



International Amateur Radio Union Region 1

IARU Region 1 SRLC – May 2024

Developing the amateur services in the 23cm band when considering ITU-R Recommendation M.2164

Background

Prior to the World Radio Conference WRC-23 the ITU-R Radio Assembly approved and published ITU-R Recommendation [M.2164](#) to provide guidance on technical and operational measures to be applied to the amateur and amateur satellite services to protect the radio navigation satellite service (RNSS) in the 23cm band (1240-1300 MHz). The WRC subsequently adopted a footnote in the Radio Regulations applicable to the frequency band 1240-1300 MHz that reminds administrations that any interference to the RNSS receivers from the amateur services should be acted upon and points to Recommendation M.2164 which provides guidance on how the potential for interference can be minimised.

In the European region, CEPT is developing spectrum decisions to harmonise and protect the GALILEO RNSS spectrum that will take into account the guidance detailed in M.2164.

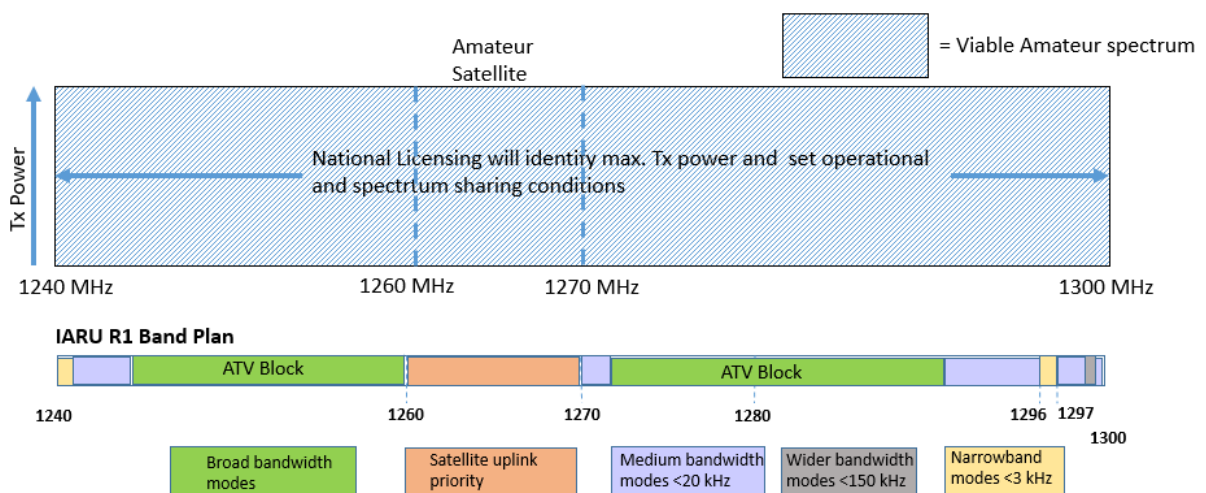


Figure 1: The currently allocated 23cm band alongside the IARU Region 1 band plan before any application of the M.2164 measures

The precise amount of spectrum available to amateur operators from the range above in any specific country depends on the national licensing arrangements and in some cases

additional nationally specific allocations exist. National regulations will also determine the maximum transmitter power levels and any other specific spectrum sharing or coordination conditions. In most countries the band is shared with other services.

The amateur service is allocated the range 1240 – 1300 MHz in the ITU-R Radio Regulations and the ERC Report 25. The allocation is a *secondary* allocation.

The amateur satellite service (E-s) is accommodated in the range 1260 -1270 MHz in the ITU-R Radio Regulations and the CEPT ERC Report 25. This is also on a *secondary* basis.

The GALILEO system in this band covers the range 1258.29 to 1299.21 MHz. This is identified as the RNSS E6 band.

Other RNSS systems in the band include:

- The GLONASS system starting below 1240 MHz and extending up to 1255.76 MHz.
- The COMPASS (Beidou) system covering 1256.52 to 1280.52 MHz.

ITU-R Recommendation M.2164

Generally, the measures in the Recommendation take the form of power and bandwidth limitations on amateur and amateur satellite operations in order to protect the RNSS. However, if all these measures are applied it will severely restrict the amount of usable spectrum for the amateur services and in some parts of the band effectively suppress any practical amateur service activity.

