



BRIEFING PAPER

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Spectrum auctions 2018

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Summary

On 20 March 2018 Ofcom began auctions to allocate portions of spectrum in two frequency bands that are being newly made available for mobile services: the 2.3 GHz and 3.4 GHz bands.

The 2.3 GHz band is compatible with existing devices and so can be immediately used to deliver 4G mobile services. The auction of this band is expected to boost the capacity of the 4G network to cope with increasing consumer demand for mobile data. It is not expected to improve coverage of mobile services.

The 3.4 GHz band is not immediately useable by existing mobile devices but will be a key band for future 5G applications.

Ofcom has approved the following five companies to bid in the auction: EE, Three, O2, Vodafone and Airspan Spectrum Holdings Limited.

The reserve price for the auction (the minimum amount that will be raised) is £70 million. This comprises £40 million for the 2.3 GHz band and £30 million for the 3.4 GHz band.

Ofcom has imposed caps on the amount of spectrum that operators are able to bid for in the 2.3 GHz band, and on the total amount that bidders can acquire across both bands. The restrictions aim to address competition concerns raised by uneven distribution of spectrum between the 4 mobile network operators (EE, Vodafone, O2 and Three). The effect of the caps will be to reduce BT/EE's and Vodafone's overall share of the spectrum. BT/EE will not be able to bid in the 2.3 GHz auction, and can bid for only 80 MHz in the 3.4 GHz band. Vodafone will only be able to gain a maximum of 160 MHz of spectrum across both the 2.3 GHz and 3.4 GHz bands.

The auction is likely to last several weeks, the time will depend on the level of demand for the spectrum. Ofcom have published a FAQ page, [What you need to know about Ofcom's spectrum auction](#) as well as a [guide to the auction](#), which provides more information about how the bidding will work.

1. 2018 spectrum auctions

1.1 What is being auctioned?

On 20 March 2018 Ofcom will begin auctions for two bands of radio frequency spectrum that are newly available for mobile services:¹

- 1 40 MHz of spectrum in the **2.3 GHz band** (2350-2390 MHz); and
- 2 150 MHz of spectrum in the **3.4 GHz band** (3410-3480 MHz and 3500-3580 MHz).

The 2.3 GHz band is “immediately useable” by existing devices for 4G mobile broadband services. The 3.4 GHz spectrum is not currently compatible with existing mobile devices on the market. It may be used for 4G services in the future and has also been identified as a primary band for the roll out of 5G services across Europe.² More information is available in the [Library briefing paper on 5G](#) (12 June 2017).

Operators will bid in 10 MHz lots for the 2.3 GHz band and in 5 MHz lots for the 3.4 GHz bands.³ The auction is likely to last several weeks, the time will depend on the level of demand for the spectrum.⁴ Ofcom have produced a [guide to the auction](#) which provides more information about how the bidding will work.⁵

For background information on the mobile spectrum and spectrum auctions see Section 4 below. Spectrum auctions have been held previously in 2000 and 2013 and raised £22 billion and £2.3 billion, respectively. More information about those auctions is provided in the Library briefing paper on [The UK 4G spectrum auction and mobile coverage](#) (20 July 2015).⁶

1.2 How will the new spectrum improve mobile services?

The auction will increase the amount of spectrum available to mobile services by 29 percent.⁷

The new spectrum is expected to boost the *capacity* of mobile networks. This means that more devices can access the network at one time and receive quality service. The new spectrum is not expected to boost mobile *coverage* (i.e. the geographical area that is covered by the signal).⁸ This is because of the technical characteristics of the spectrum that is being made available. The award of the lower frequency 700 MHz spectrum in 2019 is more suitable to improve coverage of mobile services (see Section 2 below). Lower frequencies can propagate over longer distances and are better at penetrating walls and physical objects.

Additionally, release of the 3.4 GHz band will support the roll out of new 5G technologies.⁹

¹ Ofcom, [Award of 2.3 and 3.4 GHz spectrum by auction](#), 13 March 2018.

