Documents of the Regional Administrative Conference for FM Sound Broadcasting in the VHF band (Region 1 and certain countries concerned in Region 3) (1st session) (Geneva, 1982)

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INTERNATIONAL TELECOMMUNICATION UNION

REGIONAL BROADCASTING CONFERENCE

(FIRST SESSION) GENEVA, 1982

Document No. DL/1-E
19 August 1982
Original : English

AGENDA

OF THE

MEETING OF HEADS OF DELEGATIONS

Monday, 23 August 1982, at 1030 hrs

CICG - ROOM III/IV

		Document No.
1.	Opening by the Secretary-General and appointment of the Dean of the Conference	-
2.	Approval of the agenda of the meeting	-
3.	Proposals for the election of the Chairman of the Conference	-
4.	Proposals for the election of the Vice-Chairmen of the Conference	-
5.	Conference structure	DT/2
6.	Proposals for the election of the Chairmen and Vice-Chairmen of Committees	-
7.	Draft agenda of the first Plenary meeting	DT/1
8.	Other business	

M. MILI

Secretary-General

Document No. DL/3-E
26 August 1982
Original : French

STEERING COMMITTEE

Proposed structure of the report on the First Session of RABC REG. 1 +

As agreed at the first meeting of the Steering Committee, a proposed structure for the report on the First Session of RABC REG. 1 + is herewith submitted for consideration by the Steering Committee.

Marie HUET
Chairman

Document No. DL/5-E
27 August 1982
Original : English

WORKING GROUP 4B

Report of Drafting Group 4B-3

DRAFT TEXTS ON AGENDA ITEMS 1.6 AND 1.7

Item 1.6 Maximum radiated powers

There is no need to specify maximum power limits provided countries do not use powers in excess of those necessary to provide the envisaged service / RR 2666 refers /.

Item 1.7 Basic characteristics of transmitting and receiving antennas : Polarization

1) Transmitting antennas

The maximum effective radiated power and, in the case of directional antennas, its azimuth relative to true north together with the total width of the main lobe to -3 dB points, shall be indicated in accordance with 1982 Radio Regulations (Appendix 1, section D, column 9).

The values of effective radiated power, in dB reduction relative to the maximum, should be specified at 10° intervals clockwise starting at true north. Where it is not possible to provide information in this detail administrations should provide the values at 30° intervals clockwise starting at true north.

In the case of mixed polarized transmissions the effective radiated powers and radiation patterns of the horizontally and vertically polarized components are to be specified separately.

2) Receiving antennas

The directivity curve of Figure 1, derived from CCIR Recommendation 599, is to be used for the planning of stereophonic sound services, the antenna being assumed to be at 10 m above ground. For monophonic services an omnidirectional antenna shall be assumed. Associated with use of the appropraite protection ratios this should ensure comparable coverages for stereophonic and monophonic services.

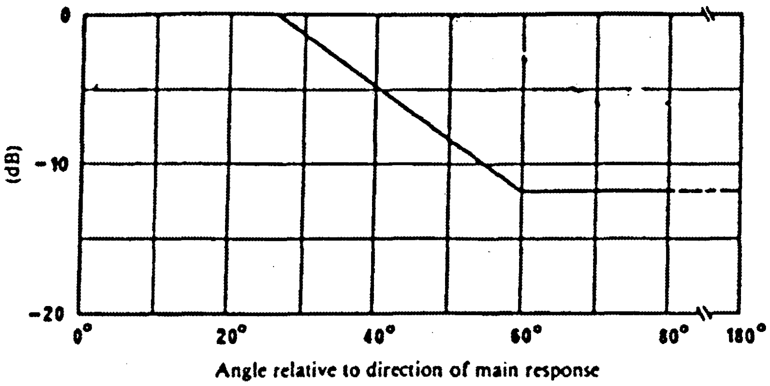


FIGURE 1 - *Discrimination obtained by the use of directional receiving antennas*

stereophonic-sound broadcasting

Note 1. - It is considered that the discrimination shown will be available at the majority of antenna locations in built-up areas. At clear sites in open country, slightly higher values will be obtained.

Note 2. - The curve in Fig. 1 is valid for signals of vertical or horizontal polarization, when both the wanted and the unwanted signals have the same polarization.

3) Polarization discrimination

Polarization discrimination shall not be taken into account in the formulation of the overall plan. It may however be taken into account, where appropriate in bilateral or multilateral negotiations between administrations, and in such cases a value of 10 dB shall be used.

Document No. DL/6-E
27 August 1982
Original : English

DRAFTING GROUP 4B-2

CHAPTER 3

TECHNICAL STANDARDS AND TRANSMISSION CHARACTERISTICS

To Item 1.4 of the agenda :

Minimum usable field strength

The planning shall be based on the following values of the minimum usable field strength (measured 10 m above ground level) which are sufficient for a satisfactory service in the presence of interference from industrial and domestic equipment :

for the monophonic service :

48 dB (μV/m) in rural areas

for the stereophonic service :

54 dB (μV/m) in rural areas.

These values shall be applied for systems with a maximum frequency deviation of ±50 KHz and ±75 KHz.

Protection ratios

The radio-frequency protection ratios required to give satisfactory monophonic reception for 99% of the time, in systems using a maximum frequency deviation of ±75 kHz, are those given by the Curve M2 in Fig. 1. For steady interference, it is desirable to provide the higher degree of protection, shown by the Curve M1 in Fig. 1 (see Annex I). The protection ratios at important values of the frequency spacing are also given in Table I.

The corresponding values for monophonic systems using a maximum frequency deviation of ±50 KHz are given in Fig. 2.

The radio-frequency protection ratios required to give satisfactory stereophonic reception for 99% of the time, for transmissions using the pilot-tone system and a maximum frequency deviation of ±75 KHz, are given by Curve S2 in Fig. 1. For steady interference (see Annex I), it is desirable to provide a higher degree of protection, shown by Curve S1 in Fig. 1. The protection ratios at important values of the frequency spacing are also given in Table I.

The radio-frequency protection ratios required to give satisfactory reception for 99% of the time for monophonic transmissions and for stereophonic transmissions using the pilot-tone system or the polar modulation system with a maximum frequency deviation of ±50 kHz are given by Table II.

The radio-frequency protection ratios required to give satisfactory stereophonic reception for 99% of the time in case the wanted and interfering transmitters use different frequency deviations are given in Table III.

The protection ratios for stereophonic broadcasting assume the use of a low-pass filter following the frequency-modulation demodulator in the receiver designed to reduce interference and noise at frequencies greater than 53 kHz in the pilot-tone system and greater than 46.25 kHz in the polar-modulation system. Without such a filter or an equivalent arrangement in the receiver, the protection-ratio curves for stereophonic broadcasting cannot be met, and significant interference from transmissions in adjacent or nearby channels is possible.

Data systems or other systems providing supplementary information, if introduced, should not cause more interference to monophonic and stereophonic services than is indicated by the protection-ratio curves in Fig. 1 (see Report 463). *It is not considered practicable in the planning to provide additional protection to data services or other services providing supplementary information signals.*

Note.- The protection ratios for steady interference provide approximately 50 dB signal-to-noise ratio. (Weighted quasi-peak measurement according to Recommendation 468, with a reference signal at maximum frequency deviation.) See also Report 796.

ANNEX I

To apply the protection-ratio curves of Fig. 1 it is necessary to determine whether, in the particular circumstances, the interference is to be regarded as steady or tropospheric [CCIR, 1978-82]. A suitable criterion for this is provided by the concept of "nuisance field" which is the field strength of the interfering transmitter (at its pertinent e.r.p.) enlarged by the relevant protection ratio.

Thus, the nuisance field for steady interference:

$$E_s = P + E(50,50) + A_s$$

and the nuisance field for tropospheric interference

$$E_t = P + E(50,T) + A_t$$

where

P: e.r.p. (dB(1 kW)) of the interfering transmitter;

A: radio-frequency protection ratio (dB);

$E(50,T)$: field strength (dB(μV/m)) of the interfering transmitter, normalized to 1 kW, and exceeded during T% of the time,

and where indices s and t indicate steady or tropospheric interference respectively.

The protection-ratio curve for steady interference is applicable when the resulting nuisance field is stronger than that resulting from tropospheric interference,

i.e. $E_s > E_t$

This means that A_s should be used in all cases when:

$E(50,50) + A_s > E(50,T) + A_t$.

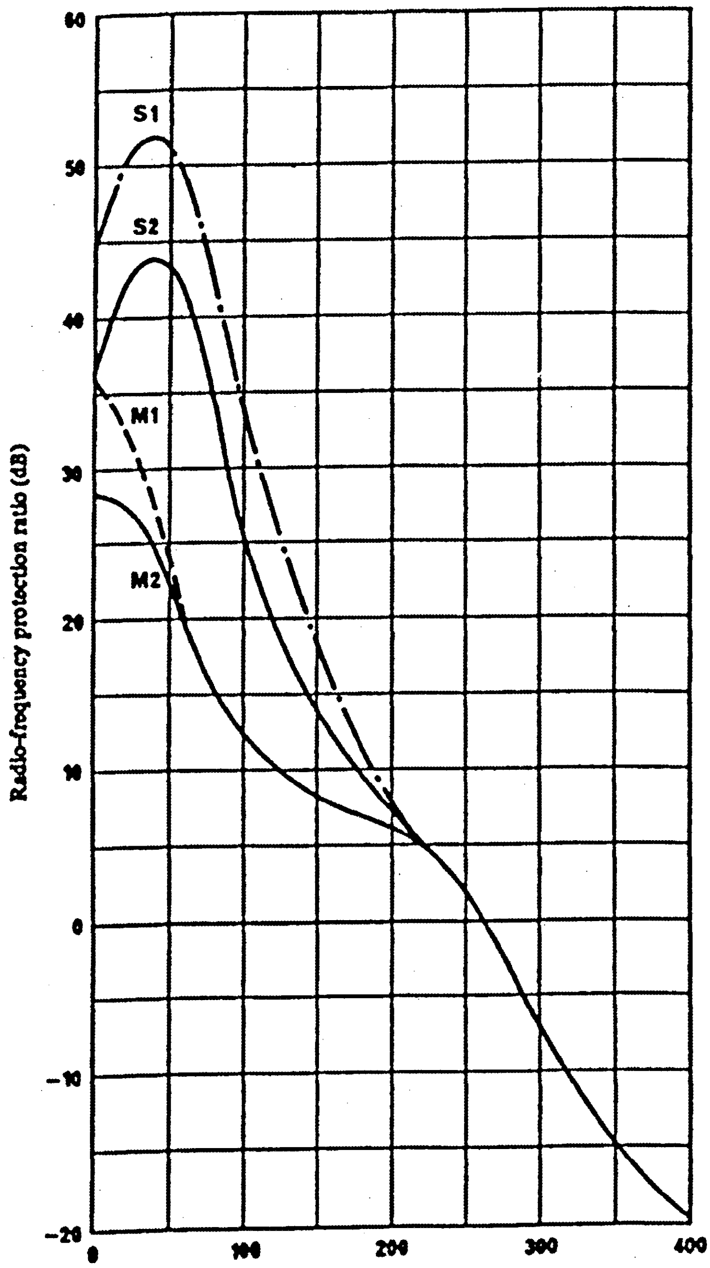


FIGURE 1 – *Radio-frequency protection ratio required by broadcasting services in band 8 (VHF) at frequencies between 87.5 MHz and 108 MHz using a maximum frequency deviation of ± 75 kHz*

Curve M1 : monophonic broadcasting; steady interference

Curve M2 : monophonic broadcasting; tropospheric interference (protection for 99% of the time)

Curve S1 : stereophonic broadcasting; steady interference

Curve S2 : stereophonic broadcasting; tropospheric interference (protection for 99% of the time)

