



BRIEFING PAPER

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The UK 4G spectrum auction and mobile coverage

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Summary

Fourth generation (4G) mobile services

Like 2G and 3G networks used by mobile phones and other devices, 4G (fourth generation) networks rely on the transmission of radio waves. Compared to 3G, 4G services are much quicker; in 2014, [Ofcom reported](#) that the average download speed for 4G mobile services was 15.1 Mbps compared with 6.1 Mbps for 3G services.

Auctioning radio spectrum

Different services operate at different frequencies to avoid interference. Ofcom is responsible for allocating the frequencies from what is referred to as the radio spectrum to different mobile network operators. The allocation of spectrum is managed by means of licences, effectively licences to transmit radio waves over defined frequency ranges.

4G spectrum auction: 800 MHz and 2.6 GHz spectrum

In early 2013, Ofcom auctioned radio spectrum licences in the 800 MHz (megahertz) and 2.6 GHz (gigahertz) frequency bands to provide spectrum for new mobile services in the UK. One of the 800 MHz lots of spectrum carries a coverage obligation to provide a mobile broadband service for indoor reception to at least 98% of the UK population by the end of 2017. The [auction raised £2.34bn](#), less than the £3.5bn forecast by the Chancellor in the preceding Autumn Statement.

EE rolls out 4G ahead of its competitors: 1800 MHz spectrum

In August 2012, [Ofcom announced](#) that EE would be allowed to use its existing 1800 MHz spectrum to roll out 4G services, ahead of its competitors. Ofcom considered that any competitive advantage EE would benefit from as a result would be short-lived and would not be to the detriment of consumers.

Interference with digital terrestrial television

Some households are likely to experience interference in their television reception due to the introduction of 4G mobile devices. To ameliorate this issue, the Government announced that it would provide a filter to allow reception of digital terrestrial television following the adoption of 4G mobile technology free of charge to be met from the £180 million funding to be provided by the mobile network operators.

Future plans for 700 MHz spectrum: mobile data

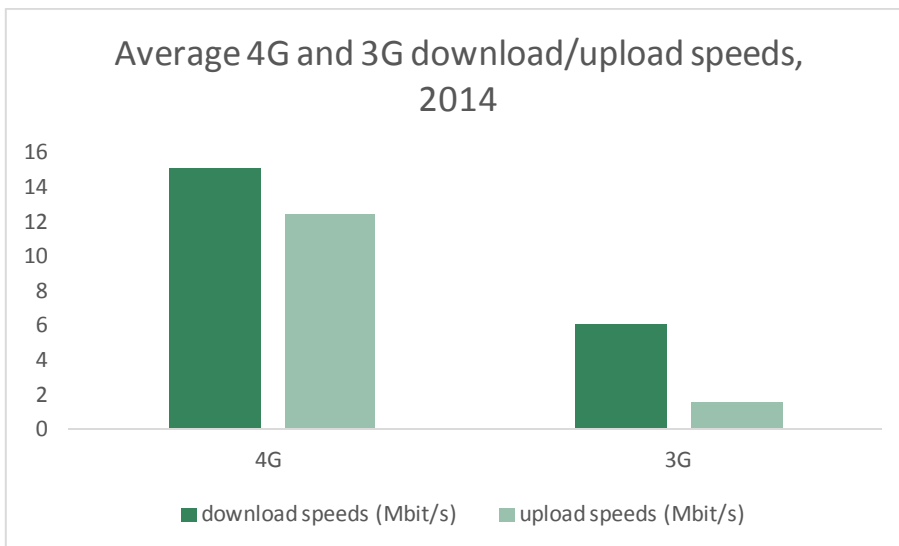
Following Ofcom's May 2014 consultation, [it decided that the 700MHz spectrum band should be made available for mobile data use](#) (November 2014). The March 2015 Budget confirmed that the Coalition Government would allocate up to £600 million to support the delivery of the change of use of 700MHz spectrum. And in March 2015, the Coalition Government stated that there would be an auction of the 700 MHz spectrum in the next parliament (2015-20).

