ASSOCIATION OF
PROFESSIONAL WIRELESS
PRODUCTION TECHNOLOGIES

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APWPT comments with regards to

„[Draft] RSPG Opinion on a long-term strategy on future spectrum needs and use of wireless audio and video PMSE applications"

To Whom It May Concern,

The RSPG was asked to advise the European Commission on a long-term strategy with regards to current and future audio / video PMSE spectrum use and requirements.

APWPT welcomes the opportunity to provide comments to RSPG on this consultation.

Please find attached APWPT's response.

30 September 2017

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Preliminary remark

The EU Commission has already initiated several studies on PMSE and its spectrum needs. So far the APWPT has always been involved and been asked for their expertise on this very special and diverse application. For this important study this was not the case. To the knowledge of APWPT none of its user associations was asked for input or interviewed on their specific needs. In the experience of the APWPT institutions always contact with those affected – but not this time as it seems.

This is reflected in the draft opinion as it has been presented for comments. For this reason the APWPT kindly asks the RSPG to take the following comments for serious consideration before submitting the opinion to the Commission.

From APWPT's point of view, and this is shared by its members, the current draft of the opinion comes to the conclusion:

> There is sufficient spectrum for interference free PMSE operations even at peak times.
> Also for the future there will be enough spectrum as PMSE will find technologies that will significantly increase spectrum efficiency.

APWPT, as the representative of market and technology-leading PMSE equipment manufacturers, questions these conclusions.
This summary seems to us to be insufficient and gives a false impression.

The mandate of this RSPG working group would appear to be limited. APWPT would prefer firm proposals that will ensure daily production at hot-spots as well as addressing peak demand requirements.

Executive Summary

What is currently missing in this draft opinion?

- Protection of 470 to 694 MHz from disruptive services until 2030 (a firm statement is required from the EU commission).
- Where to find usable and sufficient quality spectrum for interference free operations of wireless PMSE productions. APWPT suggests; the Commission to encourage as many administrations as possible to make available the bands 1518-1525 and 1350-1400 MHz in a timely manner. APWPT notes that within the RSPG Draft Opinion there seems to be no recognition that alternative spectrum for PMSE will be required in order to compensate for the loss of access to the 700 MHz band (DD2).
- Long term security of tenure to current and new frequency ranges for PMSE in order that the PMSE sector can safely refinance any investments into these new ranges with coming technologies.
- APWPT kindly likes to note that CEPT is currently studying additional radio spectrum for a possible compensation, sub-bands of the "Air band" – 960-1164 MHz.
- APWPT expects from the RSPG a vision on how to handle PMSE spectrum needs in the future and to scope out concrete steps for a binding EU-wide decision.
- APWPT asks the EC for support to identify similar solution(s) on world-wide level.
- It has become apparent that further work in Europe is necessary. The current mandate needs to be extended to include daily production spectrum requirements at 'hot-spots' (TV studios, media production parks etc.), not just peak demand. In addition, the current work should continue with the involvement of all stakeholders – similar to the work of the former "High Level Group".

Some solutions are already provided (823-832 and 1785-1805 MHz) and have been supported by the EU and some administrations, but so far have not been activated in the vast majority of the Member States.

The industries that PMSE serves are major economic drivers of the overall EU economy. The APWPT would welcome an information exchange with the RSPG before it hands over its final report to the Commission, in order to avoid potentially serious damage to the EU economy.

APWPT

The APWPT is grateful that the European Commission initiated a study into long term strategy on future spectrum needs of wireless production tools.

APWPT is the Association of Professional Wireless Production Technology. It is a German based international organisation that was founded by its members to secure continued access to a sufficient quality and quantity of spectrum for wireless production tools. The APWPT has within the organizations that support the association more than 25,000 members who are active in the Culture and Creative Industry (CCI).

APWPT is recognised on an international level as the competent source of information for PMSE applications and technology. Through its expertise APWPT has joined several WRC's and chaired an ITU-R working group where more than 60 ITU-R members formed the report BT.2338 as the guideline for ITU members on PMSE spectrum needs and allocation.

At CEPT level APWPT is active in a large number of working groups: all of those that may directly affect PMSE operations. In ETSI APWPT and the manufacturers of PMSE equipment are active to form standards to maintain the operations and, where possible, to integrate new technologies that ease daily operations – securing the production quality and implementing technologies that make operations more spectrum efficient. Additionally, APWPT keeps up with the development of consumer equipment, monitoring consumers' changing habits of listening and viewing content as well as observing the development of new technologies like 4K/8K video, immersive and HD-Audio, virtual and augmented reality and the integration of these technical needs for productions into products, systems and their standards.

The APWPT's members keep daily operations running and in line with latest developments and are heavily supported by the manufacturers of the required equipment: transmitters, receivers, complete systems for everyday use, but also complex ones for the large events described in the following chapters.

The manufacturers active inside the APWPT carry the full load of the technical development for the goals of the association's members and equipment users. The users of the PMSE technology deliver the details of their production needs which are recognised by the manufacturers and integrated into new standards and technologies.

APWPT's brief look at history

For many years now, the content and event production has been adversely affected by changing processes of the national and international frequency allocation. The situation created by the first digital dividend of 2007 (re-farming of 800 MHz) is currently being continued by the second digital dividend, decided in 2012 – coming into operation in 2015. What follows is a brief summary:

** 2007*

World Radiocommunication Conference agrees a changed frequency usage in the 800 MHz band. As a consequence, APWPT was founded as the needs of incumbent PMSE users were completely ignored at that WRC, and the sessions that followed.

** 2012*

World Radiocommunication Conference agrees a changed frequency usage in the 700 MHz band and invites membership of ITU-R to study the effect on wireless production tools (applications ancillary to broadcasting).

** 2013*

The plenary meeting on 13 June 2013 the Radio Spectrum Policy Group (RSPG) adopts a ground breaking Opinion on future spectrum for Wireless Broadband; including the 700 MHz band. RSPG further invites the EU Member States for a long-term strategic policy on the future use of the UHF TV band (470-790 MHz) that should also consider the future spectrum needs of PMSE.

In November 2013 the RSPG Report (RSPG13-540) on Strategic Sectoral Spectrum Needs notes;
"The demand considerations for future PMSE spectrum opportunities need consultation at national level, with subsequent national contribution to on-going studies in the CEPT/ECC. New spectrum opportunities for PMSE need also to be reflected in the harmonised European standards for PMSE equipment coordinated via the existing ETSI-CEPT process. The RSPG notices that the PMSE usage varies greatly in time and location, and depend of the scale of the event or programme. The RSPG found it relevant to identify the spectrum needs for audio applications and video applications separately, but also identified similarities. Possible re-allocation of primary services, new sharing possibilities and efforts to pursue opportunities in higher frequency ranges will require regulatory changes, and the users will have to adapt."

