

Exploiting the digital dividend: initial findings and options for action

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15 April 2009

Ref: 13496-146



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The focus of the study is the 'European dimension'

- The study aims to ascertain what action is needed at the European level to ensure the benefits from the digital dividend are maximised
- There is a strong European dimension to the digital dividend:
 - decisions made by one Member State could influence the use of the digital dividend in others
 - ultimately this could impact the overall benefits across Europe
- Economies of scale are key for many potential uses of the band
- Ease of use of services across Member States e.g. roaming on mobile phones
- High-power use of spectrum creates the need for extensive cross-border coordination

Main study activities

- Compile an inventory of national situations
- Undertake a socio-economic assessment of the potential use of digital dividend
- Identify feasible options for action at the European level in order to realise the full benefits of the digital dividend
- Undertake a detailed cost/benefit analysis of options
- Identify preferred option(s) and undertake a detailed impact analysis
- Develop an implementation roadmap (including a timetable)

Input from Member States is key to the study's success

Key milestones

<i>Milestone</i>	<i>Date</i>
Summary report of the Member States' workshop	30 April
Meetings with Member States	May/June
Final report	August
Public presentation	September

Objectives of this workshop

- Seek input from Member States on:
 - the study team's initial views of the European dimension for each of the potential uses of the digital dividend
 - the identified options for European coordinated action:
 - which options are most appropriate?
 - which options are impractical/unlikely to be implementable?
 - what additional options should be considered?
- Please note that we have deliberately presented a wide range of options for European action to facilitate discussion:
 - in the next stage of the study, we will be undertaking the socio-economic analysis of the benefits and costs of the main options

Agenda

- 10:40: Study team presentation on key issues and options for action (following the main themes highlighted below)
- 11:40: Increasing efficiency of use by broadcasting networks
- 12:30: Lunch break
- 13:30: Facilitating wireless broadband use
- 14:45: Supporting uses of interleaved ('white space') spectrum
- 15:30: Break
- 16:00: Enabling other uses of digital dividend spectrum
- 16:20: Other measures for improving long-term efficiency
- 16:50: Closing comments (by the European Commission)

Remainder of this presentation

- For each of the main themes described on the previous slide, we will present:
 - key issues/findings from the study to-date
 - including details of Member States' existing plans (where relevant/appropriate)
 - why European action may be needed
 - including the nature of the European dimension in each area
 - our initial range of options for coordinated European action

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Plans to adopt more efficient broadcasting techniques vary

- After ASO, most of the 470–862MHz band will be used for DTT:
 - most Member States plan between four and ten multiplexes
- More spectrally efficient techniques will allow the delivery of:
 - the same number of DTT channels using less spectrum (freeing up spectrum for new uses)
 - more DTT channels using the same amount of spectrum
- There are variations in the plans for using such techniques:
 - MPEG-4 is likely to be adopted by Member States introducing DTT at a later stage
 - SFNs are being deployed in some Member States (e.g. Spain)
 - only the UK has firm plans to use DVB-T2 (for one HD multiplex)

Example: MPEG-4 adoption in Member States

DTT compression technology	Member States
MPEG-2	DE, (CY), CZ, ES, MT, NL
MPEG-2 (but will let market forces decide whether to migrate to MPEG-4)	AT, IT, LU
MPEG-2 (but likely to migrate to MPEG-4)	DK, FI, SE, UK
MPEG-4	(BG), EE, FR, HU, (IE), LT, LV, (PL), (PT), (RO), SI, (SK)

Sources: Study questionnaire responses from Member States, brackets indicate the Member States that are yet to deploy DTT

Why European action may be needed: interference and economies of scale

- Interference from DTT in one Member State may prevent others from using the same frequencies for other services (e.g. wireless broadband)
- Enabling widespread use of SFNs will require the significant reorganisation of assignments between Member States
- Action may also be required to:
 - ensure DTT receivers are as interference tolerant as possible
 - maximise economies of scale from a single European market for MPEG-4/DVB-T2 transmission and receiver equipment

Why European action may be needed: policy issues

- From a policy perspective, action may also be appropriate because:
 - NRAs are obliged to ensure the efficient use of spectrum and to promote harmonisation (Framework Directive Article 9)
 - freeing up spectrum for other uses may help achieve numerous policy objectives (e.g. i2010, universal access)

Potential actions: DTT transmission technologies

Options for action (examples)

Benefits (and costs)

