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Shure's reply to

RSPG – Opinion on the ITU-R WRC 2023 [DRAFT]

For 97 years, Shure has been a leading manufacturer of high-quality, innovative audio products. The Headquarter for the European, African and Middle Eastern region of the US based company is located in Germany. Shure products (www.shure.com) are utilized worldwide in applications known as audio-PMSE (also known as SAB/SAP)[1], which includes deployments in industries such as broadcast and film production and other professional indoor and outdoor media content creation, in addition to a variety of other civic, business, and special event contexts. These applications continue to grow annually in scale and density to meet the needs of broadcast (incl. streaming) and event producers engaged in increasingly complex productions to meet audience expectations.

Shure welcomes the opportunity to share our view on agenda item 1.5 of the WRC 2023.

In particular, Shure agrees with the RSPG recommendation "that the European Commission proposes an EU position to the Council to ensure that the decision of WRC-23 on this Agenda item is compliant with the Decision (EU) 2017/899 providing priority to broadcasting and PMSE usage until at least end 2030."

RSPG further states that the above outlined recommendation is ensured by various options:

- One can be No Change at WRC-23, with a possible agenda item for WRC-27 or WRC-31.
- Another one can be a co-primary allocation to the mobile service which should become effective at a later stage (e.g. 31.12.2030).

Even if we support the No Change option, our interpretation of both options is that no additional mobile would be implemented in the band until after 2030 and that the situation for PMSE would remain unchanged until at least the end of 2030. We therefore agree with RSPG that the "EU Position on this agenda item should avoid ambiguity" and that EU countries should give priority to broadcasting and PMSE at least until the end of 2030.

[1] Services Ancillary to Broadcasting (SAB)/Services Ancillary to Programme making (SAP)

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Shure would even go one step further and kindly request that a long-term solution (beyond 2030) for PMSE should be found in the 470-694 MHz band, given the critical importance of this band for PMSE as explained in the following sections.

1. Importance of audio PMSE to content creation

PMSE can be considered the “pen and pencil” of the content production industry which includes web, theatre, adverts, films, sports, concerts and cultural events as emphasized in this video[2]. This is particularly relevant for Europe.

Today, it is virtually impossible to produce creative content without PMSE. Audio is of prime importance in the world of PMSE. Without the "audio" part of an event, CEOs, politicians, and entertainers cannot communicate with impact to their audience. Ultra-High Definition (UHD) video would be of little interest without high quality sound to accompany it.

Wireless microphones are ubiquitous to public life. They are widely used and relied upon in schools, houses of worship, government buildings, museums, and many other public places. The lives of most citizens are touched and enhanced by wireless microphones every day, whether in one of these places or by enjoying programs that were produced using wireless microphones. In all of these applications, wireless microphones must operate flawlessly. Interruptions, interference, and noise are not tolerated. This highlights the need for adequate amount of appropriate, clean spectrum.

During the Covid pandemic we have seen a transition driven by the resilience of the sector and the power of the human spirit that have found new ways of reaching not only that same audience as before but a more diverse, wider global audience as well. The demands for high-quality online content and meetings have dramatically increased worldwide.

- Facebook and Instagram report that 800 million people per day are watching live streams. The trend is projected to continue with 74% of live stream viewers saying they would continue to watch live streams even after concerts returned, and 70% would be willing to pay for live stream.

- In addition to the traditional live audiences, both recorded & live streams to cinemas globally opened a whole new audience. In the face of a pandemic, this has grown to include the online, on demand, live-streaming platforms – a new engagement that is here to stay. To tackle this growing demand globally, there is

[2] https://www.youtube.com/watch?v=9UnbcmVVKD8

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mention of Netflix spending $17 billion on content creation in 2020, rising to $26bn in 2026. In 2022, Disney is making a $33 billion investment in content creation, $8 billion more than for 2021.

2. Continued access to spectrum below 1 GHz for audio PMSE is critical for its future

The continued availability of sufficient, interference-free spectrum is key to meet growing demand for wireless PMSE technologies (e.g., wireless microphones, In-Ear-Monitor Systems).

A typical event production today needs 40 – 80 wireless microphones and in-ear monitoring systems with high quality of service, which requires more than 60 MHz of clean spectrum in the TV-UHF band below 1 GHz. Studies in Europe concluded that approximately 96 MHz are sufficient for the daily use of audio PMSE in the UHF band below 1 GHz [Lamy Report][3].

