interoperability among networks, applications, and devices over the last 30 years. Market-based royalty rates have been established largely through bilateral negotiations in cellular communications with 2G, 3G, and 4G technology standards, and with patent pooling of video and audio compression technology standards such as AVC/H.264 and AAC.[3] Total royalties paid for all SEP licensing are no more than around five percent of mobile phone product revenues, and rather less

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WiseHarbor is a global analyst and consulting firm serving companies, industry associations and government clients. Founded in 2006, WiseHarbor has remained focused on the ever-expanding and changing ecosystem in wireless and mobile communications as it connects people and an increasing array of things — from wearables and connected buildings to autonomous vehicles and industrial robots — and in transformation of many different markets and industry verticals. For more information, visit https://www.wiseharbor.com.

[1] For example, according to standard setting organization (SSO) ETSI, as applicable to various cellular standards including 4G and 5G, "IPR holders whether members of ETSI and their AFFILIATES or third parties, should be adequately and fairly rewarded for the use of their IPRs in the implementation of STANDARDS and TECHNICAL SPECIFICATIONS." ETSI Intellectual Property Rights Policy, Annex 6, Section 3.2 (Nov. 2022).

[2] These are patents that read on standards. In other words, such standards cannot be implemented without infringing those numerous patents owned by many different companies. An SSO will not include an SEP technology in a standard without a corresponding FRAND commitment.

[3] Market-based royalty rates are those negotiated with due regard for i) how valid patented technologies confer value to applications, *see* Georgia-Pacific Corp. v. U.S. Plywood Corp., 318 F. Supp. 1116, 1120 (S.D.N.Y. 1970), ii) established royalty-rate benchmarks including the extent to which these are underpinned through volumes and values of licensed trade over the years, Karl Fink, *Where Is the Federal Circuit on Using Comparable Licenses to Prove Reasonable Royalties and Apportionment in Patent Cases?*, JD SUPRA (Feb. 2022), and iii) the extent to which parties are "similarly situated" in the market, *see* Dennis Carlton and Allan L. Shampine, *An Economic Interpretation Of Frand*, 9(3) J. COMPET. L. ECON. 531-52 (2013).

than that on other devices and applications.[4] Aggregate amounts paid have remained rather flat over the last decade despite the introduction of new technologies and standards such as 5G, since 2019.[5] The technology transferred through licensing from SEP owners such as Ericsson, Interdigital, Nokia, and Qualcomm to implementers including smartphone Original Equipment Manufacturers (OEMs) Apple, Samsung, Sony, and Xiaomi has brought widespread commercial success and consumer satisfaction across a large and ever-expanding ecosystem.[6] Mobile voice and texting revolutionized personal communications with massive adoption globally in the 1990s and 2000s. Smartphones, which provide fast data connections to networked applications such as Instagram in social media, Netflix in video streaming, and Google's Maps in navigation, have prevailed worldwide since the mid-2010s. By yearend 2022, 5.4 billion people subscribed to a mobile service, including 4.4 billion who also used the mobile Internet.[7] Mobile connectivity is extending revolutionary change beyond personal communications to the Internet of Things (IoT) with a total now of more than 16 billion cellular devices.[8]

Notwithstanding the evident efficacy and efficiency of standards development and SEP licensing that has enabled the improvements in technical performance, commercialization, and consumer adoption, some European and US interests are lobbying for rate-setting of aggregate and individual licensors' royalties.[9] In absence of economic logic or supporting evidence that royalties are harmful, unfair, or excessive, major implementers in Big Tech and automotive industries are self-servingly seeking to reduce their royalty

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4 Keith Mallinson, *Cumulative Mobile-SEP Royalty Payments No More Than Around 5% of Mobile Handset Revenues*, IP FIN. (Aug. 19, 2015), http://www.ip.finance/2015/08/cumulative-mobile-sep-royalty-payments.html [hereinafter Mallinson, *Cumulative*]; Alexander Galetovic, Stephen Haber & Lew Zaretzki, *An Estimate of the Average Cumulative Royalty Yield in the World Mobile Phone Industry: Theory, Measurement and Results*, 42 TELECOMM. POL'Y 263 (Apr. 2018); J. Gregory Sidak, *What Aggregate Royalty Do Manufacturers of Mobile Phones Pay to License Standard-Essential Patents?*, 1 CRITERION J. INNOVATION 701 (2016).

5 Keith Mallinson, *The Smartphone Royalty Stack: A long-term look*, IAM (Mar. 2, 2022), https://www.wiseharbor.com/wp-content/uploads/2022/04/Special-Report-2022-Q1_-Patent-Dealmaking-IAM-Smartphone-royalty-stack.pdf.

6 Keith Mallinson, *Don't Fix What Isn't Broken: The Extraordinary Record of Innovation and Success in the Cellular Industry Under Existing Licensing Practices*, 23 GEORGE MASON L. REV. 967 (July 2016) [hereinafter Mallinson, *Don't Fix What Isn't Broken*].

7 GSMA Intelligence, The Mobile Economy 2023, 3 (2023).

8 The Radicati Group, *Forecast Number of Mobile Devices Worldwide from 2020 to 2025*, STATISTA (Apr. 2021), https://www.statista.com/statistics/245501/multiple-mobile-device-ownership-worldwide.

9 Gordon G. Change, *Why is Europe Helping China Decimate U.S. Tech Leadership*? NEWSWEEK (Sept. 6, 2023), https://www.newsweek.com/why-europe-helping-china-decimate-us-tech-leadership-opinion-1825029.

costs.[10] Misguided legislative proposals are based on poorly supported and dubious assertions that there is insufficient transparency in royalty rates and that rates offered by some licensors are supra-FRAND. While increasing disclosures on existing licensing would improve transparency, to instead set rates anew will harmfully upset what has been proven to work well with no sign of market failure. Proposed legislative changes are attempting to abandon or diminish well-established market-based mechanisms in determining royalty charges. It seems that processes of commercial negotiation in establishing rates and applying comparable licensing benchmarks derived from existing licenses could be replaced by the "top-down approach" in which a notional aggregate royalty is apportioned among SEP owners based on their respective applicable patent counts.[11] While there are many legal, economic, and commercial reasons why the proposed regulation should not be pursued, if aggregate rate setting and apportionment of royalties is to be employed it is essential that governance, organizational processes, and analytical methodologies are fit for purpose. While this article touches on many different important issues, it focuses principally on the economics and commercial factors in the methodologies and metrics to be used in deriving figures for aggregate royalties and individual FRAND rates using the top-down approach. My objective here is to highlight issues including shortcomings and to prescribe how — if aggregate rate setting and top-down apportionment are to be used at all — reasonably accurate, reliable, fair, and consistent rates can be set. These are necessary to ensure ongoing successful development, implementation, and consumer adoption of standard-essential technologies in the anticipated widening array of applications.

This article is largely based on the two submissions I made to the European Commission in response to its request for feedback on its draft legislation and impact assessment report, published April 27, 2023.[12] I have also

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[10] Brooke Masters, *What the Great EU Patent Fight Means for Global Competition*, FIN. TIMES (Aug. 2023), https://www.ft.com/content/ebd533a7-b8d1-4d51-bd2e-8288c60490d1.

[11] An early appearance and judicial implementation of such a technique was in Judge Holderman's 2013 Opinion in *In re Innovatio IP Ventures, LLC*, 956 F. Supp. 2d 925 (N.D. Ill. 2013). Significantly different implementations of a top-down approach have also been applied in other judgements, including in *Unwired Planet Int'l Ltd. v. Huawei Tech. Co. Ltd.*, [2020] UKSC 37 and in *TCL Comm'n. Tech. Holdings, Ltd. v. Telefonaktiebolaget LM Ericsson*, 2017 U.S. Dist. LEXIS 214003 (C.D. Cal. Mar. 9, 2018) (unanimously and entirely reversed on appeal).

[12] Feedback on draft EU legislation for SEPs by Keith Mallinson: Keith Mallinson, Comment Letter on Proposal for a Regulation of the European Parliament and of the Council on Standard Essential Patents and Amending Regulation (June 14, 2023), https://www.wiseharbor.com/wp-content/uploads/2023/06/Mallinson-SEP-consultation-response-14-June-2023.pdf [hereinafter Mallinson June]; Mallinson, Comment Letter on Proposal for a Regulation of the European Parliament and of the Council on Standard Essential Patents and Amending Regulation (Aug. 8, 2023), https://www.wiseharbor.com/wp-content/uploads/2023/08/Aggregate-rate-setting-Mallinson-WiseHarbor-2023.08.08.pdf [hereinafter Mallinson August]; European Commission, *Regulation Of The European Parliament And of The Council,* (EU)2017/1001 (Apr. 2023), https://single-market-economy.ec.europa.eu/system/files/2023-04/COM_2023_232_1_EN_ACT_part1_v13.pdf [hereinafter European Commission]. My

repeated some astute and valuable insights provided by others in their feedback to the Commission.

II. EU AND US PROPOSALS SUBSTITUTE RATE SETTING FOR NEGOTIATED RATES BASED ON COMPS.

A. *Established FRAND Licensing Practices*

If a prospective SEP licensor can demonstrate it owns infringed and valid patents it is entitled to a FRAND license. Where charges and other terms have been established in existing licenses, some of these might be comparable benchmarks for determining licensing charges in other agreements. In litigation, comparable licenses are generally considered to provide the very best benchmarks in determining royalty charges.[13] Some of these benchmarks become publicly available (e.g., in court decisions) so they are also used in separate licensing negotiations. The applicability and comparability of existing licenses depends upon the extent to which these are substantiated by licensed trade, the timing of that, and how similarly situated prospective licensees are (e.g., anticipated volumes and values in licensed trade). Absent these benchmarks or in addition to them, parties in patent licensing negotiations consider many other factors. These include the value standard-essential technologies bring to devices, size and quality of patent portfolios including product infringement and validity considerations. Focus is typically on "proud lists" of up to fifteen selected patents; patent litigation history is also pertinent.[14] FRAND licenses are typically negotiated in global agreements. When the courts are asked to adjudicate in disputes, courts may make FRAND rate determinations only for SEPs issued in their own countries, or for all SEPs worldwide that would likely be included if the license had been negotiated by the parties. This raises various inter-jurisdictional issues.

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submissions include additional detailed analysis on some economic and commercial issues I have omitted here in the interests of brevity. For example, I explain the inapplicability of using patent pool royalty rates as aggregate royalty figures for apportionment in bilateral rate-setting.

13 For example, in *Unwired Planet* decisions where the courts were able to review numerous confidential licensing agreements. [2020] UKSC 37.

14 "[L]icense negotiations outside litigation tend to focus on a 'proud list' of patents, although licensees typically wish to extend the license to all potentially relevant patents in the licensor's portfolio and all of the licensee's potentially relevant products (or, at least, all those in a given category or field of use). Similarly, patent holders generally tend to not bring suit over every patent that they might assert against the defendant, but rather choose to sue over a relatively small group of patents (a 'proud list') that have the greatest likelihood of being seen as (i) valid, (ii) infringed by a significant portion of the prospective licensee's product and service offerings, and (iii) valuable (i.e., contribute significant additional profit to the sales of those products)." Michael P. Akemann, John Blair & David Teece, *Patent Enforcement in an Uncertain World: Widespread Infringement and the Paradox of Value for Patented Technologies* 7 (Tusher Ctr. for Mgmt. Intell. Cap., Working Paper No. 6, 2014), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2845002.

While detailed analysis of these issues is beyond the scope of this article, concerns arising from these are significant factors in instigations such as that in the US to prohibit the recognition of FRAND rates set for US patents by foreign courts and to establish a US rate-setting tribunal for US patents. The proposed EU legislation would also result in rate setting. I consider the governance and organizational processes before focusing on the computational methodologies to be employed in such rate setting.

B. *New Regulation for SEPs in the EU*

1. Proposed legislation

The Commission has published its proposed legislation along with an impact assessment report.[15] The former states that "The overall objectives of [its] proposed initiative are to:

a) ensure that end users, including small businesses and EU consumers benefit from products based on the latest standardised technologies;
b) make the EU attractive for standards innovation; and
c) encourage both SEP holders and implementers to innovate in the EU, make and sell products in the EU and be competitive in non-EU markets."

