第5章　送信所置局計画

第5章　送信所置局計画

この章は，第4章において述べた送信設備を整備するため新たに開設する必要のある送信所について検討する。

5－1　中波，短波放送設備のための置局

ラジオ放送サービスの拡充のため次の送信設備の新，増設を計画しているが，いづれも既設放送所の構内に整備するので，新しく置局する局はない。

(1) 中波放送機未設置局12局に逐次放送機を新設するが，これらの局にはすでに短波放送設備が設備されており，土地，建物，受電設備等の基本的な施設が整っている。

中波放送施設をこの構内に建設する場合には発射する電波が相互に妨害することがないように留意する必要はあるが，運用上の都合がよいこと，既設STL回線が利用できることなどの利点があるので原則として同一場所に設置することとする。

敷地を拡張する必要がある局については建設時に詳細を検討することとして本計画には局舎の増築のみを考慮した。

(2) 短波放送機の増力，老朽取替が計画されている局（Table 2－4－2）において，これらの整備作業を行なうが，いづれも既設局の構内において行うので特に置局する必要はない。

(3) 短波空中線の改修 ― 既設局構内で実施するので特に置局計画はない。

(4) RN－Ⅰ番組系統24時間放送のための中波予備機増設 ― 同上

(5) RN－Ⅱ番組系統の放送サービス開始のための中波予備機増設 ― 同上

5－2　海外向放送用短波大電力送信所の新設

ASEAN諸国向け海外放送サービスをはじめ，北東および南東アジア，南太平洋，南北アメリカ，中東，ヨーロッパ，アフリカの諸国向けの海外放送を更に強化するため，大電力短波送信所を新設する。

出力500kW，250kW，100kWの短波送信機をそれぞれ2台設置すると想定して，次の立地条件を満足する置局場所を選定する。

a. 送信用高利得指向性アンテナを少なくとも6方向に架設するため2,000m× 2,000m（4,000,000m^2）の平坦な敷地を確保する。

b. 送信機室，電源室，空中線切替機室，制御室，保守作業室，試験室などの送信設備関連室を収容する10,000㎡（100m×100m）および一般管理事務室，職員社宅などの建物群を収容する敷地を上記送信所構内の適当な場所に確保する。

c. 500kW，250kW，100kWの短波送信機を運転するに要する電源にはそれぞれ1,200kVA，800kVA，350kVAの容量を考えておかねばならないので，上記のごとく500kW，250kW，100kWの送信機各2台据付るとした場合，同時運転の組合せにより，3,500kVA～5,000kVAの受配電設備が必要になる。

これを商用電源で賄うことができない場合には連続運転仕様の1,200kVA，800kVA，350kVA級の自家発電設備が必要となる。

また，上記の他に送信機室の冷却，送，排風機，照明など， station keepingのための電源設備を上記の他に考える。

d. ジャカルタから送信所までの番組伝送用に7kHz帯域の高規格回線5回線と業務連絡用回線少なくとも2回線が必要である。

5－3 FM送信設備のための置局

FM送信設備は原則として既設テレビ放送所構内に設備することで取進めることとして，送信機室，電源室の拡張を行なうほかは，新規に置局する計画はない。

5－4 TV送信設備のための置局

(1) 第4章において述べたごとく，年間10局のベースで本計画期間中に50局の中継局を建設する計画であるが，個々の局について最適の送信地点，送信出力，送信方向を決定するための調査を計画的に実施する。

送信機の出力は太陽電池を電源に使用することを前提として100W程度を標準とする。

(2) 各中継局にはパラパ番組伝送回線を経由して番組を分配することになるので，各局にはTVRO（受信専用）地球局を設置する。

(3) 送信アンテナの指向特性は送信点から見たサービス対象地区の広がりと送信点と対象地区との相対的な位置など勘案して決定するが，標準的送信アンテナとして八木アンテナを使用する。

(4) TV中継局の送信地点は下記の理由により事情の許すかぎりサービスすべき対象都市に、

近いところに選ぶ。

a. 送信機出力が小さくても，指向性アンテナを使用することによりサービス対象地域に強い信号を分布させることができる。

b. 無人運転方式を採用するので運転要員が常駐しない。

c. 3か月程度の間隔で行なう定期保守，点検のためにアクセスすることが容易である。

d. 商用電源の利用が容易である。

e. サービス対象都市に居住しているテレビ受信機販売店の技術者に中継局の運転状況の監視を委託することができる。

(5) 敷地は400㎡程度とし，その構内に直径4.5mのパラボラ・アンテナ1基，プレハブ式送信局舎，電源局舎各一戸，送信鉄塔自立35m1基を配置する。

無人局であるので勤務者用住宅は設置しない。

(6) 新設TV中継局のサービス区域に含まれる潜在受信者数は合計2,977,000名と推定される。（Table 2－4－8参照）

この数字は全人口の僅か2%程度で現在の人口カバレージ63%が2%増えて65%となるにすぎないが，300万人が新しくテレビ放送の恩恵に欲することができるようになることの意義は極めて大きいといえる。

新設TV中継所の位置等をTable 2－5－1に示す。

Table 2-5-1-(1)

Construction Plan of Relay Stations for TVN-I Service

Planned Site	Location		Population	Programme Transmission		Ch.	Remarks
	Long.	Lat.		By	From		
D.I.Aceh							
Sinabang	96E22	2N28	30,000	TVRO		9	
Sabang	95E19	5N53	32,000	Off-air	B.Aceh	9	
Blangpidie	96E50	3N44	47,000	TVRO		10	
Blangkejeren	97E20	3N59	32,000	"		8	
Sumatra Utara							
Sidikarang*	98E18	2N45	60,000	TVRO		4	S.Jarunjung Fv: 43 dBf
Telukdalam	97E48	0N34	64,000	"		7	
Sumatra Barat							
Muaralabuh	101E04	1S30	61,000	TVRO		10	
Pariaman*	100E07	0S36	88,000	Off-air	G.Gompong	11	G.Gompong Fv: 45.8 dBf, P.Q:**3
Painan Selatan	100E47	1S47	59,000	TVRO		8	

Table 2-5-1-(2)

Riau							
Tembilahan	103E07	0S21	57,000	Off-air	Rengat	6	
P. Bintan	104E27	1S07	58,000	"	P.Batam		
Jambi							
Muarabungo*	102E07	1S29	46,000	TVRO		6	Any Channel Unreceivable
Sumatra Selatan							
Sekayu*	103E50	2S53	69,000	Off-air	Prabumulih	4	Purabumulih Fv: 57.4 dBf, PQ: 2
Lubuklinggau	102E52	3S17	33,000	"	T.Tinggi	6	T.Tinggi Fv: 49.1 dBf, PQ: 3$^-$
Benkulu							
Ipuh	101E29	3S17	20,000	TVRO		8	
Muko-Muko	101E07	2S34	20,000	"		4	
Lampung							
Padancermin*	105E09	5S36	201,000	TVRO		10	
Liwa	104E05	5S02	83,000	"		8	

Table 2-5-1-(3)

Jawa Barat							
Pandegelang Barat	105E57	6S24	110,000	TVRO		11	
Pameumpeuk	107E43	7S38	232,000	"		6	
Pandegerang Selatan*	106E16	6S34	110,000	"		4	Any Channel Unreceivable
Jawa Tengah							
Bumiayu	109E02	7S14	190,000	TVRO		11	
Majenang*	108E45	7S18	210,000	"		7	Any Channel Unreceivable
Jawa Timur							
Tuban*	111E02	6S53	119,000	TVRO		6	Surabaya: Unmesurable, PQ: 2
Trenggalek*	111E42	8S03	113,000	"		8	G.Pandan: Unmesurable, PQ: 2

Table 2-5-1-(4)

Kalimantan Barat							
Singkawan	108E59	0N54	54,000	TVRO		6	
Bengkayang	109E28	0N49	54,000	"		11	
Kalimantan Tengah							
Sampit	112E58	2S32	42,000	Off-air	Palangkaraya	6	
Buntok	114E49	1S44	23,000	"	Palangkaraya	4	
Purukcau	114E34	0S37	16,000	TRVO		9	
Kualakurun	113E50	1S08	9,000	Off-air	Palangkaraya	6	
Kualapembuang	112E33	3S23		TVRO		4	
Sulawesi Utara							
Pinolosian	124E07	0N23	48,000	TVRO		10	
P.Beo	126E48	4N14	43,000	"		5	
Sulawesi Tengah							
Ampana	121E35	0S52	28,000	TVRO		4	

Table 2-5-1-(5)

Sulawasi Tenggara							
Kolaka Utara	121E17	3S53	31,000	TVRO		8	
Boepinang	121E35	4S47	48,000	"		7	
Sulawesi Selatan							
Majene	118E59	3S32	52,000	TVRO		8	
Bulukumba	120E12	5S34	90,000	"		6	
Mamuju	118E53	2S41	33,000	"		4	
Nusa Tenggara Timur							
Kalabahi	124E31	8S13	21,000	TVRO		6	
Bajawa	120E58	8S47	35,000	"		9	
Waikabubak	119E25	9S38	35,000	"		5	
Maluku							
Saumlaki	131E19	7S59	22,000	TVRO		6	
Tobelo	128E00	1N43	70,000	"		5	
Sanana	125E59	2S03	11,000	"		7	

Table 2-5-1-(6)

Irian Jaya							
Sarmi	138E45	1S52	18,000	TVRO		9	
Teminabuan	132E01	1S27	20,000	"		8	
Kaimana	133E46	3S40	9,000	"		9	
Timor Timur							
Ermere	125E24	8S45	21,000	TVRO		10	

Longitude and latitude point out the location of city or town.

Programme transmission system should be decided after precise survey.