Note: the term "peak demand" was not used.

**** 2014***

"On 1 September 2014 the European Commission adopted an Implementing Decision on harmonised technical conditions of spectrum use by programme making and special events (PMSE) equipment. The Implementing Decision, which is in response to the Radio Spectrum Policy Programme (Decision 243/2012/EU[1]), only covers wireless audio applications, such as wireless microphones and in-ear monitors. These applications are essential for production of content and documentation of social events, news, creative industries, sports, educational or community events."

Note: compensation of the 1st DD (800 MHz)

**** 2015***

Before WRC-15, RSPG published (RSPG15-593) the "Opinion on Common Policy Objectives for WRC-15" and noted to *"ensure that there is no new provision which prohibits options for PMSE equipment"*

Note: again, the term "peak demand" was not used.

**** 2016***

The 40th meeting of RSPG agrees to a request from the European Commission for an opinion on a long-term strategy for Video and Audio PMSE; *"a long-term strategy on spectrum requirements facing the future needs and use of wireless audio and video PMSE applications".* See also document RSPG16-020 as of 8 June 2016.

**** 2017***

In May 2017, the Decision (EU) 2017/899 of the EU Parliament published.

- Article 4;

"Member States shall ensure availability at least until 2030 of the 470-694 MHz ('sub-700 MHz') frequency band for the terrestrial provision of broadcasting services, including free television, and for use by wireless audio PMSE on the basis of national needs, while taking into account the principle of technological neutrality."

[1] https://ec.europa.eu/digital-single-market/en/news/commission-implementing-decision-01092014-spectrum-use-wireless-audio-pmse

- Article 5;
"1. As soon as possible and no later than 30 June 2018, Member States shall adopt and make public their national plan and schedule ('national roadmap'), including detailed steps for fulfilling their obligations under Articles 1 and 4. Member States shall draw up their national roadmaps after consulting all relevant stakeholders. 25.5.2017 L 138/135 Official Journal of the European Union EN.

2. In order to ensure that the use of the 700 MHz frequency band is in accordance with Article 1(1), Member States shall include in their national roadmaps, where appropriate, information on measures, including any support measures, to limit the impact of the forthcoming transition process on the public and on wireless audio PMSE use and to facilitate the timely availability of interoperable television broadcasting network equipment and receivers in the internal market."

APWPT has yet to see any roadmaps that seriously take into consideration the real-world spectrum needs for continued successful PMSE operations. Some Member States have compensated the spectrum access losses of DD1 with relatively small amounts of spectrum harmonised by the commission. We currently do not see any suggestion that DD2 spectrum access losses will be compensated. If action is not taken to address the loss of access to the 700 MHz band the Culture and Creative Industry will be heavily impacted. Serious consideration needs to be given to what the economic impact of lack of adequate spectrum provision for PMSE applications will be. This seems to be missing from the RSPG Draft opinion.

Detailed Background Information

In the following response APWPT delivers information on why it came to the above comments and also adds background information of PMSE applications and their needs that have to be considered carefully before going public with the final RSPG report.

Spectrums needs

APWPT members have to secure on a daily basis content production for the ever-increasing diversity of the distribution channels. APWPT has direct links to the daily business and its members are directly involved in small, medium, large productions as well as peak events. Through this the APWPT knows in detail about the increasing shortfalls of spectrum in daily productions and particularly at peak demand events.

The APWPT would like to take this opportunity to remind readers of this response that daily productions are required to secure the cultural identity of its member states, the social and political life of the EU community. This must be secured first.

Peak demands are those where extraordinary events mostly present a nation, a community or parts of it to an international audience. These are important high profile events that generate the peak demand in spectrum needs. These events are, from an economic point of view, supporting among other things the tourism development goals of a nation, but very often peak demand events have the secondary effect of promoting certain activities such as cultural engagement within the community.

Political meetings, international conferences, national days also comprise of these events: their goal is to maintain a lively democracy and encourage citizens to get involved, form and develop that democracy.

With the politically motivated spectrum sales of DD1 and DD2 PMSE will have lost access to about 50% of its traditionally available UHF spectrum when the DD2 comes into operation – in 2018 in some member states; 2020 at the latest in the rest. The remaining 50% will largely be occupied by the primary users and therefore PMSE operations will be constrained and endangered. Foreseeing this after WRC-07 APWPT started activities to identify and support the allocation of new spectrum for PMSE.

APWPT and its members invested significant resources into studies as PMSE applications can only operate with quality spectrum due to the high quality requirements of production demands. Initial studies led to the identification of a potential new spectrum range for PMSE; the L-Band, 1452 – 1492 MHz. But: the Commission then backed member states that decided to allocate this spectrum to IMT. As a result the band was lost for PMSE applications. Lost also was all of the investment, both in terms of time and finance, into developed devices that could now no longer be used! This translated into a waste of precious investments due to the lack of a comprehensive spectrum strategy by the EU and its members.

The world so far has been united in spectrum for content production and its distribution to the consumer (UHF TV Bands IV and V). This "united" status was, and partly still exists, no matter what spectrum arrangement is in use: the European system or that based in the US. The combination of DD1 and DD2 will seriously constrain this "unified" spectrum use by reducing it drastically. The unified spectrum use in both systems have traditionally supported travelling productions and by definition, social cohesion.

The RSPG should be aware that its decisions will be watched carefully and will be a guideline, especially for those who operate in the European system. Due to the goals of the EU, the in-Europe needs for productions have to be considered to further support the cultural diversity, social cohesion, national identity and its international exchange.

The RSPG Draft Opinion focusses on 'peak demand', not on the spectrum requirements of PMSE for daily operations. The peak demand is merely a special form of daily operations. In order to meet the peak demand requirements for PMSE operations, the needs of daily productions need to be secured first. After DD1 and in the advent of the DD2, daily PMSE operations will suffer from a shortage of spectrum and will experience serious problems with regards to guaranteeing the required production values and quality.

APWPT likes to note that the UK postponed its DD1 to after the Olympic Games to secure sufficient spectrum for all the CCI activities handled through PMSE associated with the Games. At the time, Ofcom UK provided a very detailed report on this. The question arises: With 50% of PMSE spectrum access gone, how will France cope with staging the Olympic Games in 2024?

APWPT's comments regarding text sections of the draft document

The RSPG states: "long-term regulatory certainty and visibility on spectrum access is desired by PMSE manufacturers and users."

