Award of the 600 MHz spectrum band

Including request to stakeholders to notify intention to apply

Consultation

Publication date: 6 February 2013

Closing Date for Responses: 4 April 2013

Contents

Section 1

Executive summary

1.1 This consultation sets out our proposals for the award of a licence to establish temporary digital terrestrial television (DTT) multiplexes in the 600 MHz spectrum band (550-606 MHz). At the same time we are inviting stakeholders wishing to acquire the licence to return a formal Notice of Intention to Apply (attached at Annex 6).

Background – the UHF Strategy statement

1.2 The proposals in this document reflect decisions reached in our UHF Strategy statement, published on 16 November 2012[1].

1.3 That statement set out our long term objective of enabling the future release of 700 MHz spectrum for mobile broadband, whilst protecting the on-going provision of DTT. A key element of the strategy is that the 600 MHz band should be available, if and when needed, to accommodate DTT services displaced by a future 700 MHz band clearance – perhaps from as early as the end of 2018. This leaves a potentially short window of opportunity for *interim* use of the 600 MHz spectrum.

1.4 The UHF statement made it clear that any interim use of the 600 MHz band should be supportive of the long-term strategy. In that context, it concluded that the most appropriate interim use of the 600 MHz band would be for establishing temporary DTT multiplexes which would operate alongside use by Programme Making and Special Events (PMSE)[2], and for devices using white-space technology (WSDs)[3]. Additionally, the statement concluded that these temporary multiplexes should adopt the more efficient DVB-T2 and MPEG4 technologies.

1.5 Although the adoption of these technologies is not essential to the process of releasing 700 MHz spectrum, it will support this long-term objective by enabling more efficient use to be made of available spectrum. In the interim period, the new services in the 600 MHz band using DVB-T2 and MPEG4 could encourage consumer take-up of receiver equipment which makes use of these more efficient technologies. For example, the 600 MHz band could be used to provide around 10 HD channels using DVB-T2 and MPEG4 if two multiplexes were deployed.

The available spectrum

1.6 The 600 MHz spectrum covers the range 550 to 606 MHz comprising seven 8 MHz channels (channels 31 to 37). The band was cleared of analogue TV on a region by region basis during digital switch-over (DSO). That process was completed in 2012.

1.7 Use of particular channels/frequencies in specific geographic locations will be constrained by international agreements designed to prevent interference, and by the requirement to avoid interference to existing DTT services. In 2009 we

[1] "*Securing long term benefits from scarce low frequency spectrum, UHF strategy statement*" http://stakeholders.ofcom.org.uk/binaries/consultations/uhf-strategy/statement/UHF_statement.pdf
[2] PMSE includes wireless microphones and communications equipment used in the broadcast, film and theatre industries.
[3] White Space Devices include in-home broadband and multi-media distribution, public hot-spot coverage, machine-to-machine communications, and provision of rural broadband services.

published a study by Arqiva[4] that illustrated how the 600MHz band could be used to provide at least two UK-wide DTT multiplexes[5]. This was followed by a more detailed study published in 2011[6]. We are providing some further information, included in the Annexes to this document, in the light of up to date information on international coordination for the 600 MHz band frequencies.

1.8 One of the channels in the cleared 600 MHz band – Channel 36 (590-598 MHz) – would be suitable for a proposed Europe-wide signal propagation study on a temporary basis. It is our understanding that the exclusion of Channel 36 from the current award would not materially affect the establishment of up to two DTT multiplexes in the rest of the 600 MHz band. We therefore propose to exclude channel 36 from the interim award in order to preserve the possibility of undertaking such a propagation study.

1.9 In making the remainder of the 600 MHz band available for DTT use, we do not intend to prescribe band plans, but will instead give the new 600 MHz licensee the flexibility to plan their own use of the spectrum within the constraints of international coordination and protection of adjacent services.

1.10 The only current use of the band is for PMSE, licensed on the basis of a six months rolling notice period[7]. The UHF Strategy statement confirmed that PMSE should have access to the band until such time as new DTT services are deployed and, thereafter, should continue to have access to the band within the interleaved spectrum. It also determined that WSDs should have interleaved access to the spectrum. We intend to conduct further work on the precise arrangements for the coexistence of PMSE equipment and WSDs in the 600 MHz band.

Award design

1.11 We propose to award the 600 MHz band in the quickest and simplest way possible, consistent with our statutory duties. This reflects the short time available for potential DTT operators to realise any positive return on their investment. A delay in making the award may mean the opportunity for interim DTT use is lost altogether, together with the associated benefits for citizens and consumers.

1.12 For this reason, this consultation includes a form - the Notice of Intention to Apply (see Annex 6) that should be completed by stakeholders who intend to apply for the licence in this band. It should be returned to us alongside any consultation responses by 4 April 2013. The Notice of Intention to Apply form asks stakeholders who intend to apply for the licence to provide various details, including in particular the frequencies, locations, antenna heights and power levels they intend to use if they were awarded the licence.

1.13 If we receive only one compliant Notice of Intention to Apply form, we intend to grant a licence to that party. We will regard a form as being compliant if the information contained in the returned Notice form indicates the potential licensee

[4] Ofcom places a strict requirement on Arqiva to ensure that certain work carried out by Arqiva under contract (such as the spectrum planning studies carried out in relation to the 600MHz award) remains confidential to the part of the business unit that is carrying out that work until that is subsequently published by Ofcom.
[5] *Creation of Layers 7 and 8 in released Spectrum*, a study by Arqiva for Ofcom 3 Mar 2009 http://stakeholders.ofcom.org.uk/binaries/spectrum/spectrum-policy-area/projects/ddr/ch21.pdf
[6] *Creation of Broadcast Layers 7, 8 and 9 in 600MHz released Spectrum*, a study by Arqiva for Ofcom 7 March 2011 http://stakeholders.ofcom.org.uk/binaries/spectrum/spectrum-awards/600mhz/600MHz-Band-Study.pdf
[7] We will replace the 6 month rolling notice period that currently applies to PMSE access rights to the 600 MHz band with longer term access arrangements once this award is complete.

will meet the conditions of the licence. If, as a result of this consultation there is a material change to the conditions we include in the licence, and which affects whether submitted Notices are compliant, then we will provide an opportunity for parties to amend their Notices.

1.14 If we receive more than one compliant Notice of Intention to Apply form, we intend to award the licence by means of a competitive award process. We believe an auction, using established procedures, represents the best option. This is in line with Ofcom's general policy for spectrum awards where there is excess demand. We propose that we would conduct an auction via a single round of sealed bids.

1.15 We are proposing to offer the available 600 MHz spectrum for DTT use under a single licence (or 'lot') to the successful stakeholder. This approach represents the most straightforward way of bringing the band into use and allows potential licensees the flexibility to determine their own preferred usage patterns within the licence terms.

1.16 The available frequencies and the technical conditions which will apply, subject to responses to this consultation, are set out in Annexes attached to this document. The licence conditions will include coverage and 'roll-out' obligations. The final licence we issue will be specific to the particular sites and frequencies identified for use by the eventual licensee.

1.17 A stakeholder proposing the use of additional or alternative transmission sites to those identified in the Annexes will need to satisfy Ofcom that their proposals remain within the UK's internationally agreed limits and will not result in additional interference to existing UK DTT services. If those conditions can be met, the licence will be adapted to incorporate their proposed specifications.

1.18 If no stakeholders wish to use the spectrum for temporary DTT multiplexes it will be used in any case for PMSE and WSDs. PMSE will continue to be licensed under the existing processes. WSDs would operate on a licence-exempt basis with the 600 MHz band being included in our planned geo-location database. We consider both these applications to be valuable and important uses of the spectrum.

Proposed licence

1.19 We propose to award the licence under the Wireless Telegraphy Act (2006). We intend it to include conditions specific to this award alongside conditions which reflect those contained in existing multiplex licences (granted under the Broadcasting Act 1996). This is to ensure consistency with the existing DTT platform. A full copy of the draft licence is attached at Annex 5.

1.20 Ofcom may need to revoke the spectrum licence for the purposes of DTT re-allocation sometime from the end of 2018. In order to give effect to the decisions made in the UHF Strategy statement, we propose to include a condition enabling the licence to be revoked on a minimum of 12-months written notice, subject to a guaranteed minimum term to 31 December 2018. We believe this approach is appropriate because it provides the licensee with some degree of certainty, while also making it clear up front that the spectrum may need to be vacated at that time.

1.21 We intend to include in the licence a condition aimed at ensuring the 600 MHz spectrum is actually used for the purposes set out in the UHF Strategy statement. We propose that the licence will include a requirement for services to be rolled out within 12 months of any licence award; and for coverage within two years to reach

50% of UK households, including a minimum of 25% coverage in each of the UK Nations. We propose roll-out in the first 12 months to reach a minimum of an initial 10% coverage, with a requirement that at least one video stream is available to consumers.

Licence fees

1.22 If we receive only one compliant Notice of Intention to Apply we intend to proceed to an award the licence on the basis of the stakeholder paying a 'cost-based[8]' licence fee of £180,000. This fee covers the period until 31 December 2018. If we receive more than one compliant Notice of Intention to Apply form, and proceed to hold an auction, we propose that the sum of £180,000 will be the reserve price for the spectrum. This will also be the deposit required from applicants wishing to participate in the auction.

[8] I.e. Based on a contribution towards the cost of regulatory administration of the licence.

Section 2

Background and context

Introduction

2.1 This consultation sets out our proposals for the award of a licence to establish temporary DTT multiplexes in the 600 MHz spectrum band (550-606 MHz, but excluding 590 to 598 MHz). This section and the following sections set out in more detail the considerations and proposals outlined in the Executive Summary.

2.2 At the same time we are inviting stakeholders wishing to be granted a licence to use the band to complete and submit to Ofcom the Notice of Intention to Apply form set out in Annex 6. If we receive only one Notice of Intention to Apply that is compliant with the proposed licence terms, we intend to grant a licence to that stakeholder. If we receive more than one compliant Notice of Intention to Apply form, we intend to award the licence by means of a competitive award process as outlined later in this document.

The digital dividend

2.3 The 600 MHz band is part of the digital dividend spectrum freed up for new uses by the switch from analogue to digital television (known as digital switch-over or DSO). We consulted on the potential uses of the 600 MHz spectrum[9] in February 2010, and had intended to proceed to an award by conducting an auction for long-term licences.

2.4 However, this process was put on hold after the World Radio-communications Conference (WRC-12) signalled that countries may begin to clear DTT from the neighbouring 700 MHz spectrum band to make way for mobile broadband in the future, probably sometime after the end of 2018. This opened up the prospect of the 600 MHz band being needed to accommodate those displaced DTT services.

The UHF Strategy statement

2.5 The long term future use of spectrum in UHF bands IV and V (470 to 862 MHz), including the 600 MHz band, was considered in our UHF Strategy consultation. The subsequent statement[10] identified the dual objectives of providing more low frequency spectrum for mobile broadband whilst also securing the on-going delivery of benefits provided by DTT. The statement confirmed that we would seek to enable a harmonised release of the 700 MHz band for mobile broadband use whilst also ensuring that the 600 MHz band could be accessed by the DTT platform, if the change of use at 700 MHz goes ahead.

2.6 This leaves a potentially short window of opportunity for *interim* use of the 600 MHz band in the period before any clearance of the 700 MHz band might begin. We said any such interim use of the 600 MHz band should be authorised in a way which allows us to terminate its use from the end of 2018 if necessary.

[9] http://stakeholders.ofcom.org.uk/binaries/consultations/600mhz_geographic/summary/600condoc.pdf

[10] "*Securing long term benefits from scarce low frequency spectrum, UHF strategy statement*" http://stakeholders.ofcom.org.uk/binaries/consultations/uhf-strategy/statement/UHF_statement.pdf

2.7 The UHF Strategy statement went on to conclude that interim use of the 600 MHz band should be for the provision of one or more temporary DTT multiplexes, alongside PMSE and WSDs operating within the geographic interleaved spectrum left unused by DTT. Additionally, we said the temporary DTT multiplexes should operate using the more efficient DVB-T2/MPEG4 technologies. The 600 MHz band could be used to provide around 10 HD channels using DVB-T2 and MPEG4 using two multiplexes, if the eventual licensee chose to do so.

2.8 Although the UHF statement said the adoption of those technologies was not *essential* to the process of releasing 700 MHz spectrum, it is in our view helpful in fulfilling this objective. It is possible that the additional services provided in the interim could be re-accommodated in the multiplexes resulting from a future spectrum re-organisation if the capacity of the platform were to increase through use of the more efficient standards.

2.9 We would expect PMSE and WSD services to continue to share spectrum on a geographic interleaved basis within a re-planned DTT platform after 700 MHz clearance. This will help to secure the continued provision of existing and future PMSE services.

2.10 We are committed to working with PMSE users to reduce and potentially avoid any negative impact in the form of cost and disruption - and to help manage the transition of existing and planned services. We intend to conduct further work on the precise arrangements for the coexistence of PMSE equipment and WSDs in the 600 MHz band.

Aims and content of this document

2.11 The conclusion of the UHF Strategy review means we are now in a position to proceed with an interim award of the 600 MHz spectrum. The period of certainty over which spectrum at 600 MHz can be used on an interim basis could be as little as five years, from 2013 to 2018. This is a short period for investors to establish temporary DTT multiplexes and realise any return. The opportunity may be lost altogether if there is any unnecessary delay.

2.12 We therefore consider it appropriate, in light of our duty to ensure the optimal use of the spectrum, to proceed without further delay in awarding the 600 MHz band for interim use. The proposed process set out later in this document reflects what we believe to be both proportionate and the most efficient way of bringing this spectrum into use, consistent with our statutory duties.

Impact Assessment

2.13 This consultation, together with its Annexes, as a whole comprises an impact assessment, as defined in section 7 of the Communications Act 2003.

2.14 Impact assessments provide a valuable way of assessing different options for regulation and showing why the preferred option was chosen. They form part of best practice policy-making. The consultation sets out the potential impacts for stakeholders and the reasons we are proposing particular options.

2.15 For the reasons set out in the UHF Strategy statement[11], Ofcom has already determined that, in the best interests of citizens and consumers, the 600 MHz spectrum band should be awarded on an interim basis of the purpose of providing a DTT multiplex service, using DVB-T2 and MPEG4 technologies. Where certain frequencies are not being used for this purpose, PMSE and WSDs should be able to operate on an interleaved basis.

2.16 The 600 MHz award process is therefore designed to put into effect decisions already considered and concluded in the UHF Strategy statement. The impact of the resulting decisions – and the potential impact of alternative options – were considered in full in the UHF Strategy consultation[12]. This further consultation does not seek to re-consider the impact of decisions already assessed and concluded. Instead, it considers the further options available in putting those policy decisions into practice.

Equality Impact Assessment

2.17 Ofcom is separately required by statute to assess the potential impact of all our functions, policies, projects and practices on race, disability and gender equality. Equality Impact Assessments (EIAs) also assist us in making sure that we are meeting our principal duty of furthering the interests of citizens and consumers regardless of their background or identity.

2.18 It is not apparent to us that the outcome of our proposed approach for the release of the 600 MHz spectrum band is likely to have any particular impact on race, disability or gender equality. Specifically, we do not envisage the impact of any outcome to be to the detriment of any group of society.

2.19 Nor have we seen the need to carry out separate EIAs in relation to race or gender equality or equality schemes under the Northern Ireland and Disability Equality Schemes. This is because we anticipate that our proposals will affect all stakeholders equally and will not have a differential impact in Northern Ireland in relation to people of different gender; ethnicity, or disability, compared to consumers in general.

Structure of this document

2.20 The remainder of this consultation sets out how we propose to license and award the 600 MHz spectrum band for temporary DTT multiplexes. The document is structured as follows

- Section 3 describes the legal framework within which our decisions on the award of the spectrum will be taken;
- Section 4 examines the available spectrum and how it might be used for additional DTT multiplexes;
- Section 5 looks at the non-technical licence conditions we propose to include in the licence, including the licence term and the roll-out and coverage obligations we intend to apply;

[11] [11] "*Securing long term benefits from scarce low frequency spectrum, UHF strategy statement*" http://stakeholders.ofcom.org.uk/binaries/consultations/uhf-strategy/statement/UHF_statement.pdf
[12] http://stakeholders.ofcom.org.uk/binaries/consultations/uhf-strategy/summary/spectrum-condoc.pdf

- Section 6 sets out the technical conditions we intend to include in the licence to ensure (amongst other things) compliance with international agreements and to avoid interference with existing UK services;

- Section 7 describes our proposals for inviting applications and awarding the spectrum licence;

Section 3

Legal framework

Introduction

3.1 This section sets out the relevant legal framework for this award. We have taken this framework into account when setting out our proposals in this consultation.

3.2 The legal framework derives from our duties under both European and domestic legislation, specifically from:

- the Common Regulatory Framework[13] for electronic communications networks and services, in particular, the Framework Directive and the Authorisation Directive; and
- the Communications Act 2003 (the 'Communications Act') and the Wireless Telegraphy Act 2006 (the 'Wireless Telegraphy Act') which transpose the provisions of those directives into national law.

European Regulatory Framework

3.3 Article 8 of the Framework Directive sets out the objectives that national regulatory authorities (NRAs) must take all reasonable steps to achieve. These include:

- the promotion of competition in the provision of electronic communications networks and services by, among other things, ensuring that there is no distortion or restriction in competition in the electronic communications sector, and encouraging efficient use of radio frequencies; and
- contributing to the development of the internal market by, among other things, removing obstacles to the provision of electronic communications networks and services at a European level, and encouraging the interoperability of pan-European services.

3.4 In pursuit of these policy objectives, Article 8 requires NRAs to apply objective, transparent, non-discriminatory and proportionate regulatory principles by (amongst other things) ensuring that, in similar circumstances, there is no discrimination in the treatment of undertakings providing electronic communications networks and services; safeguarding competition to the benefit of consumers; and promoting efficient investment and innovation in new and enhanced infrastructures.

3.5 Article 8 also requires EU Member States to ensure that in carrying out their regulatory tasks, NRAs take the utmost account of the desirability of making regulations technologically neutral.

[13] The Common Regulatory Framework comprises the Framework Directive (Directive 2002/21/EC), the Authorisation Directive (Directive 2002/20/EC), the Access Directive (Directive 2002/19/EC), the Universal Service Directive (Directive 2002/22/EC) and the Directive on privacy and electronic communications (Directive 2002/58/EC), as amended by the Better Regulation Directive (Directive 2009/140/EC).

3.6 Article 9 of the Framework Directive requires Member States to ensure the effective management of radio frequencies in accordance with (amongst other things) Article 8.

3.7 Article 5 of the Authorisation Directive provides that where it is necessary to grant individual rights of use of radio frequencies, Member States must grant such rights through open, transparent and non-discriminatory procedures and in accordance with the provisions of Article 9 of the Framework Directive. When granting those rights, Member States are required to specify whether they can be transferred by the holder, and if so, under which conditions.

3.8 Article 7 of the Authorisation Directive provides that where Member States decide to limit the number of rights of use to be granted for radio frequencies, they must, among others, give due weight to the need to maximise benefits for users and to facilitate the development of competition.

3.9 The legal duties imposed on the UK by the Framework and Authorisation Directives are transposed into UK law and given effect to by the Communications Act and the Wireless Telegraphy Act (see below).