* Measured point at the second field survey

** Picture Quality

第6章　周波数割当計画

第６章　周波数割当計画

６－１　中波放送

新たに周波数割当を行なう必要があるのは中波未設置局に新たに中波送信設備整備する１２の地方局のみである。

(1)　このうちの７局については使用周波数および最大送信電力をすでにTable ２－６－１のとおりＩＦＲＢに登録ずみであるので，この承認された割当周波数の範囲内で下表のとおり決定した。

ブキティンギ	1,512kHz	10kW
パランカラヤ	1,197kHz	5kW
クパン	1,107kHz	5kW
ソロン	909kHz	10kW
ファク・ファク	774kHz	10kW
テルナテ	891kHz	10kW
ディリ	711kHz	2kW

(2)　ＩＦＲＢ未登録５局の周波数，電力については次の方法で選択し，速やかに登録手続を進めると共にこの決定に従って建設を進める。

a.　周波数についてはインドネシア政府がＩＦＲＢに登録し既に割当を受け運用中の既設局の周波数のなかから，同一周波数妨害あるいは隣接周波数妨害が生ずるおそれのない周波数を選ぶ。

b.　選定に当っては次のＣＣＩＲの技術基準を適用して妨害のないことを確かめる。

- 最小必要電界強度…………… 70dB／μv／m
- 計算に使用する電波伝播曲線は

  地表波…………… ＣＣＩＲ　REC. 368−2

  空間波…………… カイロ南北伝播曲線
- 混信保護比はＣＣＩＲ　REC. 449−2により

  同一周波数…………… 30dB

  隣接周波数…………… 4dB

この技術基準に基づき混信妨害を発生しないための必要局間距離を相互の送信電力毎にTable ２－６－３，Table ２－６－４のごとく算出し，この必要最小局間距離より以上

に離れた位置にある既設局の周波数を使用した。その結果の確認はTable 2－6－5，6のとおりである。

ただし，フィリピンの放送局のなかにも同一周波数の局があり，しかもインドネシアの局との局間距離が必要間距離に達しない例があるが，フィリピンの放送局もIFRBに登録されているので，例外扱いとし，実際に妨害が発生した場合にはIFRBに手続きをとり解決することとする。

6－2　短波放送

短波放送については既述のごとく中波放送設備の拡充に伴って逐次廃止する方向で検討しており，本5か年計画においては海外向短波送信所の新設を除き国内向けに新しく短波送信所を開設することは考えない。ただし，既設の短波送信所の送信空中線を改善し，短波放送の受信改善を図る。

海外向短波放送用の周波数として現在使用されている波は11,790kHzと15,150kHzの2波のみであるので，さらに9，17，21MHz帯の波を追加する。

また，1979年にWARC会議において13MHz帯が追加されるので将来使用が可能となる見込みである。

これらの周波数割当については1984年および1986年WACの結果に基づき再割当のための短波放送用周波数を選択し，IFRBに登録する。

6－3　FM放送

(1)　FM放送局はジャカルタの既設局以外はすべて新設局となるので，これらの局に対する周波数の割当を以下の要領によって行なう。

a. 各FM放送局には将来の放送番組系統の増加を考えて1局につき3波ずつ割当てる。

b. 既設ラジオ放送所がSTL用に使用しているFM放送用周波数帯の電波は将来UHF帯あるいはSHF帯に移すこととなっているが，当分の間この波を継続使用するとしても，混信妨害のないように周波数を割当てる。

c. 隣国，特にシンガポール，マレーシアの既設あるいは計画中継のFM局およびTV局の放送電波と相互に混信妨害を生じないよう，それらの周辺に置局するFM放送局の周波数割当には特別の考慮を払った。（Table 2－6－10参照）

(2) ＦＭ放送用周波数割当計画に使用した技術基準は次のとおりである。

a. 局間周波数間隔　　　２００kHz

b. 原則としてインドネシアに割当てられているＦＭ放送用周波数帯内の全チャンネル１０１波のうちの下半分チャンネル１～４９を使用し，上半分は将来計画のために保留した。

c. 同一地域内の複数局に対しては８００kHzの間隔で割当てる。ただし第３波の割当には３波間の混信を避けるため１MHzとする。

d. 異った地域にある２局による地域的な混信を避けるために必要な周波数間隔をTable ２－６－７のとおり設定する。

e. 同一周波数の局間距離は少なくともTable ２－６－８に示す距離よりも大きくとる。

f. これらの基準に基づき，建設予定のＦＭ放送局に対してTable ２－６－９に示す周波数を割当てた。

注：インドネシアにおいては，局間周波数間隔を３００kHzとしているが，FM送信機に出力フィルターを付加することによりＣＣＩＲの技術基準２００kHzを採用することができる。

６－４　ＴＶ放送

インドネシアにおいては，一部の既設局にBand－Ⅰのチャンネルを割当てているが，本計画におけるＴＶ置局においてはBand－Ⅰ（ＣＨ－２および３）* の使用を避け，できるだけBand－Ⅲの８つのチャンネルを使用する。

注：Band－Ⅰは周波数が低いため異常伝播が発生しやすく遠距離の局に混信妨害を与えることがある。

現在，インドネシアにおいて同じチャンネルを共用しているテレビ局の数はTable ２－６－１１のごとく最大でも４３局であり，外国の実例から見てもチャンネル割当を工夫すれば１００局位までは問題なく共用できるので一部の地区を除き，なおBand－Ⅲのチャンネルを割当てることができる地域が多い。

(1) 新設ＴＶ局に対する周波数割当

本計画における新設テレビ局５０局に対してはTable ２－５－１のごとく，シンガポールの近傍のP. Bintan局を除き，すべての局にBand－Ⅲのチャンネルを割当てた。

この割当は第２次現地調査において実測した既設テレビ局の電波分布の状況から見て混信妨害の発生するおそれがないと判断されるものである。

上記の割当においては同一周波数局の混信保護比を45dBとして混信妨害の有無を予測したが，もし同一チャンネル混信妨害が発生した場合においても，オフセットキャリヤー方式を採用することにより，混信保護比の条件をTable 2－6－12のごとく緩和できるのである程度までは救済することができる。

(2) TVN－Ⅱ放送局に対する周波数割当

上記と同じ原則に従ってBand－Ⅲのチャンネルを TVN－Ⅱ放送局8局に割当てるとTable 2－6－13のとおりである。この表に注記してあるごとく，第2次現地調査の結果によればメダンのCH－11は，シマルジャルンジュンのCH－10と隣接チャンネル妨害，また，ジョグジャカルタのCH－4はゴンペルのCH－4と同一チャンネル妨害を発生するおそれのあることが予見される。

これらの問題をBand－Ⅲ内の周波数割当変更によって解決することができるか否かについては更に精密な現地調査を行なう必要がある。

MW Radio Stations Registered in IFRB (A)

1	2	4	6	7	12	13	14
540 (2)	Bandung	107E34 06S57	5	7.4	139	4	2200 - 1700
630 (12)	Ujung Pandang	119E28 05S09	100	22.1	234	4	2100 - 1600
693 (19)	Madiun	111E31 07S36	10	10.4	108	4	2200 - 1700
693 (19)	Palembang	104E45 02S59	50	17.4	110	3	2200 - 1700
693 (19)	Sorong	131E17 00S50	2	3.4	108	5	2000 - 1500
711 (21)	Atambua	121W49 19S12	2	3.0	50	7	2100 - 1600
720 (22)	Ambon	128E10 13S41	10	10.4	93	4	2000 - 1500
738 (24)	Jember	113E45 08S07	2	3.4	100	4	2200 - 1700
747 (25)	Bengkulu	102E20 03S46	10	10.4	100	4	2200 - 1700
756 (26)	Purwokerto	109E12 07S26	10	10.4	99	4	2200 - 1700
765 (27)	Banjarmasin	114E33 03S22	5	7.4	100	4	2100 - 1600
774 (28)	Bandung	107E34 06S57	10	10.4	97	4	2200 - 1700
774 (28)	Fak-Fak	132E17 12S55	10	10.4	97	5	2000 - 1500
783 (29)	Tj. Karang	105E18 05S22	5	7.4	96	5	2200 - 1700
801 (31)	Semarang	110E29 06S58	10	10.4	94	5	2200 - 1700
810 (32)	Merauke	140E22 08S30	5	7.6	104	6	2000 - 1500
819 (33)	Medan	98W39 03N35	10	10.4	66	5	2200 - 1700
819 (33)	Merauke	140E22 08S30	5	7.4	92	6	2000 - 1500
828 (34)	Jayapura	140E39 02S37	5	7.4	90	6	2000 - 1500
837 (35)	Atambua	124E49 09S12	2	3.4	90	7	2100 - 1600
855 (37)	Medan	96E39 03N35	100	22.1	163	5	2200 - 1400
864 (38)	Cirebon	108E43 06S45	2	3.4	87	5	2200 - 1700
873 (39)	Fak-Fak	132E17 02S55	5	7.4	84	5	2000 - 1500
873 (39)	Surakarta	110E50 07S32	2	3.4	75	5	2200 - 1700
891 (41)	Malang	112E45 07S59	10	10.4	84	4	2200 - 1700
891 (41)	Ternate	127E23 00N48	10	10.4	84	6	2000 - 1500
900 (42)	Samarinda	117E09 00S30	25	16.1	150	4	2100 - 1600
900 (42)	Jakarta	106E45 06S23	10	10.4	83	5	2200 - 1700
909 (43)	Sorong	131E17 00S50	10	10.4	82	5	2000 - 1500
918 (44)	Surabaya	112E45 07S14	10	10.4	82	4	2200 - 1700
927 (45)	Pekanbaru	101E30 00N33	50	19.1	162	4	2200 - 1700
954 (48)	Kendari	122E36 03S57	10	10.4	78	5	2100 - 1600
963 (49)	Biak	121E40 01S11	2	3.4	78	5	2000 - 1500
963 (49)	Jember	113E45 08S07	10	10.4	78	4	2200 - 1700
972 (50)	Yogyakarta	110E24 07S48	20	13.4	77	5	2200 - 1700
981 (51)	Endeh	121E40 08S51	5	7.4	76	5	2100 - 1600
999 (53)	Jakarta	106E53 06S14	300	26.9	150	5	2200 - 1700