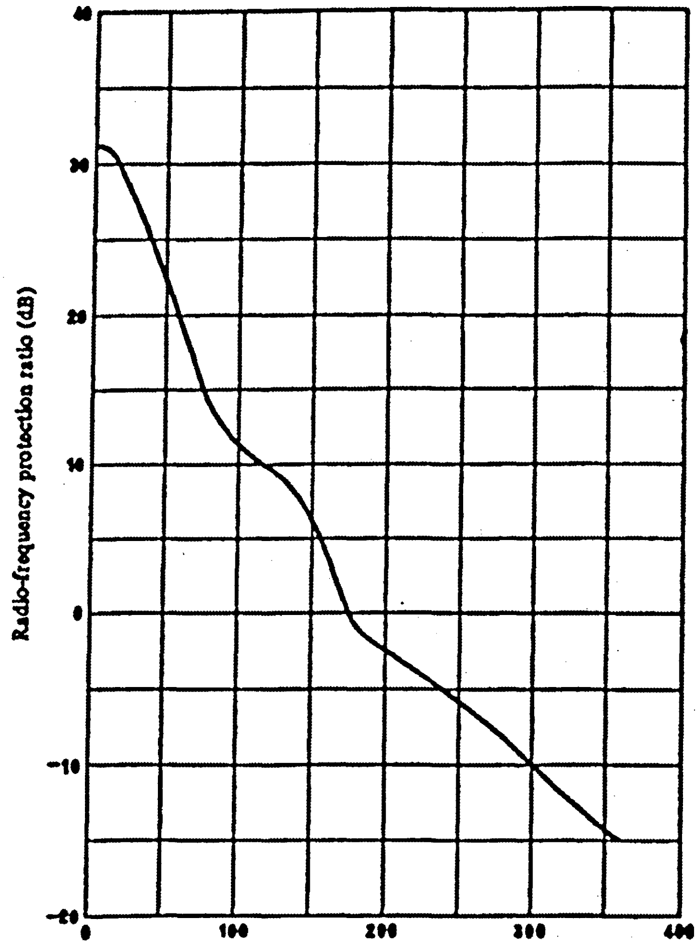


FIGURE 2 – *Radio-frequency protection ratios for monophonic sound broadcasting in band 8 (VHF) using a maximum frequency deviation of ± 50 kHz*

Tropospheric interference (protection for 99% of the time)

TABLE II

Frequency spacing (kHz)	Radio frequency protection ratio (dB) for maximum frequency deviation ± 50 kHz			
	Monophonic		Stereophonic	
	Steady interference	Tropospheric interference	Steady interference	Tropospheric interference
0	-	32	-	41
100	-	12	-	25
200	-	-2.5	7	-
300	-	-10	-7	-
400	-	-	-	-

TABLE III

Frequency spacing (kHz)	Maximum frequency deviation		Maximum frequency deviation	
	wanted transmitter : ±50 kHz	interfering transmitter : ±75 kHz	wanted transmitter : ±75 kHz	interfering transmitter : ±50 kHz
	Radio frequency protection ratio (dB) stereophonic		Radio frequency protection ratio (dB) stereophonic	
	Steady interference	Tropospheric interference	Steady interference	Tropospheric interference
0	-	41	45	37
100	-	25	33	25
200	7	-	7	7
300	-7	-	-7	-7
400	-	-	-20	-20

G. GRÖSCHEL
Chairman of Drafting Group 4B-2

Document No. DL/7-E
28 August 1982
Original : English

SUB-WORKING GROUP 5A-1

DRAFT

PLANNING METHODS

In the preparation of a frequency plan in the band 87.5 to 108 MHz for the countries of Region 1 and for parts of Afghanistan and Iran the Second Session of the Conference may apply one of the following two planning methods :

1) regular lattice planning with linear channel distribution scheme;

2) method of foremost priority (planning by trial and error).

The efficiency of the two methods will depend on circumstances which may vary considerably from one part of the planning area to the other. For instance, in Europe it is likely that frequency assignments to VHF/FM transmitters will only be subject to slight modifications in a restricted number of cases in most of the countries, whereas in the remaining part of the planning area an assignment plan for the entirety of sound-broadcasting transmitters will have to be established.

The lattice planning method which is described in CCIR Report 944 would be a powerful tool in the latter case, but it would be of little use in the former case.

The main advantage of this method is that the whole planning area can be sub-divided at the beginning into sub-areas of adequate size and shape. This will permit planning to start simultaneously in various parts of the planning area. A further advantage is that the method permits the quick assignment of large numbers of frequencies to non-constrained transmitters. This is due to the fact that within a theoretical channel distribution scheme mutual interference is brought down to the minimum practicable and that by its adaptation to a practical situation interference will be increased only slightly.

However, the applicability of the method is restricted to networks with transmitters of comparable interference potential (power, effective antenna height). The method should, therefore, not be used for the assignment of frequencies to low-power transmitters in an environment of numerous high-power transmitters. It may also fail to be applicable if a large number of contraints has to be respected, as for instance, the protection against the origination of annoying intermodulation frequencies.

When use is being made of the lattice planning method it is important that the channel distribution scheme to be applied is the same throughout the planning area. If different schemes were used in different parts of the area the adaptation of these schemes to one another would inevitably lead to reduced spectrum utilization efficiency.

The method of foremost priority consists in assigning to transmitters for which the number of appropriate frequencies is smallest the most favourable among these frequencies (worst transmitter - best frequency). As the determination of the "worst transmitter" and the "best frequency" is difficult, it can best be done with the aid of a computer. The advantage of this method is that all the constraints to be respected in every individual case can be taken into account. However, the method is time-consuming and its reliability is only warranted when a computer is used. Nevertheless, there can be no doubt that in parts of the planning area and in parts of the band conditions will be found in which the use of this method will be the only resort.

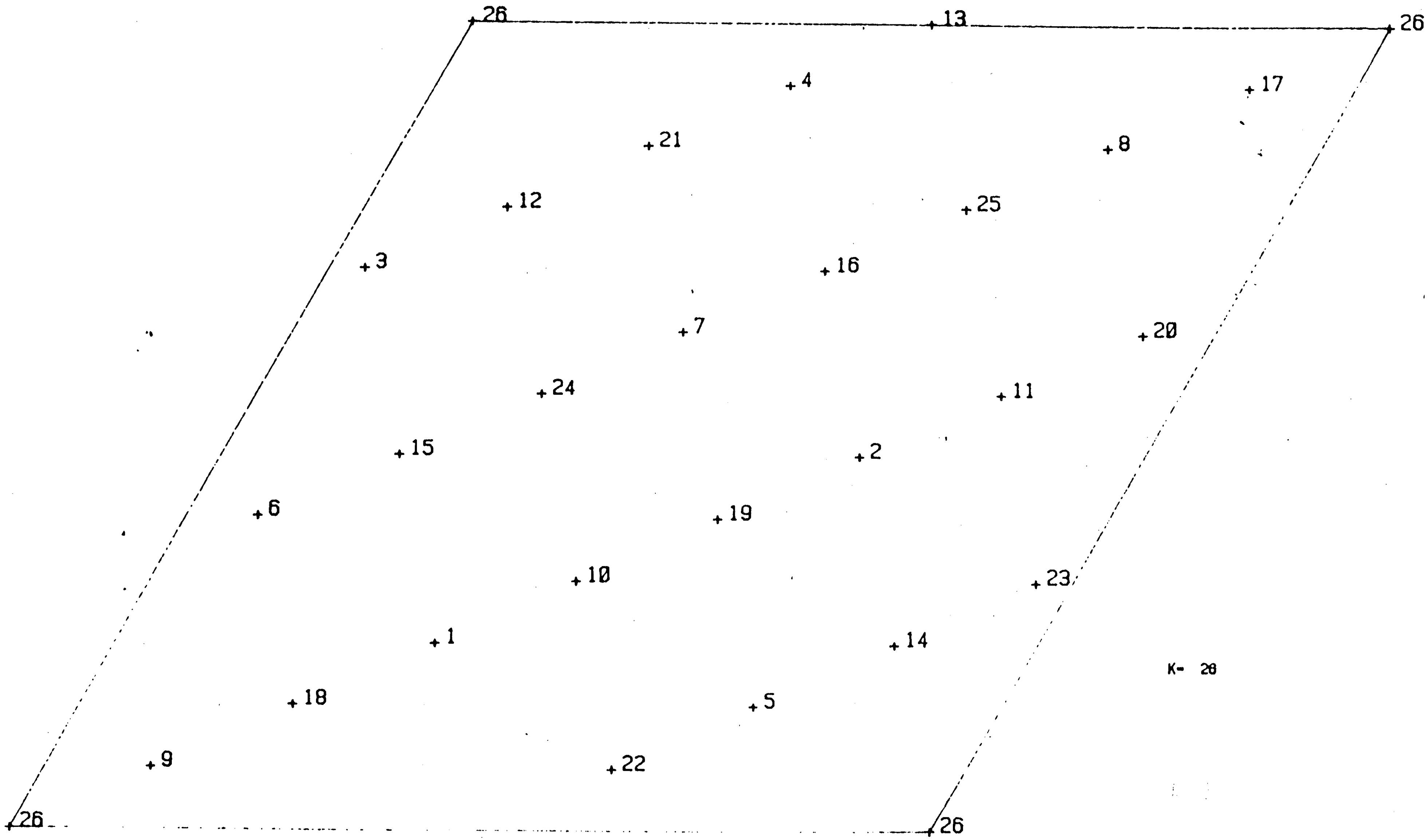
Because of the limited time that will be available for planning purposes during the Second Session of the Conference it is felt that both methods should go together. In the band 100 - 108 MHz in Europe (including the Asian part of the U.S.S.R.) and in the whole band in the remaining part of the planning area the lattice planning method should be used in the first instance. Refinement of the plan in a second step and planning in "desperate cases" will require the use of the method of foremost priority. In this respect it may well happen that planning in Europe while providing protection to the aeronautical radionavigation service will have to be considered as a desparate case.

Note to the Sub-Working Group 5A-1

The attached Figures 1, 2, 3a and 3b are providing examples of linear channel distribution schemes for 26, 80 and 204 channels, respectively. The complete distribution for 204 channels is given in Figure 3a, whereas an extract from the same distribution in Figure 3b shows the 80 channels situated at the upper end of the band.

H. EDEN

Chairman of Sub-Working Group 5A-1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26
4
17
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8
12
25
3
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1
14
K= 20
18
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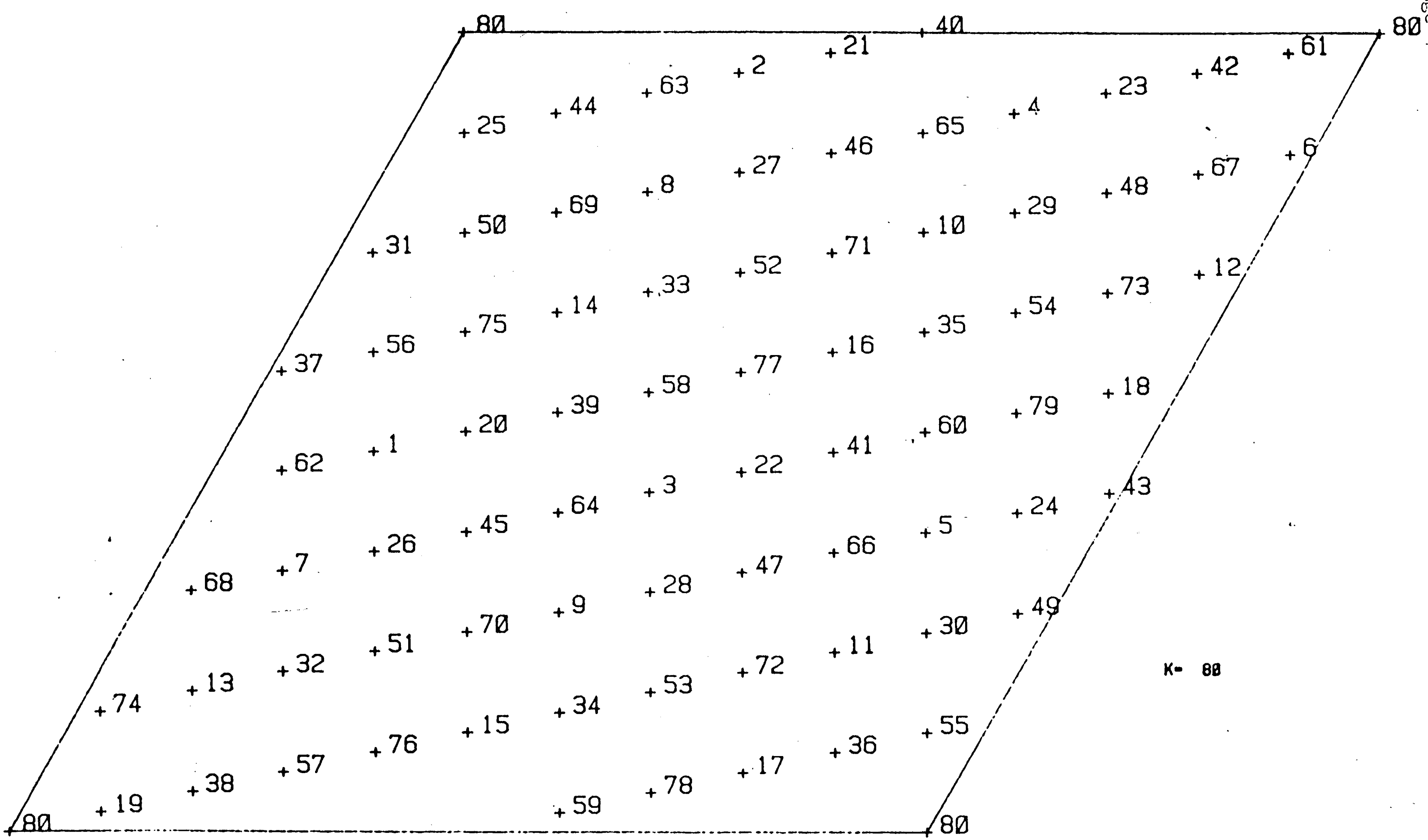
26