Our general duties under the Communications Act 2003

3.10 Section 3 of the Communications Act 2003 provides that our principal duty is:

- to further the interests of citizens in relation to communications matters; and
- to further the interests of consumers in relevant markets, where appropriate, by promoting competition.

3.11 In carrying out our functions, section 3(2) provides that we are required, amongst other things, to secure the optimal use for wireless telegraphy of the electromagnetic spectrum; the availability throughout the UK of a wide range of electronic communication services; and the availability throughout the UK of a wide range of television and radio services.

3.12 Section 3(3) provides that, in performing our duties, we must in all cases have regard to the principles of transparency, accountability, proportionality and consistency, as well as ensure that our actions are targeted only at cases in which action is needed.

3.13 Section 3(4) requires us, in carrying out our functions, to have regard to certain factors as appear relevant in the circumstances, including the desirability of encouraging investment and innovation in relevant markets; and the different needs and interests of everyone who may wish to use the spectrum for wireless telegraphy.

3.14 In performing our duty under section 3 of furthering the interests of consumers, we must have regard, in particular, to the interests of those consumers in respect of choice, price, quality of service and value for money.

3.15 Section 4 requires Ofcom to act in accordance with the six Community requirements, which give effect to the requirements of Article 8 of the Framework Directive.

Our duties under the Wireless Telegraphy Act 2006

3.16 Section 3 of the Wireless Telegraphy Act imposes a number of further duties relating to spectrum management. Amongst other things, in carrying out our spectrum functions, we are required to have regard to the extent to which the spectrum is available for use and to the demand, both current and future, for the use of the spectrum.

3.17 In carrying out those duties, section 3(2) requires us to have regard to (amongst other things) the desirability of promoting the efficient management and use of the spectrum; the economic and other benefits that may arise from the use of wireless telegraphy; and the development of innovative services and competition in the provision of electronic communications services.

Wireless telegraphy licences

3.18 The Wireless Telegraphy Act sets out our legal power to grant wireless telegraphy licences. Section 8(1) makes it an offence for any person to establish or use any station for wireless telegraphy or to install or use any apparatus for wireless telegraphy except under and in accordance with a licence granted by us under that Section (a wireless telegraphy licence).

3.19 Section 9(1) of the Wireless Telegraphy Act gives us the power to grant wireless telegraphy licences subject to such terms as we think fit. This broad discretion is, however, subject to the rule that we must impose only those terms that we are satisfied are objectively justifiable in relation to the networks and services to which they relate, not unduly discriminatory and proportionate and transparent as to what they are intended to achieve (see Section 9(7)).

3.20 In addition, our discretion under section 9 must be interpreted in a way that is consistent with the licence conditions permitted under the Authorisation Directive.

Granting licences

3.21 In accordance with section 10 and Schedule 1 of the Wireless Telegraphy Act, Ofcom may grant licences in accordance with procedures prescribed in regulations made by Ofcom.

3.22 Ofcom has made general regulations in relation to licensing procedures (the Wireless Telegraphy (Licensing Procedures) Regulations 2010[14]). Where Ofcom decides to award licences by auction or 'beauty contest', it makes specific regulations for those purposes, in accordance with section 14 of the Wireless Telegraphy Act in relation to auctions, and Schedule 1 of the Wireless Telegraphy Act in relation to 'beauty contests'.

3.23 The Wireless Telegraphy (Licensing Procedures) Regulations make provision for Ofcom to grant licences in relation to particular wireless telegraphy stations or apparatus, where an applicant has provided Ofcom with the requisite information set out in Regulation 5.

3.24 Ofcom also has powers under the Broadcasting Act 1996 to award DTT multiplex licences. The procedure and criteria for such a contest are prescribed in sections 7 - 12 of that Act.

[14] Made under section 10 and Schedule 1 of the Wireless Telegraphy Act 2010.

Charging fees for wireless telegraphy licences

3.25 Section 12 of the Wireless Telegraphy Act permits Ofcom to charge fees for wireless telegraphy licences, subject to certain specified exemptions relating to licences granted in accordance with auction regulations made under section 14 of the Wireless Telegraphy Act.

3.26 Under Article 13 of the Authorisation Directive, any fees imposed for rights of use of radio frequencies must reflect the need to ensure the optimal use of the resources. Such fees must be objectively justifiable, transparent, non-discriminatory and proportionate in relation to their intended purpose and take into account the objectives set out in Article 8 of the Framework Directive.

Section 4

Availability and use of the 600 MHz spectrum

Introduction

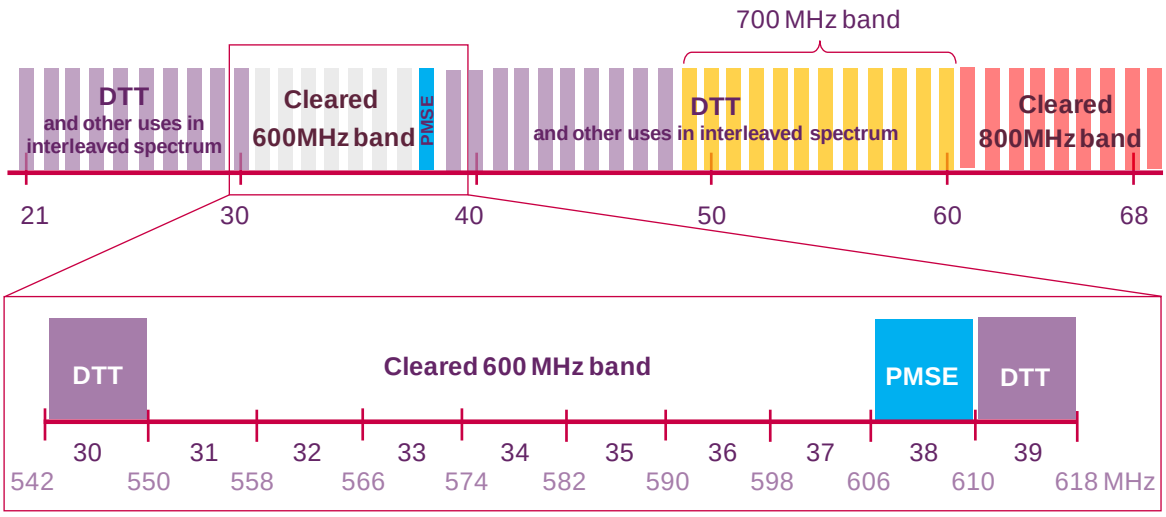
4.1 It is important to understand the nature of the spectrum available in the 600 MHz band before we can specify appropriate licence conditions and make proposals for an award. In this section we discuss:

- The nature of the available spectrum and the constraints that apply
- The potential use of the spectrum by DTT
- Use by PMSE
- Use by WSDs

The available spectrum

4.2 The 600 MHz spectrum covers the range 550 to 606 MHz (channels 31 to 37). Figure 4.1 below illustrates the 56 MHz of spectrum contained within the 600 MHz band and its relationship to adjacent services.

Figure 4.1 The available spectrum



4.3 The 600 MHz spectrum was cleared of analogue TV on a region by region basis during the DSO process. Clearance was completed in 2012. PMSE access has continued on the basis of a 6 months rolling notice period beyond DSO. The UHF Strategy statement confirmed that PMSE should continue to use the band within the interleaved spectrum once temporary DTT multiplexes have been established.

Constraints on the available spectrum

4.4 The spectrum being made available is subject to both domestic and international constraints on its use. These relate primarily to the need to avoid interference to services on neighbouring frequencies in the UK, as well as international obligations placed on use of the band. These constraints vary across the band and will impose significant restrictions on use.

4.5 The 600 MHz band will, however, be offered having been cleared of existing uses, eliminating the need to consider interference arising between different users on the same frequency within the UK.

4.6 The technical constraints that will apply to use of the 600 MHz band are:

- internationally agreed limits on the level of interference that users of the band in the UK are permitted to export to other countries;
- internationally agreed limits on the level of interference that users of the band in the UK could experience from users of the same frequencies in other countries;
- limits on the level of outgoing interference to users of adjacent spectrum outside the 600 MHz band (DTT and PMSE);
- limits on the level of incoming interference from users of adjacent spectrum outside the 600 MHz band (DTT and PMSE).

4.7 These points are also dealt with in Section 6 on technical licence conditions. The following paragraphs describe the effect that the above constraints may have on the band.

International constraints

4.8 In most of Europe, the 600 MHz band is used for television broadcasting. The need to avoid the effects of cross-border interference means that our use of the spectrum must co-exist with that of our neighbours.

4.9 As a result, it has been necessary to conduct negotiations with neighbouring countries on the basis of their use of the spectrum for broadcasting. This has led us to negotiate rights on the basis of putative networks of broadcast transmitters in the UK, which place an agreed maximum signal level into other countries. Our agreements with other nations also stipulate the maximum signal levels that broadcast transmitters in other countries can put into the UK.

4.10 As a consequence of the use of the 600 MHz band for television broadcasting elsewhere in Europe, there will be relatively high levels of incoming signals in some parts of the UK with the potential to cause interference to domestic use of those frequencies. The level of incoming signals varies between channel and location, due to different frequencies being used in various parts of Europe.

4.11 There will also be limitations on the level of transmissions allowed on some frequencies in the UK, especially in areas near the south and east coasts, in order to protect television broadcasts in other countries. Conversely, on other frequencies in the band, permitted transmission levels are higher and there is greater protection from incoming transmissions from neighbouring countries.

4.12 The effect of this is that some frequencies will be of significantly greater use in some parts of the UK than others, particularly in London and the densely populated south-east.

4.13 Broadcasters have traditionally taken these international overlaps and geographical variations into account by building networks using transmitters on different frequencies to avoid incoming interference (known as Multi-Frequency Networks or MFNs).

4.14 Any service that involves the use of a single channel will be subject to differing usage rights and experience markedly different levels of incoming interference in different parts of the UK. The exception is Channel 36, which, for historical reasons, is relatively unencumbered. Each channel carries its own unique set of rights and therefore some channels may be more or less suitable for a particular use than others. Further information on the current spectrum usage rights of the UK and its neighbours on channels 31 to 37 (including sources of incoming interference) is given in Annexes to this document.

UK constraints

4.15 As illustrated in Figure 4.1 above, services occupying the 600 MHz band will need to exist alongside DTT transmissions and PMSE in neighbouring bands. There is therefore a potential for services in the 600 MHz band to suffer interference from and to cause interference to DTT and PMSE.

4.16 Services using the 600 MHz band could have an impact on existing DTT reception in neighbouring frequencies and on PMSE in channel 38. Ensuring that existing DTT reception can coexist with new services in the 600 MHz band is an important consideration when determining technical licence conditions. Public Service Broadcasting (PSB) television services continue to be available to approximately the same proportion of the population as before DSO began (estimated by Ofcom to be 98.5% of UK households).

4.17 DTT broadcasting in adjacent frequencies could also interfere with new services in the 600 MHz band. Because of technical limitations, receivers contained in devices operating within the 600 MHz band will not be able to reject DTT signals on nearby frequencies completely. The frequencies that are immediately adjacent to broadcast transmitters are most susceptible to this kind of ‘adjacent channel interference’ (ACI). If the DTT signal is very strong, for example close to a transmitter site, the device’s receiver could become overloaded and stop functioning.

4.18 The likelihood of problems occurring between DTT services in the 600MHz band and adjacent DTT are minimal if the all of the services are broadcast from the same transmission sites (or from sites that are geographically very close together). In this situation, ACI does not arise.

4.19 Without coordination procedures, PMSE devices operating within the 600MHz band (and even in channel 38) could cause interference to the reception of DTT multiplexes making use of the 600 MHz band. However, mechanisms to coordinate PMSE operations with DTT transmissions are well-established in other parts of the UHF bands, so we would not expect coexistence problems to arise between DTT transmissions and PMSE use in the 600 MHz band.

Use of the spectrum for DTT

4.20 In making the 600 MHz band available, we do not intend to prescribe band plans, but will instead give the licensee flexibility to plan its own use of the band within the constraints of international coordination and protection of (and from) adjacent services.

4.21 In 2009 we published a study by Arqiva that illustrated how the 600MHz band could be used to provide at least two UK-wide DTT multiplexes[15]. The study made various assumptions about international coordination that were pertinent at the time. We commissioned Arqiva to revise their analysis in 2011 in the light of up to date information on the status of international coordination for the 600 MHz band frequencies. The revised Arqiva report includes data on the coverage that could be achieved by a DTT multiplex operating using DVB-T2 signals[16].

4.22 In December 2011, Arqiva[17] also produced reference offers for the cost of establishing UK-wide DTT multiplexes within the 600 MHz band. These are published on the Arqiva website[18] and represent the kind of network we envisaged as a possibility before WRC-12 signalled the clearance of DTT from the neighbouring 700 MHz band. Arqiva has since produced revised reference offers, also published on the Arqiva website, based on sub-UK coverage by new DTT multiplexes using main transmitter sites only. These are likely to be more relevant to the changed circumstances of a short-term, interim award for which a full, UK-wide DTT multiplex is unlikely to be viable. Annex 11 presents an indicative coverage plan.

4.23 The arrangements show purely representative options using existing transmission sites. Other approaches to establishing temporary DTT multiplexes may be possible, provided that they achieve the intended coverage and roll-out obligations set out in Section 5 of this document; conform to the technical licence conditions set out in Section 6; and do not cause any interference to existing DTT services.

4.24 As well as the spectrum plan, the level of coverage that could be achieved by new multiplexes will depend on practical implementation factors such as antenna height, transmitter power, and antenna patterns. These will need to be determined (where relevant) by the prospective multiplex operator based on information from their chosen transmission company. This could include an evaluation of each transmitting site, and an assessment of the capabilities of existing antenna infrastructure and space on the masts for new antennas (if that is required), or the development of alternative proposals.

[15] *Creation of Layers 7 and 8 in released Spectrum*, a study by Arqiva for Ofcom 3 Mar 2009 http://stakeholders.ofcom.org.uk/binaries/spectrum/spectrum-policy-area/projects/ddr/ch21.pdf

[16] *Creation of Broadcast Layers 7, 8 and 9 in 600MHz released Spectrum*, a study by Arqiva for Ofcom 7 March 2011 http://stakeholders.ofcom.org.uk/binaries/spectrum/spectrum-awards/600mhz/600MHz-Band-Study.pdf

[17] The 600 MHz Reference Offers have been produced by Arqiva's Broadcast and Media business which is responsible for transmission infrastructure. Arqiva's Digital Platform business unit is responsible for matters relating to the organisation's multiplex licences. Arqiva has published an Information Security Strategy which details the internal handling of confidential information.

[18] http://www.arqiva.com/corporate/documentation/referenceoffers/

Channel 36

4.25 As mentioned above, the cleared 600 MHz band includes one channel – Channel 36 (590-598 MHz) – which is free from any issues of differing usage rights in different parts of the UK. Under our original 600 MHz award plans, we had considered it suitable for provision of a UK-wide single frequency network (SFN). However, for historical reasons connected to previous uses, Channel 36 is also clear across most of the rest of western Europe. This presents a valuable opportunity that is not often encountered in the UHF spectrum, for a European cross-border signal propagation study. Existing data is relatively old and incomplete and an understanding of signal propagation could aid future spectrum planning. The proposal is for a study to set up a temporary mesh network of about 15 transmitters and up to 40 receive sites covering the eastern part of Ireland, England, Wales, and areas of France, Belgium and the Netherlands bordering the English Channel and North Sea, i.e. in areas where channel 36 is presently unused.

4.26 It is our understanding that the exclusion of Channel 36 from the current award would not materially affect the establishment of up to two DTT multiplexes in the rest of the 600 MHz band. On the other hand, its inclusion in the award would raise the possibility of preventing any meaningful signal propagation study. As we are not currently aware of strong demand for establishing more than two multiplexes, we intend to exclude channel 36 from the interim award in order to preserve the possibility of undertaking such a study.

4.27 However, if stakeholders have compelling reasons for wishing to include Channel 36 in their plans for deployment of DTT multiplexes, we are prepared to consider the possibility. The advantages would need to be weighed up against the potential benefits of the European propagation study.

Use of the spectrum for PMSE

4.28 PMSE will be authorised to access spectrum in the 600 MHz band in the interleaved spectrum left open by DTT - and in all locations until such time as DTT services are launched (and, in the case of channel 36, at all times and locations that this channel is not needed for the propagation study referred to above). PMSE users already have access to this band on the basis of a six months rolling notice period. We intend that PMSE access will continue throughout the period of the interim DTT licence and – at this stage - anticipate that such use will continue after any 700 MHz clearance. We will replace the 6 month rolling notice period that currently applies with longer term access arrangements.

4.29 As indicated in Section 2, we are committed to working with PMSE users to reduce and potentially avoid the impact of any costs and disruption, and to help manage the transition of existing and planned services. Continued access to the 600 MHz spectrum for PMSE will avoid the potential ‘double hop’ that might have been required in cases where PMSE was moved from the 600 MHz band to the 700 MHz band, only to be moved back again should the 700 MHz be cleared in the future.

4.30 We intend to conduct further work on the precise arrangements for the coexistence of PMSE equipment and WSDs in the 600 MHz band.

White Space Devices

4.31 The UHF Strategy statement identified WSDs as an important potential user of the 600 MHz spectrum alongside DTT and PMSE.

4.32 As with PMSE, WSDs will operate within the interleaved spectrum left unused by the new temporary multiplexes. A number of potential uses have been identified for WSDs, including in-home broadband and multi-media distribution, public hot-spot coverage, machine-to-machine communications, and provision of rural broadband services.

4.33 WSDs will operate on a licence-exempt basis, in conjunction with a geo-location database to enable them to accurately identify the location of interleaved spectrum and so avoid causing interference to other spectrum users. We have engaged with stakeholders to discuss the technical parameters for co-existence between WSDs and incumbent users. We intend to publish a consultation document to summarise our proposals in the first half of 2013.

Consultation question

Question 1: Do you agree with our proposal not to include Channel 36 in the spectrum to be awarded?

Section 5

Non-technical licence conditions

Introduction

5.1 In this section we discuss the non-technical conditions we propose to include in the licence we intend to award in the 600 MHz band. In particular, we discuss our proposals on:

- The nature of the licence on offer;
- Restrictions on ownership;
- The duration of the licence and our rights for revoking the licence during this period;
- Service obligations;
- Provision of information to promote efficient use of spectrum;
- Access and inspection;
- Spectrum trading
- Modifications, restrictions and closure;
- Additional non-technical licence conditions;
- Licence fees;

The licence we propose to offer

5.2 The Communications Act gave Ofcom the power to operate a simpler and more flexible licensing regime for spectrum carrying broadcast services than had previously been allowed under the Broadcasting Acts of 1990 and 1996. In particular, it is no longer necessary for the operator of a broadcast multiplex to hold separate licences under both the Wireless Telegraphy Act and the Broadcasting Act 1996 (as is the case for existing DTT multiplex operators). Only a Wireless Telegraphy Act licence is now required (although *content* providers still need to hold the appropriate Broadcasting Act licence). A Broadcasting Act licence must be issued for a 12-year term. This is not appropriate for this award.

5.3 We therefore propose to award a licence under the Wireless Telegraphy Act. A draft licence is attached at Annex 5 setting out the obligations and conditions we propose to include. These are discussed more fully later in this section and in Section 6 below (technical licence conditions).

