



XVIIth PLENARY ASSEMBLY
DÜSSELDORF, 1990



INTERNATIONAL TELECOMMUNICATION UNION

RECOMMENDATIONS OF THE CCIR, 1990

(ALSO RESOLUTIONS AND OPINIONS)

VOLUME X – PART 1

BROADCASTING SERVICE (SOUND)

CCIR INTERNATIONAL RADIO CONSULTATIVE COMMITTEE

Geneva, 1990

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XVIIth PLENARY ASSEMBLY
DÜSSELDORF, 1990



INTERNATIONAL TELECOMMUNICATION UNION

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**PLAN OF VOLUMES I TO XV
XVIIth PLENARY ASSEMBLY OF THE CCIR**

(Düsseldorf, 1990)

VOLUME I (Recommendations) <i>Annex to Vol. I</i> (Reports)	Spectrum utilization and monitoring
VOLUME II (Recommendations) <i>Annex to Vol. II</i> (Reports)	Space research and radioastronomy services
VOLUME III (Recommendations) <i>Annex to Vol. III</i> (Reports)	Fixed service at frequencies below about 30 MHz
VOLUME IV-1 (Recommendations) <i>Annex to Vol. IV-1</i> (Reports)	Fixed-satellite service
VOLUMES IV/IX-2 (Recommendations) <i>Annex to Vols. IV/IX-2</i> (Reports)	Frequency sharing and coordination between systems in the fixed-satellite service and radio-relay system
VOLUME V (Recommendations) <i>Annex to Vol. V</i> (Reports)	Propagation in non-ionized media
VOLUME VI (Recommendations) <i>Annex to Vol. VI</i> (Reports)	Propagation in ionized media
VOLUME VII (Recommendations) <i>Annex to Vol. VII</i> (Reports)	Standard frequencies and time signals
VOLUME VIII (Recommendations) <i>Annex 1 to Vol. VIII</i> (Reports) <i>Annex 2 to Vol. VIII</i> (Reports) <i>Annex 3 to Vol. VIII</i> (Reports)	Mobile, radiodetermination, amateur and related satellite services Land mobile service – Amateur service – Amateur satellite service Maritime mobile service Mobile satellite services (aeronautical, land, maritime, mobile and radiodetermination) – Aeronautical mobile service
VOLUME IX-1 (Recommendations) <i>Annex to Vol. IX-1</i> (Reports)	Fixed service using radio-relay systems
VOLUME X-1 (Recommendations) <i>Annex to Vol. X-1</i> (Reports)	Broadcasting service (sound)
VOLUMES X/XI-2 (Recommendations) <i>Annex to Vols. X/XI-2</i> (Reports)	Broadcasting-satellite service (sound and television)
VOLUMES X/XI-3 (Recommendations) <i>Annex to Vols. X/XI-3</i> (Reports)	Sound and television recording
VOLUME XI-1 (Recommendations) <i>Annex to Vol. XI-1</i> (Reports)	Broadcasting service (television)
VOLUME XII (Recommendations) <i>Annex to Vol. XII</i> (Reports)	Television and sound transmission (CMTT)
VOLUME XIII (Recommendations)	Vocabulary (CCV)
VOLUME XIV	Administrative texts of the CCIR
VOLUME XV-1 (Questions)	Study Groups 1, 12, 5, 6, 7
VOLUME XV-2 (Questions)	Study Group 8
VOLUME XV-3 (Questions)	Study Groups 10, 11, CMTT
VOLUME XV-4 (Questions)	Study Groups 4, 9

All references within the texts to CCIR Recommendations, Reports, Resolutions, Opinions, Decisions and Questions refer to the 1990 edition, unless otherwise noted; i.e., only the basic number is shown.

DISTRIBUTION OF TEXTS OF THE XVIIth PLENARY ASSEMBLY OF THE CCIR IN VOLUMES I TO XV

Volumes and Annexes I to XV, XVIIth Plenary Assembly, contain all the valid texts of the CCIR and succeed those of the XVIth Plenary Assembly, Dubrovnik, 1986.

1. Recommendations, Resolutions, Opinions are given in Volumes I-XIV and Reports, Decisions in the Annexes to Volumes I-XII.

1.1 *Numbering of texts*

When a Recommendation, Report, Resolution or Opinion is modified, it retains its number to which is added a dash and a figure indicating how many revisions have been made. Within the text of Recommendations, Reports, Resolutions, Opinions and Decisions, however, reference is made only to the basic number (for example Recommendation 253). Such a reference should be interpreted as a reference to the latest version of the text, unless otherwise indicated.

The tables which follow show only the original numbering of the current texts, without any indication of successive modifications that may have occurred. For further information about this numbering scheme, please refer to Volume XIV.

1.2 *Recommendations*

Number	Volume	Number	Volume	Number	Volume
48	X-1	368-370	V	479	II
80	X-1	371-373	VI	480	III
106	III	374-376	VII	481-484	IV-1
139	X-1	377, 378	I	485, 486	VII
162	III	380-393	IX-1	487-493	VIII-2
182	I	395-405	IX-1	494	VIII-1
215, 216	X-1	406	IV/IX-2	496	VIII-2
218, 219	VIII-2	407, 408	X/XI-3	497	IX-1
239	I	411, 412	X-1	498	X-1
240	III	415	X-1	500	XI-1
246	III	417	XI-1	501	X/XI-3
257	VIII-2	419	XI-1	502, 503	XII
265	X/XI-3	428	VIII-2	505	XII
266	XI-1	430, 431	XIII	508	I
268	IX-1	433	I	509, 510	II
270	IX-1	434, 435	VI	513-517	II
275, 276	IX-1	436	III	518-520	III
283	IX-1	439	VIII-2	521-524	IV-1
290	IX-1	441	VIII-3	525-530	V
302	IX-1	443	I	531-534	VI
305, 306	IX-1	444	IX-1	535-538	VII
310, 311	V	446	IV-1	539	VIII-1
313	VI	450	X-1	540-542	VIII-2
314	II	452, 453	V	546-550	VIII-3
326	I	454-456	III	552, 553	VIII-3
328, 329	I	457, 458	VII	555-557	IX-1
331, 332	I	460	VII	558	IV/IX-2
335, 336	III	461	XIII	559-562	X-1
337	I	463	IX-1	565	XI-1
338, 339	III	464-466	IV-1	566	X/XI-2
341	V	467, 468	X-1	567-572	XII
342-349	III	469	X/XI-3	573, 574	XIII
352-354	IV-1	470-472	XI-1	575	I
355-359	IV/IX-2	473, 474	XII	576-578	II
362-364	II	475, 476	VIII-2	579, 580	IV-1
367	II	478	VIII-1	581	V