This statement is true, but not strong enough and probably reveals problems of RSPG's strategy discussion: "is demanded" would be a better reflection of the PMSE community's position. Regulatory certainty is given to those who benefit from the changed allocation of spectrum (IMT) – spectrum that was previously used by broadcast for distributing content and PMSE for producing all manner of media content. For both, Broadcast and PMSE, there is no certainty offered at the same or even similar level as that provided for the new services operating in the newly allocated spectrum. Therefore, APWPT would like to focus on facts:

* Companies (production teams, PMSE manufacturers and users and their service providers) make investment decisions based on forecasts of return of investments in a number of places.

* Voluntary organisations must fulfil the tasks within the framework of budget targets.

Given the importance of the audio and video PMSE industries in the production of European content it is essential that greater certainty over future spectrum access is offered in order to ensure continued high quality productions. European content is exported worldwide and the substantial financial returns generated by the production of this content should not be allowed to be constrained by either financial or spectrum related pressures brought to bear by possible future spectrum re-allocations.

Political decisions often change the framework conditions of both groups. Therefore, the enthusiasm for further investments is limited.

Example:

800 MHz, 700 MHz are now being reused – a significant loss of spectrum for PMSE. This results in the necessity to make considerable efforts and investments, both on the part of users and suppliers. A secure return on investment is the fundamental basis for the investment decisions of both.

The current decision-making process with regards to the changes brought about by the 700 MHz clearance should therefore be brought to an end with relevant decisions to firmly secure a future for PMSE applications. Further ongoing discussions without firm decisions being made with regards to PMSE applications is, for the PMSE sector, a waste of finite resources.

Regarding guaranties for 470 – 694 MHz; as recognised by the RSPG, 470-694 MHz will continue to be an 'important' band for audio PMSE. APWPT contends that more than just important UHF will remain the CORE band for audio PMSE, in particular as currently no alternative spectrum to mitigate for the loss of access to the 700 MHz band is on offer. Consequently, APWPT is very concerned regarding SDL and similar disruptive technologies may be 'mandated' by any future EC decisions, further eroding spectrum access for audio PMSE in the band 470-694 MHz.

APWPT members are of the view that IMT has sufficient spectrum already as many frequency ranges that have already been auctioned are not in use. This is the case for the 1452 – 1492 MHz range that was auctioned for SDL, but is not yet in use. Valuable spectrum, lying fallow. Before this and other unused bands are fully utilised it makes no sense to auction further frequency bands.

Certainty for Broadcast and PMSE appears to be given in the remaining UHF-TV range, 470 – 694 MHz, as some official statements suggest that this spectrum will remain for these two incumbents until 2030. PMSE users are very sceptical because similar statements were given after DD1 that there will be no DD2, but it was decided at the following WRC anyway. The EU needs to offer greater certainty on 470-694 MHz to regain trust in this regard.

Politicians have so far suggested this certainty but have yet to fulfil it as there is no real long term planning for some spectrum ranges: it seems that several countries do not want to miss any opportunity to sell spectrum, even on questionable grounds.

It has become apparent that further work is necessary. In APWPT's view, the RSPG PMSE group should ask for the mandate to be extended to include daily production spectrum requirements at 'hot-spots', not just peak demand. In addition, the work should be continued with the involvement of all relevant stakeholders.

The RSPG states: "the Commission Implementing Decision for audio PMSE harmonises "at Union level the availability of a baseline of about 60 MHz of sustainable spectrum to meet recurring ordinary needs".

APWPT kindly asks the RSPG to note the details of the related EC decision (29 MHz and optional 30 MHz for compensation of the loss of access to 800 MHz – DD1). It is not 60 MHz, but only 59 MHz. Out of this 59 MHz 30 MHz are "optional". Meaning: there is no binding decision nor a commitment to guarantee this across the whole of the EU. Consequently, the promised compensation for the DD1 is still missing. It was stated that no spectrum user should be left worse off after DD2 than he or she was before. How can manufacturers and users invest into event technology without having a legally binding commitment for availability suitably secure spectrum?

This is similar to the loss of the band 2.300 to 2.400 MHz for Video PMSE which was opened for LSA.

The RSPG states: "the most commonly used audio PMSE applications are wireless microphones (handheld and body worn) and in-ear monitors."

APWPT agrees to this statement and like to note that in a lot of productions also talk-back is operated in the UHF-TV Band.

The RSPG states: "mass-market PMSE equipment is typically not used in the events where the peak bandwidth demands occurs."

This statement is partly valid as an increasing number of applications also use semi-professional audio equipment according to ETSI EN 301 357.

It should be added, that special equipment is manufactured for many events. These production tools usually require a binding commitment of the usable frequencies.

The RSPG states: "…an up to date list of tuning ranges is identified in relevant CEPT deliverables"

Tuning ranges in the CEPT documents ECC REC 25-10 and ECC REC 70-03 are purely recommendations. Their national implementation varies considerably by geographical locations / countries.

Harmonization decisions, implemented nationally, would be the best way to ensure current and future planning security. Therefore, APWPT requests an EC Decision on protection of audio PMSE services in the band 470 to 694 MHz and EC Decisions on other spectrum identified in REC 25-10 and 70-03 for use by audio and video PMSE equipment.

The RSPG states: "there has been growth in the use of wireless audio PMSE in the last decade. This does not necessarily mean that spectrum demand is increasing as there are methods to address growth such as better planning and coordination, technological evolution and more efficient use of spectrum."

APWPT agrees to the steadily growing usage of wireless audio PMSE. APWPT does not share the RSPG view that his does not lead to higher spectrum demand – the phrase "not necessarily" runs the danger of misleading the Commission and, as a result, the Commission may come to the conclusion: "all is organized and fine – no need for activities." APWPT does not believe that this is the case.

For all manner of events APWPT can state and prove that productions are growing and have increasing high quality spectrum demands as productions are becoming increasingly spectacular (consumers of content expect this) and consequently have to deliver ever higher audio and video quality. How can these increasing demands be fulfilled without more spectrum – at the very least to mitigate for the impending loss of access to the 700 MHz band (audio) and the band 2300-2400 MHz (video)?

There is also an increasing diversification of content distribution channels, news gathering, entertainment etc. This content needs to be produced. For this reason, more teams operate in the same location or in close proximity than ever before. This means that there is an increasing spectrum demand to fulfil the requirements of daily productions, let alone meeting peak demand.

The EU may have a look at the most famous public event in Europe, the Eurovision Song Contest. Members of APWPT have taken care of it since the beginning of the event ensuring flawless and interference free operations of these productions. This event is consumed, not just across the EU, but globally. It is a perfect example of the growth in demand for spectrum use during the actual production as well as for the four week rehearsal period.

The increasing spectrum demand for current and future growth productions are connected to the quality of the spectrum PMSE is operating in. High quality spectrum is required in order to maintain high production values.