5.4 Many of the proposed obligations mirror the standard conditions contained in our other Wireless Telegraphy Act licences. Other terms we intend to include reflect conditions contained in existing multiplex licences that have been awarded under the Broadcasting Act 1996. They are included to ensure consistency with the existing DTT platform.

5.5 We also propose to include some conditions which are specific to this award. In particular, conditions relating to roll-out and coverage obligations. In all cases, we have considered the potential impact of these proposed conditions on stakeholders. We have also had regard to our powers to include conditions in wireless telegraphy

licences as set out in the Wireless Telegraphy Act 2006 and the Authorisation Directive.

5.6 We propose to make the 600 MHz spectrum band available for DTT in the form of a single licence (or 'lot') for award. This approach represents the most straightforward way of bringing the band into use and allows potential licensees the flexibility to determine their own preferred usage patterns within the licence terms.

5.7 We considered whether the spectrum available for DTT use in the 600 MHz band should be divided and made available in the form of separate 'lots' for award. This would allow different operators to use different channels. However, we concluded this would add considerable complexity to the award. Bearing in mind the short guaranteed licence-term available, and the risk of losing the opportunity to use the 600 MHz spectrum altogether if there is further delay, we considered a complex multi-lot award was disproportionate and unjustified.

5.8 The available frequencies and proposed technical conditions are set out in Annexes attached to this consultation and in the proposed draft licence attached at Annex 5. The technical Annexes provide details of the international and national constraints which we propose will apply, plus a spectrum plan which gives an illustrative set of assignments which comply with those constraints. They also include a coverage note (Annex 11) for that spectrum plan which will show the transmission area it would reach.

5.9 We will expect stakeholders to indicate which of the available transmission sites and frequency allocations they wish to use to deploy their multiplexes. A stakeholder proposing the use of additional or alternative transmission sites will need to satisfy Ofcom that any proposals remain within the UK's internationally agreed limits and will not result in additional interference to existing UK DTT services (also see Section 6).

5.10 The resulting licence will be specific in terms of the sites and frequencies authorised, in line with the stakeholder's proposals (subject to compliance with technical licence conditions).

Restrictions on ownership

5.11 In our consultation[19] of February 2010 we outlined the non-technical conditions we proposed to include in Wireless Telegraphy Act licences for the 600 MHz licence awards. These included certain restrictions on ownership in relation to use of the spectrum to operate new DTT multiplexes.

5.12 The Broadcasting Act 1990[20] sets out certain ownership restrictions to disqualify particular groups from operating a television or radio multiplex including:

- local authorities;
- political bodies;
- religious bodies;
- publicly-funded bodies;

[19] http://stakeholders.ofcom.org.uk/consultations/600mhz_geographic/

[20] www.opsi.gov.uk/acts/acts1990/ukpga_19900042_en_1. Subsequently amended by the Broadcasting Act 1996, the Competition Act 1998 and the Enterprise Act 2002.

- bodies exerting undue influence;
- broadcasting bodies, specifically the BBC and S4C; and
- advertising agencies.

5.13 The restrictions we propose are similar to those under the Broadcasting Act 1990[21] but do not extend to broadcasting bodies (given BBC Free to View already holds a Broadcasting Act licence for Multiplex B and is directly under the control of the BBC) or advertising agencies (as all content restrictions in relation to advertising would apply in any event via the regulation of content). The details are set out in Schedule 3 of the draft licence, attached at Annex 5.

Duration of Licence

5.14 In the UHF Strategy statement we decided that any short term use of the 600 MHz band should be authorised in a way which allows us to terminate its use in 2018 and that this should be the basis on which interim uses should be planned. As set out in the UHF Strategy statement, we need to ensure that the 600 MHz spectrum can be reclaimed when it is needed for any spectrum re-planning needed as part of releasing the 700 MHz spectrum.

5.15 Therefore in order to give effect to the decisions made in the UHF Strategy statement we propose to include in this licence a clause enabling it to be revoked on a minimum of 12-months written notice, subject to a guaranteed minimum term to 31 December 2018 (enabling notice, for example, to be issued at the end of 2017 for revocation at the end of 2018). We believe this approach is appropriate because it provides the licensee with some degree of certainty, while also making it clear up front that the licence may need to be revoked for spectrum management reasons with effect from the end of 2018.

5.16 In addition, we need to consider how long the licence should run in the event that it is not revoked for spectrum management reasons. Any new broadcast multiplexes established in the 600 MHz band would function alongside existing DTT multiplexes operating in neighbouring spectrum bands. Three of the existing six multiplex licences will reach the end of their licence term in 2026. We think there is merit in synchronising the end of the 600 MHz band licence with the latest expiry date of the existing DTT multiplexes, ie in 2026. Such an approach would enable a comprehensive assessment of the efficient use of the UHF spectrum at that time should the 600 MHz licence run its full term.

5.17 Although we propose that we will not *generally* be able to revoke this licence for spectrum management reasons before 31 December 2018, will be able to do so in the particular circumstances as set out in paragraph 3 of the draft licence at Annex 5.

Service obligations on coverage and roll-out

5.18 We consider that it would be contrary to the aim of the UHF strategy if a party were to be awarded the licence for interim DTT use of the 600 MHz band and then decided to sit on the licence and not deploy services. Consequently, we consider there are positive reasons for including coverage and roll-out obligations in the 600 MHz licences. Our specific proposals are that:

[21] www.opsi.gov.uk/acts/acts1996/Ukpga_19960055_en_1.

- coverage within two years must reach at least 50% of UK households, including a minimum of 25% coverage in each of the UK Nations. The precise selection of sites will be a matter for the licensee to determine, so long as these overall coverage targets are achieved;
- roll-out of services should begin within 12 months of any licence award and the licensee must establish at least one DTT transmitter that transmits at least one video stream capable of being received by at least 10% of UK households within that period.

5.19 The precise proposed terms are set out in Schedule 1(6) of the draft licence, attached in Annex 5.

5.20 In putting forward these proposals we have considered whether these are achievable and whether higher or lower levels of coverage would be more appropriate.

5.21 We believe our proposed obligation for at least 50% coverage within 2 years is achievable based on an assessment of the coverage achievable from a small number of key existing main transmitters. For example, the latest reference offers from Arqiva[22] indicate coverage of 64.5% of UK households is achievable in the 600 MHz band from the top 20 main transmitters (also see the coverage note attached at Annex 11). It is reasonable to infer that the proposed coverage levels and timescales proposed are unlikely to deter interested parties from providing DTT services using 600 MHz spectrum.

5.22 In addition, in order to ensure that the benefits of additional DTT services are evenly distributed, we have also had regard to coverage in each of the UK Nations. We note in this respect that coverage levels in excess of 25% are relatively straightforward to achieve in each of the home nations through use of 1 to 2 transmitters. The incremental cost of ensuring coverage in each UK Nation is therefore unlikely to place a disproportionate burden on the licensee.

5.23 We also consider that the requirement to establish initial services with at least 10% coverage within 12 months is important because this level of coverage would demonstrate a serious early commitment from the licensee to rollout services in the 600 MHz band. It would also provide an early indication of progress in meeting the 50% coverage requirement. The requirement is not, however, overly onerous for the eventual licensee as it should be possible to achieve this level of coverage from operating only one or two of the main transmitters that serve the largest populations.

5.24 If lower coverage obligations were set then this would clearly deliver lower benefits to citizens and consumers. For the reasons set out above we do not however consider that such lower levels would be warranted, given the relatively low costs involved in meeting the levels that we have proposed.

5.25 We do not think that a higher coverage obligation is likely to be appropriate because:

- Extending coverage beyond 50% of the UK population is likely to involve increasing incremental costs per viewer reached, since population coverage

[22] http://www.arqiva.com/corporate/documentation/referenceoffers/

of each additional transmitter tends to fall significantly while incremental costs do not.

- Broadcasters and multiplex operators have consistently argued that interim use of the 600 MHz band for DTT broadcast use is likely to result in net costs rather than net benefits for them, at least in the short term. However, benefits to viewers in the interim would arise in the form of additional DTT services. Incentives for more extensive coverage by interim short-term services e.g. to match current commercial multiplex coverage are likely to be very limited. A higher coverage obligation may deter interested parties from providing a service at all.

5.26 In summary, we believe these obligations strike an appropriate balance between our objectives – maximising benefits to citizens and consumers, including furthering our objectives for UHF strategy – whilst remaining proportionate to likely incremental costs.

Provision of information to facilitate optimal spectrum use

5.27 In line with our duty to manage the spectrum efficiently, we propose to include standard conditions in the licences to require licensees to provide us - on request - with general information regarding their equipment and use of frequencies, or the roll-out of their network.

5.28 We note that respondents to our earlier consultations broadly accepted similar proposals, although some expressed concerns about confidentiality and/or the need to avoid onerous reporting obligations. However, information about existing DTT spectrum use is already in the public domain through institutions such as the Digital TV Group (DTG) and so we consider this type of obligation is appropriate in these circumstances. The requirements are set out in Schedule 1(10) and Schedule 3(4) of the draft licence attached at Annex 5.

Access and Inspection

5.29 In accordance with our standard spectrum licence conditions, we propose to include a condition that reserves to Ofcom the right to access and inspect the licensee's radio equipment. This is so we can check the licensee's compliance with the terms of its licence, should we decide that is appropriate. The requirement is set out in condition 13 of the draft licence attached at Annex 5.

Spectrum trading

5.30 We are not proposing at this stage to introduce trading regulations to make the licence tradable. We anticipate that given the relatively short term there is likely to be limited interest in trading this licence. Moreover, the introduction of trading regulations for this licence could increase the lead time for awarding this licence.

5.31 We would however be happy to consider this if the licensee saw benefit in it, subject to us being satisfied that this would not undermine the ability of the licence conditions to be met, particularly any roll-out and coverage obligations.

Modification, Restriction and Closedown

5.32 In accordance with our standard spectrum licence conditions, we propose to include a condition that reserves to Ofcom the right to require the licensee to modify,

restrict or close down the use of its radio equipment, should we have reasonable grounds to believe that the licensee has breached the terms of its licence, or we consider this necessary in the event of a national or local state of emergency being declared (see condition 16 of the draft licence attached at Annex 5).

Additional non-technical licence conditions

5.33 There are also other non-technical licence conditions that we propose to include in the 600 MHz licence, reflecting the licensing arrangements currently in place with respect to multiplexes licensed under the Broadcasting Act 1996. These include:

- An obligation on the licensee to comply with directions given to it by Ofcom on notification from the Secretary of State. This includes, but is not limited to, notifications from the Secretary of State that certain announcements must be transmitted (condition 7 of the draft licence attached at Annex 5).
- A prohibition on the licensee using the multiplex for conveying television services that have not been licensed by Ofcom, or otherwise authorised by another EU Member State for the purpose of broadcasting (Schedule 3(6) of the draft licence attached at Annex 5).

Licence fees

5.34 We have considered how an appropriate licence fee should be applied in the event that there is only one applicant for the 600 MHz band spectrum.

5.35 Our current general policy position is that Administered Incentive Pricing (AIP) should apply to any new spectrum brought into use for broadcasting. The appropriate fee is based on the opportunity cost of using the spectrum for a particular purpose i.e. its value for an alternative use or user. If there is a more valuable use of the spectrum, there is an incentive for the current user to either vacate the spectrum or adopt the more valuable or more efficient use.

5.36 We do not however believe the application of AIP would be appropriate in the case of this particular award, at least not before 31 December 2018.

5.37 Furthermore, the UHF Strategy statement has already determined that the only interim licensed use of the spectrum (aside from PMSE use) before 700 MHz clearance should be for DTT. Given the likely short-term availability of the licence, we consider there is little (if any) scope for a licence holder to respond to AIP in a way which might lead to a more efficient use of the spectrum in that period.

5.38 We therefore propose that cost based fees should be applied to the licence i.e. fees based on the regulatory administration of the licence. In this case, we propose levying a single cost based fee of £180,000 to cover the period up to the end of the minimum licence term (31 December 2018). This fee represents a contribution towards the costs of Ofcom making this award plus the annual cost of administration. Fees will be reviewed if interim use of the 600 MHz band continues beyond 2018.

5.39 If the 600 MHz spectrum is awarded through an auction then there will be no annual licence fee up to 31 December 2018. However, we propose that the £180,000 figure proposed above would serve as the reserve price in any auction, and would be the deposit required for participation in any auction. The licence fees are set out in conditions 9 to 12 of the draft licence attached at Annex 5. The licence reserves

the right for Ofcom to introduce a licence fee after 31 December 2018 if the licencee is not given notice to vacate the spectrum at this date.

Consultation questions

Question 2: Do you agree that the 600 MHz band should be awarded as a single 'lot'?

Question 3: Do you agree that the licence should have an end date of 2026, with a minimum term until 31 December 2018 and a clause enabling it to be revoked after that date, subject to at least 12 months notice having been given?

Question 4: Do you agree with the proposed service obligations for the licence, including roll-out and coverage obligations to ensure 50% UK coverage (and a minimum 25% in each UK Nation)?

Question 5: Do you agree with our proposals to apply a cost-based fee instead of AIP?

Question 6: Do you have any other comments on the non-technical licence conditions that are being proposed?

Section 6

Technical licence conditions

Introduction

6.1 This section sets out our proposals for the Technical Licence Conditions (TLCs) which will be included in the licence for the 600 MHz award. These TLCs are designed to define and limit the amount of interference that the licensee may expect from, and cause to, other users of spectrum. They also set out requirements for ensuring that the new DVB-T2 Digital Terrestrial Television (DTT) multiplexes are compatible with the existing DTT multiplexes.

6.2 This section is set out in the following order:

- A description of the high level international coordination requirements that constrain the use of spectrum in the 600 MHz band.
- Proposals on interference management between the new licensee and existing users of the adjacent spectrum bands.
- The technical standards applicable to this licence.
- The requirements for ensuring interoperability between DTT multiplexes; and
- An overview of the proposed detailed TLCs for this licence.

International Coordination

Protection of International DTT Allocations

6.3 The UK and other countries coordinate the use of the spectrum in order to ensure that each nation gains equitable access to this limited resource and to manage interference between nations. Coordination is principally achieved by International Treaty through the International Telecommunications Union (ITU). Decisions on highly significant or wide-reaching matters (such as digital switchover plans across Europe) may be reached through holding a Regional Radio-communications Conference where a large number of countries come together to discuss and agree proposals. Countries also hold bilateral meetings where two neighbouring countries meet to refine the high-level plans agreed at a Radio-communications Conference.

6.4 The agreements reached through the international coordination process give countries defined rights to use spectrum, including frequency use, as well as knowledge about the kind of incoming interference that might be experienced from other countries. For DTT, the agreements often take the form of ‘assignments’ which are lists of real or notional transmitter locations together with key parameters defining the rights at each location, such as the frequencies, the antenna heights, patterns and maximum radiated powers that can be used.

6.5 International clearance has been obtained by Ofcom for high power DTT assignments in the 600 MHz band that are compatible with high power DTT assignments in neighbouring countries. These assignments are based on the ITU Regional Radio-communications Conference Geneva 2006 (GE-06) DTT plan[23], as

[23] http://www.itu.int/ITU-R/terrestrial/broadcast/plans/ge06/index.html

conditionally amended by bilateral agreements to maximise the compatibility with the plans of the UK's neighbouring countries to secure optimal use of the spectrum.

6.6 The high power assignments in these representative DTT networks have been based on two Multi-Frequency Networks (MFNs) making use of existing transmission sites, one using UHF Channels 31, 32 and 33 and the other using Channels 34, 35 and 37. This means that there are two UHF channels cleared for high power use with appropriate technical conditions at each of the transmission sites detailed in Annex 12[24]. These assignments and the associated coordination agreements are detailed in Annex 13.

6.7 Annex 8 gives an overview of the international coordination process and methods. Provided that any DTT usage of the 600 MHz band operates within the internationally agreed interference 'envelope' (and hence causes no more interference than the cleared UK DTT assignments), the requirements for protecting international agreements will be met.

6.8 It is important to emphasise the need to comply with international coordination constraints. Any new services in the 600 MHz band will need to co-exist with DTT networks in neighbouring countries and will be subject to a degree of incoming continental interference.

6.9 The international coordination agreements relating to continental transmitter networks are also listed in Annex 13. In some cases, it may be that these international DTT networks will not currently be deployed at the maximum agreed and coordinated level. Prospective licensees should undertake an analysis of the potential maximum interference impact of these networks on their new services.

6.10 Any new services will be required to operate within the existing international coordination agreements. Due to the short licence term and high likelihood that discussions relating to future use of UHF spectrum will commence in the near future, Ofcom cannot consider requests to undertake international coordination with an aim of securing additional rights for assignments in the 600MHz band.

Protection of International Radio Astronomy Services in Channel 38

6.11 Channel 38 was, until September 2011, used for radio astronomy in the UK which placed severe constraints on the use of adjacent channels by broadcasting. The use of Channel 37 for new DTT services will be easier to achieve now Channel 38 is no longer used for Radio Astronomy in the UK but, instead, used for PMSE.

6.12 Radio astronomy does still occupy channel 38 in other parts of Europe and international protection requirements can still (in principle at least) restrict national network deployments of DTT transmitters in adjacent Channel 37, especially in the east and south east of the UK. This is because the required separation distances can exceed 400 km, while the protected radio astronomy sites are within 400 km of these parts of England.

6.13 Our existing international agreements are, however, compatible with protecting international radio astronomy services in Europe to the levels given in ITU-RA769-

[24] Annexes 12 to 16 are published separately from this document and may be found at: http://stakeholders.ofcom.org.uk/consultations/600mhz-award/

2. We therefore propose that the technical licence conditions will not include any additional requirement to protect the use of Channel 38 by international radio astronomy services beyond the scope of existing international agreements and the requirement to comply with technical standards including the revised version of IR2022.

Interference management

6.14 Annex 7 and Annex 14 give details of how spectrum planning is currently undertaken for DTT services in the UK and provides an explanation of how DTT coverage is currently calculated for existing DTT networks. The new licensee would be invited to join the UK Joint Planning Project (JPP) which could then derive coverage information for those planned networks. Alternatively, new licensees would be open to undertake their own assessments of the likely coverage they might achieve. Membership of JPP is not compulsory for the licence holder, although their network plans will need to be considered by Ofcom against the licence requirements to comply with international obligations and not to cause interference to other DTT multiplexes.

6.15 In planning for a new DVB-T2 DTT service in the 600 MHz band, there are a number of constraints applicable in order to ensure compatibility with services that make use of adjacent bands. Interference can occur when the new services are co-channel with existing uses (in this case, the existing uses will be DTT services in neighbouring countries, and this situation is addressed by the provisions of the previous section) or when they are adjacent channel to existing uses.

6.16 There are existing DTT uses in the adjacent bands (UHF Channels 21-30 and Channels 39-60). PMSE also shares these channels and has exclusive access to Channel 38 in the UK. The levels of interference that will be encountered from these existing services and the requirements to protect these DTT and PMSE services from interference are set out below.

Interference from existing DTT and PMSE into the 600 MHz band

6.17 It is important to emphasise that any new user of the 600 MHz band will have to exist in channels adjacent to high power DTT broadcast transmitters. PMSE users also make use of interleaved spectrum as well as having exclusive access to Channel 38 in the UK. The bulk of any interference that might occur would arise from the high power DTT network transmitters.