IV

1.2 *Recommendations (cont.)*

Number	Volume	Number	Volume	Number	Volume
582, 583	VII	625-631	VIII-2	676-682	V
584	VIII-1	632, 633	VIII-3	683, 684	VI
585-589	VIII-2	634-637	IX	685, 686	VII
591	VIII-3	638-641	X-1	687	VIII-1
592-596	IX-1	642	X-1	688-693	VIII-2
597-599	X-1	643, 644	X-1	694	VIII-3
600	X/XI-2	645	X-1 + XII	695-701	IX-1
601	XI-1	646, 647	X-1	702-704	X-1
602	X/XI-3	648, 649	X/XI-3	705	X-1 ⁽¹⁾
603-606	XII	650-652	X/XI-2	706-708	X-1
607, 608	XIII	653-656	XI-1	709-711	XI-1
609-611	II	657	X/XI-3	712	X/XI-2
612, 613	III	658-661	XII	713-716	X/XI-3
614	IV-1	662-666	XIII	717-721	XII
615	IV/IX-2	667-669	I	722	XII
616-620	V	670-673	IV-1	723, 724	XII
622-624	VIII-1	674, 675	IV/IX-2		

1.3 *Reports*

Number	Volume	Number	Volume	Number	Volume
19	III	319	VIII-1	472	X-1
122	XI-1	322	VI ⁽¹⁾	473	X/XI-2
137	IX-1	324	I	476	XI-1
181	I	327	III	478	XI-1
183	III	336*	V	481-485	XI-1
195	III	338	V	488	XII
197	III	340	VI ⁽¹⁾	491	XII
203	III	342	VI	493	XII
208	IV-1	345	III	496, 497	XII
209	IV/IX-2	347	III	499	VIII-1
212	IV-1	349	III	500, 501	VIII-2
214	IV-1	354-357	III	509	VIII-3
215	X/XI-2	358	VIII-1	516	X-1
222	II	363, 364	VII	518	VII
224	II	371, 372	I	521, 522	I
226	II	375, 376	IX-1	525, 526	I
227*	V	378-380	IX-1	528	I
228, 229	V	382	IV/IX-2	533	I
238, 239	V	384	IV-1	535, 536	II
249-251	VI	386-388	IV/IX-2	538	II
252	VI ⁽¹⁾	390, 391	IV-1	540, 541	II
253-255	VI	393	IV/IX-2	543	II
258-260	VI	395	II	546	II
262, 263	VI	401	X-1	548	II
265, 266	VI	404	XI-1	549-551	III
267	VII	409	XI-1	552-558	IV-1
270, 271	VII	411, 412	XII	560, 561	IV-1
272, 273	I	430-432	VI	562-565	V
275-277	I	435-437	III	567	V
279	I	439	VII	569	V
285	IX-1	443	IX-1	571	VI
287*	IX-1	445	IX-1	574, 575	VI
289*	IX-1	448, 449	IV/IX-2	576-580	VII
292	X-1	451	IV-1	584, 585	VIII-2
294	X/XI-3	453-455	IV-1	588	VIII-2
300	X-1	456	II	607	IX-1
302-304	X-1	458	X-1	610*	IX-1
311-313	XI-1	463, 464	X-1	612-615	IX-1
314	XII	468, 469	X/XI-3	622	X/XI-3

* Not reprinted, see Dubrovnik, 1986.

⁽¹⁾ Published separately.

1.3 *Reports (cont.)*

Number	Volume	Number	Volume	Number	Volume
624-626	XI-1	790-793	IV/IX-2	972-979	I
628, 629	XI-1	795	X-1	980-985	II
630	X/XI-3	798, 799	X-1	987, 988	II
631-634	X/XI-2	801, 802	XI-1	989-996	III
635-637	XII	803	X/XI-3	997-1004	IV-1
639	XII	804, 805	XI-1	1005, 1006	IV/IX-2
642, 643	XII	807-812	X/XI-2	1007-1010	V
646-648	XII	814	X/XI-2	1011, 1012	VI
651	I	815, 816	XII	1016, 1017	VII
654-656	I	818-823	XII	1018-1025	VIII-1
659	I	826-842	I	1026-1033	VIII-2
662-668	I	843-854	II	1035-1039	VIII-2
670, 671	I	857	III	1041-1044	VIII-2
672-674	II	859-865	III	1045	VIII-3
676-680	II	867-870	IV-1	1047-1051	VIII-3
682-685	II	872-875	IV-1	1052-1057	IX-1
687	II	876, 877	IV/IX-2	1058-1061	X-1
692-697	II	879, 880	V	1063-1072	X-1
699, 700	II	882-885	V	1073-1076	X/XI-2
701-704	III	886-895	VI	1077-1089	XI-1
706	IV-1	896-898	VII	1090-1092	XII
709	IV/IX-2	899-904	VIII-1	1094-1096	XII
710	IV-1	908	VIII-2	1097-1118	I
712, 713	IV-1	910, 911	VIII-2	1119-1126	II
714-724	V	913-915	VIII-2	1127-1133	III
725-729	VI	917-923	VIII-3	1134-1141	IV-1
731, 732	VII	925-927	VIII-3	1142, 1143	IV/IX-2
735, 736	VII	929	VIII-3 (¹)	1144-1148	V
738	VII	930-932	IX-1	1149-1151	VI
739-742	VIII-1	934	IX-1	1152	VII
743, 744	VIII-2	936-938	IX-1	1153-1157	VIII-1
748, 749	VIII-2	940-942	IX-1	1158-1168	VIII-2
751	VIII-3	943-947	X-1	1169-1186	VIII-3
760-764	VIII-3	950	X/XI-3	1187-1197	IX-1
766	VIII-3	951-955	X/XI-2	1198	X-1 (¹)
770-773	VIII-3	956	XI-1	1199-1204	X-1
774, 775	VIII-2	958, 959	XI-1	1205-1226	XI-1
778	VIII-1	961, 962	XI-1	1227, 1228	X/XI-2
780*	IX-1	963, 964	X/XI-3	1229-1233	X/XI-3
781-789	IX-1	965-970	XII	1234-1241	XII

* Not reprinted, see Dubrovnik, 1986.

