



## The smartphone royalty stack: a long-term look

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*Even though device makers often bemoan the substantial burden of patent licensing, research shows that the value returned to major patent owners has declined over time*

You may not know it from coverage of the wireless patent world, but the overall level of SEP royalties shouldered by mobile device makers is modest and currently in the midst of long-term decline, according to research from industry analyst Keith Mallinson of WiseHarbor.

Mallinson has tracked what he terms the “royalty yield” – the total amount of licensing pay-outs divided by the total value of mobile phone sales since 2015 – using figures disclosed by publicly listed licensing firms and a range of other assumptions. For 2014, Mallinson calculated a cumulative maximum of around 5% for all licensors.

His latest work suggests that the big four listed licensors – Qualcomm, Nokia, Ericsson and InterDigital – are reaping below 2%, with the quartet’s total sum dipping below \$10 billion in 2020 for the first time after consistent downward trends stretching back to 2013. These estimates are conservatively high, Mallinson says, because the numerator includes some non-SEP royalties, as well as fees paid for non-smartphone products, while the denominator does not include sales revenues for anything other than phones.

Mallinson has updated his figures for this report based on the latest licensing results from 2021. He spoke with IAM about the purpose of this research, what it tells us about the IP licensing market and why it may not be a useful lens for looking at activity in the space going forward.

### How did your research into the mobile ‘royalty stack’ get started?

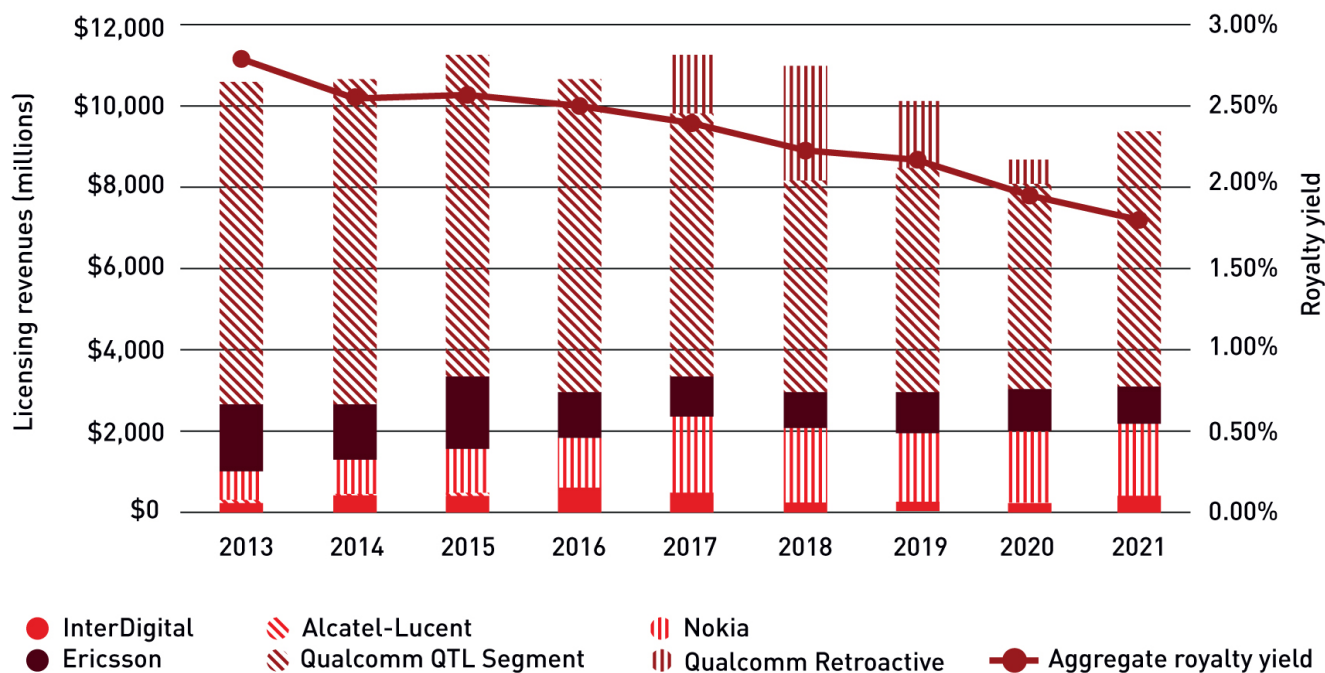
**Keith Mallinson (KM):** The royalty stacking narrative has been around since the 1990s, with speculation that aggregate royalties could be in excess of 35% of the price of a 2G device. Published estimates in the 2000s were rather lower, including figures in the teens of percent.