Its initiative seeks to:

i. "make available detailed information on SEPs and existing FRAND terms and conditions to facilitate licensing negotiations;
ii. raise awareness of SEP licensing in the value chain and
iii. provide for an alternative dispute resolution mechanism for setting FRAND terms and conditions."[16]

The proposed regulation:

I. "requires the registration of all SEPs in force in EU Member States before the newly established Competence Centre at the EU

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[15] *See* European Commission, *supra* note 12; European Commission, *Impact Assessment Report: Regulation of the European Parliament and of the Council,* (EU)2017/1001 (Apr. 2023), https://single-market-economy.ec.europa.eu/document/download/a009816a-3b24-46c8-9c3c-fd8bd89a1380_en?file-name=SWD_2023_124_1_EN_impact_assessment_part1_v4.pdf [hereinafter Impact Assessment Report].

[16] European Commission, *Explanatory Memorandum: Regulation of the European Parliament and of the Council,* (EU)2017/1001 (Apr. 2023), https://single-market-economy.ec.europa.eu/document/download/b7501cc3-febe-40ee-b4a0-6cd5a63a860c_en?file-name=COM_2023_232_1_EN_ACT_part1_v13.pdf.

Intellectual Property Office (EUIPO), as a pre-condition for litigation of SEPs in the EU;
II. provides for annual essentiality checks of registered SEPs;
III. introduces a system of notification of aggregate royalty rates for standards, and requires entering into mandatory FRAND determinations before initiating SEP litigation in the EU."[17]

The Commission indicates "uncertainty about the SEP royalty burden" and that "Stakeholders consider that the FRAND licensing concept could benefit greatly from some clarification, notably with regard to the determination of an aggregate royalty burden."[18] The proposed regulation also notes that "[i]n view of the global character of SEP licensing, references to aggregate royalty and FRAND determination may refer to global aggregate royalties and global FRAND determinations, or as otherwise agreed by the notifying stakeholders or the parties to the proceedings."[19] The proposed regulation and the above processes are evidently far from being fully defined, let alone planned out for execution. The Competence Centre needs to be set up from scratch. The EUIPO does not yet have any of the required expertise in SEPs, FRAND licensing, essentiality checking, aggregate rate setting, and individual royalty rate determination. It would be very enlightening if, instead of setting rates anew, a large and representative sample of implementers were to disclose how much they actually pay to individual licensors and in aggregate for various standards. Unhelpfully, such information is highly confidential. However, court decisions based on extensive review of executed licenses and associated licensed trade, including several in the UK, are already providing some indications of aggregate figures, notwithstanding redactions. If a trusted third party could confidentially collect such information more extensively it could calculate and publicly reveal various averages and ranges while preserving anonymity and not revealing individual royalty rates. Such ex-post figures could provide a most valuable indicator of aggregate royalties to be paid by others and such figures could be compared with the various ex-ante and other royalty rate figures disclosed (e.g., in licensors' rate cards). It is puzzling that the Commission has seemingly not sought to look into the horse's mouth in this way in its stated quest to increase transparency on aggregate royalty costs.

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[17] Igor Nikolic*, Some Practical and Competition Concerns with the Proposed Regulation on Standard Essential Patents,* 4IP COUNCIL 1 (July 3, 2023), https://www.4ipcouncil.com/application/files/4616/8847/4214/2023.07.03_Proposed_Regulation_on_Standard_Essential_Patents__1.pdf.

[18] European Commission*, supra* note 12, at 8; Impact Assessment Report, *supra* note 15.

[19] European Commission, *supra* note 12, at 27.

2. Regulated Procedures

Despite the use of well-established licensing benchmarks and negotiating practices in determining royalty rates, there is significant dispute about how else, if at all, to value SEP portfolios and determine FRAND royalty charges for these. According to the impact assessment, "[a]lthough an impressive amount of scholarship has analyzed or interpreted the FRAND concept, this scholarship is characterized by persistent differences of opinion on key aspects of the FRAND concept such as royalty evaluation methods and obligations to license certain parts of the relevant industry."[20] My article critically analyses alternative valuation methods for aggregate and individual SEP owners' royalties. The Commission clearly expects aggregate royalties to be determined for some technology standards and that these in turn will be apportioned among SEP owners. As the impact assessment indicates from the results of its literature analysis: "An aggregate royalty for a standard is the royalty due for all SEPs on the standard. It is the starting point in a top-down determination of the royalty to be paid for a given portfolio."[21]

The Commission's proposals imply that SEP holders — including net licensors and net licensees — would voluntarily participate in negotiating aggregate royalties and proposing these to the EUIPO:

- "Holders of SEPs in force in one or more Member States for which FRAND commitments have been made may jointly notify the competence centre the aggregate royalty for the SEPs covering a standard." The notification shall contain information on "the estimated percentage of SEPs they own collectively from all SEPs for the standard."[22]
- "Holders of SEPs in force in one or more Member States representing at least 20 % of all SEPs of a standard may request the competence centre to appoint a conciliator from the roster of conciliators to mediate the discussions for a joint submission of an aggregate royalty."[23]
- "A SEP holder or an implementer may request the competence centre for a non-binding expert opinion on a global aggregate royalty" to be made within 150 days of publication of the relevant standard or new implementations being sold in the EU.[24]

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20 Impact Assessment Report, *supra* note 15, at 86.

21 *Id.* at 118-119.

22 European Commission, *supra* note 12, at 35, Art. 15.

23 *Id.* at 36, Art. 17.1.

24 *Id.* at 37-38, Art. 18.

The Commission's willingness and intent to set global aggregate royalty rates is in conflict with its focus on SEPs in force in EU Member States.[25]

The aggregate rate notification deadline of 150 days from publication of the standard is unrealistic because this is insufficient time to know how a standard will be implemented. In a recent paper for 4iP Council, Dr. Igor Nikolic, Research Fellow at the European University Institute, notes that patent pool experience shows "it may take years for patent owners to agree on mutually acceptable and market-realistic rates."[26]

Notwithstanding collective public announcements in the 2000s on aggregate rate objectives for 3G and 4G, and with statements these were not caps, as discussed in Section III(E)(2)(d), major licensors have made no such announcements since then. Nevertheless, to the dismay of some SEP owners, some courts have regarded such statements as binding commitments to cap royalties while disagreeing with the major licensors making them about how those statements should be interpreted.[27]

The Commission also proposes essentiality checking by EUIPO assessors. SEP owners have shunned such a voluntary system in Japan.[28] There is no evidence that these European proposals will be any more welcome.

The Commission seeks that the essentiality of all patents or a representative random sample of them reading on standard are checked — not only small numbers of them (i.e., 50 or fewer) per patent owner's portfolio.[29] This stealthily implies that it wants patent counts to be used as measures of patent strength — as required in top-down approach FRAND rate setting — even though this widely contested apportionment method is not explicitly identified or advocated in the proposed legislation. I analyze such methods and their shortcomings in Sections III(C) and III(D).

The proposed EU legislation makes only one mention of comparable licenses — in passing when describing difficulties including transparency and complexity in making FRAND determinations.[30] The impact assessment includes references to comparable licenses to acknowledge that they are used

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25 "In view of the global character of SEP licensing, references to aggregate royalty and FRAND determination may refer to global aggregate royalties and global FRAND determinations, or as otherwise agreed by the notifying stakeholders or the parties to the proceedings." European Commission, *supra* note 12.

26 Nikolic, *supra* note 17, at 1.

27 For example, the *TCL* decision states, "the Court is unconvinced by [the Ericsson witness'] attempt disavow Ericsson's commitment to calculate royalties based on a proportional share of a total aggregate royalty capped at a modest single digit" and the decision mistakenly regards announced aggregate royalty goals as being multimode rather than single-mode rates. *See TCL*, 2017 U.S. Dist. LEXIS 214003 at *21; Mallinson August, *supra* note 12, at 14-15. While that decision was unanimously and entirely vacated on appeal, much of it is still relied on in expert FRAND licensing analysis including in litigation.

28 European Commission Joint Research Centre, Rudi Bekkers et al., *Pilot Study for Essentiality Assessment of Standard Essential Patents*, EUR 30111 EN 51-54 (2020), https://publications.jrc.ec.europa.eu/repository/handle/JRC119894.

29 The EU's proposed legislation includes the word "sample," "sampling," and "sampled" a total of 21 times. European Commission, *supra* note 12.

30 European Commission, *supra* note 12, at 34-38.

and to indicate that some are dissatisfied with the extent of disclosure of existing licensing terms and licenses. It goes no further than stating under the Section IV heading "Qualitative royalty apportionment criteria" that "Other criteria that could be considered include comparable licenses, technical importance of the claimed subject matter to the product, technical contributions to the standard, technical contributions to key features of the standard."[31] Neither document finds that the established royalty charges in existing licenses are excessive or inapplicable FRAND licensing benchmarks. There is no discussion of how disclosures might be increased.

3. Antitrust Concerns

Dr. Igor Nikolic also indicates, in his recent paper, concern about possible buyers' cartel effects (i.e., monopsony rate-setting).[32] He states, "it is unclear from the text of the Draft SEP Regulation if implementers are allowed to coordinate their submissions to conciliators."[33] He is concerned that "implementers might use the process to exchange commercially sensitive information and agree on the maximum global aggregate royalties they would pay."[34]

He is also uneasy that the draft regulation does not include the "competition safeguards against the exchange of commercially sensitive information in the process of joint notification of aggregate royalty rates."[35] Patent pools "are expressly required by the Technology Transfer Guidelines to prevent the exchange of sensitive commercial information among their members."[36]

From an economic standpoint, price coordination (i.e., of royalty rates) among some SEP owners ought not to be problematic; but only so long as other licensors are not bound by such pricing. SEPs are necessarily complements — patented technologies are not in competition with each other once they have been selected for use in a standard and have become SEPs — and so the implementation and licensing of all of them is required.[37] Competition

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31 Impact Assessment Report, *supra* note 15, at 215.

32 Nikolic, *supra* note 17.

33 *Id.* at 4.

34 *Id.*

35 *Id.*

36 *Guidelines on the Application of Article 101 of the Treaty on the Functioning of the European Union to Technology Transfer Agreements* 2014 O.J. (C 89/03) ¶¶ 259-61.

37 Cournot complements theory indicates that prices will be higher when complementary inputs are monopolized by different suppliers acting independently. *See generally* ANTOINE-AUGUSTIN COURNOT, RECHERCHES SUR LES PRINCIPES MATHÉMATIQUES DE LA THÉORIE DES RICHESSES (1838). There were some joint announcements including several SEP owners (that were also major device implementers at the time) that aimed to limit aggregate rates in 3G and 4G. However, others were not and should not be bound by such statements, and some have publicly rejected any suggestion they should be. As stated by Qualcomm in 2008, "Contrary to recent claims by a small number of manufacturers, FRAND does not,

authorities prevent anticompetitive effects by requiring that substitutes are not included in patent pools. This is one reason why essentiality checking is sometimes required by competition authorities to be undertaken by patent pools. Standard setting requires the selection of the best technology to perform a particular function so any alternative patented technology will not be included.

However, it should also be recognized that there is no clear line between implementers and SEP owners. Many SEP owners are also SEP implementers manufacturing or selling standard-based products. Submissions as SEP owners would thus likely also reflect some interests — possibly predominating interests — as implementers, and vice versa. Examination of patent pooling practices illustrates that rates for these agreed by the SEP owners are significantly affected by some of them also being major implementers that have more to gain through reduced outpayments at lower royalty rates than they would gain from higher in-payments if royalty rates were higher.[38] An extreme example of this phenomenon is in royalty-free pooling that dominates in the licensing of the widely adopted Bluetooth, USB, and DOCSIS standards. SEP owners forgo the possibility of any royalty income so they can implement standards without having to pay any royalties.

4. Governance, Process and Quality Control in Expert Determinations

Robust economic and statistical processes are required in rate setting. Scientific principles should be applied, including the need for reproducibility of results. The proposed legislation requires that "[t]he checks will be conducted based on methodology that ensures a fair and statistically valid selection capable of producing sufficiently accurate results about the percentage of truly essential patents among each SEP holder's registered SEPs."[39] The impact assessment also hopes that "if the register will be perceived by SEP holders as a means of indicating portfolio strength (and e.g. used in negotiations to determine the share of aggregate royalty applicable to them), they may increase the number of registered patents."[40]

It is unclear how the EUIPO will ensure that quality and consistency in rate setting and apportionment is achieved. Nevertheless, the aggregate rates set and their apportionments will seemingly be justified by the impressive

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and never has, prescribed formulas for imposing cumulative royalty caps or proportional allocations of such royalty caps. Such formulas 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." Qualcomm, *LTE/WiMax Patent Licensing Statement* (Dec. 2008), www.qualcomm.com/content/dam/qcomm-martech/dm-assets/documents/lte-wimax-patent-licensing-statement_1.pdf.

