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**Possible use of VHF band I for digital
sound broadcasting services**

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Broadcasting service (sound)



International
Telecommunication
Union

Foreword

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REPORT ITU-R BS.2208

Possible use of VHF Band I for digital sound broadcasting services

(2010)

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1 Introduction

Radio and television broadcasting is in the process of migrating to digital modulation schemes to better exploit the possibilities offered by existing and new delivery platforms. Digital modulation offers significant advantages in being able to give:

- consistent quality which is less dependent on variations in the channel;
- more effective use of channel capacity through resilient coding and advanced compression techniques;
- easier access through automatic or assisted tuning;
- versatility by including audiovisual and data information in the same channel.

Recognizing that analogue broadcasting technologies still find significant use and will continue to do so for some time to come, this Report will restrict itself to consideration of digital systems.

While the Internet and associated systems are playing an increasingly important role in the delivery of sound broadcasting services, conventional terrestrial radio still plays a very important part in delivering radio to its audiences. Demand for services outstrips the channel capacity and so there is pressure to increase that capacity. More efficient digital formats play a major part in this quest. However, this document examines the possibility of using digital formats in parts of the spectrum that are, have been, or can be made available for broadcasting but are not very much used at the moment.

VHF Band I is taken to include frequencies between 47 MHz and 68 MHz. From a technical point of view, there is no reason why this should not be extended to include the OIRT Bands (see Article 5 of the Radio Regulations (RR)) used in certain countries for FM analogue broadcasting. While this band may not be available in all locations it is a valuable broadcasting resource where it is available and the technical arguments are the same as for the frequency bands immediately below it.

2 Why consider the use of these bands for digital sound broadcasting?

Traditionally sound broadcasting has been carried out in the LF, MF, HF and VHF (Band II) bands. More recently, digital (DAB) sound services in VHF (Band III) have been broadcast in certain parts of the world. With the exception of the HF bands, where the unique propagation characteristics are vital to long distance international sound services, VHF Band II has become predominant among them. So much so that in many parts of the world the 88 to 108 MHz band has become crowded and there is little or no opportunity for new services to be introduced.

For various reasons – not least, better use of spectrum – some countries are considering, or are in the process of introducing, digital sound broadcasting systems. At the present time the majority of such services are located in VHF Band III using the DAB system. It has not been possible to introduce DAB services into Band II because the band is already heavily used and the introduction of a single DAB multiplex would require eight existing services to be switched off to make space.

Past experience has shown that it can take a long time for a new broadcasting format to establish itself. FM in Band II was around for a very long time before it became the predominant sound broadcasting system, AM in the MF band was displaced from this predominant role. It is therefore to be expected that any radio service will have to be simultaneously broadcast in both the old, analogue, and new, digital, formats until such time as the bulk of the audience has migrated. Obviously this will make a further demand on spectrum and further inhibit the ability to introduce new services.

The restricted quality of sound broadcasting in the LF and MF bands means that it has fallen from favour with a large part of its traditional users; both broadcasters and audiences. Despite this there is still a large residual use. In certain parts of the world, including Europe, the LF and MF bands are still crowded. Even if channels were available, their perceived low – analogue – quality and wide area propagation characteristics make them unattractive to local and community broadcasters.

There is a high demand for radio services to small, local and even community service areas. Such service areas are usually limited to a radius of less than a few kilometres covering just a small part of a town or city. The cost of setting up such a local station, the ongoing running costs and quality of coverage are important issues to be considered. Use of digital modulation techniques would certainly provide the quality of coverage while requiring low transmitter power and hence low cost.

The DAB system is good for covering large audiences. This is particularly true where a number of broadcasters have the same geographical coverage aspiration and where several high-power

transmitters can be synchronized into a large single frequency network. DAB is very good at national and regional coverage. It is less good where the coverage aspirations of the participating broadcasters in a given multiplex are not the same which is frequently the case with small, local or community broadcasters. Conventional DAB only becomes efficient in its use of spectrum when multiple transmitters can use the same channel to cover a large area. It can therefore be unattractive to local broadcasters who wish neither to reach, nor pay the transmission fees, to cover larger audiences. The DAB+ system partly addresses this by having more stations in the multiplex, thereby offering better spectral efficiency without the need for single frequency networks. However, this implies that an even greater number of stations will have to be found which are seeking identical coverage. In turn this limits its attractiveness to small broadcasters who would be better served by a transmitter designed to match their unique coverage requirements.