The 96 MHz requirement for daily use does not consider large events including events of national or global interest like the Olympics games. Those events do generate a very high “peak” demand, which might require more than 100 MHz of spectrum. For example, the EXPO 2020[4] in the United Arab Emirates (UAE) required 318 wireless microphone channels at the centre stage area and more than 1000 channels (each channel is 200 kHz wide typically) on the EXPO campus (ceremonies, pavilions, broadcaster including news gathering teams) amounting to much more than 100 MHz of spectrum.

Such special events require a very detailed frequency planning from a local frequency coordinator. This local frequency management might be in coordination with the national administration, which could setup a special license registration or could allow the use of special frequencies on a temporary basis.

The following figure shows the frequency management plan generated with Shure’s Wireless Workbench Frequency Management Software at EXPO 2020 in UAE.

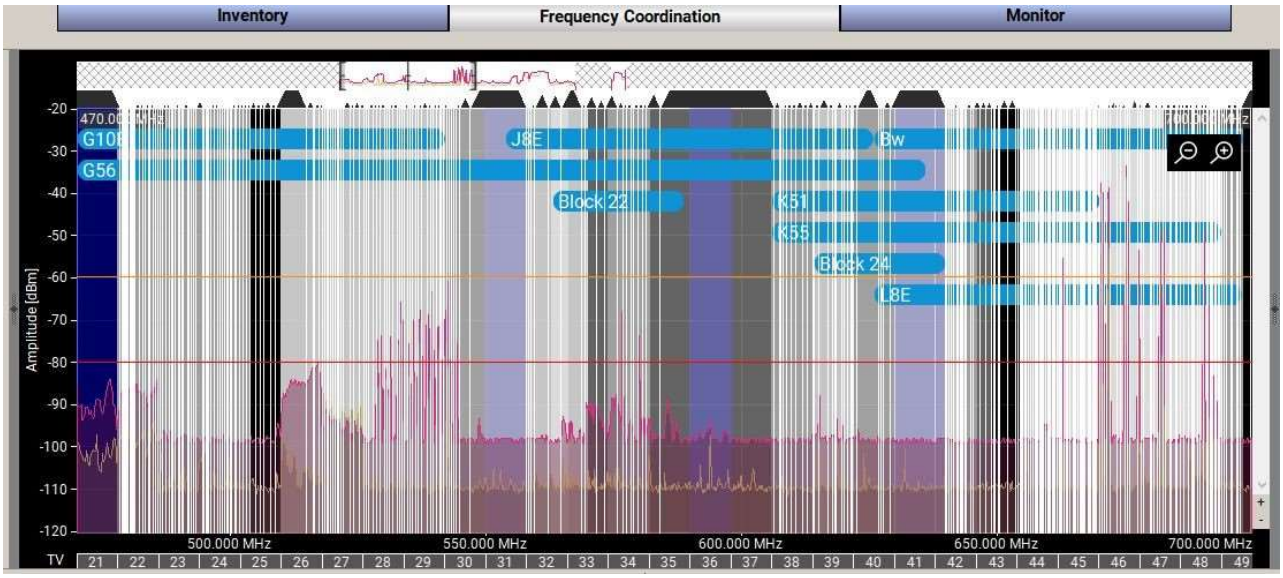
[3] https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=6721

[4] https://www.youtube.com/watch?v=Rb5m8nT7meo

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Picture legend:

- Scan from 470 – 700 MHz
- Blue vertical blocks (e.g., TV-channel 21 at 470 MHz and channel 36) indicate potential services, which need to be protected and therefore avoided.
- White lines show the planned and coordinated audio-PMSE devices

Required spectrum grows each year for medium and large events. A study conducted by Swiss Radio and Television[5] to determine the spectrum need for audio PMSE, categorizes daily spectrum requirement into; permanent use, events, and exceptional spectrum requirements. The study analyses data of 111 events over the past three relevant years. The spectrum requirements for audio PMSE are summarized as follows:

Daily spectrum requirement:

Permanent use

- Campus-Installations, which were considered in this analysis, require up to **110 MHz** spectrum in the UHF Band:
    - Example: Campus SRF Leutschenbach
    - Example: Seebecken in Zurich

[5] https://apwpt.org/wp-content/uploads/2022/03/Report-PMSE-Audio-spectrum-requirement.pdf

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Events

- Today the 82 analyzed **Small Events** (Events with less than 50 coordinated links) require prevailing **42 MHz** in the UHF Band:

    - Example sport: Engadiner Skimarathon, Fussball Super League
    - Example culture: Zürcher Sächsilüte, SRF bi de Lüt

- Today the 18 analyzed **Medium Events** (Events with 50-100 coordinated links) require prevailing **69 MHz** in the UHF Band:

    - Example politics: Local elections in Tessin
    - Example sport: Football national team games, Swiss Indoors Basel
    - Example culture: eidg. Jodlerfest, Film Festival Locarno

