CHAPTER 5

Maritime mobile, amateur and amateur-satellite, and broadcasting services in MF and HF bands

(WRC-03 agenda items 1.2, 1.7, 1.9, 1.10, 1.14, 1.23, 1.36)

CONTENTS

5.1 Agenda item 1.2

"to review and take action, as required, on No. **5.134** and related Resolutions **517 (Rev.WRC-97)** and **537 (WRC-97)** and Recommendations **515 (Rev.WRC-97)**, **517 (HFBC-87)**, **519 (WARC-92)** and Appendix **11**, in the light of the studies and actions set out therein, having particular regard to the advancement of new modulation techniques, including digital techniques, capable of providing an optimum balance between sound quality, bandwidth and circuit reliability in the use of the HF bands allocated to the broadcasting service"

Resolutions **517 (Rev.WRC-97)**

Transition from double-sideband to single-sideband or other spectrum-efficient modulation techniques in the high-frequency bands between 5 900 kHz and 26 100 kHz allocated to the broadcasting service

Resolution **537 (WRC-97)**

Survey of HF broadcasting transmitter and receiver statistics as called for in Resolution **517 (Rev.WRC-97)**

Recommendation **515 (Rev.WRC-97)**

Introduction of high-frequency broadcasting transmitters and receivers capable of operation with spectrum-efficient modulation techniques

Recommendation **517 (HFBC-87)**

Relative RF protection ratio values for single-sideband (SSB) emissions in the HF bands allocated exclusively to the broadcasting service

Recommendation **519 (WARC-92)**

Introduction of single-sideband (SSB) emissions and possible advancement of the date for cessation of the use of double-sideband (DSB) emissions in the HF bands allocated to the broadcasting service

5.1.1 Summary of technical and operational studies, including a list of relevant ITU-R Recommendations

ITU-R studies on the digital modulation techniques for use in the HF bands allocated to the broadcasting service have been carried out leading to a number of ITU-R Recommendations. Text regarding service requirements (Recommendation ITU-R BS.1348), system characteristics (Recommendation ITU-R BS.1514), and planning parameters (DNR ITU-R BS.[Doc. 6/324]) for digital broadcasting at frequencies below 30 MHz have been developed.

In relation to concerns that broadcasting services may face some constraints after 1 April 2007 in the bands identified in footnotes Nos. **5.136**, **5.143**, **5.146**, **5.147** and **5.151**, there are several ways in which administrations can ensure that harmful interference is not caused to the broadcasting service by other national services in those bands.

High frequency circuits can be managed in such a way as to avoid ionospheric propagation where the application requires only limited ranges. For instance, operating at high frequencies at night and at low frequencies during daylight. Vertical incident propagation using ionospheric propagation may be restricted in range by a suitable choice of antennas.

Fixed and/or mobile services using such management techniques can be operated so that their transmissions do not propagate via the ionosphere and thereby avoiding causing harmful interference to the broadcasting service.

5.1.2 Analysis of the results of studies

This agenda item is directed towards the introduction of digital modulation techniques for broadcasting in the HF bands. The modulation techniques to be considered under this agenda item may be limited to just the digital modulation techniques recommended in Recommendation ITU-R BS.1514.

The analytic results of the studies conducted during the last several years are reflected in Recommendations ITU-R BS.1348 and BS.1514 and in the protection ratios tabulated in DNR ITU-R BS.[Doc. 6/324].

5.1.3 Methods to satisfy the agenda item and their advantages and disadvantages

The complete set of revised and new texts described herein comprises an effective example of accommodating the introduction of digital modulation in the HFBC bands.

Component 1 Revision of Resolution 517 (Rev.WRC-97)

Example of a proposed revision is contained in Annex 5.1-1.

Component 2 Revision of RR Appendix 11

Example of a proposed revision is contained in Annex 5.1-2.

Component 3 New Recommendation [YYY] (WRC-03)

Example of a proposed new Recommendation [YYY], which contains protection ratios associated with the introduction of digital modulation in the HF BC bands, is contained in Annex 5.1-3.*

Component 4 Revision of Recommendation 517 (HFBC-87)

Example of a proposed revision is contained in Annex 5.1-4.

Component 5 Revision of No. 5.134

The purpose of the revision is to promote the use of digital modulation techniques for broadcasting and to clarify the conditions of access to the WARC-92 extension bands by the BS.

In order to protect existing use of these bands by the fixed and certain mobile services until the envisaged implementation date for the WARC-92 extension bands for HF broadcasting, the bands will only become available to the broadcasting service from 1 April 2007. The access date of 1 April 2007 corresponds to the end of the primary allocation of these bands to fixed or mobile services, as mentioned in Nos. **5.136**, **5.143**, **5.146** and **5.151**. And this provides the reasonably smooth transition necessary for these current services to find other bands which to move to in accordance with Resolution **21 (Rev.WRC-95)**.

Because the only conference currently planned prior to the 2007 implementation date is WRC-03, this revision deletes reference to the decisions of a future competent conference. WRC-03 is fully competent to determine the implementation date as it chooses.

Example of a proposed revision is contained in Annex 5.1-5.

Component 6 Suppression of Resolution 537 (WRC-97)

The information from this Resolution was submitted by the Director to WRC-2000. This has assisted in formulating the approach taken in developing proposals relating to agenda item 1.2. It is

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* One administration has opposed the adoption of DNR ITU-R BS.[Doc.6/324] which has a bearing on proposed new Recommendation [YYY] (WRC-03).

felt that there would be no added benefit in continuing this survey and accordingly this Resolution may be suppressed.

Component 7 Suppression of Recommendation 515 (Rev.WRC-97)

This Recommendation was updated at WRC-97 to reflect the interests in developing digital systems for HF broadcasting. The development of such a system has moved on apace since then and Recommendation ITU-R BS.1514 has been approved and the IEC has been informed of this development. So Recommendation **515 (Rev.WRC-97)** may be suppressed.

Component 8 Suppression of Recommendation 519 (WARC-92)

There is concern within many administrations, expressed on many occasions at WRC-97, that the introduction of SSB into HF broadcasting should not restrict the ability of administrations to continue with their existing DSB transmissions for the foreseeable future and that at this point in time it is inappropriate to specify a cessation of DSB in favour of SSB in the year 2015. It is also evident from information presented at WRC-2000 by the Director, BR that the interest in SSB within HF broadcasting is virtually non-existent. This Recommendation may therefore be suppressed.

Component 9 Revision of RR Article 23

Example of a proposed revision is contained in Annex 5.1-6.

Component 10 Revision of Resolution 535 (WRC-97)

Example of a proposed revision is contained in Annex 5.1-7.

5.1.4 Regulatory and procedural considerations

See Annexes 5.1-1 through 5.1-7.

Resolution **537 (WRC-97)**, Recommendation **515 (Rev.WRC-97)** and Recommendation **519 (WARC-92)** may be suppressed.

ANNEX 5.1-1

Example of a proposed revision of Resolution 517 (Rev.WRC-97)

MOD

RESOLUTION 517 (Rev.WRC-03)~~(Rev.WRC-97)~~

Introduction of digitally modulated and single-sideband emissions~~Transition from double-sideband to single-sideband or other spectrum-efficient modulation techniques~~ in the high-frequency bands between 5 900 kHz and 26 100 kHz allocated to the broadcasting service

The World Radiocommunication Conference (Geneva, ~~1997~~2003),

considering

a) that digital techniques are being introduced into many existing services~~the high-frequency (HF) bands allocated to the broadcasting service between 5 900 kHz and 26 100 kHz are severely congested~~;

b) that digital and single-sideband (SSB) techniques allow more ~~efficient~~ effective utilization of the frequency spectrum than double-sideband (DSB) techniques;

c) that digital and SSB techniques enable reception quality to be improved;

~~*d)* that Recommendation **515 (Rev.WRC-97)** encourages the accelerated design and manufacture of SSB transmitters and receivers;~~

~~*e*~~*d)* relevant parts of Appendix **11** concerning the digital and SSB system specifications in the HF broadcasting services;

~~*f)* that rapid developments are taking place in digital sound broadcasting technologies;~~

e) that ITU-R in its Recommendation ITU-R BS.~~[Doc.6/63]~~1514 has recommended system characteristics for digital sound broadcasts in the broadcast bands below 30 MHz;

~~*g*~~*f)* that digital modulation ~~or other spectrum-efficient modulation~~ techniques are expected to provide the means to achieve the optimum balance between sound quality, circuit reliability and bandwidth;

~~*h*~~*g)* that digitally modulated emissions can, in general, provide more efficient coverage than amplitude-modulated transmissions by using fewer simultaneous frequencies and less power;

~~*i)* that the lifetime of a transmitter is at least twenty years;~~

~~*j*~~*h)* that it ~~is~~ may be economically ~~un~~attractive, using current technology, to convert modern~~existing~~ conventional DSB broadcasting systems to ~~SSB~~digital operation in accordance with *considering d)* above;

~~*k*~~*i)* that some DSB transmitters have been used with digital modulation techniques without transmitter modifications;

~~*l)* that the lifetime of a receiver is of the order of ten years;~~

~~*m*~~*j)* that ITU-R is carrying out ~~urgent~~further studies on the development of broadcasting using digitally modulated~~ion~~ emissions in the bands allocated to the broadcasting service below 30 MHz~~;~~,

~~*n)* that other spectrum-efficient modulation techniques may be developed in the future,~~

resolves

1 that the early introduction of digitally modulated emissions as ~~procedure in the Annex to this Resolution shall be used for the purpose of ensuring an orderly transition from DSB to SSB or other spectrum-efficient modulation techniques~~ recommended by ITU-R in the HF bands between 5 900 kHz and 26 100 kHz allocated to the broadcasting service is to be encouraged;

2 that digitally modulated and SSB emissions shall comply with the characteristics specified in relevant parts of Appendix **~~S~~11**;

3 that whenever an administration replaces a DSB emission by an emission using digital or SSB modulation techniques, it shall ensure that the level of interference is not greater than that caused by the original DSB emission, and shall use RF protection values specified in Recommendations YYY (WRC-03) and 517 (Rev.WRC-03);

~~[~~4 ~~2~~that the ~~final date for the cessation~~ continued use of DSB ~~emissions specified in the Annex to this Resolution shall~~may be periodically reviewed by future competent ~~future~~ world radiocommunication conferences in the light of the latest available complete statistics on the capability of administrations to introduce digital systems~~worldwide distribution of SSB and other spectrum-efficient modulation technique transmitters and receivers, as called for in Resolution **537 (WRC-97)**~~,

instructs the Director of the Radiocommunication Bureau

to compile and maintain the statistics referred to in *resolves* ~~2~~4, to make these statistics available to administrations and to submit summaries thereof to a competent future world radiocommunication conference~~s~~,

invites ITU-R

to continue its studies on digital techniques in HF broadcasting ~~as a matter of urgency~~ with a view to assist in the development of this technology for future use,

invites administrations

to set standards for HF broadcasting transmitters that includes the capability to offer digital modulation in all new transmitters put into service after 1 January 2004,

further invites administrations

1 to assist the Director of the Radiocommunication Bureau by providing the relevant statistical data and to participate in ITU-R studies on matters relating to the development and introduction of digitally modulated emissions~~transmissions~~ in the HF bands between 5 900 kHz and 26 100 kHz allocated to the broadcasting service~~.~~;

2 to bring to the notice of transmitter and receiver manufacturers the most recent results of relevant ITU-R studies on spectrum-efficient modulation techniques suitable for use at HF as well as the information referred to in *considering d)* and *e)*.

SUP

Annex to Resolution 517 (**Rev.WRC-97**)

ANNEX 5.1-2

Example of a proposed modification of Appendix 11

MOD

APPENDIX 11

System specifications for double-sideband (DSB), ~~and~~ single-sideband (SSB) and digitally modulated emissions ~~system specifications~~ in the HF broadcasting service

NOC

PART A – Double-sideband (DSB) system

MOD

PART B – Single-sideband (SSB) system

1 System parameters

1.1 Channel spacing

In a mixed DSB, SSB and digital environment~~During the transition period~~ (see Resolution **517 (Rev.WRC-03~~WRC-97~~)**), the channel spacing shall be 10 kHz. In the interest of spectrum conservation, ~~during the transition period,~~ it is also permissible to interleave SSB emissions midway between two adjacent DSB channels, i.e., with 5 kHz separation between carrier frequencies, provided that the interleaved emission is not to the same geographical area as either of the emissions between which it is interleaved.

In an all inclusive SSB environment, ~~After the end of the transition period~~ the channel spacing and carrier frequency separation shall be 5 kHz.

1.2 Equivalent sideband power

When the carrier reduction relative to peak envelope power is 6 dB, an equivalent SSB emission is one giving the same audio-frequency signal-to-noise ratio at the receiver output as the corresponding DSB emission, when it is received by a DSB receiver with envelope detection. This is achieved when the sideband power of the SSB emission is 3 dB larger than the total sideband power of the DSB emission. (The peak envelope power of the equivalent SSB emission and the carrier power are the same as that of the DSB emission.)

2 Emission characteristics

2.1 Nominal carrier frequencies

Nominal carrier frequencies shall be integral multiples of 5 kHz.

2.2 Frequency tolerance

The frequency tolerance shall be 10 Hz.[1]

2.3 Audio-frequency band

The upper limit of the audio-frequency band (at –3 dB) of the transmitter shall not exceed 4.5 kHz with a further slope of attenuation of 35 dB/kHz and the lower limit shall be 150 Hz with lower frequencies attenuated at a slope of 6 dB per octave.

2.4 Modulation processing

If audio-frequency signal processing is used, the dynamic range of the modulating signal shall be not less than 20 dB.

2.5 Necessary bandwidth

The necessary bandwidth shall not exceed 4.5 kHz.

2.6 Carrier reduction (relative to peak envelope power)

In a mixed DSB, SSB and digital environment ~~During the transition period~~ the carrier reduction shall be 6 dB to allow SSB emissions to be received by conventional DSB receivers with envelope detection without significant deterioration of the reception quality.

In an all inclusive SSB environment~~At the end of the transition period~~, the carrier reduction shall be 12 dB.

2.7 Sideband to be emitted

Only the upper sideband shall be used.

2.8 Attenuation of the unwanted sideband

The attenuation of the unwanted sideband (lower sideband) and of intermodulation products in that part of the emission spectrum shall be at least 35 dB relative to the wanted sideband signal level. However, since there is in practice a large difference between signal amplitudes in adjacent channels, a greater attenuation is recommended.

3 Characteristics of the reference receiver

The reference receiver has the main characteristics as given below. For more detailed characteristics see the relevant ITU-R Recommendations.

3.1 Noise limited sensitivity

The value of the noise limited sensitivity is equal to or less than 40 dB(μV/m).

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[1] See Note 21 of Appendix **2**.

3.2 Demodulator and carrier acquisition

The reference receiver is equipped with a synchronous demodulator, using for the carrier acquisition a device which regenerates a carrier by means of a suitable control loop which locks the receiver to the incoming carrier. The reference receiver should work as well with DSB emissions as with SSB emissions having a carrier reduced to 6 or 12 dB below peak envelope power.

3.3 Overall selectivity

The reference receiver has an overall bandwidth (at –3 dB) of 4 kHz, with a slope of attenuation of 35 dB/kHz.

NOTE – Other combinations of bandwidth and slope of attenuation are possible, as given below, and will provide the same performance at 5 kHz carrier difference.

Slope of attenuation	Overall bandwidth (–3 dB)
25 dB/kHz	3 300 Hz
15 dB/kHz	2 700 Hz

ADD

PART C – Digital system

1 System parameters

1.1 Channel spacing

The initial spacing for digitally modulated emissions use shall be 10 kHz. However, interleaved channels with a separation of 5 kHz may be used in accordance with the appropriate protection criteria appearing in Recommendation [**YYY] (WRC-03)**, provided that the interleaved emission is not to the same geographical area as either of the emissions between which it is interleaved.

1.2 Channel utilization

Channels using digitally modulated emissions may share the same spectrum or be interleaved with analogue emissions in the same HFBC band provided the protection to the analogue emissions is at least as great as that which is currently in force with analogue-to-analogue protection. To accomplish this may require that the digital spectral power density (and total power) be lower by several dB than is currently used for the same emission circuit using either DSB or SSB emissions.

2 Emission characteristics

2.1 Bandwidth and centre frequency

A full digitally modulated emission will have a 10 kHz bandwidth with its centre frequency at any of the 5 kHz centre frequency locations in the same channel raster within the HFBC bands.

Among several possible "simulcast" modes are those having a combination of analogue and digital emissions of the same programme in the same channel, that may use a digital emission of 5 kHz or 10 kHz bandwidth, next to either a 5 kHz or 10 kHz analogue emission. In all cases of this type, the 5 kHz interleaved raster used in HFBC shall be adhered to in placing the emission within the HFBC bands.

2.2 Frequency tolerance

The frequency tolerance shall be 10 Hz[1].

2.3 Audio frequency band

Digital source coding within a 10 kHz bandwidth, taking account of the need for various levels of error avoidance, detection and correction coding emission mitigation, can range from the equivalent of monophonic FM (approximately 15 kHz) to low level speech codec performance of the order of 3 kHz. The choice of audio quality is connected to the needs of the broadcaster/listener, and includes such characteristics to consider as the propagation channel conditions expected. There is no single specification, only the upper and lower bounds noted in this paragraph.

2.4 Modulation

Quadrature amplitude modulation (QAM) with Orthogonal frequency division multiplexing (OFDM) shall be used. 64 QAM is feasible under many propagation conditions; others such as 32, 16 and 8 QAM are specified for use when needed.

ANNEX 5.1-3

Example of a proposed Recommendation [YYY] (WRC-03)

DRAFT RECOMMENDATION [YYY] (WRC-03)

RF protection ratios associated with digitally modulated emissions in the HF bands allocated exclusively to the broadcasting service

The World Radiocommunication Conference (Geneva, 2003),

considering

a) that this Conference has resolved to encourage the introduction of digitally modulated emissions in the high-frequency broadcast bands allocated exclusively to the broadcasting service;

b) that the current use of the spectrum is based on the use of double-sideband (DSB) emissions;

c) that RF co-channel and adjacent channel protection ratios are among the fundamental parameters when determining compatibility;

d) that this Conference has adopted [Resolution **517 (Rev.WRC-03)**] relating to the introduction of digitally modulated emissions in the HF bands allocated exclusively to the broadcasting service;

e) that [Part C of Appendix **11**] contains digital system specifications that refer to this Recommendation for matters dealing with appropriate protection ratios,

recommends

that in the application of Article **12**, the protection ratios specified in the Annex to this Recommendation be used for all those cases where digitally modulated emissions operate in the same bands as double-sideband analogue emissions.

ANNEX TO RECOMMENDATION YYY (WRC-03)

RF protection ratio values

1) In accordance with [Resolution **517 (Rev.WRC-03)**] digital modulation may be used in any of the HF bands allocated exclusively to the broadcasting service. This accommodation has to be made with the appropriate amounts of protection given to both analogue and digital emissions. RF protection ratios are part of the overall regulation of these emissions. Their values appear in the table in this annex.

2) The table consists of RF protection ratios for co-channel and adjacent channel conditions. The independent variable in the table is the centre frequency separation in kHz of any pair of emissions, wanted vs. unwanted. The table provides the required relative protection ratios for the DRM mode (Mode B3) that will be used extensively for HF skywave broadcasting in 10 kHz channels. The ratio data are in decibels.

3) The digital modulation governing these protection ratios is that which appears in summary in [Part C of Appendix **11**, as revised at this conference] and the analogue modulation is double-sideband modulation as summarized in Part A of the same appendix.

TABLE

Relative RF protection ratios (dB) between broadcasting systems below 30 MHz, and Digital (64-QAM, protection level No. 1) interfered with by Digital (identical robustness modes and spectrum occupancy types)

Wanted signal	**Unwanted signal**	**Frequency separation $f_{unwanted}$-f_{wanted} (kHz)**									**Parameters**	
		–20	**–15**	**–10**	**–5**	**0**	**5**	**10**	**15**	**20**	**B_{DRM} (kHz)**	**S/I (dB)**
AM	DRM_B3	–47	–42	–32	3	6	3	–32	–42	–47	10	–
DRM_B3	AM	–54	–48	–40	–3	0	–3	–40	–48	–54	10	7
DRM_B3	DRM_B3	–53	–47	–38	–3	0	–3	–38	–47	–53	10	16

AM: DSB AM signal

DRM_B3: DRM signal, robustness mode B, spectrum occupancy type 3

B_{DRM}: Nominal bandwidth of DRM signal

S/I: Signal-to-interference ratio for a BER of 10^{-4}

NOTE - For more complete and accurate information draft new Recommendation ITU-R BS.[Doc. 6/324] should be used.