- | <i>Options for action (examples)</i> | <i>Benefits (and costs)</i> |
|---|--|
| <p>1 Share deployment plans for MPEG-4 and DVB-T2 (including timelines)</p> | <ul style="list-style-type: none"> Increases certainty for manufacturers Allows plans to be reconsidered in light of neighbouring countries' plans |
| <p>2 Produce guidelines on the timeline for adoption of MPEG-4 and/or DVB-T2</p> | <ul style="list-style-type: none"> The timeline may gain its own momentum (e.g. COM(2005)04 for ASO in 2012) – if so, most benefits as in 3 |
| <p>3 Mandate the timeline/ requirement for adoption of MPEG-4 and/or DVB-T2</p> | <ul style="list-style-type: none"> Single market/greater scale economies Assists the coordinated creation of a 'second digital dividend' across Europe (e.g. a new sub-band for other uses) Costs of migrating (more rapidly) to new technologies in some Member States |

Potential actions: DTT receivers

Options for action (examples) *Benefits (and costs)*

- | | |
|---|---|
| <p>1 Specify minimum standards for DTT receivers (interference rejection etc.)</p> | <ul style="list-style-type: none"> ● Allows more spectrum to be used for new services ● Eliminates penalisation of manufacturers investing in interference rejection components ● However, full benefits only realised if all receivers are upgraded |
| <p>2 Produce guidelines for including MPEG-4 and/or DVB-T2 in all sold receivers</p> | <ul style="list-style-type: none"> ● Greater likelihood of inclusion in receivers – leading to lower cost of future migration ● Higher consumer equipment costs initially? |
| <p>3 Mandate the inclusion of MPEG-4 and/or DVB-T2 in all sold receivers</p> | <ul style="list-style-type: none"> ● Provides certainty to manufacturers ● Lower consumer equipment costs than 2 due to greater economies of scale |

Potential actions: DTT deployment topologies

Options for action (examples)

Benefits (and costs)

- | | |
|---|--|
| <p>1 Share wider SFN deployment plans (including timelines)</p> | <ul style="list-style-type: none"> • Allows plans to be reconsidered own in light of neighbours' plans |
| <p>2 Produce guidelines on the timeline for wider adoption/ deployment of SFNs</p> | <ul style="list-style-type: none"> • Increases scope for a coordinated re-planning of spectrum across several Member States – benefits/costs as for 3 below |
| <p>3 Mandate the wider adoption of SFNs (including timeline)</p> | <ul style="list-style-type: none"> • Assists coordinated re-planning of spectrum • Potentially facilitates co-ordinated creation of 'second digital dividend' across Europe (e.g. new sub-band for other uses) • Costs from migrating (more rapidly) to SFNs in some Member States (new sites, re-pointing antennas, assignment negotiations) |

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Member States' interest in/plans for wireless broadband

- Based on previous studies, we estimate the incremental value of using digital dividend spectrum for wireless broadband across the EU to be EUR50 billion – EUR190 billion*
- Momentum is gathering behind plans to create a sub-band (790–862MHz) for wireless broadband:
 - though some Member States plan to use these frequencies for DTT, others are undecided
- Additionally, some Member States may wish to make frequencies below 790MHz available for wireless broadband/other uses:
 - in the Stakeholders' Hearings, industry indicated that 72MHz was a 'starting point'

Current plans for the 790–862MHz sub-band

Plans for the sub-band	Member States
Make available for wireless broadband or other services	DE, FI, FR, SE, UK
Considering making it available for wireless broadband or other services	CZ, HU, IE, LU, LV, SK
Undecided on the use of the 790–862MHz frequency range	AT, BE, BG, CY, DK, EE, EL, IT, NL, PL, PT, RO, SI
Plans to award all of the digital dividend to DTT	ES, LT, MT