38 Mallinson August, *supra* note 12, at 4-6.

39 European Commission, *supra* note 12 at 13, Art. 29.

40 Impact Assessment Report, *supra* note 15, at 37-41.

academic and other credentials of those who are chosen to make such determinations.

It is fanciful to believe that sub-contracting to a slew of economic, technical, and other kinds of experts to *make up* aggregate royalty values will produce better, fairer, or truer rates than those derived in market-based rates negotiated in bilateral licenses and offered by patent pools in competition to those on behalf of coordinated collections of SEP owners. Instead, processes will be susceptible to political capture, and rates derived will be significantly affected by interest group lobbying, self-interest, or conflicted interests of external experts as the proposed new Competence Centre is set up, governed, and operated.

Possibly even worse, absent adequate governance, leadership, and some standardization in the evaluation methods employed, results produced will be inconsistent and derivations will be opaque.

Expert opinions about aggregate and individual FRAND rates vary considerably. Empirical research also shows that different assessors tend to disagree with each other in around one quarter of their essentiality determinations.[41] That is worse than it might seem given that they would agree with each other in 50% of their determinations if one of the assessors was randomly making determinations based only on a coin flip.[42] High levels of disagreement on individual patents do not cancel out even when determinations are made on numerous patents. Shares of total patent counts determined essential for individual major SEP owners differ between assessors by double-digit multiples in some cases.[43]

Ericsson's feedback to the Commission on the proposed EU regulation identifies major concerns about how expertise will be applied including that:

> There also seems to be some confusion over the exact role the competence center will play going forward as many of the tasks the center is mandated with will be executed by external consultants. Indeed, the essentiality assessment, FRAND determination and aggregate royalty opinion will be done by external evaluators and conciliators. This was recently confirmed by the executive director of EUIPO Christian Archambeau indicating that "the EUIPO will not be an 'expert' as such in patent issues but will work as an administrative entity."
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> Thus, there seems to exist no plan to build up patent (or standard) expertise within the competence center. This is worrying as it is unclear how the center will be able to evaluate the quality of the work performed by the external advisors, their independence or to

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41 Bekkers et al., *supra* note 28; Rudi Bekkers et al., *Overcoming Inefficiencies in Patent Licensing: A method to assess patent essentiality for technical standards*, 51 RSCH. POL'Y 104590 (2022).

42 Keith Mallinson, *Essentiality Rate Inflation and Random Variability in SEP Counts with Sampling and Essentiality Checking for Top-Down FRAND Royalty Rate Setting* (Nov. 24, 2021), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3933944 [hereinafter Mallinson, *Essentiality Rate Inflation*].

43 Keith Mallinson, *Do Not Count on Accuracy in Third-Party Patent-Essentiality Determinations*, IP FIN. (May 12, 2017), http://www.ip.finance/2017/05/do-not-count-on-accuracy-in-third-party.html.

> ensure consistency of the work performed by them. How will the center be able to train the external consultants if its tasks are of a purely administrative nature?[44]

Deriving applicable aggregate rates and determining patent essentiality, let alone portfolio value, are highly subjective processes that tend to produce widely varying results. Consistency of procedures and in outcomes is required.

Notwithstanding hazards such as the threat of political capture, and the need to safeguard against that, there needs to be some intellectual leadership on how to set aggregate rates, or select them from among proposals, and then apportion them among licensors. The EUIPO evidently lacks that competence. Governance, operational processes, and evaluation techniques are undefined but need to be sound to ensure consistent quality with economically optimal and fair rates. For example, the proposed regulation merely states that the "examination of essentiality shall be conducted following procedure that ensures sufficient time, rigorousness and high-quality."[45] Specifics have been left for an implementing act.[46]

Left to their own devices, aggregate rates set by different conciliators acting independently will likely come up with aggregate royalty figures that will be very disparate. As noted by Justus Baron, in 2023, "[o]verall, the process described in the proposed SEP regulation is likely to result in disparate and largely arbitrary opinions on aggregate royalties." Article 18 of the proposed EU legislation also provides for the Competence Centre to provide a "non-binding expert opinion on a global aggregate royalty." With the evident major differences of opinion among experts, outcomes will be a haphazard "luck of the draw" given that the determination will be made by a conciliator or majority voting in a panel of three conciliators.[47]

In the real world, so far, experts only provide input to final decisions made by others on royalty rates and other important terms in FRAND licensing. Experts advise their respective clients who make final agreements in bilateral negotiations. In litigation, determinations follow the courts' consideration of often widely differing expert testimony from opposing parties. In recent litigation, including *Unwired Planet v. Huawei*,[48] *TCL v. Ericsson*,[49]

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44 Telefonaktiebolaget LM Ericsson, Julia Brito, Comment Letter on Proposal for a Regulation of the European Parliament and of the Council on Standard Essential Patents and Amending Regulation 9 (Aug. 10, 2023), https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/13109-Intellectual-property-new-framework-for-standard-essential-patents/F3434449_en (citation omitted).

45 European Commission, *supra* note 12 at 45, Art. 31(1).

46 *Id.* at 42-43, Arts. 26(5), Art. 29(1).

47 Justus A. Baron, *The Commission's Draft SEP Regulation – Focus on Proposed Mechanisms for the Determination of Reasonable Aggregate Royalties* 13-16 (Aug. 14, 2023), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4537591.

48 *Unwired Planet*, [2020] UKSC 37.

49 943 F.3d 1360.

Interdigital v. Lenovo,[50] and *Optis v. Apple*,[51] metrics and amounts are finally determined by the courts in FRAND trial decisions or by the parties in settlement negotiations (e.g., following the unanimous and entire reversal on appeal of the *TCL v. Ericsson* decision).

As noted by Qualcomm in its feedback to the Commission on the proposed EU regulation:

> In two of the last three major FRAND determination decisions – *Unwired Planet v. Huawei* and *IDC v. Lenovo* – sophisticated parties with tens to hundreds of millions of dollars at stake, with access to the best experts and advocates in the world, in a forum with due process and procedural safeguards, and with a lot more time to develop a case than eight months were unable to provide reliable evidence from which the courts could find an aggregate royalty. In the other case, *Optis v. Apple*, the court rejected both parties' arguments that there was a single correct aggregate rate applicable to all, and instead calculated an aggregate applicable only to Apple and based on a subset of Apple's own license agreements. Thus, in each of these cases , [sic] despite the parties' best efforts, the courts found no reliable evidence from which they could derive a broadly applicable aggregate rate. There is no reason to believe – and much reason to doubt – that the abbreviated "opinion" proceeding of the Proposal would achieve a different result.[52]

The *Interdigital v. Lenovo* decision illustrates how disparate evaluations can typically be despite parties each spending millions of dollars in expert fees over a year or so. Parties differed by a factor of 4.2 in their last FRAND offers.[53] The court's $138.7 million lump sum award was much closer to Lenovo's $80 million offer than it was to Interdigital's most recent "5G Extended Offer" including a complex collection of terms that was translated into an equivalent lump sum figure of $337 million by Interdigital's accountancy expert. Interdigital agreed that the court should determine a lump sum.[54] The court shunned ad valorem rate comparisons and based its comparisons on monetary amounts per unit.[55] In the *Interdigital v. Lenovo* decision Justice Mellor was critical of Judge Selna stating in his *TCL v. Ericsson* decision that "'Ericsson's use of floors in its rates is itself discriminatory.'"[56] Despite extensive expert work, Justice Mellor rejected the top-down approach, even only as a cross-check, at least "as pleaded" in that case.[57]

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50 Interdigital Technology Corporation & Ors. v Lenovo Group Ltd., [2023] EWHC 539 (Pat).

51 Optis v. Apple, [2023] EWHC 1095 (Ch).

52 Qualcomm Inc., Jillian Mertsch, Comment Letter on Proposal for a Regulation of the European Parliament and of the Council on Standard Essential Patents and Amending Regulation 10 (Aug. 10, 2023), https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/13109-Intellectual-property-new-framework-for-standard-essential-patents/F3434463_en (citations omitted).

53 *Interdigital Technology*, [2023] EWHC 539, at [20]-[22], [26].

54 *Id.* at [20]-[22], [26], [944].

55 *Id.* at [22].

56 *Id.* at [268]-[269] (quoting TCL Commun. Tech. Holdings, Ltd. v. Telefonaktiebolaget LM Ericsson, No. CV 15-2370 JVS(DFMX), 2017 WL 6611635, at *57 (C.D. Cal. Dec. 21, 2017)).

57 *Interdigital Technology*, [2023] EWHC 539, at [881]

C. *Agency Policy and Proposed New Regulation in US With the SERA*

The US is eschewing FRAND rate-setting regulation and stipulation of rote valuation methods by withdrawing guidance from government agencies including the USPTO, NIST and DoJ, while proposed law-making has also been neutered in this aspect.

Following a couple of months' public consultation on a draft Policy Statement issued 6 December 2021,[58] on 8 June 2022 the USPTO, NIST and DoJ formally withdrew their joint 2019 Policy Statement while also indicating that the 2013 Policy Statement was not being reinstated.[59] These agencies decided that the courts were best placed in furthering "the interests of innovation and competition" in SEPs and FRAND licensing, "and as enforced by DoJ and other agencies," without any of these three policies.[60]

Calls for new legislation arise from concerns about foreign (particularly Chinese) anti-suit injunctions, and judicial determinations of global FRAND rates have prompted US federal legislators to propose regulation to reduce the effect of foreign proceedings on US patents. Two such bills were proposed to the Senate Judiciary Committee in 2022: the Defending American Courts Act (DACA)[61] and the Standard Essential Royalty Act (SERA).[62]

The proposed SERA legislation alleges — without support — that piecemeal adjudication of SEPs has resulted in inconsistent awards, in some cases an unreasonable cumulative rate and has denied American manufacturers licenses on reasonable terms. It also dubiously asserts "*in the absence of an efficient system in the United States for determining reasonable royalties for standard-essential patents*, some patent owners and manufacturers have

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58 U.S. Dep't of Just., Draft Policy Statement on Licensing Negotiations and Negotiations and Remedies for Standards-Essential Patents Subject to Voluntary F/RAND Commitments (Dec. 6, 2021).

59 U.S. Dep't of Just., Withdrawal of 2019 Policy Statement on Remedies for Standards-Essential Patents Subject to Voluntary F/RAND Commitments (June 8, 2022).

60 *Id.* at 1-2.

61 S. 3772, 117th Cong. (2021). "If enacted, DACA would impose two types of penalties on a party that seeks to restrict an action for patent infringement before a U.S. court or the International Trade Commission (ITC) through the assertion of a foreign anti-suit injunction." Jorge L. Contreras, *A Statutory Anti-Anti-Suit Injunction for U.S. Patent Cases?*, 355 UTAH L. FAC. SCHOLARSHIP 4 (2022).

62 Standard Essential Royalties Act (Proposed Legislation), SENATE JUDICIARY COMMITTEE (2022), https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fipwatchdog.com%2Fwp-content%2Fuploads%2F2022%2F11%2FSERA-text.docx&wdOrigin=BROWSELINK. ("Purpose: To provide a . . . system for adjudicating reasonable royalties for patents that are essential to the implementation of interoperable technical standards"); William New, *Draft US Bill Proposes Federal SEP Royalty Court with Global Impact*, IAM, (Oct. 18, 2022), https://www.iam-media.com/article/draft-us-bill-proposes-federal-sep-royalty-court-global-impact; Jorge Contreras, *National FRAND Rate-Setting Legislation: A Cure For International Jurisdictional Competition In Standards-Essential Patent Litigation?*, CPI ANTITRUST CHRON., at 6 n.41, 7 (July 13, 2022), https://www.pymnts.com/cpi_posts/national-frand-rate-setting-legislation-a-cure-for-international-jurisdictional-competition-in-standards-essential-patent-litigation/ (claiming the proposed SERA "embodies some of the recommendations contained in this essay," many of which are highly interventionist and "resemble rate-setting hearings that are currently conducted with respect to utility rates and various forms of copyright licensing.").

resorted to foreign courts to set royalties for patents issued by the United States" and that "a foreign court's compelled adjudication of royalties for a United States patent violates the sovereignty of the United States."[63] The SERA would create a US judicial tribunal, to be known as the "Standards Royalty Court," to determine FRAND rates for US SEPs, notwithstanding the findings of any foreign court. According to one public policy commentator, the SERA "proposes a new federal court to decide FRAND rates where there are inconsistencies across domestic rulings, or where foreign courts hand down verdicts that disadvantage American patent holders. The bill is clearly written with China's and Europe's standard essential patents regimes in mind."[64]

However, 18 months on the SERA seems to be going nowhere with rate-setting. Alternative suggestions being discussed privately among interested parties now are light touch and require balance in disclosure obligations, for example, with a registry of patents declared potentially standard essential by their owners and a registry of devices declared standard-compliant by their producers.