However, the guidance contained in the recommendation is not mandatory. The measures have been developed across the whole 1240-1300MHz frequency band to protect the global set of RNSS systems operating across the band which are GALILEO, GLONASS and COMPASS (BEIDOU). Each of these have been developed by specific countries in different regions of the world.

Different parts of the guidance can be implemented on a national or regional basis according to the system for which protection is sought. For the GALILEO system only the frequency range 1258 to 1300 MHz needs to be considered. In this case no “M.2164 measures” are required from 1240 to 1258 MHz to protect GALILEO receivers and amateur operations could continue as they do today without any new technical measures over and above the usual national licensing conditions that have been in place for many years.

Developing the Amateur Services

Experimentation and technical investigation are at the heart of amateur radio and sufficient spectrum that can be managed in a flexible way needs to be available to facilitate this. Today most countries assign 60 MHz of spectrum in the 23 cm band to the amateur services which in some cases needs to be coordinated with other services in the band. This bandwidth allows a harmonised part of the band to be set aside for narrow band long distance communication alongside other parts of the band with the capacity for broadband applications such as Amateur TV (ATV) and data networking. New experimentation is being explored to make use of wide band communication systems such as IMT LTE for example.

Many voice repeater stations across Europe operate today in the range 1270 to 1296 MHz that have been designed, built and financed by individual amateur operators and interest groups.

The impact of M.2164 across the 23cm band

If M.2164 is implemented across the entire 60 MHz available in the band, then the amount of viable spectrum (i.e. that is not subjected to a very restrictive power level) for the amateur service is reduced to 6.24 MHz. From this reduced bandwidth, 4 MHz is identified solely for narrow band applications. For broadband applications M.2164 identifies only 2.24 MHz which is shared with narrow band applications also.

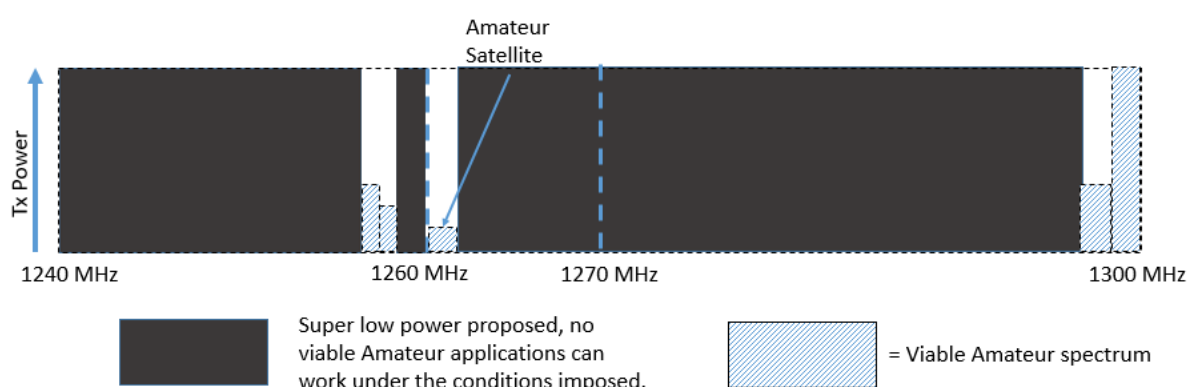


Figure 2: Parts of the 23cm band “blacked out” by the M.2164 measures from practical amateur use due to restrictive power level constraints.

If all the technical measures in M.2164 are implemented in their entirety then 51.76 MHz of the current 60 MHz band become unusable for any realistic amateur application due to the impractical low power levels proposed. This despite the clear statement in the WRC-23 Resolution 744 that removing the allocation was outside the scope of the WRC action.

Figure 2 shows this graphically. Amateur satellite spectrum is reduced from 10 MHz to just 2 MHz.

[ITU-R Report M.2532](#) (developed as a part of the ITU-R WRC-23 preparation under Resolution 774) details the wide range of amateur applications currently being deployed in the 23 cm band and it is clear that it will be extremely challenging to accommodate the majority of these activities in a band constrained by all the M.2164 measures.

Broadband amateur applications are only “allowed” by M.2164 in the 2.24 MHz wide range 1255.76 MHz to 1258 MHz. This barely enough for more than one digital amateur television channel. All the existing amateur ATV repeater stations would become redundant and analogue ATV applications are completely excluded. Broadband applications and experimentation will be severely curtailed. It will be impossible to find any additional spectrum for the amateur service to experiment and develop new wideband applications in the band.