Source: Study questionnaire responses from Member States

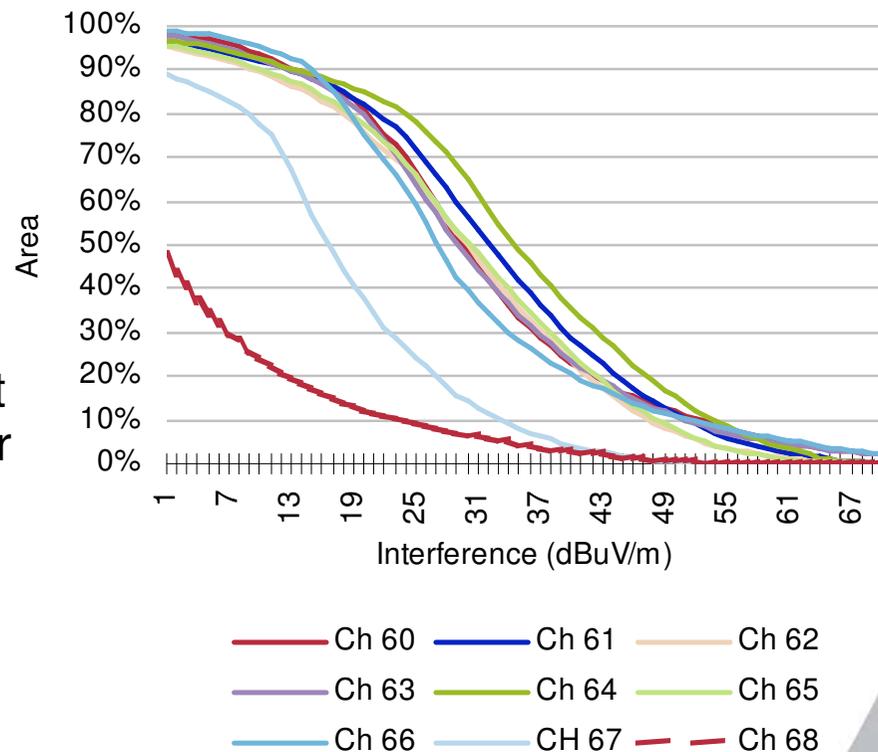
Why European action may be needed: economies of scale

- As discussed in the Stakeholders' Hearings, common frequency bands are currently key to this use for economies of scale and to facilitate roaming
- This is particularly a problem for FDD system:
 - due to the need for a standardised duplex spacing
 - i.e. different 'pairs' of frequency channels in different Member States will not result in the economic benefits being realised
- Below 790MHz, economies of scale could be realised using frequencies through common frequency bands with other major 'economic blocks' (e.g. 700MHz band in North America)

Why European action may be needed: interference management

- GE-06 was primarily developed with DTT in mind:
 - no provision was made for systems with 'uplinks'
- Use of DTT could result in high levels of interference to wireless broadband in a neighbouring Member State
- If some Member States use the sub-band for DTT, this may impact their neighbours' ability to use it for wireless broadband
- The same is true for frequencies below 790MHz

Areas in the UK affected by incoming interference from DTT



Why European action may be needed: policy considerations

- The digital dividend could be key to facilitating universal service provision for broadband:
 - there is no such requirement at present, however some Member States may be considering introducing such provisions
- Use of the digital dividend for wireless broadband may contribute to a range of other policies:
 - “broadband for all” is prime objective of the EU’s i2010 strategy
 - the Commission’s European Economic Recovery Plan

Creation of a sub-band: further considerations

- Momentum is developing behind a sub-band between 790–862MHz, however consideration is needed on whether it is the appropriate size and arrangement, before considering implementation:
 - the most beneficial size economically will vary by Member State
 - this sub-band needs to be the same size/arrangement in all Member States for consumers to benefit
 - studies have shown that 72MHz would be optimal/near-optimal to maximise the economic benefits for most Member States
 - the cost of delay from choosing an alternative sub-band size/arrangement may be greater than any additional economic benefit
- Should other options for the size/location of the sub-band be considered?
 - note: the creation of additional sub-bands (e.g. at lower frequencies) will also be considered

Potential actions: creation of the 790–862MHz sub-band [1]

Options for action (examples)

Benefits (and costs)

- | | |
|--|--|
| <p>1 Share plans for creation of sub-band (including timing)</p> | <ul style="list-style-type: none"> • Greater certainty for industry • Allows plans to be reconsidered in light of neighbouring countries' plans |
| <p>2 Produce guidelines on timing of creation of sub-band</p> | <ul style="list-style-type: none"> • Timeline may acquire its own momentum (e.g. COM(2005)04 for ASO in 2012) – if so, most benefits as in 4 |
| <p>3 Mandate the creation of a sub-band and mandate use of frequencies for medium-power services in all Member States</p> | <ul style="list-style-type: none"> • Largest market size/greatest scale economies • Loss of economic/social benefits in Member States who wish to use sub-band for DTT • Delay in timing of realisation of sub-band (concern raised in Stakeholders' Hearings) • Also see 4 |

Potential actions: creation of the 790–862MHz sub-band [2]

Options for action (examples) *Benefits (and costs)*

- | | |
|---|--|
| <p>4 Change GE-06 interference parameters to protect medium-power uses in 790–862MHz (including uplinks)</p> | <ul style="list-style-type: none">• Greater certainty for industry and larger market size/economies of scale for wireless broadband• Loss of economic/social benefits in areas where additional DTT can no longer be provided• Additional costs (transmitter sites, consumer equipment) in countries forced to adapt DTT transmitter network configuration |
|---|--|