1. 4G: Fourth generation mobile services

1.1 What is 4G?

The fourth generation of mobile technology—4G—follows on from the development of 3G and 2G technology. 2G technology was suitable for making calls and sending text messages while 3G made it possible to access the internet more effectively through your mobile phone.¹ 5G the next generation of mobile services has yet to be defined, but it is expected to be able to use very high frequency spectrum to deliver extremely fast data speeds—perhaps 10 to 50 Gbit/s.

4G networks rely on the transmission of radio waves, with different services operating at different frequencies to avoid interference. Compared to 3G, 4G services should make it much quicker to surf the web on mobile phones, tablets and laptops.



Data extracted from Ofcom's "Measuring mobile broadband performance in the UK average 4G and 3G" to show download and upload speeds in 2014. Source: Ofcom (2014)²

1.2 Auctioning radio spectrum to mobile operators—a brief history

Ofcom, the communications regulator, is responsible for allocating the frequencies for what is referred to as the radio spectrum to different mobile operators. To do so it allocates licences – effectively licences to transmit radio waves over defined frequency ranges.

¹ Ofcom, [What is 4G?](#) Accessed online: 20 July 2015

² Ofcom, "[Measuring mobile broadband performance in the UK: 4G and 3G network performance](#)" (November 2014)

5 The UK 4G spectrum auction and mobile coverage

Before the [1998 Wireless Telegraphy Act](#), licences were awarded for a specific technology and use. Fees were set to cover administrative costs only. Prospective businesses would submit proposals to the regulator, who would pick the proposal it deemed economically and socially beneficial. Such “beauty contests” were manageable when there were fewer demands for licences.³ As demand increased other models were introduced. For example the 1998 Wireless Telegraphy Act enabled the use of auctions to grant licences, where appropriate. The first UK spectrum auction was in 2000 for 3G mobile phone licences, and raised £22 billion.⁴ In addition to allocating spectrum through auctions, Ofcom also regulates the use of spectrum by the commercial sector. For example, it identifies cases of interference, illegal broadcasting, poor use of transmission equipment, and has the power to take action in such cases.⁵

³ Parliamentary Office of Science and Technology (POST) note 292 [Radio Spectrum Management](#), July 2007

⁴ BBC News, [UK mobile phone auction nets billions](#), 27 April 2000

⁵ Culture, Media and Sport Committee, [Spectrum](#), eighth report of the session 2010-12, HC 1258, 3 November 2011, para 9

2. 4G spectrum auction

The Culture, Media and Sport Committee published its [report on spectrum](#) on 3 November 2011.⁶ A particular focus was the forthcoming auction of spectrum to enable the roll-out of mobile 4G (fourth generation broadband) services. A core recommendation was that at least one of the resulting licences granted by Ofcom should include a coverage obligation of 98% of the UK population.

The Culture Media and Sport Committee recommended that Ofcom should include a coverage obligation of 98% of the UK population.

A [government response](#)⁷ to the select committee's report was published on 1 February 2012 and [Ofcom's response](#) on 19 March 2012. In the latter, the chief executive of Ofcom, Ed Richards, wrote:

... in line with the recommendation of the Committee, we would expect coverage to be provided to approximately 98% of the population without imposing an undue level of cost that might be passed on to consumers.

2.1 800 MHz and 2.6 GHz spectrum

The Government liaises closely with Ofcom on matters to do with [spectrum](#). A Direction to Ofcom from the Government - [Wireless Telegraphy Act 2006 \(Directions to Ofcom\) Order 2010](#) – provided Ofcom with a range of new flexibility in how it manages radio spectrum licences intended to further the Government's radio spectrum modernisation programme. This included a requirement that Ofcom co-ordinate a combined auction of 2.6GHz (gigahertz) and 800MHz (megahertz) spectrum as soon as possible in order that operators can deliver widespread fourth generation (4G) mobile broadband.