² Ofcom, [Enabling 5G in the UK](#), 9 March 2018.

³ Ofcom, [Ofcom sets rules for mobile spectrum auction](#), 11 July 2017.

⁴ Ofcom, [A guide to the forthcoming auction](#), 16 March 2018.

⁵ Ofcom, [A guide to the forthcoming auction](#), 16 March 2018.

⁶ House of Commons Library, [The UK 4G spectrum auction and mobile coverage](#), 20 July 2015.

⁷ Ofcom, [Ofcom sets rules for mobile spectrum auction](#), 11 July 2017.

⁸ Ofcom, [Award of the 2.3 and 3.4 GHz spectrum bands: consultation statement](#), 21 November 2016.

⁹ Ofcom, [What you need to know about Ofcom's spectrum auction](#), 20 March 2018.

1.3 Auction regulations: spectrum caps

The auction regulations ([Wireless Telegraphy \(Licence Award\) Regulations 2018](#)) set the rules for the auction. Amongst other procedural regulations, the regulations set limits on the amount of spectrum that mobile operators will be able to hold after the auction.

Ofcom consulted on proposed rules between November 2016 and January 2017,¹⁰ and announced proposed rules in July 2017.¹¹

The regulations place two different restrictions on bidding:¹²

- 1 on the amount bidders can acquire in the 2.3 GHz auction; and
- 2 on the total amount bidders can acquire across both auctions.

The first restriction places a cap of 42% (255 MHz) on the amount of “immediately useable spectrum” that operators are able to hold after the auction.¹³ This only restricts the bidding in the 2.3 GHz auction, because the 3.4 GHz band is not immediately useable.

The second restriction places a cap of 37% (340 MHz) on the *overall* amount of mobile spectrum that operators are able to hold after the auction, therefore effectively limiting the total amount that operators can bid for across both auctions. For the purposes of this overall cap, the total mobile spectrum includes all spectrum that is expected to be useable in 2020. This includes: the mobile spectrum available before the auction, the 2.3 and 3.4 GHz bands awarded in this auction, as well as 80 MHz of spectrum in the 700 MHz band that Ofcom intends to auction in 2019.

Why is Ofcom imposing caps?

There are four mobile network operators serving the UK mobile market: EE (which is owned by BT), Three (Hutchison 3G UK), O2 (Telefónica UK) and Vodafone. There are also a number of mobile virtual network operators (for example, TalkTalk and GiffGaff) which have access to a mobile network operator’s network through commercial agreements.

Ofcom considers that having 4 credible mobile network operators is required to have a competitive market that works well for consumers (e.g. through relatively low prices), while at the same time encouraging significant levels of investment in new products and services.¹⁴

Ofcom considers that asymmetry in the amount of spectrum held by mobile network operators poses a risk to competition because providers with more spectrum are better placed to respond to increased consumer demand for mobile data than others. In other words, mobile operators with more spectrum can support more customers, and operators with lower spectrum holdings cannot keep up by other means, for example, deploying more masts.¹⁵

As at July 2017, Ofcom stated that of the total amount of spectrum that was currently useable was divided between the 4 mobile network operators as follows:

- BT/EE held 45% (255 MHz)

¹⁰ Ofcom, [Consultation: Award of the 2.3 and 3.4 GHz spectrum bands](#), 15 March 2018.

¹¹ Ofcom, [Notice of proposal to make regulations in connection with the award of 2.3 GHz and 3.4 GHz spectrum](#), 11 July 2017.

¹² Ofcom, [Ofcom sets rules for mobile spectrum auction](#), 11 July 2017.

¹³ Ofcom defines the immediately useable spectrum as the mobile spectrum currently licensed in the 800MHz, 900MHz, 1400MHz, 1800MHz, 2100MHz and 2.6GHz bands and the 2.3GHz band available in this award.

¹⁴ Ofcom, [Statement: Award of the 2.3 and 3.4 GHz spectrum bands](#), 11 July 2017.