Potential actions: renegotiation of DTT assignments for sub-band

Options for action (examples) *Benefits (and costs)*

- | | |
|---|---|
| <p>1 Produce guidelines for Member States on bilateral negotiations (including negotiations with non-EU countries)</p> | <ul style="list-style-type: none"> • Could facilitate faster creation of sub-band? • Cost of preparatory work/other activities associated with frequency re-planning exercise |
| <p>2 Mandate a deadline for bilateral negotiations to be completed (including negotiations with non-EU countries)</p> | <ul style="list-style-type: none"> • As for 1 but more extensive |

Potential actions: creation of additional sub-bands below 790MHz

Options for action (examples) Benefits (and costs)

- | | |
|--|---|
| <p>1 Share plans for the creation of any additional frequency bands below the sub-band (including timing)</p> | <ul style="list-style-type: none"> • Greater certainty and harmonisation of plans could lead equipment manufacturers to develop equipment for these bands • Allow individual Member States to reconsider their own plans in light of neighbours' plans – leading to greater economies of scale etc. |
| <p>2 Mandate CEPT to develop band plans for additional frequency band(s)</p> | <ul style="list-style-type: none"> • As for 1 but possibly more extensive benefits? |

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We consider two major uses of interleaved spectrum

- SAB/SAP – note that this is also a user of dedicated nationwide channels
- Cognitive technologies
- Are there any other potential uses of interleaved spectrum which may warrant action to be taken at the European level?

It is important to consider whether interleaved spectrum will disappear

- Widespread deployment of national SFNs for DTT could reduce the amount of interleaved spectrum that is available
- In practice, such concerns about the future viability of technologies operating in interleaved spectrum may be over-stated:
 - the widespread migration to SFNs has a number of technical and logistical challenges and is likely to take some time
 - some use of MFNs is likely to continue (e.g. to support regional content/programming channels on DTT)
 - the release of large amounts of spectrum from the move to SFNs could enable more dedicated spectrum to be made available for these applications

Why European action may be needed: SAB/SAP

- SAB/SAP is an existing use of the 470–862MHz band
- The primary application in this band is radio microphones
- Spectrum available for SAB/SAP varies across Member States:
 - some have frequencies dedicated to SAB/SAP nationwide, though the location of these frequencies vary
 - interleaved spectrum is typically also used across the band
- As usage is spread across the band and equipment typically has a small tuning range (~24MHz), economies of scale are not maximised
- Some Member States are considering moving dedicated channels in order to free up the 790–862MHz sub-band:
 - if created and follows an FDD band plan, one option may be the centre gap of the 790–862MHz sub-band

Potential actions: SAB/SAP

Options for action (examples)

Benefits (and costs)

- | <i>Options for action (examples)</i> | <i>Benefits (and costs)</i> |
|---|---|
| <p>1 Produce guidance on a common set of channels which Member States could make available on a dedicated national basis for SAB/SAP</p> | <ul style="list-style-type: none"> • Creates a single European market for SAB/SAP equipment • Greater certainty for equipment manufacturers |
| <p>2 Mandate a common set of channels that Member States could make available on dedicated national basis for SAB/SAP</p> | <ul style="list-style-type: none"> • Maximises economies of scale certainty for equipment manufacturers • Unclear whether dedicated channels are desirable in all Member States |

Why European action may be needed: cognitive technologies

- Though cognitive technologies are new, they could generate significant value
- In the USA, they are to be allowed in interleaved spectrum:
 - however, there are concerns over potential interference with DTT and SAB/SAP
- In Europe a common frequency range and technical standards for cognitive technologies may be required to achieve economies of scale:
 - some cognitive applications may benefit from roaming
- One probable application of cognitive technologies is for wireless broadband, therefore the policy considerations are similar

Potential actions: cognitive technologies

Options for action (examples)

Benefits (and costs)

- | <i>Options for action (examples)</i> | <i>Benefits (and costs)</i> |
|--|--|
| <p>1 Produce guidance on a common frequency range for cognitive applications</p> | <ul style="list-style-type: none"> • Provides some certainty for equipment manufacturers |
| <p>2 Mandate a common frequency range for cognitive applications</p> | <ul style="list-style-type: none"> • Greater certainty for equipment manufacturers • Opportunity cost of uses that can no longer be supported in interleaved spectrum (e.g. SAB/SAP) |
| <p>3 Develop an agreed European Common Position regarding regulatory measures in order to introduce cognitive technologies for WRC-11</p> | <ul style="list-style-type: none"> • Common technological solutions for major issues (e.g. detecting other users/uses) leading to economies of scale • Increased industry certainty/confidence in relation to technical specifications/ potential market size – leading to faster time to market for this technology |

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What other potential uses may need European action?

