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RADIOCOMMUNICATION

WARC-92 concludes after strenuous negotiations

The World Administrative Radio Conference for dealing with frequency allocations in certain parts of the spectrum (WARC-92) which met from 3 February to 3 March at Torremolinos (Spain) closed with the signature of the Final Acts.

The Conference was attended by more than 1400 delegates from 127 countries¹ of the ITU's 166 Members and by observers from 31 international and regional organizations.



The Torremolinos Congress Hall where WARC-92 met

The work of the Conference was conducted under the chairmanship of Mr José Barrionuevo Peña, member of the Parliament of Spain.

Global agreements were reached on most issues on the basis of compromises achieved after strenuous negotiations. Whenever national interests were better served by derogation to the consensus, exceptions were agreed, also by consensus, through the introduction of footnotes or by special procedures which ensure that a country planning to use a given frequency obtains the agreement of all countries which may be affected by its use. No vote took place on any of the substantive issues.

In addition to the issues contained in its agenda, the Conference decided to update certain footnotes of the Table of Frequency Allocations (Article 8 of the Radio Regulations), by adding or deleting names of countries or by suppressing footnotes which had become obsolete whenever all countries concerned agreed to the modifications.

The salient points

HF (shortwave broadcasting)

The extension of frequency bands used for shortwave broadcasting forms part of the compromises reached by WARC-92.

A total of 790 kHz of additional spectrum was allocated² of which 200 kHz below

¹ One hundred and twenty-four countries were present and three were represented by proxy.

 2 5900-5950 kHz, 7300-7350 kHz, 9400-9500 kHz, 11600-11650 kHz, 12050-12100 kHz, 13570-13600 kHz, 13800-13870 kHz, 15600-15800 kHz, 17480-17550 kHz and 18900-19020 kHz.

10 MHz (the most congested part of the HF bands) and 590 between 11 and 19 MHz thus representing a compromise between the advocates of no change below 10 MHz and those countries requesting a substantial increase. Countries wishing no change in the bands below 10 MHz based their position on the fact that the foreseen extensions would have to be made at the expense of existing fixed and mobile services considered vital (health, agriculture, safety, etc.). In several cases, existing stations of these services will have to be transferred to other parts of the spectrum and such transfer can have important financial implications. Countries having requested that additional spectrum be allocated to broadcasting require such extensions for increasing international shortwave broadcasting.

The extended bands are allocated on a world-wide basis, subject to planning, and are reserved for single-side band (SSB) emissions. They will become available for broadcasting as from 1 April 2007. After that date, existing stations of the fixed and mobile services can continue to use the extended bands on a non-interference basis, i.e. protection will be ensured for broadcasting and the fixed and mobile stations will be authorized to operate only if they do not cause harmful interference to broadcasting stations. The conditions of use of frequencies in the tropical bands (2.5, 3 and 5 MHz) remain unchanged.

In respect of SSB techniques^{3,} a Recommendation on the introduction of SSB was accepted. It invites the ITU Administrative Council to place on the agenda of the next competent WARC the request of WARC-92 to consider the possibility of advancing as much as possible the date of 31 December 2015 for the general introduction of SSB and putting an end to the use of double-side band in all bands. It also recalls that some administrations have recommended advancing the date by up to ten years. Resolution COM4/8 was adopted on the convening as soon as possible of a WARC for the planning of HF bands allocated to the broadcasting service. In this Resolution, the Conference also resolves that no broadcasting stations can be put into service in the extended bands until the planning process has been completed. Moreover, a Recommendation urging administrations to take practical steps to eliminate HF broadcasting outside the HF bands allocated to this service was adopted.

Mobile and mobile-satellite services

The decisions made in relation to the mobile and mobile-satellite services will enable the implementation of systems such as those provided by low earth orbit (LEO) satellites or future public land mobile telecommunication systems (FPLMTS) as well as public correspondence for aircraft passengers.