3 What digital broadcasting systems might be considered in Band I?

VHF Band I is currently little used and offers the possibility to find spectrum for new radio services. The most appropriate digital modulation scheme currently available for these bands appears to be the DRM30/DRM+¹ family. The HD Radio specification does not include modes which allow it to work in the HF band or in VHF Band I. While HD Radio operation in these bands is a technical possibility, the EBU is not aware of any tests having been carried out. DRM was originally conceived as a digital medium for use in the LF, MF and HF bands below 30 MHz. Propagation conditions in the HF band can be hostile; much development effort was expended in making DRM work in these hostile conditions. DRM+ has been more recently developed, and standardized² to facilitate a system offering the benefits of DRM in the broadcast bands between 30 MHz and 174 MHz. It uses a wider-band multiplex. While DRM30 has been shown to work³ in VHF Band I, a bigger multiplex offers a greater correlation bandwidth and hence better defence against flat fading. Further, higher bit rates are possible to give better audio quality and/or more services in the multiplex.

While able to offer line-of-sight services to small communities, VHF Band I might better be used to provide services to somewhat wider areas. This is perfectly feasible as evidenced by its traditional use for television. Band I is now little used for television and so large parts of it are free in many parts of the world. It is worth noting that where parts of Band I have been used by administrations for other purposes there is little coordination. Different parts are used in different countries for different applications (see § 5). However, the band is wide and space is usually available in parts of the band, albeit different parts of the band in different parts of the world.

Line-of-sight transmission and a relatively large amount of available spectrum offer the opportunity to use higher quality, wide channel modes with the DRM30 system. In VHF Band I, the DRM+ system is perhaps the better option as it can offer up to four high-quality audio services in a 100 kHz multiplex. The trade-off between the number of streams and the audio quality – fewer streams higher quality – should be noted.

¹ DRM30 is the DRM system initially designed for use in the frequency bands below 30 MHz. DRM+ is the extension of this system for use in the frequency bands between 30 and 174 MHz.

² The DRM system specification was revised to incorporate an additional mode designed for the lower VHF band (i.e. broadcast frequencies between 30 MHz and 174 MHz) allowing operation in Bands I and II (the FM band). This standard enhancement is called DRM+. A download version of the DRM system specification (ESTI ES 201 980 V3.1.1) is available on the ESTI website at <http://www.etsi.org>.

³ The technical feasibility of using Band I for DRM, and consequently for DRM+, has been proven by trials carried out by TDF in Rennes.

DRM+ could be deployed in VHF Band II but this is at the moment saturated with FM services in many European countries. If there is a desire for usable spectrum for DRM+ at frequencies below 120 MHz in the short or medium term (or until it can be introduced in Band II), Band I would be a suitable candidate for its early introduction.

4 Band I

Successful tests have been carried out in Band I⁴ which demonstrate that this band is suitable for local broadcasting using both the DRM30 and DRM+ systems.

4.1 The existing use of Band I in Region 1

VHF Band I is the frequency band from 47 to 68 MHz. In Region 1, this band is allocated to the broadcasting service on a primary basis in the ITU RR. In the European Broadcasting Area (EBA), the broadcast use is analogue television and FM sound broadcasting; SAB/SAP applications are also included on a secondary basis. In some European countries, the broadcasting usage of that band has stopped.

The ST61 Agreement for television and sound broadcasting in the European broadcasting area is the oldest broadcasting Plan. It is still in force after 45 years and shows 1 119 assignments currently registered in Band I in Region 1 (see Annex 1).

Band I is not exclusive to broadcasting and there is sharing with land mobile and some other services (for example, the amateur service) in a number of countries. Parts of Band I are also allocated to the fixed service on a secondary basis in certain countries.

Within Band I there are several channel/frequency assignment arrangements. In Eastern Europe, in France and in Ireland, channels are 8 MHz wide and in other countries the channel width is 7 MHz. There is little consistency in the allocation of vision frequencies for a given channel within countries using either 7 or 8 MHz channels. There is, of course, no alignment of channel edges between countries using 7 MHz channels and those using 8 MHz channels.

Despite being allocated to the broadcasting service in the ITU, a number of other diverse applications also have allocations in Band I through footnotes in the RR (see Annex 2). The trend in several European countries within CEPT has been to withdraw broadcasting activity from this band. For the long term, the CEPT plans do not consider this band for broadcasting any more, as shown in Table 1 which is an extract from the European Common Allocation Table (see ERO Report 25 for more details (www.ero.dk)).

⁴ The technical feasibility of using Band I for DRM, and consequently for DRM+, has been proven by trials carried out by TDF in Rennes and Successful trials of DRM+ in Band I were carried out in Paris in July 2009 by the Syndicat National des Radios Libres (SNRL) and was performed with the help of University of Applied Sciences, Kaiserslautern and Fraunhofer IIS, Erlangen. For more information, see: <http://www.drm.org/news/detail/news/drm-in-band-i-promoted-as-a-most-suitable-technology-to-complement-other-digital-radio-standards-in/>.