D. *Transatlantic Comparisons*

The US and Europe are heading in different directions on how SEP royalties are determined in FRAND licensing disputes. US authorities are increasingly hands off, while proposed EU legislation constrains SEP enforcement and prescribes a valuation methodology, which a Chinese court has recently used to drastically and defectively undercut established rates.[65]

The recent EU Proposal has some similarities with the initially proposed SERA, but also has notable differences. That proposed version of SERA also anticipates determination of "an overall reasonable royalty rate or rates for implementation of the technical standard" and "each plaintiff's entitlement to its appropriate portion of that royalty rate."[66] However, the US proposal is for a court (without jury) where "[c]ases and controversies shall be heard and determined by a panel of at least three judges" with ability to demand "production of information or evidence from persons who are not a party to the action" and that can make binding rulings, rather than an administrative

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63 Standard Essential Royalties Act (Proposed Legislation), SENATE JUDICIARY COMMITTEE, §§ 2(9)-2(10) (2022) (emphasis added).

64 Marc L. Busch, *In the Latest 5G Fight, the US Should Support Market-based Patent Fees*, THE HILL (July 19, 2023), https://thehill.com/opinion/technology/4103521-in-the-latest-5g-fight-the-us-should-support-market-based-patent-fees/.

65 Keith Mallinson, *Race to the Bottom with Top-down Approach in FRAND Rate Setting for SEPs*, IAM (Jan. 23, 2024), https://www.wiseharbor.com/wp-content/uploads/2024/02/Race-to-the-bottom-with-top-down-approach-in-FRAND-rate-setting-for-SEPs-IAM.pdf [hereinafter Mallinson, *Race to the Bottom*].

66 Standard Essential Royalties Act (Proposed Legislation), SENATE JUDICIARY COMMITTEE, § 4.334(b) (2022).

agency with unclear governance and without such subpoena powers or legally binding authority.[67] Exhibit 1 summarizes some of the areas of commonality and divergence.

Exhibit 1: Comparison of Recent US and EU FRAND Tribunal Proposals[68]

	Proposed US Standard Essential Royalty Act (SERA) (June 2022)	**Proposed EU SEP Regulation (Mar. 2023)**[69]
Tribunal	A new federal court	EUIPO, an EU administrative agency
Authorization of collective negotiation of aggregate royalty burden	No	Yes
Binding effect	Binding in US	Non-binding
Effect on foreign FRAND determinations	Overrides foreign FRAND determinations for US patents	None
Confidentiality of decision	No	Yes
Creation of SEP registry	No	Yes
Essentiality testing	Possibly, though not required	Yes

Following a public consultation in 2022, the Commission sought written feedback on the new legislation it proposed in April 2023. In contrast to the extensive public debate and lobbying surrounding the proposed EU legislation since a draft version of it was leaked in March 2023, including 78

67 *Id.* at § 3.221.

68 Jorge Contreras, *The EU's Response to National Judicial Determinations of FRAND Royalty Rates,* PATENTLY O, (April 13, 2023), https://patentlyo.com/patent/2023/04/response-national-determinations.html.

69 This was a leaked draft version of the proposed regulation before its publication by the Commission. Nevertheless, depictions in this table remain consistent with final version of the proposed regulation that was published on April 27, 2023.

submissions to the Commission before its August 2023 deadline, there has been rather less public discourse on the proposed SERA legislation so far. Instead, in the US, various practitioners including licensees and licensors have worked together privately to seek common ground, compromise, and balance in improving disclosures for greater transparency and predictability in FRAND licensing.

The rest of this article focuses on practical matters in the setting of aggregate royalties for SEPs and in determining FRAND rates for individual licensors through apportionment of aggregate rates. Analysis is largely in consideration of the Commission's detailed proposals, but is also broadly applicable elsewhere, including in the US where the initially proposed SERA also requires aggregate royalty rate-setting and apportionment.

III. RATE SETTING AND APPORTIONMENT METHODS

A. *Definitions, Metrics, and Objectives*

According to the proposed EU legislation, "'aggregate royalty' means the maximum amount of royalty for all patents essential to a standard."[70] The Commission also indicates "uncertainty about the SEP royalty burden"[71] and that "[s]takeholders consider that the FRAND licensing concept could benefit greatly from some clarification, notably with regard to the determination of an aggregate royalty burden."[72]

Even the basis, as well as the level, of aggregate royalty rates in joint notifications will vary confusingly. For example, a group of SEP owners could announce an aggregate rate of $10 per end-product, another group announce a rate of 5% of the end-product price, while a third group would prefer a lower $1 per-product rate. And many licenses indicate lump sum payments. Translating between running-rate ad valorem and monetary amounts per unit, and between these and lump sum payment figures — in order to make comparisons — is always highly dependent on various subjective and often questionable assumptions. Aggregate royalty rates proposed to or set by the EUIPO's conciliators could be in quantification of the total payment burden or of the rate to be used in determining individual FRAND royalty rates with the *top-down approach* that apportions royalties among patent owners based on the relative strengths of their SEP portfolios.[73] The latter Aggregate Royalty Rate for Apportionment (ARRFA) should be a higher

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70 European Commission, *supra* note 12, at 27, Art. 2(10).

71 *Id.* at 8.

72 Impact Assessment Report, *supra* note 15, at 21.

73 European Commission, *supra* note 12, at 27, Art. 18(1) (stating that "[a] SEP holder or an implementer may request the competence centre for a non-binding expert opinion on a global aggregate royalty").

figure than the former to allow for SEPs that remain unlicensed and for which there is no payment.

Any aggregate royalty rates set must be precisely defined, derived, and applied. Aggregate rate setting for standards, as proposed by the Commission, will enable proposed rates to be depicted and manipulated in ways which are anticompetitive, unfair, and will under-value patented standard-essential technologies.

B. *Royalty Burden*

Aggregate royalty figures might be gleaned or derived somehow from among various different formulations of aggregate rates reported. However, these reported rates vary enormously, for example, global rates from more than 35% to less than 5% of a smartphone's selling price. The correct ARRFA for a top-down approach FRAND determination and the rather lower maximum aggregate rate implementers will need to pay will fall well within those two extremes.

In FRAND determinations for bilateral licensing there is always a shortfall between the ARRFA and what is actually paid because the SEPs in any given standard are never fully licensed. The aggregate rates from which bilateral licensing rates are derived are never fully paid due to notional royalty allocations to patents that remain unlicensed. Any aggregate royalty setting must recognize this difference if such rates are to be used to determine FRAND rates using the top-down approach.

To mitigate shortcomings in rate setting, some guiding principles must be established on what the "SEP royalty burden" and ARRFA should include and exclude, as well as how and by whom such rates should be derived and applied. The interests of both SEP owners and implementers must be safeguarded while reflecting industry realities with the many factors that shape varied financial and other terms in established licenses. Application of economic theory must have full and proper regard for what royalty figures reported in the industry represent and how licensing actually gets done. FRAND licensing is about various terms, not just rates.

However, there is no consensus even on whether there should be some kind of aggregate royalty capping, let alone what figures these should be or which methods ought to be used to derive them.[74] For example, some patent owners publicly disagreed with setting aggregate royalty goals at all, as announced by some other patent owners and technology implementers for 3G

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[74] Jorge Contreras, *Aggregated Royalties for Top-Down FRAND Determinations: Revisiting Joint Negotiation*, 65 UTAH LAW FACULTY SCHOLARSHIP (2017), https://dc.law.utah.edu/cgi/viewcontent.cgi?article=1064&context=scholarship.

and 4G in mobile phones in the 2000s.[75] Even those making the announcements did not regard aggregate figures as caps.

Even defining aggregate royalty is debatable: is this total a theoretical maximum that nobody would ever pay, a typical or average figure that would be or is actually paid after royalty-base caps (i.e., a different kind of cap than above) or sales volume discounts and with many patents remaining unlicensed? Or is it something in between? In my seminal research on aggregate royalty charges in 2015, I rebutted a common but speculative narrative based on misapplication of mid-19th Century economic theory regarding commodity complements — asserting that royalty charges could "stack" to as much as 30% of smartphone selling price — with my empirical proof that rates paid averaged no more than around 5%.[76] The difference is due to many factors including unlicensed patents, royalty-base caps, volume discounts, geographic discounts (e.g., for China), cross-licensing and pass-through rights bundled with chipset sales, as well as wishful thinking with the inflated expectations and demands of some patent owners.

Royalty charges — in lump sums, monetary figures per unit or ad valorem percentage rates, as parties agree — like most other negotiated prices, are usually established through consideration of market factors including value to customers, costs, and competition among various players.

C. *Top-Down Approach*

The top-down approach in deriving royalty charges for standard-essential patents requires the setting of aggregate royalties for specific standards and applications. These rates are then notionally apportioned among patent owners — typically including those that do not license and will never collect any royalties — based on a patent strength metric. Top-down approach rate determinations have been proposed to the courts by litigants in various SEP FRAND trials for more than a decade.[77] The top-down approach has several

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[75] For example, in 2008, Qualcomm stated "Contrary to recent claims by a small number of manufacturers, FRAND does not, and never has, prescribed formulas for imposing cumulative royalty caps or proportional allocations of such royalty caps. Such formulas 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." LTE/WiMax Patent Licensing Statement, QUALCOMM (Dec. 2008), www.qualcomm.com/content/dam/qcomm-martech/dm-assets/documents/lte-wimax-patent-licensing-statement_1.pdf.

[76] Mallinson, *Cumulative*, *supra* note 4; *see also* Galetovic et al., *supra* note 4 (replicating, validating, and refining my analysis and findings in Mallinson, *Cumulative*, *supra* note 4); Sidak, *supra* note 4 (replicating, validating, and refining my analysis and findings in Mallinson, *Cumulative*, *supra* note 4).

[77] *See generally* In re Innovatio IP Ventures, LLC Patent Litig., 2013 WL 5593609 (N.D. Ill 2013).

major shortcomings, as indicated below, and as I have explained previously elsewhere.[78]

Top-down apportionment is usually by some kind of patent count. Even top-down approach advocates have differing opinions about which patent strength metric to use — the number of declared-essential patents, number of independently-assessed-essential patents or number of contributions to the standard.

The top-down approach apportions an aggregate royalty figure to derive the different FRAND royalty rates for individual SEP owners. The top-down approach calculation is usually made to derive the royalty rate for a licensor using this apportionment formula:

> *Licensor's royalty rate (R) = aggregate rate (T) x licensor's share (S) of SEPs*
>
> R is the rate to be applied to actual sales prices or revenues.[79]

In the case of *Unwired Planet v. Huawei*, the court was unwilling to set a top-down rate due to the uncertainties in doing that.[80] Instead, the court used the same apportionment formula the other way around to *imply* an aggregate rate burden from comparable licenses (comps), as a cross check.

> *Implied aggregate rate (T') = Licensor's royalty rate implied from comps (R') ÷ S*

This is a crucial difference in use of the same simple algebraic formula because T' is implied rather than set as it is in conventional use the formula. It would have been more apposite to call this a bottom-up method, but that term had already been bagged for another valuation method.

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78 Keith Mallinson, *Unreasonably-low Royalties in Top-down FRAND-rate Determinations for* TCL v. Ericsson, IP FIN. (Apr. 30, 2018), http://www.ip.finance/2018/04/unreasonably-low-royalties-in-top-down.html [Hereinafter Mallinson, *Unreasonably-low*].

79 Much larger aggregates of headline maximum royalty rates before any discounting, as in licensors' individual rate card disclosures, than in the aggregates of rates actually paid after discounting is only to be expected. For example, if a licensee sells a handset for $400 where rates are subject to $200 cap, the royalty percentage rate actually paid will be only half as much as the headline royalty rate percentage.

80 Unwired Planet Int'l Ltd. v. Huawei Tech. Co. Ltd., [2017] EWHC 2988, at [268]-[269] (Pat) ("the main conceptual difficulty I have with the using a total stack in a top-down approach as opposed to using it as a cross-check is in the selection of the total royalty burden T to start with. In my judgment the statements set out above have little value in arriving at a benchmark rate today for a number of reasons. The claims are obviously self-serving. The statements about aggregate royalties in particular are statements about other people's money on the footing that the person making the statement says at the same time that the cake is quite small but they are entitled to a large piece of it").

