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RSPG OPINION ON STRATEGIC CHALLENGES FACING EUROPE IN ADDRESSING THE GROWING SPECTRUM DEMAND FOR WIRELESS BROADBAND

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1. INTRODUCTION

Article 2 of the amended Commission Decision[1] establishing a Radio Spectrum Policy Group states that, "*the RSPG shall assist and advise the Commission on radio spectrum policy issues, on coordination of policy approaches, on the preparation of multiannual radio spectrum policy programmes and, where appropriate, on harmonised conditions with regard to the availability and efficient use of radio spectrum necessary for the establishment and functioning of the internal market*". RSPG opinions should help in substantiating by qualitative and, wherever possible, quantitative indicators whether a European Union objective can be better achieved at EU level, taking into account the principle of subsidiarity[2].

In April 2012 the RSPG received a request from the European Commission for advice on the strategic issues and challenges to be addressed in Europe in order to meet the objective to satisfy the demand for wireless broadband services in the context of the latest regulatory environment[3]. The request also aimed at providing transparency on the policy approach, and to provide stakeholders with information which may be useful in establishing their own individual plans, including planning and timing elements.

The Commission also requested that the envisaged time frame should include both the period 2012-2015 where the Council and European Parliament have already set an objective of a minimum of 1200 MHz to be available for wireless broadband and also extend to the period 2015-2020 which coincides with the longer tail of the Digital Agenda for Europe.

More specifically the RSPG was requested to:

- "Assess the possible solutions and options for meeting the future demand for wireless broadband services in the time frame 2013-2020, including the intermediate target in the RSPP to make 1200 MHz of spectrum available for wireless data traffic by 2015. This should include a specific consideration of the bands already earmarked by the European Parliament and Council, i.e. the 700 MHz band, the 1.5 GHz band and the 2.3 GHz band. The RSPG should also assess the economic and social implications of the various options at macro level;
- Indicate to which extent shared spectrum access could also contribute to meet the demand for spectrum for wireless broadband by reducing the need for dedicated frequency bands. This aspect will require a close liaison with the other RSPG activities related to shared use of spectrum;
- To come forward with guidance for a common "roadmap ahead" which would strengthen the single market for digital services, including options for future harmonisation, while noting the different situations existing in Member States.

[1] 2009/978/EU: Commission Decision of 16 December 2009 amending Decision 2002/622/EC establishing a Radio Spectrum Policy Group.
[2] Article 5(3) of the Treaty on European Union and Article 5 of the Protocol 30 to the European Community Treaty.
[3] RSPG12-415 – Final: Request for an Opinion on Strategic Challenges facing Europe in addressing the Growing Spectrum Demand for Wireless Broadband.

The Commission Communication[4] on promoting the shared use of radio spectrum resources in the internal market noted that the RSPP (Article 6.7) also requested the Commission in cooperation with the Member States to assess the possibility of extending the allocation of unlicensed spectrum for wireless access systems.

With these objectives in mind, the RSPG has reviewed the current allocations of spectrum in Europe within the frequency range from 400 MHz to 6 GHz and identified the steps which need to be taken (the roadmap) to make particular frequency bands available for wireless broadband. An important element in developing the advice in this Opinion was the definition of the term 'wireless broadband' as this in turn determined which frequency bands and services would be of interest. A consequence of this is that 1701.5 MHz of spectrum can be identified as being already available for wireless broadband with a further 140 MHz identified with the potential to become available in the near term (by 2015) and 886 MHz having been identified as spectrum with potential to support broadband applications in the medium term (i.e. beyond 2015).

2. BACKGROUND

In looking at future demand for wireless broadband in Europe there are three key developments which need to be taken into account, i.e. the objectives of the RSPP, developments at the global regulatory level in ITU and the work in CEPT for input to that ITU process.

2.1 The RSPP

The Radio Spectrum Policy Programme[5], adopted in March 2012, states in Article 3 that at least 1200 MHz of spectrum suitable for wireless data traffic (including frequencies already in use) should be identified by 2015. In order to find the 1200 MHz of spectrum, Article 9 provides for the establishment of an inventory of spectrum use in the frequency range between 400 MHz and 6 GHz. In an earlier Opinion[6] the RSPG advised the Commission, in the context of the RSPP, on the best processes for analysing spectrum demand and the elements that would need to be assessed in determining whether that spectrum is being used in an efficient way.

2.2 WRC

The agenda for the next World Radiocommunication Conference in 2015 (WRC-15) includes three items of relevance to wireless broadband:

- (Agenda item 1.1) "*to consider additional spectrum allocations to the mobile service on a primary basis and identification of additional frequency bands for International Mobile Telecommunications (IMT) and related regulatory provisions, to facilitate the development of terrestrial mobile broadband applications, in accordance with Resolution **233 (WRC-12)"***;
- (Agenda item 1.2) "*to examine the results of ITU-R studies, in accordance with Resolution **232 (WRC-12)**, on the use of the frequency band 694-790 MHz by*

[4] COM(2012) 478 final.

[5] Decision No 243/2012/EU of the European Parliament and of the Council of 14 March 2012 establishing a multiannual radio spectrum policy programme.

[6] RSPG12-408 (Final): RSPG Opinion on Review of Spectrum Use

the mobile, except aeronautical mobile, service in Region 1 and take the appropriate measures."

After WRC-15 the frequency band 694 – 790 MHz will be allocated on a co-primary basis to the mobile service and identified for IMT in Region 1. Technical studies to be completed prior to WRC-15 will determine the technical and regulatory conditions to be applied in these bands. The lower edge of the band may also be adjusted at WRC-15 depending on the results of these studies.

The ITU has formed Joint Task Group 4-5-6-7 to undertake these technical studies. The first meeting of this group took place in July 2012. In Resolution 232 (WRC-12), the ITU resolved that these technical studies would take account of the following:

1 the spectrum requirement for the mobile service and for the broadcasting service in this frequency band [694-790 MHz], in order to determine as early as possible the options for the lower edge [of the band];

2 the channelling arrangements for the mobile service, adapted to the frequency band below 790 MHz, taking into account:

- *the existing arrangements in Region 1 in the bands between 790 and 862 MHz and defined in the last version of Recommendation ITU-R M.1036, in order to ensure coexistence with the networks operated in the new allocation and the operational networks in the band 790-862 MHz,*
- *the desire for harmonization with arrangements across all Regions,*
- *the compatibility with other primary services to which the band is allocated, including in adjacent bands;*

3 to study coexistence between the different channelling arrangements which have been implemented in Region 1 above 790 MHz, as well as the possibility of further harmonization;

4 to study the compatibility between the mobile service and other services currently allocated in the frequency band 694-790 MHz and develop ITU-R Recommendations or Reports;

5 to study solutions for accommodating applications ancillary to broadcasting requirements;

6 to report, in time for WRC-15, the results of these studies,

The studies related to the channelling arrangements referred to in 2 and 3 above will be carried out in ITU-R Working Party 5D.

In the related Resolution 233 (WRC-12), the ITU resolved that these technical studies would take account of the following:

1 to study additional spectrum requirements, taking into account:

- *technical and operational characteristics of IMT systems, including the evolution of IMT through advances in technology and spectrally-efficient techniques, and their deployment;*
- *the bands currently identified for IMT, the technical conditions of their use, and the possibility of optimizing the use of these bands with a view to increasing spectrum efficiency;*

– *the evolving needs, including user demand for IMT and other terrestrial mobile broadband applications;*

– *the needs of developing countries;*

– *the time-frame in which spectrum would be needed;*

2 to study potential candidate frequency bands, taking into account the results of the studies under resolves 1, protection of existing services and the need for harmonization.

These technical studies are ongoing with input from European administrations coordinated via CEPT (see below).

The third item of relevance to wireless broadband to be considered by WRC-15 is Agenda Item 1.3 which will:

*review and revise Resolution **646 (Rev.WRC-12)** for broadband public protection and disaster relief (PPDR), in accordance with Resolution **648 (WRC-12)**.*

3. EUROPEAN DEVELOPMENTS

CEPT launched preparatory studies in September 2012 to contribute to the ITU studies on AI 1.1 and 1.2 and to promote common positions in relevant Study Groups and in Joint Task Group 4-5-6-7. The CEPT Conference Preparatory Group (CPG) Project Team D will lead this activity and will be responsible for the above WRC-15 agenda items 1.1 and 1.2. The CPG work will be further developed in order to have a European Common Proposal adopted on these agenda items in time for WRC-15.

CEPT has also decided to harmonise the technical conditions for the use of the frequency band 1452-1492 MHz by wireless broadband supplemental downlink, while allowing the possibility for administrations to use part of this band for other usage such as broadcasting. It has also launched an initiative to develop an ECC Decision on implementation measures for Mobile/Fixed Communication Networks (MFCN) in the 2.3-2.4 GHz band and the need to review in particular how to reflect regulatory provisions for Licensed Shared Access (LSA) in the Decision including cross-border coordination. In addition, it can be noted that CEPT has already considered the possibility to migrate low capacity long range fixed links still operating in the region of 1400 MHz into frequency bands higher than 6 GHz.

Concerning cross-border coordination, a first assessment of the consequences on equitable access to spectrum, as defined in the GE06 Plan, of a new allocation to the mobile service below 790 MHz has been carried out. A proposed approach for coordination of the broadcasting service within Europe in such a case has been addressed in the RSPG Report 13-154[7].

The spectrum requirements for broadband PPDR are being addressed by the RSPG working group examining strategic sectoral spectrum needs, the final report of which

[7] RSPG Report on proposed spectrum coordination approach for broadcasting in the case of a reallocation of the 700 MHz band.

should be available towards the end of 2013. Also CEPT CPG Project Team A will be responsible for preparation of the European position onWRC-15 agenda item 1.3.

4. DEFINITION AND TRENDS FOR WIRELESS BROADBAND

Broadband services play a major part in electronic communications and the wider economy today. They provide substantial benefits to EU citizens and consumers by improving and enabling a wide range of economic, social and cultural activities. The RSPG noted earlier that the notion of broadband is continually evolving and could best be described in qualitative terms[8]. Today, this is likely to mean the possibility of accessing a wide range of media rich services including web browsing, voice-over-IP, and video services.

Broadband services can be delivered through both wired and wireless infrastructure. Sometimes wireless and wireline technologies compete with each other, but, in other cases, they are complementary. Trends show explosive growth of the delivery of broadband services over these wired and wireless infrastructures and for wireless broadband in particular. This is clearly stated in the European Commission's Digital Agenda for Europe[9]. One of the key challenges highlighted in the Digital Agenda is that more needs to be done to ensure the roll-out and take-up of broadband for all, at increasing data rates, through both fixed and wireless technologies. The Digital Agenda states that wireless (terrestrial and satellite) broadband can play a key role in ensuring coverage of all areas, including remote and rural regions.

Wireless broadband can be described as high-speed wireless transmission of data and may be provided via either fixed, mobile or satellite platforms. A fixed wireless service provides wireless broadband to devices in permanent locations, such as homes and offices. A mobile broadband service provides connectivity to users who may be in temporary locations, such as coffee shops and train stations. Mobile broadband works through a variety of devices, including portable modems and mobile phones. Depending on the characteristics of the satellite network, satellite broadband can service either mobile or fixed broadband users or both.

In several Member States, mobile broadband services have already taken an important place in the overall provision of broadband access. First, because its cost effectiveness may exceed that of wired broadband, especially in areas with a low population density, and second, because of the distinct value offered by mobility and wireless connectivity in general.

However, mobile communications is not the only means to provide wireless broadband. Wi-Fi networks play an important role in delivering broadband services as an extension to wired broadband in geographical areas which can be limited in size and where no wide area mobility is required, e.g. in home and office environments, hotspots in cities.

[8] RSPG09-284 Final, RSPG Working Group on wireless broadband – Final position paper, 14 May 2009.
[9] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:0245:FIN:EN:PDF

Broadband via satellites is a solution that economically covers entire regions irrespective of their topography. It is thus a means towards achieving 100% geographical coverage including those areas that are remote or sparsely populated where there is no business case for other technologies.

The relative roles of wired, terrestrial wireless and satellite networks in extending coverage and quality is not straightforward and will depend on local circumstances. In short, there is no "one size fits all" solution to provide cost-effective broadband services to all.

When considering future demand for spectrum for wireless broadband and the potential frequency bands to meet the demand certain assumptions need to be drawn. Mobile broadband networks typically use a minimum bandwidth of 5 MHz for TDD and 2 x 5 MHz for FDD networks. The additional frequency bands should in principle also support multiple operators. For the TDD networks the recent studies in CEPT have shown that frequency bands limited to a maximum width of 20 MHz (e.g., 1900 – 1920 MHz and 2010 – 2025 MHz) are not attractive enough for manufacturers to develop equipment. Hence, where there is a requirement for additional spectrum to support TDD operation in mobile networks in the future larger bandwidths should be considered.

4.1 Trends in consumer behaviour and demand

The end-user expects similar services over the mobile/wireless broadband network to those provided over the fixed network. There is currently a huge growth measured in cellular mobile data traffic, with about 70% annual growth rate in 2012[10]. Some forecast studies are indicating that such growth will continue at an annual rate between 50% and 70% in the next years. Additionally, mobile access enables new applications that take the mobility of the user into account, such as location-based services. The range of services that are delivered through the wireless broadband network is growing at a fast pace, and more and more data is being delivered to the user and is generated by the user.