As several of the allocations sought for these applications were in a region of the spectrum which presently accommodates several other systems already in operation, mainly fixed and mobile, one of the critical issues was to ensure that existing services would enjoy protection against harmful interference which newly introduced services could produce. The safeguards were made through different status (either primary or secondary)⁴ as well as through a co-ordination procedure adopted by WARC-92 in respect of non-geostationary satellite networks.⁵

For non-geostationary (non-GSO) satellites, including small LEOs, operating below 1 GHz,⁶ world-wide allocations were made both on a primary and on a secondary basis thus providing the possibility for operators to seek the necessary financial investments for new mobile-satellite service-based applications.⁷ In addition, a secondary allocation in the bands 312-315 MHz and 387-390 MHz was made for the mobile-satellite service (MSS) which could also be used by LEO systems, although not limited to them, subject to the co-ordination procedure for non-GSO satellites (Resolution COM5/8). Also, a primary world-wide allocation for the land-mobile satellite service in the band 149.9-150.05 MHz was made subject to the co-ordination procedure for non-GSO satellites.

For the MSS operating above 1 GHz (including big LEO), allocations were made in bands near 1.5, 1.6 and 2 GHz. In the 1.5-GHz band, a new primary allocation was made to the maritime-mobile satellite service at 1525-1530 MHz in Region 1.⁸ In addition, in the band 1525-1530 MHz, a new primary allocation was made to the MSS in Regions 2 and 3 as well as a secondary allocation to the land-mobile satellite service in Region 1. An additional primary allocation was also made for Region 2 in the band 1492-1525 MHz.

In the bands near 1.6 GHz, a new worldwide primary allocation was made to the MSS in the bands 1610-1626.5 MHz (Earth-

^{3°} At present, radiocommunications are transmitted through a technique called double-side band. The introduction of SSB would enable the use of approximately 1.5 channels more, each channel taking less bandwidth, thus leading to significant increase in spectrum efficiency.

⁴ Services allocated with certain status which rank them in terms of protection and use of frequencies. Primary service has priority over any other. Permitted service has the same rights to protection as primary services except with regard to the choice of frequencies for which the primary services have priority. Secondary services do not have the right of protection against signals from stations of the primary and permitted services but can claim protection from other stations of the secondary service category.

⁵ See Resolution COM5/8.

⁶ LEO systems can offer new services in the VHF/UHF band, using non-geostationary satellites to provide basic message communications, one or two-way data communications and position location to small and lightweight (portable) terminals. Such applications could be used for purposes such as emergency, data collection, paging, short messages, etc. to areas unserved or

to-space) paired with 2483.5-2520 MHz (space-to-Earth). As these bands are also used by the global navigation systems for civil aviation (the United States global positioning system (GPS) and the Russian global navigation satellite system (GLONASS)), MSS-based networks will have to be subject to the co-ordination procedure developed for non-GSO and will also be subject to footnotes providing the appropriate technical safeguards. Furthermore, an additional world-wide allocation in the band 1613.8-1626.5 MHz⁹ was made on a secondary basis for MSS as well as an additional primary allocation in the band 1675-1710 MHz for Region 2 provided the meteorological-satellite service does not suffer constraints due to the MSS. A new primary MSS allocation in the band 1626.5-1631.5 MHz was also made for Regions 2 and 3.

In the bands near 2 GHz, a new secondary allocation was made for MSS in Re-

underserved by telecommunications. They can also provide mobile communications world-wide, especially if operating above 1 GHz.

⁷ The primary allocations are: 137-137.025 MHz, 137.175-137.825 MHz, 148-149.9 MHz and 400.15-401 MHz; the secondary allocations are: 137.025-137.175 MHz, 137.825-138 MHz.

⁸ For the purpose of the Radio Regulations, the world is divided into three regions: Region 1 (Europe/Africa), Region 2 (Americas) and Region 3 (Asia and Australasia).

⁹ The radio astronomy service was upgraded to a primary status in the band 1610-1613.8 MHz.

¹⁰ The bands 1970-2010 MHz, 2160-2200 MHz, 2500-2520 MHz and 2670-2690 MHz will be available as from 1 January 2005 and will be subject to the non-GSO co-ordination procedure described in Resolution COM5/8.

¹¹ 1700-2450 MHz.