Stacking, as you put it, remains a pejorative yet erroneous term in the context of SEP licensing. It is based on the falsehood that individual patent owners can charge monopolistic prices and that these prices layer on top of each other. I was never convinced by such theoretical arguments and sought to show empirically how much was actually being paid in licensing fees, versus how much value was being derived from SEPs.

### What were the prevailing narratives about patent royalty levels when you first looked at this issue in a systematic way?

**KM:** So, the Next Generation Mobile Networks Alliance, a group of mobile operators, conducted its assessment on aggregate 4G/LTE royalties around 2008 to 2009 with a so-called ‘trusted third-party process’ that went about collecting royalty rates from prospective licensors and calculating aggregates. The results of this study were never made public, but figures were rumoured to be upwards of 20% of average selling prices. The aggregate figures calculated were clearly nonsense versus actual payments. But these numbers were used to cram down royalty rates. Then, companies actually started disclosing their maximum rates publicly.

**Figure 1. Licensing revenues and aggregate royalty yield for major mobile licensors, 2013-2021**



- 2021 figures for InterDigital based on a securities analyst revenue estimate published in November 2021.
- Handset revenues (for denominator of royalty yield calculation) based on industry analyst tracking and forecasting figures published in 2021

Figures are conservatively high because they reflect all these companies' licensing revenues, but only handset sales revenues.

Nokia completed its acquisition of Alcatel-Lucent in 2014.

Qualcomm figures include retroactive allocations of licensing dispute settlement payments by Apple in 2019 and Huawei in 2020 that were not included in reported Qualcomm Technology Licensing segment figures.

By 2010, Erik Stasik had published a study in *Les Nouvelles* that totalled up many disclosed 4G/LTE rates at 14.8%, including all the major licensors. From 2011, I was publishing articles that were sceptical about alleged aggregate rates.

Around 2015, the leadership of the Next Generation Mobile Networks Alliance was still saying publicly that royalties were perceived to be too high. Though they closed down that trusted third-party process in 2009, they were still trying to make this point. I thought it was strange and rather self-serving that the word "perceived" was used, and that the problem was in perception rather than the actuality of what was being paid.

There was also speculation from those who should have known better, and actually did know better. A paper written by Intel and attorneys WilmerHale – who stated that they work with confidential licensing agreements, so they should have known what was going on – suggested that the aggregate royalties could be as much as 30%, or \$120, on a \$400 smartphone.

## And what was the flaw in these estimates?

**KM:** The narratives were grossly overestimating royalties and they did so on a rather narrow basis that did not reflect where all the value was delivered throughout the mobile ecosystem. The objective really was to inflate the rates and put it on as narrow a denominator as possible. I wanted to put the record straight, because it was clear that nobody was paying any such rates.

I made my conservatively high assessment on the same definitional and mathematical basis as Intel and WilmerHale and others, because even on that basis, they were off by a factor of five – my figure of around a 5% aggregate rate versus their hypothetical and speculative 30% aggregate rate.

Even on the very narrow basis of royalties versus handset prices, the aggregate amounts allegedly being paid for cellular SEP licensing, that were being banded around in that period were grossly inflated over what was actually being paid out.

## **You say that your much smaller estimate is, if anything, conservative in the direction of a higher aggregate royalty yield. Why?**

**KM:** In the broadest sense, it is conservative because in terms of value, you have got this vast cellular ecosystem that this SEP technology is fundamental to enabling.

Using only handset prices in the denominator, with around \$400 billion in total sales per year over the last decade, still overlooks the much larger revenues derived from standard-essential technologies in, for example, operator services, which are worth around a trillion dollars annually, and in over-the-top services worth several hundreds of billions of dollars more. These have been key for the likes of Uber, for example, or Netflix, both of which grew rapidly following the introduction of Google Play on Android and Apple's App Store in 2008.

There is also the cellular network equipment and infrastructure market worth a couple hundred billion dollars each year. And value to consumers and businesses is trillions of dollars more than the total of all those figures, for example, increasing productivity or being able to work while travelling. In 2015, for example, BCG estimated that the mobile value chain generated \$3.3 trillion and directly contributed to 11 million jobs worldwide.

## **So you stuck with total handset sales as the denominator, but what about the numerator – total royalty fees?**

**KM:** By early 2015, I realised that we could actually figure out what the royalty payments were because the figures from major SEP licensors, accounting for most of royalty payments, were actually reported in the public financial statements of those companies.