For more than three decades service tools have been available (software frequency planning tools) to increase the user density of PMSE without sacrificing stringent quality demands. These tools have been improved over time but are now PMSE hardware has reached its limits due to the increasingly reduction of available radio spectrum for production purposes. For audio PMSE this is before DD2 is implemented.

Evolving technology has already provided an increase in user density in given area of radio spectrum. As PMSE is a frontend technology, it always has to provide the very best production quality to serve the various distribution channels. To maintain high quality, PMSE cannot use compression techniques similar to those that DTT or other distribution formats use, because it leads to audible and visible negative artefacts. As such, there are quality limits regarding new technologies. There is a trade-off between links per MHz and audio/video quality. It should be carefully noted that the peak demand events addressed in this draft opinion are the very events were the PMSE quality requirements are highest.

Currently PMSE uses all known technologies for maximum spectrum efficiency. This is driven by the high level of competition between manufacturers of PMSE equipment in the market place, as well as by the competition of productions among themselves.

The RSPG states: "Member States shall adopt and make available their ´national roadmap for re- assigning of terrestrial television in the UHF band by 30 June 2018."

APWPT is concerned when reading this statement: with the experiences from the past APWPT interprets this statement as an invitation to the member states to now clear the 700 MHz range without providing beforehand sufficient and suitable alternative frequency ranges for those currently using this spectrum. PMSE operators have to secure the survival of their enterprises. Will the EU take action to protect PMSE users and their operations?

Long term reliable planning will require sufficient transition times to move from one area of spectrum into another. Long term reliable planning from the PMSE users' point of view means to announce in time, 5 years or more in advance, that there will be a change in spectrum allocation for this user group. It is essential to identify and announce what alternative spectrum will be offered in order to secure a smooth transition. This is essential as the so called "compensation" (financial) for moving into alternative spectrum is currently extremely poor, if any exists at all. Besides losing their spectrum access PMSE operators will also have to finance the changes to clear spectrum – to date only Germany and the UK are set to operate funding schemes to assist PMSE users with migration costs. The EU is the people's organization for its people – for that reason APWPT would expect EU support for the disadvantaged PMSE community.

Political decision makers may have overlooked the fact that a significant number of PMSE units and systems have been paid for with tax-payers money. The above described relatively rapid spectrum clearances/re-assignments will destroy the existing value of affected equipment and will create the need to invest into new ones to maintain the duties of public operators. This might be avoided by a proper long term planning or at least a solid mid-term perspective.

The RSPG states: "removal of PMSE in parts of the 700 MHz band and re-planning terrestrial television will influence the amount of spectrum available for shared PMSE use in different local areas."

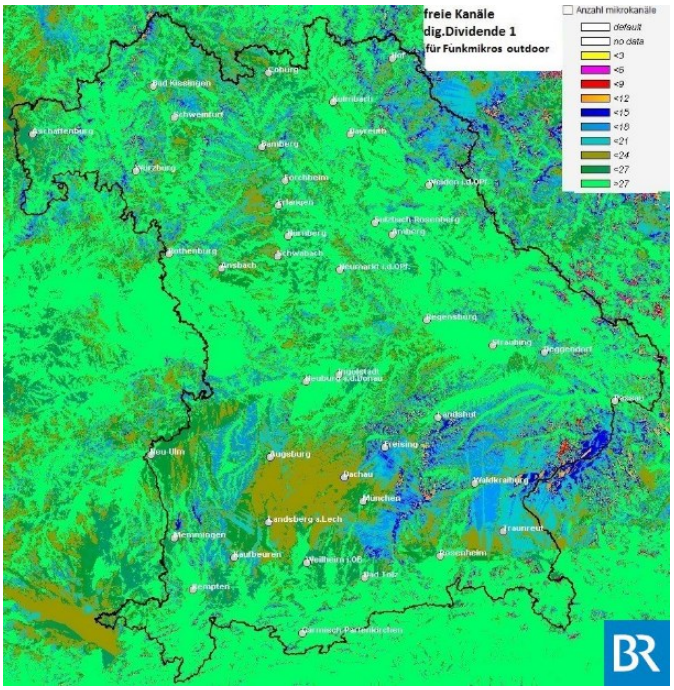
Currently, APWPT does understand the related discussion for a complete exclusion of the whole of the 700 MHz band for PMSE, e.g. in France and the UK. According to WRC-15, Resolution 232, parts of the 700 MHz range are recommended for PMSE operations – namely the guard bands and the duplex gap. Up to now, APWPT sees the majority of ITU-R Region 1 administrations not implementing Resolution 232. If this situation continues then the whole of the 700 MHz range will be lost to PMSE. Other applications (e.g. PPDR/M2M) are being discussed with regards to being allocated in the 700 MHz band guard bands and duplex gap not auctioned to IMT. The 700 MHz range is already auctioned or will be auctioned in the very near future, but any substitute spectrum for PMSE is still in a haze, still unidentified and unknown. The draft RSPG opinion resolutely fails to acknowledge that replacement spectrum to mitigate for PMSE's loss of access to the 700 MHz band will be required.

Post DD2 the remaining UHF-TV spectrum will not be sufficient for PMSE daily operations, not to mention peak demand, as it will be occupied at higher density of the primary user than ever before. Interference risks to PMSE applications are increasing dramatically – also for the EU's political events. APWPT wonders how the EU Commissioners will react when he or she experiences interference during important presentations or speeches: he/she might blame it on the technicians, but not listen to his/her argument that the EU supported and even created the conditions for this interference.

The following investigation was done by the German Bayerischer Rundfunk and shows the current situation after DD1 and the expected spectrum situation after DD2 in the UHF-TV range. The focus of this investigation was on how much spectrum is or will be available for wireless content production.

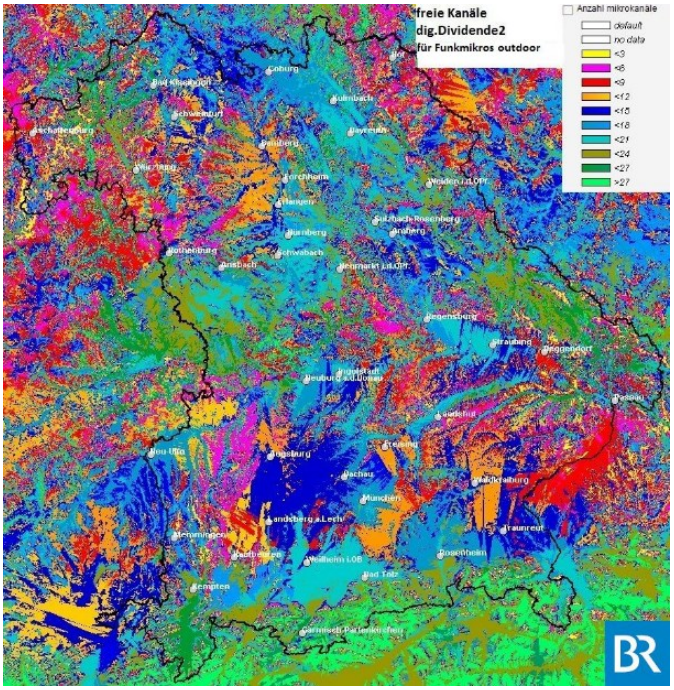
The first picture shows the State of Bavaria with the availability of spectrum for outdoor wireless production tools after the Digital Dividend 1.