TABLE 1

Allocation of Band I in the European Common Allocation Table (source ERO)

	Europe (ECA)
46.400-47.000 MHz	Defence systems/PER/Wind profilers/Radio microphones and Assistive listening devices
47.000-48.000 MHz	Defence systems/PER/Wind profilers
47.000-47.250 MHz	On-site paging
48.000-48.500 MHz	Defence systems/PER/Wind profilers
48.500-50.000 MHz	Defence systems/PER/Wind profilers/Space research
50.000-51.000 MHz	Defence systems/PER/Wind profilers/Amateur
51.000-52.000 MHz	Defence systems/PER/Wind profilers/Amateur
52.000-54.000 MHz	Defence systems/PER/Wind profilers
54.000-61.000 MHz	Defence systems/PER/Wind profilers
61.000-68.000 MHz	PER/Wind profilers
68.000-70.450 MHz	Defence systems/PER/PAM

4.2 The regulatory conditions for Band I in Region 1

DRM30 is the DRM system initially designed for use in the frequency bands below 30 MHz. DRM+ is the extension of this system for use in the frequency bands between 30 and 174 MHz, allowing operation in Bands I and II (the FM band). A download version of the DRM system specification (ESTI ES 201 980 V3.1.1) is available on the ESTI website at <http://www.etsi.org>.

This specification has been proposed as a preliminary draft revision to Recommendation ITU-R BS.1114 – Systems for terrestrial digital sound broadcasting to vehicular, portable and fixed receivers in the frequency range 30-3 000 MHz.

The relevant Plan at present in force for Band I, as an annex to Regional Agreements, is: “The Plans for television and sound broadcasting in the European broadcasting area, Stockholm, 1961 (ST61)”.

From an ITU perspective, this band is still allocated to the broadcasting service in Region 1 and partly in Regions 2 and 3. It is also allocated on a secondary basis to other services (mobile, radiolocation, etc.). It should be noted that the part of ST61 Agreement related to Band I is still applicable. The ST61 Plan in Band I contains assignments for both TV and VHF FM sound broadcasting (mono).

On the regulatory side, any use of this band in the future for broadcasting in Europe would require a modification of the CEPT long-term plans. Other radiocommunication services, such as military communications and scientific applications (wind profiler radars, for example) still have interest in using it. It will remain in use in some countries for analogue TV until analogue switch-off, which is expected between 2012 and 2015 in Europe. For the long term, the CEPT plans do not consider this band for broadcasting (see ERIC Report 25).

There is a proposal that the CEPT considers revising the ERCREP25 in the part 47-68 MHz to permit the introduction of digital sound broadcasting in this part of the spectrum (Band I).

The procedure for modification of the Plan is mainly based on coordination between the administrations concerned, and is as simple as possible, with low involvement of the Bureau. In the bands 47-68 MHz, the administration proposing a modification to the Plan directly seeks the agreement of any other administration if the distance to the border of its territory is less than the

coordination distance. This coordination distance is determined from Annex 1 to the Agreement and depends on transmitter effective radiated power, effective antenna height and propagation zones. If the administration consulted fails to reply within ten weeks, a reminder [telegram] is sent. If no reply has been received two weeks after the reminder telegram, the administration consulted is considered as having given its agreement. Once all the agreements have been obtained, the administration informs the BR. The modification is published in Part B of Special Section ST61 and entered into the Plan. However, in some cases, for example for very high effective antenna heights, Annex 1 does not give values for the coordination distance.

Concerning the possible opportunities to introduce new modulation techniques in Band I, Articles 4 and 5 of the ST61 Agreement describe the actions to be taken should an administration wish to change the characteristics of an existing sound broadcasting station or introduce a new broadcasting station. The technical annex to ST61 describes the possible introduction of stereophonic sound broadcasts which need to be protected from “fixed or mobile” interferers. This suggests that Band I from its inception would contain other services. Therefore, one might assume other modulation modes would be acceptable subject to the application of suitable protection criteria. This is included in Annex 3 to this document to show the similarity with, for example the GE84 Plan for Band II and other plans with which the reader maybe more familiar.

4.3 Technical considerations related to Band I in Region 1

There are a number of factors which need to be taken into consideration when assessing the suitability of DRM30/DRM+ in Band I. Some are positive, some, less so and some neutral. The following is a list of the considerations and their relevance.

