



# Award of Spectrum in 2010-2025 MHz, 2290-2302 MHz and 2500-2690 MHz: Technical Study

Presentation to Ofcom Stakeholder Workshop May 06

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# Ofcom's Background and Objectives for the Study

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- Ofcom is currently considering options for the award of spectrum in the bands 2010-2025 MHz, 2500-2690 MHz and 2290-2302 MHz
- Ofcom's objective is for this award to contribute to securing optimal use of the radio spectrum, with the desire to promote:
  - Efficient management and use of the spectrum
  - Economic and other benefits that may arise from use of the spectrum
  - Competition in the provision of services
- Ofcom's intention, as set out in the Spectrum Framework Review (SFR) is that:
  - Spectrum should be free of technology and usage constraints (technology neutral)
  - Rights of spectrum users should be clearly defined

## Scope of Study

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The Study is concerned with the award of available spectrum in three bands:

- 2500-2690 MHz: '2.6 GHz band', as identified for IMT-2000 at WRC-2000
- 2010-2025 MHz: part of the 3G spectrum from WARC-92
- 2290-2302 MHz: spectrum released for UK commercial use from MOD.

All bands may be attractive for a number of different uses and technologies.

The technical study aims to advise on constraints necessary to avoid interference

**Determine detailed specification of technical conditions of spectrum rights to be offered for the bands under study, compatible with all technologies that might realistically be deployed in the spectrum**

Study will include advice on:

- Managing interference between different uses/technologies within the bands to be awarded, taking account of how different technologies will use the spectrum
- Technical constraints within the bands to be awarded, to avoid harmful interference to neighbouring uses in adjacent bands.

# The technical study is being conducted in two phases

## Phase 1: March-May 2006

- Identify possible uses and applications for the spectrum
- Review existing interference and compatibility studies (e.g. CEPT, ITU-R, WiMAX Forum, 3GPP)
- Identify key issues from existing studies to be verified for UK award

## Phase 2: Summer 2006

- Undertake further modelling as required to verify technical constraints
- Assess impact of different spectrum packaging options on technical constraints
- Develop detailed specification of technical conditions for licences to be awarded

## We will shortly be completing Phase 1 of the study

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- In conjunction with the economic study, we have conducted a series of interviews with potential stakeholders:
  - vendors, spectrum users, trade associations, research organisations
- We have reviewed existing studies both completed and underway to understand what the technical constraints might be, to focus our Phase 2 work

The remainder of this workshop focuses on discussing Phase 1 of the technical study in more depth and provides an overview of key issues identified so far

# Following this workshop, Phase 2<sup>7</sup> of the study will be agreed with Ofcom



## Objectives of Phase 2 will be to:

- Build on Phase 1 studies using radio planning approaches to model technology co-existence issues relevant to the award and develop technical requirements for boundary conditions:
  - Modelling planned to be undertaken using Mason's in house radio planning tool (ADTI ICS Telecom)
  - Assess ACI effects within the bands under study, ACI to neighbouring uses and CCI considerations relevant to potential cross border effects
  - Provide inputs to economic study on spectrum packaging
- Develop technical licence terms (spectrum mask/adjacent channel emission limit etc.)
- Develop overall study conclusions and recommendations.

# Contacts

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## Uses, Applications and Technologies: Results of Industry Consultation

# A key input to both studies is to understand applications and technologies that might feasibly use the bands under study

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We have used a combination of primary and secondary research to identify most likely uses of the spectrum:

- Primary research has been based on interviews with a range of industry stakeholders with potential interest in the bands under study:
  - Including current, and prospective, spectrum users, vendors, trade associations and other industry bodies
- Primary research has been supplemented by secondary research, using published literature (research reports, market forecasts, industry studies)
- Initial ‘long list’ of uses and applications has been reviewed and assessed with a view to focussing the study on most likely uses

# Our research has been focused on five possible uses of the three bands



- Cellular/broadband mobile (3G and beyond)
- Broadband wireless access (BWA)
- Programme making and special events (PMSE)
- Terrestrial mobile multimedia
- Satellite multimedia.

Research has also been conducted into applications and characteristics of uses in neighbouring spectrum bands, to inform our compatibility/interference analysis.

We have interviewed ~ 30 organisations with interests in the spectrum under study and in adjacent spectrum



	<i>Cellular/mobile multimedia</i>	<i>BWA</i>	<i>PMSE</i>	<i>Satellite mobile multimedia</i>	<i>Adjacent spectrum users</i>
Users	6 completed	4 completed	1 completed (1 planned)	1 completed	1 completed (1 planned)
Equipment manufacturer	6 completed	5 completed		2 completed	
Other	2 completed	1 completed	1 completed		

Preliminary results per category of use are summarised in the next slides.