Marked in bright green colour are areas where 27 or more TV channels were available for PMSE production. Marked in blue are areas where are less than 15 TV channels available for PMSE productions. This is in general the case at the borders to the Czech Republic, Austria and some urban centres.



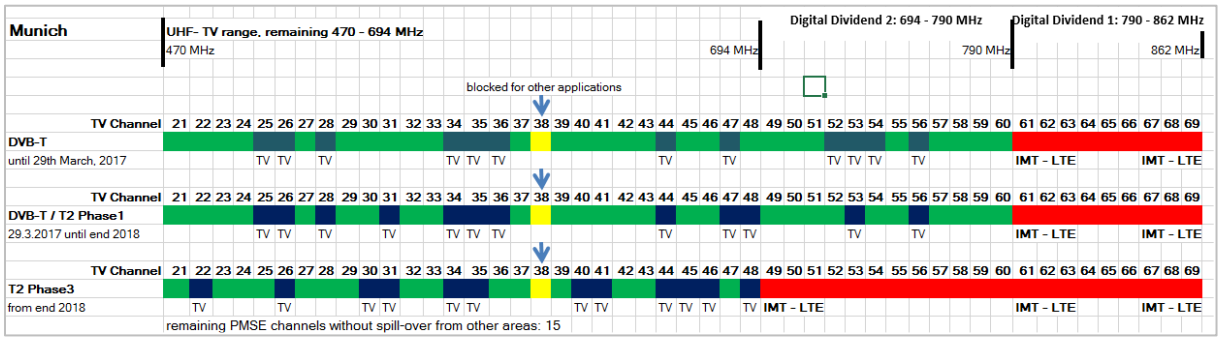
The second picture shows the effect of the DD1 and DD2.

The situation has changed dramatically: even in very remote areas, there are less than 27 TV channels available. In the urban centres and along the borders the number of available channel falls below 9, in a lot of centres even below 6.

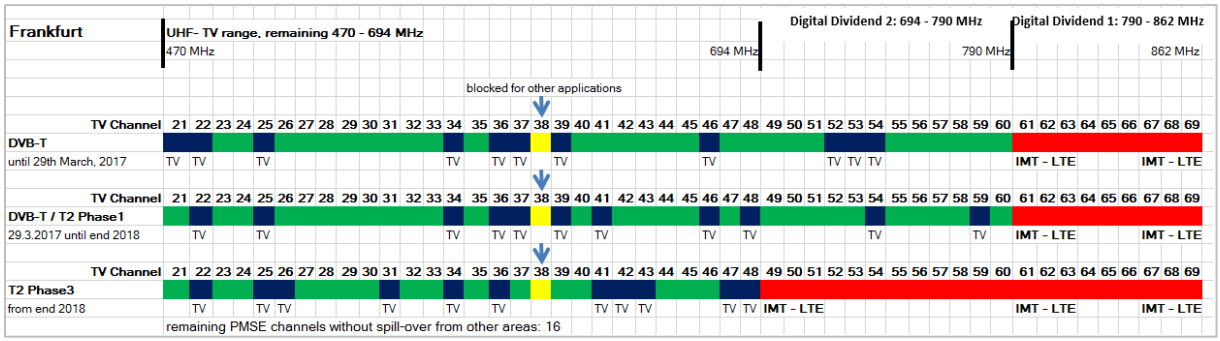


The following graph shows the situations in Frankfurt (Main) and Munich based on the TV transmitter arrangement without the spill-over from other TV station from the neighbourhood.

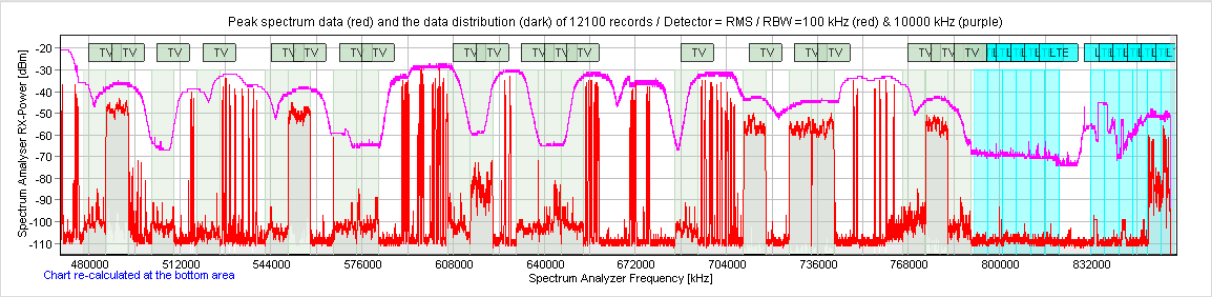
End of 2018 in Munich area only 15 TV channels will be available for PMSE.



The following graph shows a similar situation in Frankfurt (Main): only 16 TV channels will be available for PMSE.



The picture below shows the indoor spectrum use in the day of the final event of Eurovision Song Contest at Copenhagen. 20 TV channels are in use cross border in Denmark and Sweden:



What will be the situation for this region after the 2nd digital dividend?

Consequences for wireless productions:

There are plenty of other indoor and outdoor events which attract many residents and tourists. These events are daily operations for PMSE – not peak demand.

There is another example where the EU does not seem to consider PMSE operators and daily/peak demand production needs: the EU allows the member states to also deploy into any remaining UHF-TV spectrum, 470 – 694 MHz, Supplemental Downlink – SDL. By this the above mentioned "optional 30 MHz" (DD1 compensation) for PMSE may be very difficult to achieve in many geographical regions.

And even this may not the end of the story: a new discussion is coming up to change the technology for terrestrial TV again – just after the introduction of DVT-T2: WIB. WIP technology might occupy all remaining channels in the UHF-TV range for the distribution of TV content as it is a hopping system of 32 MHz bandwidth.