- **Antenna dimensions** – One reason often cited for the unpopularity of Band I spectrum relates to the physical size of even simple aerial systems. A quarter wavelength whip antenna at 60 MHz is some 1.2 metres high, making it somewhat unattractive for handheld applications. While the use of H-field antennas for receiving applications may be particularly promising. It may be possible to use orthogonal elements, under software control, to create an adaptive antenna, capable of rejecting some sources of man-made noise, or other interferers.
- **Man-made noise** – From the earliest days of broadcast television, the high levels of man-made noise present in this band have caused problems for users.
- **Ionosphere interference** – A regular cause of complaint by TV viewers in the summer months was the interference caused by propagation, via sporadic ionization of the E-layer, of signals from very distant (~1 000 km) TV transmitters.
- **Diffraction losses** – The most appealing characteristic of this part of the spectrum is that the diffraction losses over typical terrain are small compared to higher frequencies in the spectrum.
- **Spectrum availability** – Band I is largely under-utilized and could be usefully used for transition scenarios from analogue to digital or just for new broadcast technologies and services.
- **Coverage potential** – Band I offers favourable propagation conditions to cover medium to large areas with a low number of transmitters.
- **Broadcast technologies** – The technical feasibility of using Band I for DRM30 and for DRM+ has been proven by trials carried out in France. Also at present for audio in Band I many existing assignments are registered for FM use.
- **Standardization** – DRM+ has been granted standardization through ETSI recently (09) (ETSI ES 201 980 V3.1.1) and is designed to be used between 30 and 174 MHz encompassing Band I.

- **Channel Raster** – A suitable channel raster would need to be defined in Band I in order to use it with the signal bandwidths corresponding to DRM+. The DRM+ channel bandwidth is compatible with the existing channel raster in Band II.
- **Time and frequency diversity** – With some of the issues outlined above like man-made noise which could be one of the limiting factors in the coverage obtained by radio systems at these frequencies. Problems with anomalous propagation are also likely. Therefore it is suggested that with modern software techniques that time and frequency diversity may be a useful addition to modern receiver design for successful reception.

The whole of Band I between 47 and 68 MHz (21 MHz) could accommodate 210 DRM+ channels. As with the 26 MHz band this does not include any guardband and assumes adjacent channel conflict can be resolved in the planning process. Again, the geographical separation needed between channels (carrying different programmes) on the same frequency will depend on transmitter power, antenna gain and directivity characteristics. Clearly, the total number of separate channels that could be found in, for example, a country, will be established through normal frequency planning techniques given knowledge of the relevant planning parameters. If Band I is to be used for relatively small area coverage it is likely that any one frequency might be used several times.

In practice, given the existing use of Band I for other purposes in many countries, the number of available channels in the band will be less. In much the same way as with the 26 MHz band it is likely that Band I will have to be subdivided to allow DRM+ broadcasts to coexist with other services. Also, as different countries use the band in different ways it is unlikely that a subdivision which could be universally applied might be found. This is, however, a matter for local administrations and it is not necessary to be prescriptive.

5 Conclusions and proposals

It can be concluded that VHF Band I could be used for local transmissions using DRM30 or DRM+. In the case of Region 1, successful implementation requires certain conditions, including:

1. a limit on the maximum ERP to be used by any station in this band;
2. a limit on the number of stations within an area;
3. frequency assignments to be made on a national basis;
4. bilateral/multilateral agreements for bordering countries where local broadcasting at 26 MHz is implemented.