Figure 1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80
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60
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41
62
22
3
43
64
24
45
5
26
66
7
47
68
28
9
49
70
30
51
11
32
72
K= 80
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53
74
34
15
55
76
36
57
17
38
78
19
59
80
80

Figure 2

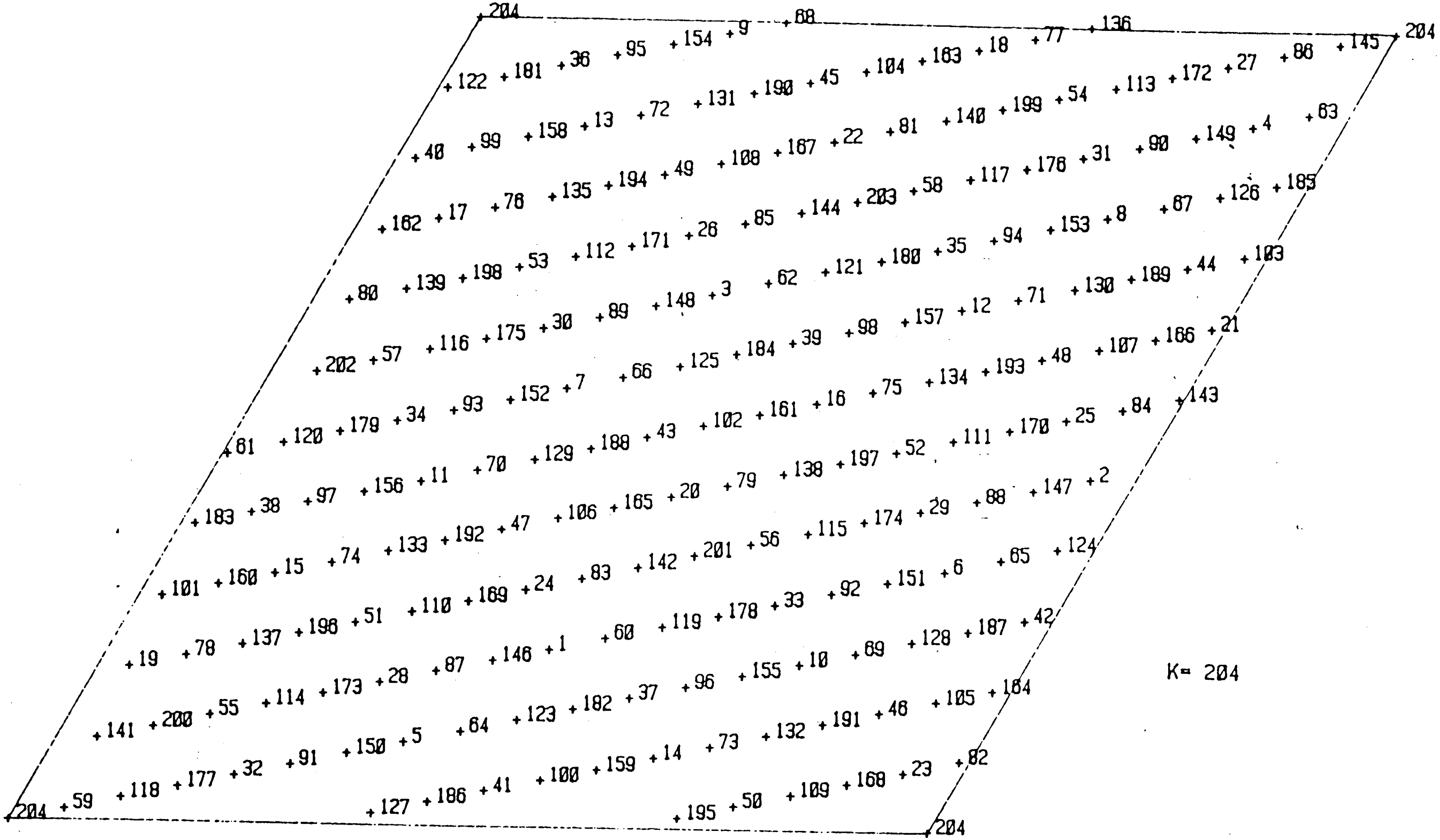
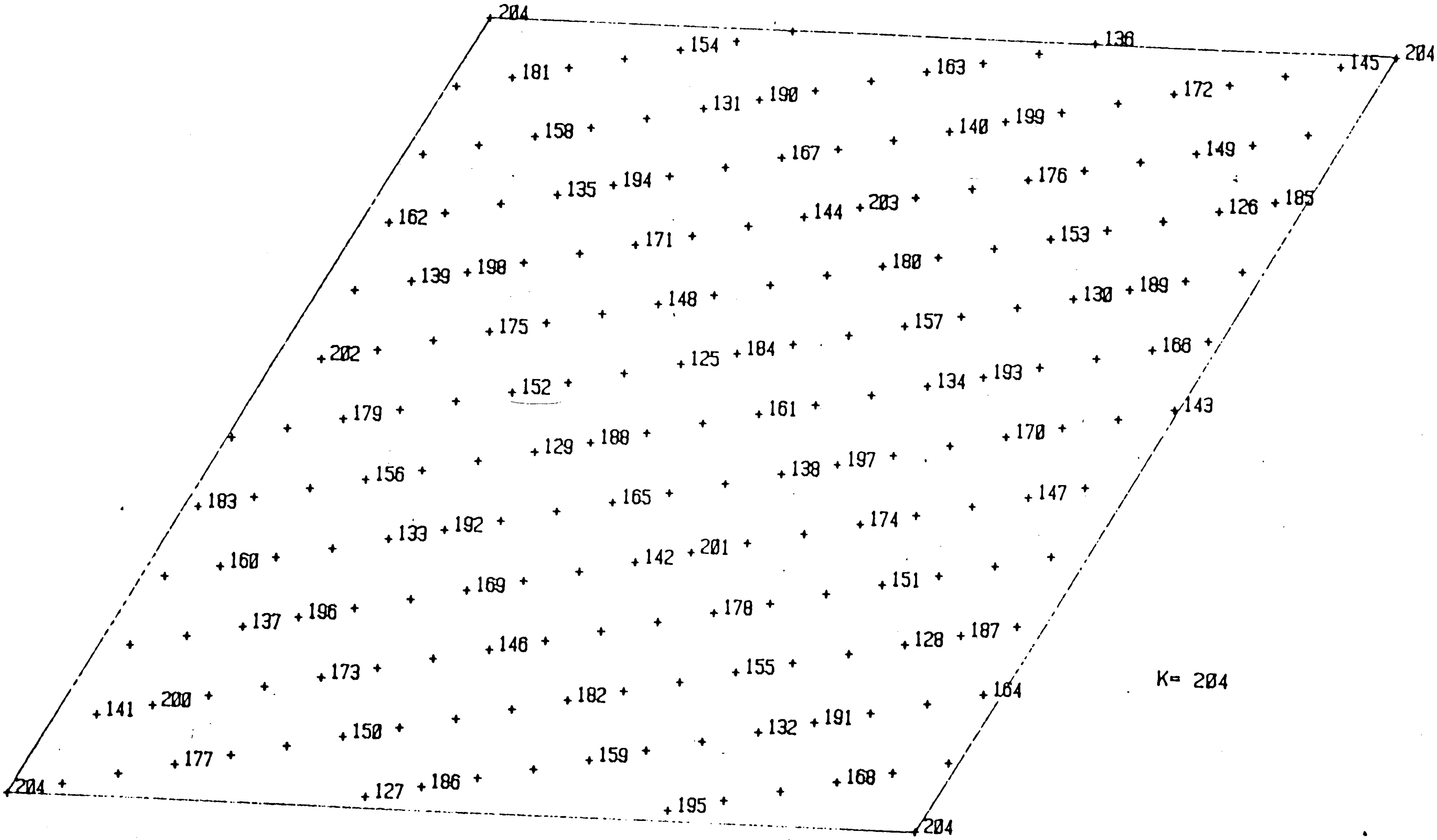

204 9 68 136 204
122 181 36 95 154 9 68
40 99 158 13 72 131 190 45 104 163 18 77 136
162 17 76 135 194 49 108 167 22 81 140 199 54 113 172 27 86 145
80 139 198 53 112 171 26 85 144 203 58 117 176 31 90 149 4 63
202 57 116 175 30 89 148 3 62 121 180 35 94 153 8 67 126 185
61 120 179 34 93 152 7 66 125 184 39 98 157 12 71 130 189 44 103
183 38 97 156 11 70 129 188 43 102 161 16 75 134 193 48 107 166 21
101 160 15 74 133 192 47 106 165 20 79 138 197 52 111 170 25 84 143
19 78 137 196 51 110 169 24 83 142 201 56 115 174 29 88 147 2
141 200 55 114 173 28 87 146 1 60 119 178 33 92 151 6 65 124
204 59 118 177 32 91 150 5 64 123 182 37 96 155 10 69 128 187 42
127 186 41 100 159 14 73 132 191 46 105 164
195 50 109 168 23 82
204
K= 204

Figure 3a


204
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197
183
147
165
133
192
174
160
142
201
151
169
137
196
178
128
187
146
155
173
164
K= 204
141
200
182
132
191
150
177
159
168
204
127
186
195
204

Figure 3b

Considering the size of the area to be planned, the expected large number of requirements to be included in the plan and the complexity of the planning task, some preparatory work is required to be carried out by IFRB in the period between the two sessions. This would permit to provide administrations preliminary results of calculations before the opening of the second session of the Conference. For the reasons mentioned above the following procedure is suggested.

1. Lattice method will be used as soon as possible after the first session of the Conference with the view to help administrations in formulating their requirements in an orderly manner. It will assist mainly the developing countries which are not able to attend the present session.

2. The application of a single lattice to the whole planning area is preferable, however for some reasons a different approach seems more appropriate. A different channel distribution scheme could be used in zones having different constraints where the geographical configuration provides appropriate separation.

3. When using the lattice method, administrations in the congested area in Europe may communicate their requirements in the band 87.5 - 100 MHz as they result from the application of the Regional Agreement.

4. When using a channel distribution scheme, countries pertaining to a given zone may agree not to include low-power stations in the lattice scheme. These low-power stations will be treated at a later stage before or during the second session of the Conference.

Document No. DL/9-E
30 August 1982
Original : English

WORKING GROUP 4C

COMPATIBILITY BETWEEN THE BROADCASTING SERVICE IN THE BAND 87.5 - 108 MHz AND THE AERONAUTICAL SERVICES IN THE BANDS 108 - 136 MHz

The Working Group reviewed Documents Nos. 4, 7, 12, 13, 19, 30 and 40 and has condensed and consolidated the various proposals and supporting material. The following report is presented to Working Group 4C for their consideration.

