telecomfinance

Could the 1.4GHz band plug the spectrum gap?

by Phillipa Marks

With sales of smartphones and tablets skyrocketing, broadband and multimedia traffic on mobile networks has grown exponentially. To meet this ever-increasing demand cost effectively, operators will need more spectrum and new technology, as a partial alternative to building yet more infrastructure. Governments around the world have announced ambitious targets for spectrum releases to support growth agendas. Yet with spectrum being a scarce resource, the key question is where this additional spectrum will come from.

The 1.4 GHz band is sitting idle across Europe and could help meet these requirements in the next five years. In addition, it can play a role in providing very high speed broadband access at a lower cost than fibre or wired infrastructure. Harmonisation of this band for mobile broadband could generate economic benefits worth as much as €54bn for Europe.

While regulators in Europe are currently busy releasing frequencies for 4G (the Digital Dividend at 800 MHz and the 2.6 GHz band), the European Union and national governments are starting to look for additional bands to release over the next 5-10 years – the US, EU and Japan have all announced targets of releasing 500 MHz or more. With all the attractive spectrum (below 3 GHz) already allocated to other services, releasing new bands is going to be a challenge. Nonetheless, the European Parliament has identified a number of candidate bands for future release. These include frequencies at 700 MHz (currently allocated to TV broadcasting), 1.4 GHz (digital audio broadcasting) and 2.3 GHz (typically defence and emergency services).

The most promising candidate appears to be the frequency range 1452-1492 MHz, which at present is largely unused despite being allocated for digital audio broadcasting (DAB) services. The band is variously called the 1.4 GHz/1.5 GHz/L band in Europe, and for convenience we call it the 1.4 GHz band. Plum was commissioned by Ericsson and Qualcomm to investigate the possible use of this band for delivery of enhanced multimedia services and broadband services.

What is the spectrum problem for wireless broadband?

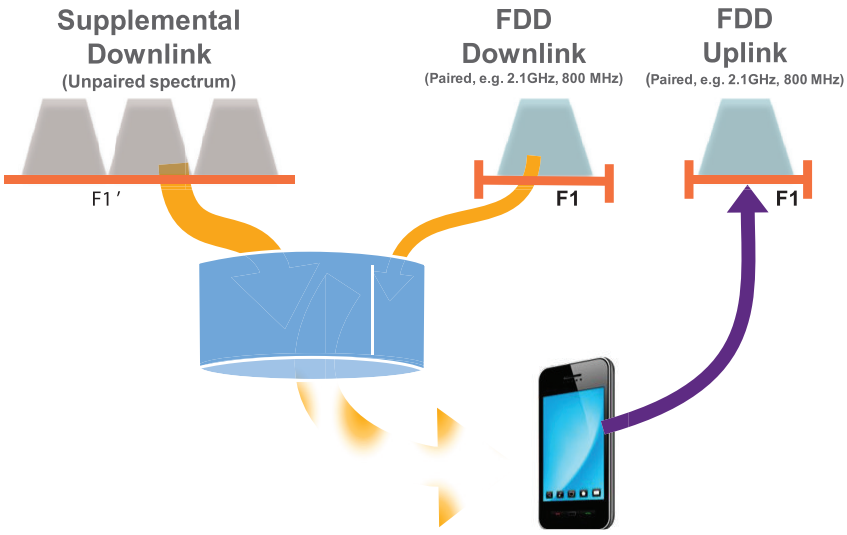
Industry forecasts suggest mobile data traffic could grow by up to 30 times current levels over the next five years. As such, downlink to uplink ratios will widen from the current ratios of between 4:1 and 8:1 to 10:1 and possibly more. To meet this increased traffic, more spectrum capacity in the downlink is required. A novel solution to this issue could be a supplemental downlink approach.

What is a supplemental downlink (SDL)?

A supplemental downlink uses unpaired spectrum to enhance the downlink capability of mobile broadband networks by enabling significantly faster downloads and supporting a greater number of users with mobile or portable wireless devices. Until now, mobile networks have not used this approach because it requires new technology. But with the development of the HSPA+ and LTE-Advanced standards, supplemental downlink and carrier aggregation are now possible.