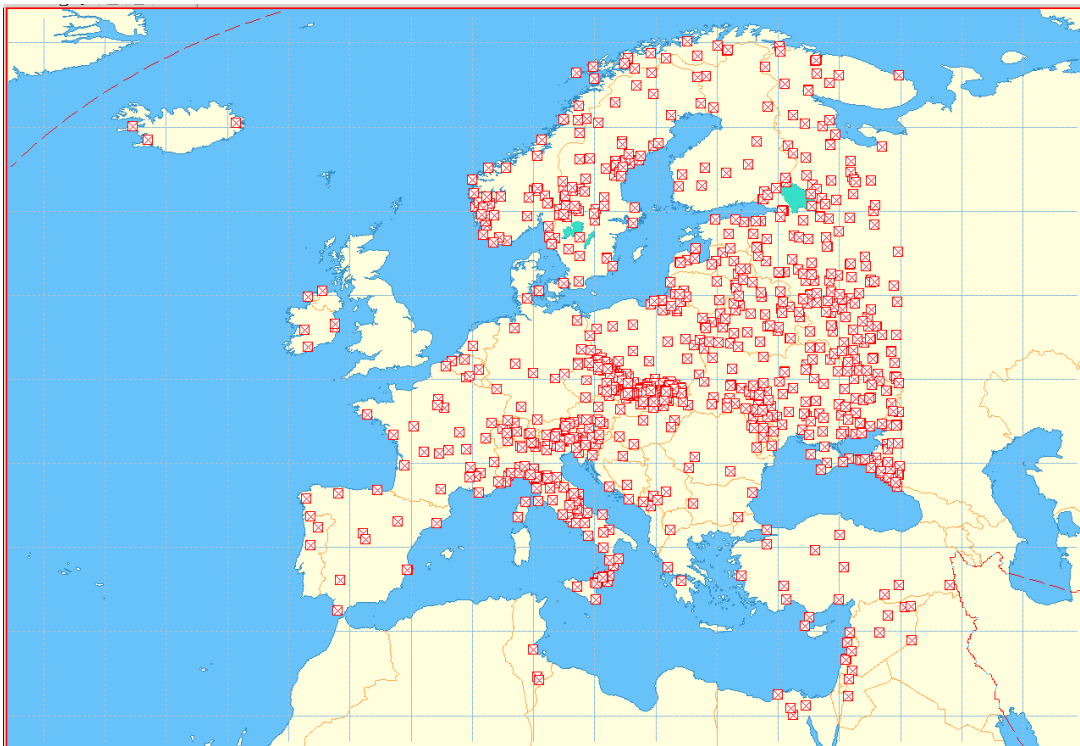
The greater quality and versatility of the DRM+ system would suggest that this was the preferred option for Band I. Band I is not at present formally available for DRM+ (or DRM30) transmissions although individual administrations could give the relevant authorization. With this in mind, there are a number of regulatory instruments that would have to be put in place before widespread deployment.

The different propagation characteristics would point to the use of Band I for coverage of larger areas than those considered with the use of the 26 MHz band for local coverage (see the WP 6A developments on the 26 MHz band). Given that there is a demand for services to cover different geographical areas it must be concluded that DRM30 in the 26 MHz band and DRM+ in VHF Band I could work in tandem and provide services that were complementary.

Annex 1

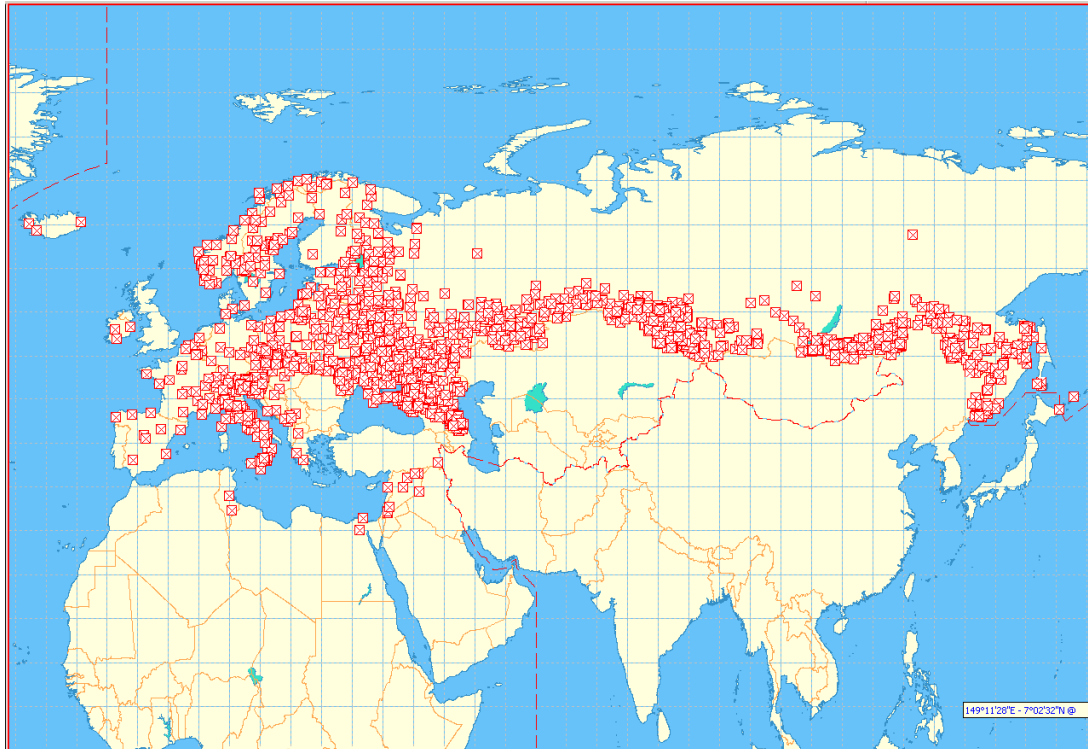
Extract from the ST61 Plan: Assignments in Band I

The following map⁵ is an extract from the ITU BR IFIC 2651 DVD data which shows the current disposition of some 1 119 assignments currently registered in ST61 in Band I in Region 1. As can be clearly seen administrations have different views as to the usefulness of Band I judging by the number of assignments.