On 12 January 2012, Ofcom published its [second consultation](#) on the assessment of future mobile competition and proposals for the award of 800 MHz and 2.6 GHz spectrum and related issues.⁸ This consultation sets out a number of new proposals for making 4G mobile spectrum available in the UK. This includes proposals to extend coverage to at least 98% of the UK population and revised plans to promote competition. [Ofcom adds](#):

1.62 Following this consultation, and subject to responses to both this consultation and the March 2011 consultation, we plan to set out our decision for the award in a statement in Summer 2012. Alongside that statement, we plan to publish for statutory consultation draft auction regulations which will give effect to our decision, and an Information Memorandum containing details of the spectrum to be auctioned.

1.63 We plan then to make the regulations as soon as practicable thereafter. We will aim to start the award process at the earliest opportunity, having given sufficient time for potential participants

⁶ Culture, Media and Sport Committee, Eighth Report of Session 2010–12, [Spectrum](#), HC 1258

⁷ Culture, Media and Sport Committee, Sixth Special Report of Session 2010–12, [Spectrum: Government Response to the Committee's Eighth Report of Session 2010–12](#), HC 1771

⁸ Ofcom, ["Second consultation on assessment of future mobile competition and proposals for the award of 800 MHz and 2.6 GHz spectrum and related issues"](#), (17 February 2012)

to prepare. We believe the process could start in Q4 2012 with the submission of applications from prospective bidders.⁹

2.2 Ofcom's auction statement: 800 MHz and 2.6 GHz

On 24 July 2012 Ofcom published its 800 MHz and 2.6 GHz spectrum auction [Statement](#). This outlines the policy decisions made following the consultations in 2011 and 2012. An accompanying [news release](#) highlighted measures aimed at ensuring good coverage and competition.¹⁰

To promote competition, Ofcom concluded that UK customers were likely to benefit if there were "at least four credible national wholesalers of 4G mobile services."¹¹ Accordingly, Ofcom decided to reserve a minimum amount of spectrum in the auction for a fourth operator.

Ofcom announced that one of the 800 MHz lots of spectrum would carry a coverage obligation to provide a mobile broadband service for indoor reception to at least 98% of the UK population by the end of 2017.¹² In addition to the UK-wide coverage obligation, Ofcom decided that the same operator would be required to provide "the same indoor service to at least 95% of the population of each of the UK nations – England, Northern Ireland, Scotland and Wales."¹³

Alongside the statement, Ofcom published a [draft of the legal instrument](#) which implements the auction rules and gives effect to the decisions outlined above. The legal instrument is subject to a statutory consultation, closing on 11 September 2012. While estimates of the proceeds of the auction are necessarily uncertain, a figure of £2bn has been cited – which compares with the £22.5bn raised by the auction for 3G spectrum in 2000.¹⁴ Another estimate puts the likely proceeds at £3bn.¹⁵

One of the 800 MHz lots of spectrum would carry a coverage obligation to provide a mobile broadband service for indoor reception to at least 98% of the UK population by the end of 2017

⁹ Ofcom, "[Second consultation on assessment of future mobile competition and proposals for the award of 800 MHz and 2.6 GHz spectrum and related issues](#)", (17 February 2012)

¹⁰ Ofcom, "[Ofcom unveils plans for 4G auction of the airwaves](#)", (24 July 2012)

¹¹ Ibid.

¹² Ibid.

¹³ Ibid.

¹⁴ "Ofcom says 4G phone auction faces delay", *Financial Times*, 6 September 2011

¹⁵ "[Auction of high-speed 4G spectrum set to raise £3bn](#)", *Guardian*, 9 October 2011

3. EE first to roll out 4G on 1800MHz spectrum

In August 2012, Ofcom [announced a decision](#) to allow Everything Everywhere (EE) to use its existing 1800 MHz spectrum to roll out 4G services (more accurately LTE [Long term evolution] and WiMax technologies).¹⁶ This followed an earlier application by EE and a subsequent consultation. Before making the decision, Ofcom considered the extent to which liberalising EE's 1800 MHz licences now would:

be to the benefit of consumers because it would further their interests by, for example, encouraging innovation, investment, and the availability and use of high speed data transfer services throughout the UK; and improve choice, price, quality of service and value for money; and/or

give rise to a material risk of a distortion of competition to the detriment of consumers such that any benefits to consumers resulting from liberalisation of EE's 1800 MHz licences now would be outweighed by the detriment to consumers resulting from such a distortion of competition.¹⁷