When we talk about royalty rates for handsets, that is typically the headline or 'rate card' rate for a licensor, with the royalty charged as a percentage of the handset selling price. In practice, the rate paid is commonly lower due to cross licensing and negotiating – in many cases it is not going to be the price that is asked for initially. Maybe there is a lump sum payment or something like that going on as an adjustment.

And, actually, many device sales go unlicensed. Many patent owners do not have licensing programmes, sometimes because they have their patents for defensive purposes and do not pursue licensing. And then of course some implementers just evade paying patent licensing fees or hold out. So, my royalty yield is simply handset focused – it is the total licensing income divided by total handset revenues expressed as a percentage. Yields are then lower than rate card prices, because yields reflect reductions and the unlicensed handset sales.

Now, I said that the numerator is the SEP licensing income, but what we actually get from the public financial statements is maybe a figure like licensing income. So in the case of Nokia, for example, that includes SEP cellular licensing revenues, which are a substantial proportion of what it reports, but there are other revenues in there as well. In the case of Nokia, they actually license their brand, so that is coming into that figure too. Licensors also generate separate licensing revenues from non-cellular SEPs and from SEPs to standards other than cellular.

So my assessment is conservatively high, because whereas we are talking about cellular, in the numerator, we have actually got other stuff. In the denominator we are conservative because we are only including handset revenues. But the value of those SEPs is actually driving into other areas like network equipment and operator services.

Another thing that was conservative is that around 2015 there were a couple of LTE patent pools that had published their rate card prices and there was the possibility or the outlook that they might drive significant revenue. I thought it highly unlikely, but I gave them the benefit of the doubt and ascribed them billions of dollars in royalties, although I knew that very little was going on and I thought the outlook was actually very low.

Most importantly, it also excludes any Internet of Things (IoT) devices, because the denominator of my calculation is literally just handsets. And obviously, as the market grows, and now extends significantly beyond handsets, then realistically, we should be accounting for that as well.

## **Your most recent figures show the aggregate royalty fees attributable to the four big publicly listed licensors (Qualcomm, Nokia, Ericsson and InterDigital) coming down over time. Do you think there is reason to believe that overall aggregate royalties, including NPEs, and other privately held licensors are also in long-term decline?**

**KM:** It is difficult to track, but the impact of NPEs on the overall figures like the royalty yield is modest in comparison to the annual aggregate of around \$10 billion for all the major revenue-generating licensors, who account for the vast majority of SEP licensing revenues. The other significant publicly listed cellular SEP owners have large downstream handset businesses,

and so they cross-license to minimise out-payments rather than licensing to generate much in the way of income. These include, for example, Apple and Samsung. Nokia until 2013, and LG, which, until last year, were also pursuing the same licensing strategy, until they stopped selling handsets.

On NPEs, we should say something specifically about the settlements and court awards that you see. The headline figures may seem large, but they tend to be one-offs for the NPE to go away and not come back.

And we often see figures appearing in the press for disputes that are still subject to appeal. For example, in Apple versus Optis, where a US court award figure was first \$506 million in 2020, and then it was revised down to \$300 million in 2021. These are not running royalty annual figures, it is a one-off number and I believe that it is still subject to appeal. So, when all is said and done, who knows what the final number will be? But it will be for many years of infringement, so it can be divided down even further.

So the numbers look big, but we are talking about an enormous cellular ecosystem here.

## **What is the effect of changes to the broader commercial handset market, including the advent of 5G?**

**KM:** Revenue for handsets is increasing, with average selling prices going up – and that is because of 5G. So again, although some of these royalty numbers seem large, as a proportion of what is going on in the broader ecosystem, they are actually small percentages.

That narrow-based royalty yield figure fell again in 2021, and this is because the average selling price of a handset is rising, so the denominator of my calculation is expanding. But the 5G royalties that are being derived are somewhat limited. They are not really that much higher.

And they are structured in a different kind of way. For example, Ericsson, like everyone else, used to do everything as a percentage of the of the handset price, but for 5G they have moved to dollars-per-unit (DPU) charges.

That means it does not matter what the average selling price of the device is, you are still getting the same royalty. So if the denominator expands, and you are getting the same amount on the numerator, that percentage is going to go down. But even those that do charge a percentage rate, they have for quite a while now capped their royalty rates. InterDigital, for example, has a cap at \$200. It does not matter how much more the phone costs, the percentage rate turns into a DPU rate. That mathematical effect means that the yield figure is likely to be lower. And it is really just a continuation of the trend that we have already seen.