(¹) Published separately.

1.3.1 *Note concerning Reports*

The individual footnote "Adopted unanimously" has been dropped from each Report. Reports in Annexes to Volumes have been adopted unanimously except in cases where reservations have been made which will appear as individual footnotes.

1.4 *Resolutions*

Number	Volume	Number	Volume	Number	Volume
4	VI	62	I	86, 87	XIV
14	VII	63	VI	88	I
15	I	64	X-1	89	XIII
20	VIII-1	71	I	95	XIV
23	XIII	72, 73	V	97-109	XIV
24	XIV	74	VI	110	I
33	XIV	76	X-1	111, 112	VI
39	XIV	78	XIII	113, 114	XIII
61	XIV	79-83	XIV		

VI

1.5 Opinions

Number	Volume	Number	Volume	Number	Volume
2	I	45	VI	73	VIII-1
11	I	49	VIII-1	74	X-1 + X/XI-3
14	IX-1	50	IX-1	75	XI-1 + X/XI-3
15	X-1	51	X-1	77	XIV
16	X/XI-3	56	IV-1	79-81	XIV
22, 23	VI	59	X-1	82	VI
26-28	VII	63	XIV	83	XI-1
32	I	64	I	84	XIV
35	I	65	XIV	85	VI
38	XI-1	66	III	87, 88	XIV
40	XI-1	67-69	VI	89	IX-1
42	VIII-1	71-72	VII	90	X/XI-3
43	VIII-2				

1.6 Decisions

Number	Volume	Number	Volume	Number	Volume
2	IV-1	60	XI-1	87	IV/IX-2
4, 5	V	63	III	88, 89	IX-1
6	VI	64	IV-1	90, 91	XI-1
9	VI	65	VII	93	X/XI-2
11	VI	67, 68	XII	94	X-1
18	X-1 + XI-1 +	69	VIII-1	95	X-1 + XI-1
	XII	70	IV-1	96, 97	X-1
27	I	71	VIII-3	98	X-1 + XII
42	XI-1	72	X-1 + XI-1	99	X-1
43	X/XI-2		IV-1 + X-1 +	100	I
51	X/XI-2	76	XI-1 + XII	101	II
53, 54	I	77	XII	102	V
56	I	78, 79	X-1	103	VIII-3
57	VI	80	XI-1	105	XIV
58	XI-1	81	VIII-3	106	XI-1
59	X/XI-3	83-86	VI		

2. Questions (Vols. XV-1, XV-2, XV-3, XV-4)

2.1 Numbering of texts

Questions are numbered in a different series for each Study Group: where applicable a dash and a figure added after the number of the Question indicate successive modifications. The number of a Question is completed by an *Arabic figure indicating the relevant Study Group*. For example:

- Question 1/10 would indicate a Question of Study Group 10 with its text in the original state;
- Question 1-1/10 would indicate a Question of Study Group 10, whose text has been once modified from the original; Question 1-2/10 would be a Question of Study Group 10, whose text has had two successive modifications.

Note – The numbers of the Questions of Study Groups 7, 9 and 12 start from 101. In the case of Study Groups 7 and 9, this was caused by the need to merge the Questions of former Study Groups 2 and 7 and Study Groups 3 and 9, respectively. In the case of Study Group 12, the renumbering was due to the requirement to transfer Questions from other Study Groups.

2.2 Assignment of Questions

In the plan shown on page II, the relevant Volume XV in which Questions of each Study Group can be found is indicated. A summary table of all Questions, with their titles, former and new numbers is to be found in Volume XIV.

2.3 *References to Questions*

As detailed in Resolution 109, the Plenary Assembly approved the Questions and assigned them to the Study Groups for consideration. The Plenary Assembly also decided to discontinue Study Programmes. Resolution 109 therefore identifies those Study Programmes which were approved for conversion into new Questions or for amalgamation with existing Questions. It should be noted that references to Questions and Study Programmes contained in the texts of Recommendations and Reports of Volumes I to XIII are still those which were in force during the study period 1986-1990.

Where appropriate, the Questions give references to the former Study Programmes or Questions from which they have been derived. New numbers have been given to those Questions which have been derived from Study Programmes or transferred to a different Study Group.

STUDY GROUP 10

BROADCASTING SERVICE (SOUND)

Terms of reference:

To study:

- technical aspects of the broadcasting service and the broadcasting-satellite service when these services are used for sound;
- the special problems of broadcasting in the Tropical Zone, taking into account the standards required for good quality service; interference in the shared bands; power required for an acceptable service; design of suitable transmitting antennas; receiving equipment; optimum conditions for utilization of the frequency bands and other associated questions;
- standards for audio-frequency equipment, including recording, to facilitate the international exchange of programmes.

1986-1990 *Chairman:* C. TERZANI (Italy)

Vice-Chairmen: A. KELLER (France)
O. P. KHUSHU (India)
H. KUSSMANN (Germany (Federal Republic of))

As from the next study period, in conformity with Resolution 61 adopted at the XVIIth Plenary Assembly, Düsseldorf (May-June 1990), the scope of the work which will be undertaken and the names of the Chairman and Vice-Chairmen are as follows.

STUDY GROUP 10

BROADCASTING SERVICE (SOUND)

Scope:

International exchange of programmes and the technical and operating aspects of the broadcasting and broadcasting-satellite services, including audio frequency and recording equipment, as well as the overall performance of the means of delivering signals to the general public, where they are used for sound, data and ancillary services accompanying sound.