1. Interference mechanisms

Type A - Due to radiation at frequencies in the aeronautical band

i) Variously described in "in-band" or "on-channel", caused by spurious emissions (including intermodulation products) at the transmitter station. This is generally a low level effect (signal strengths up to 30 µV/m), and can be regarded as harmful interference as defined in the Radio Regulations in the circumstances where the level is sufficient to affect the performance of avionics receivers. No rejection can be provided at the airborne receiver and suppression at source and/or distance separation is the only practical cure.

ii) Interference to ILS channels near to the 108 MHz band edge due to out of band emissions from broadcast stations operating on carrier frequencies in the last 200 kHz (approx.) in the upper end of the broadcasting band.

Type B - Due to radiation at frequencies outside the aeromautical band

These comprise the following :

i) Intermodulation generated in the receiver.

ii) Desensitization in the RF section of the receiver.

The two effects are caused by relatively high signals (80 dB µV/m and above) producing non-linear operation in the RF stages of the airborne receiver. Intermodulation products may be generated producing an interfering signal at the same frequency as, or near to, the wanted signal in addition to causing a desensitization of the receiver gain response.

2. Protection of ILS localizer

2.1 Protected volume and signal strength

The internationally agreed system characteristics for ILS systems are specified in ICAO Annex 10. The system standards for service volume and minimum signal strength are reproduced below and define the protection circuits for these parameters:

i) a service volume as indicated in Figure 1;

ii) a signal strength of 40 microvolts per metre (-114 dBW/m^2) over the whole of the service volume specified above;

iii) where a back beam is employed protection over the usable volume out to a maximum range of 10 n.m. (18.52 km) and a maximum height of 6,250 feet (1,905 m) is additionally necessary.

2.2 Protection criteria

The following figures have been derived from the results of bench tests on a number of typical ILS localizer receivers in current use. They are considered to be suitable for the purpose of calculating the maximum permissible values of FM broadcast signals to establish compatibility for planning purposes.

2.2.1 Type A i)

At carrier coincidence	: 17 dB
±50 kHz from carrier coincidence	: 10 dB
±100 kHz from carrier coincidence	: 5 dB
±150 kHz from carrier coincidence	: 2 dB
±200 kHz from carrier coincidence	: 0 dB

A condition of carrier coincidence exists when the centre frequency of the intermodulation product is the same as that of an ILS localizer channel.

A graph of the values above is at Figure 2

2.2.2 Type A ii)

The figure of 17 dB for the carrier coincidence case of Type A i) interference may be used as the basis of interference assessments for this mode. In planning calculations the level of the broadcast signal for separations up to about 400 kHz separation in carrier frequencies may be taken from the assumed radiation characteristic at Figure 3 taking into account the e.r.p. in the direction of the interference path. More accurate characteristics may be used by national administrations where these can be established by measurement.

2.2.3 Type B i)

(Material to be provided)

2.2.4 Type B ii)

(Material to be provided)

2.2.5 Inside service area conflict

2.2.5.1 In situations where the broadcasting site is located within the ILS service area as specified at 2.1 above, protection to the service area edge can not be provided. In these cases no positive rules can be stated since each situation will differ in respect of the interference threat, the point at which it is the worst, and the pattern and density of air operations within the service area.

Study and assessment on a case-by-case basis by national aviation and broadcast authorities will be necessary to refine and evaluate the individual character of each conflict situation encountered.

It appears possible to state basic guidelines which may be used and added to as necessary in particular cases where the conflict contains features with a more significant potential to interfere with air operations.

These basic guidelines are :

i) a minimum protection figure as defined in the foregoing enhanced by a further margin to take account of the broadcast station proximity to the ILS course sector. In most instances an increase of 3 dB would appear to be suitable;

ii) special measures may be necessary where the worst effect of the predicted interference is experienced in the sector from 6 n. miles to the touchdown point and along the runway, and in the case of back beam operation out to a similar point in the reverse direction. The category, or expected future category of ILS operation is an important factor in deciding acceptability. In all such cases further protection will be necessary in most instances particularly in the case of interference due to Mode A i);

iii) the higher figure of 100 microvolts per metre for the wanted signal strength as specified in ICAO Annex 10 may be used as the basis where it has been established and confirmed;

iv) in respect of air operations particular points to be considered are :

a) the intersection of interference areas with the course sector,

b) mandatory approach procedures, radar vectoring paths and areas of higher density of use,

c) the area over which a disturbance may be experienced in relation to

v) where it can assist resolution, and to refine the assessment, account may be taken of secondary features of which the following are some :

a) vertical polar diagram of the broadcast radiation,

b) terrain effects,

c) higher nominal ILS signals in particular parts of the service volume as confirmed by measurement.

2.2.5.2 Bilateral coordination between administrations will be necessary in cases where the transmitter and ILS locations are in different countries. Such coordination should take place at planning and at implementation.