ANNEX 5.1-4

Example of a revised Recommendation 517 (HFBC-87)

MOD

RECOMMENDATION 517 (~~HFBC-87~~REV.WRC-03)

~~Relative~~ RF protection ratio values for single-sideband (SSB) emissions in the HF bands allocated exclusively to the broadcasting service

The World ~~Administrative Radio~~ Radiocommunication Conference ~~for the Planning of the HF Bands Allocated to the Broadcasting Service~~ (Geneva, 2003 ~~1987~~),

considering

a) that WRC-97 ~~the Conference has~~ adopted Article **~~S~~12** as the seasonal ~~a method for the~~ planning procedure for ~~of~~ the HF bands allocated exclusively to the broadcasting service;

b) that this ~~method~~ procedure is based principally on the use of double-sideband (DSB) emissions;

c) that the RF co-channel protection ratio is one of the fundamental planning parameters;

d) that ~~the~~this Conference has adopted Resolution **517 (Rev.WRC-03)** relating to the ~~transition~~ introduction of digitally modulated and ~~from DSB to~~ SSB emissions in the HF bands allocated exclusively to the broadcasting service ~~and Recommendation **515** relating to the introduction of transmitters and receivers capable of both DSB and SSB modes of operation~~;

e) that the SSB system characteristics for HF broadcasting are contained in Appendix **11**;

~~*f)* that, however, due to their provisional nature, the values of the relative RF protection ratio to be applied for all relevant combinations of wanted and unwanted DSB and SSB emissions have not been included in the Appendix mentioned in *considering e)*~~;

~~g~~f) that ~~preliminary~~ studies have shown that SSB emissions may require a lower RF co-channel protection ratio for the same reception quality~~;~~,

~~*h)* Resolution **514 (HFBC-87)*** relating to the procedure to be applied by the Radio Regulations Board and the Bureau in the revision of relevant parts of their Technical Standards used for HF broadcasting~~,~~

recommends

that, in the preparation of the relevant Rules of procedure for the application of Article 12, the Bureau should use~~subject to the procedure to be applied by the Radio Regulations Board and the Bureau in the revision of relevant parts of their Technical Standards used for HF broadcasting given in Resolution **514 (HFBC-87)*** ~~, the values of ~~relative~~ RF protection ratio given in the Annex to this Recommendation ~~be used by the Bureau in its Technical Standards~~ relating to SSB and DSB emissions in the HF bands allocated exclusively to the broadcasting service~~;~~.

~~* This Resolution was abrogated by WRC-97.~~

~~*invites the ITU-R*~~

~~to continue to study the values of relative RF protection ratio for the different cases and frequency separations covered in the Annex to this Recommendation,~~

~~*and recommends administrations*~~

~~to participate actively in these studies.~~

ANNEX TO RECOMMENDATION 517 (~~HFBC-87~~Rev.WRC-03)

~~Relative~~ RF protection ratio values

1 The values of ~~relative~~ RF protection ratio given in the table should be used whenever SSB emissions in conformity with the specification in Appendix **11** are involved in the use of the HF bands allocated exclusively to the broadcasting service.

~~2 The values given refer to the case of co-channel DSB wanted and unwanted signals for the same reception quality.~~

~~3~~2 For the reception of DSB and SSB (6 dB carrier reduction relative to peak envelope power) wanted signals, a conventional DSB receiver with envelope detection designed for a channel spacing of 10 kHz is assumed.

~~4~~3 For the reception of an SSB wanted signal (12 dB carrier reduction relative to peak envelope power), the reference receiver as specified in Appendix **11**, Part B, § 3, is assumed.

~~5~~4 SSB signals with 6 dB carrier reduction relative to peak envelope power assume equivalent sideband power as specified in Appendix **11**, Part B, § 1.2.

~~6~~5 The figures for case 2 in the following Table relate to a situation where the centre frequency of the intermediate frequency pass-band of the DSB receiver is tuned to the carrier frequency of the wanted SSB signal. If this is not the case, the value for a difference of +5 kHz may increase to –1 dB.

~~Relative~~ RF protection ratio values with reference to the co-channel RF protection ratio for DSB wanted and unwanted signals (dB)[1] for use in the HF bands allocated exclusively to the broadcasting service

	Wanted signal	**Unwanted signal**	**Carrier frequency separation *f* unwanted – *f* wanted, Δ*f* (kHz)**								
			–20	**–15**	**–10**	**–5**	**0**	**+5**	**+10**	**+15**	**+20**
1	DSB	SSB (6 dB carrier reduction relative to p.e.p.)	–51	–46	–32	+1	3	–2	–32	–46	–51
2	SSB (6 dB carrier reduction relative to p.e.p.)	DSB	–54	–49	–35	–3	0	–3	–35	–49	–54
3	SSB (6 dB carrier reduction relative to p.e.p.)	SSB (6 dB carrier reduction relative to p.e.p.)	–51	–46	–32	+1	0	–2	–32	–46	–51
4	SSB (12 dB carrier reduction relative to p.e.p.)	SSB (12 dB carrier reduction relative to p.e.p.)	–57	–57	–57	–45	0	–20	–47	–52	–57

[1] Frequency separation Δ*f* less than –20 kHz, as well as Δ*f* greater than 20 kHz, need not be considered.

ANNEX 5.1-5

Example of a proposed revision of RR No. 5.134

MOD

5.134 The ~~use of the~~ bands 5 900-5 950 kHz, 7 300-7 350 kHz, 9 400-9 500 kHz, 11 600-11 650 kHz, 12 050-12 100 kHz, 13 570-13 600 kHz, 13 800-13 870 kHz, 15 600-15 800 kHz, 17 480-17 550 kHz and 18 900-19 020 kHz ~~by~~ are allocated to the broadcasting service as from 1 April 2007 and are subject to the procedure of Article 12.~~is limited to single-sideband emissions with the characteristics specified in Appendix **11** or to any other spectrum-efficient modulation techniques recommended by ITU-R. Access to these bands shall be subject to the decisions of a competent conference.~~ ~~(WRC-97)~~ Administrations are encouraged to use these bands to facilitate the introduction of digitally modulated emissions in accordance with the provisions of Resolution **517 (Rev.WRC-03)**.

ANNEX 5.1-6

Example of a proposed modification of Article 23

MOD

ARTICLE 23

23.12 § 3 Double-sideband, ~~and~~ single-sideband and digitally modulated transmitting stations operating in the HF bands allocated exclusively to the broadcasting service shall meet the system specifications contained in Appendix **11**.

ANNEX 5.1-7

Example of a proposed revision of Resolution 535 (WRC-97)

MOD

RESOLUTION 535 (REV.WRC-03) ~~(WRC-97)~~

2 Software modules

DESCRIPTION 1

Methodology and data

MOD Paragraph 3

The software should calculate the field strength values and the fading margins at each test point inside the required service area for each of the frequency bands declared to be available, taking account of the relevant transmitting antenna characteristics for each frequency band. The desired RF signal-to-noise ratio should be user selectable with a default value of 34 dB in the case of DSB and as provided in the current ITU-R Recommendation[1] in the case of digital emissions.

DESCRIPTION 3

Specification of input data for a requirement

MOD Indent 13

– modulation choice, to specify if the requirement is to use double-side band (DSB), ~~or~~ single-side band (SSB) (see Recommendation ITU-R BS.640) or digital emission (see Recommendation ITU-R BS.1514). This field may be used to identify any other type of modulation when this has been defined for use by HFBC in an ITU-R Recommendation;

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[1] Draft new Recommendation ITU-R BS.[Doc. 6/324].

DESCRIPTION 4

Methodology and data

MOD Paragraph 4

The desired RF signal-to-noise and RF protection ratios should be user selectable, the default values being 34 dB and 17 dB (DSB-to-DSB co-channel case), respectively. In the case of digital emissions, the corresponding values are as provided in the current ITU-R Recommendation[1]. The ~~latter~~ values for RF protection ratios should be used by the Bureau for its compatibility analyses.

##########

5.2 Agenda item 1.7

"to consider issues concerning the amateur and amateur-satellite services:

5.2.1 Agenda item 1.7.1

"possible revision of Article **25**"

5.2.1.1 Article 25.1

The conference may consider the suppression of No. **25.1** prohibiting international communications under certain conditions. It is the sovereign right of each Member State to regulate its telecommunications. If an administration chooses to prohibit international communications, it should be the concern of the administration to enforce this rule and not a general obligation.

Advantages:

- Simplify the Radio Regulations.
- Clarify the status of international radio communications following a disaster.
- Reduce the cost of ITU paper work regarding the notification for the objection of such communications.
- Still retaining the sovereign right of the State to regulate its communications.

Disadvantage:

None have been identified.

5.2.1.2 Article 25.2

The conference may consider simplifying and shortening the text of No. **25.2**, which defines the content of amateur communications.

An example of such modification could be:

MOD

25.2 ~~§ 2 1) When t~~Transmissions between amateur stations of different countries ~~are permitted, they~~ shall be ~~made in plain language and shall be~~ limited to communications incidental to the purposes of the amateur service, as defined in No. **1.56** ~~messages of a technical nature relating to tests and to remarks~~ or of a personal character ~~for which, by reason of their unimportance, recourse to the public telecommunications service is not justified~~. Transmissions between amateur stations shall not be encoded for the purpose of obscuring their meaning.

Advantages:

- Simplify the Radio Regulations.
- Clarify the ambiguous wording.
- Take into account changes in telecommunications.
- Eliminate obsolete restrictions while retaining the non-commercial nature of the service.

Disadvantage:

None have been identified.

5.2.1.3 Article 25.3

5.2.1.3.1 Method A

The Conference may further consider revising No. **25.3** with regard to international communications. As several administrations currently permit this kind of communication, the general rule of the Radio Regulations should be to allow it unless an administration chooses to prohibit it.

An example of such modification could be:

MOD

25.3 2) ~~It is absolutely forbidden for a~~Amateur stations ~~to~~ may be used for transmitting international communications on behalf of third parties unless objected to by one of the administrations concerned.

Advantages:

- Simplify the Radio Regulations.
- Removes the burden for the administration.

Disadvantage:

None have been identified.

5.2.1.3.2 Method B

The conference may consider suppressing No. **25.3** with regard to international communications. As some administrations currently permit this kind of communication, the general rule of the Radio Regulations should be to allow it unless an administration chooses to prohibit it.

Advantages:

- Simplify the Radio Regulations.
- Removes the burden for the administration enter into specific bi-lateral or multi-lateral international agreements to permit the transmission of third party communications by amateur stations.
- Other regulations are sufficient to protect the non-commercial nature of the service.

Disadvantage:

None have been identified.

5.2.1.4 Article 25.4

In consequence with the above proposals the conference may consider the suppression of No. **25.4**.

Advantage:

Simplify the Radio Regulations.

Disadvantage:

None have been identified.

5.2.1.5 Article 25.5

5.2.1.5.1 Method A

The question of whether there should be a domestic Morse code requirement should be left up to administrations. In consequence the conference may consider the suppression of No. **25.5**.

Advantages:

- This would give administrations further flexibility in revising and updating the qualifications related to the use of Morse code.
- Abolition of the requirement for the knowledge of Morse code in the HF bands will increase the number of radio amateurs available for communications during disaster situations.
- Abolition of the requirement for the knowledge of Morse code in the HF bands will produce a significant increase in the number of radio amateurs licensed to operate below 30 MHz. This will possibly encourage newcomers into the service.
- May encourage the development of Amateur Services.

Disadvantages:

- Abolition of the requirement for the knowledge of Morse code in the HF bands will produce a significant increase in the number of radio amateurs licensed to operate below 30 MHz, possibly leading to a congestion of the amateur bands.
- Eliminating the requirement for knowledge of Morse code might lower the level of proficiency.

5.2.1.5.2 Method B

The conference may consider modifying No. **25.5** in such a way that Morse code is no longer mandatory but if an administration chooses to require Morse code, it should be the concern of the administration to apply such a rule and not an international obligation.

An example of such modification could be:

MOD

25.5 § 3 1) Administrations shall determine whether or not a person seeking a licence to operate an amateur station shall prove that this person is able to correctly send texts in Morse code signals.~~Any person seeking a licence to operate the apparatus of an amateur station shall prove that he is able to send correctly by hand and to receive correctly by ear, texts in Morse code signals. The administrations concerned may, however, waive this requirement in the case of stations making use exclusively of frequencies above 30 MHz.~~

Advantage:

Encourages the maintaining of the Morse code skill in the amateur services.

Disadvantages:

- Discourages a global harmonization of amateur services.
- May discourage the development of amateur services.

5.2.1.6 Article 25.6

5.2.1.6.1 Method A

The Conference may consider modifying No. **25.6**.

An example of such modification could be:

MOD

25.6 2) Administrations shall verify the operational and technical qualifications of any person wishing to operate the apparatus of an amateur station.~~Administrations shall take such measures as they judge necessary to verify the operational and technical qualifications of any person wishing to operate the apparatus of an amateur station.~~

Advantage:

Simplifies the Radio Regulations.

Disadvantage:

None have been identified.

5.2.1.6.2 Method B

The conference may consider modifying No. **25.6** such that Recommendation ITU-R M.1544 becomes mandatory through the principle of incorporation by reference. See Resolution **27 (Rev.WRC-2000**).

An example of such modification could be:

MOD

25.6 2) Administrations shall ~~take such measures as they judge necessary to~~ verify the operational and technical qualifications of any person wishing to operate ~~the apparatus of~~ an amateur station. A person seeking a licence to operate an amateur station shall be required to demonstrate a knowledge of the topics specified in Recommendation ITU-R M.1544.

Advantages:

- Incorporation by reference of Recommendation ITU-R M.1544 establishes a minimum international standard for amateur licensing.
- This approach would give administrations some increase in flexibility in revising and updating the qualifications as appropriate in the context of rapidly evolving communications technology.

Disadvantages:

- Incorporation by reference may result in confusion or conflict between the version incorporated and any updated version.
- The Recommendation does not lend itself to incorporation by reference.
- This approach would remove flexibility for administrations in revising and updating the qualifications as appropriate in the context of rapidly evolving communications technology.

5.2.1.6.3 Method C

The conference may consider modifying No. **25.6** such that Recommendation ITU-R M.1544 becomes non-mandatory through the principle elaborated in § 6 of Annex 1 to Resolution **27 (Rev.WRC-2000)**.

An example of such modification could be:

MOD

25.6 2) Administrations shall ~~take such measures as they judge necessary to~~ verify the operational and technical qualifications of any person wishing to operate ~~the apparatus of~~ an amateur station. Standards of competence are contained in the most recent version of Recommendation ITU-R M.1544.

Advantage:

Provides flexibility to administrations as the Recommendation can be updated to a later version as desired since it is non mandatory text.

Disadvantage:

Administrations might lower the minimum competence level by either modifying or failing to implement the Recommendation.

5.2.1.7 Article 25.7

The conference may consider the suppression of No. **25.7**.

Advantages:

- Simplify the Radio Regulations.
- Redundant. See No. **15.2**, which provides that "Transmitting stations shall radiate only as much power as is necessary to ensure a satisfactory service".

Disadvantage:

None have been identified.

5.2.1.8 Article 25.8

The conference may consider the suppression of No. **25.8**, which is redundant with Nos. **3.6** and **3.7**.

Advantages:

- Simplify the Radio Regulations.
- The text reiterates concepts included generically in the Radio Regulations and applicable to all radio services.

Disadvantage:

None have been identified.

5.2.1.9 Article 25.9

The conference may consider the suppression of No. **25.9**, which is redundant with Nos. **19.4** and **19.5**.

Advantage:

Simplify the Radio Regulations.

Disadvantage:

None have been identified.

5.2.1.10 Article 25.11

The conference may wish to simplify the provision of No. **25.11**.

An example of such modification could be:

MOD

25.11 § 7 ~~Space stations in the amateur-satellite service operating in bands shared with other services shall be fitted with appropriate devices for controlling emissions in the event that harmful interference is reported in accordance with the procedure laid down in Article **15**.~~ Administrations authorizing ~~such~~ space stations in the amateur-satellite service shall ~~inform the Bureau and shall~~ ensure that sufficient earth command stations are established before launch to guarantee that any harmful interference ~~which might be reported~~ caused by emissions from a station in the amateur-satellite service can be terminated ~~by the authorizing administration~~immediately (see No. **22.1**).

Advantages:

- Simplify the Radio Regulations.
- The first sentence is redundant; see No. **22.1**.
- Procedures for notification to the Bureau are given in Resolution **642 (WARC-79)**.

Disadvantage:

None have been identified.

5.2.1.11 Additional provisions to Article 25

5.2.1.11.1 New provision concerning amateur communications in support of disaster relief

The conference may consider adding a provision to the regulations concerning amateur communications in support of disaster relief.

An example of such a provision could be:

ADD

25.X Administrations are urged to take the necessary steps to allow amateur stations to prepare for and meet communication needs in support of disaster relief.

Advantage:

Recognizes the value of amateur communications during disaster situations.

Disadvantage:

None have been identified.

5.2.1.11.2 New provision permitting amateurs from another administration to operate

The conference may consider adding a provision to the regulations which permits administrations to allow amateurs of other administrations to operate while temporarily in its territory.

Article **18** requires that all transmitting stations be licensed but provides for special arrangements in certain circumstances. None of these special arrangements apply to the amateur and amateur-satellite services.

An example of such a provision could be:

ADD

25.XX Administrations may determine whether or not to permit a person who has been granted a licence to operate an amateur station by another administration, to operate an amateur station while that person is temporarily in its territory, subject to such conditions or restrictions it may impose.

Advantages:

- Allows such an operation.
- The proposed addition makes it clear that administrations are authorized and encouraged to permit visiting amateurs to operate without being required to issue them a licence while protecting the prerogatives of administrations.

Disadvantage:

None have been identified.

5.2.1.12

An example as to how Article **25** may look giving all the proposed methods is contained in Annex 5.2.1-1.

ANNEX 5.2.1-1

Example of how Article **25** may look showing all the proposed changes and methods.

ARTICLE 25

Amateur services

Section I – Amateur service

SUP

25.1 § 1

MOD

25.2 § 2 1) ~~When t~~Transmissions between amateur stations of different countries ~~are permitted, they~~ shall be ~~made in plain language and shall be~~ limited to ~~messages of a technical nature relating to tests and to remarks~~ communications pertaining to the purposes of the amateur service, as defined in No. **1.56** or of a personal character ~~for which, by reason of their unimportance, recourse to the public telecommunications service is not justified~~. Transmissions between amateur stations shall not be encoded for the purpose of obscuring their meaning.

Method A

MOD

25.3 2) ~~It is absolutely forbidden for a~~Amateur stations ~~to~~ may be used for transmitting international communications on behalf of third parties unless objected to by one of the administrations.

Method B

SUP

25.3 2)

25.4 3)

Method A

SUP

25.5 § 3 1)

Method B

MOD

25.5 § 3 1) Administrations shall determine whether or not ~~Any~~ persons seeking a licence to operate ~~the apparatus of~~ an amateur station shall be required to prove that ~~he is~~ they are able to ~~send~~ correctly send ~~by hand and to receive correctly by ear,~~ texts in Morse code signals. ~~The administrations concerned may, however, waive this requirement in the case of stations making use exclusively of frequencies above 30 MHz.~~

Method A

MOD

25.6 2) Administrations shall ~~take such measures as they judge necessary to~~ verify the operational and technical qualifications of any person wishing to operate the apparatus of an amateur station.

Method B

MOD

25.6 2) Administrations shall ~~take such measures as they judge necessary to~~ verify the operational and technical qualifications of any person wishing to operate ~~the apparatus of~~ an amateur station. A person seeking a licence to operate an amateur station shall be required to demonstrate a knowledge of the topics specified in Recommendation ITU-R **M.1544**.

Method C

MOD

25.6 2) Administrations shall ~~take such measures as they judge necessary to~~ verify the operational and technical qualifications of any person wishing to operate ~~the apparatus of~~ an amateur station. Standards of competence are contained in the most recent version of Recommendation ITU-R **M.1544**.

SUP

25.7 § 4

25.8 § 5 1)

25.9 2)

ADD

25.X Administrations are urged to take the steps necessary to allow amateur stations to prepare for and meet communication needs in support of disaster relief.

25.XX Administrations may determine whether or not to permit a person who has been granted a licence to operate an amateur station by another administration to operate an amateur station while that person is temporarily in its territory, subject to such conditions or restrictions as it may impose.

Section II – Amateur-satellite service

NOC

25.10 § 6 The provisions of Section I of this Article shall apply equally, as appropriate, to the amateur-satellite service.

MOD

25.11 § 7 ~~Space stations in the amateur-satellite service operating in bands shared with other services shall be fitted with appropriate devices for controlling emissions in the event that harmful interference is reported in accordance with the procedure laid down in Article **15**.~~ Administrations authorizing ~~such~~ space stations in the amateur-satellite service shall ~~inform the Bureau and shall~~ ensure that sufficient command earth stations are established before launch to guarantee that any harmful interference ~~which might be reported~~ caused by emissions from a station in the amateur-satellite service can be terminated ~~by the authorizing administration~~ immediately (see No. **22.1**).

5.2.2 Agenda item 1.7.2

"review of the provisions of Article **19** concerning the formation of call signs in the amateur services in order to provide flexibility for administrations"

5.2.2.1 Composition of national identifiers

At the present time, some countries cannot have amateur call signs because of the restriction imposed by No. **19.49** when the letters O or I are used as the last character of the national identifier. Modes of radiocommunication in current use in the amateur services are such that there is no difficulty distinguishing between the numbers 0 and 1, and the letters O and I respectively.