1990-1994 *Chairman:* C. TERZANI (Italy)

Vice-Chairmen: H. KUSSMANN (Germany (Federal Republic of))
A. KELLER (France)
K. P. RAMASWAMY (India)
M. YUNUS KHAN (Pakistan)

INTRODUCTION BY THE CHAIRMAN, STUDY GROUP 10

1. **Organization of work**

During the study period 1986-1990, Study Group 10 held its Interim Meeting in Geneva from 3 to 17 November 1987 and its Final Meeting in Geneva from 9 to 23 October 1989, under the chairmanship of Mr. C. Terzani (Italy), assisted by the three Vice-Chairmen, Mr. A. Keller (France), Mr. O. P. Khushu (India) and Mr. H. Kussmann (Germany (Federal Republic of)).

Mr. Khushu having resigned, he was replaced by Mr. Ramaswamy (India). The XVIIth Plenary Assembly also appointed a fourth Vice-Chairman, Mr. Yunus Khan (Pakistan).

The Interim and Final Meetings were attended, respectively, by 198/223 delegates from the administrations of 28/33 countries, 15/12 recognized private operating agencies, 3/4 scientific or industrial organizations and 2/8 international organizations.

The Study Group set up the following Working Groups:

- *Working Group 10A*: Amplitude-modulation sound broadcasting, chaired by Mr. G. Petke (Germany (Federal Republic of));
- *Working Group 10B*: Frequency-modulation sound broadcasting, chaired by Mr. A. Keller (France);
- *Working Group 10C*: Audio-frequency characteristics of sound-broadcasting signals, chaired by Mr. G. Steinke (German Democratic Republic);
- *Editorial Group*: Liaison with CMV and review of texts, chaired by Mr. A. Gourbeille (France) at the Interim Meeting and Mr. A. Komly (France) at the Final Meeting.

Study Group 10 also set up the following Joint Working Groups with Study Group 11:

- *Joint Working Group 10-11D*: Sound-data broadcasting, chaired by Prof. F. Cappuccini (Italy), at the Final Meeting;
- *Joint Working Group 10-11R*: Recording of sound broadcasting and television programmes, chaired by Mr. P. Zaccarian (CBS);
- *Joint Working Group 10-11S*: Broadcasting-satellite service, chaired by Mr. R. F. Zeitoun (Canada).

2. Texts produced by the Study Group

Following the order in which the texts appear in Volume X, the Recommendations and Reports are listed first, grouped according to subject matter, followed by the Questions, Study Programmes, Resolutions, Opinions and Decisions.

Following the decisions of the XVIIth Plenary Assembly, Questions have generally been abolished and the Study Programmes have become Questions.

In accordance with the decisions taken at the XVIth Plenary Assembly (Dubrovnik, 1986), the texts relating to satellite broadcasting and to sound and television recording will appear in Parts 2 and 3 of Volumes X and XI, respectively.

The new Recommendation 705 and the Annex thereto on HF transmitting antenna characteristics and patterns will be published separately.

2.1 Recommendations and Reports

2.1.1 Amplitude-modulation sound broadcasting

This subject was dealt with in Working Group 10A, chaired by Mr. G. Petke (Germany (Federal Republic of)), which at the Interim and Final Meetings of Study Group 10 considered 26/34 contributions, drafted 18/28 documents and set up 4/6 Drafting Groups, respectively.

Recommendation 559 on objective measurement of RF protection ratios in broadcasting was radically revised, in particular by deleting the section on the graphical method and adding a short text on the subject in the new section on the numerical method, while Recommendation 560 on RF protection ratios was amended at the Interim Meeting by the addition of information on fading prediction as well as an annex relating to planning parameters in band 7.

Recommendation 598 on the factors influencing coverage in Band 6 (MF) was amended by the addition of four annexes, derived from Report 616 and the annexes thereto.

The note at the end of Recommendation 411 (fading allowances in HF broadcasting) was updated, and the results of experiments carried out in the People's Republic of China were added in Recommendation 498 on ionospheric cross-modulation.

The Interim Meeting drafted new Recommendation 702 on synchronization and multiple frequency use per programme in HF broadcasting, to replace Recommendations 205-2 and 410, which were cancelled.

Recommendation 80 (transmitting antennas in HF broadcasting) was condensed and revised, and Reports 32 and 1062 were annexed to it; Recommendation 414 (presentation of antenna diagrams) was cancelled and replaced by a new Recommendation 705 with an Annex containing all necessary details for the calculation of HF antenna characteristics and patterns, which will be published separately, along with the associated computer programs, thereby constituting a new edition of the CCIR Book of Antenna Diagrams.

New Recommendation 703 on the characteristics of AM sound broadcasting reference receivers marks the completion of IWP 10/7's work; it will be brought to the attention of the IEC.

Slight amendments were made to Recommendation 640 on the SSB system in HF broadcasting, and the Study Group approved Recommendation 706 on a data system in monophonic AM sound broadcasting, setting out the specifications for such a system, which will be brought to the attention of the IEC.

With regard to broadcasting in the Tropical Zone, Recommendation 139 on transmitting antennas was slightly amended at the Interim Meeting.

Study Group 10 approved a new Report 1201 on HF transmitters using a single channel, as well as amending a number of other Reports. In Report 516 (field-strength resulting from several electromagnetic fields), the results of research conducted in the USSR were added to supplement the studies carried out in Italy and Hungary. Report 401 (transmitting antennas in LF and MF broadcasting) was updated and condensed in the light of comments received from Study Group 6. Amendments were also made to Report 458 (broadcasting system characteristics), Report 1059 (characteristics of SSB systems in HF broadcasting) and Report 1061 (transmission of supplementary information in AM sound broadcasting), which will be brought to the attention of the IEC, as well as to Report 1060 on energy saving methods and their influence on reception quality.

On the subject of sound broadcasting in the Tropical Zone, minor amendments were made to Report 304 on fading characteristics and Report 472 on SSB reception.

Report 32-5, 461, 616-3, 617-2, 619 and 1062 were cancelled.