1008 (54)	Madiun	111E31 07S36	10	10.6	84	4	2200 - 1700
1017 (55)	Kupang	123E38 10S13	2	3.4	74	7	2100 - 1600
1035 (57)	Palu	119E52 00S54	10	10.4	73	6	2100 - 1600
1035 (57)	Tj. Karang	105E18 05S22	5	7.4	73	6	2200 - 1700
1044 (58)	Ambon	128E10 13S41	10	10.4	72	4	2000 - 1500
1044 (58)	Sibolga	98E48 01S42	10	10.4	71	5	2200 - 1700
1053 (59)	Jayapura	140E39 02S37	10	10.4	71	6	2000 - 1500
1080 (62)	Singaraja	115E04 08S06	10	10.4	70	5	2100 - 1600
1089 (63)	Endeh	121E40 08S51	2	3.4	69	5	2100 - 1600
1089 (63)	Cirebon	108E34 06S45	10	10.4	69	5	2200 - 1700
1098 (64)	Jambi	103E39 01S36	10	10.4	68	3	2200 - 1700
1098 (64)	Sumenep	113E51 07S01	10	10.6	105	6	2200 - 1600
1107 (65)	Yogyakarta	110E24 07S48	10	10.4	68	5	2200 - 1700
1107 (65)	Kupang	123E38 10S13	5	7.4	67	7	2100 - 1600
1116 (66)	Biak	136E04 01S11	10	10.6	100	5	2000 - 1500
1116 (66)	Pekanbaru	101E30 00N33	10	10.4	68	4	2200 - 1700
1125 (67)	Palu	119E53 00S54	5	7.4	64	6	2100 - 1600
1134 (68)	Banjarmasin	114E33 03S22	50	19.1	132	4	2100 - 1600
1161 (/1)	Kendari	122E36 03S57	5	7.4	64	5	2100 - 1600
1170 (72)	Semarang	110E29 06S58	50	17.4	64	5	2200 - 1700
1170 (72)	Ternate	127E23 00N48	2	3.4	64	6	2000 - 1500
1179 (73)	Padang	100E25 01S00	10	10.4	64	5	2200 - 1700
1197 (75)	Palangkaraya	113E11 02S02	5	7.4	63	6	2100 - 1600
1206 (76)	Denpasar	115E14 08S40	10	10.4	62	5	2100 - 1600
1215 (77)	Jakarta	106E45 06S23	10	10.4	61	5	2200 - 1700
1233 (79)	Pontianak	109E16 00S05	50	17.6	70	5	2100 - 1600
1242 (80)	Bogor	106E47 06S36	10	10.4	60	5	2200 - 1700
1251 (81)	B. Aceh	95E20 05N30	10	10.4	61	5	2200 - 1700
1251 (81)	Mataram	116E08 08S36	10	10.4	60	4	2100 - 1600
1269 (83)	Pontianak	109E16 00S05	10	10.4	60	5	2100 - 1600
1287 (85)	Palembang	104E45 02S59	50	17.0	159	3	2200 - 1700
1305 (87)	Manado	124E55 01N32	10	10.4	65	5	2100 - 1600
1305 (87)	Palangkaraya	113E11 02S02	5	7.4	57	6	2100 - 1600
1323 (89)	Malang	112E45 07S59	2	3.4	57	4	2200 - 1700
1332 (90)	Jakarta	106E45 06S23	10	10.4	56	5	2200 - 1700
1341 (91)	Tj. Pinang	104E28 00N55	5	7.4	56	5	2200 - 1700
1359 (93)	Ujung Pandang	119E28 05S09	10	10.4	55	4	2100 - 1600
1377 (95)	Sumenep	113E51 07S01	2	3.4	55	6	2200 - 1700

1404 (98)	Jakarta	106E53 06S14	10	10.4	54	5	2200 - 1700
1413 (99)	Pangkalpinang	106E09 02S05	5	7.4	53	5	2200 - 1700
1422 (100)	Singaraja	115E04 08S06	10	10.4	53	5	2200 - 1700
1449 (103)	Bengkulu	103E20 03S46	5	7.4	52	4	2200 - 1700
1449 (103)	Samarinda	117E09 00S30	10	10.6	60	4	2100 - 1600
1467 (105)	Tj. Pinang	104E28 00N55	10	10.4	52	6	2200 - 1700
1476 (106)	Surakarta	110E50 07S32	50	19.1	100	5	2200 - 1700
1503 (109)	Jambi	103E39 01S36	10	10.6	58	3	2200 - 1700
1512 (110)	Bkt. Tinggi	100E20 00S17	10	10.4	33	5	2200 - 1700
1530 (112)	Padang	100E25 01S00	5	7.4	51	3	2200 - 1700

Column 1: Assigned channel frequency (kHz)
Channel number; this number is shown in brackets.

Column 2: Name of transmitting station.

Column 4: Geographical coordinates of the transmitting station in degrees and minutes.

Column 6: Carrier power (kW)

Column 7: Maximum radiation in dB relative of a c.m.f. of 300V or an e.m.r.p. of 1kW, determined from the nominal power of the transmitter and the theoretical gain of the antenna without allowing for miscellaneous losses.

Column 12: Height of antenna (metres) for a simple vertical antenna only.

Column 13: Ground conductivity in millisiemens/metre (mS/m)

Column 14: Hours of operation (GMT) in hours and minutes, e.g., 0730-1800, 0000-2400, 0500-0230.

Note:

This table is listed only registered stations in Indonesia. Therefore, some of the columns are negrected as follows:

Column 3: Symbol designating the country or the geographical are in which the station is located. In case of Indonesia, it shows "INS".

Column 5: Necessary Bandwidth (kHz);the value in kHz is preceded by the Symbol A, B, C or D indicating the adjacent channel protection ratio that is to be employed in calculating the usable field strength. All of the stations in this table are shown as "A18".

Column 8: Azimuth of maximum radiation in degrees (clockwise) from True North.

Column 9: Azimuths defining the sector of limited radiation in degrees (clockwise) from True North.

Column 10: Maximum agreed radiation in the sector , in dB relative to a c.m.f. of 300V or an d.m.r.p. of 1kW determined from the nominal power of the transmitter and the theoretical gain of the antenna without allowing for miscellaneous losses.

As the antennas for all of the MW stations in Indonesia are non-directional type, no designation is shown in the Column 8, 9 and 10.

Column 11: Type of antenna. The symbol A indicates a simple vertical base-fed antenna and the symbol B any other type of antenna. All of the stations in this table are shown as "A".

Table 2-6-2-(1)

MW Radio Stations Registered in IFRB (B)

Site Name	Location		Freq.	Pwr.	Freq.	Pwr.	Freq.	Pwr.
	Long.	Alt.	(kHz)	(kW)	(kHz)	(kW)	(kHz)	(kW)
Medan	98E39	3N35	855	100	819	10		
B. Aceh	95E20	5N35	1251	10				
Bkt. Tinggi	100E20	0S17	1512	10				
Pekanbaru	101E30	0N33	927	50	1116	50		
Jambi	103E39	1S36	1098	10	1503	10		
Padang	100E25	1S00	1179	10	1530	5		
Bengkulu	102E20	3S46	747	10	1449	5		
Tj. Karang	105E18	5S22	783	5	1035	5		
Sibolga	98E48	1S42	1044	10				
Tj. Pinang	104E28	0N55	1467	10	1341	5		
Pangkalpinang	106E09	2S05	1413	5				
Yogyakarta	110E24	7S48	972	20	1107	10		
Bandung	107E34	6S57	774	10				
Semarang	110E29	6S58	1170	50	801	10		
Surakarta	110E50	7S32	1476	50	873	2		
Surabaya	112E45	7S14	585	100	918	10		
Denpasar	115E14	8S40	1206	10				
Mataram	116E08	8S36	1251	10	855	5		
Bogor	106E47	6S36	1242	10				
Cirebon	108E34	6S45	1089	10	864	2		
Purwokerto	109E12	7S26	756	10				
Madiun	111E31	7S36	693	10	1008	10		
Jember	113E45	8S07	963	10	738	2		
Malang	112E45	7S59	891	10	1323	2		
Sumenep	113E51	7S01	1098	10	1377	2		
Singaraja	115E04	8S36	1080	10	1422	10		

Banjarmasin	114E33	3S22	1134	50	765	5		
Pontianak	109E16	0S05	1233	50	1269	10		
Palangkaraya	113E11	2S02	1197	5	1305	5		
Samarinda	117E09	0S30	900	25	1449	10		
Ujung Pandang	119E28	5S09	630	100	1359	10		
Manado	124E55	1N32	1305	10				
Kendari	122E36	3S57	954	10	1161	5		
Palu	119E52	0S54	1035	10	1125	5		
Kupang	123E38	10S13	1107	5	1017	2		
Atambua	124E49	9S12	711	2	837	2		
Gorontalo*	123E04	0N32						
Endeh	121E40	8S51	981	5	1089	2		
Jayapura	140E39	2S37	1053	10	828	5		
Sorong	131E17	0S50	909	10	693	2		
Biak	136E04	1S11	1116	10	963	2		
Merauke	140E22	8S30	810	5	819	5		
Ambon	128E10	3S47	720	10	1044	10		
Fak-Fak	132E17	2S55	774	10	873	5		
Manokwari*	134E04	0S57						
Nabire*	135E30	3S22						
Serui*	136E15	1S53						
Wamena*								
Ternate	127E23	0N48	891	10	1170	2		
Jakarta	106E45	6S23	999	300	900	10	1215	10
"	"	"	1332	10	1404	10		

* Not yet registered

(Longitude and latitude point out the location of city or town.)

Table 2-6-3

Minimum Separation Distance Between Stations (Co-channel Interfernce)

Own Station \ Interfering Station	FREQ (kHz)	300 kW	100 kW	50 kW	20 kW	10 kW	5 kW	2 kW	1 kW
1 kW	700	4050	3150	2650	2250	1650	1550	1350	1050
	1000	4035	3135	2635	2235	1635	1535	1335	1035
	1500	4025	3125	2625	2225	1625	1525	1325	1025
2 kW	700	4060	3160	2660	2260	1660	1560	1360	
	1000	4045	3145	2645	2245	1645	1545	1345	
	1500	4030	3130	2630	2230	1630	1530	1330	
5 kW	700	4075	3175	2675	2275	1675	1575		
	1000	4055	3155	2655	2255	1655	1555		
	1500	4035	3135	2635	2235	1635	1535		
10 kW	700	4090	3190	2690	2290	1690			
	1000	4060	3160	2660	2260	1660			
	1500	4040	3140	2640	2240	1640			
20 kW	700	4110	3210	2710	2310				
	1000	4075	3175	2675	2275				
	1500	4050	3150	2650	2250				
50 kW	700	4150	3250	2750					
	1000	4090	3190	2690					
	1500	4060	3160	2660					
100 kW	700	4160	3260						
	1000	4100	3200						
	1500	4070	3170						
300 kW	700	4190							
	1000	4130							
	1500	4090							

Table 2-6-4

Minimum Separation Distance Between Stations (Adjacent Channel Interference)

