

Frequency Plans and related procedures for the Mobile and Radionavigation Terrestrial Services

1 Introduction

Terrestrial services other than the broadcasting service represent a significant part of radiocommunication applications in terms of the spectrum occupancy and the number of stations under operation. About 87% of all frequency assignments to terrestrial services recorded in the Master International Frequency Register are assignments to stations in the fixed, mobile and other radiocommunication services (excepting the broadcasting service).

The international regulations for these terrestrial services may include requirements to station parameters, mandatory channeling arrangements, coordination procedures, etc and vary considerably from service to service. One of the important elements of these regulations is frequency planning as a mean of preserving the rights of all Member States in the context of equitable access to the limited radio resources (the frequency spectrum and the geostationary satellite orbit).

Currently, frequency allotment and assignment plans are established for maritime mobile, aeronautical mobile, maritime radionavigation and aeronautical radionavigation services as shown below:

- worldwide frequency allotment plan for coast radiotelephone stations operating in the exclusive maritime mobile bands between 4 000 and 27 500 kHz (Appendix **25** to RR);
- worldwide frequency allotment plan for the aeronautical mobile (OR) service in the exclusive bands between 3 025 and 18 030 kHz (Appendix **26** to RR);
- worldwide frequency allotment plan for the aeronautical mobile (R) service in the exclusive bands between 2 850 and 22 000 kHz (Appendix **27** to RR);
- regional frequency assignment plan for stations of the maritime mobile service in the MF bands in Region 1 (GE85-MM-R1);
- regional frequency assignment plan for stations of the aeronautical radionavigation service in the MF bands in Region 1 (GE85-MM-R1);
- regional frequency allotment plan for national channels in the MF band in the maritime mobile service in Region 1 (Resolution 5 of GE85-MM-R1);
- regional frequency assignment plan for stations of the radionavigation service (radiobeacons) for the European maritime area in the band 283.5 – 315 kHz (GE85-EMA).

This document presents the scope, technical principals and modification procedures of the above plans, as well as some specific operation and coordination procedures applicable to the planned services. Other non-broadcasting terrestrial services such as the fixed, land mobile are not covered by any frequency assignment or allotment plan and not considered in this presentation.

2 Aspects relating to the maritime mobile service

2.1 Frequency plans for the maritime mobile service

2.1.1 Frequency allotment plan for coast radiotelephone stations operating in the exclusive maritime mobile bands between 4 000 and 27 500 kHz (Appendix 25 to RR).

2.1.1.1 Scope of the Plan

The Frequency Allotment Plan of Appendix **25** to the RR covers radiotelephone channels in the HF exclusive maritime bands intended for duplex operation. It is based on a sharing of these radiotelephone channels among coast stations throughout the world. Administrations having allotments in the Plan can assign the allotted channels to any coast stations situated in the geographical area for which the allotments appear.

The Plan is contained in Section II of Appendix **25**. It lists 240 channels identified by a number, assigned and carrier frequencies and specifies the allotment areas for each channel. In some cases, it also specifies details on the service area, on the transmission characteristics, and on the agreed hours of operation.

2.1.1.2 Technical characteristics used in the Plan

The Plan is based on a specific channeling arrangement, comprising a uniform 3 kHz spacing between the reference frequencies of every two successive channels. Such an arrangement provides for the possibility of operating single-sideband telephony channels (class of emission J3E) with a bandwidth of 2.8 kHz. The coast radiotelephone stations must use the minimum power required to cover their service area. They may in no case use a peak envelope power above 10 kW per channel.

2.1.1.3 Procedure for Plan modification

An administration which do not have an allotment in Appendix **25** (**25/1.1.1**) or which need additional allotments (**AP 25/1.1.2**) have to follow the procedure prescribed in Section I of that Appendix before the frequencies can be brought into use. The same procedure is to be followed when an administration having an allotment in the Plan needs to replace that allotment by another in the same frequency band in order to improve its service (**AP 25/1.25**).

To this end, the administration sends the information listed in Appendix **4** to the RR to the Radiocommunication Bureau, which publishes it in a special section of the informational circular (BR IFIC) together with apparent incompatibilities between the proposed allotment and any other existing or proposed allotments. At the same time as sending the information to the Bureau, the administration shall seek the agreement of the administrations having an allotment in the same channel as the proposed allotment. After the publication of the special section any administration believing that its coast stations may be affected by the proposed allotment can become party to the procedure within two months from the date of the publication.