Introduction of new services is enabled by new types of devices. A wide range of enhanced devices has entered the market. These new devices include smartphones, tablets, and other connected devices such as e-book readers and gaming consoles. Many of these devices are dual-mode (cellular and Wi-Fi). Many offer larger screens with higher resolution compared to an ordinary mobile telephone. This increases data consumption and encourages the use of media-rich broadband data services such as video. They also increase the use of media-rich social networking on mobile networks with such devices being used to upload rich media content, audio, images and video to the social network.

Video services may include both non-linear video services such as interactive TV, pay-per-view, catch-up TV or Video on Demand (VoD) and linear video services including scheduled broadcast programmes. In addition, the end-user expects improved quality in video services which explains the growth of advanced media/audiovisual services which need to be taken into account (HD, Ultra HD, 3D,

[10] For example, see "Observatory of the Electronic communications market in France" published by ARCEP 4th April 2013

etc.). This raises questions about the level of asymmetry between the downlink and the uplink and about the most efficient way to deliver video services.

Draft ECC Report 188 notes that "*Measurements in today's mobile networks clearly confirm the asymmetrical nature of the data traffic with consumers downloading considerably more than they upload data and multimedia content. The downlink-to-uplink ratios seem likely to widen towards 10:1 in high-traffic areas, as the proportion of video traffic in networks grows.*" On the other hand, the spectrum efficiency of the downlink is about 2 or 3 times higher than the spectrum efficiency in the uplink. The spectrum requirement for wireless broadband is being studied within the ITU and will provide a better understanding of the consequences of such trends in traffic asymmetry on the channelling arrangements for wireless broadband services.

4.2 Trends in wireless technology

To cater for the growing amount of data traffic in a mobile network there is not only a need for additional capacity but also a requirement to make the wireless connection as short as possible. Wireless connections over short distances are more spectrally efficient as it allows for greater re-use of spectrum. Short distances are also preferred because of the power limitations of the user equipment. This power limitation imposes a trade-off between the amount of data to be sent and the distance over which the data is transmitted; the higher the data rate, then ideally the shorter the connection will have to be for a given amount of available energy.

Smaller mobile network cell sizes are likely to be used to increase the capacity of the network. Heterogeneous networks, and especially microcells and picocells, will contribute to the overall spectral efficiency of an operator's network by providing additional capacity resource where required. Microcells and picocells are deployed by the operator itself under its full control, thus ensuring that the impact on the network is minimized. Femtocells, deployed by the end user under the control of the operator, are used to improve coverage and to increase capacity over very short distances. They are typically used indoors whereby the backhaul is realised via a connection with the fixed broadband network (such as DSL, cable or fibre). Offloading of traffic to the fixed network can also be realised via Wi-Fi networks or other licence-exempt spectrum. Many smartphones, tablets and other connected devices offer Wi-Fi capabilities. However, a drawback is that mobile operators are not able to guarantee the Quality of Service over such licence-exempt spectrum.

In its recent communication COM(2012)478[11], the Commission notes that "*more than half of all smartphone traffic appears to be routed over Wi-Fi networks, and this nomadic traffic is growing 4-6 times faster than mobile traffic. Global sales of Wi-Fi-enabled equipment should have reached 3.5 billion units by 2014*[12]*. Mobile network operators are also relying on the same licence-exempt RLAN frequencies for data off-loading to increase network capacity, improve coverage in buildings and save costs*", which can be considered as an advantage. According to Analysys-Mason 2012, the proportion of data traffic attributable to Wi-Fi on handsets will rise from 55% to 61%, and on connected mid-screen devices will remain constant at around 82%.

[11] Promoting the shared use of radio spectrum resources in the internal market

[12] SCF 2012.

Video is one of the drivers for the huge increase in broadband data. This encompasses not only video streaming and video download. The broadband network is also used to offer managed IPTV services, which may include live television programmes, Video On Demand (VOD) and time-shifted television. The possibility to offer managed IPTV services started on fixed broadband networks, but is now a growing feature on mobile broadband networks.

The broadband networks are evolving in order to deliver broadcasting services, non-linear video services and data services including social networking and cloud services to mobile devices which is driven by the development of smartphones and tablets. The impact on traffic volumes and asymmetry is under study in ITU, taking into account the overall mobile data traffic. In mobile networks asymmetry can be addressed with TDD technology or with the new Supplemental Downlink (SDL) feature within a mobile broadband system, which by means of base station transmitters in the network, is able to use unpaired spectrum to provide a supplemental downlink capacity to paired (FDD) spectrum. Wi-Fi networks also play an increasing role in offloading data traffic, particularly nomadic traffic.

Increases in network capacity will also be influenced by technological developments in network elements. The improvements in technological efficiency of the radio interface (e. g. LTE, LTE advanced) leads to more efficient use of existing spectrum resources (bit/s/Hz/). It is unlikely however that the development of technologies that are more frequency-efficient will be enough to satisfy the growing demand for high bit-rate data services. Moreover, it is very likely that the migration to these new spectrum efficient technologies will be made very gradually. Mobile operators will need to accommodate users on older networks (like GSM) for the coming years. In this perspective, it could be noted that the applicability of the European framework of technological neutrality to provision of ECS will come into full effect (including existing licences) starting from May 2016[13].

In the next years technological progress will enable an increasing number of users to be satisfied by the same amount of spectrum as today, however, the anticipated growth in data traffic will still require additional spectrum to be made available to meet those needs.

5. SPECTRUM POLICY AND REGULATORY ISSUES REGARDING WIRELESS BROADBAND

The need for wireless broadband access and the role spectrum will play in providing broadband access will depend on a number of things and will vary across the various Member States. This will have implications for the amount of spectrum and the type of spectrum needed by individual Member States. In some countries mobile will play an essential role to provide broadband access while in other countries mobile will be regarded as an extension providing additional capacity and additional services or be complementary to fixed networks. The role mobile services will play in the plans of

[13] See Directive 2009/140/EC of the European Parliament and the Council, Articles 9 and 9a.

Member States to provide broadband connectivity will depend on the roll-out of fixed broadband and to some extent also to the way in which broadcasting services are provided. In turn, these will depend on the geography of the country and the population density, i.e. the size of rural and urban areas noting that there are substantial differences between urban and rural areas in most parts of Europe.
As operators must consider both coverage and capacity requirements in all areas, it is not possible to simply say that a particular band is for coverage in urban or rural areas only. However, in general terms we can say that;

> **In urban areas** the demand for broadband services and consequent spectrum needs are very high, but in most cases fixed broadband is available with very high speeds, Wi-Fi is widely available and mobile networks make use of higher frequencies (better frequency reuse and more bandwidth) where such a use is possible.
>
> **In rural areas** there are fewer alternatives to wireless broadband; however, there are also fewer users and even if the individual need for spectrum per user is high the overall need for spectrum will still be much lower than in urban areas (big cities).

Both technical and economic factors will have to be taken into account to determine the role of wireless communications in these areas. In rural areas it would be economically and technically beneficial to use lower frequencies to provide coverage with a minimum of base stations whereas in urban areas the distance between base stations will be much smaller and based on the capacity that is needed. Conversely, using higher frequencies in urban areas, which have a shorter re-use distance and greater capacity, is more efficient.

Bringing into use additional frequency bands has a cost for the operators who need to upgrade their networks and pay for spectrum. Increasing capacity through the higher density networks also has a considerable cost. Therefore, mobile operators in particular have an interest in offloading the traffic from their radio access networks by encouraging the use of alternative wireless technologies such as Wi-Fi, while retaining the customer within the network.

On the other hand it will make economic sense to have harmonisation in the bands that are used for wireless broadband to reach economies of scale. A too fragmented approach could lead to a need for overly complex and costly user devices which may never be realised. However, given the differences in specific needs between Member States, there is a question of mandating harmonised spectrum in Member States where demand for wireless broadband can already be satisfied by some parts of the already harmonised frequency bands. Where there is evidence that spectrum harmonisation would lead to spectrum underutilisation on a temporary and/or geographical basis a more nuanced approach could be taken. One approach could be to allow those relevant Member States to use on a temporary and/or geographical basis the spectrum for services that fulfil national needs as long as they do not constrain the use of services in those Member States who have harmonised their spectrum for wireless broadband services (see the RSPG Report[14] on Improving Broadband Coverage).

[14] Document RSPG11-393 available at http://rspg.ec.europa.eu/rspg_opinions/index_en.htm

As an example of a national plan for broadband provision, in Luxembourg the government has established a national strategy for very high-speed networks. The transition from traditional telecommunications networks to a broadband network has a positive socio-economic impact. This impact is expected to intensify with the transition to networks which, using the appropriate technologies, reach up to 1 Gbit/s for fixed networks. The overall target is 1 Gbit/s downstream and a minimum of 500 Mbit/s upstream for 100% coverage of the population by 2020 (high-speed broadband is considered to be within the scope of universal service). The added value of wireless networks consists mainly in their mobility, which makes them complementary to the fixed networks.

5.1 Why some spectrum is not used

The issue of under-utilisation of harmonised spectrum was addressed in the RSPG Report on Improving Broadband Coverage (2011). In addition to this work, the 2012 RSPG work programme contains a work item to draft an RSPG Opinion on 'Addressing situations resulting in underutilisation of spectrum'. This work will, among other things, conduct a more in depth analysis of the possible causes of under utilisation, assess how viable it would be to adopt targeted harmonisation and address how service development could be promoted in those Member States where demand is notably lower than would be expected.

In summary, the findings of the 2011 Report (RSPG11-393) concluded that there were several possible causes of harmonised spectrum not being fully exploited as follows:

- Technology: the anticipated technology is not available for use in the timeframe envisaged when the spectrum is acquired leading to delayed used of the band.

- Demand: it is possible that, in particular in cases where services are provided across a number of platforms, the anticipated demand for the service in the given band does not mature.

- Regulatory uncertainty: through attempts to be as flexible as possible, Regulators may inadvertently render the spectrum unusable as a result of the technical conditions not being prescriptive enough to provide certainty.

- The packaging of the spectrum bands and / or their size may be inappropriate for an economic case to be made.

- Co-existence arrangements with adjacent bands may be prohibitively restrictive.

The report goes on to cite the examples of the 3400-3600 MHz , the 3600-3800 MHz and part of 2.1 GHz bands (unpaired bands). It notes that in the 3400-3600 MHz and the 3600-3800 MHz band several operators, who were awarded licences, did not deploy networks or provide broadband services as anticipated as neither the technology nor demand developed as forecast. This resulted in operators returning licences, e.g. in Luxembourg where all the licences were returned in 2010. Several reasons were mooted for the lack of demand including price sensitivity from

consumers compared to alternatives and the existence of legacy users in the band creating a restrictive environment. It should be noted that there were exceptions in some Member States, for example, Ireland saw significant deployment of services in this band. However, use of the band in those Member States has declined in recent years due to other alternatives including mobile broadband becoming available in other bands, e.g., in the paired 2.1 GHz bands,

In relation to the 2.1 GHz (unpaired bands 1900-1920 MHz and 2010-2025 MHz) band, there are, again, several possible interconnected reasons for the lack of use of the unpaired bands. These unpaired bands were packaged in 5 MHz channels suitable for TDD use. Post 2000, research and development clearly focussed on FDD technologies resulting in a relatively little development of TDD technologies. This, in conjunction with a lack of demand at 2010-2025 MHz, which is believed to be a result of complex co-existence issues with FDD at 1920 MHz, resulted in the unpaired bands being almost entirely unused.

These two examples alone demonstrate many of the potential reasons why some harmonised spectrum is unused or under-used. The following discussion addresses some of the reasons in detail:

- <u>High fees / lack of competition</u>
  In June 2011 the Latvian Public Utilities Commission (PUC) launched a renewed auction of 2 x 1.25 MHz channels in the 450 -457,5 MHz and 460-467.5MHz bands. The reserve was set at 35,000 lats, a significant reduction from the figure of 200,000 lats set for the previous auction in February of the same year when the spectrum failed to sell. After the failed auction comments were made by the only interested party about the high starting bid level. Given that there was only one materially interested party and the frequencies would need to be used in conjunction with others in the band to create higher network speeds (at significant roll out cost) there was a perception that the fee was set too high in the first instance, given the lack of competition. In this instance, this was recognised and remedied by a further auction with a lower reserve price, as mentioned above, and resulted in a successful outcome.

- <u>Lack of demand</u>
  In some instances spectrum harmonised for wireless services across the EU may go unused due to lack of demand. There are several possible reasons for this that could include:
    - the national market does not support the perceived requirement for the whole of the bandwidth that has been harmonised; or
    - services are already provided over other platforms (e.g., wired) and coverage is near universal, therefore further spectrum for this service is unnecessary.

  For example, in Ireland all of the 1800 MHz GSM band (2x75 MHz) was allocated to the Mobile service. However, up until November 2012 only 2 x 43.2 MHz of spectrum had actually been assigned to mobile network operators for delivery of second-generation mobile services as there was no demand for further frequency assignments. Furthermore, not all of the assigned spectrum

was used in full throughout the country, usage of the band being predominantly focused on urban areas.

It should be noted that the size of the market as well as the size of the country also plays a key role in the take-up of frequency bands.