Own Station \ Interfering station	FREQ (kHz)	300 kW	100 kW	50 kW	20 kW	10 kW	5 kW	2 kW	1 kW
1 kW	700	950	650	540	180	155	150	125	110
	1000	935	635	525	125	110	105	85	80
	1500	925	625	515	85	55	70	60	55
2 kW	700	960	660	550	190	165	160	135	
	1000	945	645	535	135	120	115	95	
	1500	930	630	520	90	60	75	65	
5 kW	700	975	675	565	205	180	175		
	1000	955	655	545	145	130	125		
	1500	935	635	525	95	85	80		
10 kW	700	990	690	580	220	195			
	1000	960	660	550	150	135			
	1500	940	640	530	100	90			
20 kW	700	1010	710	600	240				
	1000	975	675	565	165				
	1500	950	650	540	110				
50 kW	700	1050	750	640					
	1000	990	690	580					
	1500	960	660	550					
100 kW	700	1060	760						
	1000	1000	700						
	1500	970							
300 kW	700	1090							
	1000	1030							
	1500	990							

Table 2-6-5

Distance Between Planned and Existing MW Stations (Registered)

Planned Site			Co-channel				Adjacent channel			
Name	Freq. (kHz)	Pwr. (kW)	Station	Pwr. (kW)	Dist. (km)	Required Min.Dist. (km)	Station	Pwr. (kW)	Dist. (km)	Required Min.Dist. (km)
[illegible]	711	2	Davao (PHL)	5	1700	1560	Ambon	10	600	165
[illegible]	991	10	Malang	10	1860	1690	Jakarta	10	2370	195
			Dumaguete (PHL)	10	380	1690	Samarinda	25	1100	
[illegible]	774	10	Bandung	10	2770	1690	Tj. Karang	5	1970	180
			Marawi (PHL)	1	1620	1650	Banjarmasin	5	1900	180
[illegible]	909	10	Tawi Tawi (PHL)	5	1390	1675	Surabaya	10	2140	195
							Pekanbaru	50	3260	580
[illegible]	1107	5	Yogyakarta	10	1480	1655	Biak	10	1720	130
			Davao (PHL)	1	[illegible]	1535	Pekanbaru	10	2700	130
							Jambi	10	2400	130
							Sumenep	10	1100	130
[illegible]	1197	5	Kudat (PHL)	10	980	1655	Denpasar	10	[illegible]	130
			Davao (PHL)	5	1590	1555				
[illegible]	1512	10	Chiang Rai (THA)	10	2070	1640	Jambi	10	380	90

Table 2-6-6

Distance Between Planned and Existing MW Stations (Unregistered)

Planned Site			Co-channel				Adjacent channel			
Name	Freq. (kHz)	Pwr. (kW)	Station	Pwr. (kW)	Dist. (km)	Required Min.Dist. (km)	Station	Pwr. (kW)	Dist. (km)	Required Min.Dist. (km)
Manokwari	1098	10	Jambi	10	3350	1660	Yogyakarta	10	2750	135
			Sumenep	10	2400	1660	Kupang	5	1600	130
			Mandulu (PHL)	10	2200	1660	Endeh	2	1650	120
							Cirebon	10	2950	135
Nabire	1179	10	Padang	10	4000	1660				
			Tadan (PHL)	10	1700	1660				
Serui	1269	5	Pontianak	10	3050	1655				
			Kidapawan (PHL)	5	1560	1555				
Wamena	1341	5	Tj. Pinang	5	3900	1555	Jakarta	10	3550	125
			Roxas (PHL)	1	2400	1535				
Gorontalo	1503	5	Jambi	10	2030	1635	Bkt. Tinggi	10	2550	85
			Cebu (PHL)	1	1060	1535				

Table 2-6-7

Minimum Frequency Separation between Two Transmitting Stations

		V										IV											III				II												I											
		Serui	Wamena	Nabire	Fak-fak	Manokwari	Merauke	Biak	Sorong	Bkt Gresir	Gn Palemak	Kintamani	Gorontalo	Segantena	Bkt Bakung	Ternate	Oben	Dilly	Kendari	Palu	Manado	Ujung Pandang	Balik papan	Palang Karaya	Pontianak	Banjarmasin	Gn Brengik	Bogor	Depok	Cirebon	Wungrejo	Gn Pandan	Gn Gending	Gn Gebug	Gn Negrak	Gombel	Surabaya	Yogyakarta	Sibolga	P.Batam	Jambi	Bengkulu	Gn Betung	Pekanbaru	Palembang	Pandai Sikat	Gn Gompong	Banda Aceh	Bandarbaru	Jakarta
I	Jakarta																											4		1					2				1				2							4
	Bandarbaru																																																4	
	Banda Aceh																																															4		
	Gn Gompong																																													3	4			
	Pandai Sikat																																											1		4				
	Palembang																																							1	1		1		4					
	Pekanbaru																																											4						
	Gn Betung																																										4							
	Bengkulu																																									4								
	Jambi																																							2	4									
	P Batam																																							4										
	Sibolga																																						4											
II	Yogyakarta																																			2		4												
	Surabaya											1																									4													
	Gombel																																			4														
	Gn Negrak																											3							4															
	Gn Gebug																										3					2		4																
	Gn Gending											2			2																		4																	
	Gn Pandan																										2					4																		
	Wungrejo																														4																			
	Cirebon																											2	2	4																				
	Depok																											1	4																					
	Bogor																											4																						
	Gn Brengik											2			1										1		4																							
III	Banjarmasin																							1	2	4																								
	Pontianak																							1	4																									
	Palangkaraya																							4																										
	Balikpapan																						4																											
IV	Ujung Pandang																					4																												
	Manado																				4																													
	Palu																			4																														
	Kendari																		4																															
	Dilly																	4																																
	Oben																4																																	
	Ternate															4																																		
	Bkt Bakung													2	4																																			
	Segantena											2		4																																				
	Gorontalo												4																																					
	Kintamani											4																																						
V	Gn Palemak										4																																							
	Bkt Gresir									4																																								
	Sorong				1				4																																									
	Biak	2				1		4																																										
	Merauke						4																																											
	Manokwari	1				4																																												
	Fak-fak			1	4																																													
	Nabire			4																																														
	Wamena		4																																															
	Serui	4																																																

NOTE : FIGURE SHOWS THE GRADE OF FREQUENCY SEPARATION

1: 200 kHz
2: 400 kHz
3: 600 kHz
4: 800 kHz

Table 2-6-8

Minimum Separation Distance (km) between Co-channel FM Stations

Own Station / Interfering Stati	10 kW	5 kW	1 kW	0.5 kW	0.3 kW	0.1 kW
10 kW	345					
5 kW	325	320				
1 kW	280	275	260			
0.5 kW	265	260	235	235		
0.3 kW	250	245	220	220	215	
0.1 kW	230	225	225	200	195	190

Note . 1 H = 300 m, K = $4/3$

2 PROTECTION 54 dB

(CCIR REC 412 - 2)

Table 2-6-9-(1)

Frequency Allocation Plan for FM Transmitting Station

No.	RRI Station	TVRI Tx Station	Pwr. (kW)	f - 1 Ch	f - 1 Freq. (MHz)	f - 2 Ch	f - 2 Freq. (MHz)	f - 3 Ch	f - 3 Freq. (MHz)
1	Jakarta		10						
2	Medan	Bandarbaru	5	1	87.9	5	88.7	10	89.7
3	Banda Aceh		0.5	1	87.9	5	88.7	10	89.7
4	Pekanbaru		5	3	88.3	7	89.1	12	90.1
5	Padang	G.Gompong	3	1	87.9	5	88.7	10	89.7
6	Jambi		5	2	88.1	6	88.9	11	89.9
7	Palembang		5	1	87.9	5	88.7	10	89.7
8	Benkulu		0.5	1	87.9	5	88.7	10	89.7
9	Tj.Karang	G.Betung	0.5	3	88.3	7	89.1	12	90.1
10	Sibolga		0.5	2	88.1	6	88.9	11	89.9
11	Bkt.Tinggi	Pandaisikat	3	40	95.7	44	96.5	49	97.5
12	Tj.Pinang	P.Batam	0.5	4	88.5	8	89.3	17	91.1
13	Yogyakarta		5	1	87.9	5	88.7	10	89.7
14	Bogor	*	0.1	23	92.3	52	98.1	92	106.1
15	Bandung	G. Nagrak**	3	3	88.3	7	89.1	12	90.1
16	Cirebon		0.3	40	95.7	44	96.5	49	97.5
17	Semarang	Gombel	3	3	88.3	7	89.1	12	90.1
18	Madiun	G. Pandan	3	38	95.3	42	96.1	47	97.1
19	Malang	G.Gebug	0.3	40	95.7	44	96.5	49	97.5
20	Surakarta	Wungrejo	0.5	40	95.7	44	96.5	49	97.5
21	Surabaya		5	1	87.9	5	88.7	10	89.7
22	Purwokerto	Depok	3	2	88.1	6	88.9	11	89.9

Table 2-6-9-(2)

23	Jember	G.Gending	0.5	3	88.3	7	89.1	12	90.1
24	Sumenep	G.Brengik	0.5	37	95.1	41	95.9	46	96.9
25	Denpasar	Bkt.Bakung	3	5	88.7	9	89.5	14	90.5
26	Singaraja	Kintamani	0.5	35	94.7	39	95.5	44	96.5
27	Mataram	Seganteng	0.5	7	89.1	11	89.9	16	90.9
28	Banjarmasin		5	1	87.9	5	88.7	10	89.7
29	Pontianak		5	1	87.9	5	88.7	10	89.7
30	Palangkaraya		5	40	95.7	44	96.5	49	97.5
31	Samarinda		0.5	38	95.3	42	96.1	47	96.9
32	Palikpapan		0.5	40	95.7	44	96.5	49	97.5
33	Ujung Pandang		0.5	1	87.9	5	88.7	10	89.7
34	Palu		0.5	1	87.9	5	88.7	10	89.7
35	Kendari		0.5	1	87.9	5	88.7	10	89.7
36	Gorontalo		0.3	1	87.9	5	88.7	10	89.7
37	Manado	Makaweimben	3	1	87.9	5	88.7	10	89.7
38	Kupang	Oben	5	1	87.9	5	88.7	10	89.7
39	Dili		0.1	1	87.9	5	88.7	10	89.7
40	Jayapura	G.Polemak	0.5	5	88.7	9	89.7	14	90.5
41	Ambon	Bkt.Gresir	3	1	87.9	5	88.7	10	89.7
42	Ternate		0.5	1	87.9	5	88.7	10	89.7
43	Sorong		0.1	1	87.9	5	88.7	10	89.7
44	Fak-Fak		0.1	2	88.1	6	88.9	11	89.9
45	Manokwari		0.3	2	88.1	6	88.9	11	89.9
46	Biak		0.3	1	87.9	5	88.7	10	89.7
47	Serui		0.1	3	88.3	7	89.1	12	90.1
48	Nabire		0.3	3	88.3	7	89.1	12	90.1

49	Wamena		0.1	1	87.9	5	88.7	10	89.7
50	Merauke		0.3	1	87.9	5	88.7	10	89.7

Station name of TVRI is omitted where RRI station is in the same city.