This bottom-up use of the top-down formula is also how pejorative "royalty stacking" is sometimes alleged but cannot be proven. The Commission, among others, redefines royalty stacking as a counterfactual scenario.[81]

Absent evidence that anybody is actually paying aggregate rates as high as 20%, 30%, or even more, hypothetical assertions along the following lines are constructed. For example, *if* — these conjectures always start with this word — company A demands a 1% royalty while owning only 3% of the SEPs reading on a standard, then the aggregate royalty would be *1% ÷ 4% = 25%*.[82] However, as my subsequent analysis in this article shows, royalties paid are a long way below this hypothetical level for a variety of reasons. There is not, actually, any royalty stacking.

These aggregate royalty rates are absent cross-licensing effects that reduce net payments. All the above algebra is applied to one-way royalty rates (i.e., after any cross-license payment figures have been grossed-up in "unpacking"). Rates actually paid after any cross-licensing are lower than one-way rates.

Apportionment is based on the faulty premise that the relative value of different patent portfolios is directly proportional to the number of patents in each of these. On the contrary, there is abundant evidence that the value of patents, including SEPs, varies enormously. Some patented technologies are crucial in creation or improvement of standards; others, such as those reading on parts of the standard that are optional and are rarely or never implemented, are worth very little. The top-down approach ignores whether products actually infringe. Some SEPs read on optional parts of the standards that are not implemented in all products, and in some cases in none of them. Some SEPs relate to devices, and others relate to network equipment. The top-down approach ignores validity. Top-down only seeks to determine fair and reasonable royalties overall and on average for all licensees. It makes no attempt to determine non-discriminatory variations in rates among differently situated licensees.[83] For example, Small and Medium-sized Enterprises (SMEs) are

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81 Baron, *supra* note 47, at 7-11.

82 *See, e.g.*, Microsoft Corp. v. Motorola Inc., No. C10-1823JLR, 2013 WL 2111217, at *73 (W.D. Wash. Apr. 25, 2013) ("*If* each of these 92 entities [owners of Wi-Fi SEPs] sought royalties similar to Motorola's request of 1.15 % to 1.73% of the end-product price, the aggregate royalty to implement the 802.11 Standard, which is only one feature of the Xbox product, would exceed the total product price. The court concludes that a royalty rate that implicates such clear stacking concerns cannot be a RAND royalty rate") (emphasis added). Elsewhere, evidence of actual stacking has been required by the court but has never been forthcoming. *See, e.g.*, Ericsson Inc. v. D-Link Sys. Inc., No. 6:10-CV-473, 2013 WL 4046225, at *18 (E.D. Tex. Aug. 6, 2013), (agreeing with Ericsson statements that the defendants' royalty stacking argument is theoretical, and that the defendants' expert failed "to present evidence of an *actual* stack on the 802.11n essential products") (emphasis in original).

83 This was evidently one of several reasons why Justice Mellor rejected the top-down approach in *Interdigital v. Lenovo* [2023] EWHC 539, [945] (Pat), in which discrimination in royalty charging through volume discounting was a most significant and contentious issue. *Id.* at [557]. The court recognized that while Judge Selna had used the top-down approach in *TCL v. Ericsson*, Judge Selna was also mindful of

markedly different companies from the few large SEP licensees such as OEMs Apple, Samsung, Sony, and Xiaomi that dominate smartphone product supply and can bargain for volume discounts from all their suppliers.

D. *Apportionment*

Top-down apportionment is usually by some kind of patent count. Even top-down approach advocates have differing opinions about which patent strength metric to use.[84]

1. Counting Declared-Essential Patents

Counting raw declared-essential patents that remain unchecked for essentiality by any third party is widely regarded as inaccurate and unreliable because there is no constraint on patent owners distorting this measure of their patent portfolios' strengths by making excessive declarations. These bloat the denominator in essentiality rate calculations and inflate the positions of patent owners that are most liberal and voluminous in their declarations. There is a conflict between the patent policies of Standard Setting Organizations (SSOs) that encourage liberal declaration of any patents owners believe might be or might become essential to ensure standards are not blocked, and the separate use of patent counts by other organizations as metrics of patent strength. The term "over-declaration" has been coined due to the distortions this causes in the latter. Over-declaration comes in two forms: declaring excessive numbers of patents and declaring individual patents excessively to multiple technical specifications within standards.[85]

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this shortcoming and the superiority of comparable license benchmarks: "A top down method, however, cannot address discrimination as the Court interprets the term, and is not necessarily a substitute for a market-based approach that considers comparable licenses." TCL Commun. Tech. Holdings, Ltd. v. Telefonaktiebolaget LM Ericsson, No. CV 15-2370 JVS(DFMX), 2017 WL 6611635, at *9 (C.D. Cal. Dec. 21, 2017).

84 For example, while Apple advocates simply counting patents declared essential by their owners, APPLE, *A STATEMENT ON FRAND LICENSING OF SEPS*, https://www.apple.com/uk/legal/intellectual-property/frand/ (last visited Jan. 20, 2024) ("A SEP licensor's *pro rata* share of declared SEPs is an objective reference point in a FRAND negotiation"), the European Commission and many others believe that independent essentiality checks are required for measurement of portfolio patent strength. European Commission, *supra* note 12, at 12.

85 Keith Mallinson, *Gaming the System: A Scatter-Gun Approach to 5G Declarations*, IP FIN. (Dec. 5, 2022, 8:38 PM), http://www.ip.finance/2022/12/gaming-system-scatter-gun-approach-to.html.

2. Essentiality Checking and Random Sampling

While independent essentiality checking is widely demanded, this is not straightforward, and various mechanisms are proposed for this.[86] Many patent owners, implementers, and others prefer that patents are also checked for essentiality by someone other than the patent owner. With many tens of thousands of declared patents, that is very costly, and yet checking is inaccurate and subject to significant biases, with false positive essentiality determinations tending to exceed false negatives.[87] While sampling can significantly reduce the overall size of the task, random sampling errors, and non-random errors as well as random errors in essentiality determinations, must be considered in designing and evaluating patent counting studies.

Checking only samples of patents can significantly reduce costs, even if sampled patents are more thoroughly checked and even with the additional cost of claim charts. Nevertheless, sample sizes in the thousands per SEP licensor are likely to be required for adequate precision — particularly if true essentiality rates are low (e.g., at only around 12% for 4G and 8% for 5G, according to some experts).[88] This is because random sampling errors increase as a proportion of decreased essentiality rates.

Unfortunately, any use of sampling is problematic with determination errors. For example, if only one in ten patents is sampled, any determination errors and corrections after "re-checks" or appeals will have a 10-fold impact on total patent counts inferred by extrapolation. Allowing appeals on essentiality determinations of randomly sampled patents is likely to exacerbate rather than correct bias.[89] Appeals against determinations will inevitably not be random.

However, I also believe that parties must generally be able to challenge individual determinations or patent counts somehow. A right to appeal in case of error and inaccuracy is a basic right which must be preserved.

The Commission's impact assessment is confusing and misleading in its statement that "false positive and false negative random errors tend to

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86 *See* Giuseppe Colangelo, *Finding an Efficiency-oriented Approach to Scrutinise the Essentiality of Potential SEPs: A survey,* 18 OXFORD ACAD. J. OF INTELL. PROP. L. & PRAC. 502, 505 (2023).

87 *See* Keith Mallinson, *Essentiality Checks Might Foster SEP Licensing, but Do Not Stop Over-Declarations from Inflating Patent Counts and Making Them Unreliable Measures*, WISEHARBOR (Nov. 16, 2022), https://www.wiseharbor.com/wp-content/uploads/2022/12/Mallinson-WiseHarbor-SEP-overdeclarations-2022.12.05.pdf [hereinafter Mallinson, *Essentiality Checks*]; Justus Baron & Tim Pohlman, *Precision and Bias in the Assessment of Essentiality Rates in Firms' Portfolios of Declared SEPs* (Nov. 2021), https://wwws.law.northwestern.edu/research-faculty/clbe/events/standardization/documents/baron_pohlmann_bias_and_precision_essentiality_rates.pdf.

88 Mallinson, *Essentiality Rate Inflation*, *supra* note 42.

89 Impact Assessment Report, *supra* note 15, at 101 n.294 (citing European Commission, Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs, Justus Baron, *Essentiality Checks for Potential SEPs – Framework for assessing the impact of different policy options* (2023) https://data.europa.eu/doi/10.2873/002897).

cancel each other out."[90] The terms "false negative" and "false positive" in the context of essentiality checking and patent counting are usually understood to apply to individual essentiality determination errors rather than random errors in the totals of essential and not essential patents in an entire sample. It is true that random sampling errors do tend to cancel each other out (i.e., they may be substantial in any given sample, but at least they are unbiased from one sample to another). In contrast, false positive and false negative determination errors are perniciously not entirely random, do not tend to cancel out, and can result in significant bias.[91]

Consequently, checking can provide a false sense of security and precision. Over-declaration, by some patent owners, is only mitigated, not eliminated, by checking. The more a patent owner over-declares, the more inflated its patent counts and essentiality rates will be — even with checking.

Some interested parties prefer not to count patents at all and instead count the numbers of technical contributions that are approved by SSOs to be included in the standards. Among the advantages of this approach is its low cost in comparison to checking numerous patents for essentiality. Approved contributions are one of the metrics that is used by Avanci in its 4G automotive licensing programs and that is thus accepted as a valuation method by its 56 licensors and many automotive OEMs accounting for more than 80% of connected vehicle sales.

E. *Aggregate Royalty Valuation Measures*

Aggregate rate setting goes far beyond satisfying a requirement for transparency on royalty rates, which could generally be provided with disclosure of existing agreements, related ex-ante assumptions (e.g., volume and pricing forecasts in support of lump-sum figures) and royalty figures paid.

Fair and reasonable aggregate royalty figures ought to be based upon the value that the standardized technology confers. That value could be realized in higher product prices than those without the technology, increased demand volumes, or lower costs. The aggregate royalty rate-setting provisions in the proposed EU legislation must begin between 90 days and 150 days of either the publication of the standard or first sale of new implementations in the EU.

However, markets would not be sufficiently mature for such early determinations of aggregate royalties to be meaningfully estimated from figures in existing licenses or from product pricing. Alternatively, prices can be derived with linear regression in multi-factor hedonic pricing analysis,[92] but a

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90 *Id.*

91 Mallinson, *Essentiality Checks*, *supra* note 88.

92 *See* Hamish Anderson, *Value of Nature Implicit in Property Prices – Hedonic Pricing Method (HPM) Methodology Note*, OFFICE FOR NAT. STAT. (July 12, 2018),

drawback with this technique is that value in use does not always align with pricing; for example, if pricing is solely based on manufacturing costs. Furthermore, explanatory variables are generally not entirely independent of each other. For example, one hedonic model included talk time and battery capacity variables in mobile phones.[93] It unsurprisingly found these two variables to have significant correlation with a coefficient of 0.71. This collinearity impairs the predictive power of the model. An alternative approach without all these constraints is conjoint analysis in which consumers are quizzed to determine their preferences and price sensitivities for various product capabilities.[94]

However, both methods derive a figure for total economic surplus — not only the proportion of it attributable to the SEP owners. How that surplus should be divided between OEMs and SEP owners overall to come up with an aggregate figure for apportionment among SEP licensors is also a major question. An expert for Interdigital in *Interdigital v. Lenovo* proposed a 50:50 division of the output from his hedonic model. Justice Mellor was having none of that simplistic split. He indicated there was insufficient substantiation to that and there were procedural deficiencies in submitting evidence on this.

There is clearly need for much improvement before any of these methodologies can be used to regulate aggregate royalties reliably.

As I have already indicated, the starting point aggregate figure is typically described as a maximum, but that is ambiguous. Is it supposed to be the maximum:

i. That could ever potentially be paid on any individual device sold in the nation with strongest patent protection,

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https://www.ons.gov.uk/economy/environmentalaccounts/methodologies/valueofnatureimplicitinpropertypriceshedonicpricingmethodhpmmethodologynote ("The Hedonic Pricing Method (HPM) relies on the assumption that a class of differentiated products can be broken down in to [sic] a number of characteristics. A combination of these characteristics and the external factors that affect the product determines the price. The most common example of this is property values, where the market price of a property is determined by a combination of structural characteristics (floor area, number of bedrooms, garden, garage and so on) and the socio-economic and environmental characteristics of the surrounding area (quality of schools, access to retail, transport, levels of water/air pollution, proximity to green space and so on)."). *See also, e.g.*, J. Gregory Sidak & Jeremy O. Skog, *Hedonic Prices for Multicomponent Products*, 4 *CRITERION J. INNOVATION* 301 (2019).