The technology allows the bonding of the usual downlink with a supplemental downlink channel(s), in a different band, into a single wider downlink channel as shown below. This provides an efficient way of using spectrum because consumption of rich content and other data-heavy applications is asymmetric.

A supplemental downlink is not just a theoretical possibility: it is already under consideration in the United States. Once it has the necessary FCC approvals, AT&T plans to use a supplemental downlink in its LTE network, aggregating 700 MHz unpaired spectrum with other paired spectrum on which it will deploy LTE (outside of the 700 MHz band). AT&T expects to be able to deploy handsets and equipment using a supplemental downlink as early as 2014.



	LOW DEMAND AND WILLINGESS TO PAY	MEDIUM DEMAND AND WILLINGNESS TO PAY	HIGH DEMAND AND WILLINGNESS TO PAY
Avoided infrastructure costs	4	15	26
Value of enhanced user experience	9	18	28
Total	13	33	54

All figures (€bn)

What bands might be used in Europe?

Unlike the US, Europe and many other countries do not have unpaired spectrum available at 700 MHz. However, according to the draft Radio Spectrum Policy Programme, 1452-1492 MHz could be a suitable frequency. It provides 40 MHz of downlink spectrum which is more than all of the downlink spectrum (i.e. 30 MHz) provided by the digital dividend.

The band is currently allocated for use by DAB services in most European countries – part of it to terrestrial networks, and part to satellite networks. None of these services, however, have developed in the band and so it is largely sitting idle. To make the band usable for a supplemental downlink, the European Conference of Postal and Telecommunications Administrations (CEPT) would need to develop the least possible restrictive technical conditions including a band plan, in line with the EU regulatory approach to technology neutrality. 3GPP requires these conditions as an input to its standardisation work to support a supplemental downlink at 1.4 GHz. Two elements are key to the success of a supplemental downlink at 1.4 GHz – (i) harmonisation of technical conditions, and (ii) potential applicability to a large geographic area/population in Europe. These will ensure economies of scale in consumer devices and infrastructure equipment production. This approach would be compatible with the deployment of terrestrial DAB, should there be national demand for such a service.

The case for a supplemental downlink at 1.4 GHz

There is a substantial case for harmonising the 1.4 GHz for supplemental downlink. It provides much-needed downlink capacity given the asymmetric nature of mobile broadband and mobile multimedia traffic. It also enables considerably higher user data rates and supports a greater number of users, all of which will substantially enhance the user experience. It could be in use by 2014. Equipment for use of the band could be available by 2014, and the spectrum is readily available in Europe and many other countries (see Map below), providing the basis for significant economies of scale, which should drive down equipment costs.

> ‘ It is likely to be the only significant block of new spectrum available before 2018 and offers much better coverage compared to other bands that could become available before 2020’

It is likely to be the only significant block of new spectrum available before 2018 (see bar chart on the next page). It also offers much better coverage – in rural areas and in buildings – compared to other bands that could become available before 2020 (e.g. 3.5 GHz). This is because of the relatively low frequency range and regulatory conditions that allow higher powered transmissions than other bands.

What are the benefits of a supplemental downlink at 1.4 GHz?

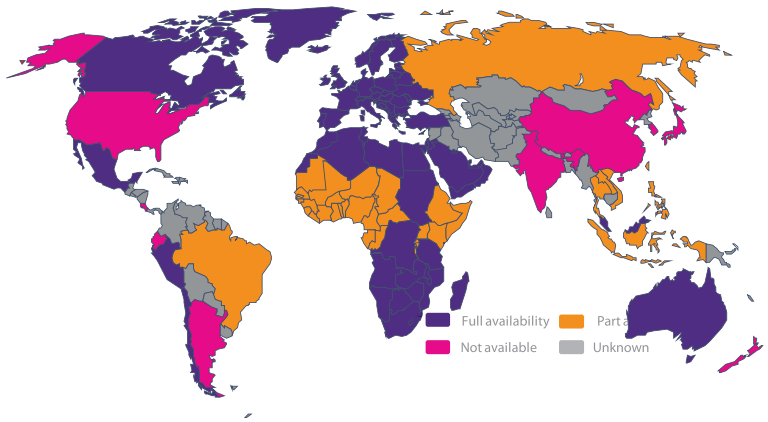
As part of our study, we estimated the value to Europe of two principal benefits of an SDL at 1.4 GHz. The first is lower network costs. By using the SDL to meet rising demand for mobile broadband, operators will not need to invest in additional base stations. This benefit is shared between operators and consumers, with the bulk of the benefit going to consumers in a competitive market.