* No suitable TV transmittint station is around Bogor, FM transmitter shall be installed in RRI Bogor station.

** Especially for Bandung station, precise survey shold be taken.

Table 2-6-10

Frequency Allocation for FM Transmitter Station in Indonesia

(in consideration of frequency allocation plan in the neighbouring country)

Planned Station			Nearest Foreign Station			Distance (Approx) (Km)	Remarks
Name	Kw	Freq. (MHz)	Name (Malaysia)	Kw	Freq. (MHz)		
Pontianak	5	87.9 88.7 89.7	Kuching	1	88.1 88.9 89.9 90.7 91.9 92.7	230	a.Min.freq.separation 200KHz b.Required Distance (In case of Co-cannel)
Pekanbaru	5	88.3 89.1 90.1	MT.Ophir	0.5	93.7 94.9 95.7 96.7 97.5 100.5	250	a. 3.6MHz b. 260Km
Medan (Bandarbaru)	5	87.9 88.7 89.7	G.Jerai	1	96.7 97.5 98.7 99.5 100.5 101.3	360	a. 7.0MHz b. 325Km

1. No Interference can be foreseen by the reason described above. (Remarks)
2. Co-channel relation will not appear in this 5-year plan period.

Table 2-6-11

Present Condition of
TV Channel Utilization

Channel NO.	NUMBER OF TV STATION					
	TRANSMITTER POWER OUTPUT					sub total
	10kw	5kW	1kW	0.5-1kW	less than 0.5kW	
2	-	-	-	-	1	1
3	-	-	2	-	5	7
4	1	1	10	2	29	43
5	3	3	5	-	13	24
6	1	3	7	1	19	31
7	2	3	6	2	21	34
8	3	2	3	-	10	18
9	3	2	6	-	18	29
10	-	-	4	-	2	6
11	1	1	2	-	-	4
sub-total	14	15	45	5	118	197

Table 2-6-12

Protection Ratio Against Co-channel

Tropospheric Interference

CONDITION		PROTECTION RATIO
1.	a) Carrier frequencies separated by less than 1,000 Hz. b) carrier frequency is not synchronized.	45 dB
2.	Nominal carrier frequencies separated by 1/3, 2/3, 4/3 or 5/3 of the live frequencies and with non-precision offset.	30 dB
3.	Carrier frequencies separated by 1/2 or 3/2 of the live frequency and with non-precision offset.	27 dB
4.	Precision offset	22 dB

CCIR Rec. 418-3

Table 2-6-13

Channel Allocation for TVN-II Station

Station		Channel		Power Output
		2nd	1st	
1	Medan (Bandarbaru)	11*	5	10 kW
2	Palembang	11	9	10 kW
3	Yogyakarta	4*	8	10 kW
4	Surabaya	4	9	10 kW
5	Denpasar (Bkt. Bakung)	10	8	5 kW
6	Balikpapan	11	9	1 kW
7	Ujung Pandang	11	4	1 kW
8	Manado (Makaweimben)	11	5	5 kW

* Channel allocation should be decided after carrying out the precise measurement and examination on the field strength and interference in the service area of own station and surrounding stations.

第７章　　業務用連絡回線網整備計画

第7章　業務用連絡回線網整備計画

7－1　業務用連絡回線網整備の必要性

ラジオ，テレビ放送事業を円滑に実施するためには迅速，確実な業務連絡手段が必要なことはいうまでもないことであるが，特にインドネシアにおいては放送局が広大な地域に分布しているため，業務連絡回線を整備することは容易なことではない。

従来は一般加入電話回線，電報などのほかＳＳＢ自営回線が主として使用されてきたが，今後ますます複雑となる番組送出業務，放送番組制作業務のための連絡手段としては十分でない。

したがって，本5か年計画期間に業務連絡用専用回線網を整備することは，他の諸計画により建設される施設を有効に活用するためにも必要欠くべからざるものと判断される。

7－2　業務連絡回線網の構成

業務連絡回線を使用する放送局の各部局はそれぞれの業務に応じて緊急性の高いもの，専用時間の長いもの，回線の高い安定度が要求されるものなど利用の方法が異なるが，いづれも電話級の回線により処理できる。

放送業務のための連絡回線に具備すべき機能は以下の各項のとおりである。

(1)　遠距離にある放送局間で即時に通話ができること。
(2)　相手放送局，通話相手がダイヤルで直接呼び出せること。
(3)　回線の安定性がよく他の通話回線からの漏話がないこと。
(4)　番組伝送にも使用できるよう電話級の回線規格を満足するものであること。
(5)　ファクシミリ，テレックス，データ伝送ができること。
(6)　上位局から選択された関係下位局に対し一斉呼び出しができ，指令が同時に伝達できること。

この様な機能を持つ回線網を整備するにはPERUMTELの通信回線網の一部を専用し，独自の回線を構成する以外に適当な方法は見出せない。

このような専用回線網に接続される端局は，一定量の通話需要が一日中断続的に発生する

放送局を優先的に採り上げる。このような条件の放送局以外の孤立したテレビ放送所などについては別の手段によることとする。

専用回線の利用効率，専用回線設備の投資効果が高いと判断され，専用回線網を構成する端局となるべき放送局は下記のとおりである。

ラジオ ……………… ・情報省ＲＴＦ本部
・ＲＲＩ中央局
・チマンギス放送所
・クバヨラン放送所
（以上ジャカルタ）
・ヌサンタラ局（５局）
・リージョナルーⅠ局（２６局）
・リージョナルーⅡ局（１７局）

テレビ ……………… ・情報省ＲＴＦ本部
・ＴＶＲＩ本部（スナヤン）
・ＴＶスタジオを持つ地方ＴＶ局（８局）
・ＭＰＵが配備されている局（予定局を含む）
・その他各地域の主要都市にあるＴＶ基幹局

７－３　業務連絡用専用回線網の整備

上記の放送局間を結ぶ通信回線はすべてPERUMTELの既設設備および新，増設計画設備により構成し，放送局内の交換設備，電話設備，付属設備は放送局側で準備する。

(1) PERUMTELに依頼して整備する回線網を本計画第２年度末までにTable ２－７－１のとおり構成する。また，同時期までにジャカルタ市内の各局所間の連絡回線をTable ２－７－１および２のとおり構成し，DEPPENの基幹交換設備に接続する。

(2) 放送局側においては，DEPPENに遠距離直後ダイヤル呼出，一斉呼出機能を備えた基幹電話交換設備を設置し，遠隔地にある放送局との間はPERUMTEL市外交換局，市内にある放送局所との間はPERUMTEL市内電話交換局をそれぞれ経由して専用回線網を構成する。

各放送局には回線容量に応じて小型PABXまたはKEY TELEPHONEを設置し，局内の主要な職場に電話回線を布設する。

(3) 第３年度末までに，上記専用連絡回線網をＭＰＵ配備局７局に拡張する。

(4) 第４年度末までに，更にリージョナルーⅠ局および第２回ＭＰＵ配備局１０局に専用連絡回線網を拡張するとともに，ジャカルタの交換設備容量，PERUMTEL 市外局との間の回線容量を増加する。

７－４　幹線以外の支線の整備

(1) 従来ＲＲＩの各放送局において運用されてきたＳＳＢ回線設備は，上記専用連絡回線の配備が終った地区から順次支線の連絡設備に転用する。

(2) 現在ジャワ島においてテレビ中継放送所間の保守業務連絡用として設置されている双方向無線電話設備を逐次ＵＨＦ帯に移して整備する。

Fig 2-7-1

TELEPHONE NETWORK FOR DAILY OPERATION

(1ST PHASE)