¹² The use of two different bands implies that aircrafts will have to carry two different types of equipment on-board in order to provide a worldwide communication service to their passengers with the resulting higher costs. gion 2 in the bands 1930-1970 MHz and 2120-2160 MHz together with a new primary allocation in Region 2 in the bands 1970-1980 MHz and 2160-2170 MHz. A world-wide primary allocation in the bands 1980-2010 MHz, 2170-2200 MHz and 2670-2690 MHz was also made to MSS.¹⁰

The MSS in the bands 20.1-20.2 GHz and 29.9-30 GHz was upgraded to primary status, providing world-wide allocation for multipurpose satellite networks (see under general-satellite service below) using narrow-spot beam antennas and other advanced space stations technology. Similar additional upgrades were made in Region 2 for the bands 19.7-20.1 GHz and 29.5-29.9 GHz.

Several additional as well as alternate allocations were made through footnotes for a number of countries in respect of MSS.

In addition, WARC-92 adopted Resolution COM5/11 inviting the technical bodies of the ITU to carry out, as a matter of priority, technical, legal and operational studies leading to the establishment of standards governing the operation of LEO systems so as to ensure equitable and standard conditions of access for all ITU Members and to guarantee proper worldwide protection for existing services and systems. The Resolution stresses the fact that only a very limited number of LEO systems offering world-wide coverage can co-exist in any given frequency band and that there exists at present no standards for the co-ordination, sharing and operation of such systems.

In respect of FPLMTS, the Conference decided to upgrade to primary status the mobile service in some bands which were already allocated on a secondary basis.¹¹This will provide a primary worldwide allocation within which FPLMTS can be implemented. As a result, there now exists world-wide primary allocation to the mobile service in the band 1700-2690 MHz.

The Conference identified, within these bands, the sub-bands 1885-2025 MHz and 2110-2200 MHz for countries wishing to implement FPLMTS, the sub-bands 1980-2010 MHz and 2170-2200 MHz being used for the space components. The initial implementation of the terrestrial components of FPLMTS is expected for the year 2000 and that of the satellite components by the year 2010. In order to protect existing services. the use of these bands by non-GSO systems of the MSS will be subject to the coordinated procedure developed for non-GSO. Resolution COM4/4 on FPLMTS also invites the CCITT to develop a world-wide numbering plan to facilitate world-wide roaming and invites the CCIR to continue its studies with a view to develop suitable technical characteristics which could also meet the needs of developing countries and rural areas.

FPLMTS are systems capable of providing a wide range of services (voice and nonvoice) including personal communications with regional and international roaming, which could be very useful in sparsely populated areas with limited communication facilities.

Finally, a primary world-wide allocation was made possible through the deletion of the restriction relating to the aeronautical mobile service in the mobile service (1670-1675 MHz) and the upgrade to primary status of the mobile service in Region 1 (1800-1805 MHz) so as to enable the introduction of aeronautical public correspondence (APC) in the bands 1670-1675 for transmissions from aeronautical stations and 1800-1805 MHz for transmissions from aircraft stations. APC is the term used for the system providing public telecommunications to passengers of commercial airlines. Three countries of Region 2 indicated in a footnote that they would provide APC in the band 849-851 MHz and 894-896 MHz. The world-wide allocation might however facilitate, in the long term, the use of a single system.¹²

BSS (sound and HDTV)

Digital sound broadcasting

The Conference agreed to make available, on a world-wide basis, a primary allocation for the broadcasting-satellite service (BSS) and for the broadcasting service in the band 1452-1492 MHz for the exclusive use of digital sound broadcasting (DSB) also called digital audio broadcasting.13 In addition, Resolution COM4/W relating to the introduction of BSS-sound in the bands allocated to this service was adopted. It calls for the convening of a Conference, preferably not later than 1998, for planning BSS-sound and developing procedures for the co-ordinated use of the complementary terrestrial broadcasting. The Conference would also have the task of reviewing the sharing criteria with existing services.

Meanwhile, BSS-sound could be introduced preferably in the upper 25 MHz of the band on an interim basis, subject to a special procedure used to protect existing services¹⁴ (essentially fixed and mobile) so as to implement, via satellite, DSB. The complementary terrestrial broadcasting may be introduced during this interim period subject to co-ordination with the administrations which could be affected.