The administrations concerned attempt to reach agreement by common consent. The administration seeking agreement may also request the assistance of the Bureau in obtaining such agreement if an administration to which a request has been sent fails to acknowledge receipt of the request within forty-five days from the date of the BR IFIC or if it fails to give a decision within two months from the date of the BR IFIC or if there is continuing disagreement between the administrations. In case of non-reply or disagreement the Bureau shall examine the proposed allotment. If after the examination the Bureau reaches favourable finding it enters the allotment into the Plan. If after the examination the Bureau reaches an unfavorable finding, it shall then examine the proposed allotment from the point of view of harmful interference, which may be caused to the services on all the various channels in the band. Should the Bureau reach an unfavorable finding in each case, it shall determine the channel, which is the least affected and, if so requested by the administration seeking agreement, it shall enter the proposed allotment in this channel in the Plan.

The administration seeking agreement shall inform the Bureau of the results of its consultations with the administrations concerned. When the Bureau finds that the procedure has been applied with respect to each administration concerned, the Bureau shall publish its finding in a special section of the BR IFIC and bring the Plan up to date.

2.1.2 Frequency assignment plans for stations of the maritime mobile and aeronautical radionavigation service in the MF bands in Region 1 (GE85-MM-R1)

2.1.2.1 Scope of the Agreement

The Final Acts of the Regional Administrative Radio Conference for the Planning of the Maritime Mobile and Aeronautical Radionavigation Services (Region 1), Geneva, 1985 contain a Regional Agreement and an associated frequency assignment plans for these services.

The agreement applies to maritime mobile stations operating in the bands 415 - 495 kHz, 505 - 526.5 kHz, 1 606.5 - 1 625 kHz, 1 635 - 1 800 kHz and 2 045 - 2 160 kHz and to aeronautical radionavigation stations in the bands 415 – 435 kHz and 510 – 526.5 kHz for those administrations of Region 1 which are parties to the Agreement.

It also applies to the fixed and land mobile service stations to which the bands 1 606.5 - 1 625 kHz, 1 635 - 1 800 kHz and 2 045 - 2 160 kHz are allocated on a primary basis as well as to the radiodetermination service stations operating under provision No. **5.92** of the RR.

2.1.2.2 Technical characteristics used in the Plan for maritime mobile service

The Plan was based on the following technical characteristics:

- - class of emission A1A for *Morse telegraphy* in the bands 415-435 kHz and 435-526.5 kHz;
- class of emission F1B for *narrow-band direct-printing telegraphy* and *digital selective calling* in the bands 415-435 kHz, 435-526.5 kHz, 1 606.5-1 625 kHz and 2 141.5-2 160 kHz;
- class of emission J3E for *single-sideband telephony* in the bands 1 635-1 800 kHz and 2 045-2 141.5 kHz.

- Minimum field strength to be protected:
 - class of emission A1A
36.5 dB ($\mu\text{V/m}$) north of and on parallel 30° North, and
56.5 dB ($\mu\text{V/m}$) south of parallel 30° North;
 - class of emission F1B
Bands 415 - 435 kHz and 435 - 526.5 kHz
31.5 dB ($\mu\text{V/m}$) north of and on parallel 30° North, and
51.5 dB ($\mu\text{V/m}$) south of parallel 30° North;
Bands 1 606.5 - 1 625 kHz and 2 141.5 - 2 160 kHz
22.5 dB ($\mu\text{V/m}$) north of and on parallel 30° North, and
42.5 dB ($\mu\text{V/m}$) south of parallel 30° North;
 - class of emission J3E
37 dB ($\mu\text{V/m}$) north of and on parallel 30° North, and
57 dB ($\mu\text{V/m}$) south of parallel 30° North.

- Channel spacing shall be 0.5 kHz for A1A, F1B emissions and of 3 kHz for J3E emissions.

- Radiated power was derived from the minimum field strength to be protected at the edge of the coverage area. The power supplied to the antenna transmission line was derived from the e.m.r.p. by applying the following typical values of antenna gain relative to a short vertical antenna, which include the loss of the antenna coupling unit: - 7 dB in the bands below 526.5 kHz and -4 dB in the bands above 1 606.5 kHz.