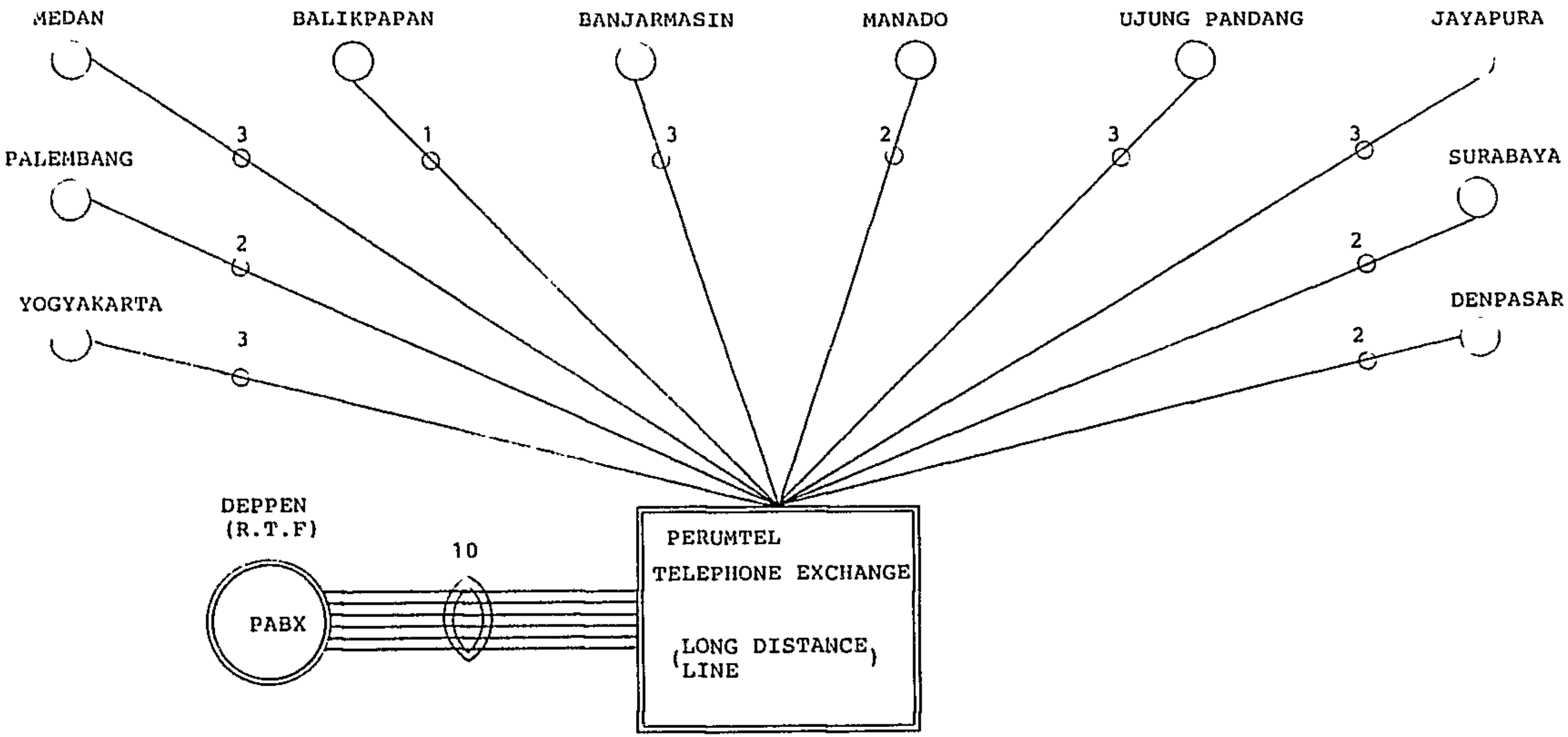
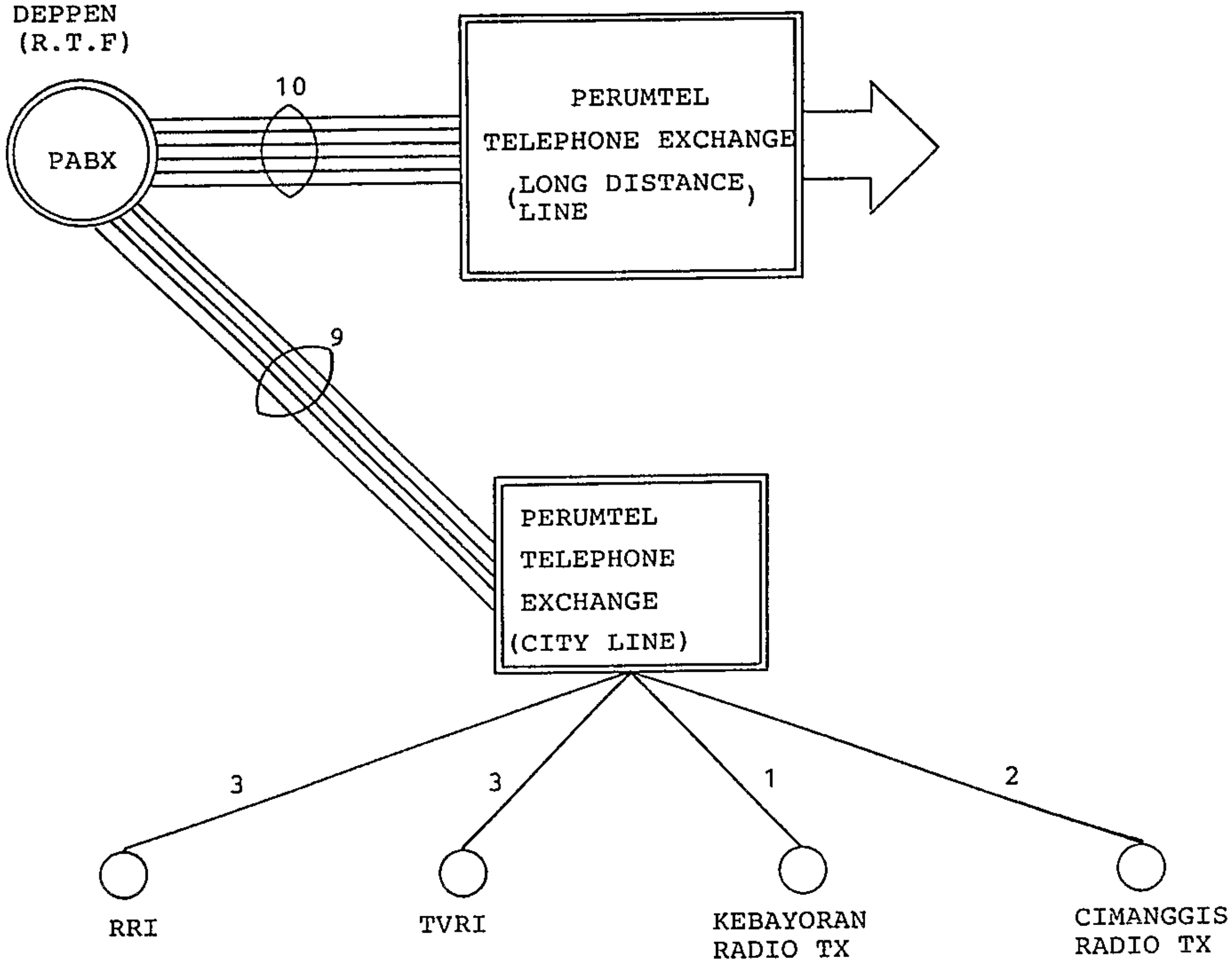


Fig 2-7-2

TELEPHONE NETWORK FOR DAILY OPERATION
(1ST PHASE)



第8章　放送用機器調達，運用，保全のための放送技術基準

第8章　放送用機器調達，運用，保全のための放送技術基準

8－1　国際的な放送技術基準の適用

放送電波を世界各国が相互に妨害を与えることなく有効に利用するため，放送電波の発射（送信電力，周波数，空中線，送信電波の周波数安定度，占有帯域幅など）について国際的な規定が設けられている。

また，ラジオ，テレビ番組の国際間における交換には，テレビ標準方式，録画，録音方式，伝送方式に一定の基準を設けて円滑な番組国際交換を図っている。

インドネシアにおいても放送機器を海外から調達する場合，当然これらの技術基準を参照して機器の選択を行っている筈である。

放送技術基準は日常の番組制作，記録，再生，伝送などの業務において放送の質を一定の水準に維持するための指針としても活用されている。保全業務においても放送技術基準が重要な役割をもっている。

以下の各項に放送の各業務に関連のある放送技術基準について述べる。

8－2　録音関係

ラジオ番組を磁気テープに録音する際の録音技術に関する基準についてはCCIR REC. 408−4により国際的に規定されている。その抜粋はTable 2－8－1のとおりである。

8－3　ラジオ番組伝送回線関係

ラジオ番組を通信回線により遠隔地に伝送する際に保持されねばならない回線特性はAM放送番組，FM放送番組（モノラル，ステレオ）についてCCITT REC. J23および同じくREC. J21にそれぞれ規定されている。その要点をTable 2－8－2および3に示す。

8－4　AMラジオ放送関係

ラジオ放送電波の発射に関する技術基準は最も重要な項目であり，自国内の各放送局相互の混信妨害を避けるのみならず，他国との間に混信問題が発生することを防止するために，

置局計画担当者が十分精通していなければならない。これに関連のあるCCIR REC. 447−2，560−1，794−1，REP. 457−2の抜粋をTable 2−8−4〜6に示す。

8−5 FM放送関係

FM放送電波の発射に関連する技術基準としてCCIR REC. 412−3，同450−1の抜粋をTable 2−8−7および8に示す。

8−6 PALカラーテレビ放送関係

(1) カラーテレビ放送電波の監視
(2) カラーテレビ番組の録画，再生
(3) カラーテレビ信号の伝送

などに関連する技術基準についてCCIR REC. から抜粋しTable 2−8−9〜11に示す。

8−7 放送局における放送の質の維持

スタジオにおいて制作された放送番組が中継回線により遠隔地の放送所に伝送され，放送所から放送電波として発射された信号を受信者が受信して，音声，画像に復元し放送番組として視聴するという一連の信号伝達経路において，放送の質がどのように変化するかをFig. 2−8−1に示す。

この図に示すごとく，テレビ，ラジオの信号が各所において歪，雑音が加わるので受信機で再生された音声，画像がスタジオで採取された原音，原画像に比べて質的に低下することは避けられない。

この音質，画質の低下を最小限にとどめ各受信者がなるべく原音，原画像に近い状態で番組が享受できるよう，信号の伝送経路の各箇所で放送の質を点検し，各区間ごとに信号が一定の基準値の範囲内に保たれるように努力しなければならない。

そのためには，少なくとも1〜4のチェック・ポイントで音質，画質の点検を行ない，歪，雑音が顕著なときは，その区間において改善対策を施し，全伝送経路についても歪，雑音を許容値内に保持する努力を払う必要がある。

放送期間中の各チェック・ポイントにおける音質，画質の点検にはモニター・スピーカー，映像モニターを使用するが，これらのモニター設備は放送番組の質を検査する重要な物指しであるので，常に正常な動作状態で規定の特性を維持するよう注意しなければならない。

放送が開始される前に先づ行なわれなければならないモニター機器の点検，較正がとかく疎かになり勝ちであるが，ラジオ，テレビ放送の質を常に一定の基準値以上に保持するためには，そのよりどころともいうべきモニターの較正から始める習慣をつけるよう現業勤務体制を確立することが肝要である。

Table 2-8-1

RECOMMENDATION 408-4 * (Abstracts)

STANDARDS OF SOUND RECORDING ON MAGNETIC TAPE FOR THE INTERNATIONAL EXCHANGE OF PROGRAMMES

(Question 52/10, Study Programme 52A/10)

(1951-1953-1956-1959-1963-1966-1970-1974-1982)

○ **Beginning of a programme**

The programme material should be preceded by a reference signal of 1000 Hz recorded at a level of 9 dB below maximum permitted programme peaks.

On monophonic tapes, this reference signal should have a duration of about 10 s, with a pause of about 5 s before the start of the programme modulation.

On stereophonic tapes, this reference signal should be recorded in the *A*-(left) channel for about 5 s, then in both channels for about 10 s, with a pause of about 5 s before the start of the programme modulation.

○ *Amplitude/frequency response of the two channels*

The tolerances on the amplitude/frequency response of the two channels *A* and *B* shall be as follows:

40	to 125 Hz :	+2	to −3	dB
125	to 630 Hz :	+1	to −1	dB
630	to 1250 Hz :	+0.5	to −0.5	dB
1250 Hz	to 10 kHz:	+1	to −1	dB
10	to 15 kHz:	+2	to −3	dB.

○ *Difference in recorded level between tracks*

In the frequency range of 125 to 10 000 Hz, a difference in level of 1.5 dB is admissible. Beyond these limits, a progressive increase up to 2 dB is admissible at 40 and 16 000 Hz.