There is no place for narrowband voice repeater channels currently accommodated in the 1270 to 1296 MHz range and these would either be scrapped or need to be re-engineered to be moved to the small portion around 1257 MHz putting even more pressure on this 2.24 MHz segment. In most countries there are many tens of repeater stations (e.g. in Germany there are around 90 such stations).

M.2164 elements for protecting GALILEO in CEPT

However, the guidance in M.2164 can easily be tailored to protect the GALILEO system specifically whilst maintaining the ability for amateur services to develop and without unnecessarily restricting the possibility for experimentation especially in the broadband area.

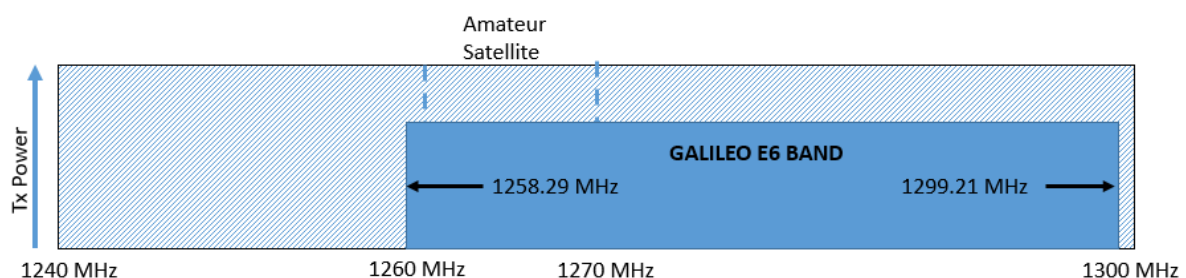


Figure 3: The GALILEO E6 band superimposed on the amateur 23cm band

In order to protect the GALILEO E6 spectrum shown in Figure 3, **only the measures from M.2164**

covering the range 1258 to 1300 MHz are required. No additional technical measures are required below 1258 MHz and the remainder of the band down to 1240 MHz can continue to be used as it is today. This is not inconsistent with the Recommendation which can allow administrations to take any specific measures they deem appropriate. This proposal is illustrated in Figure 4 below.

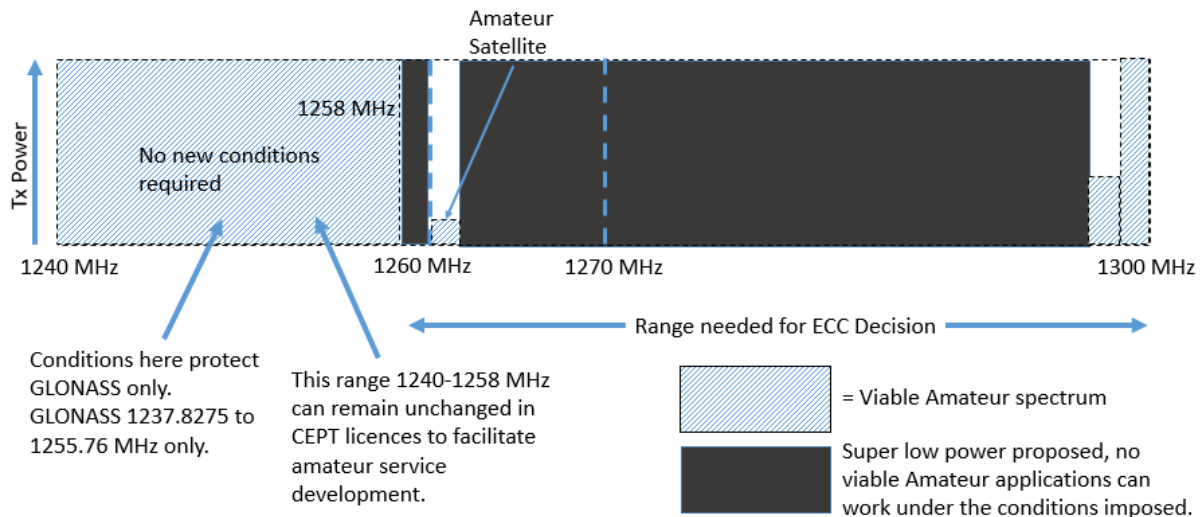


Figure 4: the 23cm band with M.2164 implemented over the range that protects the GALILEO system and allows amateur development.