- Restrictions due to legacy users in the band
  The band 3400–3800 MHz can again be used as an example of issues not directly attributable to the harmonisation measure resulting in underutilisation of spectrum. However, this could also result from the provision of the Commission Decision 2008/411/EC stating that Member States must implement the Decision in accordance with the parameters set out in the technical annex and also '*without prejudice to the protection and continued operation of other existing use in this band*' . In those countries where there is significant existing use with many satellite earth stations in the band this requirement could have added a further restriction, on the basis that sharing is challenging and at times impracticable, and that may have provided a disincentive for other users.

- Restrictive regulatory obligations
  Occasionally it is the obligations and restrictions put in place by the regulatory authorities during the award process that can result in spectrum being unused. In the Spanish 'super auction' in July 2011 several blocks of prime spectrum in the 900 MHz and 2.6 GHz bands were unsold. The Spanish Ministry of Industry, Tourism and Communications (MITYC) pointed to the top three operators (Telefonica, Vodafone and Orange) reaching their spectrum caps as the reason why the frequencies failed to sell. In a subsequent auction, in November 2011, the caps were raised from 2x20 MHz per operator across the 800 MHz and 900 MHz bands and 115 MHz across the 1800 MHz, 2.1 and 2.6 GHz bands to 2 x 25 MHz in 800/900 MHz and 155 MHz in the 1800 MHz, 2.1 and 2.6.GHz bands respectively. Consequently, all of the spectrum was sold.

  In addition to the Spanish example there was a similar situation in the Dutch 2.6 GHz auction in 2010. Only the paired FDD spectrum was sold, leaving 50 MHz of TDD spectrum unsold. Suggestions were made that one of the reasons why not all the spectrum sold was the tight spectrum caps imposed on the three incumbent bidders who were limited to 20 MHz and 10 MHz respectively. It was mooted that if the caps had been looser, one or more bidders might have found the TDD spectrum a more attractive alternative.

- Defence and other public sector spectrum
  Spectrum may also not be used on a regular basis, or only in limited geographic areas due to its allocation for use by defence or other public sector applications, e.g. for use in national emergencies. This may raise the possibility for some of that spectrum to be made available for use by other users under carefully designed conditions, e.g., on a pre-emptive basis whereby the main user can retrieve control of the spectrum if necessary.

6. THE ROLE OF SHARED SPECTRUM ACCESS AND LICENCE EXEMPT SPECTRUM

Millions of persons today use licence exempt spectrum in the 2.45 GHz band to access broadband services in a very efficient way as the re-use of the spectrum is very high. This is also the case for the 5 GHz licence exempt bands, allowing higher capacities than in the 2.45 GHz band, as approximately 500 MHz of bandwidth is available in shared access with radar systems and the Earth exploration-satellite service.

To meet the growing demand for spectrum the industry and administrations are under pressure to introduce new technologies and regulatory mechanisms to optimise the use of the limited frequency resources. In this context, the promotion of the shared use of radio spectrum resources is a valuable means to offer additional spectrum access to broadband communications, for licence exempt but also licensed usage, which is a new paradigm referred to as Licensed Shared Access. The EC has published a communication[15] on this matter which will be discussed in various fora. In particular, RSPG has already developed opinions on Collective Use of Spectrum and will develop a new opinion on Licensed Shared Access. In parallel, CEPT has initiated work on the general concept of Licensed Shared Access and implementation of the concept in the 2300-2400 MHz band.

7. IMPACT OF THE CONVERGENCE OF SERVICES

Traditionally, broadcasting and broadband communication services have their own dedicated network infrastructure (high power / high tower versus dense networks). The convergence of services requires the study of the delivery of a range of content towards the end user in the most efficient way. It is recommended to study this issue at a European level, taking into account:

- The convergence of technologies (e.g., OFDM based systems such as LTE, DVB-T, etc.);
- Various situations in CEPT countries relating to content regulations or dependency on terrestrial TV platforms;
- Cross-border coordination issues between different network topologies;
- Various reception environments (e.g. indoor/outdoor, fixed, portable, etc.;
- Coexistence with PMSE-applications.

It is assumed that the results of those studies would be used in the necessary debate to define a long-term vision for the UHF-band in Europe.

[15] COM (2012)478 Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Promoting the shared use of radio spectrum resources in the internal market.

8. MEETING FUTURE SPECTRUM DEMAND FOR WIRELESS BROADBAND SERVICES

The total amount of spectrum already available in Europe for wireless broadband services is nominally 1701.50 MHz comprised of 990 MHz for terrestrial applications, 173 MHz for satellite based broadband and importantly 538.50 MHz for WiFi-type applications. In order to meet the intermediate target in the RSPP to make every effort to identify at least 1200 MHz of spectrum for wireless data traffic by 2015, taking the terrestrial cellular component alone would require at least 210 MHz of additional spectrum to be re-allocated to wireless broadband. With that objective in mind, all of the frequency bands within the range 400 MHz to 6 GHz have been analysed as shown in **Annex 1** which identifies, in the case of each band, its potential for wireless broadband services on a harmonised basis, whether the band is already in use for wireless broadband and if not, the likely timeframe in which it could be made available. This resulted in the identification of a further 140 MHz with near future potential and 886 MHz potentially in the medium term (beyond 2015).

On the basis of that analysis the potential candidate bands for wireless broadband are then listed in **Annex 2**, indicating the pros and cons of each band, its potential for wireless broadband, the likely timeframe within which it could be made available and actions to be taken to achieve that goal. This is in effect the roadmap for meeting the requirements of the RSPP on wireless broadband.

8.1 Costs of sharing with other services

All of the frequency range (400 MHz to 6 GHz) under consideration in this Opinion is allocated, designated and used by a range of radiocommunication services. In order to facilitate the use of wireless broadband in the bands identified with potential for such use it may be necessary to implement technological solutions and other mitigation techniques to facilitate spectrum sharing and coexistence with services such as PMSE, to guarantee that those services will be able to continue to operate at an appropriate level. Mitigation techniques may already be available today, however, they often increase the costs of equipment. Therefore, it is important that the wireless broadband community is made aware that contributing to the cost of coexistence and spectrum efficiency is inseparable from considering their further spectrum needs.

9. KEY FREQUENCY BANDS WITH POTENTIAL FOR WIRELESS BROADBAND

9.1 The 700 MHz Band

The 700 MHz band is used in Europe for terrestrial television and PMSE. The frequency band 694-790 MHz represents 30% of the total remaining UHF TV spectrum. The impact of a reallocation of this spectrum for broadband will therefore potentially be significantly more important for terrestrial broadcasting than in the case of the 800 MHz band which was used in some countries for other services (i.e., defence). In addition, such a reallocation, which would take place after analogue switchover, could not appear as a share of the digital dividend between the broadcasting and mobile services but rather as a reduction of the capacity for broadcasting, which would require in many countries the implementation of new

technologies (DVB-T2/HEVC) and would impact further developments of DTT services, such as the introduction of higher definition video services. This reallocation could have a financial impact for DTT viewers as they may have to again buy new equipment with no clear benefit this time in terms of enhanced television reception.

The UHF band is also heavily used for Program Making and Special Event (PMSE) services, especially wireless microphones. PMSE services make use of the white spaces between the TV broadcasts. It is unlikely that such use can continue in the 700MHz sub-band if it is used for mobile broadband. The amount of spectrum available for PMSE services was already diminished when making the 800 MHz band available for mobile broadband. There is need to take account of the spectrum needs for PMSE services and to provide a solution for the continuation of PMSE services elsewhere in the UHF band or in other appropriate bands.

The issue of cross-border interference between the broadcasting and mobile services has been raised several times in the debate concerning the 800 MHz digital dividend. It is one of the reasons why the coordinated approach within EU was implemented. In this respect, it would be preferable to consider from the beginning the future of the 700 MHz band in a coordinated manner.

Bearing in mind that the decision to make IMT co-primary in the 700MHz band was already agreed at WRC-12 to take effect after WRC-15, it would be appropriate for Europe to develop a position in time for WRC-15 on the refinement of the lower band edge and on possible channelling arrangements for mobile services in the 700 MHz band.

It is important that Europe considers *resolves 4* of Resolution 232 (WRC-12) as the ITU studies (through JTG 4-5-6-7) have begun. Given that the decision to make IMT co-primary in the 700 MHz band will take effect after WRC-15, it may also be useful for Europe to take a longer-term view on the future use of the band from 470 to 790 MHz in order to develop a strategic view about the long-term future use of the band. This long-term view should, in particular, take account of the long-term developments of digital terrestrial television and their societal value, the possible benefit from convergent platforms in the future to deliver linear media/audiovisual services and increasing audience demand for video and data to mobile devices (smartphones, tablets, etc.).

A detailed survey on the long-term spectrum requirements for television broadcasting in the European Union including the number of TV services, HDTV, interactive services, mobility requirements and the possible introduction of Ultra High Definition Television has been carried out with the following results:

a) Long term spectrum need for broadcasting, varies amongst European countries. However, several Member States are planning an increase of the number of programmes, a widespread expansion of HD, additional mobility and possible introduction of Ultra High Definition;
b) The relative penetration of each platform for TV delivery is highly country dependent. However, most Member States consider that these platforms complement each other and most countries have stressed the importance of terrestrial TV for free-to-air services, for secondary TV sets, and that viability of DTV requires access to sufficient spectrum resource;

c) Both broadcasting and mobile networks may complement each other in the provisions of linear and non-linear audiovisual contents to mobile terminals. However, for fixed reception, it is currently considered unlikely that mobile networks will evolve to deliver video content to mass audiences, primarily because of the increased demand for spectrum to support such a network capability, which many considered inefficient. Introduction of new technologies (DVB-T2, HEVC) will enable an increase of spectrum efficiency and the provision of improved TV services. However, scenarios and timing for transitioning to these technologies are critical and very much country-dependent.

The challenge for the development of an EU policy on the 700 MHz band will be to address the variety of national situations in terms of digital terrestrial television services and the need for additional wireless broadband services. In terms of timing, there is a relationship in each country with the duration of broadcasting licenses, the timeline for the introduction of the new services for broadcasting and the implementation of more efficient broadcasting technologies and the need to meet the targets set down nationally and at EU level in relation to delivery of broadband capacity. This has also to be considered in the context of potential cross-border frequency coordination difficulties, also taking into account the required time for cross-border coordination and modifications of the broadcasting assignments.

An EU strategy needs also to be discussed on the future use of the 700 MHz band taking into account all political, economical and technical elements. Elements which could be considered by the Commission in developing a coherent strategy include:

a) The Commission should take into account the timing issues described above;
b) The Commission should be invited to support Member States taking measures relating to TV receivers to mandate more efficient technologies;
c) The Commission should invite a review of ETSI and CENELEC standards applicable to cable and terrestrial broadcast reception in the 700 MHz band and below, in order to avoid harmful interference.
d) The Commission should take into account that there is also interest in use of the 700 MHz band for PMSE and PPDR which is being studied elsewhere.

9.2 Bands 1350 – 1375, 1375 – 1400, 1427 – 1452 and 1492 – 1518 MHz

The frequency bands 1375 – 1400 MHz and 1427 – 1452 MHz are already allocated on a co-primary basis to the fixed and mobile services in Region 1 and a new ITU allocation for mobile service would only be necessary for Region 2 and 3 in the frequency band 1375-1400 MHz.

The frequency bands 1350 – 1375 MHz, 1492 – 1518 MHz are also already allocated on a co-primary basis to the fixed and mobile services, but limited to Region 1 for the band 1350-1375 MHz. The use of the frequency band 1492 – 1518 MHz would allow for a possible further extension of the band 1452 – 1492 MHz by a further 25 MHz.

The consideration of these frequency bands for WRC-15 and possible availability in longer term shall not delay the on-going harmonisation of 1452-1492 MHz in Europe (see below).

The bands1375 – 1400 MHz paired with 1427 – 1452 MHz as well as 1350 - 1375 MHz paired with 1492 - 1518 MHz are already subject to CEPT harmonisation for the Fixed Service (see Recommendation T/R 13-01 – Annex A and B). Low numbers of

point-to-multipoint applications have been reported by CEPT Administrations in these frequency bands (see ECC report 173) although some new developments for low capacity, long range private links have been reported in some countries, in particular for public utilities. Therefore, the introduction of wireless broadband services in these frequency bands would imply the identification of higher frequency bands suitable for this kind of fixed links applications and consequent refarming measures at the national level. Of relevance here is that CEPT is currently assessing the technical possibility of introducing narrow channel spacing in several frequency bands between 6 and 10 GHz similar to that existing in Annex A and B of the Recommendation T/R 13-01 (1375-1400 MHz frequency band paired with 1427-1452 MHz and 1350 – 1375 MHz paired with 1492 – 1518 MHz). However, there may still be an ongoing requirement for long-range links in these bands, e.g for links to North Sea platforms.

In many countries the bands 1375 – 1400 MHz and 1427 – 1452 MHz as well as the bands 1350 – 1375 MHz and 1492 – 1517 MHz are also used for military purposes, including for radiolocation in the band 1350-1400 MHz and for tactical radio applications. However, some administrations see indications of very limited actual use in the bands. Making part of these bands available for ECS would in some countries realistically require preserving capacities for tactical radio applications in the same frequency range and reassignment of radiolocation stations below 1350 MHz/1375 MHz.