## **Do you think your overall point – that there has been a multi-year decline in smartphone royalty stacks on the price of a handset – is well appreciated in the industry?**

**KM:** First of all, I never accepted the term 'royalty stack'. It has negative connotations and it suggests a phenomenon that has never actually occurred, despite there being many licensors, multiple generations of cellular standards and the inclusion of several entirely different standards in reported licensing revenue.

Royalty payments to major licensors have declined in aggregate, certainly as a percentage of even the narrow denominator of just handsets, and they have also fluctuated somewhat, due to timing issues on some licensing renewals. An example of that was with Qualcomm in its renewals with Apple and with Huawei.

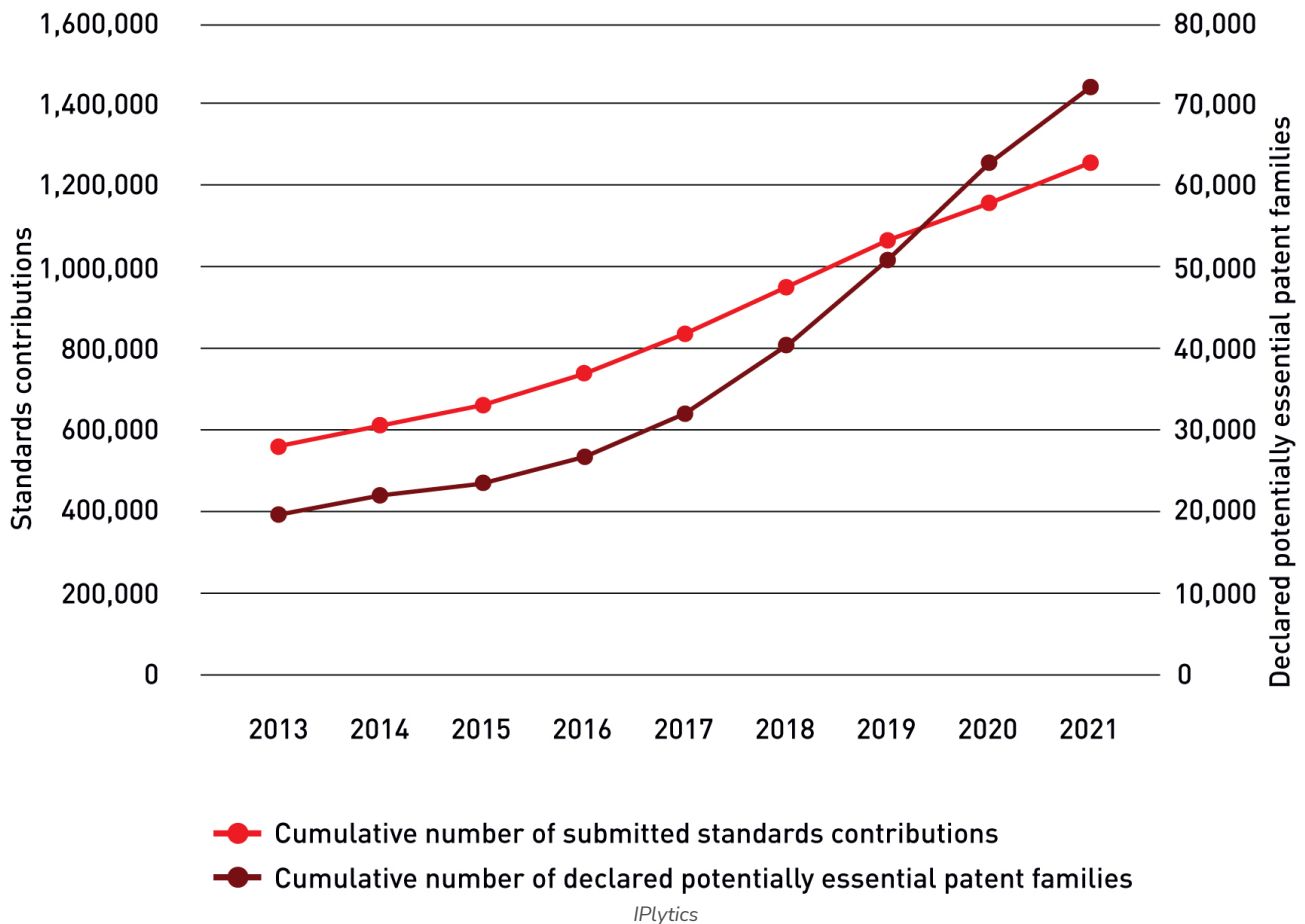
Now, other companies might generate increased royalties, including LG and Huawei, whose businesses have significantly changed having curtailed handset operations over the last year or so.