Broadcasting satellite sound is understood as essentially *individual* reception with *low-cost* portable and mobile receivers with simple antennas, in rural and urban areas.

A significant number of countries indicated, through footnotes, alternative allocation in this band, providing BSSsound in either 2310-2360 MHz or 2535-2655 MHz.

Resolution COM5/3 was adopted by the Conference to review the Broadcasting-Satellite Service Plans for Region 1 (11.7-12.5 GHz) and Region 3 (11.7-12.2 GHz) contained in Appendix 30 of the Radio Regulations together with the Feeder Links Plan contained in Appendix 30A. Taking account of the technological improvements which have taken place since the adoption of these plans, particularly in the area of satellite antennas and receiver sensitivity, it was felt that an update in the technical parameters would lead to improved spectrum and orbit efficiency. To this end an administrative radio conference should be held with the main objective of improving the use of the spectrum within the framework of these plans whilst protecting existing systems, maintaining each country's assigned BSS stations as a minimum and providing for the needs of new countries.

WARC-92 also decided to request the ITU Administrative Council to include the subject of VHF terrestrial DSB in the agenda of a future radio administrative conference for Region 1 and interested countries of Region 3. In a Resolution, the Conference recognized that several European countries were considering the implementation of DSB on an interim basis in the VHF bands allocated to broadcasting and called on the CCIR to undertake, as a matter of urgency, the relevant technical studies particularly in respect of compatibility criteria, including protection of the safety services using VHF bands. It is expected that DSB will be generally implemented within the FM broadcasting plans.

HDTV

No compromise was found on a worldwide unique frequency allocation for wideband high-definition television (HDTV). Regions 1 and 3 therefore opted for band 21.4-22 GHz to become available as from 1 April 2007. Prior to this date, HDTV may be implemented provided existing services are protected. After that date, existing services will be authorized to operate in those bands provided they do not interfere with the BSS HDTV nor claim protection from it. In Region 2, the band 17.3-17.8 GHz was also allocated as from 1 April 2007. The choice of these bands takes account of the spectrum made available by the 1977 BSS Plan (Regions 1 and 3) and the 1983 BSS Plan (Region 2).

Feeder links for HDTV may be provided, on a world-wide basis, through a new allocation for the fixed-satellite service (27.5-30 GHz); a number of additional options exist for providing feeder links to BSS HDTV including, in Region 2, the band 18.1-18.4 GHz and, in Region 3, the band 24,75-25,25 GHz. In a Resolution, the Conference underlined the difficulties for countries in high rainfall climatic zones because of the effect of rain on television signals (a phenomenon which increases with frequency) and requested the CCIR to study the particular needs of high rainfall climatic zones for HDTV with a view to proposing technical methods which could be used to implement some type of HDTV in the 12 GHz band.

Other issues

Given the difficulties experienced by developing countries in implementing the decisions of WARC-92 in respect of the transfer of their assignments from reallocated bands (investments as well as transfer of technology will be required), the Conference adopted Resolution COM5/9 providing for assistance, including financial, to be given by the ITU to developing countries.

Earth-exploration service, space research service, inter-satellite service

WARC-92 allocated on a world-wide basis the bands 2025-2110 MHz and 2200-2290 MHz to the space research, space operation and Earth-exploration satellite services on a primary basis and a worldwide primary allocation for space research in the band 2110-2120 MHz. Allocation was also made at 24.45-24.75 GHz, 25.25-27.5 GHz and 27-27.5 GHz on a worldwide primary basis to the inter-satellite service.

The Earth-exploration satellite service was also allocated, on a secondary worldwide basis, the following bands: 28.5-30 GHz and 37.5-40.5 GHz and on a

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primary basis the bands 40-40.5 GHz and 156-158 GHz whilst the space research service was allocated, either through upgrade of existing allocations or new allocations, on a world-wide primary basis, the bands 32-32.3 GHz, 34.2-34.7 GHz, 37-38 GHz, 40-40.5 GHz and, on a world-wide secondary basis, the band 74-84 GHz.