- Today the 11 analyzed **Large Events** (Events with 100-200 coordinated links) require prevailing **115 MHz** in the UHF Band:

    - Example politics: Federal council elections
    - Example sport: Ski races in Adelboden and Wengen (Lauberhorn)
    - Example culture: Gurtenfestival

Exceptional spectrum requirement:

- Major Events (events with more than 200 coordinated links) do not take place periodically. They have an exceptional cultural value and large media response at national and international level. There were 5 Major Events between 2016 and 2019 analyzed. They had together during **54 event days** (excl. setup & rehearsal) and average spectrum requirement of **174 MHz** in the UHF Band:

    - Example sport: Ski World Championship St. Moritz
    - Example culture: National wine festival “Fête de Vignerons”

Over the last decade we have seen audio PMSE spectrum reduce dramatically to go to the mobile service use while the demand for audio PMSE created content is experiencing significant growth driven by both the traditional audiences, mobile phone consumption and the new global audience realized by new delivery platforms as explained above. It is essential to recognize the significance and social and economic value of audio PMSE and the efforts the audio PMSE industry has made to improve spectral efficiency to mitigate the losses.

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The spectrum range from 470 to 698 MHz below the 700 MHz band is critical for audio PMSE and the biggest possible amount of spectrum in that frequency range should be allowed for audio PMSE so that it can continue to support content creation[6].

In summary, we respectfully ask the RSPG to take into account the PMSE spectrum needs in any future plans for bands below 1 GHz, especially for the 470 to 698 MHz range. The following section details the technical reasons to why audio PMSE requires access to the TV-UHF Band.

3. Technical considerations as to why audio PMSE needs access to the TV-UHF Band below 1 GHz

The TV-UHF band is and will likely remain the primary global spectrum band for wireless microphone operation. It has been successfully shared with television broadcasting services for many years on a cooperative basis. For technical reasons, UHF spectrum is uniquely suited and vitally important to the operation of these devices.

Wireless Microphones including In-Ear Monitors and Talkback Systems are highly portable devices that give users mobility, which is critical for many types of content production activities. As mobile devices, they are dependent on batteries, making power consumption, size, and weight important considerations. The characteristics of the spectrum in which wireless microphones operate are the single most important high-level determiner of power consumption and link reliability.

UHF spectrum below 1 GHz is ideal for wireless microphone applications from a technical standpoint.

One characteristic of the TV-UHF spectrum that makes it useful for wireless microphone operation is wavelength. Because wireless microphones are physically small devices, antenna size is an important consideration. In this UHF band, it is possible to obtain relatively good efficiency using antennas that fit inside the device or extend a short distance outside of it. Lower (e.g., VHF) frequencies require larger antennas for efficient operation. It is possible to use electrically short antennas, but this results in lower efficiency, narrower tuning range, or both. Lower efficiency causes higher power consumption and reduced transmission range.

Another characteristic of UHF spectrum that is relevant to wireless microphone operation is the ambient noise level. Electrical noise typically declines with frequency. Thus, the amount of background noise present at UHF frequencies is lower than at VHF

[6] https://www.cept.org/ecc/groups/ecc/cpg/cpg-ptd/client/meeting-documents/file-history/?fid=6860

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frequencies. The noise level is important because it determines how much power is required for a reliable radio link to be established. A higher noise level requires more transmitting power, which in turn means higher power drain and shorter operating time on batteries.

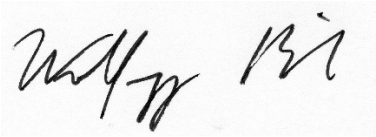
At frequencies above the 1 GHz range, both body absorption and path loss increase. Since wireless microphones are normally worn on the body or held in the hand, these losses have a negative impact on operation. Lab measurements indicate losses of 20 dB or more due to body absorption and shadowing. In addition, wireless microphone signals must often travel through obstructed paths like, e.g., the scenery on a theatre stage. Once again, this translates into a need for higher power, resulting in shorter battery life. UHF signals are better able to pass through such obstructions than higher frequency signals.

Reallocations and auctions of UHF television channels in some countries have dramatically reduced the amount of spectrum available for wireless microphones to use, particularly in cities where a great deal of content production takes place. In response, wireless microphone manufacturers have invested millions of dollars in developing spectrally efficient digital technologies. However, this technology requires clean spectrum in order to work properly.

In summary, we want to make sure that the spectrum needs for audio PMSE, especially in the bands below 1 GHz, are taken into account so that PMSE can continue to support various events and contribute to the society and economy of the European Union.

Please contact the undersigned if you have any questions.

Respectfully submitted,



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