5.2.2.1.1 Methods to satisfy the agenda item

The conference could consider suppression of No. **19.49 c)**.

Advantage:

Suppression of No. **19.49 c)** would remove the restriction for some identifiers, thus adding more flexibility for administrations, especially those unable to have amateur call signs at present.

Disadvantage:

None were identified.

5.2.2.2 Composition of call sign suffixes

No. **19.68** limits amateur and experimental call-sign suffixes to "a group of not more than three letters" This restriction places a limit on the number of possible call-sign combinations and their formulation and prohibits the use of certain combinations for special events.

5.2.2.2.1 Methods to satisfy the agenda item

The conference may consider revising No. **19.68** so that more flexibility is allowed for administrations to issue call signs.

An example of such modification could be:

MOD

19.68 § 30 1)

- one character (see No. **19.50.1**) and a single digit (other than 0 or 1), followed by a group of not more than ~~three letters~~four characters, the last of which shall be a letter, *or*
- two characters and a single digit (other than 0 or 1), followed by a group of not more than ~~three letters.~~four characters, the last of which shall be a letter.

Advantage:

Such a change would considerably expand the number of possible call-sign combinations and provide administrations with increased flexibility without creating conflict with the call-sign formats specified for stations in other services.

Disadvantage:

None were identified.

ADD

19.Y On special occasions for temporary use, administrations may waive the requirement of the call sign to contain not more than four trailing characters.

Advantage:

Provides additional flexibility for administrations.

Disadvantage:

None were identified

##########

5.2.3 Agenda item 1.7.3

"review of the terms and definitions of Article **1** to the extent required as a consequence of changes made in Article **25**"

Studies conducted to date have not indicated the need for any consequential changes to Article **1**.

##########

5.3 Agenda item 1.9

"to consider Appendix **13** and Resolution **331 (Rev.WRC-97)** with a view to their deletion and, if appropriate, to consider related changes to Chapter VII and other provisions of the Radio Regulations, as necessary, taking into account the continued transition to and introduction of the Global Maritime Distress and Safety System (GMDSS)"

5.3.1 Summary of technical and operational considerations

During the transition period to full implementation of the GMDSS, the RR had dual provisions; Appendix **13** includes the non-GMDSS provisions. Since the GMDSS provisions are internationally required only for SOLAS ships, there are a considerable number of maritime vessels that are not yet fitted with automated communications systems, necessitating some continued operation on frequencies and modes of operation for distress and safety. Support of the old and new distress and safety systems for an extended period of time is costly. Many administrations have worked to

increase fitting of GMDSS elements (e.g. radios incorporating digital selective calling (DSC) functions and satellite EPIRBs) on non-SOLAS vessels through rule-makings for specific classes of vessels and equipment certification requirements.

The International Maritime Organization (IMO) SOLAS Convention prescribes that all ships subject to that Convention are required to be fitted for GMDSS by 1 February 1999. IMO has decided that:

- Listening watch on 2 182 kHz on-board SOLAS ships is no longer mandatory after 1 February 1999.

IMO has urged administrations to implement GMDSS also for non-SOLAS vessels under national legislation as soon as possible and to encourage all maritime vessels voluntarily carrying maritime VHF radio equipment to be fitted with VHF DSC no later than 1 February 2005**.**

WRC-97 decided that listening watch on 2 182 kHz is no longer obligatory after 1 February 1999. WRC-97 also amended Resolution **331 (MOB-87)** to serve as a guidance for administrations on full transition to GMDSS and phasing out the listening watch on 2 182 kHz and VHF channel 16.

In heavy traffic areas, the announcement of safety messages, by using DSC techniques, causes an unnecessary burden on the duty watch officer. It does not enhance safety at sea when the DSC equipment generates an alarm several times a day and when in some cases the VHF equipment automatically switches to the frequency mentioned in the announcement. Busy watch officers have a tendency to silence the alarm and reset the equipment without listening to the actual safety broadcast, expecting that the same message to be received on NAVTEX as well.

According to RR No. **33.31**, the announcement of the safety message shall be made on one or more of the distress and safety calling frequencies referred to by Section I of Article **31**, using digital selective calling techniques. Recommendation ITU-R M.541-8 states that DSC on the distress and safety calling frequencies should be used by coast stations to advise shipping of the impending transmission of urgency, vital navigational and safety messages, except where transmissions take place at routine times.

Administrations have reported that there are a considerable number of maritime vessels that are not yet fitted with the automated communications systems, necessitating some continued operation on frequencies and modes used prior to the implementation of GMDSS. Additionally, many administrations have not yet required certain classes of non-SOLAS vessels to fit the new automated equipment. Therefore, consideration should be given to maintaining regulatory controls for these vessels for an extended period.

Administrations have also noted that support of duplicate systems for an extended period of time may be costly.

The information concerning the implementation of the GMDSS shore-based facilities worldwide, including operational and planned sea areas A1 (VHF DSC) and A2 (MF DSC), is disseminated by IMO in GMDSS/Circ. 8 and Corrigenda. GMDSS/Circ. 8/Corr. 5 was issued 30 April 2002 and contains information concerning almost 1400 VHF/DSC and MF/DSC stations.

Relevant Recommendations ITU-R: M.541-8, M.1169, M.1170.

5.3.2 Analysis of the results of considerations

This agenda item is intended to consider the deletion of Appendix **13** and Resolution **331 (Rev.WRC-97)** taking into account the continued transition to and introduction of the GMDSS. It was originally not intended that Appendix **13** be revised or edited.

5.3.3 Methods to satisfy the agenda item and their advantages and disadvantages

5.3.3.1 Method A

No change to Appendix **13**.

A large number of non-SOLAS vessels have not yet been fitted for GMDSS. Deletion of Appendix **13** is premature at this time; these maritime vessels should not be left without regulatory control to meet their distress and safety communication requirements. The provisions for use of 2 182 kHz and VHF channel 16 for distress, urgency and safety calling by voice should therefore be retained in Appendix **13** until they can be abrogated.

Advantages:

- There is no harm to shipping if Appendix **13** is retained.
- The provisions for use of 2 182 kHz and VHF channel 16 in the old distress and safety system are retained in Appendix **13** until they can be abrogated.
- One administration in Region 3 is still using and planning to use 500 kHz Morse telegraphy for distress and safety communication for domestic ship carriage requirements.

Disadvantages:

Some elements of Appendix **13** are out of date and not relevant to most domestic ship carriage requirements.

5.3.3.2 Method B

Modification of Resolution **331 (Rev.WRC-97)**.

Resolution **331 (Rev.WRC-97)** gives guidance to administrations on the full and final transition to the GMDSS, and on releasing stations from watchkeeping on 2 182 kHz and VHF channel 16 frequency-by-frequency and area-by-area when the transition to GMDSS and the prevailing conditions in the area concerned makes it reasonable to do so.

Considerations should therefore be given to retaining Resolution **331** as guidance for administrations on the final transition to the GMDSS. Considerations should be given to adjusting the Resolution to reflect the developments since WRC-97 and to encouraging all ships carrying maritime VHF equipment to be fitted with DSC on VHF channel 70 no later than 1 February 2005. The requirement for SOLAS ships to keep mandatory listening watch on VHF channel 16 will be reviewed by IMO prior to 2005. Consideration should also be given to modification of Resolution **331**, to request ITU-R to study the deletion of 500 kHz Morse telegraphy use and listening watch and associated certification requirements and to place this issue on the agenda of a future conference.

Advantages:

- Continues to encourage GMDSS shore based facilities to be implemented by administrations.
- Resolution **331 (Rev.WRC-97)** gives useful guidance to administrations on the final transition to GMDSS.

Disadvantages:

Continuation of Resolution **331** more than four years after the scheduled full implementation of GMDSS may send the message to administrations that GMDSS will never be fully implemented.

5.3.3.3 Method C

Modification of Chapter IX and Appendix **13**.

The international use of Morse telegraphy for distress and safety communications on 500 kHz has ceased. Delete from Appendix **13** and Chapter **IX** the requirement for use of 500 kHz and the associated obligatory operator certification requirements.

Advantages:

- The Radio Regulations would be simplified by the removal of some unnecessary provisions of Appendix **13** and suppression of associated international requirements for operator certificates.
- Administrations would no longer be required to use and maintain a listening watch on the 500 kHz Morse radiotelegraphy channel for distress and safety communications.
- Compulsory operators' certificates for Morse radiotelegraphy would no longer be required.

Disadvantages:

- Retains other provisions, which will have to be reviewed at each successive WRC with view to deletion.
- Deletion of provisions on use of 500 kHz Morse radiotelegraphy for distress and safety communications from Appendix **13** would require a significant amount of editorial work, if Appendix **13** is modified.

5.3.3.4 Method D

Modification to Article **33**.

Modify No. **33.31** in such a way that in heavy traffic areas, like the North Sea, the announcement of safety messages by using DSC will no longer be a mandatory requirement.

Advantage:

Alignment of No. **33.31** with the procedure prescribed in Recommendation ITU-R M.541-8.

Disadvantage:

None have been identified.

5.3.3.5 Method E

Modification of Chapter **IX**, Appendix **13** and Resolution **331 (Rev.WRC-97)**.

The international use of Morse telegraphy for distress and safety communications on 500 kHz has ceased. Delete from Appendix **13** and Chapter **IX** the requirement for use of 500 kHz and the associated obligatory operator certification requirements.

Resolution **331 (Rev.WRC-97)** gives guidance to administrations on the full and final transition to the GMDSS, and on releasing stations from watchkeeping on 2 182 kHz and VHF channel 16 frequency-by-frequency and area-by-area when the transition to GMDSS and the prevailing conditions in the area concerned makes it reasonable to do so.

Consideration should therefore be given to retaining Resolution **331** as guidance for administrations on the final transition to the GMDSS. Consideration should be given to adjusting the Resolution to reflect the developments since WRC-97 and to encouraging all ships carrying maritime VHF equipment to be fitted with DSC on VHF channel 70 as soon as possible taking into account the appropriate decisions of IMO. The requirement for SOLAS ships to keep mandatory listening watch on VHF channel 16 will be reviewed by IMO prior to 2005.

Advantages:

- The Radio Regulations are simplified by the removal of some unnecessary provisions of Appendix **13** and suppression of associated international requirements for operator certificates.
- Administrations would no longer be required to use and maintain a listening watch on the 500 kHz Morse radiotelegraphy channel for distress and safety communications.
- Compulsory operators' certificates for Morse radiotelegraphy would no longer be required.
- Continues to encourage GMDSS shore based facilities to be implemented by administrations.
- Resolution **331 (Rev.WRC-97)** gives useful guidance to administrations on the final transition to GMDSS.
- There is a suitable period of time for administrations to fit all ships carrying maritime VHF equipment with DSC.

Disadvantages:

- Retains other provisions, which will have to be reviewed at each successive WRC with a view to deletion.
- Deletion of provisions on use of 500 kHz Morse radiotelegraphy for distress and safety communications from Appendix **13** would require a significant amount of editorial work, if Appendix **13** is modified.
- Continuation of Resolution **331** more than four years after the scheduled full implementation of GMDSS may send the message to administrations that GMDSS will never be fully implemented.

5.3.4 Regulatory and procedural considerations

SUP

47.1

SUP

47.3

MOD

47.26 § 8 1) The holder of a radiocommunication general operator's certificate~~ or a first- or second-class radiotelegraph operator's certificate~~ is authorized to embark as chief operator of a ship station of the fourth category (see Recommendation ITU-R M.1169).

SUP

47.27

MOD

47.28 3) Before becoming chief operator of a ship station of the second or third category (see Recommendation ITU-R M.1169), the holder of a radiocommunication general operator's certificate ~~or a first- or second-class radiotelegraph operator's certificate~~ shall have had, as operator on board ship or in a coast station, at least six months' experience of which at least three months shall have been on board ship.

MOD

47.29 4) Before becoming chief operator of a ship station of the first category (see Recommendation ITU-R M.1169), the holder of a radiocommunication general operator's certificate ~~or a first-class radiotelegraph operator's certificate~~ shall have had, as operator on board ship or in a coast station, at least one year's experience of which at least six months shall have been on board ship.

MOD

55.1 The radiotelegraph procedure ~~detailed in Recommendation ITU-R M.1170 is obligatory, except in cases of distress, urgency, or safety, to which the provisions of Appendix **13** are applicable~~may be conducted in accordance with Recommendation ITU-R M.1170.

ANNEX 5.3-1

EXAMPLE OF A DRAFT REVISION OF RESOLUTION 331 (Rev.WRC-97)

MOD

RESOLUTION 331 (Rev.WRC-~~97~~03)

Transition to the Global Maritime Distress and Safety System (GMDSS) and continuation of the distress and safety provisions in Appendix 13

The World Radiocommunication Conference (Geneva, ~~1997~~2003),

noting

that the International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended, prescribes that all ships subject to this Convention shall be fitted for the Global Maritime Distress and Safety System (GMDSS) by 1 February 1999,

noting further

a) that a number of administrations have taken steps to implement the GMDSS also for classes of vessels not subject to SOLAS, 1974, as amended;

b) that an increasing number of vessels not subject to SOLAS, 1974, as amended, are making use of the techniques and frequencies of the GMDSS prescribed in Chapter **VII**;

c) that some administrations and vessels, not subject to SOLAS, 1974, as amended, may wish to continue to use provisions of Appendix **13** for distress and safety communications for some time after 1 February 1999;

d) that it would be costly for administrations to maintain in parallel for an excessive period of time shore-based facilities necessary to support both the old and new distress and safety systems;

e) that there may be a need to continue existing shore-based distress and safety services for a certain period after 1 February 1999 so that vessels not subject to SOLAS, 1974, as amended and not yet using the techniques and frequencies of the GMDSS will be able to obtain assistance from these services until such time as they are able to participate in the GMDSS;

f) that separate provisions of the existing Radio Regulations designate VHF channel 16 and the frequency 2 182 kHz as the international channels for general calling by radiotelephony;

g) that the International Maritime Organization (IMO) has already decided for GMDSS vessels that:

– listening watches on 2 182 kHz will no longer be mandatory after 1 February 1999;

– listening watches on VHF channel 16 will be continued and that a final date for the cessation of mandatory watchkeeping on channel 16 by SOLAS ships while at sea ~~is yet to be determined~~will be reviewed prior to 2005;

h) that the Radio Regulations require GMDSS ships to keep watch on the appropriate digital selective calling (DSC) distress frequencies;

i) that the Radio Regulations establish that ship stations should, when practicable, keep watch on VHF channel 13;

j) that several administrations have established Vessel Traffic Service (VTS) systems and require their ships to keep watch on local VTS channels;

k) that ships that are required by SOLAS to carry a radio station are being equipped with DSC, but the majority of vessels that carry a radio station on a voluntary basis might not have DSC equipment;

l) that similarly, many administrations have established distress and safety service based on DSC watchkeeping, but the majority of port stations, pilot stations and other operational coast stations have not been equipped with DSC facilities;

m) that for the reasons listed above, it will remain necessary for some stations in the maritime mobile service to call each other by radiotelephony in certain situations,

considering

a) that the operation of the GMDSS described in Chapter **VII** and the present distress and safety system described in Appendix **13** differ in many crucial aspects, such as means and methods of alerting, communication facilities available, announcement and transmission of maritime safety information, etc.;

b) that operation of the two systems in parallel for a long period would cause ever-increasing difficulties and incompatibilities between ships operating in the two different systems and may thus seriously degrade safety at sea in general;

c) that the GMDSS overcomes the deficiencies of the aural watch-keeping on maritime distress and calling frequencies on which the distress and safety system described in Appendix **13** relies, by replacing these watches by automatic watch, i.e. digital selective calling and satellite communication systems,

resolves

1 that, until such time as voice calling has become obsolete, VHF channel 16 and the frequency 2 182 kHz may be used as voice-calling channels;

2 to urge all administrations to assist in enhancing safety at sea by:

– encouraging all ships to make use of the GMDSS as soon as possible;

– encouraging, where appropriate, establishment of suitable shore-based facilities for GMDSS, either on an individual basis or in cooperation with other relevant parties in the area;

– encouraging all ships carrying maritime VHF equipment to be fitted with DSC on VHF channel 70 as soon as possible, taking into account the relevant decisions of IMO;

3 that administrations may, taking account of all aspects involved, such as:

– decisions by IMO on aural watch on 2 182 kHz and VHF channel 16;

– the GMDSS radio systems available in the area concerned;

– the compatibility problems mentioned in *considering a)* and *b)* above;

– the density and classes of ships normally in the area;

– the geographical nature of the area and general navigational conditions within the area;

– other adequate measures taken to ensure safety communications for ships sailing in the area,

at a time after 1 February 1999, when the development on transition to the GMDSS and the prevailing conditions in the area makes it reasonable to do so, release their ship stations and coast stations within the area concerned from the obligations described in Appendix **13** on listening watch on 2 182 kHz or VHF channel 16 or both;

when doing so, administrations should:

– inform IMO of their decisions and submit to IMO details on the area concerned;

– inform the Secretary-General on the necessary details for inclusion in the List of Coast Stations,

resolves further

that the Secretary-General should ensure that such arrangements and details regarding the area concerned be indicated in relevant maritime publications,

invites the next world radiocommunication conference

to include the review of this Resolution, Appendix **13** and Chapter **VII** on the agenda of WRC-~~01*~~07,

instructs the Secretary-General

to communicate this Resolution to IMO and the International Civil Aviation Organization (ICAO),

invites the Radiocommunication Study Group 8

to review the operational and procedural incompatibilities between the old and new systems with a view to presenting the information to WRC-~~01*~~07.

~~##########~~

5.4 Agenda item 1.10

"to consider the results of studies, and take necessary actions, relating to:"

5.4.1 Agenda item 1.10.1

"to consider the results of studies, and take necessary actions, relating to exhaustion of the maritime mobile service identity numbering resource (Resolution **344 (WRC-97)**);"

~~* *Note by the Secretariat:* This Conference will be held in 2003.~~

5.4.1.1 Summary of technical and operational studies, including a list of relevant ITU-R and ITU-T Recommendations

5.4.1.1.1 Background

Maritime mobile service identities (MMSIs) are required for many shipborne communications equipment (e.g. DSC, mobile earth stations). The MMSI (Article **19**) is a 9-digit number to uniquely identify ship stations, group ship stations, coast stations and group coast stations. Three of the nine MMSI digits are the Maritime Identification Digits (MIDs). MIDs represent the territory or geographical area of administrations and are assigned by the ITU. The total possible number of MMSIs is reduced by ITU Recommendations, which advise administrations to assign MMSIs with three trailing zeros to ships sailing worldwide and communicating with foreign coast stations. Additionally, ITU-T Recommendation E.215 has a requirement to assign MMSIs ending in 3-zeros to vessels requiring access to certain satellite services. This is in anticipation that these ships would want to take advantage of access to the public switched network via automatic radiocommunication systems. The routing and billing limitations within national telecommunication systems that led to the three trailing zero constraint still exist and some aspects appear to be unresolvable within a single stage dialling process.

Therefore, for each MID assigned, there are only 999 numbers available for use by ships with the present generation of maritime mobile-satellite networks operated by Inmarsat Ltd (Standard B, C and M). As the number of vessels carrying such systems increased, so has the demand for MMSIs with three trailing zeros. Early on, there was a recognition that a limited number of available Maritime Identification Digits (MIDs) existed. Additional MIDs are now assigned by the ITU to administrations when they have used 80% of the MMSIs with three trailing zeros. The ITU uses the notification requirements of Article **19** as evidence of use of the numbers with the three trailing zeros. Normally, these are notified and entered into the ITU maritime database and published in List VII A, List of Call Signs and Numerical Identities. The ITU, following established procedures, will not provide additional MIDs until administrations provide the ITU with evidence that 80% of their allotted MMSIs with three trailing zeros have been assigned. Although the resource of MIDs is limited, it is anticipated to be sufficient to meet the needs of the maritime community for the foreseeable future.

The ITU criteria for obtaining additional allotments of MIDs may need further development in respect of:

- specifying that the criteria under No. **19.36** should apply to the MID most recently allotted to the administration;
- clarifying that operation of the acceptance criteria given in No. **19.35.1** should relate to No. **19.36**, not **19.35**, and to all notified MMSIs in the basic category, not the active records, and that the formula itself should be modified so as to add one to the result of the division by 1000;
- modifying Resolution **344** so as to instruct ITU-R to develop a Recommendation on the management of the MID and MMSI resources entirely as an ITU-R responsibility, including concepts such as re-use of suppressed MMSIs.

The end of the useful life of the present generation of ship earth stations (Inmarsat Ltd. B, C and M) may ameliorate the present concern stemming from the numbering schemes for the maritime mobile-satellite service contained in ITU-T Recommendations E.215 and F.125. These Recommendations are expected to be replaced by a new ITU-T Recommendation covering these systems. The ITU will report on the status of the resource and if exhaustion is anticipated, urgent studies can be initiated between ITU-T Study Group 2 and ITU-R Study Group 8 to agree on necessary changes in their respective guidance to obtain some additional resources.