The following map⁵ is an extract from the ITU BR IFIC 2651 DVD data which shows the current disposition of some 1 688 Article 11 registrations currently registered in Band I in Region 1 with the same country-by-country basis as in the map of ST61 assignments above.

⁵ *Note by the BR Secretariat* – The boundaries and names shown and designations used on this map do not imply endorsement or acceptance thereof by the United Nations or the ITU.



Annex 2

Extract from Article 5 of the ITU Radio Regulations for Band I

47-75.2 MHz

Allocation to services		
Region 1	Region 2	Region 3
47-68 BROADCASTING 5.162A 5.163 5.164 5.165 5.169 5.171	47-50 FIXED MOBILE	47-50 FIXED MOBILE BROADCASTING 5.162A
	50-54 AMATEUR 5.162A 5.166 5.167 5.168 5.170	
	54-68 BROADCASTING Fixed Mobile 5.172	54-68 FIXED MOBILE BROADCASTING 5.162A

5.162A *Additional allocation:* in Germany, Austria, Belgium, Bosnia and Herzegovina, China, Vatican, Denmark, Spain, Estonia, the Russian Federation, Finland, France, Ireland, Iceland, Italy, Latvia, The Former Yugoslav Republic of Macedonia, Liechtenstein, Lithuania, Luxembourg, Moldova, Monaco, Norway, the Netherlands, Poland, Portugal, Slovakia, the Czech Rep., the United Kingdom, Sweden and Switzerland the band 46-68 MHz is also allocated to the radiolocation service on a secondary basis. This use is limited to the operation of wind profiler radars in accordance with Resolution **217 (WRC-97)**. (WRC-2000)

5.163 *Additional allocation:* in Armenia, Azerbaijan, Belarus, the Russian Federation, Georgia, Hungary, Kazakhstan, Latvia, Lithuania, Moldova, Mongolia, Uzbekistan, Kyrgyzstan, Slovakia, the Czech Rep., Tajikistan, Turkmenistan and Ukraine, the bands 47-48.5 MHz and 56.5-58 MHz are also allocated to the fixed and land mobile services on a secondary basis. (WRC-03)

5.164 *Additional allocation:* in Albania, Germany, Austria, Belgium, Bosnia and Herzegovina, Botswana, Bulgaria, Côte d'Ivoire, Denmark, Spain, Estonia, Finland, France, Gabon, Greece, Ireland, Israel, Italy, the Libyan Arab Jamahiriya, Jordan, Lebanon, Liechtenstein, Luxembourg, Madagascar, Mali, Malta, Morocco, Mauritania, Monaco, Nigeria, Norway, the Netherlands, Poland, Syrian Arab Republic, the United Kingdom, Serbia and Montenegro, Slovenia, Sweden, Switzerland, Swaziland, Chad, Togo, Tunisia and Turkey, the band 47-68 MHz, in Romania the band 47-58 MHz, in South Africa the band 47-50 MHz, and in the Czech Rep. the band 66-68 MHz, are also allocated to the land mobile service on a primary basis. However, stations of the land mobile service in the countries mentioned in connection with each band referred to in this footnote shall not cause harmful interference to, or claim protection from, existing or planned broadcasting stations of countries other than those mentioned in connection with the band. (WRC-03)

5.165 *Additional allocation:* in Angola, Cameroon, Congo (Rep. of the), Madagascar, Mozambique, Somalia, Sudan, Tanzania and Chad, the band 47-68 MHz is also allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis.

5.169 *Alternative allocation:* in Botswana, Burundi, Lesotho, Malawi, Namibia, the Dem. Rep. of the Congo, Rwanda, South Africa, Swaziland, Zambia and Zimbabwe, the band 50-54 MHz is allocated to the amateur service on a primary basis.

5.171 *Additional allocation:* in Botswana, Burundi, Lesotho, Malawi, Mali, Namibia, the Dem. Rep. of the Congo, Rwanda, South Africa, Swaziland and Zimbabwe, the band 54-68 MHz is also allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis.