In all, Study Group 10 approved 4 new Recommendations and 1 new Report, amended 8 Recommendations and 8 Reports and cancelled 3 Recommendations and 6 Reports, for a total of 20 Recommendations and 14 Reports concerning amplitude-modulation sound broadcasting.

It was also noted that it would be useful if an IEC Working Group could investigate the problem of measurements on transmitting antennas.

2.1.2 *Frequency-modulation sound broadcasting*

This subject was dealt with in Working Group 10B, chaired by Mr. A. Keller (France), which at the Interim and Final Meetings of Study Group 10 considered 44/53 contributions, drafted 14/18 documents and set up 6/9 Drafting Groups, respectively.

Recommendation 642 on limiters for high-quality sound-programme signals was slightly amended at the Interim Meeting. On the basis of the work of IWP 10/7, the Working Group proposed a new Recommendation 704 on the characteristics of FM receivers for monophonic and stereophonic reception using pilot-tone and polar modulation systems.

Amendments were made to Recommendation 412 on planning standards and to Recommendation 643 on the system for automatic tuning of receivers, while a new Recommendation 707 was approved on the emission of multisound in terrestrial television systems. The two latter Recommendations will be brought to the attention of the IEC.

Amendments were made to Report 1066 on control of modulation level and Report 1064 on particular cases of interference. Report 1202 was approved on the protection ratios in the case of the same programme and synchronized signals, based on contributions by France and Italy.

Report 464 (polarization of emissions), Report 945 (methods for the assessment of multiple interference), Report 946 (planning constraints), Report 300 (stereophonic or multi-dimensional sound) and Report 463 (transmission of several sound programmes with a single transmitter) were amended.

A new Report 1203 was produced on digital sound broadcasting to mobile, portable and fixed receivers using terrestrial transmitters, as well as a new Report 1198 on compatibility between the broadcasting service in the band 87.5-108 MHz and the aeronautical services in the band 108-137 MHz. This text, which is of considerable value, particularly as regards methods of predicting potential incompatibilities, needs to be studied in depth by JIWP 8-10/1 with a view to merging it with Study Group 8's Report 929 to provide a text, along with a Recommendation, which will now be dealt with by the new Study Group 12.

Finally, Report 795 on the transmission of two or more sound programmes or information channels in terrestrial television was completely revised, with, in annex, a draft new Recommendation for television system M.

In the field of frequency-modulation sound broadcasting, therefore Study Group 10 approved 2 new Recommendations and 3 new Reports and amended 3 Recommendations and 8 Reports, for a total of 9 Recommendations and 15 Reports.

2.1.3 *Audio-frequency characteristics of sound-broadcasting signals*

This subject was dealt with in Working Group 10C, chaired by Mr. G. Steinke (German Democratic Republic), which at the Interim and Final Meetings of Study Group 10 considered 32/40 contributions, produced 15/30 documents and set up 3/5 Drafting Groups, respectively.

Recommendation 562 on subjective assessment of sound quality was amended by the addition in Annex I of a paragraph on the subjective assessment of multi-dimensional sound systems. Recommendation 644 on audio quality parameters was amended, in particular by the addition of a new Annex on special methods of measurement of audio quality parameters.

Study Group 10 is submitting for approval by the Plenary Assembly a new Recommendation 708 on determination of the electro-acoustical properties of studio monitor headphones, which will be brought to the attention of AES, the IEC and ISO. The tolerances for such headphones are extremely low, in order to guarantee high quality.

Recommendation 647 on the digital audio interface for studios was amended so as to define the method for including the status of signals, and was supplemented by a new annex on development of the digital audio interface, for further consideration. AES is invited to send representatives to the meetings at which this subject will be discussed.

Report 1072 on sound systems for high-definition and enhanced television and Report 798 on simulated programme signals were both amended. Several new Reports were approved, namely Report 1199 (low bit-rate digital audio coding systems), Report 1200 (effect of propagation delay on sound broadcasting operations), Report 1204 (automatic synchronization of video and audio after transmission) and Report 1237 on satellite news gathering (to be published in Volume XII).

The Study Group also cancelled Report 465-3 on loudness, Report 797-2 on listening rooms, Report AE/10 on the measurement of non-linear distortion and Report AF/10 on studio monitor headphones.

Close cooperation with the IEC on the technical aspects of audio frequency signals is highly desirable.

In summary, in the field of audio-frequency characteristics of sound-broadcasting signals, Study Group 10 approved 1 new Recommendation and 4 new Reports, amended 4 Recommendations and 2 Reports and cancelled 4 Reports, for a total of 7 Recommendations and 13 Reports.

2.1.4 *Sound-data broadcasting*

This subject was dealt at the service level with in Joint Working Group 10-11D, which was set up at the Final Meetings, under the chairmanship of Professor F. Cappuccini (Italy).

The Joint Working Group examined 14 contributions on matters within the scope of Study Group 10, in 5 Sub-Working Groups.

The texts produced, which were drafted in collaboration with Working Groups 10A and 10B, include Recommendation 706 on data system in monophonic AM sound broadcasting (AMDS), Report 795 on the transmission of two or more sound programmes in terrestrial television and Report 463 on the simultaneous transmission of several sound programmes with a single transmitter in FM sound broadcasting.

The Group also requested the CCIR Secretariat to include additional information in the booklet describing teletext systems, incorporating the latest information on the recommended systems.

Finally, Joint Working Group 10-11D proposed that the necessary arrangements be made for all work on data broadcasting to be assigned to the Group and for all the CCIR texts relating to data broadcasting to be grouped together in a single separate Volume. That action will be studied by JIWP 10-11/5, which will submit proposals for consideration by Study Groups 10 and 11 during the next study period.

Following the decisions of the Plenary Assembly, JIWP 10-11/5 has been disbanded and the study of data broadcasting has been split up between Study Groups 10 and 11.

2.1.5 *Recording of sound-broadcasting programmes*

This subject was dealt with in Joint Working Group 10-11R, chaired by Mr. P. Zaccarian (CBS), which at the Interim and Final Meetings of Study Group 10 considered 22/27 contributions on sound and television broadcasting, respectively, drafting 21 documents with the assistance of two Sub-Working Groups.