6.18 Although the broadcast transmitters' signals are designed to contain most energy within their licensed channel, practical constraints on transmitter design mean that some energy will be emitted on adjacent frequencies. These 'out of band' emissions can potentially cause interference to users of the adjacent spectrum. The permissible levels of 'out of band' emissions are described in Ofcom's Interface Requirement IR2022[25] for each 8 MHz channel, taking into account the new band edges due to the 800 MHz DTT clearance. This is described later in this section.

[25] *Interface Requirement 2022 – Broadcast Transmitters operating in frequency bands administered by Ofcom* http://stakeholders.ofcom.org.uk/binaries/spectrum/spectrum-policy-area/spectrum-management/research-guidelines-tech-info/interface-requirements/ir2022.pdf. Note: this document is in the process of revision during Q1/Q2 of 2013. A draft revised version is included as an annex (Annex16) to this consultation.

6.19 This interference from high power DTT transmitters will vary geographically across the UK. In order for future potential users of 600 MHz spectrum to assess the likely impact of these high power DTT transmitters on their services, a list of existing DTT assignments is included in Annex 15. Using the protection ratios derived from the relevant mask in IR2022, the interference potential from existing DTT services into the new service in the 600 MHz band can be assessed. Out of band emissions and adjacent channel interference from other DTT multiplexes are unlikely to cause a significant problem to reception of DTT multiplexes in the 600 MHz band if the transmitters for all of the services are co-sited (or are located close together).

6.20 PMSE devices operating in Channel 38 could in principle cause interference to adjacent users of the 600 MHz band. In practice, the impact of interference from PMSE into the 600 MHz band is likely to be limited as PMSE devices generally operate at very much lower powers than broadcast transmitters.

6.21 A guard band of 0.5 MHz[26] is applied at the top and bottom of Channel 38 to ensure adequate protection of potential adjacent DTT services in Channel 37 (and Channel 39) from PMSE usage in Channel 38. This is consistent with ERC report 88[27] on the potential of PMSE to interfere with DTT receivers.

6.22 The UHF Strategy statement confirmed that PMSE should continue to use the interleaved spectrum within the 600 MHz band once temporary DTT multiplexes have been established. PMSE use is, however, licensed and JFMG[28] takes DTT coverage into account when assigning frequencies to PMSE users. The 600MHz multiplexes will be incorporated into the JFMG's database and therefore will be protected from suffering interference from PMSE users.

Co-existence with existing DTT

6.23 It is important to ensure that new services established in the 600 MHz band do not cause any undue interference to existing DTT transmissions. These services, including the free-to-air PSB channels, are highly valued by consumers. There are a number of mechanisms by which DTT can suffer interference:

- Adjacent channel interference (ACI) – where a strong signal on a frequency near to a DTT signal prevents a receiver from operating reliably.
- Blocking– where an unwanted signal on any frequency is so strong that it prevents a receiver from receiving the DTT signal.
- Image channel (N+9)[29] – many types of DTT receiver are more susceptible to interference from signals on a frequency around 72 MHz higher than the wanted frequency.

6.24 Operators of new DTT multiplexes in the 600 MHz band may have an incentive to share transmitter sites with existing DTT multiplexes (as viewers' aerials are pointing at those sites and so reception on existing aerials will be maximised). Co-location of DTT transmitters has the added advantage of ensuring that the effects of ACI, blocking and image channel interference are also mitigated with the consequence that there is no additional interference to existing DTT users.

[26] http://www.jfmg.co.uk/Pages/News/Ch38_proposed.htm
[27] www.erodocdb.dk/docs/doc98/official/pdf/rep088.pdf
[28] http://www.jfmg.co.uk/
[29] Some designs of DTT receiver are susceptible to interfering signals on a frequency 72 MHz above the wanted signal. This type of interference is sometimes called N+9 as a DTT receiver tuned to channel N could therefore suffer a greater level of interference from signals on a frequency 9 channels higher (as 9 x 8 MHz =72 MHz)

Therefore, for the new DTT services, network based mitigation can be ensured by operating from existing DTT sites.

6.25 The high power/high tower model adopted by the current broadcasters may not be the only option proposed by a prospective new operator. However, if a dense low power network was proposed this could lead to a risk of interference to existing DTT reception for those sites that are not co-located with existing DTT sites. In this case, different levels of network mitigation may be required to mitigate the risk of interference.

6.26 In particular, ACI, blocking and image channel interference (in the case of sites which are not co-located with existing DTT sites) can be mitigated by reducing the level of the unwanted signal entering the DTT receiver. At the network level this can be achieved through:

- Polarisation discrimination – use of opposite polarisation by base stations reduces the level of interfering signal picked up by a domestic aerial. However this also reduces the wanted 600 MHz signal level and therefore the likelihood of reception to existing DTT domestic aerials which are being targeted.
- Power limitations – a limit on the power of the new 600 MHz service but with attendant increase in cost for network deployment.
- Guard bands – increasing the frequency separation between unwanted and wanted signals (although this is not effective for dealing with blocking or image channel interference).
- Geographical separation – separation of transmitters at an appropriate distance from households that are relying on reception of an existing DTT service can limit interference to that existing DTT service.
- On Channel Repeaters (OCRs) – Ofcom commissioned Aegis Systems Ltd to assess[30] the feasibility of OCRs (that re-radiate the wanted existing DTT services at a level that overcomes the interference in the receiver from the new service) repairing any damage to the existing DTT services. Aegis concluded that OCRs are in many cases able to repair damage to DTT services provided that the incoming signal levels to the OCR exceed a certain level.

6.27 Where network based mitigation is ineffective, receiver-based mitigation could, in principle, also be used:

- Filters – a suitably designed filter fitted in line with a DTT receiver's aerial input lead could reduce the level of unwanted signal. Due to practical filter performance this method cannot provide much mitigation where the DTT and unwanted signals are very close together in frequency separation.
- Platform substitution – where a combination of network mitigation measures and filters is insufficient to protect DTT reception, switching to use of an alternative platform such as satellite or cable to receive television services may be the only option.

6.28 However, we believe the disruption and inconvenience to consumers involved in receiver-based mitigation is disproportionate for interim services based on a short guaranteed licence term. We therefore propose that receiver mitigation will not be permissible as a method of mitigating the risk of interference to existing uses.

[30] http://stakeholders.ofcom.org.uk/binaries/consultations/800mhz/statement/OCR.pdf

Accordingly, only the network mitigation techniques for managing interference described above will be permissible.

6.29 In coming forward with proposals that rely on non co-sited transmitters, a prospective operator should bear in mind that no further interference to existing DTT will be permitted beyond that which would have arisen from co-located DTT use.

6.30 In particular, we have included a requirement in the draft licence, Schedule 1 condition 8(3), to limit interference to existing DTT and to PMSE in Channel 38. The form of this requirement ensures that each of these uses is afforded the same level of protection from any new services in the 600 MHz band as if the new service had been co-located with DTT assignments that have been cleared with neighbouring countries (as listed in Annex 12).

Network approval to ensure co-existence with existing DTT

6.31 In order to ensure co-existence with the existing DTT network, Ofcom is proposing that any new network deployed under this licence will be subject to prior review and agreement by Ofcom. Once the identity of the new 600 MHz DTT licensee has been identified (whether by assignment to a single stakeholder, or after an auction in the event that Ofcom receives more than one compliant Notice of Intention to Apply), we propose that its intended new network must be approved by Ofcom before the grant of the licence can take place. This will be determined as part of the site clearance process from the network details submitted in the Notice of Intention to Apply (Annex 6).

6.32 Ofcom will make an assessment of the potential impact of the new 600 MHz network on existing DTT coverage and determine whether the impact meets the requirement to ensure that existing DTT users are afforded the same level of protection from the new service in the 600 MHz band as if co-located DTT services had been introduced.

6.33 The assessment will take into account adjacent channel network interference on the basis of coverage in 100m x 100m squares across the UK using the UK Planning Model (UKPM) tool taking into account:

- Wanted DTT field strengths
- Sum of interfering field strengths from UK and continental transmitters
- % of locations served
- All relevant Digital Preferred Service Area (DPSA) coverage layers including any overlaps and hence an indication of the direction in which existing rooftop aerials may be pointing. These give an indication of the particular DTT services that need to be protected under a range of assumptions. These will also include a layer that will enable an assessment of potential interference to Re-Broadcast Links (RBLs) for existing DTT services to be assessed.

6.34 Ofcom has considered what level of 'loss' indicated by the model should be regarded as material in affecting existing DTT reception in a real world environment. The issue arises because any transmitter that is not co-located with existing DTT transmitters will cause a theoretical reduction in the percentage of locations deemed to be served by existing DTT networks when using the UKPM to predict coverage, whether or not this reduction would produce a practical impact on reception.

6.35 In line with approaches that have been used in the past in international coordination or in assessing real world compatibility between DTT services, we propose the criterion will be set that there should be no more than 0.5 dB degradation in margin for existing DTT reception from any individual transmitter site that is not co-located with an existing DTT site. The margin is the headroom above the failure point of the DTT service as predicted by the UKPM when taking account of the combined contributions of receiver/background noise and all relevant interferers.

6.36 In situations where the predicted degradation in margin exceeds 0.5 dB, the various network mitigation approaches identified previously in this section will need to be considered in order to mitigate the reduction in margin to comply with this limit. This analysis can include the use of a population database to confirm that any harm caused to reception would occur geographically away from current areas of population.

6.37 For extremely dense networks that are not co-located with existing DTT transmitters, there is a potential for the cumulative effect of the entire network to raise the noise floor over time in a way that could ultimately make reception more difficult for households already at the edge of coverage.

6.38 However, this impact would be extremely difficult to model, would not be attributable to any single transmitter, and could easily be within the increase in noise floor that could arise from the introduction of other services in other bands e.g. 800 MHz. On this basis, Ofcom does not propose to require any additional limitation beyond ensuring that any individual predicted degradation in margin should not exceed 0.5 dB. We believe that this will ensure that existing real world DTT reception will become no worse than if the use of the 600 MHz band was based on co-located DTT.

6.39 Potential new licensees of spectrum in the 600 MHz band can assess the impact of their service proposals using their own tools (including their own planning models and population databases). However, Ofcom's decision on whether the service proposals meet the licence requirements will be based upon the proposals being checked against UKPM coverage.

Co-existence with PMSE in Channel 38

6.40 In many cases, existing high power DTT transmitters are located in areas away from those where demand for PMSE services is greatest and, therefore, do not constrain PMSE use of the spectrum. Use of Channel 38 by PMSE is therefore unlikely to be materially affected by a new DTT multiplex in the 600 MHz band if the network arrangement is similar to existing DTT multiplexes.

6.41 Appropriate site location, power limitation and application of the proposed technical standards including revised IR2022 should prevent undue adjacent channel interference and receiver blocking into PMSE in Channel 38.

PMSE and White Space Devices sharing with new DTT DVB-T2 networks

6.42 As previously described, a licence to establish DTT multiplexes in the 600 MHz spectrum is likely to be based on MFNs using the available channels 31 to 37 (excluding channel 36). In our UHF Strategy statement we determined that DTT use will be on a shared basis with PMSE and WSDs, which will operate in the interleaved spectrum left unused by the new multiplexes - provided that these do

not interfere with the services offered by the new DTT licensee.[31] The mechanism for PMSE use of this spectrum on a geographic basis will be the same as for the rest of the TV broadcasting band.

6.43 WSDs could also potentially use the interleaved spectrum in certain geographical areas without causing interference to the new DTT services. However, making the interleaved spectrum available could require the new DTT licensee to produce and maintain their own geo-location protection database to protect their services. We believe that the overhead for a new DTT licensee, in particular the requirement to have access to recognised frequency planning tools for DTT in the 600 MHz band, would put a disproportionate burden on any new licensee.

6.44 Therefore the new 600 MHz licensee would be invited to join the JPP, where they would have access to spectrum planning support which could mitigate the burden of producing the protection database by sharing this responsibility with the existing DTT frequency planning organisations. This will enable the interleaved spectrum to be opened up for PMSE and WSD use in the areas where the new DTT licensee does not use individual 600MHz band channels. Unused spectrum would be added to a coordinated geo-location database. The current approach to implementing geo-location protection for WSDs is described in an Ofcom statement[32].

6.45 The methods for ensuring coexistence between WSDs and DTT are being considered separately as part of the ongoing work to produce a geo-location database for these technologies[33]. The same protection requirements for WSDs in DTT interleaved spectrum are likely to apply for the protection of the new multiplexes in the 600 MHz band.

Technical Standards

6.46 Our policy objective as determined in the UHF Strategy statement is for the 600 MHz DVB-T2 DTT service to be an interim extension of the current six multiplex DTT platform, in order to encourage the take up of the more spectrum efficient DVB-T2 technology by UK DTT consumers. Therefore, there is a need to maintain a high level of service quality in line with existing conditions for the provision of DTT services.

6.47 The new services provided by the 600 MHz multiplex licensee will need to comply with the technical standards with which the other DTT multiplex licensees comply. This is to ensure that the signals carrying the new services attain the appropriate high technical quality and reliability and to minimise the disruption to viewers if any changes are carried out on the transmission infrastructure.

6.48 The requirements (draft licence, Annex 5, Schedule 1(8)) are set out in the following Ofcom technical codes of practice;

- Television Technical Performance Code[34] (including the Reference Parameters for DTT Transmissions in the United Kingdom[35] referred to therein);

[31] We intend to conduct further work on the precise arrangements for the coexistence of PMSE equipment and WSDs in the 600 MHz band.
[32] http://stakeholders.ofcom.org.uk/binaries/consultations/geolocation/statement/statement.pdf
[33] http://stakeholders.ofcom.org.uk/consultations/whitespaces/
[34] http://stakeholders.ofcom.org.uk/binaries/broadcast/guidance/tech-guidance/tv_tech_platform_code.pdf

- Code of Practice on Changes to Existing Transmission and Reception Arrangements[36];
- Guidance Note on Test Transmissions[37].

Interoperability

6.49 In order to satisfy the long term policy objectives set out in our UHF Strategy statement, we propose to facilitate technical interoperability between existing multiplex operators and new entrants providing DVB-T2 services (draft licence schedule 1, condition 9).

6.50 The most significant provision for ensuring interoperability is a proposed licence condition requiring the operator of the new DTT multiplexes to cooperate with the existing UK DTT multiplex operators. We propose that this will include a requirement to work together to ensure there is no conflict in the use of Service Information (SI), Programme Specific Information (PSI) and the allocation of Logical Channel Numbers (LCNs). It would also include minimum requirements in terms of cross carriage of EPG data, and a requirement to ensure adequate testing of transport streams and services to ensure an acceptable experience for viewers.

6.51 The new 600 MHz multiplex licensee will also need to ensure that its services are compatible with the technical arrangements described in the Reference Parameters[38]. This includes a requirement to cross-carry Service Information with the other DTT multiplexes to ensure reliable operation of the DTT EPG on viewers' receivers.

6.52 Finally, in order to ensure compatibility with the existing base of receivers, we proposed that the 600 MHz multiplex licensee be required to ensure that any EPG service carried in the multiplex service is provided using published technical standards that are freely available. Details of the broadcast data stream formats used in the provision of the EPG service must also be made freely available to receiver manufacturers.

Proposed detailed technical licence conditions

Transmission Standards

6.53 We decided in our UHF Strategy statement to require the licensee to deploy DVB-T2 using MPEG4 Advanced Video Coding (AVC) video compression, to be compatible with 'Freeview HD' receivers or their equivalent (draft licence, Annex 5, Schedule 1(5)(1)).

6.54 Because of the wide range of independent coding and modulation parameters contained in the DVB-T2 standard, the number of detailed DVB-T2-compliant transmission modes is almost limitless. The parameters which can be varied include bandwidth, constellation, code rate, pilot pattern, guard interval and FFT

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[35] http://stakeholders.ofcom.org.uk/binaries/broadcast/guidance/tech-guidance/dttt_uk.pdf
[36] http://stakeholders.ofcom.org.uk/binaries/broadcast/guidance/tech-guidance/cop.pdf
[37] http://stakeholders.ofcom.org.uk/binaries/broadcast/guidance/bguidanceapr2012/test_transmissions.pdf
[38] http://stakeholders.ofcom.org.uk/binaries/broadcast/guidance/tech-guidance/dttt_uk.pdf

size, all of which may be adjusted depending upon the system requirements for coverage, capacity, interference rejection and/or ability to operate as an SFN.

6.55 Although Ofcom would normally prefer to leave the choice of the specific DVB-T2 mode to be adopted to the new licensee, in order to maximise consumer benefit, we wish to ensure the new services will have a high level of compatibility with the UK's existing installed DVB-T2 receiver base. In theory all DVB-T2 receivers should be able to decode all DVB-T2 modes, but only a limited selection of these modes has been fully tested (for example, via the DTG testing facility) with receivers currently on the market.

6.56 The set of modes which are fully tested for functional performance within the UK is very similar to those defined by the DVB Project for validation and verification of the DVB-T2 standard. We consider that use of one of these DVB-T2 modes is desirable as the new licensee would benefit from the assurance that their services will be receivable on existing UK DVB-T2 receivers. Manufacturers and viewers would also benefit from the increased assurance that the new services will be receivable on their existing Freeview HD receivers.

6.57 In the current line-up of services on the DTT platform, one multiplex (Multiplex B) operates using the DVB-T2 standard, whereas the remaining five multiplexes operate using the longer-established DVB-T standard. The existing DVB-T2 multiplex is capable of carrying a number of MPEG4 HD services (it currently carries four). The transmission mode for this multiplex was selected on the need to maximise data capacity while also achieving very similar coverage to the DVB-T multiplexes (for a given transmission power and radio frequency [RF] channel conditions). The existing DVB-T2 multiplex provides a net data rate of 40.2 Mbit/s

6.58 The DTG has also developed certain minimum standards for the RF performance of DVB-T2 receivers. These modes are contained in the DTG's 'D-Book', and are used in detailed receiver conformance testing. The current published version of the D-Book (D-Book 7 Part A, Version 2) includes receiver performance targets for three DVB-T2 modes. The updated version of the 'D-Book' (D-Book 7 Part A version 3) is due to be published in March 2013 and will also contain the variation of the DVB-T2 standard used for the Northern Ireland Multiplex. The modes contained in the D-Book are:

- 32K 256 QAM rate 2/3 extended carrier mode (used on Multiplex B);
- 32K 256 QAM rate 2/3 non-extended carrier mode; and
- 32K 16-QAM rate ½.
- 32K QPSK rate 2/3 (will be included in the updated D-Book).

6.59 Our default proposal is that the DVB-T2 mode currently used for Multiplex B (32K 256 QAM rate 2/3)[39] , or a very similar variant if to be used in an SFN, should be used by the new DTT services, as this mode provides enough capacity for a number of services including High Definition (HD) services and also achieves good coverage. However, Ofcom will consider other DVB-T2 modes if the licence applicant can demonstrate (for example, through the commissioning their own DTG receiver testing) that the proposed alternative mode works well with existing receivers and that it would achieve satisfactory coverage.

[39] DVB-T2 reference parameters page 3:
http://stakeholders.ofcom.org.uk/binaries/broadcast/guidance/tech-guidance/dttt_uk.pdf

Frequency offsets

6.60 Multiplex operators can make a small adjustment to the centre frequency of a DTT signal to move it away from a band edge or another DTT signal in an adjacent channel. The result is to slightly offset the DTT signal either up or down in frequency within its 8 MHz channel. By convention, the value of the offset is one-sixth of a Megahertz, or approximately 167 kHz.