93 *See* Sidak & Skog, *supra*, note 93 at 305.

94 Tim Stobierski, *What is Conjoint Analysis & How Can You Use It*, HARV. BUS. SCH. ONLINE BUS. INSIGHTS BLOG (Dec. 18, 2020), https://online.hbs.edu/blog/post/what-is-conjoint-analysis#:~:text=Conjoint%20analysis%20is%20a%20form,of%20their%20products%20or%20services ("Conjoint analysis is a form of statistical analysis that firms use in market research to understand how customers value different components or features of their products or services. It's based on the principle that any product can be broken down into a set of attributes that ultimately impact users' perceived value of an item or service. Conjoint analysis is typically conducted via a specialized survey that asks consumers to rank the importance of the specific features in question. Analyzing the results allows the firm to then assign a value to each one").

ii. Of royalties averaged across all devices sold in that nation in a certain period, or

iii. Of royalties averaged across all devices sold in a certain period?

The devil is in the detail with any averaging versus the hypothetical corner case in (i). For example, in *TCL v. Ericsson,* R was further reduced for geographies where the licensor had fewer SEPs.[95]

The Court found:

> "Ericsson's 4G patent strength in China is 69.80% of its U.S. patent strength" and "that 0.45% is an appropriate FRAND for Ericsson's 4G SEP portfolio in the United States. This means that the FRAND rate for Ericsson's portfolio for the Rest of the World ("RoW") is 0.314%".[96]

The RoW rate is nearly a third less than the US rate. With most sales outside the US, the blended global average set by the court was rather closer to the RoW rate than the US rate.

The court also made a reduction for expired patents in its rate determinations. It included expired patents in the denominator while it excluded them from the numerator in calculating S. This also has a diluting effect on the royalty rate determined. In contrast, patent pools typically remove expired patents from their patent counts in both the numerator and denominator in calculating shares of fees for distribution.

On the other hand, patent portfolios tend to become enriched over the life of a standard or licensing agreement following additional patent applications, declarations, and as patents are granted. Standards are not static. For example, there were numerous improvements to 4G LTE over a decade in a succession of seven standard releases by 3GPP before the first standard release of 5G was completed in 2019.

Was it anticipated in existing licenses that royalty rate figures would reduce over time as patents expired? Alternatively, and more realistically, for example, are rates agreed for simplicity to remain at the same level for the

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95 These adjustments, for example, as used in the *TCL v. Ericsson* Decision are contentious. *See* TCL Commc'n Tech. Holdings Ltd v. Telefonaktenbologet LM Ericsson, No. 8:14-cv-00341-JVS-DFM, 2018 WL 4488286 (C.D. Cal. Dec. 12, 2017). I first noted this in Mallinson, *Unreasonably-low*, *supra* note 79. However, the issue is not necessarily whether these reductions are made, but whether the aggregate royalty rate used as the top-down approach input correspondingly anticipates such adjustments. Some aggregate figures do, and others do not. If these reductions are taken, then the applicable input figure T needs to be higher than otherwise. For example, with regard to geography, is the aggregate the maximum to be paid where patent protection is strongest, or is it a globally a blended "maximum" across all licensed sales in a given period?

96 TCL, 2018 WL 4488286, at *50-51.

duration of the standard or licensing agreement regardless of expirations and new patent additions?

To be clear, I am not advocating application of adjustments to the royalty rate and apportionment factor as undertaken in *TCL v. Ericsson*, I am merely explaining what was done and stating that, if such an approach is taken, the ARRFA should be set higher, accordingly.

1. Ad Valorem, Fixed Monetary Figures Per Unit or Lump Sums

An aggregate royalty rate — like an individual royalty rate — can be an ad valorem percentage or a fixed monetary figure per unit of licensed product sales.[97] A fundamental question in any aggregate rate setting process is which to select. I am not prescribing or proscribing either. The most applicable and best to select depends on the application.

However, considering how SEP licensing has been agreed and how royalties have mostly been depicted, measured, and compared since the 1990s, I am focusing most of the following analysis in this article on ad valorem percentage royalties as applied to the royalty base of mobile phone selling prices. This is most illustrative because it enables me to draw upon many published aggregate royalty rate figures, which almost invariably until the late 2010s were and still mostly are also ad valorem percentages.

Ad valorem percentage royalty charging suited implementers as average selling prices for handsets reduced substantially throughout the 1990s and until the 2000s when the growth of smartphone sales started increasing overall average selling prices (ASPs). Since then, licensees have increasingly sought to cap the handset price used as the royalty base. On the other hand, with basic mobile phone prices as low as $20 since the mid-2000s, some licensors have also introduced floors to their licensing terms. When ASPs rise above a cap, or fall below a floor, royalty rates become fixed monetary amounts. In some cases, such as Nokia in 5G, its standard charge is a fixed monetary charge of €3.00 ($3.36) per unit. In IoT, where selling prices for licensed items vary enormously (e.g., from as little as $10 for a basic module to typically tens of thousands of dollars for a car), royalty rates as fixed monetary charges per unit tend to make best sense.

If aggregate rates are to be set at all — as they are for patent pools in their rate cards, but in the opinion of many is unnecessary and dysfunctional in bilateral licensing[98] — such rates must be derived in the applicable context.

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[97] With ad valorem licensing, a royalty percentage rate is multiplied by the royalty base of the licensed product price, or price cap if the product price is higher than that, to derive the monetary figure for the royalty charge.

[98] Various court decisions have avoided or explicitly rejected aggregate rate setting. *See* Unwired Planet Int'l Ltd. v. Huawei Techs. Co. [2017] EWHC 711 (Pat); Interdigital v. Lenovo [2023] EWHC 539 (Pat). *Optis v. Apple* [2023] EWHC 1095 (Ch), also in the UK, also focuses on comparable licensing

Collective action in setting aggregate royalties — such as in patent pools where some major licensors are typically also major licensees — tends to imply individual rates that are lower than would be agreed bilaterally. Another crucial difference is that patent pool aggregate rates are the rates licensees actually pay.

Rates in apportionment calculations and in licensing agreement terms must also reflect whether they are single-mode rates or multimode rates. In cellular, for example, some devices are single-mode (e.g., 4G only and others are multimode (e.g., 2G, 3G, and 4G) with various different combinations of modes, each of which might command different FRAND rates.

2. Benchmarks

a. The Addition of Every SEP Owner's Maximum Wishes

Simply adding up all licensors' maximum royalty rates inevitably produces a hypothetical maximum aggregate royalty rate figure that is inflated far above what anyone would ever pay. For example, before the introduction of 4G LTE in 2009, industry association for mobile network operators NGMN appointed a Trusted-Third-Party (TTP) to collect publicly and privately indicated maximum royalty rates for licensing cellular standards from as many prospective licensees as it could and add up all those rates. In other words, it was attempting to measure a theoretical maximum "stack." Aggregate figures of around 30% for 4G LTE were derived. While this process was ostensibly to increase transparency on royalties, aggregate rate figures were only ever leaked and were never made public officially.

Licensing expert Eric Stasik published a widely-cited 2010 paper adding up the only nine publicly-announced 4G LTE royalty rates at that time for an aggregate royalty of 14.8% from a list of more than 30 firms with patents declared essential to the standard.[99]

No licensee ever paid anywhere near as much as the aggregate rates the TTP derived. Many of the figures in the summation resulted from wishful thinking by SEP owners. Maximum rates are very often reduced by selling price royalty base caps on ad valorem rates and many SEPs go totally unlicensed by any implementer. Fully licensed aggregate rates are thus not paid

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benchmarks in its FRAND determinations. However, the very recent *Nokia v. Oppo* decision in China uses comparable license benchmarks and top-down determinations including the first judicially set aggregate royalty for 5G. *See Chongqing No. 1 Intermediate People's Court Sets Global FRAND Rate for 5G SEPs at $0.707/Unit in Nokia/OPPO Case*, CHINA IP L. UPDATE (Dec. 16, 2023). https://www.chinaiplawupdate.com/2023/12/chongqing-no-1-intermediate-peoples-court-sets-global-frand-rate-for-5g-seps-at-0-707-unit-in-nokia-oppo-case/; Mallinson, *Race to the Bottom*, *supra* note 65.

[99] Erik Stasik & David Cohen, *Royalty Rates and Licensing Strategies for Essential Patents on 5G Telecommunication Standards: What to Expect*, 3 LES NOUVELLES 176 (2020).

on a single device or model, let alone overall for any OEM when blended across all product sales in a nation or accounting period.

Also, according to Stasik's testimony in *Optis v. Apple* citing his same report:

> In 1998, ITSUG (an obscure organisation representing some operators and manufacturers) filed a complaint with the European Commission claiming that "when GSM mobile handsets first appeared on the market place cumulative royalties amounted to as much as 35 per cent to 40 per cent of ex-works selling price."
>
> In 2007, Lemley and Shapiro commentated that they had "seen estimates for [W-CDMA] as high as 30 per cent of the total price of each phone…based on summing royalty demands before any cross-licensing negotiations began."[100]

b. Academics' and Analysts' Published Estimates

Over the decades, academics and various industry and financial analyst firms have come up with widely differing estimated aggregate royalty rates, in some cases including some additional indication of what the figures represent. In addition to the above estimate of academics Lemley and Shapiro, estimates for WCDMA also included 25% to 30% by Dr. Bekkers in 2006,[101] 31.5% by ABI Research in 2008,[102] and 17.5% by ABI Research in 2011.[103] In 2005, investment bank Credit Suisse First Boston provided an estimate for cumulative WCDMA royalties at 17.3%, noting that rates "could be as high as 25-30%."[104] Industry expectation for aggregate royalties on the UMTS standard (which is effectively the same as WCDMA) were also reportedly up to 20% by Dr. Bekkers in 2009.[105]

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100 This hypothetical percentage is cited as evidence of alleged "royalty stacking" — based on the Cournot complements theory described *supra* in footnote 33 — with bilateral negotiations between individual SEP owners and implementers supposedly leading to excessive aggregate royalties. *See* Mark Lemley & Carl Shapiro, *Patent Holdup and Royalty Stacking*, 85 TEX. L. REV. 1991 (2007).

101 Rudi Bekkers, *The Rules, Norms, and Standards on Knowledge Exchange* (DIME, Working Paper No. 9, 2006). https://rbekkers.ieis.tue.nl/Bekkers%20West%20(2006)%20DIME%20IPR%20working%20paper%209%20.pdf.

102 Stuart Carlaw & Clint Wheelock, *Mobile Device Royalties: Intellectual Property Rates for GSM, WCDMA, and LTE,* ABI RESEARCH (2008) (table 1.2 indicates royalty stacks of 31.5% for 3G likely for licensees without patent strength).

103 Phil Solis & Stuart Carlaw, *Mobile Device Royalties: GSM, WCDMA, and LTE,* ABI RESEARCH, 31-33 (Dec. 20, 2011) (royalty rate for licensees without patent strength is 17.5% for GSM/WCDMA).

104 Credit Suisse First Boston, *3G Economics* (Sept. 6, 2005).

105 Rudi Bekkers & Joel West, *The Limits to IPR Standardization Policies as Evidenced by Strategic Patenting in UMTS,* 33 TELECOMMS. POL'Y 80, 92 (2009), (total royalties of up to 20% for UMTS).

Estimates for 4G LTE have also varied, with rates including 23.6% by ABI Research in 2008[106] and 35.4% by ABI Research in 2011.[107]

c. The Overall Royalty Yield in All Potentially Licensable Sales

My seminal empirical research on aggregate royalty rates in 2015 indicated that the overall aggregate royalty paid as a percentage of total phone sales revenues for all standards and including all cellular handset vendors was no more than around 5%.[108]

This article is where I coined the term "royalty yield" for that kind of aggregate rate.[109] The term was subsequently adopted by others in their published literature where they validated my methodology and derived even lower rates than mine.[110] Such labeling, and that of ARRFA, are required in FRAND licensing royalty assessments to distinguish between the different complexions of aggregate rate with significant differences among them in what various figures presented are actually depicting.

The huge differences between aggregate figures in Section III(E)(2)(a) *The Addition of Every SEP Owner's Maximum Wishes* and Section III(E)(2)(b) *Academics' and Analysts' Published Estimates* — versus Section III(E)(2)(c) *The Overall Royalty Yield in All Potentially Licensable Sales* of only around 5% or even less result from many omissions and reductions. Licensors' aggregate royalty yields — after royalty caps, volume and geographic discounts, discounts to get deals done, discounts on prior sales, cross-licensing, and patents that remain unlicensed — tend to be a lot lower. The headline maximum rates and "program rates"[111] disclosed by many licensors are much higher than the individual royalty yields paid by licensees after all those exclusions and reductions.