3. Protection of VOR

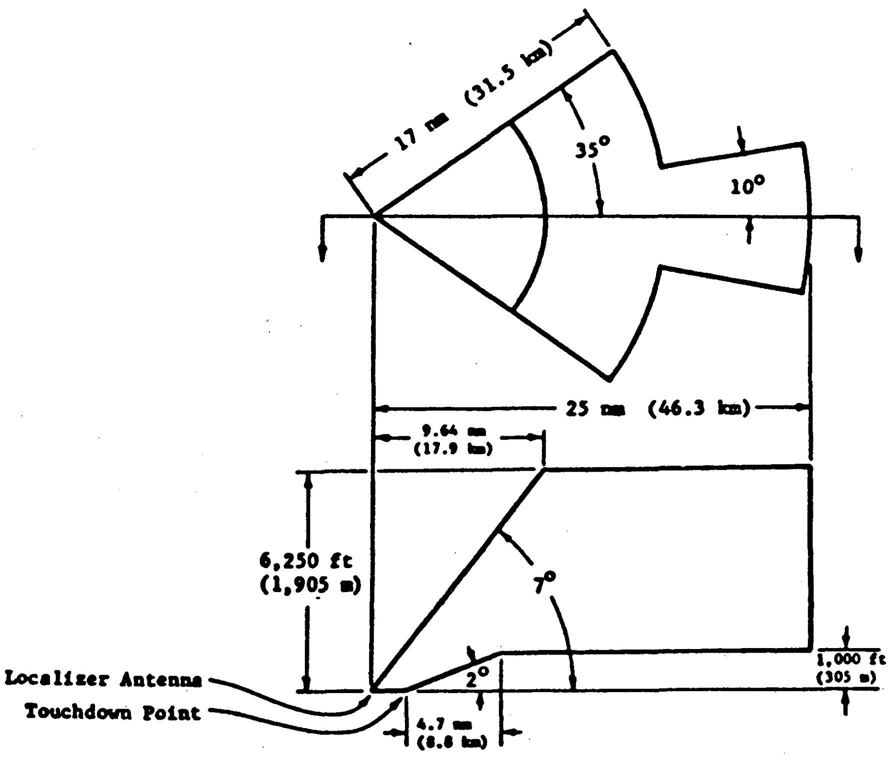

Figure 1 - ILS Localizer Protection Volume

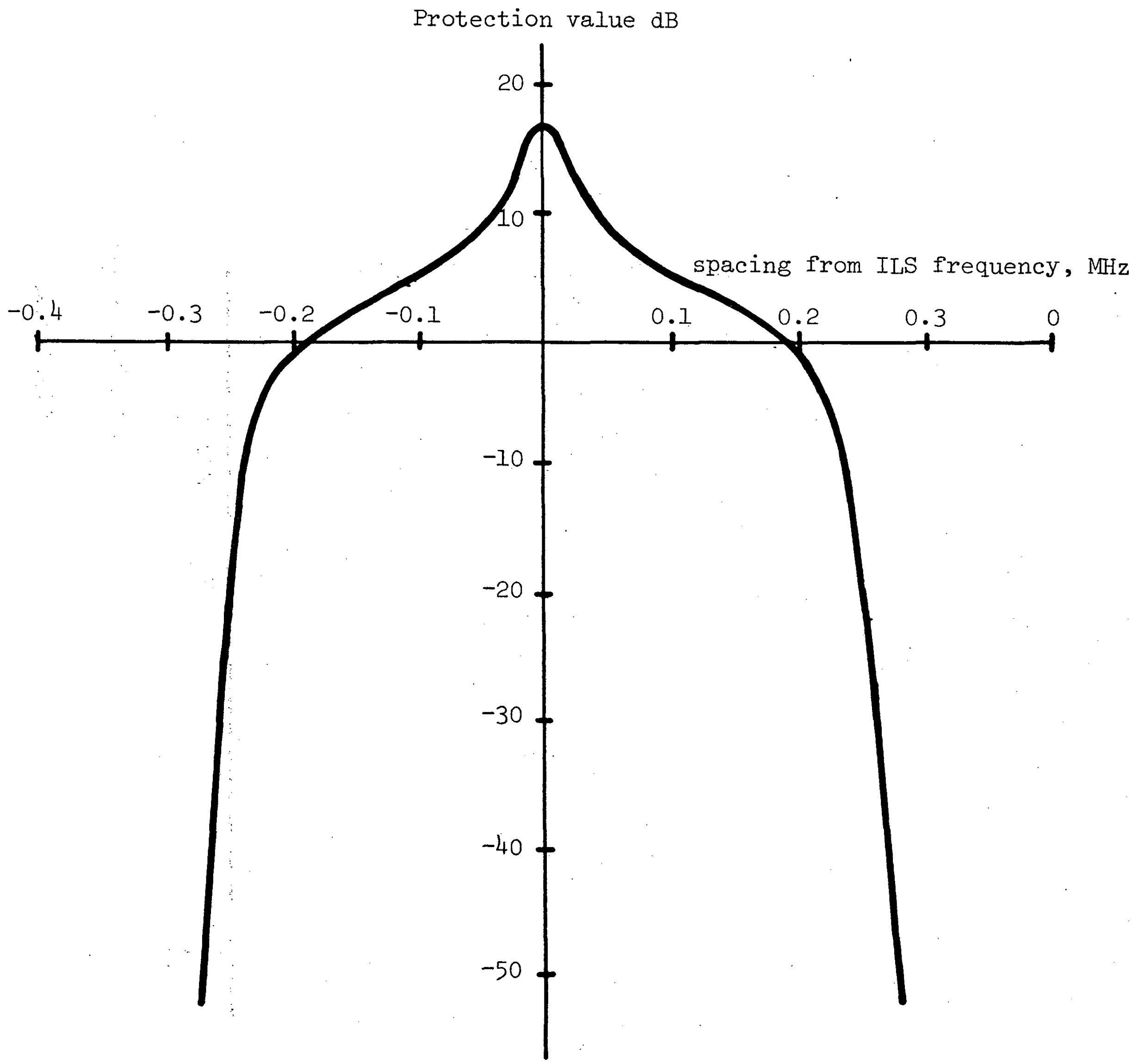

Figure 2 - Protection values for Type A i) interference mode

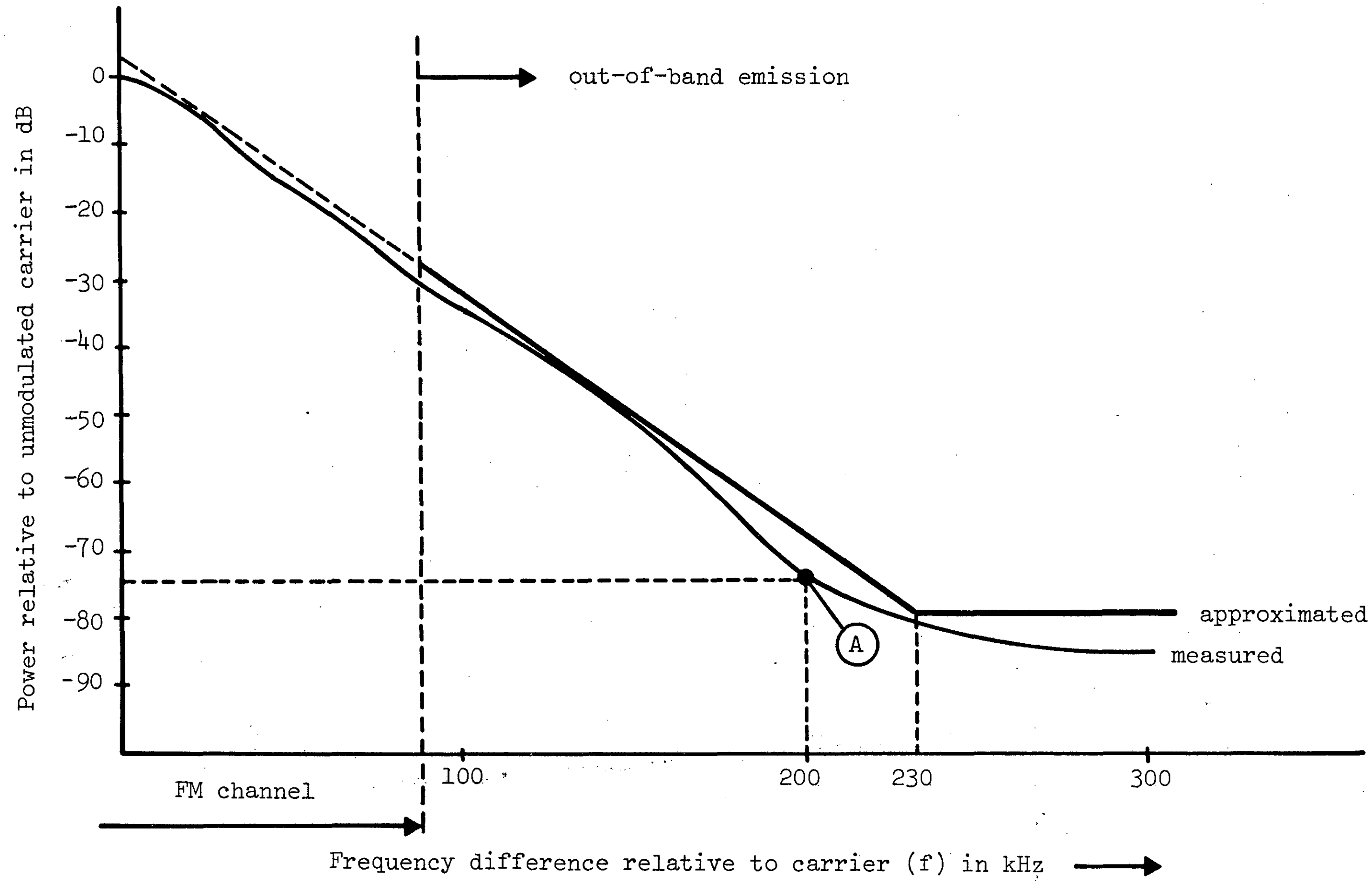

Figure 3 - Broadcast transmission characteristics (assumed)

WORKING GROUP 4B

PRACTICAL APPLICATION OF THE SIMPLIFIED MULTIPLICATION METHOD

This paper gives some additional explanation on the practical application of the simplified multiplication method by computer or with manual calculation.

1. Calculation by computer

The calculation of the usable field strength with the simplified multiplication method is based on the probability integral for a normal distribution :

$$L(x) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{x} e^{-\frac{t^2}{2}} dt$$

This integration however can be avoided in the practical calculation in replacing it by a polynomial approximation as follows :

$$L(x) = 1 - \tfrac{1}{2}(1 + a_1 x + a_2 x^2 + a_3 x^3 + a_4 x^4)^{-4} + \varepsilon(x)$$

with $a_1 = 0.196854$

$a_2 = 0.115194$

$a_3 = 0.000344$

$a_4 = 0.019527$

$\varepsilon(x)$ represents the error between the approximation and the exact value, received by the probability integral. Since $|\varepsilon(x)|$ is less than $2.5 \cdot 10^{-4}$ this error can be neglected.

The above approximation is used by several countries to calculate the multiple interference with the simplified multiplication method. As the experience in these countries has shown, the calculation time for both methods, the simplified multiplication method and the power addition method, is the same.

2. Manual calculation

In the following the basic material for the manual calculation of the usable field strength in applying the simplified multiplication method is given. (Extract from Document No. 14, pages 95 to 97; identical to Report 945 of CCIR, Geneva 1982, Volume X, pages 80 to 82.)

The manual calculation needs only additions, subtractions, multiplications, divisions and the reading of a value from Table I.

An example with five interfering transmitters is given in Table II.

Experience has shown that it is expedient to begin with a value for E_u, which is 6 dB larger than the largest of the E_{si} values. If the difference between 0.5*) and the result (product of the 5 values of $L(x_i)$ equals Δ, it is appropriate to modify the value of E_u by $\frac{\Delta}{0.05}$ to obtain a better approximation. The whole process can be repeated to receive better accuracy.

Table II shows, that even after the first step the difference to the precise value is in the order of 0.2 dB.

G.C. STEMP
Chairman of Working Group 4B

*) 0.5 represents the coverage probability for 50% of locations.

TABLE I – *Probability integral* $\varphi(x) = \frac{2}{\sqrt{2\pi}} \int_0^x [\exp(-t^2/2)]\, dt$

x	$\varphi(x)$	x	$\varphi(x)$	x	$\varphi(x)$	x	$\varphi(x)$
0.00	0.0000	0.60	0.4515	1.20	0.7699	1.80	0.9281
01	0.0080	61	0.4581	21	0.7737	81	0.9297
02	0.0160	62	0.4647	22	0.7775	82	0.9312
03	0.0239	63	0.4713	23	0.7813	83	0.9328
04	0.0319	64	0.4778	24	0.7850	84	0.9342
0.05	0.0399	0.65	0.4843	1.25	0.7887	1.85	0.9357
06	0.0478	66	0.4907	26	0.7923	86	0.9371
07	0.0558	67	0.4971	27	0.7959	87	0.9385
08	0.0638	68	0.5035	28	0.7995	88	0.9399
09	0.0717	69	0.5098	29	0.8029	89	0.9412
0.10	0.0797	0.70	0.5161	1.30	0.8064	1.90	0.9426
11	0.0876	71	0.5223	31	0.8098	91	0.9439
12	0.0955	72	0.5285	32	0.8132	92	0.9451
13	0.1034	73	0.5346	33	0.8165	93	0.9464
14	0.1113	74	0.5407	34	0.8198	94	0.9476
0.15	0.1192	0.75	0.5467	1.35	0.8230	1.95	0.9488
16	0.1271	76	0.5527	36	0.8262	96	0.9500
17	0.1350	77	0.5587	37	0.8293	97	0.9512
18	0.1428	78	0.5646	38	0.8324	98	0.9523
19	0.1507	79	0.5705	39	0.8355	99	0.9534
0.20	0.1585	0.80	0.5763	1.40	0.8385	2.00	0.9545
21	0.1663	81	0.5821	41	0.8415	05	0.9596
22	0.1741	82	0.5878	42	0.8444	10	0.9643
23	0.1819	83	0.5935	43	0.8473	15	0.9684
24	0.1897	84	0.5991	44	0.8501	20	0.9722
0.25	0.1974	0.85	0.6047	1.45	0.8529	2.25	0.9756
26	0.2041	86	0.6102	46	0.8557	30	0.9786
27	0.2128	87	0.6157	47	0.8584	35	0.9812
28	0.2205	88	0.6211	48	0.8611	40	0.9836
29	0.2282	89	0.6265	49	0.8638	45	0.9857
0.30	0.2358	0.90	0.6319	1.50	0.8664	2.50	0.9876
31	0.2434	91	0.6372	51	0.8690	55	0.9892
32	0.2510	92	0.6424	52	0.8715	60	0.9907
33	0.2586	93	0.6476	53	0.8740	65	0.9920
34	0.2661	94	0.6528	54	0.8764	70	0.9931
0.35	0.2737	0.95	0.6579	1.55	0.8789	2.75	0.9940
36	0.2812	96	0.6629	56	0.8812	80	0.9949
37	0.2886	97	0.6680	57	0.8836	85	0.9956
38	0.2961	98	0.6729	58	0.8859	90	0.9963
39	0.3035	99	0.6778	59	0.8882	95	0.9968
0.40	0.3108	1.00	0.6827	1.60	0.8904	3.00	0.99730
41	0.3182	01	0.6875	61	0.8926	10	0.99806
42	0.3255	02	0.6923	62	0.8948	20	0.99863
43	0.3328	03	0.6970	63	0.8969	30	0.99903
44	0.3401	04	0.7017	64	0.8990	40	0.99933
0.45	0.3473	1.05	0.7063	1.65	0.9011	3.50	0.99953
46	0.3545	06	0.7109	66	0.9031	60	0.99968
47	0.3616	07	0.7154	67	0.9051	70	0.99978
48	0.3688	08	0.7199	68	0.9070	80	0.99986
49	0.3759	09	0.7243	69	0.9090	90	0.99990
0.50	0.3829	1.10	0.7287	1.70	0.9109	4.00	0.99994
51	0.3899	11	0.7330	71	0.9127		
52	0.3969	12	0.7373	72	0.9146	4.417	$1-10^{-5}$
53	0.4039	13	0.7415	73	0.9164		
54	0.4108	14	0.7457	74	0.9181	4.892	$1-10^{-6}$
0.55	0.4177	1.15	0.7499	1.75	0.9199	5.327	$1-10^{-7}$
56	0.4245	16	0.7540	76	0.9216		
57	0.4313	17	0.7580	77	0.9233		
58	0.4381	18	0.7620	78	0.9249		
59	0.4448	19	0.7660	79	0.9265		
0.60	0.4515	1.20	0.7699	1.80	0.9281		

TABLE II

1. Approximation E_u = 78 dB					σ_n = 8.3 dB
i	E_{si} (dB)	$z_i = E_u - E_{si}$ (dB)	$x_i = \frac{z_i}{\sigma_n \sqrt{2}}$	$\varphi(x_i)$ (from Table 1)	$L(x_i) = \frac{\varphi(x_i)}{2} + \frac{1}{2}$
1	64	14	1.19	0.7660	0.8830
2	72	6	0.51	0.3899	0.6950
3	60	18	1.53	0.8740	0.9370
4	50	28	2.39	0.9831	0.9916
5	45	33	2.81	0.9950	0.9975
					$\prod_{i=1}^{5} L(x_i) = 0.5688$
					$\frac{\Delta}{0.05} = \frac{0.5-0.5688}{0.05} = -1.38$ dB
2. Approximation E_u = 76.62 dB					
1	64	12.62	1.08	0.7199	0.8600
2	72	4.62	0.39	0.3035	0.6518
3	60	16.62	1.42	0.8444	0.9222
4	50	26.62	2.26	0.9762	0.9881
5	45	31.62	2.69	0.9929	0.9965
					$\prod_{i=1}^{5} L(x_i) = 0.5090$
					$\frac{\Delta}{0.05} = \frac{0.5-0.5090}{0.05} = -0.18$ dB
3. Approximation E_u = 76.44 dB					
1	64	12.44	1.06	0.7109	0.8555
2	72	4.44	0.38	0.2961	0.6481
3	60	16.44	1.40	0.8385	0.9193
4	50	26.44	2.25	0.9756	0.9878
5	45	31.44	2.68	0.9927	0.9964
					$\prod_{i=1}^{5} L(x_i) = 0.5016$
					$\frac{\Delta}{0.05} = \frac{0.5-0.5016}{0.05} = -0.03$ dB

*The 4th approximation yields E_u = 76.44 − 0.03 = 76.41 dB.
This value can be considered as sufficiently exact.

Document No. DL/13-E
31 August 1982
Original : English

WORKING GROUP 5B

INSTRUCTIONS FOR FILLING OUT THE FORM

The instructions for filling out the form refer to boxes 01 to 16, box 21 and box 31. Box 00 is for the use of the IFRB and should be left blank. Provision has been made on the form for an administration to enter its reference number in the box entitled ADMIN SERIAL No.

Leading zeroes should be given when appropriate in boxes 04, 05, 06, 08, 10, 12, 14 and 16.

Box No.

00 IFRB SERIAL No.

For IFRB use only.