Moreover, Resolution COM4/7 was adopted so as to include in the agenda of a future conference, space issues not dealt with by WARC-92 and particularly in respect of the Earth-exploration satellite service used for sensing ecologically important data and for monitoring environmental data. The task of the Conference would include the consideration of a common world-wide primary allocation to the Earthexploration satellite service and the space operations services in the band 8.025-18.8 GHz and provide additional spectrum for the inter-satellite service near 23 GHz. Resolution COM4/3 calls for the reallocation in frequency bands above 20 GHz of those assignments of space missions at present in the 2-GHz band.

Amateur service

Given the fact that no spectrum was freed by WARC-92 in the 7-MHz band, a further world-wide allocation to the amateur service in this band was not considered possible. Recommendation COM4/C was therefore adopted inviting a future WARC to consider the possibility of aligning the allocations to the amateur and broadcasting services around 7 MHz so as to provide a world-wide allocation.

Fixed-satellite service (FSS)

As regards the FSS, the Conference was unable to provide the spectrum required to redress the imbalance between the up-link and down-link spectrum allocated to the FSS (10-17 GHz) in the frequency bands foreseen to this end in the agenda. It therefore approved an extension in the band 13.75-14 GHz.

General-satellite service

On the issue of a general-satellite service (GSS), it was decided not to proceed given the lack of support for this proposal. It was felt that the applications foreseen for the GSS could be met by the FSS and MSS provided adequate footnotes were added in the Radio Regulations to take account of this new type of network architecture while protecting existing services. To achieve the objectives of a GSS, it was therefore decided to upgrade to a primary status the MSS allocation in Region 2 at 19.7-20.1 GHz (i.e. 400 MHz) and upgrade to a primary status the MSS allocation worldwide at 20.1-20.2 GHz (i.e. 100 MHz) with an associated footnote. Recommendation COM4/D calling on the CCIR to carry out studies on the technical characteristics and sharing criteria of multiservice satellite networks using the geostationary-satellite orbit was adopted.

Wind profiler radars

Recommendation GT-PLEN/A concerning the study, by the CCIR, of the characteristics and requirements of wind profiler radars was approved with a view to allocating appropriate frequency bands around 50, 400 and 1000 MHz. Wind profiler radars are used by meteorological services to measure wind direction and speed as a function of altitude. This information is vital for the safety of air navigation, particularly at the time of landing; the absence of such information may have had an influence on several aircraft crashes in the past. In conducting these studies, particular attention will have to be paid to the protection of the COSPAS-SARSAT system which provides safety communications for ships at sea and which operates in the same frequencies as one of the bands foreseen for the wind profiler radars. The Recommendation also invites the ITU Administrative Council to include on the agenda of a future WARC the question of appropriate frequency allocations for the operational use of wind profiler radars.

Aeronautical-mobile service (OR)

A first series of adjustments was made to the 1959 Frequency Allotment Plan contained in Appendix 26 and relating to the aeronautical-mobile service (off-routes)¹⁵ and on the basis of guidelines established by the Conference, further refinements will be introduced by the IFRB according to an approved timetable.

Articles 55 and 56 of the Radio Regulations

Finally, the Conference concluded that no changes were necessary to harmonize Article 55 of the Radio Regulations with the International Maritime Organization (IMO) Convention on the Safety of Life at Sea (SOLAS) relating to the global maritime distress and safety system but that a revision of Article 56 was required. In accordance with Resolution COM5/4, Article 56 may be applied on a provisional basis until the entry into force of the revision of the Radio Regulations as obtained in the Final Acts of the Conference.

Entry into force of the Final Acts

The partial revision of the Radio Regulations as contained in the Final Acts of WARC-92 will enter into force on 12 October 1993 at 00h01 UTC. A number of provisions may however come into effect at dates other than the date of the entry into force of this partial revision.



¹³ DSB will also be implemented via terrestrial means.

¹⁴ Resolution 33 of the Radio Regulations.

¹⁵ The aeronautical-mobile service (OR-offroute) is used by non-commercial aircraft.

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