In the future, many new systems may evolve which will desire to participate in GMDSS. IMO has indicated that it is no longer valid to require that the MMSI be used in these systems as part of the diallable telephone number as long as the ship can be efficiently identified by accessing a database accessible 24 hours per day by appropriate authorities. Therefore, these new systems should not be restrained by inefficient numbering plans. There may be certain provisions in ITU-R and ITU-T Recommendations and in the Radio Regulations, which will need to be modified to remove ambiguity or to remove any constraints, which may be interpreted to require any relationship between the numbering plans for these systems and the MMSI.

5.4.1.1.2 Technical and operational considerations

Resolution **344 (WRC-97)** instructs the Director of the BR to monitor the status of the MMSI numbering resource and to report to each WRC regarding the anticipated reserve capacity and expected exhaustion of the resource. The most recent report from the Bureau (WRC-2000 Document 16) with respect to this indicates that there is no shortage at this time. However, this situation may change rapidly with the increased transition to GMDSS and the ever-increasing number of installed ship earth stations.

ITU-T SG 2 WP 1/2 has concluded that ITU-T Recommendation E.210 is no longer appropriate and that the issues of maritime communications in general are no longer a topic for study within ITU-T SG 2. Accordingly, it has decided that E.210 should be deleted and replaced with a new Recommendation (provisionally E.MMSI) that is better suited to the current situation. It has also decided that ITU-T Recommendations E.215 and F.125 should be deleted, but that the texts should be retained as annexes to the proposed new Recommendation. There will in turn be ramifications for Recommendation ITU-R M.585-2, which deals with the assignment and use of MMSIs since the proposed changes in ITU-T SG 2 will make clear that ITU-R should be entirely responsible for management of the MMSI and MID resources.

ITU-R (SG 8) is reviewing Recommendation ITU-R M.585 and has a proposed draft Revision to remove outdated guidance and provide some additional MID resources. This has been coordinated with ITU-T so that corresponding changes to ITU T Recommendations may be aligned. Revisions proposed also include the possibility to reserve an MID for special uses, such as for a Group Coast Station Call which includes all Coast Stations in the World.

Relevant Recommendations: ITU-R M.585-2, and ITU-T E.210, E.215 and F.125.

5.4.1.2 Analysis of the results of studies

When the format of MMSIs was originally drafted, the format of MMSIs assigned to ships with earth station terminals was required to be consistent with the identity number issued through Inmarsat Ltd. The end of the useful life of the present generation of maritime mobile-satellite systems may ameliorate the present concern caused by the ITU-T Recommendation E.215 numbering scheme.

Potential exhaustion is due to certain systems requiring MMSIs to end in "000". WRC-97 instructed the Director of the Radiocommunication Bureau to monitor the status of the MMSI resource and report to each world radiocommunication conference on the anticipated reserve capacity and expected exhaustion of the resource.

As new systems are implemented, the existing recommendations may be ambiguous and may lead systems providers to the conclusion that the existing numbering scheme, i.e. MMSIs with three trailing zeros**,** would be required.

Depending on the results from the Director of the Radiocommunication Bureau on the impending exhaustion of the MID resource, the ITU-R may need to address consequential changes to the relevant Recommendations, particularly Recommendation ITU-R M.585, affecting the assignment and use of MMSIs and thus, the MID numbering resource.

5.4.1.3 Methods to satisfy the agenda item and their advantages and disadvantages

It is necessary to give full authority to the Director of BR to manage the MMSI and MID numbering resources, including the ability to adjust the geographic structure of allocating MIDs to meet specific demands from certain geographical areas.

The present regional allocation structure of the MID resource should be retained as long as possible. There is still spare capacity available within the regional MID allocation blocks because MIDs with the format X79-X99 (where "X" is in the range 2 to 7) have been reserved for expansion. This capacity should now be brought into use. However, as MIDs within individual regional blocks approach exhaustion, non-geographic MID assignments starting with digit "1" should be made. Further non-geographic MID assignments may be possible starting with digits "8" or "9" when the MID 100-199 series nears exhaustion. If this is not the case then out of region allotments from any spare MIDs with the format X79-X99 should be considered.

Method

Revisions to Article **19**, Resolution **344 (WRC-97)** and additional guidance within ITU-R Recommendations.

Component 1

Article **19** should be revised in order to address the following requirements:

a) to remove any ambiguity from Article **19** and ITU Recommendations which could be interpreted as a requirement for future mobile service and mobile satellite service systems to imbed the MMSI within their numbering space;

b) to permit administrations to demonstrate use of 80% of assigned MID resources without requiring certain government vessels, which may require anonymity, to be published in List V; and

c) to make provision for the creation of special group calls which includes all Coast Stations in the World (00 MID 0000) where the MID would be a special reserved MID = 999 and could also be used for other applications where an MID assigned to particular administrations may not be appropriate.

Component 2

Resolution **344 (WRC-97)** should be revised in order to address the following requirements:

- to provide authority to the Director of the Radiocommunication Bureau to manage the allotment and distribution of the MID resource within the MMSI numbering format;
- to continue active monitoring of the use of the MID and MMSI resources and make a status report to each WRC.

In the event that WRC-03 is advised of impending exhaustion of the MID resource, the revisions to Resolution **344** should also include urgent action on the assignment and use of MMSIs and thus, the MID numbering resource, and invite the ITU-R and, if necessary ITU-T, to address consequential changes to their respective Recommendations.

Advantage:

None have been identified.

Disadvantage:

None have been identified.

Component 3

The better-defined ITU-R management responsibilities for the MID and MMSI resources that WRC-03 is recommended to introduce need to be supported by further guidance to the Director of BR and administrations on resource management. Specific guidance is required on the re-use of MMSIs and treatment of requests for additional MID resources when the national totals of MMSIs shown in ITU records fall significantly as a result of ships being removed from national ship registers. Such guidance will include considerable detail, which may be subject to change as MMSI use develops, and should therefore be included in ITU-R Recommendations. It is recommended that Recommendation ITU-R M.585 be adapted for this purpose.

Advantage:

None have been identified to satisfy the agenda item.

Disadvantage:

None.

5.4.1.4 Regulatory and procedural considerations

Several changes are needed to the Radio Regulations in order to remove existing ambiguity and confusion surrounding the management of the MID and MMSI resources and to assist administrations and the ITU Secretariat in making optimum use of these resources.

Examples of the necessary changes to Article **19** are shown below and Annex 5.4.1-1 shows the changes needed to Resolution **344 (WRC-97)** in order to implement the new resource management responsibilities.

ADD

19.31A 4) Means shall be provided for uniquely identifying mobile stations operating in automated terrestrial or satellite communication systems for the purposes of answering distress calls, avoiding interference and for billing. Identification of the mobile station by accessing a registration database is satisfactory, provided that the system can associate the mobile station calling number with the particular mobile station user.

SUP 19.35.1

MOD

19.36 § 17 ~~A single~~Each administration has been allocated one or more maritime identification digits (MID) ~~has been allocated initially to each administration~~for its use. A second or subsequent MID should not be requested[2] unless the ~~first~~previously allocated MID is more than 80% exhausted in the basic category ~~of~~ having three trailing zero~~es~~, and the rate of assignments is such that 90% exhaustion is foreseen. ~~The same criteria should be applied to subsequent requests for MIDs.~~

ADD

[2] **19.36.1** In no circumstances may an administration claim more MIDs than the total number of its ship stations notified to the ITU divided by 1 000, plus one. Administrations shall make every attempt to reuse the MMSIs assigned from earlier MID resources which become redundant after ships leave their national ship registry. Such numbers should be considered for re-assignment after being absent from at least two successive editions of List VIIA. Administrations seeking additional MID resources must have notified all previous assignments, in accordance with No. **20.16**. This

criterion applies only to MMSIs in the basic category and to all MIDs assigned to the administration.

MOD

19.101 2) These identities are formed in such a way that the identity or part thereof can be used by telephone and telex subscribers connected to the public~~general~~ telecommunication~~s~~ network principally to call ships automatically in the shore-to-ship direction. Access to public networks may also be achieved by means of free-form numbering plans, so long as the ship can be uniquely identified using the registration database referred to No. **19.31A** to obtain the ship station identity, call sign or ship name and nationality.

ADD

19.108A § 42 The maritime identification digits $M_1I_2D_3$ are an integral part of the maritime mobile service identity and denote the geographical area of the administration responsible for the station so identified (see Nos. **19.102** to **19.106**).

SUP 19.109

MOD

19.112 *a)* follow the guidelines contained in the ~~relevant~~most recent version of Recommendation ITU-R ~~and ITU-T Recommendations for~~M.585 concerning the assignment and use of ship station identities.

MOD

19.114 *c)* take particular care in assigning ship station identities with six significant digits (i.e. having three-trailing-zero identities), which should be assigned only to ship stations which can reasonably be expected to require such an identity for automatic access on a worldwide basis ~~for~~ to public switched networks~~;~~, in particular for mobile satellite systems accepted for use in GMDSS on or before 1 February 2002, as long as those systems maintain the MMSI as part of their numbering scheme.

SUP 19.115

SUP 19.116

ANNEX 5.4.1-1

Example of revised Resolution 344 (WRC-97)

RESOLUTION 344 (Rev.WRC-~~97~~03)

~~Exhaustion~~Management of the maritime mobile service identity numbering resource

The World Radiocommunication Conference (Geneva, ~~1997~~2003),

noting

~~*a)* that ships not required to carry Global Maritime Distress and Safety System (GMDSS) equipment may do so, for safety purposes;~~

~~*b*~~*a)* that the installation of digital selective calling equipment ~~on such ships for VHF radio, and/~~or Inmarsat B, C or M ship earth station equipment on ships participating in the Global Maritime Distress and Safety System (GMDSS) on a mandatory or voluntary basis requires the assignment of a unique nine-digit maritime mobile service identity (MMSI);

b) that such equipment offers the possibility to connect with public telecommunication networks;

c) that only mobile-satellite systems have been able to resolve the various billing, routing, charging and signalling requirements needed to provide full two-way automatic connectivity between ships and the international public correspondence service;

d) that ships using the present generation of mobile-satellite ship earth stations have to be assigned an MMSI ending with three trailing zeros in order to support automatic access to public telecommunication networks through a dialable ship telephone number whose format is compliant with ITU-T Recommendation E.164 but can only accommodate the first six digits of the MMSI;

e) that the first three digits of a ship station MMSI form the maritime identification digits (MID), which denote the ship's administration or geographical area of origin;

f) that each MID only has sufficient capacity to identify 999 ships using the three-trailing-zero number format, with the result that widespread use of MMSIs with three trailing zeros rapidly exhausts the capacity of each MID,

~~*c)* that not all administrations assign these identities to users of digital selective calling-equipped VHF radios on such ships, from the numbers intended for use by vessels sailing and communicating only with domestic coast stations,~~

considering

a) that ~~VHF~~ digital selective calling distress alerts require valid identities ~~for use~~recognizable by search and rescue authorities in order to ensure a timely response;

b) that Recommendation ITU-R M.585 contains guidance for the assignment of MMSIs, ~~including to non-compulsory ships which communicate only with domestic radio stations; and~~

~~*c)* that Recommendation ITU-R M.585 was derived from ITU-T Recommendation E.210,~~

recognizing

a) that even domestic ships which install the present generation of ship earth stations operating to Inmarsat B, C or M standards will require the assignment of MMSI numbers from those numbers originally intended~~reserved~~ for ships communicating worldwide, further depleting the resource;

b) that future growth of Inmarsat B, C ~~and~~or M ~~mobile~~ship earth station use by non-compulsory ships ~~is not, however, expected to~~may further deplete the MMSI and MID resources;

c) that ~~growth projections of Inmarsat systems by non-compulsory ships could nevertheless change~~future generations of mobile-satellite systems offering access to public telecommunication networks and participating in the GMDSS will employ a free-form numbering system that need not include any part of the MMSI,

noting further

a) that ITU-T has recommended that ITU-R assume sole responsibility for managing the MMSI and MID numbering resources;

b) that ITU-R can monitor the status of the MMSI resource, through regular reviews of the spare capacity available within the MIDs already in use, and ~~by monitoring~~ the availab~~le~~ility of spare ~~maritime identification digits~~ MIDs ~~(first three digits of the MMSI)~~, taking account of regional variations,

resolves to instruct~~s~~ the Director of the Radiocommunication Bureau

1 to manage the allotment and distribution of the MID resource within the MMSI numbering format, taking into account:

– Sections II, V and VI of Article **19**;

– regional variations in MMSI use;

– spare capacity within the MID resource; and

– the guidelines on MID and MMSI management contained in the most recent version of Recommendation ITU-R M.585, in particular as regards the re-use of MMSIs;

2 to ~~monitor the status of the MMSI resource, and to~~ report to each world radiocommunication conference on the use and status of the MMSI resource, noting in particular the anticipated reserve capacity and ~~expected~~any indications of rapid exhaustion of the resource,

~~*resolves to* invites *ITU-T and ITU-R*~~

~~1~~ to keep under review the Recommendations for assigning MMSIs, with a view to:

– improving the management of the MID and MMSI resources; and

– identifying alternative resources ~~before~~if there is an indication of rapid exhaustion of these resources ~~are exhausted;~~,

~~2 to consult each other when addressing changes to any of the Recommendations affecting the MMSI numbering resources;~~

~~3 to complete studies on an urgent basis when a future world radiocommunication conference identifies the impending exhaustion of the MMSI resource,~~

instructs the Secretary-General

to communicate this ~~R~~resolution to the International Maritime Organization.

~~##########~~

5.4.2 Agenda item 1.10.2

"to consider the results of studies, and take necessary actions, relating to shore-to-ship distress communication priorities (Resolution **348 (WRC-97)**)."

5.4.2.1 Summary of technical and operational considerations

A shore-based search and rescue authority has no means to interrupt or preempt the satellite communications to a vessel in a distress or safety situation. This communications inability may increase the probability of loss of life and property.

At present, when vessels are using their ship earth stations, it is not possible to send them a distress or safety message without extremely complex and time-consuming manual intervention at a land earth station to remove all other shipboard traffic. Although this is technically possible, it is not

practical. In a recent distress case, the shore-based search and rescue authorities were unable to contact a vessel because of on-going routine traffic to the vessel. This inability to preempt lower priority traffic hindered the overall search and rescue operation.

A shore-based search and rescue authority must have the means to interrupt or preempt the satellite communications to a vessel in a distress or safety situation, without using extremely complex and time-consuming manual intervention.

The International Maritime Organization considered this problem and decided that provisions are necessary for giving priority to shore-originated distress communications. Inmarsat Ltd. is aware of this requirement and has been studying how to provide such priority arrangements.

5.4.2.2 Analysis of the results of considerations

For any GMDSS system, including future generations of mobile satellite communications systems intended for use aboard ships as part of its distress and safety communications, shore-originated search and rescue communications must be given priority. If practicable, this capability should be incorporated in existing GMDSS systems. If not, specific manual procedures should be standardized. Future generations of GMDSS systems must include this capability.

5.4.2.3 Methods to satisfy the agenda item and their advantages and disadvantages

Method

Develop appropriate Resolutions or ITU-R Recommendations

Consider IMO and Inmarsat Ltd findings and their proposed methods to provide priority for shore-originated distress communications, with a view to modifying provisions of the Radio Regulations. Develop appropriate Resolutions or ITU-R Recommendations to ensure priority access is secured for shore-originated distress communications.

Advantage:

Priority for shore-originated distress communications would be secured.

Disadvantage:

None have been identified.

5.4.2.4 Regulatory and procedural considerations

None have been determined.

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5.5 Agenda item 1.14

"to consider measures to address harmful interference in the bands allocated to the maritime mobile and aeronautical mobile (R) services, taking into account Resolutions **207 (Rev.WRC-2000)** and **350 (WRC-2000)**, and to review the frequency and channel arrangements in the maritime MF and HF bands concerning the use of new digital technology, also taking into account Resolution **347 (WRC-97)**"

Background

Issue A: Measures to address harmful interference in the bands allocated to the maritime mobile and aeronautical mobile (R) services (Resolution **207 (Rev.WRC-2000)**)

At previous WRCs, administrations have reported interference on the HF calling, distress and safety frequencies used by the aeronautical and maritime mobile services. Resolution **207** contains

provisions and measures to combat the growing concern of aviation and maritime authorities over the increased interference to operational distress and safety communications caused by unauthorized (illegal) transmissions.

Interference to safety communications in the HF maritime and AM(R)S bands in some areas of the world is now a matter of very serious concern to maritime and civil aviation authorities, and to aircraft operating in those areas. The international maritime and civil aviation community fully supports the development of measures to lessen the number and severity of unauthorized transmissions. Such measures could include the strengthening of the RR, as far as is feasible, and their application by administrations.

Any proposed solutions affecting the technical characteristics of currently-used equipment and solely aimed at mitigating the effects of interference must be carefully assessed as to their effect on internationally agreed standards and their effectiveness in both the short and the long term. The prime focus for action has to remain in the area of the regulatory control exercised by radio administrations. Technical means should primarily promote the control and make this more effective. Careful attention must be given to avoid unnecessary or ineffective changes to equipment, which would place an economic burden on operators. Enforcement of existing regulatory provisions, cooperative action by administrations, and the implementation of recommended measures and techniques, is necessary to help mitigate the occurrences of harmful interference on safety communication channels.

Issue B: Study on interference caused to the distress and safety frequencies 12 290 kHz and 16 420 kHz by routine calling (Resolution **350 (WRC-2000)**)

Having received several complaints of interference to the HF GMDSS distress and safety communication frequencies, especially the frequencies 12 290 kHz and 16 240 kHz, caused by general calling, IMO by circular letters and ITU WRC-97 by Resolution **346 (WRC-97)** decided to urge administrations to remove, where appropriate, their coast station calling frequencies from the channels 1221 and 1621 to any other suitable channel.

IMO in its submissions to WRC-2000 reaffirmed its opinion that the frequencies 12 290 kHz and 16 420 kHz should only be used for distress and safety communications and allocated solely for such purpose.

In an ongoing effort to reduce interference to HF distress and safety frequencies used in the GMDSS, WRC-2000 determined that, as soon as possible, and no later than 31 December 2003, general calling from ships should not be permitted on 12 290 kHz and 16 420 kHz. The RR currently permit routine voice calling from ships on these two simplex GMDSS distress and safety frequencies, which also constitute the lower legs of channels 1221 and 1621 in Appendix **17** of the Radio Regulations. WRC-2000 actions removed the calling function on these two channels. To compensate for the resultant loss of calling functionality, 12 359 kHz and 16 537 kHz were additionally allocated as alternative carrier frequencies for use by ship and coast stations for calling on a simplex basis.

Issue C: Review the frequency and channel arrangements in the maritime MF and HF bands concerning the use of new digital technology (Resolution **347 (WRC-97)**)

Use of some maritime mobile services such as Morse telegraphy and Narrow-Band Direct Printing (NBDP) are declining, while at the same time the need for spectrum for other maritime communications such as data communications and introduction of new digital technology for maritime mobile services is increasing. It would therefore be appropriate to review parts of the channel arrangements for the maritime mobile MF and HF services in order to make sufficient spectrum available for such other maritime mobile services.

5.5.1 Summary of technical and operational considerations

5.5.1.1 Issue A

The ITU-R Special Monitoring Programme in the HF bands by administrations as organized by the Radiocommunication Bureau in accordance with the decision of WRC-2000 and described in CR/147 has been useful in the collection of interference data for the MMS and AM(R)S in the MF and HF bands.

Studies related to the AM(R)S have considered alternative modulation methods, antenna pattern modification methods, channel barring of transmitter equipment, coordinated regional monitoring and DF strategies. These techniques are considered in more detail in section 5.5.3.1 Techniques 1-4.

Operational studies related to the AM(R)S have considered the transmission of warning messages on channels affected by harmful interference. This is considered in more detail in section 5.5.3.1 Technique 5.

In addition there has been consideration of national and regional education and publicity initiatives. This is considered in more detail in section 5.5.3.1 Technique 6.

Many of these studies also have applications to the maritime mobile service.

5.5.1.2 Issue B

No studies.

5.5.1.3 Issue C

Studies have been performed in ITU-R.

5.5.2 Analysis of the results of studies and considerations

5.5.2.1 Issue A

The results of the ITU-R Special Monitoring Programme in the HF bands are summarized in the ITU-R website http://www.itu.int/ITU-R/terrestrial/monitoring/index.html . The data indicates a continuing problem of interference for the maritime mobile and aeronautical mobile (R) services in the MF and HF bands. Monitoring has demonstrated that the problem is widespread particularly in the Asia-Pacific region. The problem has increased over recent years as more unauthorized operators have found it convenient to use the apparently clear aviation and maritime channels. Further, the availability of low cost HF SSB transceivers and the long-distance propagation characteristics of the HF band provide an economic incentive to use HF for communications.