6.61 Frequency offsets are employed at some sites by the existing DTT multiplexes in order to ease RF filtering requirements.

Extended Carrier Operation for DVB-T2

6.62 DVB-T2 can be operated in normal carrier mode or extended carrier (EC) mode whereby the signal occupies slightly more spectrum than a DVB-T signal, but still fits inside a standard 8 MHz channel. Using EC mode adds approximately 1 Mbit/s to the multiplex data capacity for the existing UK DVB-T2 mode; normal carrier mode offers 39.2 Mbit/s whilst extended carrier mode offers 40.2 Mbit/s.

6.63 When DVB-T2 services launched in 2008, it was deemed desirable to maximise the potential of the new standard by including the extended-carrier (EC) mode. However, the increase in data capacity offered by adopting EC mode reduces the frequency 'gap' to the channel edge to 115 kHz.

6.64 Extended Carrier mode operation for the new 600 MHz multiplexes is acceptable provided that it causes no additional interference to existing DTT services in adjacent channels than would have been caused by a DVB-T service complying with the non-critical spectrum mask. The use of EC mode with frequency offsets is addressed below.

Frequency Offsets and Extended Carrier Operation for DVB-T2

6.65 Combining frequency offsets and a DVB-T2 signal employing EC mode will result in the wanted part of the DVB-T2 signal overlapping the adjacent channel by a small amount.

6.66 We propose to retain case-by-case scrutiny of the ongoing use of frequency offsets with DVB-T2 extended carrier mode signals (draft licence, Annex 5, Schedule 1(7), Table 1(J)). The existing multiplex operators have adopted a convention of offsetting DTT signals away from the band edges. Because this results in no more energy being put into the adjacent cleared channel, we believe that there will be no impact on the use of the 600 MHz band by the continued use of DVB-T2 EC services by existing multiplex operators.

6.67 Offsets and EC modes could be used without undue interference if managed and coordinated with existing services. Therefore Ofcom proposes that this mode of operation will remain permissible in the 600MHz band on a case-by-case basis, if verified and approved by Ofcom.

Transmission Filtering Standards

6.68 Details of the permitted out-of-band emissions for broadcast transmitters in the UK are set out in Ofcom's Interface Requirement 2022 (IR2022[40]), (draft licence, Annex 5, Schedule 1(2)).

6.69 As part of a wider review, Ofcom is currently in the process of revising the frequency limits contained in this Interface Requirement which should be updated in the near future. This is due to changes to the DTT network and PMSE allocations that are being made as a consequence of the clearance of UHF Channels 61 - 69 for mobile services.

6.70 The consequences of these changes to the DTT network and PMSE allocations are:-

- The need to move the block edge mask specification from Channel 41 to Channel 39.
- The need to move the block edge mask specification from Channel 62 to Channel 60.
- The need to redefine the channels over which a non critical mask may be applied to Channels 22 to 37 and 40 to 59.

6.71 Changes to IR 2022 are also required to make provision for the use of the DVB-T2 standard with the option of extended carrier mode of operation and set conditions on the use of frequency offsets.

6.72 New DTT services in Channels 31-37 will be required to have an out-of-band profile that does not exceed the non-critical mask given in IR 2022 for each 8 MHz channel. As there is a 2 MHz frequency gap between Channel 37 band edge (606 MHz) and the band edge of Radio Astronomy use in Channel 38 (608 – 614 MHz) there is no requirement for a critical filter. The mask requirement for Channel 39 will be the same block edge mask as that defined in previous IR2022 for Channel 30 because of the need to protect radio astronomy outside the UK.

6.73 The specification of these masks for new services in the 600 MHz band will ensure that existing DTT and PMSE operations in the adjacent bands will be protected by a requirement to ensure that new services do not provide any additional interference than if new co-located DTT services had been launched in the 600 MHz band.

6.74 A copy of the draft update version of IR2022 is available to view in Annex 16.

Transmitter site clearance

6.75 Site clearance is a requirement and process to check that existing services are appropriately protected from new services, internationally and nationally. This will be carried out using the proposed transmitter network details and planned service dates supplied in the Notice of Intention to Apply.

6.76 A list of the UK's existing DTT transmitters and the technical arrangements they have adopted following the completion of DSO and clearance of the 800 MHz band are presented in Annex 15.

[40] http://stakeholders.ofcom.org.uk/binaries/spectrum/spectrum-policy-area/spectrum-management/research-guidelines-tech-info/interface-requirements/ir2022.pdf

6.77 A list of the internationally coordinated sites in the 600 MHz band is presented in Annex 12.

6.78 Stakeholders will be able to comply with the licence condition to protect existing DTT allocations outside the 600 MHz award by remaining within the envelope of the assignments listed in Annex 13 (draft licence, Annex 5, Schedule 1(4)). Specifically, this means that at the maximum listed ERP, any antenna restrictions and/or quoted maximum field strength levels at test points for each of the sites may not be exceeded without prior reference to Ofcom (because of the requirements to protect existing DTT services, to protect international assignments and to limit the potential for receiver blocking).

6.79 Use of alternative transmission sites for the 600 MHz multiplexes may result in the reception of existing DTT services being affected due to the 600 MHz signals being very much stronger than the other multiplexes in the vicinity (known as 'hole punching').

6.80 Proposals by stakeholders to use alternative sites will be considered by Ofcom, although evidence of the methods used to protect existing DTT reception should be provided. For example:

- Ensuring the licensed site is located physically away from households that might suffer interference at a distance exceeding the likely interference range.
- Additional filtering at the transmitter to reduce the likely interference range.
- The use of 'On Channel Repeaters' to completely repair any holes 'punched' in the coverage of the other DTT networks.
- The use of frequency guard bands where appropriate to reduce the likely interference range (as for additional filtering)

6.81 Applicants proposing alternative transmission sites should set out how adjacent channel interference would be avoided and satisfy Ofcom that reception of existing multiplexes would not be affected. This will be checked by Ofcom as previously described in this section with respect to the requirement to cause no more interference than if the existing (coordinated) transmission site had been used. For the avoidance of doubt, only network-based measures should be proposed (such as locating transmission sites away from housing). Ofcom considers that receiver-based measures (such as providing receiver filters for affected households) are not appropriate for this short term award.

6.82 As for existing DTT sites, the availability of each UHF channel at any new or alternative transmission site will be determined by both the need to comply with international constraints, and also by the need to protect existing DTT allocations outside the 600 MHz award. The method for determining international coordination constraints is set out in the section on international coordination. The licensee will be able to comply with the licence condition (draft licence, Annex 5, Schedule 1(8)(3)) to protect existing DTT allocations outside the 600 MHz award by appropriate network design.

6.83 Because of the site clearance requirement to ensure that new services can co-exist with existing DTT and PMSE services and international agreements, as set out above, Ofcom will require that plans be submitted for network roll-out and station designs in advance of the grant of the licence, with additional plans for network mitigation at sites which are not co-sited with existing DTT stations.

Summary of TLCs

6.84 The proposed TLCs for the 600MHz band award may be summarised as:

- DVB-T2, 32K, 256 QAM, rate 2/3, normal or EC mode (Draft licence, Annex 5, Schedule 1(5)(1) and Table 1(B));
- MPEG4 Advanced Video Coding (AVC) (Draft licence, Annex 5, Schedule 1(5)(1) and Table 1(C));
- Compliance with international coordination agreements for co-channel allocations (Draft licence, Annex 5, Schedule 1(4));
- Compliance with Ofcom Technical Standards (Draft licence, Annex 5, Schedule 1(8));
- IR 2022 (taking into account new band edges due to 800MHz clearance) (Draft licence, Annex 5, Schedule 1(2));
- Technical interoperability with existing DTT services (Draft licence, Annex 5, Schedule 1(9));
- Protection of existing DTT and PMSE services (Channel 38) (Draft licence, Annex 5, Schedule 1(8)((3));
- Internationally coordinated transmitters sites - or the applicant may propose the use of additional or alternative transmission sites subject to satisfying Ofcom that its proposals remain within the UK's internationally agreed limits and will not result in additional interference or receiver blocking to consumers of existing UK DTT services (Draft licence, Annex 5, Schedule 1(8)(3));
- Enable PMSE and WSD sharing of the geographically interleaved spectrum (Draft licence, Annex 5, Schedule 1(5)(2)).

Consultation question

Question 7: Do you agree with the technical licence conditions we propose to include in the licence?

Section 7

Proposals for award process

7.1 For the reasons outlined in this document, we propose to award the 600 MHz spectrum in the simplest and most efficient way, consistent with our statutory duties. This section therefore sets out our proposed process consistent with this objective, including:

- A process by which applicants are required give Notice of Intention to Apply for the licence if they wish to be involved in the award process;
- Our consideration of potential competition issues and why we do not believe we should restrict applicants for the award;
- A process for the award of the licence if we receive only one compliant Notice of Intention to Apply;
- A process for the award of the licence in the event that two or more stakeholders submit a compliant Notice of Intention to Apply.

Notice of Intention to Apply

7.2 As we have set out above, we consider it is important to grant a licence for the use of the 600MHz band as soon as possible given the relatively short period of time for which the 600 MHz band may be available for use under this licence.

7.3 Our stakeholder engagement for the UHF Strategy consultation process suggests there may only be a limited number of stakeholders interested in being licensed to use the 600 MHz band for DTT use. We believe it would therefore be useful to ascertain at the outset whether or not, in light of the proposals set out in this consultation and subject to our final decisions, more than one stakeholder intends to apply for the licence. This will help us to decide whether we need to hold a competitive selection process to grant a licence. In that context we note that any such process would inevitably take time which will reduce the overall period of the licence (and hence the value of the services that could be offered) if, as we expect, it will need to be revoked some time after the end of 2018. Holding a competitive process would, in our view, only be likely to be appropriate if there is genuine competing interest in the licence for interim DTT use of the band.

7.4 For this reason, we are inviting stakeholders who intend to apply for the 600 MHz licence to notify us of this intention, alongside any response to this consultation. We are asking stakeholders to indicate their intention by completing and submitting the Notice of Intention to Apply form attached at Annex 6.

7.5 We will regard submission of a compliant Notice of Intention to Apply as confirmation by the particular stakeholder that they would, in principle, be prepared to operate a DTT multiplex service in accordance with the proposals contained in this consultation. We will regard a form as being compliant if the information contained in the returned form indicates the potential licensee will meet the conditions of the proposed licence, set out in Annex 5 (subject to any consultation responses we receive).

7.6 Submissions that are incomplete or which clearly fail to address the information being sought are likely to be excluded from consideration. We would be happy to

discuss the information that we are requesting with interested stakeholders during the consultation period.

7.7 Should stakeholders wish to suggest the inclusion of alternative obligations and conditions to those contained in the draft licence, we will consider these as part of the overall consultation process, noting the policy decisions that we have already taken in our UHF Strategy statement which set out our overall UHF strategy objectives. If, as a result of the consultation, we decide to make a material change to the conditions included in the licence in a way that affects whether the submitted Notices of Intention to Apply are compliant, then we will provide an opportunity for parties to amend their Notices.

Competition assessment

7.8 Our primary duty under Section 3 of the Communications Act 2003 is to further the interests of citizens in relation to communications matters, and the interests of consumers in relevant markets, where appropriate by promoting competition. We have considered whether there is a role for specific measures in the award to promote competition in line with this duty. We note that a number of features of the award are relevant to an assessment of competition, and in particular to considering whether to introduce measures to promote competition. Those key factors we have considered are as follows:

- The strength of demand among broadcasters for additional DTT capacity (or viewers for additional channels on DTT) is unclear.
- The interim period in which 600 MHz spectrum will be available to deliver additional DTT capacity is expected to be relatively short.
- The licence holder will be required to broadcast in DVB-T2 and MPEG4. While this requirement is consistent with our UHF Strategy, and expected to benefit the DTT platform long-term, these technologies are not compatible with first generation DVB-T and MPEG-2 receivers. Therefore, not all households will be able to receive new services with their current equipment.[41]

7.9 We have identified potential implications of the award for competition in (a) the provision of TV services to homes, and (b) the supply of commercial DTT capacity, taking into account the above points. We shall consider each in turn.

Competition in the provision of TV services

7.10 We have considered whether there would be a risk to competition if a party with an interest in a rival TV platform such as satellite or cable were to be licensed for interim DTT use of 600 MHz spectrum. Improvements to the DTT platform would tend to increase the competitiveness of DTT at the expense of other platforms, so there is a risk that a party with an interest in a rival platform could have a relatively weak incentive to deliver such improvements.

7.11 We note that a rival to DTT would have to meet the service obligations which we propose to include in the licence. As a result, the licensee would entail significant costs. Furthermore, the potentially short licence duration of interim use of 600 MHz

[41] We estimate the proportion of DVB-T2 MPEG-4 enabled primary sets in DTT primary homes to be around 20% at the end of 2012

spectrum is likely to limit the competitive benefit of the licence to the DTT platform. As such, the strategic benefit to a rival from acquiring the licence might also be relatively limited.

7.12 Taken together, we consider that the risk of a rival winning the spectrum for strategic purposes, and the potential harm to competition arising from such an outcome, are sufficiently low that further consideration of measures to prevent such an outcome would not be justified.

Competition in the supply of commercial DTT capacity

7.13 If the award led to an increase in commercial DTT capacity, we would expect this to promote competition in its supply. This is because, if the additional capacity were won by a new entrant, it could potentially be used to challenge existing operators' market positions. On the other hand, if it were won by an existing operator, it could give that operator an incentive to price more attractively (because it would have more capacity to fill), which would also benefit competition.

7.14 If the 600 MHz spectrum were to be won by a party which was independent of existing multiplex operators this could be considered a better competitive outcome than if it were won by an incumbent. The supply of commercial DTT capacity is concentrated (i.e. one company currently controls two of the three commercial DTT multiplexes) suggesting that, in theory, there may be scope for market entry to improve competition. Such an outcome could be supported by Ofcom restricting existing operators from applying/bidding.

7.15 In practice, for the reasons set out above, it is not clear that a new multiplex delivered using 600 MHz spectrum, even if delivered independently of existing capacity, would act as an effective competitive constraint on the supplies of that existing capacity. The potentially short duration of the licence, and the requirement to broadcast on DVB-T2, would limit the attractiveness to broadcasters of switching from existing multiplexes to interim use of 600 MHz spectrum (since the latter would not give them security of tenure or access to as many households as they have at present).

7.16 There is also a possibility that an incumbent may be the only party interested in using the spectrum for new DTT multiplexes. Any restriction on bidding by an incumbent could prevent the spectrum being used for DTT at all, to the detriment of the DTT platform and consumers. We conclude that any such measure would be unjustified and disproportionate.

Award mechanism

7.17 We consider below the approach to the award of the 600 MHz spectrum band in the following circumstances:

- A mechanism for award of the spectrum in the event of receiving only one compliant Notice of Intention to Apply;
- A mechanism for award in the event of receiving two or more compliant Notices of Intention to Apply.

7.18 In the event that we receive no Notices of Intention to Apply, then we will clearly not proceed with an award of a licence for interim DTT use of the 600 MHz band. Instead, the 600 MHz band will remain available for use by PMSE (under the

current authorisation arrangements) and, in due course, by WSD applications (once we have put the appropriate authorisation mechanisms in place).

Award mechanism in the event of one compliant Notice of Intention to Apply

7.19 If we receive only one compliant Notice of Intention to Apply form we propose to proceed to grant the licence to that stakeholder, subject to (i) our consideration of consultation responses on the terms of the licence and finalising those terms with the relevant party, and (ii) the information contained in the Notice of Intention to Apply form meeting the conditions of the proposed licence (particularly with respect to the coverage and roll-out obligations).

7.20 In this scenario, we intend to grant the licence in accordance with the Wireless Telegraphy (Licensing Procedures) Regulations 2010.

Award mechanism in the event of more than compliant Notice of Intention to Apply

7.21 If more than one stakeholder submits a compliant Notice of Intention to Apply form we propose to move to a competitive selection process in order to ensure that the rights to use the spectrum are awarded in an open and fair manner.

7.22 We have a general policy in favour of market led spectrum awards where demand exceeds supply, and have a policy to award spectrum via auction in such cases. We believe auctions are the most open, transparent and non-discriminatory way of determining who is likely to make the most efficient use of the spectrum.

7.23 In the case of this award, we have also considered other mechanisms for holding a competitive award process, in particular, by way of a 'beauty contest' in which competing applications would be assessed against at set of specified criteria. A beauty contest could award the spectrum to the bidder with the proposals we judge to be best in line with our long-term objectives. We have not previously awarded a wireless telegraphy licence by beauty contest and so would need to develop appropriate procedures to hold such a process.

7.24 Given the relatively short term nature of the licence we are proposing to grant in this case, we do not believe the circumstances in this case justify the additional time that would be required to develop such new procedures. We consider that the licence conditions we have proposed are sufficiently capable of delivering our policy objectives. An award by auction is likely to result in a quicker process in the event of competing interest in the band, and is capable of ensuring that the spectrum is awarded in a fair, open and transparent manner.

7.25 Accordingly, if we receive more than one compliant Notice of Intention to Apply form we propose to award the 600 MHz band through an auction.

7.26 We have considered two approaches to an auction:

- An award by simple single-round sealed bids
- An award by simple ascending price multi-round auction

7.27 In both cases we propose to apply a second price rule, whereby the winning bidder would pay the price of the second highest bid. This approach recognises the opportunity cost of using the spectrum i.e. the value of the spectrum to the next alternative user. We propose that the reserve price for the auction 'lot' should be the same as the fee we propose would be payable in the event of the spectrum being awarded to a single applicant (see Section 5). This figure should cover the costs incurred by us in the administration of the licence. We propose that this fee is also an appropriate deposit payable for participation in an auction.

7.28 An award by single-round sealed bid is the quickest and easiest way of awarding the spectrum. In this type of auction, each bidder has a single opportunity to submit a bid, and the number of bids and amounts bid are not published during the auction. For reasons outlined elsewhere in this document, speed is one of the most important considerations in making this award. Applicants would submit their bid to Ofcom by a pre-determined date and the bidder who valued the spectrum most highly would be awarded the spectrum licence.

7.29 An alternative approach would be to make the award by multi-round ascending bid auction. In this type of auction, Ofcom would set an opening price and then increase the price in successive rounds. Auction participants would have the opportunity at each round to withdraw their names from the auction as the price increased. Such an approach has advantages where there is common value uncertainty in the auction[42]. This is because at each stage bidders will know how many other bidders are still in the auction, and can adjust their valuations accordingly. This approach would take longer to put in place and would also take longer to complete, depending on the time allowed between auction rounds.

7.30 In practice, we have no basis for expecting that common value uncertainty would be a significant concern in an auction for this licence. The 'second price' payment rule means bidders themselves have no strong reason to understate their valuations, and so a sealed bid auction can be expected to deliver an efficient outcome. We see no particular advantage in applying the more time-consuming multi-round ascending auction procedure. For this reason we propose to conduct an auction via single round sealed bid.

7.31 For avoidance of doubt, if the winning bid exceeds the reserve, there will be no additional fees payable before 31 December 2018 for holding the licence above the price determined by the auction.