The NJFA (NATO Joint Civil/Military Frequency Agreement) with reference to the frequency range 1350-2690 MHz states that the "*essential military requirement for TRR, with harmonised bands of 90 MHz, with a total of 180 MHz for major exercises in some countries*", and recommends that "*in the long term (in particular post-2007) the harmonised sub-bands for TRR, in those countries having land borders, shall be 2025-2070 MHz and 2200-2245 MHz*". Therefore, the frequency range 1350-1518 MHz can be seen as an alternative to meeting the requirement in certain countries for TRR (tactical radio relay) spectrum which cannot be satisfied in the 90 MHz of spectrum harmonised for TRR in the 2 GHz frequency range.

Also, protection of adjacent band services is necessary and in particular, protection of the passive band (1400-1427 MHz) for both radioastronomy and the Earth Exploration-Satellite Service (EESS)[16]. Coexistence between certain types of Mobile service and the EESS (passive) was already considered at WRC-07 and led to relevant conditions being included in ITU-R Resolution 750. Protection of the passive services seems feasible but should be confirmed by sharing studies.

Adopting a frequency arrangement for mobile broadband in the 1375-1400 MHz (uplink) band paired with 1427-1452 MHz (downlink) may be a suitable approach and prove to be more compatible to sharing with other services. In that case the harmonised frequency arrangement for fixed services in the band 1350-1375 MHz / 1492-1518 MHz could be maintained for fixed links. CEPT is also considering the possibility of the band 1492-1518 MHz for PMSE applications but a decision has yet to be taken on this.

[16] Noting that today there is interference to the ESA satellite SMOS from terrestrial radio services.

It is noted that the frequency band 1350-1375 MHz / 1492-1517 MHz may also be considered by WRC-15 for WBB applications.

9.3 The Band 1452-1492 MHz

This frequency band has been harmonised since WARC-92 for terrestrial and satellite sound broadcasting but with little development until now (although there are some initiatives recently taken by some countries for licensing terrestrial sound broadcasting in this band), thus attracting interest from other services.

After two years of an extensive review and studies of this band, CEPT decided in September 2012 to develop an ECC Decision designating the band for mobile/fixed communication networks (MFCN) supplemental downlink and defining the Least Restrictive Technical Conditions with a harmonised band plan based on 8 blocks of 5 MHz each. This new regulatory framework will provide for mobile supplemental downlink deployment and significant additional capacity for mobile networks. It should also allow individual countries to meet national requirements by, if necessary, using part of the band for terrestrial broadcasting and other terrestrial applications.

When developing Least Restrictive Technical Conditions in this band possible use of the adjacent bands for WBB applications should be taken into account.

9.4 The 2 GHz Mobile Satellite Service Bands

The bands 1980-2010 and2170-2200 MHz were identified for mobile satellite services (MSS) in 1992 at WARC-92 as the satellite component of the new IMT-services, with the frequency bands 1920-1980 MHz and 2110-2170 MHz being allocated for the terrestrial component of IMT. The terrestrial component has now been in use for 3G services in Europe for more than 10 years, while the bands 1980-2010/2170-2200 MHz which were assigned to operators in 2009 by a European selection and authorisation process have yet to prove to be a commercial success.

There is a Commission Decision[1] in force harmonising the 2 GHz MSS band in the EU for MSS (the 'Harmonisation Decision'). There is also a Co-Decision[2] of the Parliament and Council providing for selection and authorisation of MSS systems in the 2 GHz band. On 13 May 2009, the Commission selected Inmarsat Ventures Limited and Solaris Mobile Limited as the undertakings to provide MSS on a pan-European basis in the 2 GHz band in the EU.[3]

The allocation represents 2 x 30 MHz of particularly attractive, harmonised, spectrum and there have been calls for it to be re-allocated to terrestrial mobile broadband

[1] Commission Decision of 14 February 2007 (2007/98/EC) on the harmonised use of radio spectrum in the 2
GHz frequency bands for the implementation of systems providing mobile satellite services

[2] Decision of the European Parliament and of the Council of 30 June 2008 (626/2008/EC) on the selection and
authorisation of systems providing mobile satellite services (MSS)

[3] Commission Decision of 13 May 2009 (2009/449/EC) on the selection of operators of pan-European systems
providing mobile satellite services (MSS)

services. In the USA, the FCC has removed restrictions on MSS spectrum in the 2 GHz range in order to allow for future use by terrestrial wireless broadband services.

In 2011, the Commission adopted Decision 2011/667/EU[17] on modalities for coordinated application of the rules on enforcement to an authorised operator of mobile satellite systems (MSS) in the event of an alleged breach of the common conditions attached to its authorisation (launch of satellite, launch of commercial services, coverage, etc.). Subsequently, in late 2012 Germany sent a notification of lack of compliance with the licence conditions to both authorised MSS operators which launched the step-by-step procedure at EU level.

The RSPG acknowledges the interest in this band for alternative uses, especially given the economic and social value of this spectrum, and recognises the on-going process, led by the COCOM MSS Working Group, regarding the EC Decision on co-ordinated enforcement action. In light of this, the RSPG recommends that if future actions taken by Member States related to Decision 2011/667/EU result in the withdrawal of licences, the Commission should consider re-allocation of the bands to terrestrial mobile services

9.5 The 2300-2400 MHz Band

This frequency band is currently used within CEPT for aeronautical telemetry (ERC/REC 62-02) and SAB/SAP (ERC/REC 25-10), e.g., as a core band for wireless cameras, and also used at a national level for various applications However, after its identification for IMT at WRC-07 this band has started to be used in other parts of the world for broadband mobile applications and equipment is available, thus attracting interest from several European administrations and leading to new activities in CEPT.

In September 2012, CEPT set up a Project Team which was tasked with developing a draft ECC Decision aimed at harmonising implementation measures for MFCN in the band including the least restrictive technical conditions (LRTC) and the regulatory provisions based on LSA, while ensuring the long term incumbent use of the band in the territory of those administrations that wish to maintain such use. This project team will finalise its work in the first half of 2014.

Recognizing, in some countries, that strategic governmental usage in the band such as aeronautical telemetry or CCTV for security purposes, would need to maintain their primary allocation status, considerations have been given to the possibility to provide access to this band through an appropriate regulatory mechanism such as Licensed Shared Access (LSA), as described in RSPG Report 11-392. The LSA concept is being studied in more detail in another RSPG working group. Furthermore, the studies being carried out in CEPT will detail the technical basis for such a shared access, if shown feasible, and assess the interest for broadband industry and operators in the regulatory mechanisms (LSA) to be applied.

[17] Commission Decision of 10 October 2011 on modalities for coordinated application of the rules on enforcement with regard to mobile satellite services (MSS) pursuant to Article 9(3) of Decision No 626/2008/EC of the European Parliament and of the Council

9.6 The Band 3800-4200 MHz

Initiatives at the EU-level have been taken in order to make the 3400-3800 MHz band available for wireless broadband applications such as LTE and LTE-A. The spectrum in the region of 4 GHz has useful properties in that it can support significant bandwidths suitable for broadband and it can provide a useful range in terms of area coverage. In that context, the question has been raised whether it is possible that the 3800-4200 MHz band may be a candidate for future wireless broadband systems.

In most European countries the 3800-4200 MHz band is mainly used for satellite Earth stations of the Fixed-Satellite Service (FSS) and terrestrial fixed links. There are approximately 160 geostationary-orbit satellites operating in the band 3400 – 4200 MHz providing essential services (mainly governmental and security services) to consumers (NGO and non-NGO and IGO) around the world, some 60 of which are providing coverage to all or part of Europe and interconnecting Europe with other regions of the world. Additional satellites using the C-band are under construction and new C-band Earth stations are being deployed all around the world.

C-band is also used for Galileo (GDDN), for satellite systems for the meteorological community, for EUMETCAST and GEONETCAST, for public sector emergency applications (e.g., see www.emergency.lu) as well as by embassies and diplomatic missions due to the very high robustness of these frequencies towards atmospheric conditions. There is also an ITU Resolution[18] addressing use of the band for aviation security and reliable distribution of meteorological information. The band is also used for feeder links for the GMDSS. Sharing conditions between satellite and terrestrial services are complex, and it has been demonstrated that there is no technical compatibility between the FSS and MS operation in the same geographical area and that required separation distances are large. The number of European FSS earth stations using the band 3800 – 4200 MHz is more than eight times the number of those using the band 3400 – 3800 MHz which is likely to limit the opportunities for terrestrial mobile applications in the band.

Nevertheless, the frequency range 3800-4200 MHz has the potential to play a role in the provision of electronic communications services to ensure that the future capacity needs especially in urban areas, are met. Therefore, studies should be carried out into the possibility of sharing in Europe between the FSS and terrestrial wireless broadband services.

9.7 The 5 GHz Bands

EC Decision 2005/513/EC designated the bands 5150-5350 MHz and 5470-5725 MHz for RLAN/WAS, in conformity with the WRC-03 results.

Some proposals have been recently made, in particular in the United States to further consider the bands 5350-5470 MHz and 5725-5925 MHz to provide a wide and contiguous 5 GHz spectrum for RLAN/WIFI applications, which would facilitate the implementation of wider channels and higher bit rates, so as to ensure that Wi-Fi could not become the “bottleneck” of broadband communications.

[18] Resolution 154 (WRC-12): Consideration of technical and regulatory actions in order to support existing and future operation of fixed-satellite service earth stations within the band 3 400-4 200 MHz, as an aid to the safe operation of aircraft and reliable distribution of meteorological information in some countries in Region 1.

The frequency bands 5350-5470 MHz and 5725-5925 MHz bands were not designated for reasons relating to the protection of radio services such as the radiodetermination services and the EESS (active) service. Therefore, studies will be needed within ITU-R JTG 4-5-6-7 and CEPT to address all compatibility issues:

1) GMES requires, among others, a set of satellites carrying 5 GHz SAR instruments (Sentinel-1A, -1B and -1C) that have been developed within the 5350-5470 MHz sub-band to avoid any potential risk of having SAR imaging of large parts of the world surface interfered by RLAN systems. The Sentinel-1 development is already well advanced with the first satellite of this series planned for launch this year (2013) and introduction of RLAN in the same band should not put at risk the whole Sentinel-1 satellite series and the many GMES data exploitation initiatives that are based on the availability of proper satellite data.
2) Sharing between radars and RLANs is based on the application of DFS mechanism. However, DFS cannot work properly for the detection of frequency agile radars and the bands 5350-5470 MHz and 5725-5850 MHz are considered as "safe harbour" for ensuring sufficient interference-free bands for the continued operations of these radars. In addition, one could also note that there are numerous interferences to radars (in particular meteorological radars) from RLANs in the 5470-5725 MHz band despite the provision of DFS on RLAN devices[19].
3) Part of the band 5850-5925 MHz is designated for ITS, and some other proposals are under consideration in ETSI and CEPT in this frequency band.
4) 5725-5925 MHz is allocated to the FSS in ITU Region 1.

10. RESPONSES TO THE CONSULTATION

A public consultation on a draft version of this Opinion was held from Feb 2013 until May 2013. In all, 51 responses were received. The RSPG is grateful to all respondents for their input. All responses can be found on the RSPG website http://www.rspg-spectrum.eu/consultations/index_en.htm. A summary of the responses is provided in **Annex 3** to this Opinion.

Overall, respondents' views remain divided on releasing more spectrum for WBB applications. Some respondents favoured releasing additional spectrum while others did not. However, most respondents commended the Opinion for providing an exhaustive review of the overall situation in Europe. Furthermore, these respondents agreed that the EC should develop a strategic roadmap for wireless broadband services, provided the need for additional spectrum for such services was well justified.

[19] At the time of producing this Opinion a CEPT ECC Report on the issue of interference from 5 GHz RLANs to meteorological radars was in preparation: ECC Report 192 on The Current Status Of DFS (Dynamic Frequency Selection) In The 5 GHz Frequency Range. The ECC Report examines the interference problem in detail and proposes actions to resolve the problem.

For each of the bands identified for WBB, a similar pattern emerged. Respondents were grouped into those wholly in favour of bands being released and those opposed on a variety of economic, social, cultural and technological grounds. Respondents in favour agreed to all measures proposed in the draft opinion, with some suggesting additional frequency bands for consideration. Of those who opposed the release of bands for WBB, many requested that impact assessments be carried out prior to any action being taken.

The largest volume of responses related to the 700 MHz band, with respondents, among others, making the following points:

- that a public consultation be carried out in advance of WRC-15 on a common EU-level approach to the 700 MHz band, taking into account national situations;
- that all Member States should have the flexibility to use the 700 MHz band for terrestrial digital TV applications under GE06 arrangements and retain the right of derogation if necessary;
- that the band should be harmonised across Europe in order to achieve economies of scale, even if this takes longer to implement. In particular, these respondents favoured a frequency arrangement in ITU region 1 that could provide a global solution, leveraging already-existing specifications for Band 28 (B28) from 3GPP. This arrangement is based on the lower sub-band of 2x30MHz of the Asia-Pacific Telecommunity (APT) bandplan. The resulting harmonisation would facilitate easier global roaming and more cost-effective equipment; and
- that an LSA approach could be considered where incumbent users cannot vacate within an acceptable timeframe

Some respondents requested to include the following additional frequency bands for consideration:

- *2700 – 2930 MHz band*: This band could be used to enhance future capacity requirements, given that the band is adjacent to 2500 – 2690 MHz and is globally harmonised.
- *2090 – 2110 MHz and 2200 – 2215 MHz band:* This band could considerably increase available WBB bandwidth if they were to be paired with 1900 – 1920 MHz and 2010 – 2025 MHz.
- *4400 – 4900 MHz* band: This band could be combined with 3800 – 4200 MHz for future support of IMT channel bandwidths of up to 100 MHz.