5.5.2.2 Issue B

At WRC-2000 some administrations had difficulty with agreeing to the removal of the calling function on 12 290 kHz and 16 420 kHz. It was reasoned that if the existing RR were followed, use of these frequencies for calling would not interfere with distress traffic. It was also reasoned that if users on these frequencies were not following prescribed procedures within the RR, making additional changes to the RR would not solve the interference problem. Removal of the calling function may require additional equipment resources and possible operational costs for those search and rescue organizations who utilize and maintain watch on these frequencies for distress, safety and general calling as they may now have more channels to monitor. Though not the practice in Europe, some search and rescue organizations may decide to reduce the priority of distress and safety communications and focus their resources towards maintaining watch on the general calling frequencies alone. This will result in non-GMDSS vessels in emergency situations having to first make a distress call on the routine calling channel. They may remain on this channel instead of moving to the related 12 or 16 MHz band distress working channel. If required to move to the

related distress working channel, which in practice is difficult to do, this may result in loss of communications. Additionally, an operational procedure that requires the mariner in distress to use a calling channel to initiate a distress call and then to manually change frequencies for distress communications places an unacceptable burden on the mariner.

5.5.2.3 Issue C

WRC-97 modified certain provisions in order to make it possible to use some of the maritime mobile MF and HF frequencies also for data transmissions. There is an urgent need for introduction of further possibilities for use of digital technology within the existing maritime MF and HF planned bands.

ITU-R is carrying out studies on the use of new digital technologies in the HF bands. Some of these technologies might also be useful for the introduction of new digital technology in the maritime mobile MF and HF services.

When these studies are complete, it will be necessary to completely review App. **17** to feature new technology services over the traditional services in light of the declining use of NBDP, the discontinuation of Morse and the lack of available coast stations offering voice services, without compromising GMDSS.

In order to provide full worldwide interoperability of equipment on ships, there should be one technology, or more than one interoperable worldwide technology, implemented under App. **17**.

5.5.3 Methods to satisfy the agenda item and their advantages and disadvantages

5.5.3.1 Issue A

5.5.3.1.1 Method A

Regulatory control by administrations

The prime focus for action has to be in the area of the regulatory control exercised by administrations. Enforcement of existing regulatory provisions, cooperative action by administrations, and the implementation of recommended measures and techniques, is necessary to help mitigate the occurrences of harmful interference.

Advantages:

- The maritime and aviation communities are best suited for assessing any HF maritime and aeronautical mobile (R) interference mitigation solutions.
- No regulatory changes to the ITU Radio Regulations are necessary.

Disadvantages:

None have been identified.

5.5.3.1.2

Together with regulatory control, the following recommended HF interference mitigation measures and techniques have been identified together with their advantages and disadvantages. Use of any or all of these techniques is not mandatory.

Technique 1 - Alternative modulation methods

Alternative modulation methods such as digital modulation protocols (FSK, QPSK, etc.) as a replacement for analogue SSB would reduce the effect of interference on services caused by unauthorized users in these bands. Its success would depend on the level and type of interference as

well as the error-correction capability of the system. Any such initiative would need to be adopted internationally to allow the interoperability of equipment.

Advantages:

Advanced digital processing methods can reduce the effect of interference on the service.

Disadvantages:

- The cost of implementing this solution would be substantial. Authorities and operators would need to replace or substantially modify equipment to maintain international interoperability.
- It does not remove the interference from the channel.

Technique 2 - Passive and active/adaptive antenna systems

Passive and active/adaptive antenna systems are designed to attenuate noise originating from directions other than that of the desired signal.

One passive antenna method is the Near Vertical Incidence Skywave (NVIS) antenna. This method relies on reducing the antenna gain and hence interference signal levels from ground waves and low angle of incidence (to the horizon) skywaves.

Active (or "adaptive") antenna systems constantly update the beam pattern to optimize performance in all conditions. In order for the phased arrays to effectively block unwanted interferers they must first be able to isolate the desired signal. The antenna pattern is then modified to face the main lobe towards the desired signal source and a null towards the interferer. One operational system being used for HF digital systems has been demonstrated to reject unwanted jamming signals with jamming-to-signal power ratios of up to 40 dB. This solution may be suitable for digital maritime mobile services but no assessment has been made at this point.

Advantages:

Currently developed dynamic/adaptive antenna systems operate in a digital modulation environment and make use of anti-jamming algorithms that differentiate between desired and undesired signals based on the known characteristics of digital signals (synchronization codes or preambles). They can provide improvements in throughput of data and thus channel efficiency.

Disadvantages:

- Authorized HF AM(R)S communication is a mixture of medium- and long-distance communication and therefore passive NVIS antenna systems would attenuate both authorized users and interference together.
- For the current dynamic/adaptive antenna system solution to be appropriate without further development, systems would need to convert from analogue SSB to digital modulation (i.e. method 2). Further technical development of this solution is required to enable an assessment of its suitability in an analogue SSB environment.
- This method provides no benefit to countries or stations that do not have access to the system, as it does not reduce the amount or severity of channel interference.
- The currently developed systems would provide benefit only to the ground and shore-based operator. Due to size and weight considerations, the system would not be installed in aircrafts or ships and accordingly not reduce the amount of interference received by the mobile operator.
- Cost to implement changes may preclude uptake due to substantial infrastructure and equipment replacement.

Technique 3 - Channel barring

Administrations could require manufacturers of HF radio equipment to prevent users through electronic means from accessing frequencies allocated exclusively to the aeronautical mobile (R) service (see App. **27**) without proper authorization. Frequencies excluded would be those allocated for worldwide common use and shared with AM(OR)S (see App. **26/3.4**). This barring would apply to new equipment but could apply retrospectively by modification to existing equipment. This is a long-term strategy and its effectiveness increased through education and publicity.

Advantages:

New HF transmitter equipment employ digital tuner technology and so the modifications required to provide electronic barring would be minimal. It would be a relatively low-cost strategy to administrators. Aircraft equipment would not need modification, as they would be authorized users of these aeronautical frequencies. The approach would be of benefit to both operators (aircraft and ship pilots) and base stations in the aeronautical and maritime services.

Disadvantages:

- Unscrupulous operators could bypass barring. Old equipment and equipment already in circulation would be difficult (but not impossible) to apply the barring, and modification would need the cooperation of the operators and would involve a cost borne by someone.
- This method is a long-term strategy to mitigate interference.

Technique 4 - Regional HF monitoring and direction finding

The ability to ascertain the location of unauthorized users through the implementation of comprehensive and effective regional HF monitoring and direction finding networks would enable regulators to better identify and address interference. These networks would require significant cooperation and commitment from regional regulators, assisted by aviation and maritime authorities. Network accuracy would be proportional to the number and geographic spread of monitoring stations.

Several administrations in the Asia-Pacific region support this method as a means of mitigating interference.

Advantages:

Makes use of or builds on existing equipment infrastructure. Could reduce the cost and increase the effectiveness of policing the bands by administrations by identifying more accurately the location of unauthorized users. Several Asia-Pacific region countries have indicated that their current DF capabilities are limited to providing bearing information. Their operations could be enhanced through a regional coordination network. This method could have significant short and long-term effects.

Disadvantages:

Highly dependent on the establishment and maintenance of regional cooperation. National security issues may need to be addressed depending on the type of networking used.

Technique 5 - Transmission of warning messages

Some countries transmit multi-language warning messages on specific channels affected by harmful interference. The Australian civil aviation authority has used this method for a number of years to mitigate strong and/or persistent interference in the AM(R)S band.

Advantages:

- Operational reports tend to suggest success in clearing affected frequencies at least in the short term.
- Easy to implement and control by telecommunications administrations, aviation or maritime authorities.
- Often has immediate effect on the channel receiving the interference.

Disadvantages:

Potential for interference to authorized users.

Technique 6 - Education and publicity initiatives

Education and publicity initiatives could be provided on an ongoing basis by national administrations to non-compliant users supported by international and regional telecommunications, aviation and maritime bodies.

Advantages:

Sharing of experience and knowledge in education and publicity initiatives can provide benefits regionally and nationally.

Disadvantages:

Does not have immediate effect but a long-term strategy.

5.5.3.2 Issue B

5.5.3.2.1 Method A

Allow limited safety-related calling to and from rescue coordination centres on 12 290 kHz and 16 420 kHz subject to certain safeguards as contained in a new Resolution [XXX].

Advantages:

- Continuation of the calling function on these frequencies will enhance the capability of those search and rescue organizations who maintain watch on these distress and safety frequencies to call ships not required to fit GMDSS equipment.
- The protection of these frequencies from extensive calling for commercial communications would be retained while at the same time permitting Maritime Rescue Coordination Centres, required to offer some public correspondence of a safety-related character, to use these frequencies for limited calling for such purpose under controlled conditions.
- Those search and rescue organizations that maintain watch on these frequencies, where currently dedicated to distress and safety communications, would not be required to operate and maintain additional equipment for the calling frequencies. Additionally, this allows a vessel in a distress situation to communicate on these channels rather than making a distress call on a working channel; hence, de facto changing the working channel into a distress and safety channel.

Disadvantages:

- Additional emphasis and effort by administrations would be required to identify and report users that are causing interference on these frequencies by use of operational procedures not in accordance with the Radio Regulations.
- Transmitting ship stations not adhering to existing regulatory standards, which require a ship station to listen on its transmitting frequency prior to transmitting, may cause

interference to ongoing distress and safety communications which will be exacerbated by the use of duplex channels as opposed to simplex channels.

- The requirement of IMO that these frequencies should be allocated exclusively for distress and safety communications would no longer be met.

5.5.3.2.2 Method B

Permit limited DSC routine calling on HF DSC distress and safety calling frequencies by coast stations and ships when attempting to communicate with ships. Such routine calling would be allowed if no other means are available and if no traffic is present on the channel.

Advantages:

- At present, routine calling is prohibited on channels allocated for digital selective calling (DSC) under the GMDSS. Lacking this, a calling facility presents considerable communications difficulties among and between GMDSS and non-GMDSS fitted vessels. This change should be made provided adequate precautions are taken not to interfere with distress calls.
- This will facilitate communications to and from ships that are outside coverage of MF/VHF radiotelephone frequencies.
- It allows DSC-equipped radios to meet the recommendations of IMO that GMDSS equipment not be reserved for emergency use only, as described in IMO COMSAR/Circ. 17.

Disadvantages:

Further study would be needed. Inclusion of a new requirement in the specifications for HF DSC equipment similar to the existing requirement for VHF DSC equipment to automatically prevent the transmission of a DSC routine call until the channel is free might be needed.

5.5.3.3 Issue C

5.5.3.3.1 Method A

Considerations should be given to make the current HF Morse telegraphy and narrow-band direct-printing channels in Appendix **17** available for digital maritime services.

The conference could consider modifications to Appendix **17** which would provide administrations with greater flexibility to use the current HF Morse telegraphy and narrow-band direct-printing channels available for the initial testing and possible future introduction of new technology, subject to non-interference and no protection. This would necessarily be subject to a special arrangement between interested or affected administrations.

Advantages:

- Use of digital formats will greatly increase the utility of these frequencies and enhance the communications capabilities to and from vessels.
- Use of internationally accepted standards will ensure worldwide interoperability of systems and, hence, enhance overall safety. This would allow any vessel to use this digital service to seamlessly transmit safety and other communications, such as ship reporting systems and weather observations.
- Use of internationally accepted standards will alleviate national entities (e.g. national weather agencies) from having to contract with every coast station that offers a proprietary data messaging service to ships.
- May permit facilitation of the development and testing of new technology.

- Use of channels for the development and testing of new technology may, in turn, encourage maritime radio equipment manufacturers to advance or accelerate such development and testing.
- This method will allow immediate use of certain bands for testing of new digital technology. The method will minimize the limitations put on the technology used, as the revision of the channelling arrangement will be deferred to a later conference. Consequently the changes made to Appendix **17**, Part A will not prejudge the outcome of the studies being carried out concerning new digital technology in the maritime-mobile MF and HF services.

Disadvantages:

- Use of channels for testing may increase the channel loading of the remaining operational channels for the concerned administrations.
- This change is only really an interim solution to the problem of allowing new technology on the HF bands. The disadvantage here is that it might put back the requirement for a thorough revision of Appendix **17**, which is urgently needed.

5.5.3.3.2 Method B

Adopt a Resolution inviting ITU-R to finalize studies on the introduction of digital technology in maritime-mobile MF and HF services.

Advantages:

Gives a clear framework for the ongoing studies for the introduction of digital technology in maritime-mobile MF and HF services.

Disadvantages:

None have been identified.

5.5.4 Regulatory and procedural considerations

5.5.4.1 Issue A

Modify Resolution 207 (Rev.WRC-2000) to incorporate the techniques in 5.5.3.1 as shown in Annex 5.5-3.

5.5.4.2 Issue B

5.5.4.2.1 Method A

MOD

52.221A 2) Limited safety-related ~~C~~calling on the carrier frequencies 12 290 kHz and 16 420 kHz shall ~~cease as soon as possible and no later than 31 December 2003~~be permitted only to and from rescue coordination centres (see No. **30.6.1**), subject to the safeguards of Resolution **(XXX)**. The alternative carrier frequencies 12 359 kHz and 16 537 kHz may be used by ship stations and coast stations for calling on a simplex basis, provided that the peak envelope power does not exceed 1 kW.

5.5.4.2.2 Method B

MOD APPENDIX 15, TABLE 15-1, Legend:

MOD

DSC These frequencies are used exclusively for distress and safety calls using digital selective calling in accordance with No. **32.5** (see Nos. **32.9**, **33.11** and **33.34**). Exceptionally, however, these frequencies may also be used for ship-to-ship and shore-to-ship routine calling if no other means are available and if no traffic is present on the channel (see No. **31.4**).

5.5.4.3 Issue C

An example of a possible modification of Appendix **17** is given in Annex 5.5-1 to this section and an example of a possible new Resolution is given in Annex 5.5-2.

ANNEX 5.5-1

APPENDIX 17 (WRC-~~200~~03)

Frequencies and channelling arrangements in the high-frequency bands for the maritime mobile service

(See Article **52**)

PART A – Table of subdivided bands

In the Table, where appropriate[1], the assignable frequencies in a given band for each usage are:

– indicated by the lowest and highest frequency, in heavy type, assigned in that band;

– regularly spaced, the number of assignable frequencies (*f.*) and the spacing in kHz being indicated in italics.

Table of frequencies (kHz) to be used in the band between 4 000 kHz and 27 500 kHz allocated exclusively to the maritime mobile service

Add to the first column for the frequencies **4 172.5** to **4 181.5**, **4 181.75** to **4 186.75**, **4 187** to **4 202**, **4 202.5** to **4 207**, **4 209.5** to **4 219**, **6 281** to **6 284.5**, **8 365.75** to **8 370.75, 8 371** to **8 376, 8 376.5** to **8 396, 12 549.75** to **12 554.75, 12 555** to **12 559.5** Note *p)* and

Add new Note *p)* to the Table as follows:

p) These sub-bands may be used for initial testing and possible future introduction of new digital technology within the maritime mobile service. Stations using these sub-bands for this purpose shall not cause harmful interference to, and shall not claim protection from, other stations operating in accordance with Article **5**.

[1] Within the non-shaded boxes.

ANNEX 5.5-2

Example of possible new Resolution

DRAFT RESOLUTION [MMM]

Review of the frequency and channel arrangements in the maritime MF and HF bands with a view to improving efficiency by considering the use of new digital technology by the maritime mobile service

The World Radiocommunication Conference (Geneva, 2003),

considering

a) that the agenda of this conference included consideration of the use of new digital technology in the MF and HF bands in the maritime mobile service;

b) that the introduction of new digital technology in the maritime mobile service shall not disrupt the distress and safety communications in the MF and HF bands including those established by the International Convention of Safety of Life at Sea, 1974 as amended;

c) that changes made in Appendix **17** should not prejudice the future use of these frequencies or the capabilities of systems or new applications required for use by the maritime mobile service;

d) that the requirement to use new digital technologies in the maritime mobile service is growing rapidly;

e) that the use of new digital technology on maritime HF and MF frequencies will make it possible to better respond to the emerging demand for new services;

f) that the maritime HF A1A Morse telegraphy and narrow-band direct-printing frequency bands are significantly under-utilized at present;

g) that the ITU Radiocommunication Sector is conducting ongoing studies to improve the efficiency in these bands,

noting

a) Resolution **347** (**WRC-97**);

b) that different digital technologies have already been developed and used in the MF and HF bands in several radio services,

noting also

that this conference has modified Appendix **17** to permit, on a voluntary basis, the use of various channels or bands identified in the MF and HF bands for initial testing and future introduction of new digital technology,

resolves

1 that, in order to provide full worldwide interoperability of equipment on ships, there should be one technology, or more than one interoperable worldwide technology, implemented under Appendix **17**;

2 that, as soon as the ITU-R studies are completed, a future competent conference should consider necessary changes to Appendix **17** to enable the use of new technology by the maritime mobile service,

invites ITU-R

to finalize studies currently ongoing:

– to identify future requirements of the maritime mobile service;

– to identify the technical characteristics necessary to facilitate use of digital systems in the MF and HF maritime mobile bands taking into account any relevant ITU-R Recommendations;

– to identify the digital system(s) to be used by the MF/HF maritime service;

– to identify any necessary modifications to the frequency plan contained within Appendix **17**;

– to propose a timetable for the introduction of new digital technology and any consequential changes to Appendix **17**;

– to recommend how digital technology can be introduced while ensuring compliance with the distress and safety requirements,

instructs the Secretary General

to bring this Resolution to the attention of the International Maritime Organization, the International Civil Aviation Organization, the International Association of Lighthouse Authorities and the International Maritime Radio Association (CIRM).

ANNEX 5.5-3

Example of a proposed revision of Resolution 207 (Rev.WRC-2000)

MOD

RESOLUTION 207 (REV.WRC-~~200~~03)

Measures to address unauthorized use of and interference to frequencies in the bands allocated to the maritime mobile service and to the aeronautical mobile (R) service

The World Radiocommunication Conference (~~Istanbul, 2000~~Geneva, 2003),

considering

a) that the HF frequencies currently used by the aeronautical and maritime mobile services for distress, safety and other communications, including allotted operational frequencies, suffer from harmful interference and are often subject to difficult propagation conditions;

b) that WRC-97 considered some aspects of the use of the HF bands for distress and safety communications in the context of the Global Maritime Distress and Safety System (GMDSS), especially with regard to regulatory measures;

c) that unauthorized operations using maritime and aeronautical frequencies in the HF bands are continuing to increase and are already a serious risk to HF distress, safety and other communications;

d) that some administrations have resorted to, for example, transmitting warning messages on operational HF channels as a means of deterring unauthorized users;

e) that provisions of the Radio Regulations prohibit the unauthorized use of certain safety frequencies for communications other than those related to safety;

f) that enforcing compliance with these regulatory provisions is becoming increasingly difficult with the availability of low-cost HF single side-band (SSB) transceivers;

g) that monitoring observations of the use of frequencies in the band 2 170-2 194 kHz and in the bands allocated exclusively to the maritime mobile service between 4 063 kHz and 27 500 kHz and to the aeronautical mobile (R) service between 2 850 kHz and 22 000 kHz show that a number of frequencies in these bands are still being used by stations of other services, many of which are operating in contravention of No. **23.2**;

h) that, in certain situations, HF radio is the sole means of communication for the maritime mobile service and that certain frequencies in the bands mentioned in *considering g)* are reserved for distress and safety purposes;

i) that, in certain situations, HF radio is the sole means of communication for the aeronautical mobile (R) service and that this is a safety service;

j) that WRC-2000 and this Conference has~~ve~~ reviewed the use of the HF bands by the aeronautical mobile (R) and maritime mobile services with a view to protecting operational, distress and safety communications~~;~~,;

k) that this resolution identifies several interference mitigation techniques that can be employed by administrations on a non-mandatory basis,

considering in particular

a) that it is of paramount importance that the distress and safety channels of the maritime mobile service be kept free from harmful interference, since they are essential for the protection of the safety of life and property;

b) that it is also of paramount importance that channels directly concerned with the safe and regular conduct of aircraft operations be kept free from harmful interference, since they are essential for the safety of life and property,

resolves to invite ITU-R and ITU-D, as appropriate

~~1 to study possible technical and regulatory solutions to assist in the mitigation of interference to operational distress and safety communications in the maritime mobile service and aeronautical mobile (R) service;~~

~~2~~ to increase regional awareness of appropriate practices in order to help mitigate interference in the HF bands, especially on distress and safety channels~~;~~,;

~~3 to report the results of the above studies to the next competent conference,~~

urges administrations

1 to ensure that stations of services other than the maritime mobile service abstain from using frequencies in distress and safety channels and their guardbands and in the bands allocated exclusively to that service, except under the conditions expressly specified in Nos. **4.4**, **5.128**,

5.129, **5.137** and **4.13** to **4.15**; and to ensure that stations of services other than the aeronautical mobile (R) service abstain from using frequencies allocated to that service except under the conditions expressly specified in Nos. **4.4** and **4.13**;

2 to make every effort to identify and locate the source of any unauthorized emission capable of endangering human life or property and the safe and regular conduct of aircraft operations, and to communicate their findings to the Radiocommunication Bureau;

3 to participate in ~~the~~ any monitoring programmes ~~that the Radiocommunication Bureau may organize pursuant to this Resolution~~organized by the Radiocommunication Bureau or administrations, if so agreed among those administrations, without adversely affecting the rights of other administrations or conflicting with any provisions of the Radio Regulations, in accordance with item 4 in the annex;

4 to make every effort to prevent unauthorized transmissions in bands allocated to the maritime mobile service and the aeronautical mobile (R) service;

5 to request their competent authorities to take, within their respective jurisdiction, such legislative or regulatory measures which they consider necessary or appropriate in order to prevent stations from unauthorized use of distress and safety channels or from operating in contravention of No. **23.2**;

6 to take all necessary steps in such cases of contravention of No. **23.2** to ensure the cessation of any transmissions contravening the provisions of the Radio Regulations on the frequencies or in the bands referred to in this Resolution;

7 to ~~participate actively in the studies requested by this Resolution~~ employ as many of the interference mitigation techniques in the annex as are appropriate for the maritime mobile and aeronautical mobile (R) services,

instructs the Radiocommunication Bureau

~~1 to continue to organize monitoring programmes, at regular intervals, in the maritime distress and safety channels and their guardbands and in the bands allocated exclusively to the maritime mobile service between 4 063 kHz and 27 500 kHz and to the aeronautical mobile (R) service between 2 850 kHz and 22 000 kHz, with a view to ensuring the timely distribution of monitoring data and identifying the stations of other services operating on these channels or in these bands;~~

~~2~~1 to seek the cooperation of administrations in identifying the sources of those emissions by all available means and in securing the cessation of those emissions;

~~3~~2 when the station of another service transmitting in a band allocated to the maritime mobile service or to the aeronautical mobile (R) service has been identified, to inform the administration concerned;

~~4~~3 to include the problem of interference to maritime and aeronautical distress and safety channels on the agenda of relevant regional radiocommunication seminars,

instructs the Secretary-General

to bring this Resolution to the attention of the International Maritime Organization and the International Civil Aviation Organization for such actions as they may consider appropriate~~and to invite them toparticipate in these studies~~.