Next steps for the award process

7.32 The closing date for responses to this consultation document - and the deadline for submission of the Notice of Intention to Apply form in respect to the spectrum licence – is **4 April 2013**. We consider that this is an appropriate period which balances both the need to award this spectrum as expeditiously as possible, whilst still providing interested parties with sufficient time to consider our proposals and put together the information that we are requesting in the Notice of Intention to Apply form.

7.33 We will consider responses to the consultation and submissions of Notice of Intention to Apply in tandem in the same timely manner. We will publish a statement on our conclusions as soon as possible after the consultation closing date. We

[42] This means that some or all of the value of the award is common among bidders, but the level of this value is uncertain to bidders

anticipate this will be in April/May 2013, depending on the number and range of responses we receive. The statement will include our conclusions on both the licence (and it conditions) and on the award process itself. It will identify the number of stakeholders who have submitted the Notice of Intention to Apply document.

7.34 The proposed process for award of the licence in the case of us receiving only one compliant Notice of Intention to Apply is as set out above. After the closing date, the stakeholder will be invited to submit a formal full application confirming details of the technical specifications already submitted. We will provide these details to JPP in order for them to check for interference issues and to model the proposals using UKPM. This will provide figures for the population coverage of the proposed 600MHz multiplexes and also any existing DTT coverage loss. This is particularly relevant if non co-sited transmitters are proposed. Subject to this confirmation, the licence will then be awarded with the specific technical features consistent with the stakeholder's plans.

7.35 If we receive more than one Notice of Intention to Apply – and the information provided shows that the relevant stakeholders are likely to meet the requirements of the proposed licence (particularly with respect to the coverage and roll-out obligations) - we will move to an auction process. Subject to the potential applicants' proposals meeting the minimum criteria, we would then need to prepare and consult on auction regulations.

7.36 Once this process has been completed, and appropriate time allowed after publication of the final auction regulations, we would invite bids from licence applicants and award the spectrum to the highest bidder in accordance with the auction regulations. As with the process for award to a single applicant, we will provide final details of the proposed technical plans to JPP in order for them to check for interference issues and to model the proposals using UKPM. The final licence will then be issued.

7.37 It is inevitable that a competitive award process will take longer to complete than an award to a single applicant. We estimate the following minimum timescales will apply from the date of publication of our statement on this award:

Action	Time
Preparation and publication of draft auction regulations	3 wks
Consultation on draft auction regulations	4 wks
Time before final regulations take effect	3 wks
Publication of invitation to bid and bid submission	3 wks
Award of spectrum licence	Subject to agreement on TLCs

Consultation questions

Question 8: Do you agree with our proposal not to restrict any party from participating this award process?

Question 9: Do you have any comments on the proposed award process in the case of a single compliant Notice of Intention to Apply?

Question 10: Do you have any comments on the proposed award process in the case of more than one compliant Notice of Intention to Apply?

Annex 1

Responding to this consultation

How to respond

A1.1 Ofcom invites written views and comments on the issues raised in this document, to be made by 5pm on 4 April 2013.

A1.2 Ofcom strongly prefers to receive responses using the online web form at https://stakeholders.ofcom.org.uk/consultations/600mhz-award/howtorespond/form as this helps us to process the responses quickly and efficiently. We would also be grateful if you could assist us by completing a response cover sheet (see Annex 3), to indicate whether or not there are confidentiality issues. This response coversheet is incorporated into the online web form questionnaire.

A1.3 For larger consultation responses - particularly those with supporting charts, tables or other data - please email 600MHz@ofcom.org.uk attaching your response in Microsoft Word format, together with a consultation response coversheet.

A1.4 Responses may alternatively be posted or faxed to the address below, marked with the title of the consultation.

John Glover
Floor 3
Spectrum Policy Group
Riverside House
2A Southwark Bridge Road
London SE1 9HA

Fax: 020 7981 3878

A1.5 Note that we do not need a hard copy in addition to an electronic version. Ofcom will acknowledge receipt of responses if they are submitted using the online web form but not otherwise.

A1.6 It would be helpful if your response could include direct answers to the questions asked in this document, which are listed together at Annex 4. It would also help if you can explain why you hold your views and how Ofcom's proposals would impact on you.

Further information

A1.7 If you want to discuss the issues and questions raised in this consultation, or need advice on the appropriate form of response, please contact John Glover 020 7981 3878.

Confidentiality

A1.8 We believe it is important for everyone interested in an issue to see the views expressed by consultation respondents. We will therefore usually publish all responses on our website, www.ofcom.org.uk, ideally on receipt. If you think your response should be kept confidential, can you please specify what part or whether

all of your response should be kept confidential, and specify why. Please also place such parts in a separate Annex.

A1.9 If someone asks us to keep part or all of a response confidential, we will treat this request seriously and will try to respect this. But sometimes we will need to publish all responses, including those that are marked as confidential, in order to meet legal obligations.

A1.10 Please also note that copyright and all other intellectual property in responses will be assumed to be licensed to Ofcom to use. Ofcom's approach on intellectual property rights is explained further on its website at http://www.ofcom.org.uk/about/accoun/disclaimer/

Next steps

A1.11 Following the end of the consultation period, Ofcom intends to publish a statement in April or May 2013.

A1.12 Please note that you can register to receive free mail Updates alerting you to the publications of relevant Ofcom documents. For more details please see: http://www.ofcom.org.uk/static/subscribe/select_list.htm

Ofcom's consultation processes

A1.13 Ofcom seeks to ensure that responding to a consultation is easy as possible. For more information please see our consultation principles in Annex 2.

A1.14 If you have any comments or suggestions on how Ofcom conducts its consultations, please call our consultation helpdesk on 020 7981 3003 or e-mail us at consult@ofcom.org.uk . We would particularly welcome thoughts on how Ofcom could more effectively seek the views of those groups or individuals, such as small businesses or particular types of residential consumers, who are less likely to give their opinions through a formal consultation.

A1.15 If you would like to discuss these issues or Ofcom's consultation processes more generally you can alternatively contact Graham Howell, Secretary to the Corporation, who is Ofcom's consultation champion:

Graham Howell
Ofcom
Riverside House
2a Southwark Bridge Road
London SE1 9HA

Tel: 020 7981 3601

Email Graham.Howell@ofcom.org.uk

Annex 2

Ofcom's consultation principles

A2.1 Ofcom has published the following seven principles that it will follow for each public written consultation:

Before the consultation

A2.2 Where possible, we will hold informal talks with people and organisations before announcing a big consultation to find out whether we are thinking in the right direction. If we do not have enough time to do this, we will hold an open meeting to explain our proposals shortly after announcing the consultation.

During the consultation

A2.3 We will be clear about who we are consulting, why, on what questions and for how long.

A2.4 We will make the consultation document as short and simple as possible with a summary of no more than two pages. We will try to make it as easy as possible to give us a written response. If the consultation is complicated, we may provide a shortened Plain English Guide for smaller organisations or individuals who would otherwise not be able to spare the time to share their views.

A2.5 We will consult for up to 10 weeks depending on the potential impact of our proposals.

A2.6 A person within Ofcom will be in charge of making sure we follow our own guidelines and reach out to the largest number of people and organisations interested in the outcome of our decisions. Ofcom's 'Consultation Champion' will also be the main person to contact with views on the way we run our consultations.

A2.7 If we are not able to follow one of these principles, we will explain why.

After the consultation

A2.8 We think it is important for everyone interested in an issue to see the views of others during a consultation. We would usually publish all the responses we have received on our website. In our statement, we will give reasons for our decisions and will give an account of how the views of those concerned helped shape those decisions.

Annex 3

Consultation response cover sheet

A3.1 In the interests of transparency and good regulatory practice, we will publish all consultation responses in full on our website, www.ofcom.org.uk.

A3.2 We have produced a coversheet for responses (see below) and would be very grateful if you could send one with your response (this is incorporated into the online web form if you respond in this way). This will speed up our processing of responses, and help to maintain confidentiality where appropriate.

A3.3 The quality of consultation can be enhanced by publishing responses before the consultation period closes. In particular, this can help those individuals and organisations with limited resources or familiarity with the issues to respond in a more informed way. Therefore Ofcom would encourage respondents to complete their coversheet in a way that allows Ofcom to publish their responses upon receipt, rather than waiting until the consultation period has ended.

A3.4 We strongly prefer to receive responses via the online web form which incorporates the coversheet. If you are responding via email, post or fax you can download an electronic copy of this coversheet in Word or RTF format from the 'Consultations' section of our website at www.ofcom.org.uk/consult/.

A3.5 Please put any parts of your response you consider should be kept confidential in a separate Annex to your response and include your reasons why this part of your response should not be published. This can include information such as your personal background and experience. If you want your name, address, other contact details, or job title to remain confidential, please provide them in your cover sheet only, so that we don't have to edit your response.

Cover sheet for response to an Ofcom consultation

BASIC DETAILS

Consultation title:

To (Ofcom contact):

Name of respondent:

Representing (self or organisation/s):

Address (if not received by email):

CONFIDENTIALITY

Please tick below what part of your response you consider is confidential, giving your reasons why

Nothing ☐

Whole response ☐

Part of the response ☐

Name/contact details/job title ☐

Organisation ☐

If there is no separate Annex, which parts?

If you want part of your response, your name or your organisation not to be published, can Ofcom still publish a reference to the contents of your response (including, for any confidential parts, a general summary that does not disclose the specific information or enable you to be identified)?

DECLARATION

I confirm that the correspondence supplied with this cover sheet is a formal consultation response that Ofcom can publish. However, in supplying this response, I understand that Ofcom may need to publish all responses, including those which are marked as confidential, in order to meet legal obligations. If I have sent my response by email, Ofcom can disregard any standard e-mail text about not disclosing email contents and attachments.

Ofcom seeks to publish responses on receipt. If your response is non-confidential (in whole or in part), and you would prefer us to publish your response only once the consultation has ended, please tick here. ☐

Name

Signed (if hard copy)

Annex 4

Consultation questions

A4.1 The consultation above has identified the following key questions on which we are consulting. Respondents are also welcome to raise other issues on which they would like to comment.

Question 1: Do you agree with our proposal not to include Channel 36 in the spectrum to be awarded?

Question 2: Do you agree that the 600 MHz band should be awarded as a single 'lot'?

Question 3: Do you agree that the licence should have an end date of 2026, with a minimum term until 31 December 2018 and a clause enabling it to be revoked after that date, subject to at least 12 months notice having been given?

Question 4: Do you agree with the proposed service obligations for the licence, including roll-out and coverage obligations to ensure 50% UK coverage (and a minimum 25% in each UK Nation)?

Question 5: Do you agree with our proposals to apply a cost-based fee instead of AIP?

Question 6: Do you have any other comments on the non-technical licence conditions that are being proposed?

Question 7: Do you agree with the technical licence conditions we propose to include in the licence?

Question 8: Do you agree with our proposal not to restrict any party from participating this award process?

Question 9: Do you have any comments on the proposed award process in the case of a single compliant Notice of Intention to Apply?

Question 10: Do you have any comments on the proposed award process in the case of more than one compliant Notice of Intention to Apply?

Annex 5

Draft licence

WIRELESS TELEGRAPHY ACT 2006

OFFICE OF COMMUNICATIONS

WT Television Multiplex Service LICENCE 550 TO 606 MHz Band (excluding 590 to 598 MHz)

Licence no: xxxxxx

Date of issue: dd/Month/yyyy

Commencement Date: dd/Month/yyyy

1. The Office of Communications (Ofcom) grants this licence under the Wireless Telegraphy Act 2006 ("the Act") to:

   [**Insert company name**, ("the Licensee") **company registration number, company address]**

   to establish, install and use wireless telegraphy stations and/or wireless telegraphy apparatus as described in Schedule 1 ("the Radio Equipment") subject to the terms set out below.

LICENCE TERM

2. The Licence shall commence on [DATE TO BE INSERTED] ("the Commencement Date") and shall continue in force until 31 December 2026, unless revoked by Ofcom in accordance with Paragraphs 4 to 6 below, or surrendered by the Licensee.

LICENCE REVOCATION AND VARIATION

3. Pursuant to section 10 and Schedule 1, paragraph 8 of the Act, Ofcom may not revoke this Licence under Schedule 1, paragraph 6 of the Act except:

   (1) at the request of, or with the consent of, the Licensee;

   (2) in accordance with paragraph 6 of this Licence;

   (3) in accordance with Schedule 1 paragraph 8(5) of the Act;

   (4) if there has been a breach of a term of the Licence;

(5) if it appears to Ofcom to be necessary or expedient to revoke this Licence for the purposes of complying with a direction by the Secretary of State given to Ofcom under section 5 of the Act or under section 5 of the Communications Act 2003;

(6) for reasons related to the management of the radio spectrum, provided that in such case:

(i) the power to revoke is exercised after 31 December 2018; and

(ii) before exercising the power to revoke, at least twelve (12) months' notice is given in writing to the Licensee, such notice not to be given before 31 December 2017.

4. Ofcom may revoke or vary this Licence by notification in writing to the Licensee and in accordance with Schedule 1, paragraphs 6 and 7 of the Act.

RADIO EQUIPMENT USE

5. The Licensee must ensure that the Radio Equipment is established, installed and used only in accordance with the provisions, restrictions and requirements specified in the Schedules to this Licence. Any proposal to amend any detail specified in the Schedules to this Licence must be agreed with Ofcom in advance and implemented only after this Licence has been varied or reissued accordingly.

6. The Licensee must ensure that the Radio Equipment is operated in compliance with the terms of this Licence and is used only by persons who have been authorised in writing by the Licensee to do so and that such persons are made aware of, and of the requirement to comply with, the terms of the Licence.

7. The Licensee must comply with any direction given to it by Ofcom for the purposes of any relevant international obligation, or pursuant to a notification to Ofcom by the Secretary of State, including (but not limited to) any notification by the Secretary of State to transmit specified announcements, or to refrain from transmitting such announcements or other specified material.

8. The Licensee must comply with the restrictions and requirements set out in the Schedules to this Licence.

FEES

9. [The Licensee shall, on the grant of the Licence, pay to Ofcom the sum of one hundred and eighty thousand pounds (£180,000) for the period beginning with the Commencement Date until 31 December 2018 in accordance with sections 12 and 13 of the Act and the regulations made thereunder][After 31 December 2018 the Licensee shall each year pay to Ofcom the relevant fee(s) as provided in section 12 of the Act and the regulations made thereunder on or before the fee payment date notified in writing to the Licensee.] **OR** [where the licence is awarded by auction, provision will

be made for the payment of the bid amount in Regulations made under section 14 of the WTA].

10. The Licensee must comply with the regulations referred to in paragraph 11 and with the relevant terms, provisions and limitations of the Licence, failing which Ofcom may revoke this Licence.

11. The Licensee shall pay interest to Ofcom on any amount which is due under the terms of this Licence or provided for in any regulations made by Ofcom under sections 12 and 13(2) of the Act from the date such amount falls due until the date of payment, calculated with reference to the current Bank of England base rate. In accordance with section 15 of the Act, any such amount and any such interest is recoverable by Ofcom.

12. If the Licence is surrendered or revoked, no refund, whether in whole or in part, of any amount which is due under the terms of this Licence or provided for in any regulations made by Ofcom under sections 12 and 13(2) of the Act will be made, except at the absolute discretion of Ofcom in accordance with any regulations made under the Act.

ACCESS AND INSPECTION

13. The Licensee shall permit a person authorised by Ofcom:

    (1) to have access to the Radio Equipment; and

    (2) to inspect this Licence and to inspect, examine and test the Radio Equipment

    at any and all reasonable times or, when in the opinion of that person an urgent situation exists, at any time to ensure that the Radio Equipment is being used in accordance with the terms of this Licence.

CHANGES

14. This Licence is not transferable. The transfer of rights and obligations arising by virtue of this licence may, however, be authorised in accordance with regulations made by Ofcom under powers conferred by section 30(1) and section 30(3) of the Act.

15. The Licensee must give prior notice to Ofcom in writing of any proposed change to the Licensee's name and address from that recorded in the Licence.

MODIFICATION, RESTRICTION AND CLOSEDOWN

16. A person authorised by Ofcom may require any of the radio stations or radio apparatus that comprise the Radio Equipment to be modified or restricted in use, or temporarily or permanently closed down immediately if in the opinion of the person authorised by Ofcom:

    (1) A breach of a term of the Licence has occurred; and/or

(2) The use of the Radio Equipment is causing or contributing to undue interference to the use of the other authorised radio equipment.

17. Ofcom may require any of the radio stations or radio apparatus that comprise the Radio Equipment to be modified or restricted in use, or temporarily closed down either immediately or on the expiry of such period as may be specified in the event of a national or local state emergency being declared. Ofcom may only exercise this power after a written notice is served on the Licensee or a general notice applicable to holders of a named class of Licence is published.

INTERPRETATION

18. In this Licence, including the Schedules thereto:

(1) The "Act" referred to in this Licence is the Wireless Telegraphy Act 2006;

(2) The expression "a.g.l" means above ground level;

(3) The expression "DTT" means digital terrestrial television and the associated expression "DTT transmitter" means a transmitter used to transmit DTT services;

(4) The expression "digital television additional service" ("DTAS") has the meaning given in section 24(1) of the Broadcasting Act 1996 (as amended);

(5) The expression "digital television programme service" ("DTPS") has the meaning given in section 1(4) of the Broadcasting Act 1996 (as amended);

(6) The expression "EPG" means Electronic Programme Guide, which is the on-screen guide which lists the available channels and programme schedule data on a digital television platform;

(7) The expression "e.r.p." means the effective radiated power. This is the power fed to the antenna multiplied by the maximum gain of the antenna with respect to a half-wave dipole;

(8) The establishment, installation and use of the Radio Equipment shall be interpreted as establishment and use of stations and installation and use of apparatus for wireless telegraphy as specified in Section 8(1) of the Act;

(9) The expression "frequencies" means the frequencies specified in the range 550 – 606 MHz, excluding 590 – 598 MHz, and a "frequency" means any of the frequencies;

(10) The expression 'interference' shall have the meaning given by section 115 of the Act;

(11) The expression "JPP" means the Joint Planning Project[43];

(12) The expression "logical channel number" means the unique identification number for each DTPS or DTAS carried on a DTT multiplex service or radio multiplex

[43] JPP is a spectrum planning group comprising Ofcom, BBC and multiplex operators

service, which assigns the service to a position on the electronic programme guide;

(13) The expression “multiplex service” shall have the meaning set out for “television multiplex service” in section 241(2) of the Communications Act 2003;

(14) The expression “network identification” means the unique label which identifies each television multiplex service;

(15) The expression “PMSE” means programme making and special events;

(16) The expression “service identification” means the unique label which identifies each DTPS and DTAS on a DTT multiplex;

(17) The expression “transport stream components” means the individual packets of data that together make up the transport stream that carries all the services and service information within a television multiplex service;

(18) The expression “video stream” means a sequence of digital information that conveys a broadcast programme service consisting principally of moving images and accompanying sound;

(19) The expression “white space technologies” means low power licence exempt devices that makes opportunistic use of spectrum that is not used by the Licensee or other licensees in specific geographic areas;

(20) The expression “wireless telegraphy apparatus” and “wireless telegraphy station” shall have the meanings given by section 117 of the Act;

(21) The expression “800 MHz DTT Clearance” means the removal of Television frequency allocations from the 790 – 862 MHz part of the spectrum.