In the field of sound broadcasting, amendments were made to Recommendation 407 (international exchange of sound programmes recorded in analogue form) to delete references to recording on disk records, and to Recommendation 408 (standards of sound recording on magnetic tape) to include the definitions of the reference recording-duplicating chains following the deletion of Report 800.

The Group also deleted Recommendation 564 on the use of magnetic tape cartridges and cassettes for sound-broadcasting.

In the area also concerning television, the Group drafted Recommendation 715 on the international exchange of recordings of electronic news broadcasts, which will be brought to the attention of the IEC, SMPTE and the broadcasting unions.

Study Groups 10 and 11 amended Report 468 on synchronizing methods and Report 950 on digital recording of audio signals, as well as deleting Report 800 on the recording-duplicating chain.

In all, on the recording of sound programmes, Study Group 10 drafted 1 new Recommendation, amended 2 Recommendations and 2 Reports and deleted 1 Recommendation and 1 Report, giving a total of 5 Recommendations and 3 Reports.

2.1.6 *Broadcasting service (sound) using satellites*

This subject was dealt with in Joint Working Group 10-11S, chaired by Mr. R. Zeitoun (Canada), which at the Interim and Final Meetings of Study Groups 10 and 11 received 62/83 contributions concerning sound and television broadcasting and produced 27/38 documents, respectively, setting up 3 Sub-Working Groups.

As regards sound broadcasting via satellite, Recommendation 566 on terminology was updated to take account of the definitions established by WARC ORB-88 and Recommendation 712 was adopted on high-quality sound and data standards in the 12 GHz band.

The corresponding systems are described in Report 1228, while another new Report 1227 was drawn up to cover satellite broadcasting systems for ISDB.

Report 215 (systems for the broadcasting-satellite service), Report 632 (technically suitable methods of modulation), Report 955 (satellite sound broadcasting with portable receivers and receivers in automobiles), Report 953 (digital coding for the emission of high-quality sound signals), Report 954 (multiplexing methods for the emission of several digital audio signals and also data signals), Report 810 (antennas) and Report 473 (ground receiving equipment) were amended and updated, as well as Report 631 on frequency sharing with terrestrial services and Report 807 on unwanted emissions.

Accordingly, in the field of satellite sound-broadcasting, Study Groups 10 and 11 are submitting to the Plenary Assembly 1 new Recommendation, 2 new Reports, 1 amended Recommendation and 9 amended Reports, for a total of 3 Recommendations and 11 Reports.

2.2 *Questions, Study Programmes, Resolutions and Opinions*

Question 44/10 on LF, MF and HF sound broadcasting was amended to include study of the factors affecting satisfactory coverage, along with 7 of the 12 Study Programmes relating to it. Furthermore, a new Study Programme was added on the design of systems for HF broadcasting.

The XVIIth Plenary Assembly abolished this Question, as well as Study Programmes 44D/10 and 44E/10.

Amendments were also made to Study Programme 45F/10 in order to provide more specific details on the studies to be carried out on transmitting antennas for short-distance sound broadcasting in the Tropical Zone and the Plenary Assembly proposed the transfer of Study Programme 45B/10 to Study Group 6 and the cancellation of Study Programmes 45C/10 and 45D/10.

Question 46/10 on FM sound broadcasting in the VHF band was modified to accommodate data broadcasting, and amendments were made to Study Programmes 46H/10 (transmission of supplementary information), 46J/10 on compatibility with the aeronautical services, which will be dealt with by the new Study Group 12 with the exception of the part concerning compatibility with television, and 46N/10 on immunity of FM receivers against interference. Two new Study Programmes were also drawn up, namely 46P/10 on the transmission of data information as an alternative to the main programme, now abolished by the Plenary Assembly, and 46Q/10 on transmitting and receiving antenna characteristics for planning in VHF broadcasting.

The Plenary Assembly also abolished Study Programmes 46A/10, 46D/10, 46E/10, 46F/10 and 46H/10, as well as Questions 47-1/10 and 48-1/10.

Question 50/10 on the audio-frequency characteristics of broadcasting signals was deleted by the Plenary Assembly, as well as Study Programmes 50A/10 and 50B/10. Study Programmes 50C/10 on the subjective assessment of sound quality and 50D/10 on the acoustic properties of control rooms were amended. Two new Study Programmes were drafted, namely 50F/10 on determination of the electro-acoustical properties of headphones and 50G/10 on sound systems for the hearing impaired. These Study Programmes have now all become Questions.

Question 51/10 on standards for digital techniques for sound in broadcasting was also amended to take account of signal path delay, as was Study Programme 51B/10 on digital coding standards, to include study of that phenomenon.

Study Group 10 also amended Question 52/10 on the recording of sound-broadcasting programmes for international exchange, together with Study Programme 52A/10 on sound recording standards, both subsequently abolished by the Plenary Assembly. Study Programme 52B/10 on sound recording using digital modulation was amended. A new Study Programme 52D/10 on optical recording was drafted and Study Programme 52C/10 on the automatic programming of sound broadcasting stations was deleted.

The Plenary Assembly decided to discontinue Question 54/10 on broadcasting systems using non-conventional energy sources.

A new Question was drawn up on interconnection specifications for audio-visual equipment related to broadcasting.

As regards satellite sound-broadcasting, amendments were made to Study Programmes 1A/10-11 on use of the 12 GHz band by the broadcasting-satellite service and 2K/10-11 on satellite sound-broadcasting.

Study Group 10 had proposed to the Plenary Assembly that Resolution 61 be amended so as to add a fourth item to its terms of reference concerning the overall performance of the means of delivering television signals to the general public. However, the Plenary Assembly, acting on Study Group 10's proposal, changed terms of reference to sphere of competence.

An amendment to Resolution 76 on the presentation of antenna diagrams is also proposed to accommodate the studies requested by WARC HFBC(2).