For example, royalty caps can result in dramatically lower royalty yields than headline rates. Interdigital's web site rate card indicates a 0.5% headline

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106 Carlaw & Wheelock, *supra* note 103 (table 1.2 indicates a royalty stack of 23.6% for single-mode LTE is likely for licensees without patent strength).

107 Solis & Carlaw, *supra* note 104 (Table 10 indicates royalty rate for licensees without patent strength is 35.4% for LTE multimode devices).

108 Mallinson, *Cumulative*, *supra* note 4.

109 The royalty yield for a licensee, licensor, or an entire standard is defined as royalties paid by licensee to licensor, divided by corresponding handset revenues. It can be considered the effective royalty rate achieved across all licensed and unlicensed phone sales after all omissions and adjustments including caps, discounts (e.g., for volume and geography) and net of cross-licensing. The sum of yields for all licensors, all licensees, and in a standard, is the same.

110 Galetovic et al., *supra* note 4.

111 Program rates are also referred to as rate card rates. Absent clear or universally accepted definitions, I am distinguishing between undiscounted headline maximum rates indicated on rate cards and the lower rates that are actually applied with any discounts including those due to handset selling price caps that are also made explicit on those rate cards.

maximum royalty rate with a $200 royalty cap on handset price (i.e., $1.00 maximum royalty) for 4G.[112] The corresponding royalty yield on a $1,000 phone is, therefore, only 0.1%.

d. Publicly-Stated Aggregate Royalty Goals by Some Companies

The first collective attempts to agree aggregate rates "enabl[ing] the cumulative royalty rate for W-CDMA to be at a modest single digit level"[113] and for a "single-digit percentage of the sales price"[114] for 4G LTE were around when the standards were first introduced in the early 2000s and late 2000s, respectively. A key objective in setting these single-mode aggregate rate goals was to encourage adoption of these standards in competition to 3G CDMA2000 and 4G WiMAX, respectively.[115] Public announcements in press releases were made by various SEP owners including Alcatel-Lucent, Ericsson, Nokia, and Siemens. All of these also had predominant interests — then, but no longer today — as net payers of royalties on handset sales, as did other OEMs and network operators making these announcements. For example, Nokia's global handset market share was in excess of 40% for much of the 2000s. Nokia and all the other European companies named above had exited the handset market by 2014.[116]

These announcements by only a handful of companies faced plenty of opposition from others. While the former companies have maintained that they were seeking broader support, they have also argued that was not obtained and the goals were not achieved (i.e., aggregate rates paid ended up being higher than goals). Other announcements by some of the same

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112 *Rate Disclosure,* INTERDIGITAL, https://www.interdigital.com/rate-disclosure (last visited Jan. 20, 2024).

113 Press Release, NTT DoCoMo, Ericsson, Nokia, Siemens, Industry Leaders NTT DoCoMo, Ericsson, Nokia and Siemens, and Japanese Manufacturers Reach a Mutual Understanding to Support Modest Royalty Rates for the W-CDMA Technology Worldwide, (Nov. 6, 2002), https://www.sec.gov/Archives/edgar/data/924613/000110465902006769/j6199_6k.htm.

114 Press Release, Nokia, Wireless Industry Leaders Commit to Framework for LTE Technology IPR Licensing, (April 14, 2008), https://www.sec.gov/Archives/edgar/data/924613/000110465908029241/a08-13064_16k.htm.

115 An additional objective was to reallocate shares of royalties among SEP owners, versus some existing licensing, with "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[,]" Press Release, NTT DoCoMo, Ericsson, Nokia, Siemens, Industry Leaders NTT DoCoMo, Ericsson, Nokia and Siemens, and Japanese Manufacturers Reach a Mutual Understanding to Support Modest Royalty Rates for the W-CDMA Technology Worldwide, (Nov. 6, 2002), and for LTE "according to the licensors' proportional share of all standard essential IPR for the relevant product category[,]" Press Release, Nokia, Wireless Industry Leaders Commit to Framework for LTE Technology IPR Licensing, (April 14, 2008).

116 Keith Mallinson, *How Europe can Build on Strengths in SEPs to Reclaim Leadership in Cellular with 5G and 6G*, 4IP COUNCIL (Apr. 28, 2022), https://www.4ipcouncil.com/features/how-europe-can-build-strengths-seps-reclaim-leadership-cellular-5g-and-6g.

licensors indicated that aggregate figures should not be regarded as royalty caps and licenses should be negotiated bilaterally not simplistically apportioned based on patent counts.[117] "The Minimum Change Optimum Impact (MCOI)" proposal, issued jointly by Ericsson, Motorola, and Nokia in 2006, sought to codify the twin principles of aggregated reasonable terms (ART) and proportionality into the FRAND definition.[118] Two years later, Tim Frain, Nokia's Director of IPR Regulatory Affairs, gave a public address at a European Commission workshop stating that "ART is not any kind of royalty cap. . . . It is no more than an individual patent owner's own understanding or articulation of what a reasonable cumulative royalty would be given all the market conditions. Also, Proportionality is not simply about patent counting . . . Actual royalties remain to be negotiated bilaterally in the normal way."[119]

As these announcements were targets for aggregate rates actually paid, these are also effectively target royalty yields, rather than input figures to be used as ARRFAs, which would necessarily need to be higher figures given that standards are never fully licensed, and some apportionments would not result in any payments.

Such figures have created self-reinforcing "anchoring."[120] Despite all the above, the figures in these announcements are still commonly cited, for example, in FRAND licensing litigation (e.g., *Unwired Planet*), and are proposed as prospective benchmarks for use in making FRAND rate determinations.

e. Other Estimates of Hypothetical and Actual Rates Paid

Cases in litigation include consideration of various estimates for aggregate royalties. Little or no weight is given to the hypothetical maximum aggregate rates in Section III(E)(2)(a) *The Addition of Every SEP Owner's Maximum Wishes* that nobody would actually ever pay because these ignore discounting and unlicensed SEPs. At the other end of the scale, consideration is given to royalty yields derived bottom-up from royalties paid using the top-down approach formula, but these are typically higher than in Section III(E)(2)(c) *The Overall Royalty Yield in All Potentially Licensable Sales*

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117 Tim Frain, Director, IPR Regul. Affs., Nokia Corp., Address at European Commission Workshop on IPR in ICT Standardisation: FRAND Best Practice, 3 (Nov. 19, 2008); Ericsson, Motorola, and Nokia, Joint Proposal to ETSI, Minimum Change Optimum Impact (MCOI) (2006).

118 WIPO, Tim Frain, *Patents in Standards & Interoperability*, at 7-8 (Nov. 29, 2006) (explaining the MCOI approach laid out in Ericsson, Motorola, and Nokia, Joint Proposal, *supra* note 119.

119 Frain, *supra* note 119, at 3.

120 In their research about the anchoring effect, psychologists Daniel Kahneman and Amos Tversky showed that when we're asked to make a judgment in the face of uncertainty, we are easily swayed by the first figure that's introduced into the conversation, however irrelevant, outrageous, or insulting it may seem. *See generally*, Daniel Kahneman & Amos Tversky, *Judgment Under Uncertainty: Heuristics and Biases*, 185 SCI. 1124 (1974).

because the denominators in those royalty yields focus on sales of phones conforming to specific standards such as 4G or 5G, albeit in multimode devices, and because rates considered are typically higher one-way rates after unpacking cross-licenses.

In *Unwired Planet v. Huawei,* the court derived an "implied total burden" of 8.8% for multimode 4G from the comparable licenses and the share of Unwired Planet's relevant SEPs.[121] The court also noted that "[o]n Huawei's figures the implied total aggregate [4G] royalty burden T would be 13.3% while for Unwired Planet it would be 10.4%."[122] The rates derived from unpacking comparable licenses are based on amounts that would be paid, but for cross-licensing. Consequently, aggregate rates implied from these with use of the top-down formula are theoretical. They are adjusted royalty yields, before cross-licensing reductions and are elevated by including notional royalties (i.e., royalties not paid) for unlicensed SEPs that are counted in the denominator for the derivation of S (licensor's share of SEPs).

In the UK's *Optis v. Apple* FRAND trial, expert witness Eric Stasik, with many years' experience in licensing negotiations was asked by Optis' solicitors to give [his] view as to whether it would be reasonable, assessed as of today, for implementers to be expected to bear a theoretical notional aggregate royalty burden for 4G multimode handsets in the range of around 8% to 15% (i.e., a total royalty burden in respect of all relevant (i.e., handset) SEPs in the 2G, 3G and 4G "universe."

In response he testified:

> [I]n the (hypothetical) scenario where implementers do all behave as willing licensees and all in fact therefore pay truly "FRAND rates" for the whole stack, a range of 8% to 15% is appropriate ["in respect of all relevant (i.e. handset) SEPs in the 2G, 3G and 4G 'universe'"].[123]

Stasik also noted that "[i]n practice, implementers do not pay the theoretical total aggregate royalty burden for a 4GMM handset because implementers in my experience are never fully licensed under all SEPs in the 4G, 3G and 2G universe." His description is therefore, seemingly of more than a royalty yield — by pretending unwilling licensees are willing, licensed, and paying royalties. While I presume cross-licensing did not feature much in that particular case because Optis is not an implementer, it is unclear whether the rate at the lower end of that range is supposed to be net of cross-licensing reductions.

The wide percentage range — with the top figure nearly double the bottom figure — seemingly reflects the variability in amounts paid — largely to major licensors. Major licensees such as OEMs Apple, Samsung, Sony, and Xiaomi with relatively large sales and ability to pay large lump sum fees up

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121 Unwired Planet v. Huawei, [2017] EWHC 711, at [478] (Pat).

122 *Id.* at [261].

123 Optis v. Apple, [2023] EWHC 1095, at [400] (Ch).

front might be able to obtain significant further discounts to headline rates offered in rate cards and as are also disclosed on licensors' web sites. In contrast, payments made by small licensees with little or no negotiating power will be much closer to rates indicated initially in rate cards.[124] Various aggregate rate figures have also been presented to government agencies including competition authorities. Where such figures are reported, in some cases confidentially, it is not always clear how terms such as "typical" aggregate rate are defined — if at all — or what exactly they depict.

F. *Comparing and Setting Aggregates*

The aggregate royalty rate selected as the starting point *input* for apportionment among licensors in top-down approach determinations of FRAND royalties for SEPs (i.e., the ARRFA) must reflect the actuality that the *output* aggregate rate paid in cash or in kind by licensees will generally be lower. Some SEP royalty pie is left uneaten when it is shared in top-down approach apportionments.

It would be inapplicable to use the maximum stack of single-mode or multimode program rates in Section III(E)(2)(a) *The Addition of Every SEP Owner's Maximum Wishes* as the ARRFA because the inflated claims of some owners would over-value the entire pie, and in turn, also the apportionments.

However, apportioning only the aggregate royalty rate figures in Section III(E)(2)(c) *The Overall Royalty Yield in All Potentially Licensable Sales* or in Section III(E)(2)(d) *Publicly-Stated Aggregate Royalty Goals by Some Companies* will in turn result in sub-FRAND rate determinations for individual licensors and licensees, and yet lower aggregate royalty rate payments. If this approach caught on, there would be a vicious cycle of rates spiraling lower and lower as sub-FRAND rates are used to set the next aggregate rate for apportionment, and so on ad infinitum. The total of all licensors' R figures would fall short of T. Aggregate royalty yields in Section III(E)(2)(c) *The Overall Royalty Yield in All Potentially Licensable Sales* are inapplicable as the input for apportionment because the top-down approach allocates royalties that generate no royalty payments. Unpaid royalty allocations to unlicensed SEPs and to SEPs that are cross-licensed without payment are not royalty costs. There is no direct or variable cost in cross-licensing to reduce

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[124] As I pointed out in my previous feedback to the Commission's proposed legislation, the top-down approach makes no attempt to determine non-discriminatory variations in rates among differently situated licensees. Mallinson June, *supra* note 12. It is beyond the scope of this paper to consider whether or how to adjust aggregate rates for apportionment to deal with this major issue in FRAND licensing.

royalty net payments. The R&D costs in developing patents for cross-licensing are sunk fixed costs.[125]

Similarly, target maximum payments in Section III(E)(2)(d) *Publicly-Stated Aggregate Royalty Goals by Some Companies* also appear to be something like royalty yields — derived from what is actually paid, or would actually be paid in accordance with those announcements — not based on what should be available for payment in the hypothetical and unrealistic circumstance of full licensing. All those paid rates, or to be paid rates, would need to be grossed-up by various factors before being used as the top-down input ARRFA.