- In this workshop we consider two further potential uses of the digital dividend:
 - broadcast mobile TV networks
 - public protection and disaster relief (PPDR)
- Are there any other potential uses which may warrant action to be taken at the European level?

Interest in broadcast mobile TV networks seems to have declined

- Interest in the deployment of broadcast mobile TV networks has fallen as a result of limited consumer interest
- These networks can be provided using a wide range of technologies
- A common frequency band is key to:
 - realising economies of scale:
 - facilitating roaming, however this may be less important than for traditional mobile services
- Our understanding is that handset terminals can tune over a wide range in this band, so the allocation of different frequencies to this service in different Member States may not be a major issue
- 14 Member States indicated they have allocated/plan to allocate multiplexes (as assigned at GE-06) for broadcast mobile TV

Potential action: broadcast mobile TV networks

Options for action (examples)

Benefits (and costs)

- | | |
|---|---|
| <p>1 Produce guidance on frequencies to be used by mobile TV</p> | <ul style="list-style-type: none"> ● Provides some certainty for manufacturers regarding equipment specifications |
| <p>2 Create a dedicated sub-band for one-way, medium-power services</p> | <ul style="list-style-type: none"> ● Greater certainty for industry ● A smaller frequency range eases manufacture of terminals ● Opportunity cost of alternative uses of this spectrum that are no longer possible |
| <p>3 Ensure interference parameters for 790–862MHz enable use for broadcast mobile TV networks</p> | <ul style="list-style-type: none"> ● Ensure widest possible frequency ranges are available for broadcast mobile TV network ● This sub-band may not be attractive for due to its proximity to the 900MHz cellular band |

Why European action may be needed: PPDR

- In a 2008 Communication, the Commission stated that the enhancement to pan-European broadband and mobile communications for PPDR should be examined:
 - however we are not aware of a specific European policy that is well advanced in this area*
 - it was noted at the Stakeholders' Hearings, that some Member States have recently deployed similar systems and may be unlikely to invest in new systems in the near future
- The spectrum requirements for such a system have yet to be defined:
 - WIK Consult have estimated that 2×15MHz may be required
- A common frequency band will be required to facilitate inter-operability and to provide the economies of scale

Potential action: PPDR

Options for action (examples)

Benefits (and costs)

- | <i>Options for action (examples)</i> | <i>Benefits (and costs)</i> |
|--|--|
| <p>1 Produce guidelines on using part of the sub-band for PPDR</p> | <ul style="list-style-type: none"> • Sub-band may be protected from interference from DTT |
| <p>2 Mandate Member States to make part of the sub-band available</p> | <ul style="list-style-type: none"> • Benefits unproven at this stage – spectrum may lie unused in some or all Member States • Provide certainty to equipment manufacturers • Opportunity cost of other potential uses of the sub-band (e.g. wireless broadband) |
| <p>3 Produce guidelines on an alternative sub-band/frequency range for PPDR</p> | <ul style="list-style-type: none"> • If a major PPDR initiative requiring digital dividend spectrum does become sufficiently advanced, it may be easier/faster for Member States to implement this |
| <p>4 Mandate the creation of an alternative dedicated sub-band for PPDR use</p> | <ul style="list-style-type: none"> • Same as 2 above |

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More flexible use of the 470–862MHz band is a beneficial long-term aim

- Having low barriers to changes in spectrum use is beneficial:
 - the relative value of uses changes over time
 - technical developments mean that uses may require less/different spectrum over time
- If the use of spectrum can change over time to reflect these developments, then the long-term value generated is maximised
- Key uses of the 470–862MHz band are inflexible in their spectrum requirements, making it difficult for dynamic changes in use:
 - DTT deployments prevent sterilise spectrum over large areas
 - MFN DTT deployments use large portions of the band
 - FDD wireless broadband needs the same frequencies across Member States

Potential action: long term

- When the 470–862MHz band is next reconfigured, assignments for MFN multiplexes should be close together rather than spread across the entire band:
 - this will make freeing up spectrum for new technologies easier
- Research into flexibly agile FDD technologies should be encouraged:
 - this could remove the need for a fixed duplex spacing for FDD
- Is there any further action that could encourage more flexibility of use in the band?

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