Other points raised by the respondents included:

- that RSPG should recommend a work programme for future consideration of higher-frequency bands beyond 6 GHz, as these bands have the ability to accommodate greater system bandwidths;
- to consider exempting SRDs and RLANs in the 921-925 MHz band from licensing; and
- that Electromagnetic Limits vary considerably among member states requiring some countries to deploy more BTS sites for the same coverage level than others. The increased site count could drive up energy consumption, resulting in higher costs and greater environmental impact.

This respondent therefore recommended the EC consider harmonising EU rules on ELM limits, undertaking a specific review on these limits in order to efficiently design a roadmap for future broadband spectrum availability.

- 450 – 470 MHz and the L-band could be used for potential smart metering and P-MP applications, respectively.

10.1 RSPG view on additional bands and topics proposed

2700 – 2900/2930 MHz band: Whilst originally not viewed as a potential band for wireless broadband, a number of respondents felt there was merit in considering the band 2700 – 2900/2930 MHz. Reasons given were that this band is adjacent to the globally harmonised band at 2500 – 2690 MHz, and some also felt that this band was underutilised by aeronautical radionavigation and weather radar services and that these services could be moved to alternate frequency bands. Currently it is clear that any co-frequency sharing of the band, between mobile and radar systems, is not technically feasible. In some Member States the band is underutilised, but this varies greatly between Member States. The wider frequency range 2700 – 3100 MHz has a mix of aeronautical, weather and maritime (ship and land based) radars and any re-planning of those bands would have both national and international issues to consider. As a result of this the entire range 2700 – 2930 MHz mentioned in responses may well not be realistic. In addition this band is under study for PMSE usage within CEPT. A review of the use of the band at some point in the future should be considered.

Due to the long term requirements of existing services and applications the other bands *2090 – 2110 MHz, 2200 – 2215 MHz* and *4400 – 4900 MHz* are not considered to be suitable candidates for WBB.

The proposal that a work programme be undertaken in respect of higher-frequency bands beyond 6 GHz is an issue that the Commission may wish to consider in the future.

The proposal to exempt SRDs and RLANs in the 921-925 MHz band from licensing is not practicable due to current usage of the band by defence systems and GSM-R applications.

The issues of harmonising electromagnetic radiation limits, smart metering and point-to-multipoint applications are beyond the scope of the Request for Opinion.

11. THE OPINION OF THE RSPG

Broadband services play a major part in electronic communications and the wider economy today. They provide substantial benefits to EU citizens and consumers by improving and enabling a wide range of economic, social and cultural activities.

Trends show a tremendous increase in the volume of data traffic which was not foreseen before WRC-07 for delivery of broadband services over both wired and wireless infrastructures at large and for wireless broadband in particular. This is

clearly stated in the European Commission's Digital Agenda for Europe[20]. One of the key challenges highlighted in the Digital Agenda is that more needs to be done to ensure the roll-out and take-up of broadband for all, at increasing data rates, through both fixed and wireless technologies. The Digital Agenda states that wireless (terrestrial and satellite) broadband can play a key role in ensuring coverage of all areas, including remote and rural regions.

Wireless broadband can be described as high-speed wireless transmission of data and may be provided via either fixed, mobile or satellite platforms. The relative roles of wired, terrestrial wireless and satellite networks in extending broadband coverage and quality is not straightforward and will depend on local circumstances. There is no "one size fits all" solution to provide cost-effective broadband services to all.

The purpose of this Opinion is to provide guidance to the European Commission on the future demand for spectrum for wireless broadband in meeting the goals of the Digital Agenda. This Opinion focuses on the problems associated with the provisioning of wireless broadband in general and specifically with the spectrum requirements for terrestrial wireless broadband.

This has to be considered in the context of the inventory established under Article 9 of the RSPP and aims to identify frequency bands that could be allocated or reallocated for wireless broadband, taking into account spectrum efficiency, possibility of sharing and potential negative or positive impact of reallocation of such bands on existing users and consumers.

The RSPG notes that:

(a) broadband networks are evolving in order to deliver data services to mobile devices, including linear and non-linear video services. The impact of the increasing mobile traffic asymmetry on channelling arrangements needs to be assessed;
(b) broadcasting networks are evolving in order to deliver high-definition and ultra high-definition programmes, to increase delivery to portable/mobile receivers. They are also envisaged for the delivery of linear and non-linear video services and data services to mobile devices (see RSPG Report RSPG(13)522);
(c) the actual use and future needs of bands for wireless broadband in Member States will vary, depending on the national requirements for broadband access and for other services;
(d) platforms other than terrestrial cellular such as WiFi have an essential role to play in facilitating user access to broadband services
(e) the frequency band 694-790 MHz represents 30% of the total remaining UHF TV spectrum. The impact of a reallocation of this spectrum for broadband will potentially be significantly more important for terrestrial broadcasting in some countries than in the case of the 800 MHz band;
(f) as sharing of the band between mobile services and DTT broadcasting will not be feasible, it is likely that they will compete for access to the 700MHz band. However, the situation for the digital terrestrial platform spectrum requirement varies significantly amongst Member States;

[20] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:0245:FIN:EN:PDF

(g) the reallocation of the 700 MHz band to mobile service, ie reducing the spectrum available for broadcasting, would require in many countries the implementation of more efficient technologies (e.g. DVB-T2/HEVC). Therefore, any EU-policy decision regarding the use of the 700 MHz band by wireless broadband should take into account, among other things,
- the EC supporting Member States taking measures to transition DTT receivers to more efficient technologies.
- That the cost for the network and the TV viewers would be increased in case of accelerated transition;

(h) there are merits in developing a common EU strategy on the whole UHF band 470-790 MHz, taking into account internal market and cross-border issues. However, this strategy has to reflect the variety of situations in Member States concerning the digital terrestrial platform and developments in terms of converged use of the spectrum;

(i) there is increasing pressure on the spectrum available for SAB/SAP (audio and video) applications;

(j) in the case of TDD networks, the recent studies[21] in CEPT have shown that frequency bands limited to a maximum width of 20 MHz (e.g., 1900 – 1920 MHz and 2010 – 2025 MHz) were not attractive enough for manufacturers to develop equipment for mass markets;

(k) more than half of smartphone, tablets, and other connected devices data traffic is routed over Wi-Fi networks and this nomadic traffic is growing faster than mobile data traffic. The use of Wi-Fi networks will help in responding to the increasing demand for wireless data traffic;

(l) Mobile operators are also relying on some licence exempt spectrum for offloading of traffic to increase network capacity, improve coverage in buildings and to save costs.

The RSPG recommends that:

1. On the basis of the analysis in Annex 1, the roadmap for future broadband spectrum in Annex 2 of this Opinion and the intermediate target set in the RSPP of identifying at least 1200 MHz of spectrum by 2015 a strategic plan should be developed by the Commission to make sufficient and appropriate spectrum available to meet the increasing demand for wireless broadband services in the time frame 2013-2020,
2. The strategic plan should include: -
   a detailed analysis of the usage of all bands identified in Annex 2, including the 700 MHz, 1.5 GHz[22], 2.3 GHz, 3.8-4.2 GHz and 5 GHz bands, in Member States and their potential for wireless broadband services on a harmonised basis, prioritising the bands in accordance with their potential and timeframe in which they are likely to be available;
   i) further exploration of the economic, cultural and social implications of the various options at macro level;
   ii) potential impact on other Union policies as referenced in the RSPP, such as GMES, PMSE, broadcasting, ITS, Galileo, etc

[21] CEPT Report 39: Report from CEPT to the European Commission in response to the Mandate to develop least restrictive technical conditions for 2 GHz bands

[22] 1452-1492 MHz and other frequency band in the 1.5GHz range such as 1375-1400 MHz and 1427-1452 MHz

iii) the spectrum needs for SAB/SAP (both audio and video applications);
iv) an analysis of the need for licence exempt spectrum for WBB.

3. In addition to the above, the RSPG recommends the development by the Commission, in cooperation with the Member States, of a long-term strategic policy on the future use of the UHF band (470-790 MHz), taking account of, in particular, the spectrum needs of the DTT platforms in the EU, the spectrum needs of PMSE, and the possible benefits arising from future convergent broadcasting-mobile platforms to deliver linear media/audiovisual services and high-audience video and data to mobile devices (smartphones, tablets, etc.).

4. In developing this strategic policy for the future use of the UHF Band the Commission, in cooperation with the Member States, should in the short-term, develop:
    a) a common European policy objective in time for WRC-15 on the refinement of the lower band edge and on possible channelling arrangements for mobile services in the 700 MHz band; and
    b) an EU-wide strategy to be discussed at political level on the future use of the 700 MHz band. This strategy should take account of the following elements: duration of broadcasting licenses, the impact on consumers, the necessity to transition to new technologies, the resulting costs for the different players, the variety of digital terrestrial platforms in Member States and cross-border frequency coordination issues. In particular, this strategy (including target date for availability of the band) should take into account that scenarios and timing for transitioning to new technologies (e.g. DVB-T2, HEVC) would be critical to making the 700 MHz band available for WBB and very much country-dependent; and
    c) a clear policy to facilitate any migration which may ease making available the 700 MHz band to wireless broadband while allowing Member States to take measures relating to TV receivers in order to mandate more efficient technologies (e.g., DVB-T2, HEVC) and to minimize hurdles for viewers; and
    d) a review of ETSI and CENELEC standards applicable to broadcast, cable, and terrestrial reception. This includes a need for a clear EU policy on improving spectrum efficiency, where it would be an essential requirement to construct TV receivers so as to avoid harmful interference;

5. For the band 1452-1492 MHz, noting that CEPT has established a project to develop harmonised implementation measures for SDL applications, the Commission should consider adopting complementary measures to further promote the use of this band for SDL, while preserving the possibility for Member States to use part of this band for other uses such as broadcasting.

6. In the case of the 2GHz bands identified for use by Mobile Satellite Services with Complementary Ground Component (1980-2010 MHz/2170-2200 MHz), if future actions taken by Member States in relation to Decision 2011/667/EU result in the withdrawal of licences, the Commission should consider re-allocation of the bands to terrestrial mobile services.

7. For the band 2300-2400 MHz, noting that CEPT has established a project to develop harmonised implementation measures for MFCN in the band, the Commission should consider adopting complementary measures to further promote shared and flexible use of the band between wireless broadband applications and other services, based on LSA regulatory provisions, facilitating the long-term incumbent use of the band in the territory of those Member States that wish to maintain such use.

8. The frequency range 3800-4200 MHz may play a role in the provision of ECS to enhance future capacity requirements especially in urban areas. The Commission should study the possible application of new sharing techniques in Europe between the FSS and terrestrial wireless broadband services in this frequency range[23], while recognizing that the situation within and outside Europe may differ, thus not enabling worldwide harmonisation for shared use of the band by wireless broadband services.

9. In considering the harmonisation of frequency bands for wireless broadband the Commission should take into account the fact that the actual use of bands for wireless broadband in Member States will vary, depending on the national requirements for broadband access and for other services.

[23] See ECC Report 100: Compatibility studies in the band 3400- 3800 MHz between Broadband Wireless Access (BWA) systems and other services; and ITU-R Report M.2109: Sharing studies between IMT Advanced systems and geostationary satellite networks in the fixed-satellite service in the 3 400-4 200 and 4 500-4 800 MHz frequency bands .

Preliminary Identification of Frequency Bands in Range
400 MHz to 6 GHz
for Wireless Broadband (WBB)

Key

In use/available for WBB

Potential for WBB (near term)

Medium term potential (>2015)