¹⁵ Ofcom, [Ofcom sets rules for mobile spectrum auction](#), 11 July 2017.

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- Vodafone held 28% (176 MHz)
- O2 held 15% (86 MHz)
- Three held 12% (90 MHz).¹⁶

Three also held 40 MHz of spectrum in the 3.4 GHz band, which is expected to be usable in 2020.¹⁷ These spectrum holdings are depicted in the Figure below.

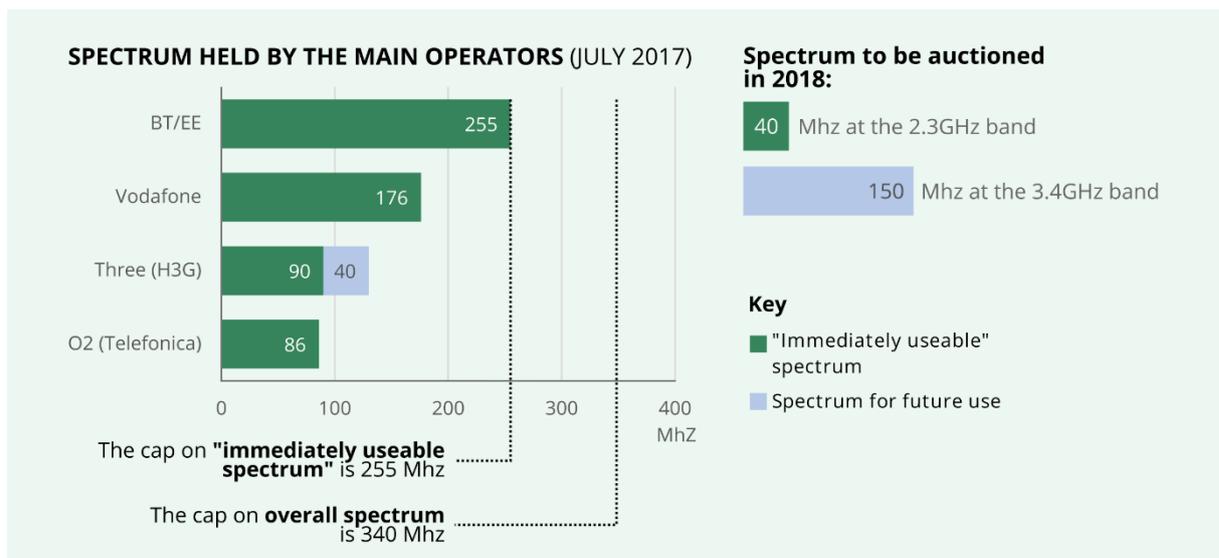
What is the effect of the caps?

The effect of both caps together will reduce BT/EE's overall share of the spectrum. BT/EE already hold 42% of currently useable spectrum so will be prevented from bidding in the 2.3 GHz spectrum auction. This will bring BT/EE's share of the immediately useable spectrum down to 39% immediately after the auction.¹⁸

The overall cap means that, BT/EE will be only be able to bid for a maximum of 85 MHz of new spectrum in the 3.4 GHz band. Additionally, Vodafone will only be able to gain a maximum of 160 MHz of spectrum across both the 2.3 GHz and 3.4 GHz bands.¹⁹

Based on the spectrum holdings as at July 2017, there is no restriction on the amount that any other bidder could acquire.²⁰

The following figure illustrates the effect of the spectrum caps alongside the total holdings of the four major operators prior to the auction.



Source: Ofcom, [Ofcom sets rules for mobile spectrum auction](#), 11 July 2017.

The restrictions only apply to the March 2018 auction. So, although the 700 MHz spectrum is included for the purpose of calculating the overall spectrum share, the same caps will not necessarily apply to auction of the 700 MHz spectrum in 2019. Ofcom will reassess whether caps are necessary for auctions in the future, taking into account the results of this auction.²¹

¹⁶ Ofcom, [Ofcom sets rules for mobile spectrum auction](#), 11 July 2017.