01 Administration

Indicate the country symbol designating the administration on whose behalf the requirement of the frequency assignment is being submitted. Use a symbol from Table No. 1 of the Preface to the International Frequency List.

02 Name of transmitting station

Give the name by which the station is (or will be) known.

Limit the number of letters and numerals to a total of 20.

Insert each letter or number in a separate space, starting from the first space on the left. In the case of compound names, one space should be left blank between each part of the name.

03 Country

Indicate, by symbol, the country or geographical area in which the station is (or will be) located. Use a symbol from Table No. 1 of the Preface to the International Frequency List.

04 Longitude and latitude of the antenna site

Give the geographical coordinates, in degrees and minutes of the site of the transmitting antenna; seconds should be rounded to the nearest minute. From the symbols E or W, N or S, indicate those which apply.

Box No.

05 Height of site above sea level (a.s.l.)

Indicate the height (in metres) above sea level of the site of the transmitting antenna.

06 Height of the antenna above ground level (a.g.l.)

Indicate the height (in metres) of the centre of the antenna above ground level.

07 Polarization

Indicate the polarization of radiation by using the following symbols :

H Horizontal

V Vertical

M Mixed

If different linear polarizations are used in different azimuthal directions, two requirement forms have to be completed.

08 Maximum effective radiated power (e.r.p.)

- Sub-box "total" :

  In the case of horizontal or vertical polarization indicate the maximum effective radiated power, in kW or W, as appropriate.

  In the case of mixed polarization this value is the sum of the horizontally and vertically polarized components.

- Sub-box "horizontal component (HC)"

  In the case of mixed polarization indicate the maximum effective radiated power of the horizontally polarized component, in kW or W, as appropriate.

- Sub-box "vertical component (VC)"

  In the case of mixed polarization indicate the maximum effective radiated power of the vertically polarized component, in kW or W, as appropriate.

09 Directivity of radiation

Indicate N in the case of omnidirectional radiation and D in the case of directional radiation.

Box No.

10 Maximum effective antenna height

Indicate the maximum value of effective height of the transmitting antenna, in metres, irrespective of angle in azimuth. This height is defined as the maximum height of the centre of the antenna over the average level of the ground between distances of 3 and 15 km from the transmitter. The minus sign should be indicated when the value of the effective antenna height arrived at in the above manner is negative.

11 System

Indicate the system of transmission by using the following symbols :

1 Monophonic (maximum frequency deviation ±75 kHz)

2 Monophonic (maximum frequency deviation ±50 kHz)

3 Stereophonic, polar modulation system (maximum frequency deviation ±50 kHz)

4 Stereophonic, pilot-tone system (maximum frequency deviation ±75 kHz)

5 Stereophonic, pilot-tone system (maximum frequency deviation ±50 kHz)

12 Radiation characteristics for a directive antenna

For each of the maxima of radiation, indicate :

- total effective radiated power, in kW or W, as appropriate;
- azimuth in degrees, clockwise from True North;
- the azimuths of the -3 dB-points anticlockwise and clockwise respectively from the azimuth of the maximum;
- effective antenna height in metres.

12a Sectors of restricted e.r.p.

When restriction of e.r.p. in certain sectors has been negotiated, indicate the maximum e.r.p. in these sectors in kW or W as appropriate.

12b Effective antenna heights in particular directions

Indicate, if requested, the directions concerned and the value of the effective antenna heights.

Box No.

13 Antenna pattern

Indicate by an X in the appropriate box when either :

- the information required in box 31 has been provided;

- the antenna radiation diagram, in the horizontal plane, has been furnished.

14 Desired frequency

Indicate, if appropriate, the frequency desired for assignment. If there is no preference for a specified frequency, boxes 14 and 15 should be left blank.

15 Station status

a) When the transmitting station has been coordinated with the same parameters as contained in the form of submission, indicate this by inserting the letter C in the sub-box headed "COORD".

b) When the transmitting station has been notified to the IFRB with the same parameters as contained in the form of submission, indicate this by inserting the letter N in sub-box headed "NOTIF".

21 Supplementary information

Indicate any additional, pertinent information, regarding this requirement which may be of use in planning. If necessary, attach additional sheet.

Furthermore, indicate another additional, pertinent information, regarding this requirement which may be of use in planning. If necessary, attach additional sheet.

31 Annex : Azimuthal variation of radiation in the horizontal plane and of effective antenna height

Indicate, for each azimuth shown :

- for a directive antenna, the attenuation with respect to the maximum effective radiated power (dB);

- effective antenna height in metres.

Administrations should endeavour to provide the information required in this box for existing antennas.

C. TERZANI
Chairman of Working Group 5B

REGIONAL ADMINISTRATIVE RADIO CONFERENCE FOR VHF SOUND BROADCASTING IN THE BAND 87.5 - 108 MHz

SECOND SESSION (31 OCTOBER - 12 DECEMBER 1984)

FORM FOR SUBMISSION OF A FREQUENCY ASSIGNMENT REQUIREMENT

(01) ADMINISTRATION | ADMIN SERIAL No. | (00) IFRB SERIAL No.

(02) NAME OF TRANSMITTING STATION

(03) COUNTRY

(04)

LONGITUDE			LATITUDE		
DEGREES	E/W	MIN.	DEGS.	N/S	MIN.

(05) HEIGHT OF SITE a.s.l. (m)

(06) HEIGHT OF ANTENNA a.g.l. (m)

(07) POLARIZ.

(08)

MAXIMUM EFFECTIVE RADIATED POWER (e.r.p.)					
TOTAL		HOR. COMP. (HC)		VERT. COMP. (VC)	
kW	W	kW	W	kW	W

(09) DIRECT.

(10) MAX. EFFECTIVE ANTENNA HEIGHT (metres)

(11) SYSTEM

(12)

RADIATION CHARACTERISTICS FOR A DIRECTIVE ANTENNA				
TOTAL e.r.p.		AZIMUTH	BEARINGS OF -3 dB-POINTS	EFFECTIVE ANTENNA HEIGHT
kW	W	DEGREES	DEGREES	+ METRES

(12a)

SECTORS OF RESTRICTED ERP		
SECTOR	TOTAL e.r.p.	
DEGREES	kW	W

(12b)

EFFECTIVE ANTENNA HEIGHTS IN PARTICULAR DIRECTIONS	
AZIMUTH	EFFECTIVE ANTENNA HEIGHT
DEGREES	METRES

(21) SUPPLEMENTARY INFORMATION

(13)

ANTENNA PATTERN	
BOX 31	DIAGRAM

(14) DESIRED FREQUENCY . MHz

(15)

STATION STATUS	
COORD.	NOTIF.

Document No. DL/14-E
1 September 1982
Original : Spanish

SUB-WORKING GROUP 5B-2

Working document

1. To enable it to complete its task and comply with the terms of reference laid down by Working Group 5B at its third meeting, namely, "to propose to Working Group 5B the schedule for the preparation and submission of requirements to the IFRB", Sub-Working Group 5B-2 must base itself on the following facts and assumptions.

2. Possible activities of administrations and the IFRB between the First and Second Sessions of the Regional Sound Broadcasting Conference

a) In a Conference Resolution, the IFRB, by circular-letter, invites the administrations concerned to notify their requirements within the time limits and on the forms approved by the Conference at its First Session.

b) In planning, and in checking and preparing their requirements, administrations observe the planning methods and principles approved by the Conference.

c) The IFRB prepares and finalizes the computer programs it considers necessary for performing the tasks entrusted to it by the Conference. These may include the following :

- C.1 Storage of requirements.
- C.2 Arrangement and classification of the inventory of requirements by frequency, sub-band and/or country.
- C.3 Publication of the complete inventory, or of parts of it, according to countries or sub-bands.
- C.4 Choice of suitable frequencies, in accordance with the planning methods and principles, in cases where the desired frequency is not entered on the request form.
- C.5 Calculations of interference and incompatibility and publication of the results.
- C.6 Compilation of statistics.

d) Administrations submit their requirements to the IFRB.

e) The IFRB executes the corresponding programs.

f) The IFRB sends in duplicate to administrations the results of its interference calculations, the basic inventory of requirements with appropriate observations and a statement of incompatible requirements. All this information will form a document to be submitted to the Second Session of the Conference.

g) Administrations study the information and prepare proposed modifications to their requirements for submission to the Second Session and, when they consider it necessary, undertake bilateral or multilateral coordination beforehand.

3. Possible schedule

Period		Activity
18 September 1982 - 31 December 1982 :	:	"a" (preparation and distribution of IFRB circular-letter)
18 September 1982 - 31 December 1983	:	"b" and "c"
1 July 1983 - 31 December 1983	:	"d"
1 January 1984 - 31 June 1984	:	"e"
1 July 1984 - 31 July 1984	:	"f"
1 August 1984 - 30 October 1984	:	"g"

E. MARTINEZ DE ARAGON
Chairman of Sub-Working Group 5B-2

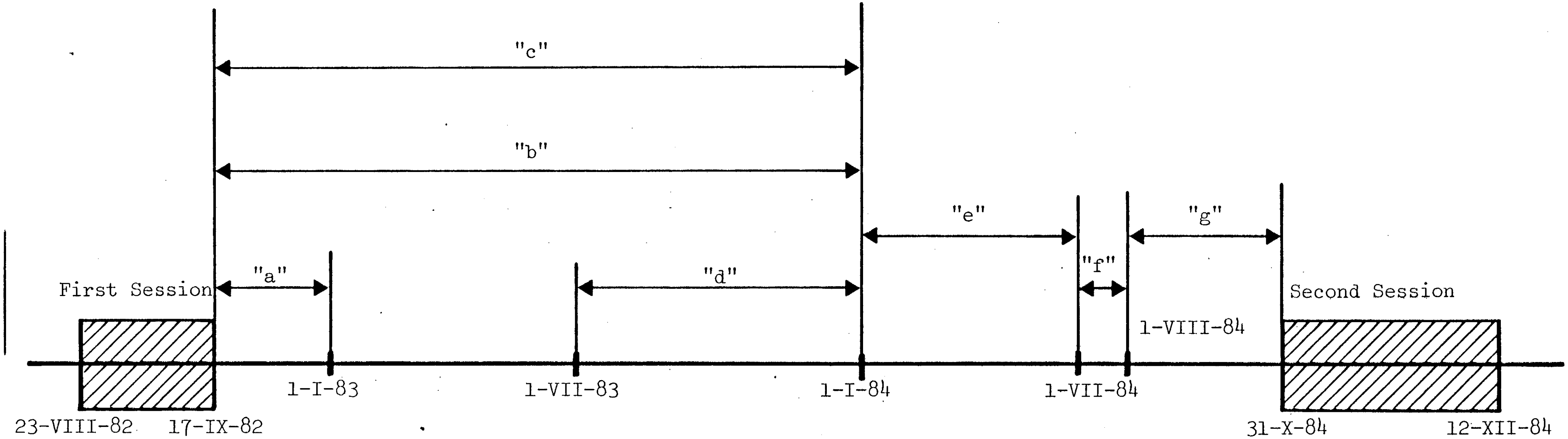

Figure 1 - Possible schedule
(See point 3)

Document No. DL/15-E
1 September 1982
Original : English

WORKING GROUP 5A

Planning principles

3. During the planning process all requirements should be processed in the same manner according to the technical evaluation procedure adopted by the Conference. In accordance with Resolution No. 510 of WARC 1979, the planning of the band 87.5 - 108 MHz in Region 1 and parts of Afghanistan and Iran which are contiguous to Region 1 should observe the following conditions :

- this new plan should in no way affect existing or planned assignments to television stations in the band 87.5 - 100 MHz made in accordance with the Regional Agreement, Stockholm, 1961;

- that this new plan in the band 87.5 - 100 MHz should not result in the deterioration of the service areas of those existing sound broadcasting stations operating in accordance with the Regional Agreement, Stockholm, 1961, which are situated in the coordination area with countries using this band for television in accordance with the Regional Agreement, Stockholm, 1961;

- radio equipment used by aircraft for automatic landing purposes, which operates in the adjacent band 108 - 112 MHz, may be subject to harmful interference from nearby broadcasting stations operating in the band 87.5 - 108 MHz if the frequencies of the respective stations are not selected with care and that such interference can put human life at risk.