19. The Schedules to this Licence form part of this Licence together with any subsequent Schedules which Ofcom may issue as a variation to this Licence at a later date; and

20. The Interpretation Act 1978 shall apply to this Licence as it applies to an Act of Parliament.

SCHEDULE 1 TO LICENCE NUMBER XXXX

Licence Category: Spectrum Access Licence 550 to 606 MHz Band (excluding 590 to 598 MHz

1. **Description of Radio Equipment Licensed**

   In this Licence, the Radio Equipment means any radio transmitting and receiving stations and/or any radio apparatus that transmits in accordance with the requirements of the Schedules to the Licence.

2. **Interface requirements for the Radio Equipment use**

   Use of the Radio Equipment shall be in accordance with the following Interface Requirement:

   IR 2022 Broadcast transmitters operating in frequency bands administered by Ofcom (98/34/EC Notification number 2007/124/UK), as may be amended to take account of new band edges due to 800 MHz DTT clearance.

   In addition, spurious emissions shall comply with the limits defined in CEPT/ERC/REC 74-01 Unwanted Emissions in the Spurious Domain.

3. **Co-ordination at Frequency and Geographical Boundaries**

   The Licensee shall ensure that the Radio Equipment is operated in compliance with such co-ordination and sharing procedures as may be notified to the Licensee by Ofcom from time to time.

4. **Cross-border coordination**

   The Licensee shall ensure that the Radio Equipment is operated in compliance with such cross-border coordination agreements and sharing procedures as may be notified to the Licensee by Ofcom from time to time.

5. **Purpose of Use**

   (1) The Licensee shall use the frequencies for the purpose of providing a DTT multiplex service, using the DVB-T2 technical standard and MPEG4 advanced video coding compression.

   (2) The Licensee shall, where it is not transmitting on certain frequencies for the purposes of providing a digital terrestrial television multiplex, make these available for use by PMSE providers and the operators of white space technologies by notifying such frequencies to Ofcom.

6. **UK coverage and roll-out obligations**

   The Licensee shall comply with the following coverage and roll-out obligations:

(1) the Licensee must establish at least one DTT transmitter that transmits at least one video stream capable of being received by at least ten per cent (10%) of the households in the UK within twelve (12) months of the Commencement Date;

(2) the Licensee must, within twenty-four (24) months of the Commencement Date, ensure that DTT services transmitted in accordance with the Schedules to this Licence are capable of being received by at least fifty per cent (50%) of the households in the UK, including a minimum of twenty-five per cent (25%) of the households in each of England, Scotland, Wales and Northern Ireland.

7. Technical Requirements

The Licensee shall, in relation to all Radio Equipment listed in Schedule 2 to this Licence, comply with the following technical requirements set out in Table 1 below and in Schedule 2:

(a) The Radio Equipment may only be used for wireless telegraphy on the frequency set out in the column headed "Frequency Range" in Table 1 below;

(b) The transmission parameters of the Radio Equipment must comply with those set out in Table 1 and Schedule 2;

(c) The maximum permitted effective radiated power shall not exceed that specified in the column headed "Maximum Effective Radiated Power" in Table 1 and Schedule 2.

Table 1: Details of transmitting operating conditions

A	Class of Emission	8M00X7FXF
B	Transmission Type	DVB-T2 32K 256QAM rate 2/3 normal or extended mode. Extended carrier mode allowed is permitted
C	Video Compression	MPEG4 Advanced Video Coding
D	Maximum Effective Radiated Power	X kW (xxdBW) as recorded in Schedule 2
E	Description of Antenna	To meet the antenna restrictions and template diagram set out in Schedule 4 of this Licence in order to conform with international co-ordination agreement conditions.
F	Polarisation	Horizontal/Vertical as recorded in Schedule 2
G	Frequency Range	550 – 606 MHz (excluding 590 – 598 MHz)

H	Spurious Emissions	As defined in UK Interface Requirements 2022 (as may be amended to take account of new band edges)
I	Frequency Tolerance	1 kHz
J	Frequency Offset	Allowed if approved by Ofcom

8. Technical Standards

(1) The Licensee shall ensure that the signals being transmitted attain as high standards in terms of technical quality and reliability as is reasonably practicable and shall, in particular (but without limiting the foregoing), ensure that it complies with the technical standards contained in the following[44]:

(a) The Television Technical Performance Code (including the Reference Parameters referred to therein);

(b)The Code of Practice on Changes to Existing Transmission and Reception Arrangements;

(c) The Guidance Note on Test Transmissions.

(2) The Licensee shall minimise, to the extent reasonably practicable, any disruption caused to the viewers of its DTT transmissions as a result of any changes made by the Licensee to its Radio Equipment or transmission infrastructure.

(3) The Licensee shall ensure that appropriate network-based measures are taken to minimise undue interference with existing DTT services transmitting in 470 – 550 MHz and PMSE services transmitting in the frequencies 606 – 614 MHz.

(4) The Licensee shall ensure that any EPG service included in the multiplex service is provided using published technical standards which are freely available and have been standardised either by a recognised European Standardisation body or such other industry body as recognised by the European Commission.

9. Interoperability

The Licensee shall ensure that any labelling of transport stream components, including logical channel numbers, service identification and network identification, used in the provision of a television multiplex service does not conflict with the labelling used by other operators providing technically compatible services.

10. Information provision

(1) During the period that this Licence remains in force, unless consent has otherwise been given by Ofcom, the Licensee shall compile and maintain accurate records of the following details relating to the Radio Equipment:

[44] These documents are available on the Ofcom website: www.ofcom.org.uk

(a) Postal address (including post code);

(b) National Grid Reference (to 100 meters resolution);

(c) Antenna height (a.g.l) and type;

(d) Radio frequencies on which the Radio Equipment is transmitting;

(e) The technical characteristics of the Radio Equipment in terms of transmission;

and the Licensee must produce these records if requested by a person authorised by Ofcom.

(2) (2) The Licensee must submit to Ofcom copies of such parts of the records detailed in sub-paragraph (1)(a) above at such intervals as Ofcom shall notify to the Licensee. Without prejudice to any information which Ofcom is required by law to publish or disclose, Ofcom may, from time to time, publish such extracts of this information as it sees fit, including:

(a) Details of the Radio Equipment which is operational;

(b) The location of the Radio Equipment, aggregated by outward postcode;

(c) The frequencies used by the Radio Equipment.

SCHEDULE 2 TO LICENCE NUMBER XXXX

[Details to be inserted from completed Notice of Intention to Apply Form]

Station name	**Grid Ref.**	**UHF Channel**	**ERP kW**	**Pol (V/H)**	**Antenna Height (m)**
[Example]	*[XXXXXX YYYYYY]*	*[31]*	*[50]*	*[V]*	*[100]*

SCHEDULE 3 TO LICENCE NUMBER XXXX

The restrictions and requirements set out in this Schedule 3 apply pursuant to Condition 10 of the Licence.

1. Local authorities and political bodies

(1) Subject to sub-paragraph (2), the following persons are not permitted to provide a DTT multiplex service under this Licence:

(a) a local authority;
(b) a body whose objects are wholly or mainly of a political nature;
(c) a body affiliated to a body falling within paragraph (b);
(d) an individual who is an officer of a body falling within paragraph (b) or (c);
(e) a body corporate which is an associate of a body corporate falling within paragraph (b) or (c);
(f) a body corporate in which a body falling within any of paragraphs (a) to (c) and (e) is a participant with more than a 5 per cent interest;
(g) a body corporate which is controlled by a body corporate falling within paragraph (f);
(h) a body which is controlled by a person falling within any of paragraphs (a) to (e) or by two or more such persons taken together; and
(i) a body corporate in which a body falling within paragraph (h), other than one which is controlled:

(i) by a person falling within paragraph (d), or
(ii) by two or more such persons taken together, is a participant with more than a 5 per cent interest.

(2) Where a service is provided exclusively for the purposes of carrying out the functions of a local authority under section 142 of the Local Government Act 1972 (provision by local authorities of information relating to their activities), a person is not permitted to provide a DTT multiplex service by virtue of sub-paragraph (1) in relation to a licence to provide that service only if he would not be permitted to do so disregarding paragraph (a) of that sub-paragraph.

2. Religious bodies

(1) The following persons are not permitted to provide a DTT multiplex service:

(a) a body whose objects are wholly or mainly of a religious nature;
(b) a body which is controlled by a body falling within paragraph (a) or by two or more such bodies taken together;
(c) a body which controls a body falling within paragraph (a);
(d) a body corporate which is an associate of a body corporate falling within paragraph (a), (b) or (c);
(e) a body corporate in which a body falling within any of paragraphs (a) to (d) is a participant with more than a 5 per cent interest;
(f) an individual who is an officer of a body falling within paragraph (a); and
(g) a body which is controlled by an individual falling within paragraph (f) or by two or more such individuals taken together.

3. Undue influence

(1) A person is not permitted to provide a DTT multiplex service if in the opinion of Ofcom:

(a) any relevant body is, by the giving of financial assistance or otherwise, exerting influence over the activities of that person, and
(b) that influence has led, is leading or is likely to lead to results which are adverse to the public interest.

(2) In sub-paragraph (1) "relevant body" means a person falling within paragraph 1(1)(a) to (f) or (i) above or a body which is controlled:

(i) by a person falling within paragraph 1(1)(a) to (e) above, or
(ii) by two or more such persons taken together.

4. General provision of information to Ofcom

(1) The Licensee shall furnish to Ofcom in such manner and at such times as Ofcom may reasonably require such documents, accounts, returns, estimates, reports, notices or other information as Ofcom may (require for the purpose of exercising the functions assigned to it under the Act (but without prejudice to the generality of the foregoing):

(a) a declaration as to its corporate structure in such form and at such times as Ofcom shall specify; and
(b) such information as Ofcom may reasonably require from time to time for the purposes of determining whether the Licensee is on any ground not permitted to provide a television or radio multiplex service by virtue of any of the provisions within paragraphs 1, 2 and 3 of this Schedule 3.

5. Changes

(1) Where the Licensee is a body corporate, the Licensee shall notify Ofcom:

(a) of proposals affecting shareholdings in the Licensee or any body corporate which controls the Licensee, or the directors of the Licensee or the directors of any body corporate which controls the Licensee, and of any proposals to enter into any arrangements of the type referred to in paragraph 5(2) below, by giving advance notice of such proposals where they are known to the Licensee as soon as reasonably practicable where such proposals would constitute a change in the persons having control over the Licensee within the meaning of paragraph 8 below; and

(b) of changes, transactions or events affecting shareholdings in the Licensee or any body corporate which controls the Licensee, or the directors of the Licensee or the directors of any body corporate which controls the Licensee (irrespective of whether proposals for them have fallen to be notified) within 28 days of the Licensee becoming aware of any such change, transaction or event and where such change, transaction or event would constitute a change in the persons having control over the Licensee within the meaning of paragraph 8 below.

(2) The Licensee shall

(a) notify Ofcom within 28 days if any person:

(i) holding or being beneficially entitled to 50 per cent. of the equity share capital in the Licensee or in any body corporate which controls the Licensee; or

(ii) possessing 50 per cent. of the voting power in the Licensee or any body corporate which controls the Licensee,

enters into any arrangement with any other participant in the Licensee or in any such body corporate which controls the Licensee as to the manner in which any voting power in the body possessed by either of them is to be exercised, or as to the omission by either of them to exercise such voting power.

(b) For the purposes of paragraph 5(2)(a):

(i) "arrangement" includes any agreement or arrangement, whether or not it is, or is intended to be, legally enforceable;

(ii) a person shall be treated as holding, or being beneficially entitled to, any equity share capital which is held by a body corporate which he controls or to which such a body corporate is beneficially entitled, and as possessing any voting power possessed by such a body corporate.

6. Prohibition on conveyance of unlicensed services

(1) The Licensee shall ensure that:

(a) All DTPS broadcast under this Licence are provided by the holder of a DTPS licence under section 18 of the Broadcasting Act 1996 or by the BBC;

(b) All DTAS broadcast under this Licence are provider by the holder of a licence under section 25 of the 1996 Act or by the BBC.

(c) This Condition shall not apply to the provision of a DTPS or a DTAS by a person established and licensed (if required) to provide such a service in another EEA member state.

7. Interpretation

(1) In this Schedule 3:

"control"

(a) in relation to a body corporate, shall be construed in accordance with subparagraph (4), and
(b) in relation to any body other than a body corporate, means the power of a person to secure, by whatever means and whether directly or indirectly, that the affairs of the first-mentioned body are conducted in accordance with the wishes of that person;

"equity share capital" has the same meaning as in the Companies Act 1985;

"local authority"

(a) in relation to England, means any of the following, that is to say, the council of a county, district or London borough, the Common Council of the City of London and the Council of the Isles of Scilly;
(b) in relation to Wales, means a county council or county borough council;
(c) in relation to Scotland, means a council constituted under section 2 of the Local Government etc (Scotland) Act 1994; and
(d) in relation to Northern Ireland, means a district council;

"participant", in relation to a body corporate, means a person who holds or is beneficially entitled to shares in that body or who possesses voting power in that body;

(2) For the purpose of determining the persons who are the associates of a body corporate for the purposes of this Schedule 3:

(a) an individual shall be regarded as an associate of a body corporate if he is a director of that body corporate, and
(b) a body corporate and another body corporate shall be regarded as associates of each other if one controls the other or if the same person controls both.

(3) For the purpose of determining the persons who are an individual's associates for the purposes of this Schedule, the following persons shall be regarded as associates of each other, namely:

(a) any individual and that individual's husband or wife or civil partner and any relative, or husband or wife or civil partner of a relative, of that individual or of that individual's husband or wife or civil partner;
(b) any individual and any body corporate of which that individual is a director;
(c) any person in his capacity as trustee of a settlement and the settlor or grantor and any person associated with the settlor or grantor;
(d) persons carrying on business in partnership and the husband or wife or civil partner and relatives of any of them;
(e) any two or more persons acting together to secure or exercise control of a body corporate or other association or to secure control of any enterprise or assets;

and in this sub-paragraph "relative" means a brother, sister, uncle, aunt, nephew, niece, lineal ancestor or descendant (the stepchild or illegitimate child of any person, or anyone adopted by a person, whether legally or otherwise, as his child, being regarded as a relative or taken into account to trace a relationship in the same way as that person's child); and references to a wife or husband shall include a former wife or husband and a reputed wife or husband and references to a civil partner shall include a former civil partner and a reputed civil partner.

(4) For the purposes of this Schedule a person controls a body corporate if:

(a) he holds, or is beneficially entitled to, more than 50 per cent of the equity share capital in the body, or possesses more than 50 per cent of the voting power in it; or

(b) although he does not have such an interest in the body, it is reasonable, having regard to all the circumstances, to expect that he would (if he chose to) be able in most cases or in significant respects, by whatever means and whether directly or indirectly, to achieve the result that affairs of the body are conducted in accordance with his wishes; or

(c) he holds, or is beneficially entitled to, 50 per cent of the equity share capital in that body, or possesses 50 per cent of the voting power in it, and an arrangement exists between him and any other participant in the body as to the manner in which any voting power in the body possessed by either of them is to be exercised, or as to the omission by either of them to exercise such voting power.

(5) For the purposes of sub-paragraph (4)(c):

(a) "arrangement" includes any agreement or arrangement, whether or not it is, or is intended to be, legally enforceable, and

(b) a person shall be treated:

(i) as holding, or being beneficially entitled to, any equity share capital which is held by a body corporate which he controls or to which such a body corporate is beneficially entitled, and

(ii) as possessing any voting power possessed by such a body corporate.

(6) For the purposes of any provision of this Schedule which refers to a body controlled by two or more persons or bodies of any description taken together, the persons or bodies in question shall not be regarded as controlling the body by virtue of paragraph (b) of sub-paragraph 7(4) unless they are acting together in concert.

(7) In this Schedule any reference to a participant with more than a 5 per cent interest in a body corporate is a reference to a person who:

(a) holds or is beneficially entitled to more than 5 per cent of the shares in that body, or

(b) possesses more than 5 per cent of the voting power in that body.

(8) Sub-paragraph 6(7) shall have effect subject to the necessary modifications in relation to other references in this Schedule:

(a) to an interest of more than a specified percentage in a body corporate, or

(b) to an interest of a specified percentage or more in a body corporate.

8.

(1) Subject to sub-paragraph 7(2) any reference in paragraph 7(1) above to a person:

(a) holding or being entitled to shares, or any amount of the shares or equity share capital, in a body corporate, or

(b) possessing voting power, or any amount of the voting power, in a body corporate,

is a reference to his doing so, or being so entitled, whether alone or jointly with one or more other persons and whether directly or through one or more nominees.

(2) For the purposes of this Schedule, a person's holding of shares, or possession of voting power, in a body corporate shall be disregarded if, or to the extent that:

(a) he holds the shares concerned
  (i) as a nominee,
  (ii) s a custodian (whether under a trust or by a contract), or
  (iii) under an arrangement pursuant to which he has issued, or is to issue, depositary receipts, in respect of the shares concerned, and
(b) he is not entitled to exercise or control the exercise of voting rights in respect of the shares concerned.

(3) For the purposes of sub-paragraph 7(2)(b):

(a) a person is not entitled to exercise or control the exercise of voting rights in respect of shares if he is bound (whether by contract or otherwise) not to exercise the voting rights, or not to exercise them otherwise than in accordance with the instructions of another, and
(b) voting rights which a person is entitled to exercise or of which he is entitled to control the exercise only in certain circumstances shall be taken into account only when those circumstances have arisen and for as long as they continue to obtain.

9.

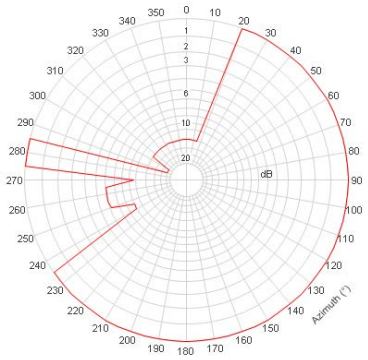
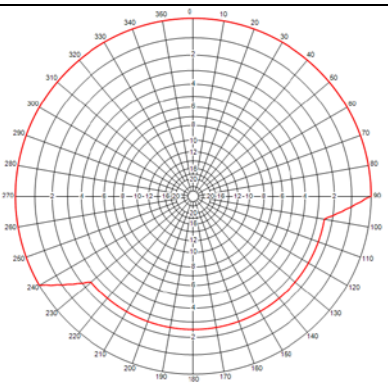
For the purposes of this Schedule the following persons shall be treated as connected with a particular person:

(a) a person who controls that person,

(b) an associate of that person or of a person falling within paragraph (a),and

(c) a body which is controlled by that person or by an associate of that person.

SCHEDULE 4 TO LICENCE NUMBER XXXX

Station Name	*[Example1]*
	
Station Name	*[Example2]*
	
Station Name	*[Example3]*
Non- direction antenna	
Station Name	*[Example4]*
Non- direction antenna	
Station Name	

Station Name	
Station Name	
Station Name	

Annex 6

Notice of Intention to Apply for the 600 MHz band licence

Introduction

(A) This form ("the Notice") is a notification to Ofcom. It confirms that the entity whose details are set out in section 1 below intends to apply for the grant of a licence to use frequencies in the 550 – 606 MHz band (excluding 590 -598 MHz) for the purposes of providing a DTT multiplex service using DVB-T2 technical standard and MPEG-4 advanced video coding compression technologies.