¹⁷ Ofcom, [Ofcom sets rules for mobile spectrum auction](#), 11 July 2017.

¹⁸ Ofcom, [Award of the 2.3 and 3.4 GHz: competition issues and auction regulations](#), 11 July 2017, paragraph 1.37

¹⁹ Ofcom, [Ofcom sets rules for mobile spectrum auction](#), 11 July 2017.

²⁰ Ofcom, [Ofcom sets rules for mobile spectrum auction](#), 11 July 2017.

²¹ Ofcom, [Ofcom sets rules for mobile spectrum auction](#), 11 July 2017.

Legal challenges to the auction regulations

Ofcom originally intended to hold the auctions in late 2017.²² This timeframe was delayed by legal challenges to the auction rules, brought separately by Three and then by EE. Both challenges were heard concurrently before Justice Green in the High Court, who found in favour of Ofcom in December 2017.²³

Justice Green explained the main arguments of parties as follows:

The principal focus of attack is upon the legality of the caps. H3G [Three] argues that the restrictions do not go far enough. BT/EE says that they go too far. Vodafone and Telefónica [O2] (whilst making no concessions about the caps) nonetheless argue that they are not unlawful, and that Ofcom should press ahead quickly with the auction since the delays in its inception are holding the market back. In some measure the two claims are mirror images of each other. Both Claimants contend that they (and they alone) are right. The Defendant to each set of proceedings, Ofcom, contends that these submissions reflect the MNOs' [mobile network operators] commercial positions and they balance each other out and show just how complex and nuanced were the judgment calls that Ofcom had to make and just how reasonable, rational and proportionate the Decision was in the public interest.²⁴

[...]

In conclusion the Decision was properly reasoned and based upon sound evidential findings. I reject all of the claims of H3G and BT/EE.²⁵

Three applied to appeal the decision, which was refused by the Court of Appeal in February 2018.²⁶

1.4 Which companies are set to bid?

To date, the following five companies have been approved to bid in the 2018 spectrum auction:

- 1 EE Limited
- 2 Hutchison 3G UK Limited ("Three")
- 3 Telefónica UK Limited ("O2")
- 4 Vodafone Limited;
- 5 Airspan Spectrum Holdings Limited.²⁷

Airspan Spectrum holdings is a UK-based subsidiary of US-based vendor Airspan.²⁸

Ofcom approves bidders to participate in the auction, requiring bidders to be fit and proper persons for holding a mobile spectrum operator licence.²⁹

1.5 How much are the auctions expected to raise?

The reserve price set by Ofcom for the auction (the minimum price) is £70 million and is broken down as follows:

- £10 million per 10 MHz lot in the 2.3 GHz band (£40 million); and

²² Ofcom, [Statement: Award of the 2.3 and 3.4 GHz spectrum bands](#), 11 July 2017.

²³ *Hutchinson 3G v Ofcom* [2017] EWHC 3376.

²⁴ *Hutchinson 3G v Ofcom* [2017] EWHC 3376 at para 17.

²⁵ *Hutchinson 3G v Ofcom* [2017] EWHC 3376 at para 21.

²⁶ Ofcom, [Ofcom approves six companies to take part in spectrum auction](#), 27 February 2018.

²⁷ Ofcom, [A guide to the forthcoming auction](#), 16 March 2018.

²⁸ *ISP review*, [Ofcom Clears 6 UK Mobile Operators to Bid on 4G and 5G Spectrum](#), 27 February 2018.

²⁹ *Wireless Telegraphy (Licence Award) Regulations 2018*, regulation 12.