4. Taking into account the modifications introduced in the planning criteria (such as the channel spacing and the degree of implementation of the Geneva 63 Plan), the systematic planning in Africa will cover the entire band 87.5 - 108 MHz. In this respect, it will be necessary to resolve the incompatibility problems on a basis of equality of rights among all the countries concerned in the Region.

5. In Europe, it would be desirable that administrations communicate their requirements by taking into account their existing stations which operate in accordance with the Radio Regulations and the Stockholm (1961) Agreement. During the Second Session, while all proposed assignments shall be open to discussion for bilateral or multilateral negotiations among the countries concerned, every appropriate effort shall be made to incorporate in the Plan :

a) those stations which currently operate in accordance with the Stockholm (1961) Plan;

b) planned modifications to this plan notified prior to [1 December 1983]; and

c) new requirements from administrations not signatories to the original plan notified prior to [1 December 1983].

T. BOE
Chairman of Working Group 5A

Document No. DL16/-E
1 September 1982
Original: English

WORKING GROUP 5 A

EQUIVALENT NATIONAL COVERAGE

The "equivalent national coverage" is the weighted sum of the coverage areas relative to 100% national coverage by means of a transmitter network operating at reference power level. Weighting will have to be done individually for every coverage area according to the power used.

T. BOE

Chairman of Working Group 5A

Document No. DL/17-E
31 August 1982
Original : English

SUB-WORKING GROUP 4C-1

Report by Drafting Group 4C-1A to Sub-Working Group 4C-1

COMPATIBILITY BETWEEN THE BROADCASTING SERVICE IN THE BAND 87.5 - 108 MHz AND THE AERONAUTICAL SERVICES IN THE BANDS 108 - 136 MHz

(Paragraphs 1 and 2 see Document No. 66.)

3. Protection of VOR

3.1 Protected volume and signal strength

i) The protected volume of VOR should be that volume promulgated in appropriate aeronautical documents as modified by radio horizon considerations at the lower flight levels.

ii) A minimum field strength of 90 microvolts per metre (39 db uV/m) as specified in ICAO Annex 10 over the volume above should be protected.

3.2 Protection criteria

Only a limited amount of bench test data is available to assess the protection criteria of VOR receivers from FM broadcast signals. Present information suggests that the behaviour of VOR receivers is not dissimilar to that for ILS for the three interference modes studied, as in many cases the two systems have common antennas and common circuitry up to and including the second detector.

Further study is necessary to confirm and refine the present data. In the meantime first order estimates of compatibility may be made by the application of the criteria for ILS, including the treatment of the case of inside area conflicts.

4. Protection of VHF communications

The following results have been derived from a limited series of bench testing on a few typical receivers, and including information from CCIR Report No. 929.

4.1 Protected volume and field strength

i) The protected volume for a VHF communication channel should be that volume promulgated in appropriate aeronautical documents as modified by radio horizon considerations at lower flight levels.

ii) The minimum specified signal strength is 75 uV/m (37 db uV/m) and this level should be protected throughout the service volume above. The protection criteria will, in most cases, ensure that inadvertent squelch operation will not take place.

W.T. YOUNG
Chairman of Drafting Group 4C-1A

Document No. DL/18-E
1 September 1982
Original : English

WORKING GROUP 4C

Note by the Chairman of Working Group 4C

7. Implications to the broadcasting service of the need to provide compatibility with the aeronautical service in the bands 108 to 118 MHz

7.1 General

In order to meet the protection criteria which are essential to protect the aeronautical service from the mechanisms of interference identified in section 1 (Document No. 66), there are four principle means by which the broadcasting service could contribute towards a practical solution to the compatibility problem. These are elaborated upon in sections 7.2 to 7.5. There is also the possibility that the general aeronautical requirements can be relaxed in specific cases. Further, in the longer term, improvements in the characteristics of airborne installations is desirable. These aspects are dealt with in section 8.

7.2 Limiting the broadcasting station power

For all modes of interference a reduction in interfering power can be achieved by reducing the broadcasting station power. However, since the broadcasting power is set by the coverage requirement such a reduction would directly reduce the coverage or the quality of reception within the same coverage area.

Some horizontal aerial directivity at the broadcasting station could enable a reduction in the power radiated towards the aeronautical service volume whilst resulting in a reduction in quality in only part of the broadcasting coverage area. However, this approach is only likely to contribute in marginal situations.

7.3 Set minimum separation distance between the broadcasting station transmitter site and the aeronautical service volume

This is the most effective way of gaining sufficient attenuation of the broadcasting signal to meet the aeronautical service protection criteria (see Table /_A_/).

In many instances there will be little or no choice in the location of the broadcasting transmitting station e.g. airports located near major cities. For economic reasons the use of existing broadcasting transmitting station sites for new services may also be essential. Thus, in many cases, distance is not a variable which can simply be set to suit the sharing criteria.

7.4 Improve filtering of broadcasting service transmitters

Spurious emissions from broadcasting transmitters must meet the requirements of the Radio Regulations i.e. Appendix 8. An important case is intermodulation interference generated at broadcasting station transmitter sites which can be reduced by fitting improved combining filters and paying careful engineering attention to all possible sources of non-linearity following the output stages of the transmitters. Through such measures it is technically feasible to reduce the level of third order

TABLE A

Minimum distances for principal modes of interference

a) Third-order products radiated by transmitter assuming -85 dB filtering

Transmitter erp (kW)	Distance (km) for: ILS	VOR
100	22	10
50	15.5	7
10	7.0	3.2
1	2.2	1
Protected field, dB(μV/m)	32	39
Protection ratio, dB	17	17

b) Intermodulation in receiver: equal field strengths
(applies to $2f_1 - f_2$ or $f_1 + f_2 - f_3$ for examples given)

Distance (km) for following cases:

MHz, f_1, f_2, f_3	108, 105, 102		100, 97, 94		94, 91, 88	
System	ILS	VOR	ILS	VOR	ILS	VOR
dB(μV/m)F/S permitted	100	102	108	110	114	116
erp 100 kW	22	18	9	7.0	4.5	3.5
50 kW	15.5	13	6.2	5.0	3.1	2.5
10 kW	7.0	5.6	2.8	2.2	1.4	1.1
1 kW	2.2	1.8	0.9	0.7	0.45	0.35

c) Desensitisation

Distance (km) for following cases (ILS or VOR):

Frequency, MHz	108	107	106	100
Permitted dBm at receiver	-20	-12.5	-5	-5
Permitted field strength, dB(μV/m)	101	109.5	118	124
erp 100 kW	20	7.4	2.8	1.4
50 kW	14	5.2	2.0	1.0
10 kW	6	2.2	0.9	0.45
1 kW	2	0.7	0.3	0.14

intermodulation interference generated at the broadcasting station transmitter site to /¯-85_/ dB relative to the carrier power. It is also technically feasible to fit improved filters on the output of transmitters to improve suppression of other spurious emissions to the order of /¯-90_/ dB. These values should be regarded as the limit of feasibility and, in view of the additional cost, only to be applied in those situations where problems of compatibility with the aeronautical service demand it.

7.5 Arrange broadcasting service frequency plan to minimize interference to the aeronautical service

There are two ways in which the placement of broadcasting assignments within the plan can add to or reduce the burden of sharing with the aeronautical service. The first is how far below 108 MHz the broadcasting assignment is placed. The second is the particular combination of carriers chosen. This latter factor is pertinent to the two interference mechanisms where the generation of intermodulation products is the cause of the interference.

7.5.1 Separation between the broadcasting service assignment and the aeronautical service assignment

The aeronautical service airborne receiving equipment has some rejection of out-of-band signals and may be assumed to provide 3 dB plus one dB for each MHz down from 108 MHz. This rejection characteristic may be applied to all the type B modes of interference. In addition, the side band interference reduces the further away a broadcasting assignment is placed below 108 MHz.

7.5.2 Relationship between two or more broadcasting carriers in the same coverage area

By programming the mathematical relationship for the intermodulation frequencies into a computer is is possible to predict frequencies on which the most significant of these interference carriers (i.e. third order products) will fall. This would apply to products radiated from the transmitter site or produced in the aeronautical receiver. Thus, in theory, it is feasible to choose the assignments at a particular multi-channel broadcasting station transmitter site or combination of nearby sites such that all the intermodulation interference carriers do not coincide with any assignments of nearby aeronautical service systems. However, this implies that spurious emissions from the broadcasting service will fall in the unused portions of the aeronautical band in that specific location. From a purely broadcasting view-point unless this is possible, it would impose severe constraints on broadcasting assignments and hence militate against the efficient use of the spectrum between 87.5 - 108 MHz.

7.5.3 Practical limitations in arranging the broadcasting service frequency plan to minimize interference to the aeronautical service

On the broadcasting side, the task of arranging a compatible set of assignments within the broadcasting service will be a very difficult task. Imposing constraints in order to meet the aeronautical service protection requirements will add to the complexity of the task and the time needed to make a plan. Indeed it would be a quite formidable task for information on all ILS and VOR systems to be submitted to the Conference and be taken comprehensively into account in the planning process. On the aeronautical service side there would naturally be a preference to preserve the efficiency of use of their spectrum i.e. for the protection criteria to be applied across the whole band rather than the actual assignment which may exist at present. In particular, if levels of harmful interference resulting from implementing a broadcasting plan fall in the 108 to 118 MHz band between the existing aeronautical channels in use it will inhibit the possibility of replanning the aeronautical band and of being able to provide new assignments to meet future growth.

From the foregoing, it can be seen that it is highly desirable to limit to the absolute minimum the number of ILS and VOR systems which the Regional Broadcasting Conference will need to take into account in planning.

8. Factors within the aeronautical service which may facilitate compatibility

There are no general measures in the immediate future within the aeronautical service which would ease the compatibility problem, although in the longer term it is in the interest of both services for the out-of-band rejection of aeronautical service airborne receivers to be significantly improved. Meanwhile, in each individual situation, factors may exist which could provide an easement of the situation. These factors include :

a) terrain effects e.g. shielding,

b) higher signal levels in particular parts of the service volume,

c) typical operational heights in use,

d) acceptable constraints on a part of the aeronautical band which is not in use and need not be protected to the full criteria in a particular individual location,

e) change of aeronautical service assignment in a specific location. (This is unlikely to be possible in some countries due to the tight constraints within the aeronautical band.)

f) vertical radiation pattern of the broadcasting station in the direction of the aeronautical service volume.

Where such easements do appear feasible, an acceptable assurance of aircraft safety may require ground and perhaps airborne measurements of signal levels under appropriate conditions. For all such situations a case by case examination by an administration or administrations is necessary. Consideration also needs to be given by administrations to the problem of blocking and desensitization of airborne receivers when aircraft fly close to broadcasting transmitting station sites. Within a limited volume around such a site it is impossible to meet the necessary protection criteria. One solution for the communications case might be for such zones to be published and for aircraft to avoid them or at least be made aware of the interference situation within such zones. However, again case by case treatment by administrations, taking the operational situation fully into account, is the only way to determine whether this approach is consistent with the very important air safety considerations.

9. Recommendations

9.1 Prior to the Second Session of the Regional Broadcasting Conference, administrations should calculate and draw on a suitable map an interference contour around each proposed VHF broadcasting station site according to the values set down in Table [B].

TABLE B

Coordination zone around a broadcasting station

e.r.p. kW	100	50	10	1
Distance km	125	125	125	40

Where this contour cuts an ILS or VOR service volume as published in the air navigation plan communication tables published by ICAO a detailed compatibility analysis shall be undertaken. In many cases, this may be achieved through existing national coordination machinery but, in some cases, the joint analysis will need to take place between administrations of neighbouring countries. Where the interference contours from two or more broadcasting stations cut the same aeronautical service volume then they will need to be treated together for the mode of interference arising from intermodulation generated in the aeronautical receiver itself.

9.2 The first stage in the analysis should be to determine whether, for each mode of interference set out in section 1 and by applying the measures set out in sections 7.2, 7.3 and 7.4, a compatibility exists between the two services. For example by applying the values set out in 7.4 the coordination zone reduces to the values set down in Table /_C_/.