ANNEX TO RESOLUTION 207 (Rev.WRC-03)

Interference mitigation techniques

This annex lists several possible HF interference mitigation techniques that may be used to protect receivers either in combination or singly depending on the resources of administrations. Use of any or all of these techniques is not mandatory.

1 Alternative modulation methods

The use of digitally modulated emissions, such as QPSK, to replace or supplement analogue SSB voice (J3E) and data (J2B) emissions. This initiative would need to be adopted internationally to allow the interoperability of equipment. For example, ICAO has adopted the HF datalink standard to provide packet data communications using automated link establishment and adaptive frequency control techniques as a supplement to analogue SSB voice communications, see ICAO Convention Annex 10.

2 Passive and dynamic/adaptive antenna systems

Use of passive and active/adaptive antenna systems to reject unwanted signals.

3 Channel barring

Administrations should ensure through their licensing, equipment standardization and inspection arrangements that, in compliance with No. **43.1**, HF radio equipment cannot transmit on frequencies exclusively assigned to the aeronautical mobile (R) service, as detailed in Appendix **27**, except for frequencies allocated for worldwide use and shared with the aeronautical mobile (OR) service (see Appendix **26**/3.4).

4 Regional HF monitoring and direction-finding facilities

Collaboration and cooperation between regional administrations to coordinate the use of monitoring and direction finding facilities.

5 Transmission of warning messages

Transmission of multi-language warning messages on specific channels affected by strong or persistent interference. Such transmissions should be conducted after coordination with the users of the affected services and the administration(s) or competent authorities concerned.

6 Education and publicity initiatives

Administrations provide education and publicity initiatives on the proper use of the radio-frequency spectrum in these bands.

ANNEX 5.5-4

Example of possible new Resolution
DRAFT RESOLUTION [XXX] (WRC-03)

Use of carrier frequencies 12 290 kHz and 16 420 kHz for limited safety-related calling, to and from rescue coordination centres

The World Radiocommunication Conference (Geneva, 2003),

considering

a) that this Conference modified **52.221A** to allow limited safety-related calling on the carrier frequencies 12 290 kHz and 16 420 kHz;

b) that the limited safety-related calling function on these carrier frequencies will enhance the capability of those search and rescue organizations which maintain watch on these distress and safety frequencies to call ships not fitted for the GMDSS,

noting

a) that regulation IV/4.8 of the International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended, requires that SOLAS ships, while at sea, be capable of transmitting and receiving general radiocommunications to and from shore-based radio systems or networks;

b) that general communications may consist of safety-related communications necessary for the safe operation of shipping,

further noting

that safety-related communications must be afforded adequate, effective and immediate access and protection,

recognizing

that Resolution MSC.129(75) of the International Maritime Organization notes that distress, urgency and safety radiocommunications include, but are not limited to:

- transmissions of maritime safety information;
- distress calls and traffic;
- acknowledgment and relaying of distress calls;
- search and rescue coordination communications;
- ship movement service communications;
- communications related to the safe operation of ships;
- communications related to navigation;
- meteorological warnings;
- meteorological observations;
- ship position reports; and
- medical emergencies (e.g. MEDICO/MEDIVAC),

resolves

1 that the carrier frequencies 12 290 kHz and 16 420 kHz be used only for distress, urgency and safety communications, and limited safety-related calling;

2 that safety-related calling be initiated only after determination that other communications are not present on these frequencies;

3 that safety-related calling is minimized and does not cause interference to distress, urgency and safety communications,

requests the Secretary-General

to bring this Resolution to the attention of the International Maritime Organization.

##########

5.6 Agenda item 1.23

"to consider realignment of the allocations to the amateur, amateur-satellite and broadcasting services around 7 MHz on a worldwide basis, taking into account Recommendation **718 (WARC-92)**"

5.6.1 Summary of technical and operational studies

Studies in response to Recommendation **718 (WARC-92)** have been ongoing in ITU-R for a number of years.

The purpose of carrying out a realignment of the bands around 7 MHz is to remedy the long-standing difficulties experienced by the AS and the limitations placed on the BS as a result of the changes made to the frequency bands around 7 MHz at the Atlantic City WARC in 1947.

Historically until the 1938 Cairo Conference the band 7 000-7 300 kHz was allocated exclusively to the AS. Conditions in Europe and Asia lead to the reduction to 7 000-7 150 kHz in ITU Regions 1 and 3. A final reduction to 7 000-7 100 kHz took place at WARC-59. The Region 2 allocation remained unchanged at 7 000-7 300 kHz amateur exclusive.

For the AS the usefulness of the allocations around 7 MHz for worldwide links is limited because only 100 kHz of spectrum between 7 000 and 7 100 kHz is common to Region 2 and Regions 1 and 3. The 7 100-7 300 kHz band is allocated exclusively to the BS in Regions 1 and 3, and exclusively to the AS in Region 2. Given the large disparity in signal levels between the two services, broadcasting transmissions cause interference to the sensitive receivers used in the AS during periods of good propagation between Regions 1 and 2. The degree of interference experienced in Region 2 varies with the time-of-day, season, solar activity and distance from broadcasting stations in other regions.

It is essential that information on sharing between the services involved in the 7 MHz realignment is available to guide the discussions at WRC-03. Fortunately, much of the information on sharing scenarios in the HF bands is to be found in the Report of JIWP 10-6-8-9/1 (25 October 1990) concerning "*Compatibility considerations arising from the allocation of spectrum to HF broadcasting*". This study, which formed Section 5 of the CCIR Report to WARC-92 (Doc. 3), is still valid and was reproduced in the Report of the Director to WRC-2000 in response to Resolution **29 (WRC-97)** (see Attachment 1 to Document CMR-2000/5). The study concludes that:

1) the sharing of frequency bands by the AS and BS is undesirable and should be avoided, because of system incompatibility between BS and AS. (See Res. **641 (Rev.HFBC-87)**);

2) the AM(R)S cannot share with other services within a Region, because it contains safety of life communications;

3) above 6 MHz the AM(OR)S operates to a Plan and cannot share with other services, because it contains safety of life communications;

4) maritime mobile international distress and calling frequencies cannot be shared with other services except for search and rescue operations (e.g. concerning manned space vehicles) because it contains safety of life communications;

5) above 4 063 kHz, the MMS operates to a Plan and does not share with any other service except fixed in the band 8 100 to 8 195 kHz, because it contains safety of life communications;

6) the LMS is now sharing with the MMS (except international calling and distress frequencies), FS and AS;

7) the FS is now sharing with the LMS, MMS (except international calling and distress frequencies) and AS. Some sharing with the BS has been adopted within the broadcasting band extensions agreed by WARC-79 and WARC-92. (See No. **5.147**);

8) dynamic frequency sharing or real time frequency management is a useful tool for providing communication circuits that are not otherwise possible because of interference constraints. Dynamic sharing implies operation on a secondary basis where there is no possibility of a claim for interference-free communication. This type of sharing is possible with frequency-agile transmitting and receiving equipment made feasible by modern technology. Dynamic frequency sharing is enhanced when one service operates with high power on known or published frequencies, such as the BS and the dynamic service operates with low power involving two-way communications such as in the FS, MS and AS. No. **5.147** gives an example of bands in which dynamic sharing is possible.

Since WARC-92, there has been further progress on the use of dynamic frequency management and sharing in the bands below 28 MHz, as a result of ITU-R studies. Regulatory changes and modified notification procedures introduced at WRC-95 and WRC-97 give full recognition to frequency agile systems, thereby facilitating the use of intelligent radiocommunication systems which can make more effective use of the radio spectrum.

In the long term, the use of frequency adaptive techniques will serve to overcome the difficulties imposed by a fixed band allocation structure under variable propagation conditions and therefore allow the available spectrum to be used with better effect than at present. Comprehensive guidance on the introduction of frequency adaptive systems for the FS is given in the forthcoming Handbook on "Frequency Adaptive Communication Systems and Networks in the MF/HF bands", which has been developed by ITU-R.

It will be advantageous to change the allocation designations for the bands currently allocated to the fixed or non-planned MS to denote shared primary use by the FS and LMS. Such merged generic fixed/mobile allocations will allow greater flexibility in the use of the bands involved and also facilitate the use of frequency adaptive techniques, thereby leading to greater efficiency in the use of the spectrum.

Another ITU-R study shows that the spectrum immediately below 7 MHz is of prime importance to the FS and MS because of its dual use in supporting near vertical incidence skywave (NVIS) communications, over relatively short distances of 100 km or so, and its more traditional use for longer range communications using oblique incidence reflection from the ionosphere. Moreover, it

is not possible to offset any loss of spectrum below 7 MHz because NVIS operations cannot make use of frequencies above 0.9 of the critical frequency, which for normal planning purposes has to be assumed to generally lie below 8 MHz.

5.6.2 Analysis of the results of studies

The following factors were identified during the studies as conditioning the search for a viable solution:

1) the fixed, land mobile and amateur allocations around 7 MHz support many important national and international applications, including those with a humanitarian and disaster relief dimension, which are particularly suited to the propagation characteristics of these bands;
2) any solution requiring sharing of spectrum between AS and BS is not desirable, since experience has shown that this is unacceptable in the long run;
3) the entire 300 kHz is required in Region 2 for the AS;
4) some movement in frequency of the allocation to the amateur services around 7 MHz may be acceptable;
5) a reduction of the amount of contiguous spectrum allocated to the BS in the 7 MHz band is unacceptable to broadcasters because of existing and anticipated congestion, but there is flexibility with regard to the actual location of this band;
6) attention should be given to the spectrum requirements of the LMS below 7 MHz;
7) spectrum allocated to the MMS, AM(OR)S, and AM(R)S should not be considered for reallocation;
8) the band 6 765-7 000 kHz has been identified as essential for supporting FS operations of all types and it is not feasible to relocate certain types of operations to higher bands because of propagation considerations;
9) sharing between the AS and the FS and MS may be possible;
10) the realignment should involve the minimum necessary shift in allocation blocks in order to limit the economic impact on users.

5.6.3 Methods to satisfy the agenda item and their advantages and disadvantages

Six methods are described in this section. Five methods result in additional allocations for the amateur service in Regions 1 and 3 immediately above its current 7 000-7 100 kHz allocation and retention of the current allocation of 7 100-7 300 kHz in Region 2, with the broadcasting service in Regions 1 and 3 moving up in frequency. Some methods also provide additional allocations to the broadcasting service in Region 2. In some cases the band above 7 350 kHz currently allocated to the fixed service on a primary basis and the land mobile service on a secondary basis would be affected.

Some administrations, in particular those of developing countries, are of the opinion that, due to the technical, operational and economic impacts of the proposed alignments contained in this document, the corresponding time-frames need to be sufficiently long in order to enable these administrations to implement the decisions, if so decided. Some other administrations are of the view that sufficient regard has been given to these aspects in the various methods.

5.6.3.1 Method A

The conference could consider modifications to Article **5** that would provide a worldwide exclusive allocation to the amateur service of 7 000-7 300 kHz and a worldwide primary allocation to the broadcasting service of at least 250 kHz of contiguous spectrum above 7 300 kHz.

In order to reduce the impact of the changes to the broadcasting, fixed and land mobile services to manageable levels it is envisaged that this option would be introduced over several years in two stages (starting date D1 and completion date D2) as follows:

Stage 1 (see Table 5.6-1)

6 765-7 000 kHz Fixed and mobile (except aeronautical mobile (R)) co-primary

7 000-7 100 kHz Amateur and amateur-satellite co-primary (NOC)

7 100-7 200 kHz Amateur primary

7 200-7 300 kHz Broadcasting primary Regions 1 and 3, amateur primary Region 2 (NOC)

7 300-7 450 kHz Broadcasting primary

MOD

5.142 The use of the band ~~7 100~~7 200-7 300 kHz in Region 2 by the amateur service shall not impose constraints on the broadcasting service intended for use within Region 1 and Region 3.

*****

D1 could range from the date of entry into force for the WRC-03 changes and the 1 April 2007 implementation date for the WARC-92 extension bands for broadcasting.

Stage 2 (see Table 5.6-1)

6 765-7 000 kHz Fixed and mobile (except aeronautical mobile (R)) co-primary (NOC with respect to Stage 1)

7 000-7 100 kHz Amateur and amateur-satellite co-primary (NOC)

7 100-7 300 kHz Amateur primary

7 300-7 550 kHz Broadcasting primary

D2 = 3 to 5 years after D1 and no later than 2010.

Advantages:

Amateur service

- Global harmonization.
- Conforms with the present Region 2 amateur allocation.
- Removal of interregional amateur/broadcasting incompatibility.
- Spectrum requirements will be met in Regions 1 and 3.

Broadcasting service

- Global harmonization of 7 MHz broadcasting band.
- Additional spectrum in Region 2.
- Improved relationship between the 7 MHz broadcasting band and the 6 MHz and 9 MHz broadcasting bands, to meet changing propagation.
- Removal of interregional amateur/broadcasting incompatibility.

Fixed and land mobile services

- No impact on important fixed and land mobile networks below 7 MHz.
- Land mobile upgraded to co-primary status as (generic) mobile in the band 6 765-7 000 kHz.

Disadvantages:

Broadcasting service

- Economic impact of broadcast spectrum shift. Both broadcasters and listeners may be affected and/or face extra costs. However, it is easier for the broadcasting service to adapt under this two-stage process, rather than if all the changes came into effect at a single date.

Fixed and land mobile services

Impact on fixed and land mobile services above 7 350 kHz. Could be compensated for partly by upgrading land mobile to primary status as (generic) mobile and partly by use of adaptive techniques.

TABLE 5.6-1

Example of stage 1 of a realignment process, which improves the utility of the band allocations around 7 MHz while retaining regional differences during an interim period, commencing at date D1 and running to date D2

6 765-7 450 kHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
6 765-7 000	FIXED ~~Land mobile~~MOBILE except aeronautical mobile (R)	
7 000-7 100	AMATEUR AMATEUR-SATELLITE	
~~**7 100-7 300**~~ ~~BROADCASTING~~	~~**7 100-7 300**~~ ~~AMATEUR~~	~~**7 100-7 300**~~ ~~BROADCASTING~~
7 100-7 ~~3~~2~~0~~0	AMATEUR	
7 ~~1~~2~~0~~0-7 300 BROADCASTING	**7 ~~1~~2~~0~~0-7 300** AMATEUR	**7 ~~1~~2~~0~~0-7 300** BROADCASTING
7 300-7 ~~3~~4~~5~~0*	BROADCASTING	
* This block of spectrum is only intended to meet the criteria of agenda item 1.23 and is not intended to limit compatible proposals associated with other agenda items.		

As shown, the changes are appropriate to a first stage implementation date D1, as determined by WRC-03, but prior to 1 April 2007.

TABLE 5.6-2

Example of stage 2 of a realignment process, which provides for globally harmonized allocations around 7 MHz, following an interim period, retaining regional differences, commencing at date D2

6 765-7 550 kHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
6 765-7 000	FIXED ~~Land mobile~~MOBILE except aeronautical mobile (R)	
7 000-7 100	AMATEUR AMATEUR SATELLITE	
~~**7 100-7 300**~~ ~~BROADCASTING~~	~~**7 100-7 300**~~ ~~AMATEUR~~	~~**7 100-7 300**~~ ~~BROADCASTING~~
7 100-7 300	AMATEUR	
7 300-7 ~~3~~5~~5~~0	BROADCASTING	
* This block of spectrum is only intended to meet the criteria of agenda item 1.23 and is not intended to limit compatible proposals associated with other agenda items.		

5.6.3.2 Method B

The conference could consider modifications to Article **5** that would provide a worldwide exclusive allocation to the amateur service of 7 000-7 200 kHz, a regional allocation of 7 200-7 300 kHz to the amateur service in Region 2 and to the amateur, fixed, and mobile except aeronautical mobile (R) services in Regions 1 and 3, and a worldwide primary allocation to the broadcasting service of 7 300-7 550 kHz.

In order to minimize the time-frame for access to the new proposed bands for the amateur service to be as short as possible, the frequency band 7 100-7 200 kHz can be allocated to the amateur service on a secondary basis from 1 January 2005.*

In order to reduce the impact of the changes to the broadcasting, fixed and land mobile services to manageable levels it is envisaged that this option would be introduced over several years in two stages (starting date D1 and completion date D2) as follows:

Stage 1 (see Table 5.6-3)

6 765-7 000 kHz Fixed and mobile (except aeronautical mobile (R)) co-primary

7 000-7 100 kHz Amateur and amateur-satellite co-primary (NOC)

7 100-7 200 kHz Amateur, fixed and mobile (except aeronautical mobile (R)) co-primary Regions 1 and 3, amateur primary Region 2

7 200-7 300 kHz Broadcasting primary Regions 1 and 3, amateur primary Region 2 (NOC)

7 300-7 450 kHz Broadcasting primary

7 450-8 100 kHz Fixed and mobile (except aeronautical mobile (R)) co-primary

* Regulatory procedures for eliminating possible interferences to reception in the broadcasting service need to be developed.

D1 = 1 April 2007.

Stage 2 (see Table 5.6-4)

6 765-7 000 kHz	Fixed and mobile (except aeronautical mobile (R)) co-primary (NOC with respect to Stage 1)
7 000-7 100 kHz	Amateur and amateur-satellite co-primary (NOC)
7 100-7 200 kHz	Amateur primary
7 200-7 300 kHz	Amateur, fixed and mobile (except aeronautical mobile (R)) co-primary Regions 1 and 3, amateur primary Region 2
7 300-7 550 kHz	Broadcasting primary
7 550-8 100 kHz	Fixed and mobile (except aeronautical mobile (R)) co-primary

D2 = 25 October 2009.

Advantages:

Amateur service

- Conforms with the present Region 2 amateur allocation.
- Removal of interregional amateur/broadcasting incompatibility.
- Spectrum requirements will be met in Regions 1 and 3.

Broadcasting service

- Global harmonization of 7 MHz broadcasting band.
- Additional spectrum in Region 2.
- Improved relationship between the 7 MHz broadcasting band and the 6 MHz and 9 MHz broadcasting bands, to meet changing propagation.
- Removal of interregional amateur/broadcasting incompatibility.

Fixed and land mobile services

- No impact on important fixed and land mobile networks below 7 MHz.
- Additional shared allocation with amateur service in the band 7 200-7 300 kHz in Regions 1 and 3.
- Land mobile upgraded to co-primary status as (generic) mobile in the bands 6 765-7 000 and 7 550-8 100 kHz.

Disadvantages:

Amateur service

Requires sharing of 100 kHz with fixed and mobile services in Regions 1 and 3.

Broadcasting service

- Economic impact of broadcast spectrum shift. Both broadcasters and listeners may be affected and/or face extra costs. However, it is easier for the broadcasting service to adapt under this two-stage process, rather than if all the changes came into effect at a single date.

Fixed and land mobile services

Impact on fixed and land mobile services above 7 350 kHz. Compensated partly by additional shared allocation with amateur service in the band 7 200-7 300 kHz in Regions 1 and 3. Could be

compensated for partly by upgrading land mobile to primary status as (generic) mobile and partly by use of adaptive techniques.