(B) A draft of the licence that Ofcom proposes to grant is set out in draft form at Annex 5 to this Consultation. The terms of the licence will be finalised by Ofcom once it has considered responses to this Consultation, and those final terms will be notified to all entities who have submitted to Ofcom a Notice in the form set out below. Those entities will then have an opportunity to confirm their application for the grant of the relevant licence, or to withdraw from the process.

(B) For the purposes of this Notice, the phrase:

(i) "coverage obligation" means the proposal that the Licensee must establish at least one DTT transmitter that transmits at least one video stream[45] capable of being received by at least ten per cent (10%) of the households in the UK within twelve (12) months of the Commencement Date[46] of the Licence;

(ii) "roll-out obligation" means the proposal that the Licensee must, within twenty-four (24) months of the Commencement Date, ensure that the DTT services that are being transmitted from its DTT multiplex are being received by fifty-per cent (50%) of the households in the UK, including a minimum of twenty-five per cent (25%) of the households in each of Scotland, Wales and Northern Ireland.

(C) Where Ofcom receives only one completed Notice, that Notice may be construed as a "licence application form" for the purposes of Regulation 5(2) of the Wireless Telegraphy (Licensing Procedures) Regulations 2010 (SI 2010/1823) ("the Regulations").

(D) A completed Notice in the form set out here must be submitted to Ofcom no later than 5pm on 4 April 2013. The address to which to submit a Notice is set out below:

Ofcom
Riverside House
2a Southwark Bridge Road
London
SE1 9HA

[45] "Video stream" means a sequence of digital information that conveys a broadcast programme service consisting principally of moving images and accompanying sound.
[46] The "Commencement Date" is the date on which the Licence commences, to be confirmed.

OR

Via email to 600MHz@ofcom.org.uk

Information to be provided

Ofcom requires the following information:

1. Details of entity intending to apply

Name:

Address:

Telephone:

Fax:

Email:

2. Details of contact person for the entity

Name:

Address:

Telephone:

Fax:

Email:

3. Proposed frequencies and equipment

Please indicate, by completing the table below, the stations and frequencies which you would propose to use if (i) you were granted the Licence and (ii) that Licence contained an obligation to comply with the coverage obligation and the roll out obligation (as defined in paragraphs A1.3.1 - 2 above).

Station name (Call sign)	**Grid Ref.**	**UHF Channel[47]**	**ERP kW**	**Pol[48] (V/H)**	**Antenna Height (m)**
[Example]	*[XXXXXX YYYYYY]*	*[31]*	*[50]*	*[V]*	*[100]*

[47] The UHF Channel number (Ch) is a frequency range of 8 MHz, the centre frequency of which is determine by (8 x Ch)+306 = Centre frequency (MHz)
i.e. Ch31 = (31 x 8) + 306 = 554 MHz. (Channel 31 is from 550 to 558 MHz with a centre frequency of 554MHz)
[48] Polarisation details to be inserted in this column: “V”= vertical; “H” = horizontal.

4. Further information in relation to the proposed equipment

If, following consideration of responses to this Consultation, you were required under the Licence to comply with the coverage obligation and the roll out obligation (as set out in paragraphs A1.3.1 - 2 above) please confirm or provide:

4.1 your proposals as to the position of any remote control point for a fixed station(s) (if relevant);

4.2 the type of station that you would propose to use if you were required to comply with the coverage obligation and the roll-out obligation, as set out in paragraphs A1.3.1 - 2 above;

4.3 your proposals, (to the extent not already addressed in the table above), as to the type, position, direction, signal strength, output power and signal beam width (ie. the

antenna template showing the radiation pattern) of each antenna forming part of the proposed station(s);

4.4 details of which version of DVB-T2 you intend to use;

4.5 the following information for the purposes of Ofcom's Radio Site clearance process:

(a) your proposals as to the transmission commencement date of each station you would propose to use if you were required under the Licence to comply with the coverage obligation and the roll-out obligation;

(b) your proposed methods for protecting the reception of existing DTT services, where those services are being transmitted from non-co-sited transmitters (NB, these should be network based measures only);

5. Declaration
I hereby declare that:

I am authorised to complete this Notice on behalf of [*insert name of entity intending to apply*].

I understand that Ofcom may publish the non-confidential aspects of this Notice on its website or otherwise disclose the non-confidential Intention to Apply to any person, together with [*entity intending to apply's*] responses to any request by Ofcom for [*entity intending to apply*] to furnish it with additional information about its proposal(s). I have clearly indicated below the parts of this Notice which [*entity intending to apply*] regards as confidential:

[Please state which, if any, sections of this Notice you consider to be confidential].

I understand that Ofcom may in certain circumstances be required by law to disclose the information contained in this Notice.

I declare that the information given by [*entity intending to apply*] in this Notice is accurate and up-to-date to the best of my and [*entity intending to apply's*] knowledge.

I further declare and warrant that [*entity intending to apply*] is not a body that falls within the scope of Schedule 3 of the draft form licence contained in Annex 5
.

Signature:
Name (BLOCK CAPITALS):
Position:
Date:

Annex 7

JPP Coordination: Spectrum Planning for the DTT platform

A7.1 UK DTT spectrum planning is carried out by the Joint Planning Project (JPP), which was established in 1999 to produce the frequency plan for digital switch over, and subsequently for clearing DTT from 800 MHz spectrum. Detailed planning work is carried out by the JPP project team which consists of members from Arqiva, BBC and Ofcom. The work of the project team is overseen by a management board consisting of Ofcom and the DTT multiplex licensees.

A7.2 DTT spectrum planning is carried out using a prediction model developed by the JPP and known as the UK planning model (UKPM). At its heart is a field strength prediction method based on terrain diffraction models, and an algorithm for calculating attenuation due to buildings and trees. The prediction method has been tested and calibrated against a large number of field strength measurements gathered over a long period. The model also contains agreed planning parameters (e.g. minimum field strength levels and protection ratios) and agreed methods for carrying out the calculations. It uses reliable and reproducible processes to plan and predict DTT coverage that take account of the interaction between DTT services and the impact of international coordination.

A7.3 The actual software implementations of UKPM were developed by Arqiva and the BBC. The development process necessarily included a significant amount of effort devoted to conformance checking, in order to produce results that are both accurate and consistent between the organisations.

A7.4 An outline description of the UKPM can be found on the BBC's website[49] and the planning parameters used by the UKPM can be found in Annex 14.

A7.5 The Coverage Note contains predictions of the coverage that two example DTT networks in channels 31 to 37 (550-606MHz) might achieve if they adopt the transmission parameters proposed by Arqiva in their indicative reference offer.

A7.6 It should be noted that the UKPM is not essential to carry out coverage predictions and other tools could be used for planning DTT in channels 31 to 37, since there is limited interaction with DTT in the adjacent blocks of spectrum. However Ofcom will use the UKPM model to verify that existing DTT coverage is not affected by the proposed 600 MHz DTT networks.

[49] Description of UKPM: http://www.bbc.co.uk/rd/pubs/whp/whp-pdf-files/WHP048.pdf

Annex 8

Background on international spectrum rights

Background

A8.1 This Annex provides background information on the framework underpinning international spectrum rights. It also sets out the current status of international rights negotiated for the 600 MHz band and details the process for coordinating and modifying these rights.

International Framework

A8.2 The International Telecommunications Union (ITU) is responsible for the management of global radio spectrum allocations and the development of technical standards. The ITU's Radio-communication Sector (ITU-R) coordinates this vast and growing range of Radio-communication services, as well as the international management of the radio-frequency spectrum.

A8.3 The UK is a member of the ITU's geographical 'Region 1' (comprising Europe, Africa, the former Soviet Union, parts of the Middle East and central Asia). All member states are governed by the ITU's Radio Regulation Acts and Agreements that regulate the spectrum bands.

A8.4 The UHF spectrum band (470-862 MHz) is primarily allocated to broadcasting services. The next section will detail the UK's use of and international rights to this band.

International Rights

A8.5 All UHF television broadcast allocations have international spectrum rights coordinated through a framework of international bilateral agreements. Under these agreements, the administrations of neighbouring countries define incoming levels of field strength that can be accepted towards transmitters that share the same frequency. This is often achieved by agreeing signal levels towards test points on the coastline or to allotment service areas.

A8.6 An underlying principle of these agreements is to achieve equitable spectrum rights across the whole UHF band, such that one country does not gain improved access rights to spectrum at the expense of another.

A8.7 The ITU manages a formal master register containing the technical parameters of each country's assignment and/or allotment data. Television transmitter plans for the UHF bands date back to the early 1960s, detailing the frequencies used by analogue transmitters in Europe (as agreed in the Stockholm 1961 Agreement [ST61]).

A8.8 The development of digital broadcasting standards has led most countries, including those in Europe, to transition from analogue to digital TV broadcasting by creating digital switch-over plans to replace their existing analogue networks.

A8.9 The ITU hosted a Regional Radio-communication Conference (RRC) in Geneva during 2006 (RRC-06) which set out a framework for coordination of frequency assignments and allotments for the digital terrestrial television (DTT) networks which would eventually replace analogue TV. International coordination of spectrum rights was achieved via bilateral negotiations to form the basis of the overall networks. These plans were agreed through the RRC process to form the new Geneva 2006 Plan (GE06).The GE06 plan lists digital television allocations (i.e. rights to use spectrum for DTT broadcasting) for transmitters in the UHF band for countries including the UK and its neighbours. The GE06 plan also provides a framework with which to sustain each country's obligations to protect its neighbours from interference.

A8.10 Existing alongside the broadcasting assignments and allotments listed in the GE06 plan are associated detailed bilateral coordination agreements. These agreements set out in detail the parameters of permitted cross-border interference negotiated between the two countries in question. These detailed agreements underpin the UK's 600MHz assignments negotiated with its four immediate neighbours: Belgium, France, Ireland and the Netherlands.

UK UHF Band Plan

A8.11 Following decisions at EU level to harmonise band plans for mobile services in the 800 MHz spectrum (and the UK's decision in 2008 to align with these arrangements) the UK has been proactively involved in EU-wide 800 MHz DTT clearance coordination.

A8.12 The UK original GE06 frequency plan required further international coordination in order to clear the use of Channels 61 to 68 for the 800 MHz DTT clearance. The UK's neighbours also required coordination negotiations with the UK for agreement of their own frequency re-plan requirements.

A8.13 At RRC-06 the UK achieved rights to implement eight multiplexes at each high power main transmitter station. The 800 MHz DTT clearance plan was designed to maintain this eight multiplex model. The frequencies were planned using a combination of GE06 rights and new frequencies.

A8.14 The arrangement in the 600MHz band was achieved based on two multi-frequency networks (MFN's) using existing transmission sites, with one network utilising UHF Channel 31, 32 or 33 at each site, and the other network using Channel 34, 35 or 37 at each site. The spectrum rights that apply to these channels will vary depending on the location of the transmitter in question and the coordinated rights gained at international bilateral meetings.

Technical Conditions

A8.15 Based on compatibility analysis, discussions and many co-operative bilateral negotiations with neighbouring countries, each assignment in the UK plan is agreed with specific technical parameters. These include the site location and height, antenna height and maximum power as well as any agreed restrictions relating to a reduction in transmitted power in certain directions (azimuth) towards the assignments or allotments using the same channel in other countries.

A8.16 These technical details are recorded with each assignment for each country where coordination is applicable (e.g. mainly with Ireland for sites in western parts of the UK, and mainly with France, Belgium and the Netherlands in the case of sites in eastern parts of the UK).

A8.17 The format of the recorded technical agreement can vary depending upon whether the neighbouring country's frequency plan is primarily allotment-based (i.e. whether it makes extensive use of Single Frequency networks) or assignment based (for example, the multi-frequency networks used in the UK). In the case of allotment-based countries typically a maximum received interfering field strength to the allotment boundary, coastline or country border is recorded. In the case of an assignment-based network plan then a maximum transmitter power and antenna template with azimuth and restrictions may be recorded. In some cases there is a mixture of both approaches.

A8.18 The recorded interfering field strength values were determined using ITU-R P 1546[50] 1% time mixed path as described in Chapters 2 and 3 of the Geneva 2006 Agreement.

A8.19 The technical parameters and the international coordination agreements are listed and detailed in the Annexes to the 600MHz consultation document.

Bilateral Agreements

A8.20 The UK has been engaged in bilateral coordination meetings with its neighbouring countries for many years. The UK has negotiated bilateral coordination agreements for the technical parameters of all DTT transmitter stations in the UK 800 MHz DTT Clearance Plan, including the 600 MHz band assignments.

A8.21 The UK concluded the coordination process for the 800MHz DTT clearance and has signed official bilateral agreement documents with France and Ireland to formally record the coordinated spectrum rights.

A8.22 International coordination technical parameters and the UK frequency plan have been bilaterally agreed in principle with Belgium and the Netherlands. Ofcom is in the process of getting the formal agreement document finalised and signed.

A8.23 The UK's new 800MHz DTT Clearance frequency assignment plans will be submitted to the ITU for entry in the GE06 plan, ensuring that each allocation is granted full international recognition and protection.

A8.24 A list of the coordination parameters for each of the 600 MHz assignment allocations is included in Annex 13.

[50] http://www.itu.int/rec/R-REC-P.1546-4-200910-I/en

Annex 9

Glossary of key terms

ACI - Adjacent Channel Interference
Television multiplexes nominally occupy approximately 8 MHz of bandwidth. Due to practical limitations in the design of transmitter equipment and filters, residual energy is transmitted outside this bandwidth. This can cause interference to signals in an adjacent 8 MHz channel in some circumstances. For digital terrestrial TV broadcasting, the effect is only usually significant when the two signals are transmitted from geographically separated transmitter sites, or where the difference in power between the two signals is large.

AIP - Administered Incentive Pricing
A mechanism for pricing spectrum based on the opportunity cost of its use (i.e. its value in the most valuable use case)

AVC - Advanced Video Coding (MPEG-4 AVC, or H.264)
A video compression technology which is more efficient than earlier video compression standards such as MPEG-2 (MPEG-2 is used for services including most standard definition TV channels and media such as DVDs). The efficiency gains provided by AVC allow a higher number of video signals to be carried in a given available data rate.

DDR - Digital Dividend Review
Ofcom's programme of work which examined uses for the frequency spectrum released by digital switchover. This is known as the released spectrum, or digital dividend spectrum.

DPSA - Digital Preferred Service Area
A geographically-defined area where terrestrial TV viewers are most likely to be watching a certain transmitter (and which therefore provides an estimation of where domestic receiving aerials are most likely to be pointing).

DSO - Digital Switchover
The process of transitioning from analogue broadcasting to fully digital broadcasting. Television DSO in the UK was completed during 2012.

DTG - Digital Television Group
The DTG is an industry association for digital television in the UK. The DTG publishes and maintains the technical specifications for the UK's Freeview and Freeview HD platforms (the 'D-Book'), and operates a digital television receiver test centre.

DTT - Digital Terrestrial Television
Any form of Terrestrial Television broadcasting delivered by digital means. In the UK and Europe, DTT transmissions use the international DVB-T and DVB-T2 technical standards.

DVB-T2
An advanced digital terrestrial transmission technology developed by DVB. DVB-T2 technology is more efficient than the original DVB-T standard, and is used to deliver high definition TV services on DTT in the UK,

EIRP - Equivalent Isotropic Radiated Power
The amount of radiated signal power from a practical transmitter antenna that a theoretical isotropic antenna (i.e. one which radiates equally in all directions) would radiate to produce the same power in the direction of maximum antenna gain.

EPG - Electronic Programme Guide.
The on-screen guide which lists the available channels and programme schedule data on a digital television platform.

FTA - Free-to-air
Broadcast content that is unencrypted, and which can be accessed without subscription or the use of conditional access (scrambling) systems.

HD - High Definition
A television or other video service with at least 720 lines of vertical resolution. This higher resolution picture raster can provide enhanced quality and more detailed pictures, particularly on larger displays.

ITU - International Telecommunications Union
Part of the United Nations with a membership of 193 countries and over 700 private-sector entities and academic institutions. ITU is headquartered in Geneva, Switzerland.

JPP - Joint Planning Project
The Digital Terrestrial Television frequency planning group consisting of Ofcom, the BBC and national transmission providers.

LCN - Logical Channel Number
The number assigned to an individual DTT channel on electronic programme guides (EPGs).

MFN - Multi-frequency network
A network of transmitter sites in which each transmitter uses a different frequency from its neighbours.

MHz - Megahertz.
A unit of frequency of one million cycles per second.

MPEG - Moving Picture Experts Group
A body which develops technical standards for the compression of digital audio-visual content. Most UK standard definition digital television services use MPEG-2 video compression. The more recent MPEG-4 AVC (H.264) video compression offers greater efficiency than MPEG-2.

Multiplex
In digital TV broadcasting, a single physical layer signal which contains, when decoded, multiple discrete streams of digital information (including video and audio streams). Individual components of the multiplex are decoded at the receiver in order to present the desired TV service to the viewer.

NRA - National Regulatory Authority
An agency that manages and regulates the spectrum resource in an individual country, and which acts on that country's behalf in international spectrum matters.

OCR - On-Channel Repeater
A small transmitter which re-broadcasts signals from a main transmitter using the same UHF channels.

PMSE - Programme Making and Special Events
A class of radio applications that support a wide range of activities in entertainment, broadcasting, news gathering and community events.

PSB - Public Service Broadcasting or Public Service Broadcaster.

PSI - Programme Specific Information
A set of 'invisible' control data contained in a digital TV multiplex which relates to the composition of specific programme services within that multiplex.

RBL - Re-broadcast link
Most TV relay transmitters receive signals directly off-air from another transmitter. These signals are then transposed in frequency and re-transmitted by the relay. 'RBL' refers to the signal path between the relay and its 'parent' transmitter. The RBL must be of a minimum strength and quality at the relay in order to permit reliable re-transmission.

SD - Standard Definition
The lower, and currently most common, of the picture resolutions used for television broadcasting. Standard definition TV services in the UK and Europe have a vertical resolution of 576 (interlaced) lines.

SFN - Single Frequency Network
A network of transmitter sites in which each transmitter uses the same frequency as its neighbours.

SI - Service Information
A set of 'invisible' control data contained in a digital TV multiplex which includes information relating to the content of the multiplex, certain information on other multiplexes within the network, and EPG data.

UHF - Ultra-High Frequency
The frequency range from 300 MHz to 1000 MHz. Terrestrial TV broadcasting in the UK uses UHF frequencies between 470 MHz and 790 MHz.

UKPM - United Kingdom Planning Model
A set of propagation and coverage prediction algorithms used by the JPP to plan UK DTT services.

WRC - ITU World Radiocommunication Conference
WRC reviews and revises the ITU Radio Regulations. Conferences are held every two to three years.

WSD - White Space Device(s)
Radio devices which make use of transmission frequencies that are nominally allocated to other services but which are unused in the vicinity of the device.

Annex 10

Index of additional Annexes published separately

There are other Annexes published separately to this document:

Annex 11:	UK 600 MHz coverage note
Annex 12:	600MHz internationally co-ordinated assignments
Annex 13:	International agreements for assignments
Annex 13a:	International agreements spreadsheet
Annex 14:	JPP technical planning parameters
Annex 15:	Details of the existing UK DTT network
Annex 16:	IR2022 draft update

These Annexes may be found at:
http://stakeholders.ofcom.org.uk/consultations/600mhz-award/