2.1.2.3 Procedure for Plan modification for maritime mobile service

Article 4 of the Agreement contains a Plan modification procedure that is to be applied whenever an administration proposes to modify the characteristics of an assignment appearing in the Plan or to bring an additional assignment into use. Under this procedure, agreement is sought from all administrations whose assignments may be affected according to criteria specified in Annexes 5 and 6 to the Agreement. These assignments could be ones from the Plan or assignments recorded in the Master Register for stations of services to which the bands 1 606.5-1 625 kHz, 1 635-1 800 kHz and 2 045-2 160 kHz are allocated on a primary basis.

Proposing administration sends the parameters listed in Appendix 4 to the RR and the names of administrations with which agreement should be sought to the Radiocommunication Bureau. The Bureau examines the information received in order to identify the administrations affected and publishes the complete information in a special section of BR IFIC. At the same time the Bureau informs the affected administrations accordingly. After the publication of the special section any administration believing that it should have been included in the list of affected administrations can become party to the procedure.

The administrations concerned attempt to reach agreement by common consent. If an administration has not communicated its agreement or disagreement to the proposing administration within 90 days after the publication of the special section and within 15 days from the date of a reminder it is regarded as being unaffected.

After the expiry of the period 90 days and 15 days or when agreement has been reached the proposing administration shall inform the Bureau of the results indicating the agreed characteristics and the names of the administrations with which agreement has been reached.

If, after application of the procedure described in this section agreement has been reached with all administrations involved, the BR shall publish an appropriate modification to the Plan. In case of continuing disagreement the administrations concerned may use one of the methods for the settlements of disputes described in the appropriate Article of the Convention or they may agree to apply the Optional Additional Protocol to the Convention.

2.1.3 Frequency allotment plan for national channels in the MF band in the maritime mobile service in Region 1 (GE85-MM-R1)

Resolution 5 of the GE85-MM-R1 Conference contains allotment plans for national channels for Digital selective calling in the MF bands (3 channels in the band around 500 kHz, 8 channels in the band around 2 MHz). It also specifies the procedure for modification of these plans (“*invites further*”).

According to this procedure, the administrations, which wish to enter into a group in the allotment plan, or wishing to make modifications to the plan annexed to Resolution 5, are invited to coordinate the proposed changes with other interested and affected administrations.

The updated Plan is regularly published with every new edition of the List of Coast stations.

2.2 Procedures relating to coordination for maritime mobile service

Apart from the standard procedures for coordination that are applicable, as appropriate, to all terrestrial services (Procedure of Article 9 of the RR) there are no other mandatory coordination procedures for the maritime mobile service. There are recommended coordination procedure, such as the one of Resolution 339 (Rev. WRC-97): coordination of frequencies for the transmission of navigational and meteorological warnings (NAVTEX) on 490 kHz, 518 kHz or 4209.5 kHz. The operational coordination procedures to be applied are those established by the International Maritime Organization (IMO) taking into account the IMO NAVTEX Manual. IMO provides ITU with that coordination information on a regular basis and the information received from IMO is published by the Radiocommunication Bureau in the List of Coast Stations (see No. 20.7 of the RR).

Procedure of Resolution 300 for coordination of paired frequencies listed in Appendix 17 has been abrogated by WRC-2000. Consequently, as from 3 June 2000 paired frequencies in the HF bands reserved for narrow-band direct-printing telegraph and data transmission systems are subject only to the standard notification procedure.

3 Aspects relating to the maritime radionavigation service

3.1 Frequency assignment plan for stations of the radionavigation service (radiobeacons) for the European maritime area in the band 283.5–315 kHz (GE85-EMA)

3.1.1 Scope of the Agreement

The Final Acts of the Regional Administrative Radio Conference for the Planning of the Maritime Radionavigation Service (Radiobeacons), Geneva, 1985 contain a Regional Agreement and an associated Frequency Assignment Plan for the maritime radionavigation service. The agreement applies in the European Maritime Area to the band 283.5 – 315 kHz allocated to the maritime radionavigation service on a primary basis. It also applies to frequency assignments to stations of the aeronautical radionavigation service to which the same frequency band is allocated on a primary basis.