Ofcom also responded to concerns of other mobile operators about giving EE a head start – before the 4G auction outcome:

1.8 Although we consider it likely that EE will enjoy a competitive advantage during the period before other operators are able to launch their own LTE services, we consider on the evidence available that any such advantage is unlikely to result in an enduring advantage which distorts competition to the detriment of consumers. Our assessment takes account of the impending release of additional spectrum in the 800 MHz and 2.6 GHz bands which will enable other operators to launch competing LTE services during the course of 2013. We have also taken into account EE's obligation to divest itself of some its 1800 MHz spectrum.

1.9 In light of this assessment, and for the reasons explained in more detail in this decision, we consider that it is in the interests of consumers for us to vary EE's licences now, in accordance with EE's request. We have therefore today issued EE with varied 1800 MHz licences with the provisions authorising LTE and WiMAX coming into force on 11 September 2012.¹⁸

On 11 September 2012, the *Financial Times* reported¹⁹ that former Secretary of State, Jeremy Hunt, had brokered a "standstill agreement" involving all four mobile operators to prevent any [legal action](#) for a month.

Ofcom "Although we consider it likely that EE will enjoy a competitive advantage during the period before other operators are able to launch their own LTE services, we consider on the evidence available that any such advantage is unlikely to result in an enduring advantage which distorts competition to the detriment of consumers."

¹⁶ Ofcom, "[Decision to vary Everything Everywhere's 1800 MHz spectrum licences to allow use of LTE and WiMax technologies](#)", (21 August 2012)

¹⁷ Ibid.

¹⁸ Ibid.

¹⁹ "Government brokers deal to allow peace talks over 4G", *Financial Times*, 11 September 2012 p17

4. Interference with Digital terrestrial television

Some households are likely to experience interference in their television reception due to the introduction of 4G mobile devices. This is because 4G mobile services in the 800MHz frequency band can cause interference to digital TV reception (around 700MHz) in homes near 4G masts.²⁰

In addition to press reports,²¹ the issue of interference with digital terrestrial television (including Freeview) services has been raised in an early day motion.²²

The Secretary of State, Ed Vaizey MP, responded to concerns raised by the prospect of digital television reception being affected by 4G mobile services in answer to a Parliamentary Question in May 2012:

To address the issue the Government has now taken policy decisions relating to DTT [digital terrestrial television] coexistence. These are as follows:

A single implementation body (referred to as 'MitCo') will be set up to manage the delivery of DTT interference mitigation and provide support to DTT consumers. This will be led by the new 800 MHz licensees.

MitCo will be provided with funding of £180 million. This money is expected to come from the new 800 MHz licensees. Government will bear the risk of any overspend and there will be a 50:50 gain share of any underspend between new licensees and Government when MitCo is closed down.

MitCo will provide support to DTT consumers. This will include information and providing DTT receiver filters to households proactively and reactively. Platform changes will also be offered to households where filters do not solve the issue of interference.

A Supervisory Board will be established to monitor MitCo's performance, and to advise Ofcom accordingly.

Additional support will be provided to vulnerable consumers, including installation support; approximately £20 million of the £180 million fund is intended to cover the cost of this support.²³ Vaizey also stated that [Ofcom had identified](#) that as many as 760,000 homes could be affected in the absence of any mitigating measures.²⁴ A [technical report](#), published by Ofcom, gives a breakdown by TV transmitter (see annex 8).²⁵ On 9 July 2012, Ed Vaizey MP detailed the financial and practical

As many as 760,000 homes could be affected by 4G signal in the absence of any mitigating measures

²⁰ Simon Thomas, ["4G Radio Waves To Clash With Digital Terrestrial Television"](#), *4G.co.uk*, (15 November 2012)