## **Is this sort of royalty yield methodology becoming less useful over time?**

**KM:** I used the methodology because I was trying to rebut directly what others were saying up to and around 2014. But I think as we move forward, this handset-based approach is becoming inapplicable, because with 5G, it is about so much more than just handsets.

So, I think it has been useful for me to revisit this but I am also wary of playing to the defective narrative that it is all about what goes on in a handset or some narrowly defined device, rather than what is really happening – which is that 5G is what the economists call a 'general purpose technology', it is a fundamental enabler for so much more.

**Figure 2. Numbers of submitted 2G, 3G, 4G or 5G standards contributions and declared potentially essential patent families**



### Has tracking these figures given you a sense of what you think is the royalty outlook for some of these big listed licensors in other verticals like cars?

**KM:** I would rather not give an indication of what the royalty outlook is other than to say this: wherever it stands, or wherever exactly it goes, it is going to be a tiny proportion of the value that is conferred downstream in the ecosystem. I think that is the key point. In terms of exactly how much and how quickly, it all depends on the market.

There is a lot of excitement and commitment to 5G, particularly with 5G Advanced upcoming. But initially, 5G has been to a large extent a kind of turbocharged version of 4G. We are on the cusp now of what can happen next, but industrial markets take a while to get going, and I am not talking about royalties, I am just talking about doing 5G IoT at all.

Certainly, at the moment, when it comes to SEP royalties, it is mostly still about smartphones.

### One talking point you hear all the time is that the number of declarations is proliferating and companies are playing numbers games around their contributions. What do you make of that, and its potential impact on aggregate royalties?

**KM:** Well, first of all, I would say that patent counting is a poor determinant of portfolio value. I have recently done some work showing the inherent biases and inaccuracies you get in patent counting as applied to top-down royalty rate analysis and determination.

There is evidence that some companies are seeking to game the system by over-declaring patents when they would not actually be found essential. So proper comparable licences remain the best benchmark of value. Real comparisons that are underpinned by real licensing transactions over many years involving substantial amounts of payments, that is the way it should be done. And in absence of these, there are value-based assessments that can be done. Nevertheless, patent counting approaches and top-down seem to be favoured by judges and the courts, at least as a cross check. So inevitably, some of that needs to be done.

But just because the counts are being bloated by over-declarations, this does not mean that the aggregate amount is going up. I think there is a lot of tactical behaviour with gaming the system and trying to grab a bigger piece of the pie.

## **A lot of implementers also point to technologies like video and the audio codecs and all the different technologies that go into a smartphone.**

**KM:** As I mentioned before, when I get the public licensing figures they may include brand licensing and maybe some software licensing and that kind of stuff, but also non-SEPs. It might also include SEP licensing to other standards, with video being one of the prime ones. So, for example, InterDigital has a programme for licensing video standards but it is modest in comparison to cellular. And video is a really important application – most of the data that is carried over the networks is now for video. But for what has been the most commonly used video codec for many years, which is AVC, most of the patents there are licensed by MPEG LA, which has a licensing fee structure that pretty much maxes out at \$0.20 per unit. So again, if you think of the enormous value that you get, a one-off charge of \$0.20 is tiny.

## **What do you think your analysis says about reaching the right royalty balance to continue to incentivise standards development?**

**KM:** I would say that 3GPP and the standardisation process is the most successful example on the large, global scale of human and organisational coordination that has ever occurred – including hundreds of companies, many thousands of individuals and millions of contributions to the standards. As an implementer, you are being given a lot of support on how to implement the standards in the combination of the patents, the declarations and the technical specifications; with all that information and all that value flowing to those downstream. And it is done in an extremely effective and coordinated way. All that is being asked is that a fair and adequate reward be provided for that.

While many implementers are paying their dues, the challenge is that a lot of them are not. A lot of them are holding out, getting away with not paying or trying to manipulate the process through the narrative to try to depress the royalties. However, this could well prove counterproductive because it will deprive those innovators of the compensation that they need to justify taking the ongoing risky investments and to contribute to the standards.

So it is logical and rational that we should be considering the entire value of the ecosystem when figuring out what that right balance is, rather than just doing it on a narrower basis.

As I said before, my approach was originally just to rebuff some egregious distortions. That approach though, is in a way doing a bit of a disservice to the innovator side of things, because the value is so much more than what has been historically depicted literally just in the price of a handset.

The value as a percentage of all the economic value generated by cellular technologies is miniscule – a lot less than 1%. That ain't no stack.

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