Possibly in very long timeframe

Spectrum Band	Amount of Spectrum	Common Allocation	Current Use	Constraints	Possible Candidate band for Wireless BB	Remarks
400 - 450 MHz	50	METEOROLOGICAL AIDS, METEOROLOGICAL-SATELLITE, SPACE SEARCH, SPACE OPERATION, EARTH EXPLORATION SATELLITE, MOBILE SATELLITE, LAND MOBILE, AMATEUR, RADIO ASTRONOMY,RADIOLOCATION	PPDR, Sondes, S-PCS, Active Medical Implants, Meteorology, Emergency beacons, PMR/PAMR, Amateur, ISM, On-site paging, SRDs, Radio Astronomy, Wind profilers		No	
450 - 470 MHz	20	MOBILE	PPDR,PMR/PAMr, On-site paging, On-board communications, space research, meteorology, land mobile	band used extensively for PMR, PAMR type applications. Very limited potential for WBB, I,e., few CDMA450 licences	limited	
470 - 694 MHz	224,00	BROADCASTING, Mobile, Radio astronomy	Broadcasting(terrestrial), PMSE, wind profilers, radio astronomy	Key band for DTT	Possibly in very long time frame	Potential in long term on basis of convergence between mobile and broadcasting. Situation will vary from country to country
694 - 790 MHz	96,00	BROADCASTING, Mobile	Broadcasting(terrestrial), PMSE, wind profilers, radio astronomy	part of key band for DTT	Yes	Identified by WRC-12 for co-primary allocation to Mobile post WRC-15. Lower band edge to be determined by WRC-15
791 - 821/832-862 MHz	60,00	BROADCASTING, MOBILE except Aeronautical Mobile	Broadcasting(terrestrial), PMSE, Defence systems, TRA-ECS	PMSE audio in 790 - 797 MHz or 821-832 MHz (depends on frequency arrangement for 800 MHz band). Implementation of PMSE would need revision of EC Decision	Yes	60 MHz available assumes FDD approach is adopted; Whole band available across EU for ECS i.a.w. Decision 2010/267/EU
862 - 870 MHz	8	MOBILE	Aids for hearing impaired, Alarms, Defence systems, SRDs, PMSE, RFID	Already in use for range of SRDs, defence systems, PMSE	No	
870 - 876 MHz	6	MOBILE	Defence systems, PMR/PAMR, Digital Landmobile		No	
876 - 880/921 - 925 MHz	8	MOBILE, Radiolocation	Defence systems, GSM-R	Use for railway mobile communications	No	
880 - 915/925 - 960 MHz	70,00	MOBILE, Radiolocation	Defence systems, GSM-900, IMT, MCV		Yes	Available across EU for ECS i.a.w. EC Decision 2011/829/EU amending Decision 2006/771/EC
915 - 921 MHz	6,00	MOBILE, Radiolocation	Defence systems, Digital PMR/PAMR		No	
960 - 1350 MHz	390,00	AERONAUTICAL RADIONAVIGATION, AERONAUTICAL MOBILE, RADIONAVIGATION-SATELLITE, EARTH EXPLORATION-SATELLITE, RADIOLOCATION, SPACE RESEARCH, Amateur, Amateur-satellite	Navigation systems, Galileo, GLONASS, GNSS repeater, GPS, Defence systems, Active sensors, Radar, Amateur, Wind profiler radars		No	Sharing not feasible due to critical nature of aeronautical comms
1350-1375	25,00	FIXED, MOBILE, RADIOLOCATION	Defence systems, low capacity fixed links -FS with 1492-1518 MHz, Radio astronomy		No	further consideration dependant on outcome of WRC-15
1375-1400	25,00	FIXED, MOBILE, RADIOLOCATION	Defence systems, low capacity fixed links -FS with 1427-1452 MHz, Radio astronomy		Yes	Refarming of FS/Radar use to other bands required. Wireless cameras in some countries
1400-1427	27,00	EARTH EXPLORATION SATELLITE (passive), RADIO ASTRONOMY, SPACE RESEARCH (passive)	Passive sensors (satellite), radio astronomy		No	

Preliminary Identification of Frequency Bands in Range
400 MHz to 6 GHz
for Wireless Broadband (WBB)

Spectrum Band	Amount of Spectrum	Common Allocation	Current Use	Constraints	Possible Candidate band for Wireless BB	Remarks
1427 - 1452 MHz	25,00	FIXED,MOBILE except aeronautical mobile, SPACE OPERATION (E/S)	Defence systems, low capacity fixed links - FS with 1375 - 1400 MHz	Need to refarm military use to other bands, e.g. in region of 2 GHz. Existing fixed links and ENG/OB would mitigate against use for WBB	Yes	Refarming of FS use to other bands required. Wireless cameras in some countries
1452 - 1492 MHz	40,00	BROADCASTING, BROADCASTING-SATELLITE, Fixed, MOBILE except aeronautical mobile	S-DAB, T-DAB		Yes	Identified by CEPT for MFCN supplemental downlink
1492-1518 MHz	26,00	FIXED, MOBILE except aeronautical mobile,	Defence systems, low capacity fixed links - FS with 1350 - 1375 MHz	CEPT investigating as possible PMSE band	No	further consideration dependant on outcome of WRC-15
1518-1525 MHz	7,00	FIXED, MOBILE except aeronautical mobile, MOBILE-SATELLITE(S/E)	Defence systems, IMT Satellite component, Mobile satellite applications, Unidirectional fixed links		Yes (satellite)	Paired with 1670-1675 MHz
1525-1530 MHz	5,00	SPACE OPERATION (S/E), FIXED, MOBILE-SATELLITE (S/E)	IMT Satellite component, Mobile satellite applications, Unidirectional fixed links		Yes (satellite)	
1530-1535 MHz	5,00	MOBILE-SATELLITE (S/E), SPACE OPERATION (S/E), Earth exploration-satellite, Fixed, Mobile except aeronautical mobile	IMT Satellite component, Mobile satellite applications		Yes (satellite)	
1535-1559 MHz	24,00	MOBILE-SATELLITE(S/E)	IMT Satellite component, Mobile satellite applications, Distress and safety communications (incl GMDSS)		Yes (satellite)	
1559-1610 MHz	51,00	AERONAUTICAL RADIONAVIGATION, RADIONAVIGATION-SATELLITE	GPS, Galileo, GLONASS, GNSS Pseudolites, GNSS Repeater		No	
1610-1626.5 MHz	16,50	AERONAUTICAL RADIONAVIGATION, MOBILE-SATELLITE (E/S), Mobile- Satellite (S/E), RADIO ASTRONOMY	GPS/Galileo (RADIOASTRONOMY 1610.6-1613.8 MHz)		Yes (satellite)	IMT Satellite component: paired with 2483.5-2500 MHz
1626.5-1660 MHz	33,50	MOBILE-SATELLITE (E/S)	IMT Satellite component, Mobile satellite applications		Yes (satellite)	IMT Satellite component
1660-1660.5 MHz	0,50	MOBILE-SATELLITE (E/S) RADIOASTRONOMY	IMT Satellite component, Mobile satellite applications, Radio astronomy		Yes (satellite)	IMT Satellite component
1660.5-1668 MHz	7,50	RADIOASTRONOMY , SPACE RESEARCH (passive), Fixed, Mobile except aeronautical mobile	Defence systems, Radioastronomy		No	
1668-1668.4 MHz	0,40	MOBILE-SATELLITE (E/S), RADIOASTRONOMY , SPACE RESEARCH (passive), Fixed, Mobile except aeronautical mobile	Radioastronomy, IMT -2000 satellite component		No	
1668.4-1670 MHz	1,60	METEOROLOGICAL AIDS, MOBILE-SATELLITE, FIXED. MOBILE except aeronautical mobile, RADIOASTRONOMY	Defence systems, IMT Satellite component, Meteorology, Radio astronomy		No	
1670-1675 MHz	5,00	METEOROLOGICAL AIDS, METEOROLOGICAL-SATELLITE (S/E), MOBILE-SATELLITE (S/E), MOBILE, FIXED	IMT Satellite component, Meterological Satellites, Mobile satellite applications (E/S)		Yes (satellite)	Paired with 1518-1525 MHz
1675-1690 MHz	15,00	METEOROLOGICAL AIDS, FIXED, METEOROLOGICAL-SATELLITE, MOBILE except aeronautical mobile	Defence systems, Meteorological Satellites, Mobile satellite applications (E/S)		No	
1690-1700 MHz	10,00	METEOROLOGICAL AIDS, METEOROLOGICAL-SATELLITE, Fixed, Mobile except aeronautical mobile	Defence systems, Meteorological Satellites		No	
1700-1710 MHz	10,00	FIXED, METEOROLOGICAL-SATELLITE, MOBILE except aeronautical mobile	Defence systems, Meteorological Satellites	Possible use for PMSE	No	CEPT studies for PMSE audio
1710 - 1785 MHz	75,00	FIXED, MOBILE	GSM-1800, IMT, MCA, MCV		Yes	Available across EU for ECS i.a.w. EC Decision 2011/829/EU amending Decision 2006/771/EC
1785 - 1805 MHz	20,00	FIXED, MOBILE, Fixed	Mobile applications, PMSE		No	CEPT Report 50 identifies band for PMSE
1805 - 1880 MHz	75,00	FIXED, MOBILE	GSM-1800, IMT, MCA, MCV		Yes	Available across EU for ECS i.a.w. EC Decision 2011/829/EU amending Decision 2006/771/EC

Preliminary Identification of Frequency Bands in Range
400 MHz to 6 GHz
for Wireless Broadband (WBB)

Spectrum Band	Amount of Spectrum	Common Allocation	Current Use	Constraints	Possible Candidate band for Wireless BB	Remarks
1880 - 1900 MHz	20,00	MOBILE, Fixed	DECT	DECT Directive	Yes	assuming replacement of DECT Directive
1900 -1920 MHz	20,00	MOBILE, Fixed	IMT	Identified for IMT but no use of band	No	CEPT studies on use of band: BDA2GC and PMSE under consideration.
1920 - 1980 MHz	60,00	MOBILE, Fixed	IMT paired with 2110-2170 MHz		Yes	EC Decision 2012/688/EU
1980 - 2010 MHz	30,00	MOBILE, MOBILE-SATELLITE,Fixed	IMT Satellite component, Mobile satellite applications. Designated for MSS with CGC	lack of implementation of MSS	Yes (satellite)	MSS 2 GHz band paired with 2170-2200 MHz. EC Decision 2007/98/EC applies. See ECC Report 197.
2010 - 2025 MHz	15,00	MOBILE, Fixed	IMT	Identified for IMT but no use of band	No	CEPT studies on use of band: BDA2GC and PMSE under consideration.
2025 - 2110 MHz	85,00	EARTH EXPLORATION-SATELLITE, FIXED, MOBILE, SPACE RESEARCH, SPACE OPERATION	Defence systems, Fixed links, SAP/SAB, Space research/EESS	High density mobile systems not allowed (F/N S5.591)	No	
2110 - 2170 MHz	60,00	MOBILE, Fixed, SPACE RESEARCH (2110-2120 MHz)	IMT paired with 1920-1980 MHz		Yes	EC Decision 2012/688/EU
2170 - 2200 MHz	30,00	MOBILE, MOBILE-SATELLITE, Fixed	IMT Satellite component, Mobile satellite applications. Designated for MSS with CGC	lack of implementation of MSS	Yes (Satellite)	MSS 2 GHz band paired with 1980-2010 MHz. EC Decision 2007/98/EC applies
2200 - 2300 MHz	100,00	EARTH EXPLORATION SATELLITE, FIXED,MOBILE,SPACE RESEARCH, SPACE OPERATION	Fixed links, Radio astronomy, SAP/SAB, space research, Mobile applications, Defence systems	High density mobile systems not allowed (F/N S5.591)	No	
2300 - 2400 MHz	100,00	FIXED, MOBILE, Amateur, Radiolocation	Aeronautical telemetry, Amateur, Mobile applications, SAP/SAB	Parts of the band are used for aeronautical telemetry on a national basis. Wireless cameras	Yes. Depends on the outcome of sharing studies and on the availability of the band in individual Member States	CEPT studies underway. Some countries already assigned to wireless broadband (including outside Europe)
2400 - 2483.5 MHz	83,50	FIXED, MOBILE, Amateur-satellite, Radiolocation	Amateur Satellite, ISM, SRDs, Railway applications, RFID, Wideband Data transmission systems, Radiodetermination applications		Yes	Key band for WiFi, etc
2483.5 - 2500 MHz	16,50	FIXED, MOBILE, MOBILE-SATELLITE	Active medical implants, ISM, mobile satellite applications, SAP/SAB		Yes (satellite)	IMT satellite component: paired with 1610-1626.5 MHz
2500 - 2570//2620 - 2690 MHz	140,00	FIXED, MOBILE, Earth Exploration-Satellite, Radio astronomy, Space Research	IMT, MFCN, Defence systems, SAP/SAB, Radio astronomy		Yes	Available across EU for ECS i.a.w. EC Decision 2008/477/EC
2570 - 2620 MHz	50,00	FIXED, MOBILE except aeronautical mobile	Defence systems, IMT, SAP/SAB		Yes	
2690 - 2700 MHz	10,00	EARTH EXPLORATION SATELLITE (passive), RADIO ASTRONOMY, SPACE RESEARCH (passive)	Passive sensors (satellite)		No	
2700 - 2900 MHz	200,00	AERONAUTICAL RADIONAVIGATION, Radiolocation	Meteorological radars, Radar navigation systems		No	
2900 - 3100 MHz	200,00	RADIOLOCATION, RADIONAVIGATION	Defence systems, Radar and navigation systems		No	
3100 - 3300 MHz	200,00	RADIOLOCATION, Earth Exploration-Satellite (active), Space Research (active)	Active Sensors, Defence systems, Radars, UWB		No	
3300 - 3400 MHz	100,00	RADIOLOCATION	Defence systems, Radars, UWB		No	
3400 - 3600 MHz	200,00	FIXED, FIXED-SATELLITE, MOBILE, Radiolocation,Amateur	Amateur, BWA, FSS, IMT, Mobile applications, Radars, UWB		Yes	Available across EU for ECS i.a.w. EC Decision 2008/411/EC
3600 - 3800 MHz	200,00	FIXED, FIXED-SATELLITE, MOBILE	BWA, FSS, Medium/high capacity fixed links, UWB		Yes	
3800 - 4200 MHz	400,00	FIXED, FIXED-SATELLITE	FSS, Medium/high capacity fixed links, UWB	Difficulty of sharing between FSS and terrestrial mobile	Yes	potential hot-spot/ capacity coverage (limited geographical areas)
4200 - 5000 MHz	800	AERONAUTICAL RADIONAVIGATION,FIXED, MOBILE, FIXED-SATELLITE, Radio astronomy	Altimeters, Passive sensors(satellite), UWB, Defence systems, Mobile applications, FSS, Radiodetermination applications, BBDR		No	

Preliminary Identification of Frequency Bands in Range
400 MHz to 6 GHz
for Wireless Broadband (WBB)