○ *Phase difference between tracks*

In the frequency range from 250 to 4000 Hz, the maximum phase difference should be 15°. Outside these frequency limits, a progressive increase of this value is admissible; it can reach 30° at 40 Hz and 65° at 16 000 Hz.

○ *Crosstalk*

In the frequency range from 250 to 4000 Hz, crosstalk should not exceed −35 dB. Outside these frequency limits, a progressive increase up to −20 dB at 40 Hz and −25 dB at 16 000 Hz is admissible.

○ *Weighted signal-to-noise ratio*

The weighted signal-to-noise ratio of the *A*, *B* and *M* signals should be at least 51 dB.

Note. – This value represents the difference in level between the noise measured with the meter and weighting network defined in Recommendation 468 and a signal, the amplitude of which corresponds to the maximum level of programme peaks indicated.

○ *Non-linearity distortions*

The total percentage harmonic distortion of the *A*, *B* and *M* signals should be less than or equal to the following values:

2% from 40 Hz to 125 Hz
1.6% from 125 Hz to 8 kHz.

Recommendation J.23 [1), 2)]

Table 2-8-2

PERFORMANCE CHARACTERISTICS OF NARROW-BANDWIDTH SOUND-PROGRAMME CIRCUITS (Abstracts)

(amended at Geneva, 1980)

Circuits of medium quality for monophonic transmission

The CCITT

unanimously recommends

that, taking into account the definitions in § 1, narrow-bandwidth sound-programme circuits should satisfy the requirements for monophonic transmission laid down in §§ 2 and 3.

1 Definitions

In this Recommendation the narrow-bandwidth sound-programme circuits include:

7 kHz type circuits,

The requirements in § 3 should be met by the hypothetical reference circuit as defined in CCIR Recommendation 502-1 [3].

2 Requirements at audio interconnection points

2.1 *Measurement of characteristics*

When measuring the characteristics of a circuit, the output should be terminated with a 600 ohm nonreactive load.

2.2 *Impedance and matching conditions*

The audio-frequency input impedance should be 600 ohms balanced: the tolerance on this value is a matter for further study.

It is provisionally recommended that the output impedance be balanced with respect to earth and be so low that the output level in the nominal transmission range does not decrease by more than 0.3 dB if the open-circuit output is loaded with 600 ohms. This output impedance is intended for connection to a nominal load impedance of 600 ohms.

For amplifiers which are intended for direct connection to audio programme lines, the reactive part of the output impedance should be restricted. A maximum value of 100 ohms for the series reactance part of the output impedance at frequencies in the transmitted range is provisionally recommended.

2.3 *Relative level*

The relative level on a sound-programme circuit at the audio-frequency amplifier output should be fixed at +6 dBrs. [4)]

3 Performance of the hypothetical reference circuit

The values given should be met by circuits operating with analogue techniques. However, the international circuits which have equipments designed before the adoption of this Recommendation may have parameters different from those given here in § 3.

Special additional parameters concerning digital transmission are under study.

3.1 *Nominal bandwidth*

7 kHz type circuits: 0.05 to 7 kHz

3.2 *Insertion gain at 0.8 or 1 kHz*

This parameter is defined at a sending level of −12 dBm0 in accordance with Recommendation N.21 [4].

a) *Adjustment error*

Less than ± 0.5 dB

b) *Daily variation*

Less than ± 0.5 dB

3.3 *Gain/frequency response referred to 0.8 or 1 kHz*

This parameter is defined at a sending level of −12 dBm0 in accordance with Recommendation N.21 [4].

a) *7 kHz type circuits*

0.05 to 0.1 kHz: +1 to −3 dB
0.1 to 6.4 kHz: +1 to −1 dB
6.4 to 7 kHz: +1 to −3 dB

3.4 *Difference of group delay between the minimum value and the values at given frequencies*

a) *7 kHz type circuits*

0.05 kHz: < 80 ms
0.1 kHz: < 20 ms
6.4 kHz: < 5 ms
7 kHz: < 10 ms

3.5 *Maximum weighted noise level*

This parameter is defined by terms of a weighting network and a quasi-peak measuring instrument in accordance with CCIR Recommendation 468-2 (which is reproduced at the end of Recommendation J.16):

7 kHz type circuits −44 dBq0ps

Note 1 — If an r.m.s. measuring instrument is used, the measured value will be about 5 dB less than that for the quasi-peak measurement.

Note 2 — If the weighting network defined in the Recommendation cited in [5] is used, the measured value will be about 4 dB less.

Note 3 — Suitable values for unweighted noise cannot be recommended with precision, because such values depend upon the characteristics of the circuit noise. However, if an unweighted noise measurement is performed upon a sound-programme circuit just complying with the requirements for weighted noise and single tone interference, then the worst values expected to be found are −35 dBq0s or −40 dBm0s, and in most cases the values obtained will be several decibels better.

3.6 *Single tone interference*

This parameter (measured selectively) should not exceed (−73 − Δps) dBm0s. Δps is the correction for the frequency being considered which is given by the weighting characteristic in CCIR Recommendation 468-2 (which is reproduced at the end of Recommendation J.16).

3.7 *Disturbing modulation by power supply*

The highest-level unwanted side-component due to modulation of a sound-programme signal caused by interference from conventional a.c. line power supply sources should not be greater than −45 dB relative to the level of a sine-wave measuring signal applied to the sound-programme circuit (in accordance with CCIR Recommendation 474 [6]). The value for higher frequencies has to be determined (see CCIR Report 495-1 [7] and Study Programme 17F/CMTT [8]).

3.8 *Non-linear distortion*

Total harmonic distortion measured with fundamental signals at +9 dBm0:

- below 0.1 kHz: < 2%
- above 0.1 kHz: < 1.4%.

Third order difference tone measured at 0.18 kHz using signals of 0.8 and 1.42 kHz each at +3 dBm0: < 1.4%.

3.9 *Error in reconstituted frequency*

Less than 1 Hz.

Note – A maximum error of 1 Hz is in principle acceptable where there is only a single transmission path between the signal source and the listener.

When the broadcast network is composed of two or more parallel paths, e.g. commentary and separate sound channels, or radio broadcast from different transmitters on the same frequency, unacceptable beats may occur unless zero error can be assured. The CCITT is studying methods of effecting this in all recommended systems.

3.10 *Intelligible crosstalk ratio*

3.10.1 The near- or far-end crosstalk ratio (for speech) between two sound-programme circuits or between a telephone circuit (disturbing circuit) and a sound-programme circuit (disturbed circuit) should be at least 74 dB for the range 0.5 kHz to 3.2 kHz. For the range below 0.5 kHz and above 3.2 kHz it should be 74 dB reducing in value at a rate of 6 dB per octave.

3.10.2 The near- or far-end crosstalk ratio between a sound-programme circuit (disturbing circuit) and a telephone circuit (disturbed circuit) should be at least 65 dB.

3.11 *Error in amplitude/amplitude response*

This parameter is defined by a step level signal −6/+6 dBm0 at 0.8 or 1 kHz: < 0.5 dB.

Table 2-8-3

PERFORMANCE CHARACTERISTICS OF 15-kHz TYPE SOUND-PROGRAMME CIRCUITS [1]

(Geneva, 1972; amended at Geneva, 1976 and 1980) (Abstracts)

Circuits for high-quality monophonic and stereophonic transmissions

The CCITT

unanimously recommends

that, taking account of the definition in § 1 below, high-quality monophonic and stereophonic sound-programme transmissions should satisfy the requirements laid down in §§ 2 and 3 below.

1 Definition

When the hypothetical reference circuit defined in Recommendation J.11 is composed of three "sound-programme carrier sections" the requirements indicated below should be met.

2 Requirements at audio interconnection points

2.1 *Measurement of characteristics*

When making measurements of the characteristics of a circuit, these should be made with the output terminated with a 600-ohm non-reactive load.

2.2 *Impedance and matching conditions*

The audio-frequency input impedance should be 600 ohms balanced; the tolerance on this value is a matter for further study.

It is provisionally recommended that the output impedance be balanced with respect to earth and be so low that the output level in the nominal transmission range does not decrease by more than 0.3 dB if the open-circuit output is loaded with 600 ohms. This output impedance is intended for connection to a nominal load impedance of 600 ohms.

This clause alone would not, however, rule out a large difference in the reactive parts of the output impedances of a stereophonic pair, and this in turn could lead to difficulties in meeting the limits of § 3.2.2 below. This aspect needs further study.

For amplifiers which are intended for direct connection to audio frequency sound-programme lines, the reactive part of the output impedance should be restricted. A maximum value of 100 ohms for the series reactance part of the output impedance at frequencies in the transmitted range is provisionally recommended.

2.3 *Relative level*

The relative level on a sound-programme circuit at the audio-frequency amplifier output should be fixed at +6 dBrs [2].

3 Performance of the hypothetical reference circuit for 15 kHz-type sound-programme circuits

The values given correspond to circuits operating with analogue techniques and are expected to be met on such transmission systems. Special additional parameters concerning digital techniques are under study (see § 4 below).

3.1 *Parameters for monophonic sound-programme transmission*

3.1.1 Nominal bandwidth: 0.04 to 15 kHz..

3.1.2 Insertion gain at 0.8 or 1 kHz: this parameter should be measured at a sending level equivalent to −12 dBm0 as specified by the CCITT for setting up sound-programme circuits.

3.1.2.1 Adjustment error: not to fall outside the range ± 0.5 dB.

3.1.2.2 Variation during 24 hours: not to exceed ± 0.5 dB.

If the broadcasting organizations wish to have closer tolerances, it is necessary for the receiving broadcasting organizations to insert additional timing attenuators.

3.1.3 The gain/frequency response referred to 0.8 or 1 kHz should comply with the following limits:

0.04	to 0.125	kHz:	+0.5 to −2.0 dB
0.125	to 10	kHz:	+0.5 to −0.5 dB
10	to 14	kHz:	+0.5 to −2.0 dB
14	to 15	kHz:	+0.5 to −3.0 dB

For the combined effect of three modulator and demodulator equipments, a tolerance of ± 0.5 dB from 0.125 to 10 kHz is considered the closest that can be met by equipments in practice. If broadcasting organizations wish to have closer tolerances, it is necessary for the receiving broadcasting organization to insert additional equalizers.

This response should be measured using a test level of −12 dBm0.