- £1 million per 5 MHz lot in the 3.4 GHz band (£30 million).³⁰

2. Future spectrum auctions

Ofcom intends to conduct two further spectrum auctions in the second half of 2019:

- 80 MHz in the 700 MHz spectrum band;³¹ and
- 116 MHz in the 3.6 GHz to 3.8 GHz band.³²

The 700 MHz band is expected to initially be used for 4G services because existing devices are available that support this band. It is expected to be useful for improving rural 4G coverage, as the relatively low frequency is well suited for covering long distances.³³ The 700 MHz band is also expected to be used for future 5G applications to support wide coverage.³⁴ Ofcom has proposed to include coverage obligations on the award of this spectrum.³⁵

The 700 MHz spectrum is currently used for Digital Terrestrial Television (DTT) services and for wireless communication for musical and sporting events. Ofcom is currently conducting a programme of work to clear the spectrum, which will require some users to retune their television.³⁶ ³⁷ The spectrum is expected to become available in mid-2020.³⁸

The 3.6-3.8 MHz spectrum has been identified by the UK and EU as a primary band for 5G.³⁹ Ofcom expects the band to be available in many areas from 2020 but not necessarily nationwide before 2022.⁴⁰

3. Mobile spectrum auctions: background information

Mobile data is transmitted over the radio frequency spectrum, which is part of the wider electromagnetic spectrum. There is a finite amount of appropriate spectrum available. Each mobile network operator transmits signals over separate frequencies to avoid interference, in the same way that radio broadcasts are separated over different frequencies. Frequencies are identified in the units hertz (Hz), one megahertz (MHz) is equal to 1 million hertz, and one or gigahertz (GHz) is equal to 1000 MHz.

Different frequencies of spectrum are suited to different applications. For example, lower frequencies are better at travelling long distances and penetrating physical objects, and are therefore better suited for providing good rural and indoor coverage.

³⁰ Ofcom, [Ofcom sets rules for mobile spectrum auction](#), 11 July 2017.

³¹ Ofcom, [Improving mobile coverage: Proposals for coverage obligations in the award of the 700 MHz band](#), 9 March 2018.

³² Ofcom, [Improving consumer access to mobile services at 3.6GHz to 3.8GHz: Statement and Consultation](#), 28 July 2018.

³³ Ofcom, [Enabling 5G in the UK](#), 9 March 2018.

³⁴ Ofcom, [Enabling 5G in the UK](#), 9 March 2018.

³⁵ Ofcom, [Improving mobile coverage: Proposals for coverage obligations in the award of the 700 MHz band](#), 9 March 2018.

³⁶ Ofcom, [Maximising the benefits of 700 MHz clearance](#), 17 October 2016.

³⁷ Ofcom, [Moving Freeview to make more airwaves available for mobile – the 700 MHz clearance programme](#), 30 January 2018.

³⁸ Ofcom, [Improving mobile coverage: Proposals for coverage obligations in the award of the 700 MHz band](#), 9 March 2018.

³⁹ Ofcom, [Enabling 5G in the UK](#), 9 March 2018.

⁴⁰ Ofcom, [Improving consumer access to mobile services at 3.6GHz to 3.8GHz: Statement and Consultation](#), 28 July 2018.

Ofcom is responsible for granting licences to mobile network operators to use a defined range of radio frequency spectrum (called a 'band' of spectrum) to deliver mobile services. Each mobile operator will be licenced to operate over a certain frequency band. To allocate spectrum between the mobile network operators, Ofcom usually conducts spectrum auctions, where mobile network operators bid to be allocated portions of spectrum.

The first UK spectrum auction was held in 2000 for 3G mobile phone licences and raised £22 billion.⁴¹

The second auction was in 2013 to provide spectrum for new 4G mobile services in the UK. This auction raised £2.34 billion, which was less than the £3.5 billion forecast by the Chancellor in the preceding Autumn Statement.^{42 43}

More information about spectrum is available in the Library briefing papers on [5G](#) (12 June 2017) and [The UK 4G spectrum auction and mobile coverage](#) (20 July 2015).

⁴¹ DTI Press Notice P/2000/296, *Byers announces 3G Mobile Licence Winners*, 27 April 2000.

⁴² HM Treasury, [Autumn Statement 2012](#), December 2012.

⁴³ See [Library Briefing Paper on 4G spectrum](#) (SN06383) for further information.

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