Annex 3

Extracts from the ST61 Agreement: Modification and notification procedures

ARTICLE 4

Changes in the characteristics of stations covered by the Agreement

1 Procedure in the frequency bands 41-68 Mc/s, 87.5-100 Mc/s, 174-216 Mc/s, 470-582 Mc/s and 606-790 Mc/s.

1.1 When a contracting administration proposes to change the characteristics of a broadcasting station shown in the Plans or brought into operation in accordance with the provisions of the present Agreement, or proposes to put into operation a broadcasting station not appearing in the Plans, the following action shall be taken:

1.1.1 If the distances from the station under consideration to the nearest points of the boundaries of other countries, the administrations of which are contracting administrations, are less than the limits corresponding to the proposed power of the station and other characteristics specified in Annex 1, the administrations of those countries shall be consulted by registered post.

1.1.2 In effecting this consultation the administration proposing the change shall furnish all the information specified in Appendix 1, Section A, of the Radio Regulations, together with the effective height of the antenna as defined in Annex 2 to the Agreement, its directional characteristics and the polarization of radiation. The administrations that are being consulted may request any other information they need to assess the probability of harmful interference to their own services.

1.1.3 If agreement is reached between the administrations concerned, the administration proposing the change may proceed with its project. Administrations which have been consulted and have not replied within ten weeks following the date of registration of the consultation letter in the post of the country of origin shall be reminded by urgent telegram. Administrations which have not replied within two weeks following the despatch of the urgent telegram shall be considered to have agreed to the proposed change.

1.1.4 If no agreement is reached between the administrations concerned, the I.F.R.B. shall make any technical examination that may be requested by the administration proposing the change, or by administrations whose services may be affected by the proposed change, and shall inform them of the results of such examination.

1.2 The administration proposing the change may proceed with its project without consulting other administrations if:

- a) the proposed modification relates to a reduction in power or to other changes of technical characteristics which would reduce the probability of harmful interference to services of other countries; or
- b) the distances from the station under consideration to the nearest points of the boundaries of other countries, the administrations of which are contracting administrations, are equal to or greater than the limits corresponding to the proposed power of the station and other characteristics specified in Annex 1.

1.3 In the cases referred to in sub-paragraph 1.1.3 and paragraph 1.2 above, the administration proposing the change shall inform the I.F.R.B. of the particulars specified in sub-paragraph 1.1.2 above and, where appropriate, of the names of the countries consulted.

1.4 The I.F.R.B. shall publish the information in a special section of its weekly circular, specifying either that the proposed change is the result of consultation carried out under the provisions of subparagraphs 1.1.1, 1.1.2 and 1.1.3 above, or that it is being effected under the provisions of paragraph 1.2 above.

2 Procedures in the frequency bands 162-174 Mc/s, 216-230 Mc/s, 582-606 Mc/s and 790-960 Mc/s.

2.1 Procedure for broadcasting stations.

2.1.1 Any contracting administration proposing to change the technical characteristics of any of its broadcasting stations appearing in the Plans or to operate broadcasting stations not appearing in the Plans, shall first inform the I.F.R.B., furnishing the technical information specified in sub-paragraph 1.1.2 above.

2.1.2 The I.F.R.B. shall publish this information in a special section of its weekly circular, indicating that comments on such information should be sent directly to the administration originating the proposal.

2.1.3 Such comments must be received by the administration originating the proposal within the twelve weeks following the date of the weekly circular in question. Administrations which have not furnished such comments within this period shall be considered to have agreed to the proposed change.

2.1.4 If no comments have been received at the expiry of the period of twelve weeks referred to in subparagraph 2.1.3 above, or if agreement has been reached with the administrations making these comments, the administration proposing the change may proceed with its project, and shall inform the I.F.R.B. in the manner specified in paragraph 1.3 above.

2.2 Procedure for stations of services other than broadcasting.

2.2.1 For stations of services other than broadcasting, the provisions of the Radio Regulations shall apply, taking into account the categories of service and allocations specified in Article 5 thereof. Contracting administrations proposing to change the technical characteristics of such stations or to establish new stations of such services shall take into account the broadcasting stations appearing in the Plans or brought into use in accordance with this Agreement and shall do so after reaching mutual agreement with the administrations that may be concerned.

3 Procedure common to all frequency bands.

3.1 The Secretary-General shall be informed by the I.F.R.B. of all changes made in the Plans in application of the provisions of Sections 1 and 2 above.

3.2 If a change, although made in accordance with the provisions of Sections 1 and 2 above, causes harmful interference to services of other contracting administrations, the administration which has made the change shall take the requisite action to eliminate such interference.