TABLE C

Coordination zone with maximum filtering at the broadcasting station

e.r.p. kw	100	50	10	1
distance km	22	15.5	7.0	2.2

Where such compatibility exists, planning of the broadcast frequency assignments can proceed without constraints imposed by the need to protect the aeronautical services.

9.3 For the remaining cases, a more detailed case by case study should be undertaken applying the factors set out in section 8. By this means, it may be possible to further eliminate problem cases.

9.4 For each individual case still without a solution, the administrations should determine, taking account of future expansion of the aeronautical service, whether protection in the service volume is required over a limited number of channels or for the entire band 108 - 118 MHz. In the first case the administration should then calculate whether the particular measures set out in section 7.5 could provide a solution.

9.5 Where compatibility is clearly only feasible through broadcasting frequency planning solutions, the administration, when submitting its requirements, shall indicate in a supplementary note to the IFRB what particular frequency planning constraints are needed in order to ensure compatibility with the aeronautical service for each individual case. These supplementary constraints shall be deemed as requirements and satisfied in planning during the Conference to the extent that it is feasible.

9.6 If, after following the procedures set out in 9.1 to 9.5 above, a solution is still not arrived at then the only other possible way a solution may be found is to choose another site for the broadcasting station. It is conceivable in some situations that this may not be feasible in which case such a broadcasting station assignment will be non-implementable.

9.7 Part 2 of the Regional Broadcasting Conference, when establishing the regulatory procedures whereby the broadcasting plan can be subsequently modified, will need to include steps to ensure that the necessary degree of protection is afforded to the aeronautical service in the 108 to 118 MHz band.

9.8 The attention of ICAO should be drawn to the pressing need to promote a programme of up-grading the out-of-band rejection characteristics of airborne receivers, in particular, rejection of signals in the broadcasting service bands below 108 MHz.

10. Conclusion

A difficult and complex problem arises in attempting to plan the introduction of the broadcasting service, which in general employs high radiated power, in a band immediately adjacent in the radio frequency spectrum to a band used by a service which uses much lower powers and features sensitive receiving systems for important safety of life functions. The problem is exacerbated by the fact that, in order to meet the coverage requirements, the locations of broadcasting transmitting stations are often near and in some cases within the service volume of the aeronautical service systems. The full severity of the problem will not become clear until administrations have undertaken the case by case studies that have been recommended in section 9. At this stage it may be tentatively concluded that full exploitation of the new spectrum made available by WARC 1979 to the broadcasting service may be constrained in some areas by the need to provide the essential protection to the aeronautical safety of life services.

F.R. NEUBAUER
Chairman of Working Group 4C

Document No. DL/19-E
31 August 1982
Original : English

SUB-WORKING GROUP 4C-1

Report by Drafting Group 4C-1A

COMPATIBILITY BETWEEN THE BROADCASTING SERVICE IN THE BAND 87.5 - 108 MHz AND THE AERONAUTICAL SERVICES IN THE BANDS 108 - 136 MHz

(Paragraphs 1 and 2 see in Document No. 66.)

(Paragraphs 3 and 4.1 see in Document No. DL/17.)

4.2 Protection criteria

4.2.1 Type A (i)

For this interference mode a protection ratio of 17 dB at carrier coincidence has been derived from available test data. No data is available on the relaxation for frequency offset.

4.2.2 Type A (ii)

Due to the separation of 10 MHz between the lowest assignable VHF communications channel and the broadcasting band edge of 108 MHz no account need be taken of this effect.

4.2.3 Type B

(As in Documents Nos. DL/10 and DL/11.)

5. Conversion factors between signal levels of avionics receiver input and corresponding field strength values

(As in Document No. DL/10.)

6. Propagation law

Free space propagation may be assumed for most planning purposes concerning the effect on the aeronautical service.

Attached Note

Coordination

A number of coordination issues have been identified in the study of protection criteria. These relate to the need for coordination within national administration at both planning and implementation stages, and particularly in difficult conflict situations where further refinement of the compatibility problem based on local features is necessary to establish a more accurate conflict model. An international dimension also exists in respect of those situations where aeronautical services of one country require compatibility assessment with the broadcasting stations of another.

Attention is drawn to this important aspect which can have implications on plan preparation and on the later implementation of the agreed ITU plan. Further discussion within the appropriate components of this Conference appears necessary to derive an agreed basis, or procedure, for dealing with this aspect.

Improvements in aeronautical receivers

Interference to airborne equipment from Type "A" mechanisms cannot be reduced by improvements in aeronautical receivers.

Interference effects due to Type "B" mechanisms may be reduced by improvement in the airborne antenna and receiver design particularly in respect of front end rejection characteristics. Factors such as overall cost of replacement, the performance environment within the aircraft and implementation time scale must be taken into account in any improvement programme. Extended time scales for a sufficient re-equipment to assure new parameters in planning is likely because of economic and operational factors.

CCIR Report 929 discusses current equipment and expected improvements (paragraph 4.2.2) and future system characteristics (paragraph 4.2.3).

Both the broadcasting and the aeronautical authorities should make efforts to improve their equipment performance. It is clear however that this could take considerable time.

National and international organizations concerned with avionics equipment should cooperate in promoting a programme to improve the out of band rejection characteristics of airborne receivers below 108 MHz with a view to the earliest practicable implementation.

W.T. YOUNG
Chairman of Drafting Group 4C-1A

Document No. DL/20-E
2 September 1982
Original : English

WORKING GROUP 4C

Note by the Chairman of Sub-Working Group 4C-1 to the Chairman of Working Group 4C

Coordination

A number of coordination issues have been identified in the study of protection criteria. These relate to the need for coordination within national administration at both planning and implementation stages, and particularly in difficult conflict situations where further refinement of the compatibility problem based on local features is necessary to establish a more accurate conflict model. An international dimension also exists in respect of those situations where aeronautical services of one country require compatibility assessment with the broadcasting stations of another.

Attention is drawn to this important aspect which can have implications on plan preparation and on the later implementation of the agreed ITU broadcasting plan. Further discussion within the appropriate components of this Conference appears necessary to derive an agreed basis, or procedure, for dealing with this aspect.

Improvements in equipment

Interference to airborne equipment from Type "A" mechanisms cannot practically be reduced by improvements in aeronautical receivers. No benefit can therefore be assumed in planning.

Interference effects due to Type "B" mechanisms may be reduced by improvement in the airborne antenna and receiver design particularly in respect of front end rejection characteristics. Factors such as overall cost of replacement, the performance environment within the aircraft and implementation time scale must be taken into account in any improvement programme. Extended time scales for a sufficient re-equipment to assure new parameters in planning is likely because of economic and operational factors.

CCIR Report 929 (see Conference Document No. 14) discusses current equipment and expected improvements (paragraph 4.2.2) and future system characteristics (paragraph 4.2.3), and studies are continuing within the CCIR on this subject.

The broadcasting authorities should make efforts to reduce the level of spurious emissions in the band 108 - 137 MHz (particularly third-order intermodulation products) from broadcasting transmitters. A level significantly lower than that required in Appendix 8 of the Radio Regulations would considerably reduce the problem of interference.

Aeronautical authorities should make efforts to improve the out-of-band rejection characteristics of airborne receiving equipment in the band 87.5 - 108 MHz. National and international organizations concerned with avionics equipment should cooperate in promoting a programme to achieve this with a view to the earliest practical implementation. It is clear however that this could take considerable time.

L. BERGMAN
Chairman of Sub-Working Group 4C-1

Document No. DL/21-E
3 September 1982
Original : English

WORKING GROUP 4C

Report of the Chairman of Drafting Group 4C-4
to the Chairman of Working Group 4C

DRAFT RECOMMENDATION /‾A_7

Relating to the immunity to interference of airborne receiving equipment used by the aeronautical radionavigation service operating in the frequency bands between 108 - 118 MHz from the FM broadcasting service operating in the frequency band 87.5 - 108 MHz.

The Regional Broadcasting Conference, (Region 1), First Session, Geneva 1982,

considering

a) Resolution No. 510, Recommendations Nos. 66 and 704 of the WARC-79 and provisions of No. 311 in Article 5 of the Radio Regulations;

b) that /‾for initial planning purposes_7 this Conference has established some criteria for the protection of the aeronautical services but these would appear to constrain in some areas in Region 1 the full exploitation of the frequency band 100 - 108 MHz;

c) that in other ITU Regions the potential interference danger due to the lack of adequate immunity standard for the aeronautical services has been reported;

d) the operating and other constraints on the aeronautical services,

recommends that the CCIR

1. studies as a matter of urgency :

1.1 whilst still retaining existing airborne receiving equipment, by how much can the value of immunity to FM sound broadcasting interference of that equipment be improved over those values established at this Conference;

1.2 by replacing existing airborne equipment by new better performance airborne equipment, by how much the value of immunity to FM sound broadcasting interference of that equipment can be improved over those values established at this Conference;

2. finalizes these studies before [January 1983],

invites

1. the Secretary-General of the ITU to bring this Recommendation to the attention of ICAO;

2. administrations to participate actively in these studies.

R. WITZEN
Chairman of Drafting Group 4C-4

Document No. DL/22-E
3 September 1982
Original : English

WORKING GROUP 4C

Report of the Chairman of Drafting Group 4C-4
to the Chairman of Working Group 4C

DRAFT RECOMMENDATION [B]

Relating to the level of spurious emissions of FM broadcasting stations (operating in the frequency band 87.5 - 108 MHz) falling in the frequency bands allocated to the Aeronautical Radionavigation Service and the Aeronautical Mobile (R) Service between 108 - 137 MHz

The Regional Broadcasting Conference, First Session, Geneva, 1982,

considering

a) Resolution No. 510, Recommendation No. 66, Recommendation No. 704 of the WARC 1979 and provisions No. 301 of Article 5 of the Radio Regulations;

b) that provisions in the Radio Regulations (Appendix 8) will give considerable compatibility problems between the FM broadcasting service (87.5 - 108 MHz) and the aeronautical radionavigation service and the aeronautical mobile (R) service (108 - 137 MHz);

[c) that no measures can be taken by the Aeronautical Services involved (which are safety-of-life-services) to reduce these compatibility problems;]

d) that this Conference has established for [initial planning purposes] some criteria for the protection of the aeronautical services involved but these would appear to constrain in some areas in Region 1 full exploitation of the frequency band 100 - 108 MHz by the broadcasting service,

recommends that the CCIR

- carries out studies in order to determine the maximum suppression of spurious emissions, particularly intermodulation products, from the broadcasting transmitting stations into the aeronautical frequency bands between 108 - 137 MHz which can be maintained continuously in all operational conditions of the broadcasting service;

- finalizes these studies before January 1983, invites

1. the Secretary-General of the ITU to bring this Recommendation to the attention of ICAO;

2. administrations in Region 1 to participate actively in these studies and to provide CCIR with expert guidance on this matter.

R. WITZEN
Chairman of Drafting Group 4C-4

Document No. DL/23-E
6 September 1982
Original : English

WORKING GROUP 5B

TENTATIVE DETAILED PROGRAMME 31.1.84 TO OPENING SECOND SESSION

31.1.84 — Date limit receipt of requirements by IFRB from administrations

Data capture validation + correction

Preparation microfiche + printing dispatch

30.4.84 — Date limit dispatch to administrations
- microfiche total List of Requirements and antenna characteristics
- printout of administrations' own requirements

Verification by admins. & notification of material corrections

30.6.84 — Date limit receipt by IFRB of material corrections to List of Requirements and antenna characteristics

Data capture corrections

31.7.84 — Start of calculations by IFRB

Calculations by IFRB and
Preparation mailing results of calculations

31.8.84 — Date limit mailing to administrations results of calculations

31.

Document No. DL/24-E
8 September 1982
Original : French

AD HOC GROUP 5/4

Station status

(point 15 of Document No. 69(Rev.2))

15. Coordination prior to the submission of requirements

When the assignment has been coordinated with an administration, with a view to submission, on the basis of the characteristics contained in the form, insert the country symbol in the "COORD" box. When coordination concerns more than 5 countries, insert the letter x in the 5th sub-box and continue the list of countries in box 21.

Information relating to notification in the Master International Frequency Register and to conformity with the ST61 Agreement will be provided by the IFRB when the list of requirements is published.

C O O R D

M. DERRAGUI
Chairman of ad hoc Group 5/4