3.1.2 Technical characteristics used in the Plan

The Plan was established on the basis of class of emission A1A. However, the technical parameters also provide for composite emissions using both A1A and F1B. In addition, class of emission G1D may also be used, for those administrations wishing to transmit supplementary navigational information using narrow-band techniques, such as differential corrections of other radionavigation system (Omega, GPS, Loran-C, etc.), as envisaged in RR **5.73** and Resolution **602 (Mob-87)**. Minimum field strength to be protected is 34 ($\mu\text{V/m}$) north of and parallel 43° North, and 37.5 dB ($\mu\text{V/m}$) south of parallel 43° North.

3.1.3 Procedure for Plan modification

The Plan modification procedure is applied in conjunction of the notification procedure, immediately before the bringing the assignment into operation. It is based on seeking agreement between the administration proposing modification or addition to the Plan and all other administrations whose assignments may be affected.

Proposing administration sends the parameters listed in Appendix 4 and the names of administrations with which agreement should be sought or has already been reached to the Radiocommunication Bureau not earlier than 90 days before the date of bringing into use of the assignment. The Bureau shall consider this information as a notification in accordance with Article 11 of the RR and publish it in Part 1 of BR IFIC.

If after the examination of the assignment the Bureau reaches a favorable finding it shall record the assignment in the Master Register on a provisional basis. When assignment is brought into use the Bureau verifies whether agreement of all affected administrations has been obtained. If so, the assignment is retained in the Master Register, otherwise the Bureau asks proposing administration to delete the entry.

When the Bureau finds that the agreement of Contracting Members is not required or when the required agreement has been obtained, it shall update the master copy of the Plan.

4 Aspects relating to the aeronautical mobile service

Two types of aeronautical mobile service are defined in the RR:

- Aeronautical mobile (R) service: An aeronautical mobile service reserved for communications relating to safety and regularity of flight primarily along national or international civil air routes (No. **1.33**);
- Aeronautical mobile (OR) service: An aeronautical mobile service intended for communications, including those relating to flight coordination, primarily outside national or international civil air routes (No. **1.34**).

These two types of the aeronautical mobile service are governed by differentiated procedures, some of them are described in the RR and others, specially for the aeronautical mobile (R) service, in Annex 10 to the Convention of the International Civil Aviation Organization.

4.1 Frequency allotment plans for the aeronautical mobile services

The use of frequencies situated in an HF band allocated exclusively to the aeronautical mobile service is based on Frequency Allotment Plans:

- frequency allotment plan for the aeronautical mobile (OR) service in the exclusive bands between 3 025 and 18 030 kHz contained in Appendix **26** provides specific frequencies for particular geographical areas;
- frequency allotment plan for the aeronautical mobile (R) service in the exclusive bands between 2 850 and 22 000 kHz contained in Appendix **27** concerns the bands reserved for communications on civil aviation air routes within world or regional air route areas clearly defined in that Appendix, which do not necessarily coincide with the national frontiers of countries included within those areas.

4.1.1 Frequency allotment plan for the aeronautical mobile (OR) service in the exclusive bands between 3 025 and 18 030 kHz (Appendix 26 to the RR)

4.1.1.1 Scope of the Plan

Appendix **26** contains channeling arrangement for the carrier (reference) frequencies which should be used by aeronautical stations in the aeronautical mobile (OR) service in the bands allocated exclusively to that service between 3 025 kHz and 18 030 kHz. With the exception of the carrier (reference) frequencies 3 023 kHz and 5 680 kHz one or more frequencies may be assigned to any aeronautical station and/or aircraft station, in accordance with the Frequency Allotment Plan, as contained in Part III of the Appendix.

For each frequency channel the Plan specifies allotment areas that are the areas in which the aeronautical station can be situated and which coincides with all or part of the territory of the country, or of the geographical area.

4.1.1.2 Technical characteristics used in the Plan

The Plan was based on the following technical characteristics:

- class of emission used for telephony is J3E (single-sideband, suppressed carrier). Classes of emission used for telegraphy including automatic data transmission are A1A; A1B; F1B(A,H)2(A,B); (R,J)2(A,B,D); J(7,9)(B,D,X);
- bandwidth shall be up to 2.8 kHz, situated wholly within frequency channel concerned. For the aeronautical radiotelephone stations the upper sideband shall be employed, and the assigned frequency shall be 1 400 Hz higher than the carrier (reference) frequency;
- the transmitter power limits are specified in No AP 26/4.4 for each authorized class of emission. On the assumption that no antenna gain is involved, these transmitter powers result in a mean effective radiated power of 1 kW (for the aeronautical stations) and 50 W (for the aircraft stations).