This would create serious problems for PMSE in the UHF-TV band, which the EU Commission has suggested will remain available until 2030. A clear roadmap for PMSE which acknowledges the needs of PMSE is urgently required. APWPT does not currently believe that the Draft RSPG opinion offers a clear, sustainable roadmap.

The RSPG states: "the frequency band 470-694 MHz will, at least until 2030, continue to be an important frequency band for audio PMSE".

APWPT would like to clearly state to the RSPG that 470-694 MHz is the **core** band for Audio PMSE, for the so-called daily operations as well as for high peak demand events.

With all the investigations so far conducted and considering all available future spectrum usage documentation APWPT is of the firm opinion that this 'core band for audio PMSE' will not be able to accommodate the spectrum demand for daily operations from 2019 onwards in many locations. To accommodate high peak demand in that range as well is, as things currently stand, out of the question.

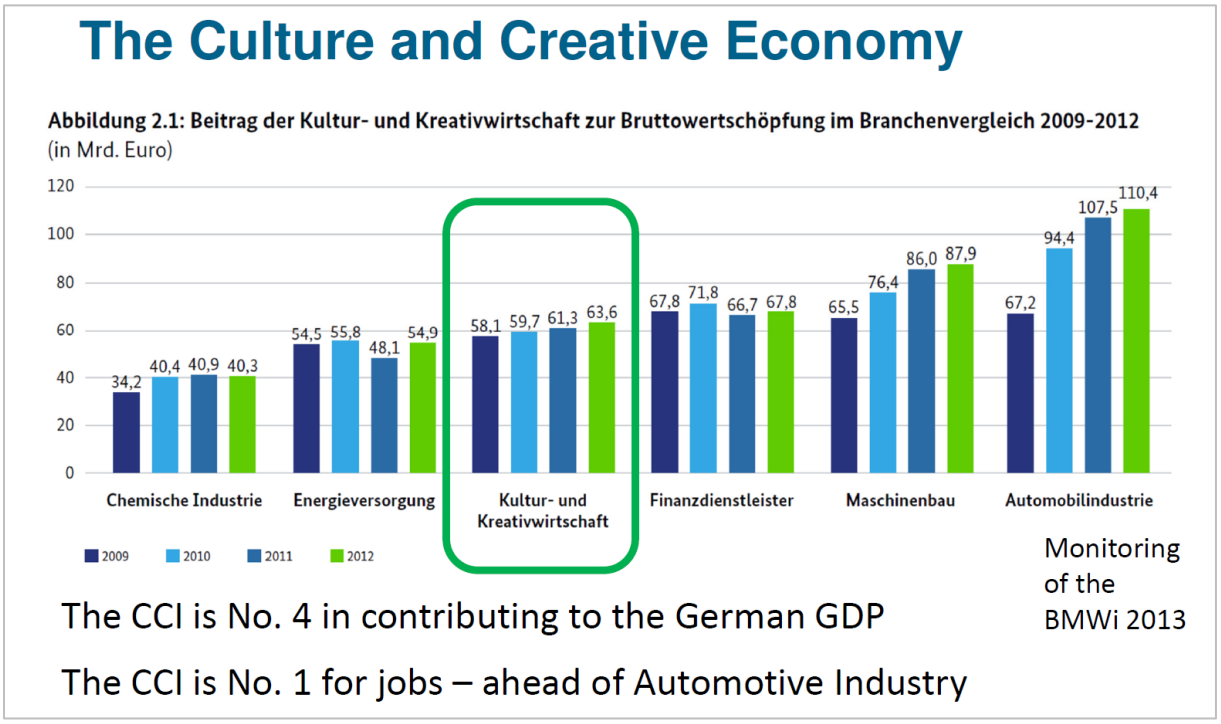
APWPT would like to know which concrete spectra will be dedicated to PMSE to cover high peak demand events. When the 700 MHz band has been auctioned to IMT or other users there will be no turning back. The

more spectrum is sold the less movement the EU Commission will be afforded to guarantee the daily needs of its citizens regarding the production of events.

It should be noted that at the time of the 800 MHz clearance, many people bought equipment that operated in the 700 MHz range. This equipment will now be rendered redundant, well before its' normal life expectancy.

As a result of these very short-term notices to vacate spectrum and with almost no compensation, both in terms of finance and alternative radio spectrum, for PMSE user's investment has been wasted and much trust is gone.

APWPT believes that too many EU institutions cannot see that a commodity (PMSE) that has always been on hand for the reliable communication and production of events will, step by step, vanish away, together with the skills of the people that operated it. The EU and its institutions are disrupting the PMSE sector, and as a consequence, the contribution that content creation delivers in terms of contribution to the GDP and job creation. And this, an industry that even showed growth during the years of the crisis.



EC should be aware in their decisions that the users behind PMSE represent an industry that contributes significantly to the EU GDP, which provides many more jobs, over a wide range of platforms, than other industries.

Will the EU now strive to find a fair, reasonable and non-discriminatory balance between the commercial interests of IMT spectrum users and the Culture and Creative Industry?

After WRC-19 or WRC-23, APWPT can imagine a situation similar to WRC-12, where some countries supported the re-allocation of the 700 MHz band, despite non-inclusion of the subject on the meeting's agenda. APWPT fears this may happen to the band 470 to 694 MHz if the EC does not take steps to ensure the security of their previously given statements.

The RSPG states: "there are different views regarding whether UHF spectrum available on a national level post 2020 is enough to meet the future peak demands for audio PMSE.

As previously stated in this response to the Draft RSPG opinion, APWPT believes that there are already spectrum constraints at peak demand events. This situation will be made worse post DD2 if no alternative spectrum is identified and made available for PMSE applications.

The RSPG states: " welcomes PMSE equipment that can operate with larger tuning ranges, which provides flexibility for operation in different countries and ensures more efficient local planning at a national level and encourages users to use this kind of equipment especially for peak demand events".

APWPT notes, expanding tuning ranges can result in negative operational benefits. For example, as frequency ranges for PMSE applications become increasingly fragmented, developing PMSE receivers that cover all available bands becomes increasingly problematic. The challenge of wanted signals vs. unwanted signals with a hyper-wide tuning range, spanning different RF applications/services, is significant. The challenge also applies to equipment that is operated close to the human body.

The RSPG states: "in some Member States certain sub bands within the 2 GHz range could be subject to some evolution of use at national level."

The Commission supported additional PMSE tuning ranges published in ECC REC 25-10 and ECC REC 70-03.

APWPT strongly urges the EU Commission to transfer these Recommendations into binding decisions as the Commission did for the mobile operators' spectrum.

However, it should be noted that the 'new' bands identified in the above Recommendations may not, in themselves, be sufficient to fully compensate for loss of access to the 700 MHz band.