Spectrum Band	Amount of Spectrum	Common Allocation	Current Use	Constraints	Possible Candidate band for Wireless BB	Remarks
5000 - 5150 MHz	150	AERONAUTICAL RADIONAVIGATION, RADIONAVIGATION-SATELLITE, Radio astronomy, Space research(passive)	Galileo C1, Radio astronomy, Radio determination applications, Satellite navigation systems, MLS		No	
5150 - 5350 MHz	200,00	FIXED-SATELLITE, MOBILE except aeronautical mobile, EARTH EXPLORATION-SATELLITE(active), RADIOLOCATION, SPACE RESEARCH	Aeronautical telemetry transmission, BBDR, Feeder links for MSS, Radiodetermination applications, WAS/RLANs, Active Sensors, Position fixing, shipborne & VTS radar, Weather radar, Defence systems	RLANs indoor use only	Yes	Already in use for RLANs. EC Decision 2005/513/EC as amended by 2007/90/EC
5350 - 5470 MHz	120,00	AERONAUTICAL RADIONAVIGATION, EARTH EXPLORATION-SATELLITE(active), RADIOLOCATION, SPACE RESEARCH	Active Sensors, Defence Systems, Position fixing, Radiodetermination applications, Shipborne &VTS radar, Weather radar		Yes	sharing studies underway in JTG 4-5-6-7 WRC-15 (potential for WiFi)
5470 - 5725 MHz	255,00	EARTH EXPLORATION SATELLITE (active), MARITIME RADIONAVIGATION, MOBILE except aeronautical mobile, RADIOLOCATION. SPACE RESEARCH, Amateur, Amateur-satellite	Active Sensors, Defence systems, Amateur, amateur-satellite, Position fixing, Shipborne&VTS radar,Weather radars, Radiodetermination applications, WAS/RLANs		Yes	Already in use for RLANs. EC Decision 2005/513/EC as amended by 2007/90/EC
5725-5875 MHz	150,00	FIXED, FIXED-SATELLITE, RADIOLOCATION, MOBILE, Amateur, Amateur-satellite	Amateur, BFWA, Defence systems, ISM, SRDs, Radio determination applications, RTTT, Weather radars, Fixed links, FSS, UWB		Yes	Band identified for BFWA: ECC/REC(06)04: (150 MHz)
5875-5925 MHz	50,00	FIXED, FIXED-SATELLITE, RADIOLOCATION, MOBILE, Amateur, Amateur-satellite	Amateur, SRDs, Radio determination applications, RTTT, Fixed links, FSS, UWB	RTTT (Intelligent Transport Systems),FSS Earth stations	Yes	Sharing studies underway in JTG 4-5-6-7(potential for Wi-Fi); 2008/671/EC on the harmonised use of radio spectrum in the 5875 - 5905 MHz frequency band for safety related applications of Intelligent Transport Systems
5925-6000 MHz	75	FIXED, FIXED-SATELLITE, RADIOLOCATION, MOBILE, Amateur, Amateur-satellite	Amateur, BFWA, Defence systems, ISM, SRDs, Radio determination applications, RTTT, Weather radars, Fixed links, FSS, UWB		No	

Total Spectrum from 400 MHz - 6 GHz	**5600 MHz**
No Potential for WBB	**2648,50 MHz**
Already in use or Future Potential for WBB	**2951,50 MHz**

Broadband access	In use/available for WBB (MHz)	Potential for WBB (near term) (MHz)	Medium term potential (>2015) (MHz)	Possibly in very long timeframe	Totals (MHz)
Terrestrial	990,00	140,00	566,00	224,00	**1920,00**
Satellite	173,00	0	0,00	0	**173,00**
WIFI	538,50	0	320,00	0	**858,50**
Total	**1701,50 MHz**	**140,00 MHz**	**886,00 MHz**	**224,00 MHz**	**2951,50**

Preliminary Identification of Candidate bands to meet future spectrum demands for wireless broadband

Frequency band (MHz)	Size of Band (MHz)	Current Use	Pros of WBB in band	Cons of WBB in band	Remarks	Action to make band available for WBB
470 – 694	224	Broadcasting(terrestrial), PMSE, radio astronomy	Ideal band for wireless broadband due to its physical attributes, it provides good coverage both indoors and outdoors. Benefits to consumers of WBB services	• Significant impact on terrestrial broadcasting, and further development of broadcasting services (HD, UHD, 3D, etc) Impact on equitable access to broadcast spectrum (GE06} Potential need to transition to new technologies (e.g., DVB-T2/HEVC) in short/medium term. Financial impact on viewers, who have to again buy new equipment. • PMSE services are likely to lose significant spectrum capacity and to have to migrate to other technologies and/or bands in the long-term.	Potential in long term on basis of convergence between mobile and broadcasting. Situation will vary from country to country	Balance between mobile and broadcast spectrum requirements uncertain in the long term. Need to develop a long term strategy for TV distribution. Need to take account of spectrum needs for PMSE services.

Frequency band (MHz)	Size of Band (MHz)	Current Use	Pros of WBB in band	Cons of WBB in band	Remarks	Action to make band available for WBB
[694]-790	96	Terrestrial television broadcasting and PMSE (currently making use of the white spaces between the TV broadcasts).	Ideal band for wireless broadband due to its physical attributes, it provides good coverage both indoors and outdoors. Prospects for global harmonization may provide economy of scale for manufacturers	• Significant impact on terrestrial broadcasting, and further development of broadcasting services (HD, UHD, 3D, etc) Impact on equitable access to broadcast spectrum (GE06} Potential need to transition to new technologies (e.g., DVB-T2/HEVC) in short/medium term. Financial impact on viewers, who have to again buy new equipment. • PMSE services are likely to lose significant spectrum capacity and to have to migrate to other technologies and/or bands in the long-term	Depending on situation in individual countries could take significant time post-2015 Cross-border coordination between broadcasting and mobile services during transition period.	Balance between mobile and broadcast spectrum requirements uncertain in the long term. Need to develop a long term strategy for TV distribution. Need to take account of spectrum needs for PMSE services.

Frequency band (MHz)	Size of Band (MHz)	Current Use	Pros of WBB in band	Cons of WBB in band	Remarks	Action to make band available for WBB
1375 – 1400	25	• Military services, primarily radiolocation and tactical radio. wireless cameras (ENG/OB) in some countries (e.g. NL) • In bands 1375 – 1400 MHz / 1427 – 1452 MHz (CEPT harmonisation for Fixed Service), low numbers of P-MP applications and some new development for low capacity, long range private links, in particular for public utilities.	• Already allocated on a co-primary basis to the fixed and mobile services. • The bands around 1500 MHz are covered by the 3GPP standards, which provide an opportunity for LTE and LTE-A equipment to become available in the bands. • in some countries very limited actual use of the band.	Need to refarm civil and military use to other bands. Existing fixed links and ENG/OB would mitigate against use for WBB in some countries. Sharing with existing services, such as radars and adjacent passive services can be challenging. Would need to be studied further.		Re-allocation of bands 1375 – 1400 MHz / 1427 – 1452 MHz to WBB may be best option for sharing with other services. Designation of bands 1375 – 1400 MHz paired with 1427 – 1452 MHz for WBB would require: • allocation of alternative frequencies for tactical radio applications, e.g. in the frequency bands 2025-2070 MHz and 2200-2245 MHz (in line with NATO Joint Civil / Military Frequency Agreement). • identification of higher frequency bands adapted for fixed links. • Protection of adjacent band services, in particular of the passive band (1400-1427 MHz) for both radioastronomy and Earth Exploration Satellite Service.
1427 – 1452	25					

Frequency band (MHz)	Size of Band (MHz)	Current Use	Pros of WBB in band	Cons of WBB in band	Remarks	Action to make band available for WBB
1452 - 1492	40	Band designated for DAB (terrestrial and satellite sound broadcasting). Covered by Maastricht 2002 Special Arrangement (Revised Constanța 2007)	Little development until now of currently allocated services. CEPT decided in September 2012 to develop an ECC Decision designating the band for mobile/fixed communication networks (MFCN) supplemental downlink (SDL). Individual countries are allowed to adapt to national circumstances in part of the band for terrestrial broadcasting and other terrestrial applications.	Other terrestrial applications interested in the band (see ECC Report 188[1])	.	Complementary measures to further promote the harmonized implementation measures defined by CEPT
1880 – 1900	20	DECT	Band already harmonised	DECT eco-system already exists – focused on voice applications		Would require replacement of DECT Directive

[1] Future Harmonised Use of 1452-1492 MHz in CEPT

Frequency band (MHz)	Size of Band (MHz)	Current Use	Pros of WBB in band	Cons of WBB in band	Remarks	Action to make band available for WBB
1980 - 2010/ 2170 - 2200	2 x30	• Mobile Satellite Services with CGC: pan-European licences assigned on 13 May 2009 to Inmarsat Ventures Limited and Solaris Mobile Limited.	The obligations under the European Decisions have yet to be fulfilled. The allocation represents 2 x 30 MHz of particularly attractive harmonised spectrum and there have been calls for it to be re-allocated to terrestrial mobile broadband services.	MSS with CGC could yet be delivered in the band. See ECC Report 197[2]	Potential for satellite WBB	In the case of the 2GHz bands identified for use by MSS with CGC, if the future actions related to Decision 2011/667/EU taken by the Member States result in the withdrawal of licences, the Commission should consider re-allocation of the bands to terrestrial mobile services
2300-2400	100	Aeronautical telemetry and SAB/SAP.	After identification for IMT at WRC-07, this band has started to be used in other parts of the world for broadband mobile applications. Equipment is available.	Strategic governmental usages in this band such as aeronautical telemetry or CCTV for security purposes need to be considered. Use of band by ENG/OB needs to be considered. Band may not be available in all Member States for WBB	.	For the band 2300-2400 MHz, noting that CEPT has established a project to develop harmonised implementation measures for MFCN in the band, the EC should consider adopting complementary measures to further promote shared and flexible use of the band between wireless broadband applications and other services, based on LSA regulatory provisions facilitating the long term incumbent use of the band in the territory of those Member States that wish to maintain such use

[2] MSS terminals transmitting to a satellite in the band 1980-2010 MHz and adjacent channel UMTS services

Frequency band (MHz)	Size of Band (MHz)	Current Use	Pros of WBB in band	Cons of WBB in band	Remarks	Action to make band available for WBB
3800-4200	400	• Satellite earth stations and terrestrial fixed links, UWB applications • Galileo (GDDN), public policy emergency applications and applications for embassies and diplomatic missions. Approx 160 GEO satellites, providing essential services to consumers (NGO and non-NGO and IGO), some 60 of which provide coverage of all or part of Europe and interconnecting Europe with other regions of the world. Additional satellites and new earth stations using C-band under construction.	Potential to play a role in the provision of ECS to ensure the future capacity needs especially in urban areas. These frequencies have propagation characteristics that are suitable for use in dense urban areas where the deployment of mobile networks is typically capacity limited since it provides an opportunity for increased frequency reuse. These frequencies also have potential to provide large contiguous bandwidths that can be used for microcell and picocell networks to provide increased capacity and performance.	Sharing conditions between satellite and terrestrial services are complex, and it has been demonstrated that coexistence between ubiquitous FSS Earth stations and the Mobile service in the same geographical area is not workable (See ECC Report 100[3] and ITU-R Report M.2109[4]). The number of European FSS earth stations using this band is more than eight times the number of those using the band 3400 – 3800 MHz, which is likely to limit the opportunities for terrestrial mobile applications in the band Only limited possibilities for global harmonisation of this band for wireless broadband due to diverse	.	Studies should be carried out into the possibility of sharing in Europe between the FSS and terrestrial wireless broadband services including LSA. Potential for access to band by wireless broadband under a LSA regime.

[3] Compatibility studies in the band 3400- 3800 MHz between Broadband Wireless Access (BWA) systems and other services

[4] Sharing studies between IMT Advanced systems and geostationary satellite networks in the fixed-satellite service in the 3 400-4 200 and 4 500-4 800 MHz frequency bands

Frequency band (MHz)	Size of Band (MHz)	Current Use	Pros of WBB in band	Cons of WBB in band	Remarks	Action to make band available for WBB
3800-4200 (cont)				national situations. ITU-R Resolution 154 (WRC-12) addresses use of the band for aviation security and reliable distribution of meteorological information Band also used in Europe for critical services such as Galileo and GMES		
5350 - 5470	120	Active Sensors, Defence Systems, Position fixing, Radiodetermination applications, Shipborne &VTS radar, Weather radar	Potential band for Wi-Fi applications Allocating the band for Wi-Fi could be useful to mobile networks in providing data offload and indoor wireless connectivity	New routers would be required to utilise this additional spectrum for Wi-Fi Existing harmonised Wi-Fi standards needs to be developed further	.	Sharing studies underway in JTG 4-5-6-7. Studies should be undertaken to see if band could be utilised for WiFi
5725-5875	150	Amateur, BFWA, Defence systems, ISM, SRDs, Radio determination applications, RTTT, Weather radars, Fixed links, FSS, UWB	Band identified by CEPT for Broadband Fixed Wireless Access (ECC/REC/(06)04) See also ECC Report 68	May not be available in all Member States due to e.g defence systems or RTTT.		Studies should be undertaken to see if this band could be more widely available for wireless broadband including WiFi, taking into account the to the need to protect services in the upper adjacent band

Frequency band (MHz)	Size of Band (MHz)	Current Use	Pros of WBB in band	Cons of WBB in band	Remarks	Action to make band available for WBB
5875-5925	50	RTTT (ITS), Fixed links, FSS, UWB	Potential for WiFi	Sharing with FSS Earth stations may impose geographical constraints on usage 2008/671/EC on the harmonised use of radio spectrum in the 5875 - 5905 MHz frequency band for safety related applications of Intelligent Transport Systems		Sharing studies underway in JTG 4-5-6-7. Studies should be undertaken to see if band could be utilised for WiFi

Summary of responses to the Public Consultation on the draft RSPG Opinion on Wireless Broadband

The Radio Spectrum Policy Group (RSPG) published its draft "Opinion on Strategic Challenges Facing Europe in Addressing the Growing Spectrum Demand for Wireless Broadband" in February 2013. In all, 51 responses were received to the draft Opinion. A list of respondents is in the Appendix to this summary.