TABLE 5.6-3

Example of stage 1 of a realignment process, which improves the utility of the band allocations around 7 MHz while retaining regional differences during an interim period, commencing at date D1 and running to date D2

6 765-8 100 kHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
6 765-7 000	FIXED ~~Land mobile~~MOBILE except aeronautical mobile (R)	
7 000-7 100	AMATEUR AMATEUR-SATELLITE	
~~**7 100-7 300**~~ ~~BROADCASTING~~	~~**7 100-7 300**~~ ~~AMATEUR~~	~~**7 100-7 300**~~ ~~BROADCASTING~~
7 100-7 ~~3~~2200 AMATEUR FIXED MOBILE except aeronautical mobile (R)	**7 100-7 ~~3~~2200** AMATEUR	**7 100-7 ~~3~~2200** AMATEUR FIXED MOBILE except aeronautical mobile (R)
7 ~~1~~200-7 300 BROADCASTING	**7 ~~1~~200-7 300** AMATEUR	**7 ~~1~~200-7 300** BROADCASTING
7 300-7 ~~3~~450	BROADCASTING	
7 ~~3~~450-8 100	FIXED ~~Land mobile~~MOBILE except aeronautical mobile (R)	

TABLE 5.6-4

Example of stage 2 of a realignment process, which provides for globally harmonized allocations around 7 MHz, following an interim period, retaining regional differences, commencing at date D2

6 765-8 100 kHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
6 765-7 000	FIXED ~~Land mobile~~ MOBILE except aeronautical mobile (R)	
7 000-7 100	AMATEUR AMATEUR-SATELLITE	
~~**7 100-7 300**~~ ~~BROADCASTING~~	~~**7 100-7 300**~~ ~~AMATEUR~~	~~**7 100-7 300**~~ ~~BROADCASTING~~
7 100-7 ~~3~~200	AMATEUR	
7 ~~1~~200-7 300 AMATEUR FIXED MOBILE except aeronautical mobile (R)	**7 ~~1~~200-7 300** AMATEUR	**7 ~~1~~200-7 300** AMATEUR FIXED MOBILE except aeronautical mobile (R)
7 300-7 ~~3~~550	BROADCASTING	
7 ~~3~~550-8 100	FIXED ~~Land mobile~~ MOBILE except aeronautical mobile (R)	

5.6.3.3 Method C

The conference could consider modifications to Article **5,** which would provide administrations with a worldwide exclusive allocation of 200 kHz to the amateur service in the band 7 000-7 200 kHz. There would be no change to the allocation between 7 200-7 300 kHz. A worldwide exclusive allocation of 100 kHz would be allocated to the broadcasting service in the band 7 350-7 450 kHz. As well, the land mobile service would be upgraded to co-primary status as mobile, except aeronautical (R) (see Table 5.6-5):

6 765-7 000 kHz Fixed and mobile (except aeronautical mobile (R)) co-primary

7 000-7 100 kHz Amateur and amateur-satellite co-primary (NOC)

7 100-7 200 kHz Amateur primary

7 200-7 300 kHz Broadcasting primary Regions 1 and 3, amateur primary Region 2 (NOC)

7 300-7 450 kHz Broadcasting primary

7 450-8 100 kHz Fixed and mobile (except aeronautical mobile (R)) co-primary

Advantages:

Amateur service

- Worldwide exclusive allocation increases from 100 kHz to 200 kHz.
- Doubles the spectrum available to the amateur service in Regions 1 and 3.
- Decrease of interregional amateur/broadcasting incompatibility.

- Allocation of 300 kHz is maintained in Region 2.
- Provides improved interregional operability for the amateur service through the availability of 200 kHz of common spectrum.

Broadcasting service

- Worldwide exclusive allocation increases from 50 kHz to 150 kHz.
- Increases the allocation to the broadcasting service in Region 2 by 100 kHz.

Fixed/land mobile service

- Land mobile service is upgraded to primary status as (generic) mobile between 6 765-7 000 kHz and between 7 450-8 100 kHz.
- No impact on spectrum for the fixed and land mobile services below 7 MHz.

Disadvantages:

Amateur service

- 300 kHz exclusive worldwide spectrum requirement is not met.
- Interregional amateur/broadcasting sharing is not eliminated completely.

Broadcasting service

- Interregional amateur/broadcasting sharing is not eliminated completely.
- Some economic impact to broadcast spectrum shift. Both broadcasters and listeners may be affected and/or face extra costs.

Fixed service

- Fixed service and land mobile service lose 100 kHz worldwide.

TABLE 5.6-5

6 765-8 100 kHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
6 765-7 000	FIXED ~~Land mobile~~MOBILE except aeronautical mobile (R)	
7 000-7 100	AMATEUR AMATEUR-SATELLITE	
~~**7 100-7 300**~~ ~~BROADCASTING~~	~~**7 100-7 300**~~ ~~AMATEUR~~	~~**7 100-7 300**~~ ~~BROADCASTING~~
7 100-7 ~~3~~200	AMATEUR	
7 ~~1~~200-7 300 BROADCASTING	**7 ~~1~~200-7 300** AMATEUR	**7 ~~1~~200-7 300** BROADCASTING
7 300-7 ~~3~~450	BROADCASTING	
7 ~~3~~450-8 100	FIXED ~~Land mobile~~MOBILE except aeronautical mobile (R)	

The implementation date for this option should be 1 April 2007.

5.6.3.4 Method D

The conference could consider modifications to Article **5** that would provide a worldwide exclusive allocation to the amateur service at 7 000-7 300 kHz with no resultant loss or gain of spectrum by the broadcasting service. Also, to help compensate for the loss of spectrum by the fixed and mobile services in Regions 1 and 3, and to provide for more flexibility, the mobile service would be elevated to co-primary status with the fixed service, and would be changed from land mobile to the more generic MOBILE (except aeronautical mobile (R)) designation worldwide in the bands 6 765-7 000 kHz and 7 550-8 100 kHz, and in Region 2 in the band 7 350-7 550 kHz.

In order to reduce the impact of the changes to the broadcasting, fixed and land mobile services, by allowing sufficient time for administrations to manage this transition, it is proposed that these changes would be introduced over several years with a completion date of 1 April 2010.

The following schedule outlines a proposed timeline of the transition:

As of entry into force of the Final Acts of WRC-03:

7 100-7 300 Broadcasting primary and amateur secondary in Regions 1 and 3. No change in Region 2.

7 350-7 550 Broadcasting co-primary with fixed, land mobile secondary in Regions 1 and 3. No change in Region 2.

As of 1 April 2007

7 100-7 300 Amateur exclusive worldwide.

7 300-7 350 Broadcasting worldwide as of 1 April 2007 (WARC-92 extension band).

7 350-7 550 Broadcasting primary, fixed and land mobile secondary in Regions 1 and 3. No change in Region 2.

As of 1 April 2010

7 350-7 550 Broadcasting exclusive Regions 1 and 3. No change in Region 2.

Advantages:

Amateur service

- Global harmonization.
- Conforms with the present Region 2 amateur allocation.
- Removal of interregional amateur/broadcasting incompatibility.
- Spectrum requirements will be met in Regions 1 and 3.

Broadcasting service

- Removal of interregional amateur/broadcasting incompatibility.
- No loss of spectrum to broadcasting service.

Fixed and land mobile services

- No impact on important fixed and land mobile networks below 7 MHz.
- Land mobile upgraded to co-primary status as (generic) mobile in the band 6 765-7 000 kHz and 7 550-8 100 kHz worldwide and in the band 7 350-7 550 in Region 2.
- No loss of fixed and mobile spectrum in Region 2.

Disadvantages:

Broadcasting service

- Economic impact of broadcast spectrum shift. Both broadcasters and listeners may be affected and/or face extra costs. The impact is eased by a three-stage, rather than a one-stage process.
- The lack of interregional realignment as requested in the agenda item.

Fixed and land mobile services

- Loss of spectrum in Regions 1 and 3 between 7 350-7 550 kHz. Could be compensated for partly by upgrading land mobile to primary status as (generic) mobile and partly by use of adaptive techniques.
- Broadcasting in Regions 1 and 3 might interfere with critical fixed and mobile operations in Region 2 in the frequency band 7 350-7 550 kHz.

TABLE 5.6-6

Example of the Table of Frequency Allocations as it would appear after the completion of the realignment process

6 765-7 350 kHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
6 765-7 000	FIXED ~~Land mobile 5.139~~MOBILE (except aeronautical mobile (R)) 5.138 5.139	
7 000-7 100	AMATEUR AMATEUR-SATELLITE 5.140 5.141	
7 100-7 300 ~~BROADCASTING~~ AMATEUR	**7 100-7 300** AMATEUR ~~5.142~~	**7 100-7 300** ~~BROADCASTING~~ AMATEUR
7 300-7 350	BROADCASTING 5.134 5.143	

TABLE 5.6-7

7 350-8 100 kHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
7 350-~~8 100~~7 550 ~~FIXED~~ ~~Land mobile~~ BROADCASTING	**7 350-~~8 100~~7 550** FIXED ~~Land mobile~~ MOBILE (except aeronautical mobile (R))	**7 350-~~8 100~~7 550** ~~FIXED~~ ~~Land mobile~~ BROADCASTING
7 550-8 100	FIXED ~~Land mobile~~MOBILE (except aeronautical mobile (R)) 5.144	

5.6.3.5 Method E

The conference could consider modifications to Article **5**, which would provide administrations with a worldwide allocation of 200 kHz to the amateur service in the band 7 000-7 200 kHz.
The band 7 100-7 200 kHz is also allocated to fixed and land mobile services with co-primary status in Regions 1 and 3. There would be no change to the allocation between 7 200-7 300 kHz.
A worldwide exclusive allocation of 100 kHz would be allocated to the broadcasting service in the band 7 350-7 450 kHz. (See Table 5.6-8):

6 765-7 000 kHz Fixed primary and land mobile secondary (NOC)

7 000-7 100 kHz Amateur and amateur-satellite co-primary (NOC)

7 100-7 200 kHz Amateur, fixed and land mobile co-primary in Regions 1 and 3, amateur primary in Region 2

7 200-7 300 kHz Broadcasting primary in Regions 1 and 3, amateur primary in Region 2 (NOC)

7 300-7 450 kHz Broadcasting primary

7 450-8 100 kHz Fixed primary and land mobile secondary (NOC)

Advantages:

Amateur service

- Worldwide allocation increases from 100 kHz to 200 kHz.
- Doubles the spectrum available to the amateur service in Regions 1 and 3.
- Some improvement of interregional amateur/broadcasting alignment.
- Allocation of 300 kHz is maintained in Region 2.
- Provides improved interregional operability for the amateur service through the availability of 200 kHz of common spectrum.

Broadcasting service

- Worldwide exclusive allocation increases from 50 kHz to 150 kHz.
- Increases the allocation to the broadcasting service in Region 2 by 100 kHz.

Fixed/land mobile service

- Land mobile service is upgraded to primary status between 7 100-7 200 kHz in Regions 1 and 3.
- Retains the current spectrum amount for existing services in Regions 1 and 3.

- No impact on spectrum for the fixed and land mobile services below 7 MHz.

Disadvantages:

Amateur service

- 300 kHz exclusive worldwide spectrum requirement is not met.
- Interregional amateur/broadcasting alignment is not completely achieved.

Broadcasting service

- Interregional amateur/broadcasting alignment is not completely achieved.
- Economic impact of broadcast spectrum shift, both broadcasters and listeners may be affected and/or face additional costs.

Fixed service/land mobile service

- Decreases the allocation to the fixed and land mobile services in Region 2 by 100 kHz.

TABLE 5.6-8

6 765-8 100 kHz

Allocation to services		
Region 1	**Region 2**	**Region 3**
6 765-7 000	FIXED Land mobile	
7 000-7 100	AMATEUR AMATEUR-SATELLITE	
7 100-7 200 AMATEUR FIXED LAND MOBILE	**7 100-7 300** AMATEUR	**7 100-7 200** AMATEUR FIXED LAND MOBILE
7 ~~1~~200-7 300 BROADCASTING		**7 ~~1~~200-7 300** BROADCASTING
7 300-7 ~~3~~450	BROADCASTING	
7 ~~3~~450-8 100	FIXED Land mobile	

The implementation date for this option should be 1 April 2007.

5.6.3.6 Method F

WRC-03 may decide to make no changes to the allocations under this agenda item.

No change to Article 5 is required under this method.

Advantages:

Broadcasting service

- No change to current allocations.

Fixed service

- No change to current allocations.

Disadvantages:

Amateur service

- The current situation and resultant difficulties arising from unharmonized amateur service bands will continue.

Broadcasting service

- Interregional amateur/broadcasting alignment is not achieved.

5.6.4 Regulatory and procedural considerations

If any of the above methods, except Method F, are adopted the appropriate consequential amendments to the RR would need to be considered.

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5.7 Agenda item 1.36

"to examine the adequacy of the frequency allocations for HF broadcasting from about 4 MHz to 10 MHz, taking into account the seasonal planning procedures adopted by WRC-97"

5.7.1 Summary of technical and operational studies

It has been evident for several decades that the spectrum available to the broadcasting service between 4 and 10 MHz is inadequate. The bands are ideal for short- and medium-range coverage (up to 2 000 km) during daytime and are also needed to support longer-range services at night. In recent years, there has been a tendency for many broadcasters to improve the reliability of their transmissions by using short-distance, single hop-transmissions in the lower frequency bands to replace their long distance, multihop services.

Since 2000, a comprehensive study of the use of the HF bands for broadcasting, aided by the better information now available through the regional coordination arrangements introduced by WRC-97 as part of RR Article **12**, demonstrates that the total shortfall in spectrum in the 6, 7 and 9 MHz broadcasting bands is at least 250 kHz. That is if the objective is limited just to eliminating co-channel collisions. However, up to 800 kHz would be needed to eliminate adjacent channel collisions as well.

In addition, practical experience in planning confirms this analysis. This conclusion is remarkably similar to the estimate of a 700 kHz shortfall contained in proposals submitted to WARC-92.

Relevant Recommendations ITU-R: P.373, P.533.

5.7.1.1 HF propagation considerations

In common with all other services using the HF spectrum for beyond line-of-sight skywave transmissions, ionospheric conditions constrain broadcasting to the lower bands during periods of low to mid sunspot activity particularly during local winter. A typical example of this is demonstrated by the maps shown in Figures 5.7-1 and 5.7-2.

These maps show the Maximum Usable Frequency (MUF) at peak broadcasting time (typically 9 p.m. local time) for sunspot numbers (SSN) of 10 and 100 and local Winter. A NTIA/ITS implementation of Recommendation ITU-R P.533 was used to prepare these maps.

The light shading shows the area around a transmitter where the MUF is below 10 MHz while the dark shading shows the area where the MUF is above 10 MHz. Not only must a transmission be below 10 MHz to provide a service within the lighter shaded area from the transmitter location but

also any transmission from within the lighter shaded area to the transmitter location will need to be below 10 MHz.

It should be noted that the MUF is a 50% value. This means that on 50% of the days for a given month the frequency is above, and on 50% of the days the frequency is below this value. A frequency can be supported for 80% of days if it is 85% of the MUF. This is referred to as the Frequency of Optimum Traffic (FOT). These terms are defined in Recommendation ITU-R P.373.

Broadcasters use the FOT to provide reliable transmissions, achieved in practice by selecting frequencies in the next band below the predicted MUF. Should the MUF be around 9 MHz, then the 7 MHz band will provide the best compromise between reliability and strength of signal delivered.

FIGURE 5.7-1

Vienna, Austria, December 2000 - UTC sun spot number 10

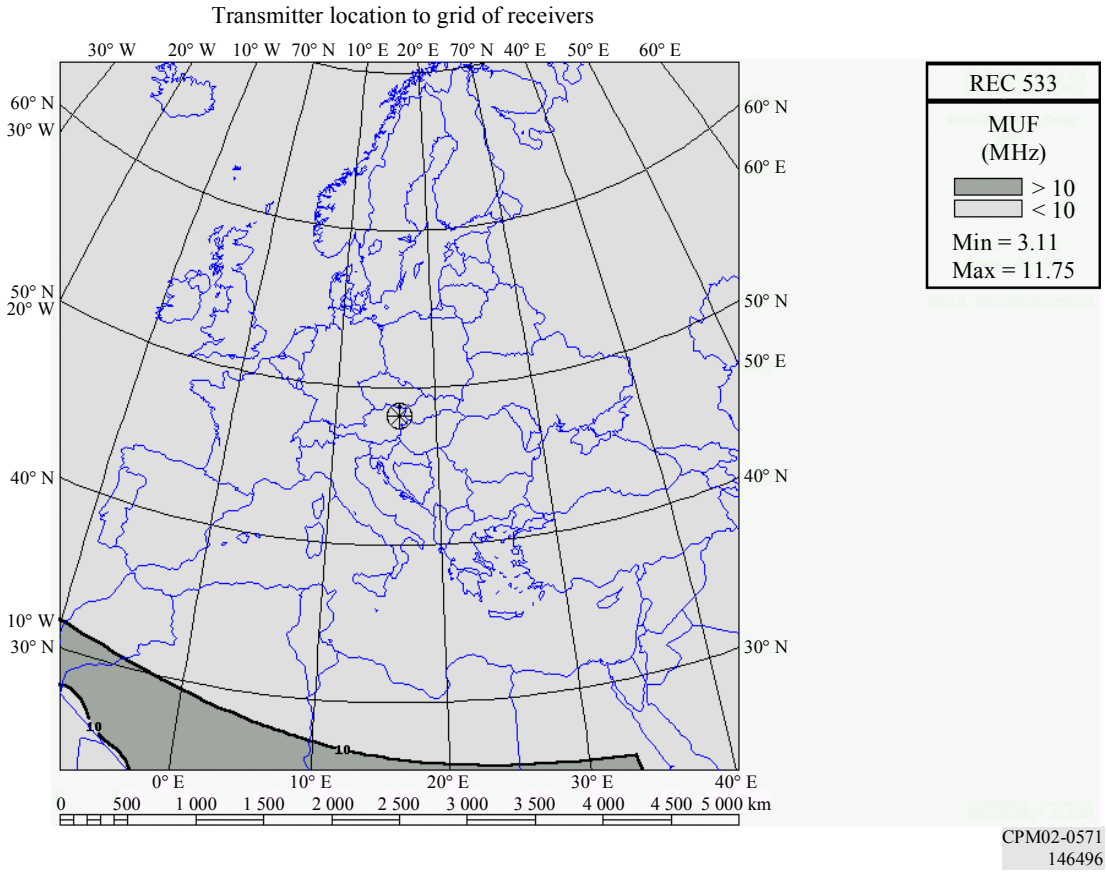
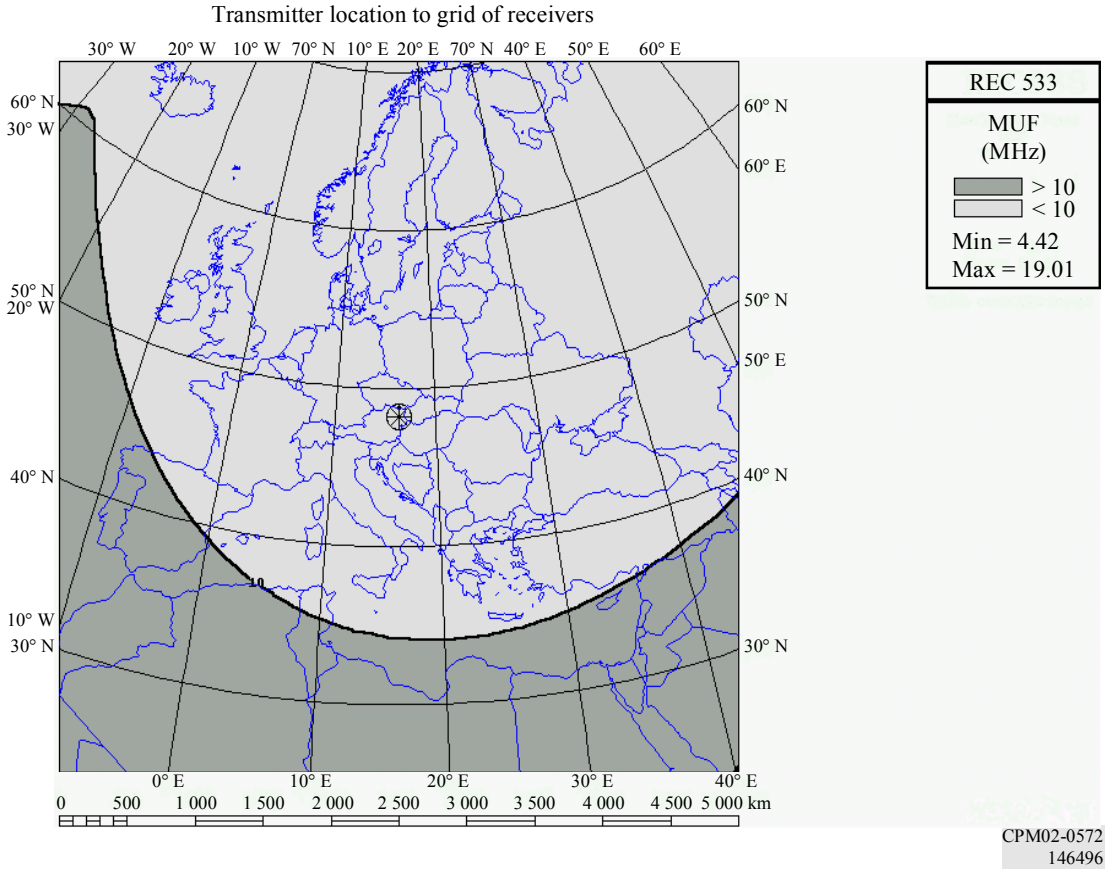


FIGURE 5.7-2

Vienna, Austria, December 2000 - UTC sun spot number 100



5.7.2 Analysis of the results of studies

A major advance in the RR Article **12** Procedure developed by WRC-97 is the encouragement given to regional coordination groups in coordinating their requirements prior to development of each season's tentative schedules for HF broadcasting. This coordination is currently achieved in two HF Coordination Groups recognized by ITU. These are:

HFCC/ASBU - an informal group of organizations with interests in HFBS from Europe, North America and the Arab States;

ABU-HFC - an informal group of organizations with interests in HFBS from the Asia Pacific region and others with interest in broadcasting within Asia.