The RSPG states: "is of the view that due to the local and temporary nature of PMSE, especially for peak demand situations, requirements are best addressed on a case-by-case basis at a national level using the "tuning range concept" developed by CEPT."

This cannot be viewed as an attempt to solve the broader issue – the spectrum turmoil created by DD1 and ultimately, DD2 is thrown back to be resolved at individual national levels. Even on a case-by-case solution every member state has to identify spectrum in advance which would be available for PMSE. What is required is a pan EU/CEPT solution for PMSE applications going forwards.

The RSPG states: "is of the view that technology advances will improve the spectrum efficiency of PMSE and enable more efficient sharing with a wider range of users, technologies and applications."

What source RSPG is referring to? What does RSPG mean by "spectrum efficiency"?
If, by the term "spectrum efficiency", the RSPG is referring to an increased number of audio links per MHz then it is unlikely in the foreseeable future that technology advances will adequately mitigate for the loss of access to 96 MHz of the 700 MHz band. APWPT is not aware of any technology that can securely fulfil this RSPG statement whilst providing the same quality as the Audio links that we currently have today.

As previously stated, compression technology is not the solution as RSPG knows due to several investigations and statements from Universities like the FAU Erlangen, Germany.

APWPT kindly request that the RSPG name the source for this statement.

The implication that 'technology will fix it' is misguided, at best. As for more efficient sharing of spectrum, all peak demand events are already highly managed. The previously mentioned Eurovision Song Contest does not come together by accident. Spectrum is already carefully managed at peak demand events, yet, even before DD2, the limitations in spectrum availability are evident.

The RSPG states: "encourages the PMSE industry and academia to continue to research and develop more advanced and spectrally efficient technologies, including digital ones, and to implement these technologies in ETSI harmonised standards."

APWPT understands that the RSPG is watching the development of standards driven by the APWPT for the PMSE community. APWPT is also conscious that RSPG is probably aware of the activities of the PMSE manufacturers to find solutions for what is increasingly looking like a very difficult situation in the future. Very few, if any, of these activities are currently supported at a national level. It should be noted that PMSE equipment manufacturers would very much appreciate strong economic support from the European Commission with regards to the research and development of 'advanced and spectrally efficient technologies'.

APWPT believes current PMSE technology is very spectrum efficient but APWPT's membership is happy to work with whatever organizations or agencies, in order to identify possible new technologies. The Commission should consider providing adequate funding to back suitable research projects and the required financially support.

The RSPG states: "recommends PMSE stakeholders further to explore the development of 5G regarding its potential for PMSE."

The RSPG is aware of the initiative taken by one of the PMSE manufacturers, who has formed a consortia of a wide span of PMSE manufacturers and high ranking insiders of 5G technology to investigate if 5G, as a platform, will be able to ease the looming spectrum shortage. As of today the project has been running for more than half a year and it can currently be seen that there are some "show-stoppers" that need to be integrated in order to make 5G usable for PMSE along with the other vertical industries that will also need ultra-high reliability and very low latency.
The task will be to get this into the 5G-standard and keep it there to make certain that the hardware can support the applications. Besides the hardware there might also be many legal requirements in order to secure safe operation under the 5G technology umbrella. Spectrum will need to be allocated for the vertical industries so that they can operate their own, independent, hard- and software networks.

All these questions are currently un-answered. For this reason APWPT questions whether 5G will become the future solution of all PMSE related issues – many other technologies promised advances in the past, but ultimately did not fulfil expectations. In all likelihood, current PMSE technology will remain the workhorse of productions for many years to come. Unless, of course, PMSE is forced out of existing spectrum bands, with no alternative spectrum on offer.

APWPT's current view is that 5G will not replace the current PMSE technologies, but may be able to complement existing technology in certain PMSE applications.

APWPT would very much appreciate if the RSPG could become more closely engaged in this field and start its own research programs to support the standardization of 5G, in the sense of PMSE. The standardization process is a heavy load for the PMSE community: any support offered would be highly appreciated.

What might be the result if successful? Europe will go ahead with this technology and will be able to get more PMSE-productions and events in Europe. Another economic aspect is Europe will be able to export this new production technology and further secure its economy. As mentioned above: it is not just PMSE that might benefit from the results of these investigations, but also all other vertical industries with similar demanding quality needs. Europe has the chance to take the lead – if support is given.

The RSPG states: "is of the view that PMSE may benefit from R&D funding of related industries development."

As already described above: if RSPG and especially the European Commission wants Europe to take the lead in this field, they have to start funding projects to find solutions for a higher density of PMSE users/MHz without any negative impacts on current quality demands.

The RSPG states: "is of the view that operational advances like detailed planning, better on-site coordination and assistance by Member States, coupled with the adoption by PMSE users of more efficient working practices and technologies, can be used successfully to achieve high density spectrum use at peak demand events. Member States are encouraged to continue to provide information and share best practices on the CEPT Portal."

Detailed planning, better on-site coordination are tools and working procedures that have been developed for more than three decades when the demand for multichannel systems rose in Musicals, Theatres, Live Music and TV Shows. These tools and working procedures have been optimized and have limited room for improvement. The spectrum access situation will seriously deteriorate post DD2. So far, APWPT sees no offer to compensate the 700 MHz spectrum loss: compensation, in terms of alternative spectrum allocation, is required, but not considered in this draft RSPG opinion.

PMSE users are used to coordinating their frequencies and taking care not to disturb other users. This is on a voluntary basis since the beginning of wireless productions. Despite the decreasing number of frequencies available up to today most of the events are produced without interference. It is obvious that coordination cannot generate more spectrum. Taking into account the permanent increase of links for wireless devices for communication and production there is a natural border. Only access to more spectrum can remove the bottleneck.

The RSPG states: " Will continue to monitor developments in UHF spectrum (e.g. the recent auction for mobile in the 600 MHz band in the US), and consider whether this has any implications for PMSE use in Europe, taking into account that spectrum bands below 694 MHz will remain available for PMSE until at least 2030 on the basis of national needs in accordance with Decision (EU) 2017/899 and will be subject to a review anticipated by 2025 in the Lamy report"

APWPT totally agrees and the reduced amount of spectrum should be protected from use by disruptive services such as Supplementary Downlink (SDL) and White Space devices (WSD) until the proposed review in 2025 takes place.

The RSPG states: " Recommends that future requirements for PMSE should be considered in conjunction with a review of the UHF band anticipated by 2025 in the Lamy Report. This review should carefully consider technological developments and the evolution of demand for PMSE. If considered necessary, a strategy to identify spectrum options below 2 GHz for audio PMSE may be needed, considering aspects such as the potential for widespread adoption on a global level (in order to achieve economies of scale), and the request from the PMSE community for long term stability and regulatory certainty."