3.3 If, after application of the procedure defined in, sub-paragraphs 1.1.1, 1.1.2 and 1.1.3 on the one hand, and paragraphs 2.1 and 2.2 on the other hand, no agreement has been reached between the administrations concerned, recourse may be had to the procedures defined in Article 15 of the Radio Regulations, or in Article 27 of the International Telecommunication Convention, Geneva, 1959, as the case may be.

Annex 1 to the Regional Agreement for the European broadcasting area

Tables of distances to be used in the application of Article 4 of the Agreement

The following tables give, for each frequency band⁶, as a function of the effective radiated power, the effective transmitting antenna height (h) and the nature of the path under consideration, the limiting distances to be taken into account in the application of Article 4 of the Agreement. For powers different from the values given in the tables, the limiting distance shall be determined by linear interpolation. For antenna heights different from the values given in the tables, the limiting distance corresponding to the next higher height shall be used.

For mixed paths in the case of Bands I, II and III, no consultation is necessary if:

- the total length of the path is equal to or greater than the limiting distance quoted in the table for a sea path; or
- the total length of those parts of the path lying over land is equal to or greater than the limiting distance quoted in the table for a land path. For mixed paths in the case of Bands IV and V, where the percentage of sea path is different from the values quoted in the tables, the distance corresponding to the next higher percentage shall be used. For transmitting antenna effective heights greater than 1 200 m, or in cases where no limiting distance appears in the tables, the procedure given in Section 2.1 of Article 4 shall be applied.

TABLE A - BAND I

Effective Radiated Power (ERP)	Limiting distances in km for different effective antenna heights h								
	h = 75 m			h = 300 m			h = 1200 m		
	Land	Sea (generally)	Sea Mediterranean	Land	Sea (generally)	Sea Mediterranean	Land	Sea (generally)	Sea Mediterranean
300 kW	660	920	*)	680	970	*)	760	1 050	*)
100	600	820	1 050	630	870	*)	700	950	*)
30	540	740	920	565	780	970	650	850	1050
10	480	630	830	520	670	870	590	750	950
3	430	520	740	465	570	780	540	650	850
1	370	450	630	420	490	670	480	560	750
300 W	320	370	530	360	410	570	420	480	650
100	270	300	450	310	330	490	370	410	560
30	220	230	370	260	270	410	330	340	480
10	170	170	300	205	205	330	290	290	410
3	130	130	230	160	160	270	240	240	340
1	100	100	170	135	135	205	200	200	290
300 mW	70	70	130	100	100	160	160	160	240
100	50	50	100	80	80	135	140	140	200
30	35	35	70	60	60	100	120	120	160
10	25	25	50	50	50	80	100	100	140
3	25	25	35	35	35	60	80	80	120
1	25	25	25	30	30	50	65	65	100

⁶ For simplicity, the frequency bands are designated as follows: 41-68 Mc/s Band I.

ARTICLE 5

Notification of frequency assignments

Whenever an assignment in conformity with the Plans or for which the procedure prescribed in Article 4 of the present Agreement has been applied, is put into service, the administration concerned shall notify this assignment to the I.F.R.B. in accordance with the provisions of Article 9 of the Radio Regulations.

3.1 Sound Broadcasting in the VHF Band**3.1.1 Protection against other sound broadcasting transmissions****(a) Monophonic broadcasting**

The protection ratios required to give satisfactory reception are given by the curves of Fig. 19 in terms of the spacing between the carrier frequencies, for a maximum frequency deviation not exceeding ± 75 kc/s.

The solid curve applies for all carrier frequency spacings when the interference results from tropospheric propagation, and the protection is for 99% of the time. It also applies for carrier frequency spacings exceeding 60 kc/s under conditions of steady interference.

The dotted curve applies for carrier frequency spacings from 0 to 60 kc/s under conditions of steady interference.

For FM sound broadcasting services on carrier frequencies below 87.5 Mc/s using a maximum frequency deviation not exceeding ± 50 kc/s, the protection ratios are given in Fig. 20, (Fig. 20 is a reproduction of Fig. 4 of the Final Acts of the Special Regional Conference, Geneva, 1960).

(b) Stereophonic broadcasting

No agreement has yet been reached on a definitive stereophonic system, and it is therefore recommended that any extension of the present plans for VHF sound broadcasting be based on monophonic standards.

However, the stereophonic system finally adopted may require a few decibels more protection than a monophonic system in order to give satisfactory monophonic reception and account may be taken of this to any possible extent.

3.1.2 Protection against other radiocommunications services

In the absence of further information, the curves given in Figs. 19 and 20 should be used to determine the necessary protection ratios for VHF-FM sound broadcasting services against interference caused by other services (e.g. fixed or mobile) account being taken only of the frequency difference and the carrier powers involved.