A very positive effect of RR Article **12** (WRC-97) Procedure is that the activities of the regional coordination groups have helped to reduce incompatible spectrum requirements and congestion in the HF bands.

Collectively, these two groups coordinate over 80% of the broadcasting requirements worldwide. The HFBC requirements coordinated are considered to be realistic, as they are used in practice and provide a useful indication of how the HF broadcast bands are utilized.

However, congestion in the bands below 10 MHz continues, especially within the 6, 7 and 9 MHz bands, and there is considerable evidence that additional broadcasting spectrum below 10 MHz is needed as soon as possible.

The initial case for more broadcasting spectrum below 10 MHz was based on a consideration of the broadcasting hour requirements above and below 10 MHz and contrasting these with actual spectrum availability. The scheduling process for the year 1999 and 2000 seasons showed

broadcasting hour requirements rising to 10 000 hours below 10 MHz where 900 kHz of spectrum is currently available, and would only rise to 1 100 kHz if the WARC-92 extension bands were available. In contrast 2 280 kHz is currently available above 10 MHz (rising to 2 870 kHz once the WARC-92 bands are included) and the current broadcasting requirement is only around 7 000 hours. This simple analysis demonstrated that transmitter hour requirements below 10 MHz are 133% of those in the range 10-30 MHz, whereas the available spectrum below 10 MHz is only 38% of the spectrum available above 10 MHz. In addition to this fundamental imbalance between capacity and requirement, the coordination process showed that between 20% to 33% of requirements remain unsatisfied. This was considered to be an underestimate because programming continuity requirements are not immediately taken into account when analysing the total number of incompatible co-channel or adjacent channel hours. However, even on the basis of such a simplistic calculation, there is a shortfall in spectrum requirements of between 250 and 400 kHz.

Additional statistics have since been generated using data available from the new Article 12 Procedure. HFCC has developed a pragmatic approach to identifying interference between requirements. This uses Recommendation ITU-R P.533 to calculate field strengths and then uses a special routine to identify interference between requirements both co- and adjacent channel (±5 kHz). The interference between two requirements is called a "collision". Experience has shown that this process provides a realistic assessment of interference. The collision hours calculated are the number of hours remaining in the schedule where no solution has been found to the interference situation during the coordination process.

The statistics shown in Tables 5.7-1 and 5.7-2, and Figures 5.7-3 to 5.7-6 have been prepared using the process outlined above. They include the actual broadcasting use of the WARC-92 bands, although these bands are not available to the broadcasting service until 2007.

Season B00 (November - March)

Source data: HFCC and ABU-HFC combined schedule B00 database version 03-02.

Collisions identified with Rec. ITU-R P.533 software, sun spot number 108, December 2000.

Season A01 (April - October)

Source data: HFCC and ABU-HFC combined schedule A01 database version 03-00.

Collisions identified with Rec. ITU-R P.533 software, sun spot number 109, July 2001.

5.7.2.1 Evaluation

The HF broadcasting statistics show that the broadcast bands below 10 MHz are congested even at the current high level of sunspot activity. Table 5.7-1 (B00 season) indicates most collisions occur in the bands below 10 MHz and that the 7 MHz band is the most congested with just 35% of transmission hours having no co- or adjacent-channel interference. Table 5.7-2 (A01 season) shows that the bands below 10 MHz are still congested although the highest level of congestion is now at 11 MHz.

These results can be easily seen in Figure 5.7-4 (B00) and Figure 5.7-6 (A01), which show the satisfied hours per band Figure 5.7-3 (B00) and Figure 5.7-5 (A01) show the number of co- and adjacent-channel hours per band.

Congestion in the bands below 10 MHz will increase as sunspot activity declines and broadcasters are forced to use the lower bands to maintain viable transmissions. The next sunspot minimum is predicted to occur around 2006/7 and so it is inevitable that the congestion in the bands below 10 MHz will increase.

For the most recent schedule periods, the statistics show that around 250 kHz of additional spectrum is needed to clear the co-channel collisions and up to 800 kHz to clear both the co-channel and adjacent channel collisions.

Consideration of propagation constraints underlying the planning of HF services leads to the conclusion that congestion is further exacerbated by the fact that the present broadcasting bands between 4 and 10 MHz are not optimally spaced, so as to allow frequency changes to take place that will maintain service to target areas on frequencies close to 85% of the MUF. The spacing between the 4 and 6 MHz bands and the 7 and 9 MHz bands is about double the optimum, which means that the spectrum available is being used inefficiently and that many services are scheduled to use a sub-optimal frequency. A more general conclusion is that the HF spectrum could be used more effectively if service allocations were determined on the basis of a larger number of appropriately spaced narrower bands than a smaller number of broader bands.

TABLE 5.7-1

B00 collision statistics and spectrum requirements per day

HF BS band (MHz)	Transmit hours	Mutual co-channel collision hours	Mutual adj-channel collision hours	Satisfied hours	Spectrum available (inc. WRC 92 bands) (kHz)	Additional spectrum required to satisfy co-channel requirements (kHz)	Additional spectrum required to satisfy adj-channel requirements (kHz)	Percentage of satisfied hours
6	2544.78	258.08	1041.65	1218.50	300	65	255	47.9
7	2461.20	416.58	903.75	864.88	250	120	260	35.1
9	3286.40	310.32	927.34	1544.67	500	100	300	47.0
11	2517.90	157.91	528.25	1588.07	500	50	165	63.1
13	522.40	19.35	46.25	420.62	300	15	35	80.5
15	1822.92	65.67	251.50	1391.75	700	35	125	76.3
17	1009.15	28.58	72.79	867.37	420	15	35	86.0
18	22.50	0.00	0.00	22.50	120	0	0	100.0
21	471.28	6.82	15.32	443.15	400	5	15	94.0
26	10.00	0.00	0.00	10.00	430	0	0	100.0
Total	**14668.53**	**1263.31**	**3786.85**	**8371.51**	**3920**	**405**	**1190**	**57.1**

FIGURE 5.7-3

B00 collision statistics per day

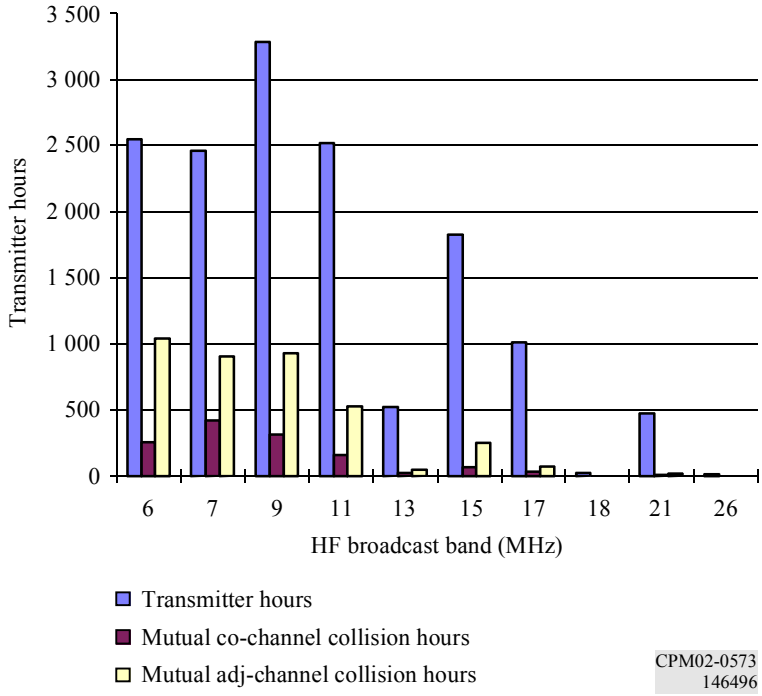


FIGURE 5.7-4

Percentage of satisfied hours per band for B00 season

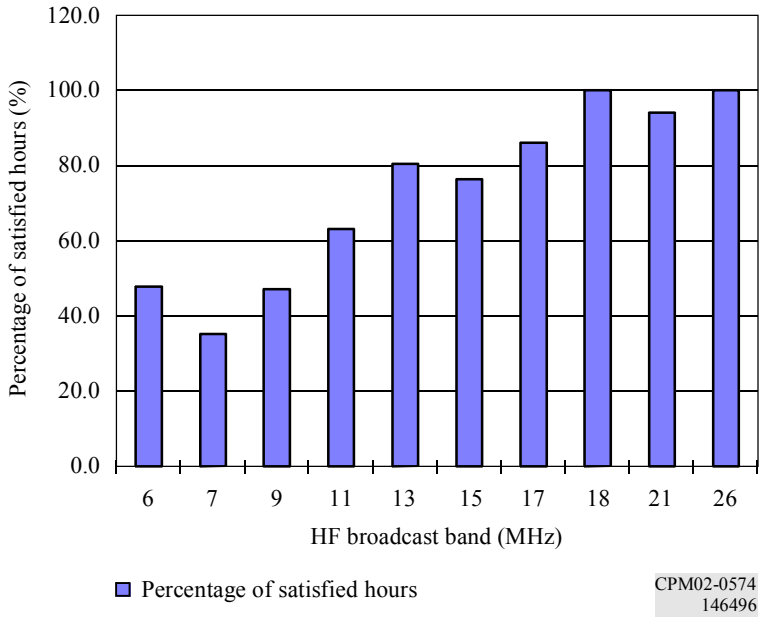


TABLE 5.7-2

A01 collision statistics and spectrum requirements per day

HF BS band (MHz)	Transmitter hours	Mutual co-channel collision hours	Mutual adj-channel collision hours	Satisfied hours	Spectrum available (inc. WRC 92 bands) (kHz)	Additional spectrum required to satisfy co-channel requirements (kHz)	Additional spectrum required to satisfy adj-channel requirements (kHz)	Percentage of satisfied Hours
6	2537.77	215.84	888.67	1536.09	300	40	175	60.5
7	1755.50	265.22	548.95	969.58	250	70	140	55.2
9	2935.68	368.60	1273.02	1437.33	500	130	445	49.0
11	2966.81	507.25	1262.01	1392.00	500	180	455	46.9
13	874.52	94.67	225.16	508.70	300	55	135	58.2
15	2401.21	147.58	569.15	1506.73	700	70	265	62.7
17	1409.92	79.45	216.60	997.78	420	35	90	70.8
18	19.50	0.00	0.00	19.50	120	0	0	100.0
21	644.51	16.23	43.90	531.15	400	10	35	82.4
26	4.00	0.00	0.00	4.00	430	0	0	100.0
Total	**15549.42**	**1694.84**	**5027.46**	**8902.86**	**3920**	**590**	**1740**	**57.3**

FIGURE 5.7-5

A01 collision statistics per day

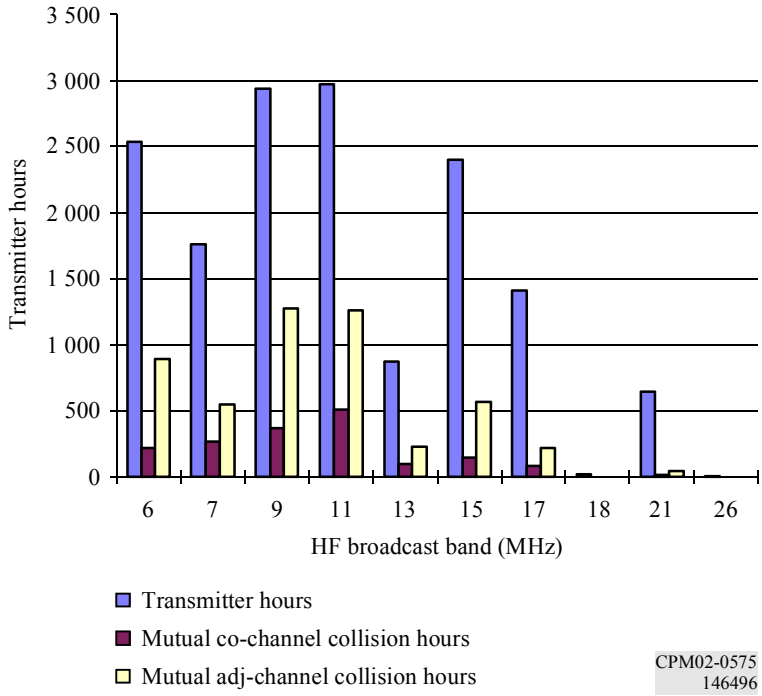
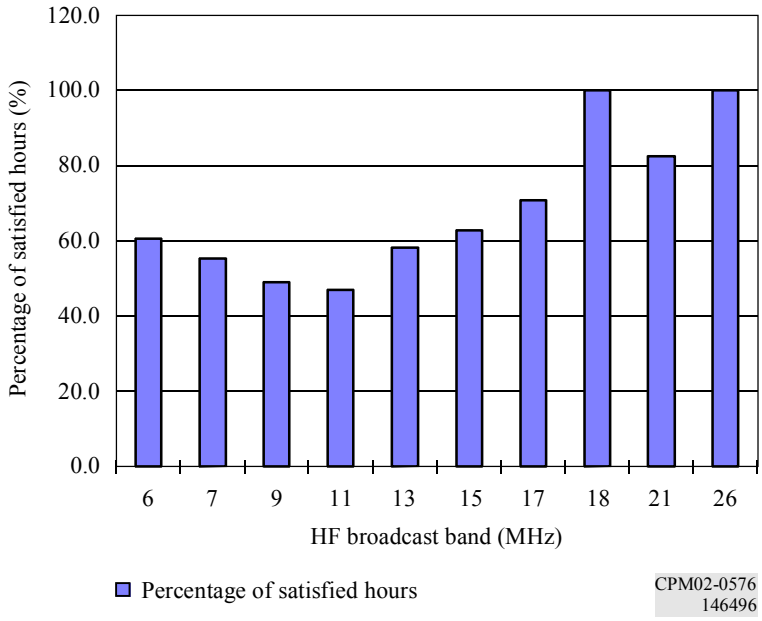


FIGURE 5.7-6

Percentage of satisfied hours per band for A01 season



5.7.3 Methods to satisfy the agenda item their advantages and disadvantages

Since many of the scheduling requirements in the 4-10 MHz range will be for relatively short-range coverage - subregional service in effect - it may be that there will be no need to adopt the same solution for new broadcasting bands across all three ITU Regions.

The results of the studies on spectrum requirements and optimum band location show that only the following parts of the HF spectrum should be studied further with a view to identifying suitable additional spectrum that would be effective in reducing the present deficiencies:

Band	Considerations
4 MHz	Review the current position in the band 4 500-4 650 kHz. The potential problems with displaced services will need careful investigation.
5 MHz	Review the current position on the band 5 060-5 250 kHz, which was proposed by several European countries as a source of additional spectrum for broadcasting at WARC-92. Again, the potential problems with displaced services will need careful investigation. Furthermore, the footnote RR No. **5.133** gives primary status, over part of the band, to the mobile services in a number of countries.
6 MHz	Review the current position on the band 5 840-5 900 kHz as a matter of urgency noting the potential problems with the displaced services.
7 MHz	Extend the 7 MHz band upwards by 300 kHz.
9 MHz	Extend the present 9 MHz band downwards by 110 kHz, i.e. 9 290-9 400 kHz Extend the present 9 MHz band upwards by 40 kHz, i.e. 9 900-9 940 kHz.

In view of the urgency of the problem, the aim should be to implement the resulting solutions on 1 April 2007, in line with the access date for the WARC-92 bands.

Other factors connected with the implementation of the additional spectrum are:

- The additional allocation around 7 MHz. This should be compatible with any changes agreed under agenda item 1.23 and should ideally be implemented within a common timeframe so that the totality of the changes needed around 7 MHz are implemented in an orderly manner, thus giving confidence to all the services involved.
- The additional allocations 5 840-5 900 kHz, 9 290-9 400 kHz and 9 900-9 940 kHz are adjacent to existing broadcasting bands.
- The additional band at 5 060-5 250 kHz is adjacent to an existing tropical broadcasting band.
- The additional band at 4 500-4 650 kHz is currently allocated to the fixed and mobile services.

In the case that further study is required on any or all of these candidate bands then a Resolution should be established to condition the completion of this work at the following conference. This is likely to be so for the bands, which are not adjacent to an existing international broadcasting band. An example format for such a Resolution is given in Annex 5.7-1[6].

No consideration should be given to expanding the use of the tropical zone broadcasting bands identified in No. **5.113**. Broadcasting operations in these bands commonly use near vertical incidence skywave (NVIS) techniques on frequencies less than 0.9 of the critical frequency. This type of operation is compatible with shared use elsewhere by the fixed service, which is either relatively short range, if NVIS techniques are also employed, or at lower power levels than broadcasting. In contrast broadcasting operations under RR Article **12** procedures tend to use relatively higher powers and would mostly operate using oblique incidence at a frequency of 1.1 to 3 times the critical frequency. Since the critical frequency would normally be lower outside the tropical zone, there would be good chance that the best choice of oblique incidence frequency outside the tropical zone would conflict with the optimum choice of NVIS frequency inside the tropical zone.

5.7.4 Regulatory and procedural considerations

Because any of the above potential sources of spectrum will inevitably involve some form of transition arrangements or adherence to sharing criteria in respect of existing services, a number of additions to the Radio Regulations will be necessary to define the circumstances under which any additional spectrum could be brought into use.

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[6] Some administrations believe that proposals on the additional specific frequency bands for HF broadcasting cannot be made before the completion of studies on compatibility with other services which can be affected, and without taking into account progress in development of digital technologies. Some other administrations consider it necessary to implement additional allocations to the broadcasting service at WRC-03 in the bands identified here.

ANNEX 5.7-1

Example
RESOLUTION [XXX] (WRC-03)

Identification of additional spectrum for the broadcasting service in the HF bands

The World Radiocommunication Conference (Geneva, 2003),

considering

a) that the spectrum allocated to the broadcasting service from 4 MHz to 10 MHz is about 25% of the all spectrum allocated to HF broadcasting;

b) that WARC-79 allocated only an additional 125 kHz of spectrum to the HF broadcasting service below 10 MHz (9 775-9 900 kHz);

c) that WARC-92 allocated an additional 200 kHz HF to the broadcasting service consisting of 100 kHz at 9 MHz, 50 kHz at 7 MHz and 50 kHz at 6 MHz. This additional spectrum will become available to the broadcasting service from [1 April 2007];

d) that the agenda for WRC-07 includes the revision of allocations to the services in HF bands;

e) that the results of coordination under Article **12** demonstrate that the broadcast bands below 10 MHz are congested, even when there are high levels of sunspot activity, with little more than half of the broadcasting requirements being satisfied;

f) that in the most recent periods of seasonal planning, the statistics show that around 250 kHz of additional spectrum is needed to clear the co-channel collisions and up to 800 kHz to clear both the co-channel and adjacent channel collisions in the bands below 10 MHz;

g) that the introduction and promotion of the new digital technology, that improves spectrum utilization and efficiency, cannot completely solve current congestion problems;

h) that the broadcasting service, in an era of convergence of services, will play an increased socio-political role,

resolves

that the following conference should conclude on additional spectrum requirements for the broadcasting service by making sufficient allocations from all the following bands:

[4.500-4.650 kHz]

[5.060-5.250 kHz]

[5.840-5.900 kHz (*)]

[7.350-7.650 kHz (*)(**)]

[9.290-9.400 kHz (*)]

[9.900-9.940 kHz (*)]

invites ITU-R

1 to carry out technical studies on this matter, taking into account technical, operational, economic and other relevant factors;

2 to bring the results of these studies to the attention of WRC-07,

urges administrations

to participate actively in the aforementioned studies by submitting contributions to ITU-R.

(*) bands adjacent to the HF broadcasting bands governed by Article **12**.

(**) band location may need to be revised in light of actions decided in respect of WRC-03 agenda item 1.23.

NOTE – Some administrations believe that proposals on the additional specific frequency bands for HF broadcasting cannot be made before the completion of studies on compatibility with other services which can be affected, and without taking into account progress in development of digital technologies.