APWPT agrees but the review should fully include all relevant ETSI groups and industry representatives unlike this report.

The RSPG states: " Cognitive systems in PMSE come in a number of forms, a simpler form now commonly used is that a scan of the available spectrum is taken at the start of an event and the system automatically (or in some cases manually) tunes the transmitters and receivers to clean spectrum. A more advanced form was developed in the C-PMSE research project ran in Germany.
Cognitive PMSE systems may eventually enable a higher degree of automation of the frequency utilization within the assigned frequency spectrum as well as a higher flexibility and re-configurability, and contribute to a more coordinated coexistence of different users in the same frequency range thereby resulting in increased spectral efficiency. In addition sharing with services PMSE traditionally has not shared with may be enabled. Cognitive capabilities for PMSE are therefore encouraged to be further studied"

The result of this research project can be summarized in a nutshell:It is possible to maintain the production quality even in case of disturbances, if you can quickly switch to undisturbed frequencies. This results in a higher frequency requirement for wireless production tools. Alternative high quality frequencies are required to switch to in the event of disturbances (interference).

The RSPG states: "An alternative in the future for talkback services could be the use of LTE or 5G-Platforms since PMR functionalities are being added to the LTE technology. The development of a 5G platform for PMSE on a local (private) node basis could also contribute to more advanced technical solutions for example by enabling more sharing and maximizing latency advantages"

Whilst this area is being discussed and pursued within ETSI there are a wide range of technology and legal/licencing issues to be overcome plus the reluctance of users to try new technologies.

An alternative in the future for talkback services could be the use of LTE or 5G-Platforms since PMR functionalities are being added to the LTE technology. The development of a 5G platform for PMSE on a local (private) node basis could also contribute to more advanced technical solutions for example by enabling more sharing and maximising latency advantages…

Such systems would also be subject to economic and technical issues and an LTE/5G based system in the proximity of non LTE/5G audio PMSE systems would, in all probability, generate interference into the audio PMSE.

The RSPG states: "Monitoring the development in the area of 5G should be fostered – it could have an impact on the long term bandwidth needs of extra spectrum for video PMSE and multichannel Audio PMSE"

This is currently being undertaken but, as previously stated, it has to be both a technical and an economically viable solution.

The RSPG states: "The frequency bands often used today to meet the peak demand are mainly the UHF-band, and according to national variations also the VHF band, and increasingly the 1800 MHz band"

The VHF band is not currently a favoured band for audio PMSE due to limited spectrum availability. Additionally other services use the band, such as DAB+. The noise floor generated by electronic equipment also creates issues. However, some PMSE manufacturers have recently introduced digital systems in this band.

The RSPG states: "To meet specific demand, RSPG recognises that Member States may, where possible and appropriate, supplement audio PMSE usage possibilities with spectrum not designated to PMSE, for example frequencies in bands allocated to PMSE in other regions or use of DECT technology"

APWPT would welcome a request to ECC to initiate sharing studies between DECT and audio PMSE as the bands are adjacent to the 1800 MHz band.

The RSPG states: "PMSE. In particular, the strategy to identifying solutions for audio PMSE frequency use should be considered, taken into consideration aspects such as:

• Potential for widespread adoption on a global level (in order to achieve economies of scale)

• Sub 2 GHz (suitable for audio PMSE)

• The request from the PMSE community for Long term stability and regulatory certainty"

APWPT welcomes these proposals and would support any work items to further them.

Brief Statements for Video PMSE

In this section, APWPT misses an introduction like in the audio section. Long-term binding decisions here are also the basic pre-requisite for further work in this usage scenario.

The sub 3 GHz spectrum has effectively been reduced to the 2010-2025 MHz, which gives 1-2 video channels. LSA has been suggested in the 2300-2400 MHz band but is ill defined and the concept of a mobile operator, having paid for a licence, shutting down a number of cells to allow video transmissions is going to be difficult to implement. If the LSA is to work effectively better definition of how it will work is required at the EC level.

General comment with regard to Source Coding and Compression

If one uses a higher compression system in program distribution, then the compression needs to be reduced at the frontend. If attention is not paid to this, artefacts will be created in the final distribution that are not visible in production environment – high risk.

Conclusion

As laid out above, when DD2 has fully rolled out, PMSE will not have sufficient spectrum for its daily operations. As a result, daily PMSE operations, let alone peak demand events are endangered.

So far DD1 has partially been compensated by the inclusion of 823-832 MHz and 1785-1805 MHz. However, the 'opening' of these spectrum bands is an EU Recommendation only; APWPT urges the Commission to encourage as many Member States as possible to conform to the mandate relating to the above mentioned bands. However, these two small bands in no way compensate for the frequencies re-assigned by DD1 that were previously in use by PMSE, all over Europe – and even worldwide. For DD2 there is currently no spectrum of identical or similar quality that has been identified and allocated for PMSE.

The peak demand the RSPG is focussing on will therefore be not be fulfilled in the foreseeable future. This means that major events of international format or events of high national interest will not be able to be staged as currently experienced.

This also includes events such as the Olympic Games. The UK postponed its auctioning of the DD1 until after the games to ensure that enough spectrum was available to meet demand. The next Olympic Games will be in Paris 2024. Post DD2, how will Paris cope? Additionally, other major events will be affected; European and World Championships in Sports as well as the Mega-Events of Europe's most important sport: Soccer.

Peak events also include VIP visits, Teams or even institutions of very high interest for the general public. The span of these events ranges from the Papal visits to Music and Pop Stars, to Actors and also, popular politicians.

Peak events also include international political meetings or visits – no matter if it's on a European or World level. National Days, Conferences and also national elections. Already today, these events occupy the entire UHF-TV spectrum.

By its spectrum policy decisions it seems the EU does not want to support the diversity of interests, opinions, reporting and distribution of information for and to all of its citizens. If APWPT is wrong, APWPT kindly asks the EU to set clear signals to the CCI in supporting its needs.

Due to the importance of PMSE for CCI, and our society, APWPT's membership needs a long term strategy with concrete and reliable future spectrum access. Suitable alternative spectrum to compensate for future lack of access to the 700 MHz band needs to be identified before more frequencies are awarded to IMT and/or other spectrum users. In the view of APWPT, RSPG expectations that technical developments and better frequency usage planning will be sufficient to solve the issues, are not based in reality. Everyone has to be aware that spectrum which has been awarded to IMT and other users will, no longer, be available for PMSE applications.

APWPT and its members request that the RSPG and the European Commission takes the lead in securing PMSE's future. If this can be achieved, then production of high quality content will be future-proofed. If it cannot be achieved, then the consequences for content, jobs, economic contributions and professional standards could be profound.

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30 September 2017