Respondents' views remain divided on releasing more spectrum for WBB applications. Some respondents favoured releasing additional spectrum while others did not. The reasons provided by those who opposed releasing additional spectrum (at least in the short to medium term) included:

- that those operators who already acquired a good amount of spectrum in the recent auctions are well positioned to meet future customers' demand through investments in network rollout; and
- that the disparity in spectrum bands allocated for wireless backhaul across member states makes it difficult to achieve economies of scale while meeting capacity requirements. Highlighting this fact, one respondent suggested that instead of allocating more spectrum to Wireless Broadband, the EC should look at harmonising spectrum bands for wireless backhaul links across Europe.

The following sections summarise the responses received by the RSPG with regard to each of the potential bands identified in the draft Opinion.

700 MHz Band

Some respondents strongly opposed releasing this band for future WBB applications and recommended that the band should remain available to broadcasting services. These respondents claimed that releasing these bands for WBB applications would de-stabilise DTT as a platform, jeopardising future investments and having an adverse impact on the whole broadcasting industry.

These respondents demanded that, before the 700MHz band is evaluated for WBB applications, the following arguments be taken into consideration:

- that the forecasts for data traffic growth on mobile networks are overly ambitious and that new studies should be carried out to assess real demand;
- an assessment of mobile broadband spectrum efficiency should be carried out to determine the most spectrum-efficient technologies in all relevant bands. For example, one respondent stated that out-dated GSM networks should be replaced with more spectrum-efficient networks such as LTE;
- an assessment should be made of the impact on EU Member States of future spectrum liberalisation, considering recent auctions in the 800 MHz band and the investments planned and made by operators on LTE technology;

- an assessment of the incremental benefits of the 700 MHz band for the mobile industry should be weighed against the costs of removing the incumbent broadcast users of the band;
- an assessment should be carried out of the potential for interference from wireless broadband in the 700 MHz band with existing customer equipment (including cable equipment);and
- an assessment should be made of the relative demand for linear versus non-linear services;

Should these assessments show that sufficient justification does exist to release spectrum in the 700 MHz band for WBB applications, these respondents requested:

- that individual Member States should develop conditions to foresee co-operation between broadcast and broadband networks and to enable implementation of broadcast receivers in mobile devices (smartphones, tablets etc);
- that a public consultation be carried out in advance of WRC-15 on a common EU-level approach to the 700 MHz band, taking into account national situations;
- that all Member States should have the flexibility to use the 700 MHz band for terrestrial digital TV applications under RRC-06 arrangements and retain the right of derogation if necessary;
- that a compensation scheme should be put in place for PMSE users if these users are required to relocate again. Furthermore, this respondent suggested that PMSE users should be awarded at least three 8 MHz channels of contiguous spectrum in the 600 MHz band as a smaller, single lot, and
- that Licensed Shared Access (LSA) or Dynamic Spectrum Access could be considered as a solution to provide additional capacity to wireless broadband while at the same time ensuring capacity for digital TV and that this approach be studied further.

Those respondents who were in favour of releasing the 700 MHz band for wireless broadband made the following remarks:

- that the band should be harmonised across Europe in order to achieve economies of scale, even if this takes longer to implement. In particular, these respondents favoured a frequency arrangement in ITU region 1 that could provide a global solution, leveraging already-existing specifications for Band 28 (B28) from 3GPP. This arrangement is based on the lower sub-band of 2x30MHz of the Asia-Pacific Telecommunity (APT) bandplan. The resulting harmonisation would facilitate easier global roaming and more cost-effective equipment;
- that WRC-15 should allocate the entire UHF band to mobile services on a co-primary basis;
- that the broadband requirements for PPDR applications are taken into consideration;
- that transitions should be well managed by governments and regulators and should be developed in co-operation with the industry;

- that a transition to DVB-T2 should be considered as an adequate measure to release the 700MHz band, and
- that there should be no disruption of the existing DTT services to consumers.

1350 – 1375, 1375 – 1400, 1427 – 1452 and 1492 – 1518 MHz:
There was considerable support for releasing these bands for WBB applications while protecting any passive services in the 1400 – 1427 MHz band. In particular, support was expressed for the approach of combining 1452 – 1492 MHz with adjacent bands for wider mobile allocation, when the band is used for SDL only. Furthermore, respondents urged that such an initiative be brought to the attention of ITU WRC-15.

However, one respondent (Cyprus) did not agree that the band should be made available for WBB given that this would cause serious problems to existing P-P links users and that migration to a different band would not be feasible. One other respondent (Thales Nederland B.V.) highlighted that NATO intends to use the band 1375 – 1400 MHz to set up a missile defence system which will be comprised largely of land- and sea-based primary radiolocation systems in the L-band. Should this band be allocated to WBB, it could cause an unacceptable limitation in performance for such radiolocation systems.

2 GHz MSS bands
Views of respondents were divided on this band. Some expressed full support for all points relating to this band in the draft RSPG opinion, while other respondents did not. Those respondents who disagreed with the opinion stated that the view of RSPG is poorly timed and potentially damaging to the commercial success of the MSS 2 GHz project. These respondents also asserted that COCOM is the right group for any discussions on this issue.

2.3 GHz band
Almost all respondents who commented on this band expressed support for releasing the band for WBB applications. Some suggested that an LSA approach could be considered where incumbent users cannot vacate within an acceptable timeframe. One other respondent added that this band could also be considered for light-licensing or a licence-exempt approach, suggesting that this would enable a greater variety of applications than current proposals allow.

3.8 – 4.2 GHz band
The views of respondents were divided in relation to this band. Those in favour of considering the band for WBB stated that it would play an important role as part of future LTE-Advanced systems. In addition, one respondent requested that sharing studies be carried out in the 3.8 – 4.2 GHz band for both WBB and RLAN applications. Respondents who did not favour releasing the 3.8 – 4.2 GHz band for WBB applications pointed out that some international broadcasting operators currently rely on satellite downlink frequencies in this band for programme distribution (including BBC International). Other respondents objected to the proposal on the basis of the impact it would have on their existing business and claimed that sharing would not be possible between FSS and MBB.

5 GHz band
Those respondents who commented on this band were in favour of extending the band as licence exempt for WBB applications. Some respondents suggested that contiguous blocks of spectrum from 5150 – 5925 MHz would help address the demand for higher bandwidths and support Europe's digital agenda with respect to the co-existence of multiple licence-exempt RLANs. Highlighting the fact that both LTE and RLAN technologies are currently being

integrated into converged networks, one respondent (Ericsson) advised that the EC consider very carefully any future action in the bands 5350 – 5470 MHz and 5725 – 5925 MHz.

Other respondents did not favour releasing band for WBB as it would have an impact on their business. One respondent did not see any justification for additional licence-exempt spectrum in the 5 GHz band for WBB as there are two interference issues to be taken into account: i) interference from a transmitting FSS earth station to terrestrial IMT receivers; and ii) interference from terrestrial IMT stations using these bands into FSS satellite receivers.

Additional recommendations made by respondents

Additional recommendations made by respondents included:

- ***2700 – 2930 MHz band*:** Some respondents recommended RSPG to consider the 2.7 – 2.93 GHz band for mobile broadband services to enhance future capacity requirements, given that the band is adjacent to 2500 – 2690 MHz and is globally harmonised. One respondent (Ericsson) stated that they are currently running trials in this range using LTE-Advanced to deliver capacity of the order of 1Gbps. Furthermore, this respondent suggested that the 2700 – 2900 MHz was underused by aeronautical radionavigation and weather radar services and that these services could be moved to the 2590 -3000 MHz band. The reason put forward for this move was that previous studies have shown that co-existence between IMT, Radars, aeronautical radionavigation and weather radar systems is not feasible.
- ***2090 – 2110 & 2200 – 2215 MHz and 4400 – 4900 MHz:*** One respondent (Vodafone) recommended including the 2090-2110 MHz and 2200-2215 MHz bands for WBB in the draft opinion as it would considerably increase available WBB bandwidth if they were to be paired with 1900 – 1920 MHz and 2010 – 2025 MHz. The same respondent also recommended including the 4400 – 4900 MHz bands together with 3800 – 4200 MHz for future support of IMT channel bandwidths of up to 100 MHz.
- (Wi-Fi Alliance and IEEE 802) To consider exempting SRDs and RLANs in the 921-925 MHz band from licensing. This band is currently reserved for defence systems and GSM-R applications.
- ***Higher frequency bands beyond 6 GHz:*** Some respondents requested RSPG to recommend a work programme for future consideration of higher-frequency bands, as these bands have the ability to accommodate greater system bandwidths.
- One respondent (EUTC) requested the EC to consider 450 – 470 MHz and the L-band for potential smart metering and P-MP applications, respectively.
- Electromagnetic Limits (ELM): One respondent (Wind) stated that ELM varies considerably among member states requiring some countries to deploy more BTS sites for the same coverage level than others. The increased site count could drive up energy consumption, resulting in higher costs and greater environmental impact. This respondent therefore recommended the EC consider harmonising EU rules on ELM limits, undertaking a specific review on these limits in order to efficiently design a roadmap for future broadband spectrum availability.

Appendix

List of respondents

Organisation	Type	Country	Date received
Alcatel Lucent	Manufacturer	France	30/04/2013
Allianz für Rundfunkqualität und Kulturvielfalt	PMSE	Austria	04/05/2013
ANFR (France)	Regulator	France	30/04/2013
Association of European Radios (AER)	Broadcasting Industry Group	Belgium	17/05/2013
Association of Professional Wireless Production Technologies	PMSE	Germany	02/05/2013
Babcock International Group	Network operator	UK	25/04/2013
BBC	Broadcaster	UK	02/05/2013
BNetzA - Federal Network Agency (Germany)	Member State	Germany	30/04/2013
British Entertainment Industry Radio Group (BEIRG)	PMSE	UK	30/04/2013
Broadcast Networks Europe (BNE)	Broadcasting Industry Group	Belgium	03/05/2013
BSkyB	Broadcaster	UK	04/05/2013
Cable Europe	Industry Group	Europe	04/05/2013
Cisco	Manufacturer	Belgium	04/05/2013
Copsey Communications Consultants	Consultant	UK	30/04/2013
Digital Europe	Industry Group	Belgium	17/04/2013
DLM German Media Authorities	Broadcasting Group	Germany	30/04/2013
EBU	Broadcasting Group	Europe	02/05/2013
EE	Mobile Network Operator	UK	30/04/2013
Ericsson	Manufacturer	Europe	02/05/2013
ESOA	Satellite Operators Group	Europe	02/05/2013
ETNO	Industry Group	Belgium	04/05/2013
EUTC	Utilities Industry Group	UK	04/05/2013
Finnish Communications Regulatory Authority	Regulator	Finland	02/05/2013
France Televisions	Broadcasting Group	France	04/05/2013
GSMA Europe	Mobile Industry Group	Belgium	08/05/2013
GVF (Global VSAT Forum)	Satellite Industry Group	UK	04/05/2013
IEEE 802	Industry group	Europe	30/04/2013
Intel	Manufacturer	UK	04/05/2013
Ministry of Communications	Member State	Cyprus	22/04/2013

Organisation	Type	Country	Date received
and Works(Cyprus)			
Motorola Solutions Inc	Manufacturer	Denmark	04/05/2013
NLKabel	Cable Industry group	Netherlands	30/04/2013
Nokia	Manufacturer	Finland	04/05/2013
Nordic PSB	Broadcasting Group (representing broadcasters in 5 Nordic countries)	Belgium	02/05/2013
OETHG	Broadcasting Group/PMSE	Austria	04/05/2013
Österreichische Rundfunksender	Broadcasting Group	Austria	29/04/2013
Qualcomm	Manufacturer	France	04/05/2013
RCEG (PPDR group)	Industry Group	Germany	25/04/2013
RNP Forum	Industry Group	France	04/05/2013
RTE	Broadcaster	Ireland	04/05/2013
Samsung	Manufacturer	UK	29/04/2013
SpectrumConsult	Consultant	Europe	02/05/2013
Solaris Mobile	Satellite Operator	Ireland	02/05/2013
TDF	Network operator	France	04/05/2013
Telecom Italia	Mobile Network Operator	Italy	04/05/2013
Telecommunications Industry Association	Industry Group	USA	30/04/2013
Telefonica Group	Mobile Network Operator	Belgium	02/05/2013
Thales Nederland BV	Industry	Netherlands	29/04/2013
Vodafone	Mobile Network Operator	UK	04/05/2013
VON Europe	Industry Group	Belgium	30/04/2013
Wi-Fi Alliance	Industry Group	USA	30/04/2013
Wind	Mobile Network Operator	Italy	30/04/2013