Implied total burden figures such as those derived in *Unwired Planet* appear to be more appropriately formulated to be used as ARRFAs because they account for unlicensed SEPs. However, the precision and reliability of such figures is highly questionable — particularly as an ARRFA, rather than as an implied figure for cross checking, as was the sole intention of the judge. The court noted in that case that for 4G from the comparable licenses its "[8.8%] is lower than the aggregate implied by either party's case (Huawei's 13% and Unwired Planet's 10.4%)."[126] Implied aggregate rates are proportionate to rates derived from unpacking and inversely proportional to shares of total SEPs. An aggregate is implied by dividing an SEP owner's unpacked rate by its respective estimated share of all SEPs in the applicable standard.

The cost to the licensee is what it actually pays, not what it avoids paying when it should pay, or the discount it receives for geography or patent expirations, or for any other notional charges that it has not and will not be asked for. Unpaid liabilities might eventually be paid, but back royalties are often only paid as deeply discounted release payments when new licenses are negotiated and agreed.

While the formulation in Section III(E)(2)(a) *The Addition of Every SEP Owner's Maximum Wishes* depicts rates that are too high, even as the starting point input for apportionment, let alone an indication of what one would have to pay, the royalty yield formulations in Section III(E)(2)(c) *The Overall Royalty Yield in All Potentially Licensable Sales* and Section III(E)(2)(d) *Publicly-Stated Aggregate Royalty Goals by Some Companies* indicate rates that are too low to be the ARRFA. In between, such formulations and figures, with suitable adjustments, and some formulations in Section III(E)(2)(b) *Academics' and Analysts' Published Estimates* and Section III(E)(2)(e) *Other Estimates of Hypothetical and Actual Rates Paid*, might well be suitable for that purpose, subject to applicability of the timing and verified accuracy of such estimates.

While the following pie chart in Exhibit 2 is not to scale it is intended to include everything that might be depicted in various aggregate rate figures.

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125 I agree with Alexander Galetovic, Stephen H. Haber, and Lew Zaretski about how to deal with cross-licensing in deriving aggregate royalty costs. Mallinson, *Cumulative*, *supra* note 4; Galetovic et al., *supra* note 4; Sidak, *supra* note 4.

126 *Unwired Planet*, [2017] EWHC 711, at [476].

Some slices might be very small or non-existent under certain circumstances. It also shows how pieces of aggregate royalty pie will be left uneaten (e.g., unlicensed SEPs). A proportion of the value ascribed from any aggregate rate figure other than the royalty yield is not paid for in cash. Instead, some payments are made in kind, as in aforementioned cross-licensing. Whether these should be regarded as royalty charges — from an economic, management accounting, or financial accounting point of view — depends on what is provided in kind and how that is costed. For example, product supply in kind is likely to require significant variable cost.

Exhibit 2: Aggregate pie gets left on the table in top-down apportionments among licensors (not to scale)

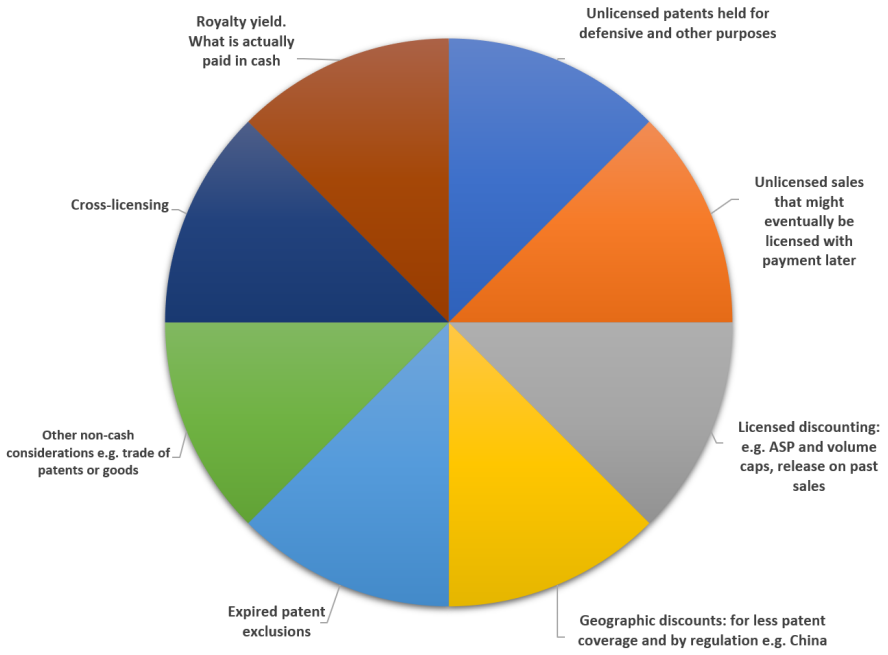

Exhibit 2 aims to include all hypothetically possible charges, including the maximum rates for all SEP owners, as do some of the highest among aggregate rates presented at around 30% for 4G LTE in Section III(E)(2)(a) *The Addition of Every SEP Owner's Maximum Wishes*. However, only the royalty yield slice is actually monetized in cash payments to licensors. It corresponds to the lowest among aggregate rates, such as only around 5% or even less including all standards, as indicated in Section III(E)(2)(c) *The Overall Royalty Yield in All Potentially Licensable Sales*.

G. *How Much More Than Royalties Paid Would Aggregates be with Full Licensing?*

The "fully licensed" aggregate rate is the applicable ARRFA.[127] The aggregate royalty allocated needs to include all the SEPs counted in the denominator of the apportionment calculation of S as if all SEPs are fully licensed for FRAND royalty payments. In contrast, in the special case of patent pools, there are no allocations for patents outside the pool because patent pools do not count SEPs that are outside the pool, even though some of them might be licensed bilaterally or by another pool. In the top-down approach, the count of all SEPs in a standard are included in the denominator calculating S whether or not they are licensed. Consequently, the ARRFA must be increased above the aggregate royalty yield figures, as if those additional SEPs are under license and paid for at FRAND rates.

The same goes for geographic reductions. If the overall royalty rates being determined are attenuated due to geographies where patent protection is relatively weak, as I illustrate above with the example in the *TCL v. Ericsson* decision, then the ARRFA needs to be increased correspondingly. Such increases will be taken back out to the extent applicable on case-by-case basis in specific FRAND determinations. In practice, for example, handset OEMs almost invariably sell in in multiple jurisdictions, with higher rates paid in some than others, and so overall royalty rates paid will average out.

There also needs to be an upward adjustment if expired patents are excluded from the numerator while being retained in the denominator in calculating the rate of apportionment S. Alternatively, as patents expire, they should be removed from both the numerator and denominator, as they typically are by patent pools. Similarly, new SEPs should be added to both numerator and denominator. Fully licensed royalties should be derived entirely from the non-expired patents in the standard, as numbers of these fluctuate.

It is also necessary to gross-up for cross-licensing. Imagine a world where the aggregate royalty yield was zero due to completely balanced cross-licensing. While net royalty rates are zero there, one-way rates could still be substantial. Top-down apportionments derive one-way rates. These can then be netted off to determine how much should be paid in cash and to whom.

However, there should be no upward adjustment for licensors' discounting against their maximum headline rates or for rates agreed below the indicated discounts offered in rate cards. This is on the assumption that their SEPs are being fully monetized by receiving FRAND royalties overall at the discounted rates they have bilaterally agreed through negotiation and that they receive in payments. There should be upward adjustments for notional charges that are unilaterally not sought (i.e., no licensing offered) or not paid (i.e., unlicensed hold-out by unwilling licensees).

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127 "Fully licensed" is a term that was used with this meaning by Eric Stasik in the *Otis v. Apple* decision. *See* Otis v. Apple, [2023] EWHC 1095 (Ch).

CONCLUSION

The US and Europe are heading in different directions on how to determine FRAND charges and other licensing terms for SEPs. While the US has shunned rate-setting regulation by withdrawing guidance from government agencies including the USPTO, NIST and DoJ and is diminishing proposed lawmaking, the European Commission's advocated legislation requires mandatory — albeit non-binding — patent registration, essentiality checking, aggregate royalty setting and rate apportionment among licensors.

There is no evidence of market failure in market-based pricing of SEP royalty rates. To the contrary, established licensing incentivizes innovation and has brought success throughout the ecosystem including implementers and consumers.[128] Disrupting this would harm US and European licensors including Qualcomm, Interdigital, Ericsson, and Nokia among others. The result would be a massive transfer of wealth, principally to Asian implementers and would be a substantial setback for future innovation including upcoming standards such as 6G in the emerging IoT.

Setting aggregate rates and apportioning them among patent owners, centrally by the EUIPO or its subcontracted conciliators — even on a non-binding basis — will unnecessarily distort the free market processes in standards development and FRAND patent licensing compensation. This has been effective in enabling the world's fastest growing and largest ever technology ecosystem serving more than five billion people and 16 billion connections with cellular worldwide. Parties in licensing disputes will feel obliged in the proposed mandatory — but notionally non-binding — conciliation process to give significant weight to the EUIPO's determinations, as will the courts. However, there is no basis whatsoever, let alone supporting evidence, to infer there is harm to be fixed, or that established benchmarks for royalty charges need to be replaced.

Limited checking to ensure that licensors have at least some SEPs would show that they can legitimately demand licensing and royalties. Many patent owners are already able to do this with their proud lists of patents that have been scrutinized by experts and, in some cases, verified by the courts. The proposed processes at the EUIPO, including submission and checking of patents and some claim charts, as well as conciliators setting royalty rates, is fraught with all kinds of issues that will lend to manipulation, favoritism, or bias and also subject checks or patents to subsequent legal challenges. SEP owners have shunned voluntary essentiality checking by an official body in Japan. There is no evidence that these European proposals will be any more welcome or widely adopted.

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128 *See also* Mallinson, *Don't Fix What Isn't Broken*, *supra* note 6.

Until 2014 we were still being told by some that aggregate royalty rates paid on smartphones could be as much as 30%.[129] In 2015 I showed that rates paid were only around 5%.[130] While both percentages are aggregate rates, they are depicting very different phenomena. An appropriate percentage to be used as the ARRFA in FRAND rate determinations for smartphone licensing will surely fall well between those two extremes and will be higher than any of the royalty yield figures derived. The recent *Optis v. Apple* decision included expert testimony that an aggregate rate range from 8% to 15% would be applicable for multimode 4G, while also indicating that those rates are what would be paid if SEPs were, hypothetically, fully licensed, which is never the case in practice.

Parties in negotiation may agree to use whatever methods they wish to value patents and determine royalties, and courts also decide what to use case-by-case in litigation where they have often rejected top-down rate setting. Rote, formulaic methods for setting and allocating royalties by a central government bureaucracy are unnecessary and will harm a vibrant and well-functioning ecosystem in standards-based technology innovation and development. Better to obtain and reveal more information about existing licensing charges and other terms in many existing licenses than to make up alternatives.

ARRFA figures need to be net of licensors' rate reductions, such as royalty base price caps and other discounts agreed bilaterally between licensor and licensee. However, figures such as royalty yields should be grossed-up for what is unilaterally missing from aggregate payments received from all licensors. These unpaid royalties are due to SEPs being unlicensed, for example, where licenses are not offered and the SEPs are held only for defensive purposes, and where implementers are unwilling licensees and are not paying. Upward adjustments to royalty yield figures are also needed to adjust for the effects of cross-licensing in existing licenses.

We are still in the process of properly identifying and describing all the factors that should be incorporated or excluded in setting aggregate rates for apportionment, and building rigorously-reasoned consensus on what the figures should be with coherent methods for their apportionment.

If we are going to do top-down apportionment properly and with precision, we must develop well-defined ARRFAs, as distinct from and among other kinds of aggregate rates. For example, some will need to be fixed monetary figures per unit rather than percentages, depending on application (e.g., fixed monetary figures in IoT). This article contributes to the ongoing debate about the need for such figures, what exactly they should include and exclude, how to apportion them, if at all, where to find the benchmark royalty

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129 *See, e.g.*, Ann Armstrong, Joseph J. Mueller, & Timothy D. Syrett, *The Smartphone Royalty Stack: Surveying Royalty Demands for the Components Within Modern Smartphones* (June 1, 2014), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2443848.

130 Mallinson, *Cumulative*, *supra* note 4.

data, and what other valuation methods can be used in determining those rates.