Annex 1 identifies the specific elements from Recommendation M.2164 that will facilitate an arrangement shown in Figure 4. The number of operational amateur satellites using the 1260 – 1270 MHz frequency band is very small and all current usage is restricted to backup tele-command links in some countries outside of CEPT.

Conclusion

It is expected that CEPT will reflect the technical conditions from Recommendation M.2164 in an ECC Decision or that individual administrations may take their own steps to protect the GALILEO service in the E6 band. This document identifies the relevant parts of Recommendation M.2164 to achieve this without severely and unduly hampering the possibility for the amateur service to develop and experiment in the band.

Annex 1

The specific elements from M.2164

This annex identifies the specific technical measures from M.2164 needed to provide the protection to the GALILEO E6 as illustrated in fig 4 above. The greyed out parts are not required:

1) For **narrowband** (bandwidth ≤ 150 kHz) applications operating in the amateur service:

~~a) 1 240-1 255.76 MHz:~~

~~Maximum values of e.i.r.p.2:~~

~~-39.0 dBW in (150 kHz) for $-90^\circ \leq \theta < 0^\circ$~~

~~-39.0 dBW in (150 kHz) for $0^\circ \leq \theta < 5^\circ$~~

~~-39.0 - 1.05 ($\theta - 5$) dBW in (150 kHz) for $5^\circ \leq \theta < 25^\circ$~~

~~-60 dBW in (150 kHz) for $25^\circ \leq \theta < 90^\circ$,~~

~~where θ = elevation angle of amateur station antenna,~~

~~b) 1 255.76-1 256.52 MHz:~~

~~Maximum value of e.i.r.p.2 = 24 dBW,~~

~~• Out of band emissions below 1 255.76 MHz, should be as defined in point 1a) above.~~

~~c) 1 256.52-1 258 MHz: Maximum value of e.i.r.p.2 = 21 dBW~~

d) 1 258-1 296 MHz: Maximum value of e.i.r.p. = -17 dBW

e) 1 296-1 298 MHz: Maximum transmitter power = 17 dBW

f) 1 298-1 300 MHz: Maximum transmitter power = 22 dBW

- for narrowband Earth-Moon-Earth applications in the amateur service using a symmetric high-performance antenna (e.g. boresight gain at least 30 dBi) pointing at least 15 degrees above the horizontal:

a) 1 298-1 300 MHz: Maximum transmitter power = 27 dBW

2) For **narrowband** applications operating in the **amateur-satellite service** (Earth-to-space) (bandwidth ≤ 150 kHz):

a) 1 260-1 262 MHz:

Maximum value of e.i.r.p.:

-3 dBW for $0^\circ \leq \theta < 15^\circ$

17 dBW for $15^\circ \leq \theta < 55^\circ$

26.8 dBW for $55^\circ \leq \theta < 90^\circ$

where θ = elevation angle of amateur station antenna,

b) 1 262-1 270 MHz: Maximum value of e.i.r.p. = -17 dBW

3) For **broadband** (bandwidth > 150 kHz), including amateur television (ATV), applications operating in the amateur service:

~~a) 1 240-1 255.76 MHz:~~

~~Maximum values of e.i.r.p.2:~~

~~-39.0 dBW in (150 kHz) for $-90^\circ \leq \theta < 0^\circ$~~

~~-39.0 dBW in (150 kHz) for $0^\circ \leq \theta < 5^\circ$~~

~~-39.0 - 1.05 ($\theta - 5$) dBW in (150 kHz) for $5^\circ \leq \theta < 25^\circ$~~

~~-60 dBW in (150 kHz) for $25^\circ \leq \theta < 90^\circ$,~~

~~where θ = elevation angle of amateur station antenna,~~

~~b) 1 255.76-1 256.52 MHz: Maximum value of e.i.r.p.2 = 24 dBW/150 kHz,~~

~~• Out-of-band emissions below 1 255.76 MHz, should be as defined in point 3a) above.~~

~~c) 1 256.52-1 258 MHz: Maximum value of e.i.r.p.2 = 21 dBW/150 kHz~~

d) 1 258-1 300 MHz: Maximum value of e.i.r.p. = -17 dBW/1 MHz

The greyed and struck out elements above refer to the frequency range 1240 – 1258 MHz in which no specific measures are required or relevant to protect the GALILEO E6 band. In this range the amateur service can continue to operate as it does today based on the usual national licensing conditions.