The Study Group is proposing amendments to Opinion 74 (facilities for the interconnection of sound-broadcasting receivers and associated equipment) to identify more clearly the studies to be carried out by the CCIR and indicate that the Opinion is to be transmitted to Study Group 11, the CCITT and the IEC. Similarly, a new Opinion was drafted on equipment interconnection in professional programme production installations, which will be brought to the attention of the IEC.

2.3 *Decisions and Interim Working Parties*

Study Group 10 amended Decision 79, thereby maintaining IWP 10/1, under the chairmanship of Mr. G. Groeschel (Germany (Federal Republic of)), to enable it to complete its work on HF broadcasting antennas and move on to LF and MF antennas, as well as receiving antennas. This has now become Working Party 10D.

Interim Working Party 10/7 on reference receivers had completed its work, under the chairmanship of Mr. M. Schneider (Switzerland), and was thus disbanded by Study Group 10. Decision 52 was deleted accordingly.

Decision 78 establishing IWP 10/9 to standardize the basic requirements for control and listening rooms, under the chairmanship of Mr. T. Magchielse (Netherlands), was retained without change, with a view to the preparation of a draft Recommendation replacing Report 797, for submission to the next Interim Meeting of Study Group 10. This IWP has been disbanded and replaced by a Special Rapporteur in Working Party 10C.

The Study Group approved new Decision 96 setting up IWP 10/10, under the chairmanship of Mr. W. Richards (United States of America), to carry out CCIR studies for the WARC-93 dealing with matters connected with the HF broadcasting service. IWP 10/10 will prepare the CCIR's consolidated report to WARC HFBC-93, incorporating the reports by IWP 10/1, with the collaboration of Study Groups 1 and 6. The consolidated report will be forwarded to the Conference at least ten months before it opens, once approved by the Chairmen of Study Groups 10, 1 and 6.

In accordance with new Decision 99, IWP 10/11 is to be established, under the chairmanship of Mr. K. Hunt (EBU), in order to prepare a report on HF broadcasting system design for submission to the next Final Meeting of Study Group 10. This IWP has been disbanded and replaced by a Special Rapporteur in Working Party 10A.

New Decision 94 provides for the establishment of IWP 10/12, under the chairmanship of Mr. G. Theile (Germany (Federal Republic of)), to study multi-channel sound systems (for high-definition and enhanced television). After establishing the necessary contacts with the other groups concerned by this subject, the IWP will submit draft Recommendations to the Interim Meeting of Study Group 10 in 1991. In the new CCIR structure, this IWP has become Task Group 10/1.

Decision 71, establishing JIWP 8-10/1 on compatibility between the aeronautical services and MF sound broadcasting stations in the band 87-108 MHz, under the chairmanship of Mr. J. Karjalainen (Finland), was amended to enable the JIWP to continue its work, in particular with a view to drafting a consolidated text which, once approved by Study Groups 8 and 10, will be published in a separate Volume. The Decision will be brought to the attention of the ICAO. This JIWP comes under the new Study Group 12.

The Study Groups concerned approved new Decision 97 establishing JIWP 10-3-6-8/1, under the chairmanship of Mr. J.S. Finnie (United Kingdom), to identify more precise criteria and parameters for sharing between broadcasting and fixed and mobile services in the band 2-30 MHz and to draw up a report on the subject by the end of 1990.

Study Group 10 agreed to disband JIWP 10-3-8/1, chaired by Mr. A. Romero Sanjinés (Peru), to which thanks were extended for its work in preparing the technical bases for the RARC for the planning of broadcasting in the band 1605-1705 kHz in Region 2.

Decision 43 concerning the establishment of JIWP 10-11/1, under the chairmanship of Mr. D. Sauvet-Goichon (France), responsible for studying satellite sound broadcasting and sharing and spectrum aspects of broad RF band HDTV was amended to include the sharing and spectrum aspects of HDTV.

Decision 51, concerning the establishment of JIWP 10-11/3 under the chairmanship of Mr. Ö. Mäkitalo (Sweden) to deal with satellite broadcasting of HDTV signals and the accommodation of several audio or data channels in terrestrial or satellite broadcasting channels was amended to cover transmission aspects relating to terrestrial HDTV and the coding and multiplexing of sound channels in HDTV signals.

The Decision contains a draft Resolution instructing JIWP 10-11/3 to revise, by 31 December 1990, the CCIR special publication "Specifications of transmission systems for the broadcasting-satellite services".

A new Decision was drawn up specifying the work to be accomplished by JIWPs 10-11/1 and 10-11/3 in preparation for WARC-92, so that the relevant report may be submitted directly to the JIWP for preparation of the Conference, to be established by the CCIR Plenary Assembly, no more than two months before the JIWP meets.

Decision 59 establishing JIWP 10-11/4, under the chairmanship of Mr. P. Zaccarian (CBS), to study problems relating to television programmes recorded on digital tape and film was amended, in particular so as to ensure more effective liaison with the IWPs studying similar subjects and to indicate that the JIWP shall complete its work in the 1990-1994 study period. The Decision will be brought to the attention of the IEC, ISO and SMPTE.

Decision 72 establishing JIWP 10-11/5, under the chairmanship of Prof. F. Cappuccini (Italy), to study services using data broadcasting was updated, in particular to incorporate data broadcasting in HDTV. This WP has been disbanded so far as Study Group 10 is concerned.

JIWP 10-11/6 is set up by new Decision 95 to study subjective assessment of television sound and picture quality, thereby extending the scope of the old IWP 11/4 to include subjective assessment of sound quality. The JIWP will be chaired by Mr. D. Wood (EBU). This WP has been disbanded and replaced by a Special Rapporteur in Working Party 10C.

Under Decision 75, JIWP AFBC(2) of Study Groups 1, 5, 8, 9, 10 and 11 had been set up, under the chairmanship of Mr. H. Kussmann (Germany (Federal Republic of)), to study sharing criteria between the services using the bands 790-862 MHz in the African Broadcasting Area and the use of circular polarization, in preparation for the Second Session of the Regional Administrative Conference for the Planning of Television Broadcasting in the African Broadcasting Area and Neighbouring Countries. Study Groups 10 and 11 having taken cognizance of the reports to the Conference, the JIWP, which had fulfilled its task, was disbanded with congratulations and thanks.