# Results of our research suggest the following services and technologies that might be deployed in the spectrum



	<i>Services</i>	<i>Candidate Technologies</i>
Cellular	Additional capacity for 3G services Voice, data, mobile multimedia	IMT-2000 FDD and TDD (3GPP based and evolution of 3GPP specifications), 802.20?
BWA, including backhaul services	Mobile broadband services, backhaul services Data, voice, mobile multimedia	WiMAX Rev. d or e (TDD), UMTS TDD
Mobile multimedia	Mobile TV, radio, etc.	e.g. UMTS (3GPP/3GPP LTE), MBMS, TDtv
PMSE	Wireless camera links City-wide video links	DVB-T technology
Satellite mobile multimedia	No interest in deploying services in the bands under study, but requirement to protect adjacent services in 1980-2010 MHz and 2483.5-2500 MHz	N/A

# Cellular Mobile (3G and Beyond)

- Interest in deploying 3G, and beyond, services in 2010-2025 MHz and 2500-2690 MHz, consistent with ITU-R and CEPT decisions and recommendations
  - 3GPP TDD equipment is already available for operation in 2010-2025 MHz, and both FDD and TDD equipment could be available for 2.6 GHz within required timeframes
- Question over demand for 2290-2302 MHz, due to lack of European harmonisation
- Harmonisation of channel arrangements within Europe is important to the cellular industry
- A mix of 3GPP based FDD and TDD technologies could be used, although demand is higher for FDD, requiring paired spectrum
  - Existing 3GPP FDD and TDD air interfaces (3GPP Release 6) migrating to 3GPP LTE (3GPP Release 8) within 2008-2010 timeframe
- Main driver for access to the spectrum is to support growth in 3G networks and evolving customer demand
- Alternative technologies may also be of interest (e.g. IEEE 802.20)

# Broadband Wireless Access

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- Interest in deploying portable/mobile broadband wireless services in 2010-2025 MHz and 2500-2690 MHz
  - Could be based on IEEE802.16-d, IEEE802.16-e or 3GPP TD-CDMA (TDD)
- Stronger interest in 2.6 GHz than 2010-2025 MHz, due to increased bandwidth available
  - 2500-2690 MHz consistent with IEEE802.16-e profiles, and also with 3GPP TD-CDMA developments
- Lesser, or no, interest in 2290-2302 MHz, due to limited bandwidth and lack of European harmonisation
- Possible broadband wireless access technologies are TDD based, so do not require paired spectrum
- Services could be metropolitan area broadband wireless in urban areas, or used in conjunction with other spectrum to extend broadband wireless coverage to rural areas
  - Main driver for access to the spectrum is introduction of new broadband services.

# PMSE

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- PMSE is the incumbent user of the 2500-2690 MHz band
  - Band is currently divided into 19 x 10 MHz channels for ENG/OB
  - Existing licences will be subject to a rolling three-month notice period from 01 January 2007
- PMSE also uses spectrum adjacent to both 2010-2025 MHz and 2290-2302 MHz:
  - 2025-2110 MHz accommodates 8 channels used for city-wide video links (video links from trucks or helicopters to a central point)
  - 2200-2290 accommodates 9 channels used for wireless camera links (video links for wireless cameras to vehicles)
- Interest in use of all three bands under study to meet current and future PMSE demands
- Existing 2500-2690 MHz equipment is not tuneable across the other bands
- Bands 2010-2025 MHz and 2290-2302 MHz could be added reasonably easily to existing 2025-2110 MHz and 2200-2290 MHz band plans, and current equipment is tuneable across this range.

# Satellite Mobile Multimedia

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- Satellite services are deployed in parts of the 2.6 GHz band outside Europe:
  - Sub bands 2500-2520 MHz and 2670-2690 MHz have been allocated to the Mobile Satellite Service in the Radio Regulations, but ECC Decision (05) 05 designates the whole band for terrestrial use
  - Sub band 2535-2565 MHz is allocated in some countries to the Broadcasting Satellite Service, and used for satellite DMB in countries, including Korea and Japan, deployed by SK Telecom
- Satellite network providers and vendors spoken to as part of the study indicated they consider there is no longer the possibility to make use of the 2.6 GHz MSS allocations in Europe now that ECC Decision (05) 05 designates the 2.6 GHz band for terrestrial use
- 2010-2025 MHz is adjacent to the MSS uplink 1980-2010 MHz, which is an important band for satellite IMT-2000 services
  - Strong interests in protecting 1980-2010 MHz from harmful interference from terrestrial use of 2010-2025 MHz
  - ECC Decision (06) 01 proposes guard bands, specific to use of 2010-2025 MHz for technologies complying with the 3GPP spectrum masks.

# Mobile TV and Mobile Multimedia

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- Interest from mobile and BWA network providers to deploy multimedia services in conjunction with existing networks
  - Interest is in deploying an ‘overlay’ layer compatible with existing networks, rather than a separate air interface
- Possible technologies are 3GPP based e.g. MBMS and TDtv
  - View is that ‘broadcasting’ technologies, such as DVB-H, are likely to be deployed in lower spectrum (e.g. UHF or L-Band) for cost and performance reasons
- Trials of MBMS and TDtv within current networks across Europe
  - Strong take up of mobile TV services would be a demand driver towards requirements for additional spectrum in 2.6 GHz

# Summary

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- Demand for 2010-2025 MHz and 2500-2690 MHz for 3G and broadband wireless services
- Less demand for 2290-2302 MHz, due to lack of European harmonisation and limited bandwidth
- Possible mix of technologies, some requiring paired spectrum and some not requiring paired spectrum:
  - 3GPP FDD and 3GPP TDD
  - WiMAX (TDD)
- Demand for spectrum for PMSE to meet current and future requirements
  - Technologies likely to be DVB-T based
- Relevant compatibility considerations with services in adjacent spectrum include:
  - Radio astronomy at 2690-2700 MHz
  - MSS at 1980-2010 MHz
  - Radar
  - PMSE.

## Further contact

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- Additional comments can be emailed to [project9WR@mason.biz](mailto:project9WR@mason.biz)
- Or emailed directly to one of the project team members (who are all here today)