4.1.1.3 Procedure for Plan modification

The provisions of Appendix 26, which entered into force on 12 October 1993, provide the following procedure for updating of the allotment arrangement of Appendix 26:

- when an administration which has no allotment in the allotment arrangement requests an allotment, the Bureau shall select an appropriate allotment and shall enter it in the allotment arrangement;
- when an administration submits a request for additional allotment, the corresponding allotment shall be entered in the allotment arrangement only if it is compatible with the remaining allotments;
- when an administration informs the Bureau that it renounces the use of an allotment, the allotment concerned is cancelled from the allotment arrangement.

4.1.2 Frequency allotment plan for the aeronautical mobile (R) service in the exclusive bands between 2 850 and 22 000 kHz (Appendix 27 to the RR)

4.1.2.1 Scope of the Plan

Appendix 27 contains channeling arrangement for the carrier (reference) frequencies which should be used by aeronautical stations in the aeronautical mobile (R) service in the bands allocated exclusively to that service between 2 850 kHz and 22 000 kHz. One or more frequencies may be assigned to any aeronautical station and/or aircraft station, in accordance with the Frequency Allotment Plan, as contained in Part II of Appendix 27.

The Plan is presented in two formats: allotment plan by areas and allotment plan in numerical order of frequencies. The definitions and descriptions of boundaries of major world air route areas (MWARAs), regional and domestic air routes (RDARAs), VOLMET areas are given in Part II of the Appendix.

4.1.2.2 Technical characteristics used in the Plan

The Plan is based on the following technical characteristics:

The frequency separation between carrier (reference) frequencies shall be 3 kHz. The carrier (reference) frequency of the channels in the Plan shall be an integral multiple of 1 kHz. For radiotelephone emissions the audio frequencies are limited to between 300 Hz and 2 700 Hz and the occupied bandwidth of other authorized emissions is not exceed the upper limit of J3E emissions. In specifying these limits, however, no restriction in their extension is implied in so far as emissions other than J3E are concerned, provided that the limits of unwanted emissions are met;

Classes of emission used for telephony are J3E (on any plan frequency) and A3E, H3E (on frequencies 3 023 kHz and 5 680 kHz). Classes of emission used for telegraphy including automatic data transmission are A1A, A1B, F1B, H2B and any SSB (suppressed carrier) class of emission (e.g., J2B, J2D, J7B, J7D, J9B, J9D);

The peak envelope powers supplied to the antenna transmission line shall not exceed the maximum values indicated in the table of No. AP 27/60; the corresponding peak effective radiated powers being assumed to be equal to two-thirds of these values. It is assumed that the maximum peak envelope powers specified in the table mentioned above for aeronautical stations will produce the mean effective radiated power of 1 kW used as a basis for the interference range contours.

4.1.2.3 Procedure for Plan modification

There is no procedure for updating the Frequency Allotment Plan contained in Appendix 27 and the allotments contained in this Plan cannot be modified. An administration can, however, notify and bring into service assignments that are not contained in the Plan.

4.2 Procedures relating to coordination for the aeronautical mobile service

In the aeronautical mobile service, no special procedure is stipulated in the Radio Regulations regarding the coordination of a frequency assignment with the administrations concerned prior to bringing it into service. Coordination is, however, desirable to ensure that the proposed use will neither suffer nor cause harmful interference. If necessary, administrations may request the assistance of the Radiocommunication Bureau in coordinating appropriate frequencies for their aeronautical service.

ICAO and its regional offices play an active part in the coordination of aeronautical (R) service frequencies. Any administration requiring a new frequency for the (R) service (within the exclusive HF bands) or in the ICAO's regional air navigation Plans (in the band 117.975 - 137 MHz) should first of all consult the ICAO's regional office to coordinate the use of the new frequency.

For the use of frequencies allotted to the Worldwide Allotment Areas of the Plan in Appendix 27, the ITU and ICAO have established, in application of Recommendation 402 of WARC-79 and on the basis of requirements submitted by the administrations, a list for the coordinated use of frequencies for long-distance air operation communications. When this list contains no frequencies, which satisfy the requirements of a new frequency, the administration should ask the BR or ICAO to effect the required coordination for such use and to update the coordinated list.