The second is benefits of an enhanced user experience. These benefits (sometimes termed “consumer surplus”) from faster download speeds in urban and suburban areas, support for a greater number of users, and better in-building coverage.

The values obtained depend on the mobile broadband demand scenario (higher demand implies a higher economic value for the band), whether the spectrum is used by a single operator or split between several operators (the more fragmented the spectrum, the lower the economic value of the band) and consumers’ future willingness to pay for enhanced mobile multi-media services (the higher the willingness to pay, the higher the economic value of the band). In the chart, we assume conservatively that the spectrum is split equally between four operators.

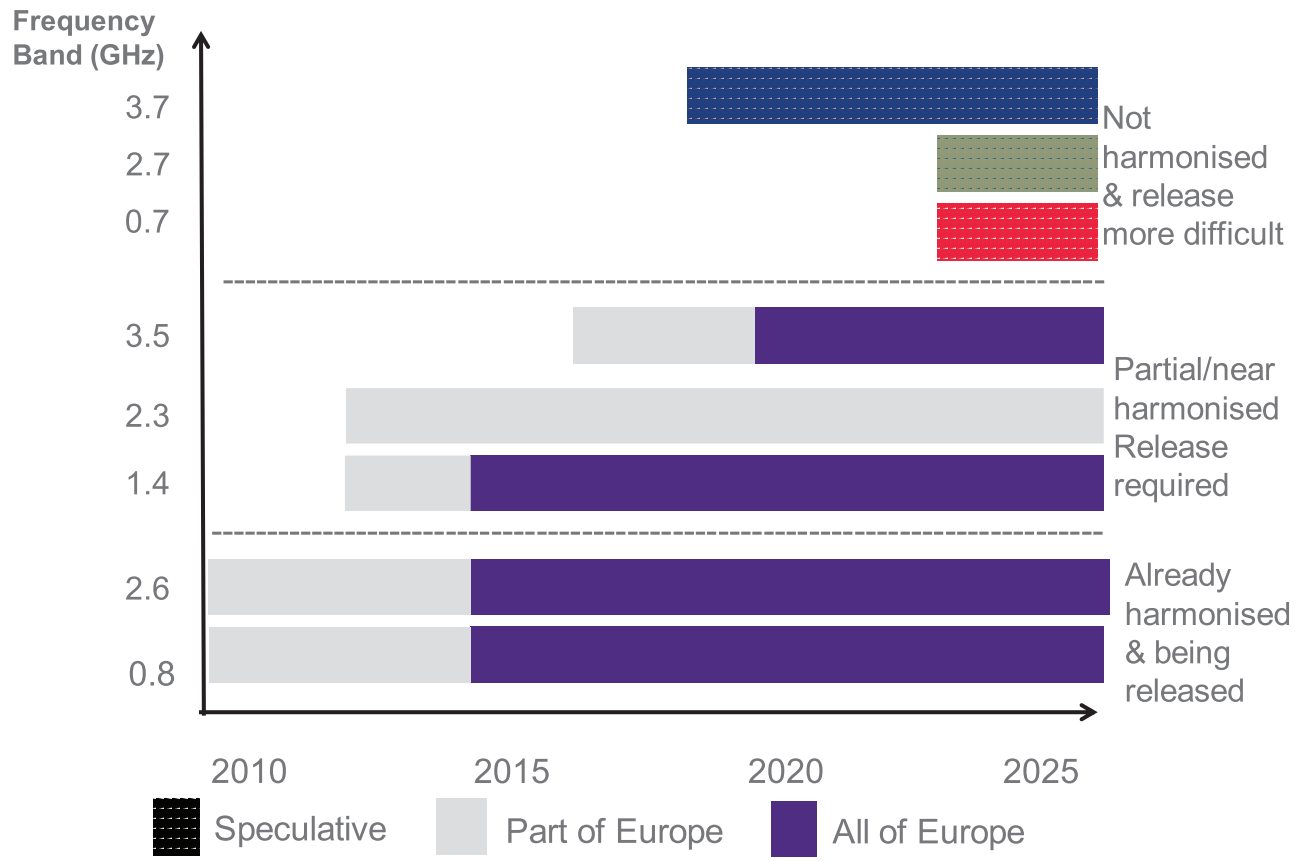
There are three additional major benefits from the use of an SDL at 1.4 GHz, which:

❒ Supports delivery of the Digital Agenda target to provide 30 Mbps access to 100 per cent of the EU by 2020. This is an extremely challenging target for the market to deliver. Wireless has a key role in providing



Source Plum analysis

What are the benefits of a supplemental downlink at 1.4 GHz?



Possible Timings for Release of Bands for Mobile Services

high speed broadband to remote and rural customers. The 1.4 GHz band can play an important role in providing very high speed broadband access at a lower cost than fibre or wired infrastructure. This will help reduce public subsidies for providing broadband in rural areas, which currently amount to around €2.5bn a year.

❒ Increases competition in the mobile broadband and content markets. Limited availability of spectrum below 1GHz means that in many countries, operators will have little or possibly even no low frequency spectrum to provide mobile broadband services. The availability of additional spectrum at 1.4 GHz for an SDL will enable players to compete more aggressively in supplying high speed mobile broadband and multimedia content. Increased competition is likely to result in lower prices for consumers. For operators, more mobile broadband capacity would encourage new business models.

❒ Gives European suppliers an early opportunity to develop innovative mobile multimedia services and new mobile broadband business models utilising an SDL. There is considerable scope for adopting 1.4 GHz for an SDL outside Europe such as in the Middle East and Africa, Australia, Canada and Mexico. Implementing the standard in Europe will open up new business opportunities in international markets, particularly for innovative service and content providers.

Conclusion

Mobile traffic will continue to grow exponentially over the coming years. This traffic is asymmetric with more downloads than uploads, and this asymmetry will be amplified by the tablets and smartphone boom. The 1.4 GHz band offers a unique opportunity for a supplemental mobile downlink offering additional mobile broadband downlink capacity, enhancing the user experience through faster download speeds and fostering access, content competition and new business models.

The 1.4 GHz-band band is widely available and currently underutilised across Europe and many other countries, thus offering a scalable opportunity. Without additional spectrum, the industry will struggle to deliver cost-rising demand for multimedia and broadband services in a cost effective way. The move to cloud based services, for example, makes little sense without good mobile connectivity.

The release of 1.4 GHz for SDL could stimulate economic activity by allowing new applications and business models to develop and lowering the cost of delivering wireless services. The economic benefits could be worth as much as €54bn for Europe, which would support government spectrum release targets. The application of a supplemental downlink at 1.4 GHz could help meet these targets in a relatively short timescale – the next 3-4 years – and will help operators reduce their costs. In time, the supplemental downlink could have wider application in mobile networks.

About the author

Phillipa Marks is a founding Director of Plum Consulting, which provides policy, strategy and regulatory advice in telecoms, media and radio spectrum. She is an international expert in the application of economics to policy and management of the radio spectrum. She advised the New Zealand government on creating the first ever national market in spectrum in 1989. Since then, she developed the approach to spectrum pricing now applied in the UK and has advised numerous other regulators and operators on spectrum policy frameworks, spectrum pricing, auctions and trading issues. She is currently a member of the Ofcom Spectrum Advisory Board.