²¹ "Fury as 3 million face £200 bill to watch TV", *Daily Mirror*, 2 July 2012

²² [Early day motion 51—Digital Terrestrial Television and 4G Mobile Broadband Services](#) (14 May 2012)

²³ [HC Deb 16 May 2012 c139-40W](#)

²⁴ Ofcom, ["Coexistence of new services in the 800 MHz band with digital terrestrial television"](#), (2 June 2011)

²⁵ Ofcom, ["Technical analysis of interference from mobile network base stations in the 800 MHz band to digital terrestrial television"](#), (10 June 2011)

support to be made available, in answer to a [Parliamentary Question](#). This included:

- Provision of a filter to allow reception of digital terrestrial television following the adoption of 4G mobile technology free of charge. Ofcom estimate that the typical cost for a fitting a filter for a communal aerial installation would be around £220
- Installation of the filter, if needed, free of charge for the one in four homes with residents deemed to be “vulnerable
- All these costs will be met from the £180 million funding to be provided by the mobile network operators. This figure was based on Ofcom estimates of the size of the expected problem and includes a significant margin.²⁶

²⁶ [HC Deb 9 July 2012 cc1-2W](#)

5. Auction results, 2013

Ofcom announced the results from its 4G auction on 20 February 2013. The auction raised £2.34bn, less than the £3.5bn forecast by the Chancellor in the preceding Autumn Statement. Ofcom provided the following breakdown of what was won:

The auction raised £2.34bn, less than the £3.5bn forecast by the Chancellor in the preceding Autumn Statement.

Winning bidder	Spectrum won	Base price
Everything Everywhere Ltd	2 x 5 MHz of 800 MHz and 2 x 35 MHz of 2.6 GHz	£588,876,000
Hutchison 3G UK Ltd	2 x 5 MHz of 800 MHz	£225,000,000
Niche Spectrum Ventures Ltd (a subsidiary of BT Group plc)	2 x 15 MHz of 2.6 GHz and 1 x 20 MHz of 2.6 GHz	£186,476,000
Telefónica UK Ltd	2 x 10 MHz of 800 MHz	£550,000,000
Vodafone Ltd	2 x 10 MHz of 800 MHz, 2 x 20 MHz of 2.6 GHz and 1 x 25 MHz of 2.6 GHz (unpaired)	£790,761,000
Total		£2,341,113,000

Ofcom also announced it will be carrying out research to measure the performance of 3G and 4G networks. It expects to conduct the research around December 2013 and publish the results in spring 2014.²⁷

²⁷ Ofcom Press Notice, [Ofcom announces winners of the 4G mobile auction](#), February 20, 2013

6. 700 MHz spectrum

In May 2014, [Ofcom published a consultation document](#) seeking views on their proposal to make spectrum in the 700 MHz band available for mobile broadband from 2022 or possibly up to two years earlier.²⁸ The proposal would involve moving parts of the Digital terrestrial television and Programme Making and Special Events (PMSE) services to other frequencies.

In November 2014, [Ofcom decided that the 700MHz spectrum band should be made available for mobile data use](#)²⁹, and at Autumn Statement 2014 the government asked Ofcom and DCMS to work up delivery options to support that decision.

The March 2015 Budget confirmed that the Coalition Government would allocate up to £600 million to support the delivery of the change of use of 700MHz spectrum.³⁰ Furthermore, the Coalition Government's [Digital communications infrastructure strategy](#) stated that there would be an auction in the next parliament (2015-20) for the use of the 700 MHz spectrum for 4G mobile communications.³¹

²⁸ Ofcom, ["Consultation on future use of the 700 MHz band - Cost-benefit analysis of changing its use to mobile services"](#), (28 May 2014)

²⁹ Ofcom, ["Decision to make the 700 MHz band available for mobile data – statement"](#), (19 November 2014)

³⁰ DCMS, HM Treasury, ["The digital communications infrastructure strategy"](#), (18 March 2015)

³¹ DCMS, HM Treasury, ["The digital communications infrastructure strategy"](#), (18 March 2015)

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