New Decision 98 provides for the establishment of JIWP 10-CMTT/1, under the chairmanship of Mr. A. Komly (France), to consider low bit-rate digital audio coding systems. The JIWP will work in liaison with the IWPs studying similar subjects and will submit a draft Recommendation to the Interim Meetings in 1991. Decision 98 will be brought to the attention of the IEC and ISO. This WP has become Task Group 10/2.

Decision 76 establishing JIWP CMTT 4-10-11/1 on satellite news gathering, under the chairmanship of Mr. J. A. Colson (NANBA), was revised to enable the JIWP to pursue its work and prepare an overall strategy for SNG. This WP now comes under the CMTT as Task Group 5.

Decision 18 on digital systems for the transmission of sound-programme and television signals was amended so as to convert IWP CMTT/1 into a JIWP CMTT-10-11/1, which will cooperate with CCITT Study Groups I, XV and XVIII in order to make the CCIR and CCITT Recommendations on the digital transmission of sound and television broadcasting signals as compatible as possible. JIWP CMTT-10 11/1 has been placed under the chairmanship of Mr. G. Simpson (United Kingdom). This IWP has been disbanded and the subject will be dealt with by a CMTT Working Party.

The JIWP of Study Groups 1, 2, 4, 5, 8, 9, 10 and 11 to prepare for WARC ORB-88, set up under the chairmanship of Mr. E. Hauck (Switzerland) by Resolution 90, which replaced Decision 73, had completed its work and was disbanded with thanks. It was also proposed that Resolution 90 and Decision 73 be deleted.

The JIWP of Study Groups 1, 5, 6, 8, 9, 10 and 11 on sharing criteria between the broadcasting service and the fixed and mobile services in the VHF and UHF bands, set up under the chairmanship of Mr. J. N. McKendry (Australia) in accordance with Resolution 94, is continuing its work in preparation for the conference responsible for developing the above criteria in Region 3 and the countries concerned in Region 1. The JIWP has drawn up a report for Study Group 1. The subject will be dealt with by the new Study Group 12.

The Director of the CCIR submitted to the Study Groups concerned a draft Decision on the studies to be carried out by the CCIR with a view to WARC-92 dealing with frequency allocation in certain parts of the spectrum. The new Decision foresees that the CCIR Plenary Assembly should create a JIWP of Study Groups 1, 2, 3, 4, 5, 6, 8, 9, 10 and 11 on the basis of proposals formulated by the meeting of Study Group Chairmen in January 1990. The JIWP will study, in particular, the problem of frequency sharing between services, and will draw up a consolidated report to the conference on the basis of the reports prepared by the different Study Groups (the reports within the scope of Study Group 10 will be drafted by JIWPs 10-11/1 and 10-11/3, as indicated in the new Decision). The Plenary Assembly in Düsseldorf set up JIWP WARC-92.

3. Cooperation with other Study Groups

Cooperation between Study Group 10 and the other Study Groups is effected primarily through the Interim Working Parties described in the previous section. Study Group 10 also considered documents received from Study Groups 1, 2, 3, 5, 6, 8, 9, 11, CMTT and CMV and gave its opinion on their content.

Study Groups 10 and 11 also drafted a note to Study Group 4 requesting it to communicate the results of studies concerning transportable transmitting earth stations for feeder-links to broadcasting satellites.

They also approved a note addressed to Study Groups 5 and 9 concerning the protection of line-of-sight terrestrial radio-relay systems against possible interference which may be caused by the BSS in the 20 GHz band. This note will be published in Part 2 of Volumes X and XI.

Study Group 10 confirmed that, in order to ensure the necessary coordination, it will be represented in CMTT by the Chairman of Working Group 10C.

Finally, Study Groups 10 and 11 addressed a note to CCV drawing attention to the amendments made to Recommendation 566 on space radiocommunications terminology and to its comments concerning the terms defined in Chapters 723 and 725 of the International Electrotechnical Vocabulary.

Study Group 10 will have to appoint a new Rapporteur for Spanish on CCV. The Spanish Administration has proposed Mr. L. Del Amo Ruiz. Its Rapporteurs for French and English are Mr. A. Keller (France) and Mr. A. H. Jones (United Kingdom), respectively.

4. Problems concerning the developing countries

Resolution 33 on technical cooperation invites the developing countries to take an active part in the work of the CCIR Study Groups, states that the CCIR should take up actively the study of Questions posed by developing countries and asks Chairmen to include in the Volumes of the CCIR published after each Plenary Assembly a section, to be as comprehensive as possible, especially devoted to problems of interest to developing countries.

The work of Study Group 10 is of particular interest to the developing countries in view of the importance of sound broadcasting for the information and education of the people in those countries.

As regards amplitude-modulation broadcasting, the developing countries are especially interested in the texts relating to broadcasting in the Tropical Zone, in which several of them are situated.

With regard to the recording of sound-broadcasting programmes, Recommendation 408 (standards of sound recording on magnetic tape for the international exchange of programmes) concerns the developing countries, and their attention is particularly drawn to the CCIR special publications on transmission systems for satellite broadcasting and on recording, prepared in accordance with Resolution 81.

In the field of satellite broadcasting, a subject of particular interest to the developing countries is the problem of sound broadcasting between a satellite and portable or mobile receivers, which is dealt with in Report 955.

The attention of the developing countries is also drawn to the importance of the Interim Working Parties for the preparation of forthcoming ITU conferences, in particular IWP 10/10, which will be preparing the HF broadcasting conference, and the JIWP for the preparation of the 1992 World Administrative Radio Conference to study frequency allocations in certain parts of the spectrum.

Resolution 108 on information meetings also concerns the developing countries in particular, in enabling them to familiarize themselves with relevant CCIR texts.

Although it may be thought that the developing countries are particularly interested in texts offering guidance in the selection and use of equipment, Study Group 10 would certainly find it easier to contribute to the solution of problems concerning those countries if they took a more active part in its work, so as to focus attention on problems of particular interest to them, in line with the provisions of Resolution 95 of the XVIIth Plenary Assembly.