3.1.4 The difference between group delay at the given frequency and the minimum value of group delay should not exceed the following limits:

0.04 kHz:	55 ms
0.075 kHz:	24 ms
14 kHz:	8 ms
15 kHz:	12 ms

3.1.5 *Maximum weighted noise level*

−42 dBq0ps.

This parameter is defined in terms of a weighting network and a quasi-peak measuring instrument in accordance with CCIR Recommendation 468-2, which is reproduced at the end of Recommendation J.16.

3.1.8 *Nonlinear distortion*

There are certain difficulties in giving a general recommendation on nonlinearity, due to restrictions imposed by the CCITT on the levels and durations of test tones (see especially Recommendations N.21 [7] and N.23 [8]). Pending progress with other test methods, the following tests are recommended.

3.1.8.1 Harmonic distortion factors measured with single-tone test signals at +9 dBm0s should not exceed the limits given in Table 1/J.21.

TABLE 1/J 21

Frequency of test-tone (kHz)	Total harmonic distortion (%)	Second harmonic and third harmonic measured selectively (%)
0.04 to 0.125	1	0.7
0.125 to 7.5	0.5	0.35

3.1.10 *Intelligible crosstalk ratio*

3.1.10.1 The intelligible crosstalk ratio from other sound-programme circuits or from a telephone circuit into a sound-programme circuit should be measured selectively in the disturbed circuit at the same frequencies as those of the sinusoidal test signal applied to the disturbing circuit, and should not be less than the following values:

0.04 kHz: 50 dB
0.04 to 0.5 kHz: oblique straight-line segment on linear-decibel and logarithmic-frequency scales
0.5 to 5 kHz: 74 dB
5 to 15 kHz: oblique straight-line segment on linear-decibel and logarithmic-frequency scales
15 kHz: 60 dB.

3.1.10.2 The near- or far-end crosstalk ratio between a sound-programme circuit (disturbing circuit) and a telephone circuit (disturbed circuit) should be at least 65 dB.

3.2 *Additional parameters for stereophonic programme transmission*

3.2.1 The difference in gain between A and B channels should not exceed the following values:

0.04 to 0.125 kHz: 1.5 dB
0.125 to 10 kHz: 0.8 dB
10 to 14 kHz: 1.5 dB
14 to 15 kHz: 3 dB

3.2.2 The phase difference between the A and B channels should not exceed the following values:

0.04 kHz: 30°
0.04 to 0.2 kHz: oblique straight-line segment on linear-degree and logarithmic-frequency scales
0.2 to 4 kHz: 15°
4 to 14 kHz: oblique straight-line segment on linear-degree and logarithmic-frequency scales
14 kHz: 30°
15 kHz: 40°

3.2.3 The crosstalk ratio between the A and B channels should not be less than the following limits:

3.2.3.1 Intelligible crosstalk ratio, measured with sinusoidal test signal from 0.04 to 15 kHz: 50 dB.

3.2.3.2 Nonlinear crosstalk ratio [4] from 0.04 to 15 kHz: 60 dB.

Table 2-8-4

RECOMMENDATION 447-2 *

SIGNAL-TO-INTERFERENCE RATIOS IN SOUND BROADCASTING

Definitions

(Question 44/10, Study Programme 44A/10)

(1966-1978-1982)

The CCIR

UNANIMOUSLY RECOMMENDS

that, when considering problems of interference in sound broadcasting, the following definitions should be used:

1. *The audio-frequency* (AF) *signal-to-interference ratio* is the ratio (expressed in dB) between the values of the voltage of the wanted signal and the voltage of the interference, measured under specified conditions, at the audio-frequency output of the receiver.

This ratio corresponds closely to the difference in volume of sound (expressed in dB) between the wanted programme and the interference.

2. *The audio-frequency* (AF) *protection ratio* is the agreed minimum value of the audio-frequency signal-to-interference ratio considered necessary to achieve a subjectively defined reception quality.

This ratio may have different values according to the type of service desired.

3. *The radio-frequency* (RF) *wanted-to-interfering signal ratio* is the ratio (expressed in dB) between the values of the radio-frequency voltage of the wanted signal and the interfering signal, measured at the input of the receiver under specified conditions.

For example, in the case of amplitude-modulation wanted and interfering transmissions (carrier with double sideband), the chosen values will be the effective radio-frequency voltages that correspond to the wanted and interfering carriers.

4. *The radio-frequency* (RF) *protection ratio* is the value of the radio-frequency wanted-to-interfering signal ratio that enables, under specified conditions, the audio-frequency protection ratio to be obtained at the output of a receiver.

The specified conditions include such diverse parameters as: spacing Δf of the wanted and interfering carrier, emission characteristics (type of modulation, modulation depth, frequency deviation, carrier frequency tolerance, etc.), A.F. signal characteristics (bandwidth, dynamic compression, etc.), receiver input level as well as the receiver characteristics (selectivity and susceptibility to cross-modulation, etc.).

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* This Recommendation should be brought to the attention of the CMV

RECOMMENDATION 560-1 * (Abstracts)

RADIO-FREQUENCY PROTECTION RATIOS IN LF, MF AND HF BROADCASTING

(Question 44/10, Study Programme 44A/10)

(1978-1982)

The CCIR

UNANIMOUSLY RECOMMENDS

that the radio-frequency protection ratios for sound broadcasting in bands 5 (LF), 6 (MF), and 7 (HF) as given in §§ 1 and 2 should be applied.

1. Radio-frequency protection ratio in bands 5 (LF) and 6 (MF)

The radio-frequency protection ratio (as defined in Recommendation 447), for co-channel transmissions (± 50 Hz) should be 40 dB when both the wanted and the unwanted signals are stable (ground-wave).

When the wanted signal is stable and the unwanted signal fluctuates (including short-term fluctuations), the radio-frequency protection ratio should be 40 dB at the reference time (see Annex 1 to Recommendation 435) for at least 50% of the nights of the year. This protection ratio corresponds to the ratio of the wanted field strength and the annual median value of the hourly medians of the interfering field strength at the reference time.

The protection so defined is provided:

- for 50% of the nights at the reference time;
- for more than 50% of the nights at times other than the reference time;
- for 100% of the days during daylight hours.

The radio-frequency protection ratio values specified above will permit a service of excellent reception quality. For planning purposes, however, lower values may be required. In this respect, proposals have been made by some countries and organizations (see Report 794).

Note 1. – The minimum usable field strength to which this protection ratio of 40 dB applies varies in the different regions and with frequency. Within the European zone, this minimum is of the order of 1 mV/m.

Note 2. – In the United States of America, when the wanted and unwanted signals are stable (ground-wave), the radio-frequency protection ratio for co-channel transmissions is 26 dB. When the unwanted signal is fluctuating (sky-wave), the same protection ratio is applied for 90% of the nights of the year, computed for the second hour after sunset. The minimum usable field strength is either 100 or 500 μV/m, depending upon the class of service.

2. Relative radio-frequency protection ratio curves in bands 5 (LF), 6 (MF) and 7 (HF)

The relative radio-frequency protection ratio is the difference, expressed in decibels, between the protection ratio when the carriers of the wanted and unwanted transmitters have a frequency difference of Δf (Hz or kHz) and the protection ratio when the carriers of these transmitters have the same frequency.

Once a value for the co-channel radio-frequency protection ratio (which is equal to the audio-frequency protection ratio) has been determined, then the radio-frequency protection ratio, expressed as a function of the carrier-frequency spacing, is given by the curves of Fig. 1 (see also Annex 1):

- curve A, when a limited degree of modulation compression is applied at the transmitter input, such as in good quality transmissions, and when the bandwidth of the audio-frequency modulating signal is of the order of 10 kHz;
- curve B, when a high degree of modulation compression (at least 10 dB greater than in the preceding case) is applied by means of an automatic device and when the bandwidth of the audio-frequency modulating signal is of the order of 10 kHz;
- curve C, when a limited degree of modulation compression (as in the case of curve A) is applied and when the bandwidth of the audio-frequency modulating signal is of the order of 4.5 kHz;
- curve D, when a high degree of modulation compression (as in the case of curve B) is applied by means of an automatic device and when the bandwidth of the audio-frequency modulating signal is of the order of 4.5 kHz.

* Further information is given in Report 794

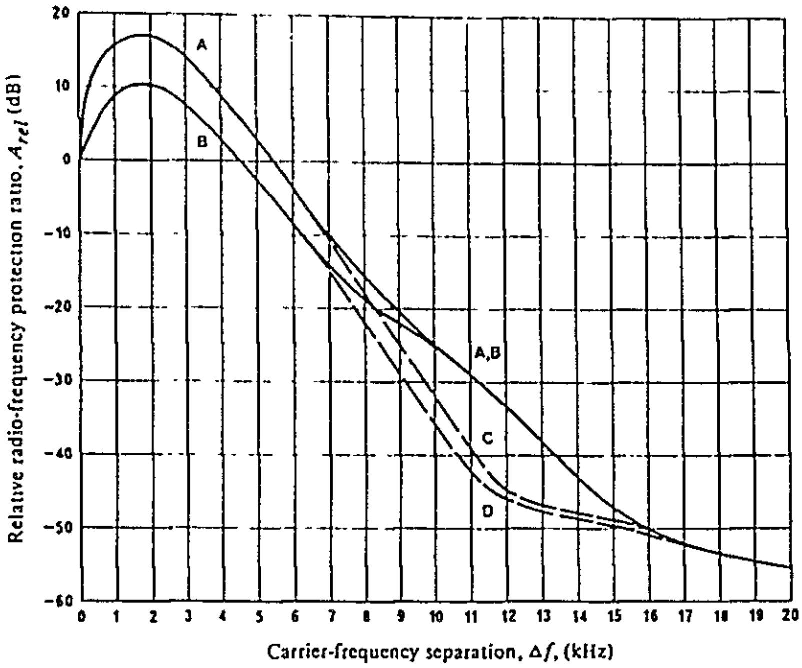

FIGURE 1 – *Relative value of the radio-frequency protection ratio as a function of the carrier-frequency separation*

The curves A, B, C and D (see also Annex I) are valid only when the wanted and unwanted transmissions are compressed to the same extent. They have been obtained mainly from measurements and calculations with a reference receiver representative of good quality receivers used for reception in bands 5 (LF) and 6 (MF). The overall frequency response curve of the European Broadcasting Union (EBU) reference receiver used passes through −3 dB, −24 dB and −59 dB at 2 kHz, 5 kHz and 10 kHz, respectively, [Petke, 1973].

REPORT 457-2

NECESSARY BANDWIDTH OF EMISSION IN LF, MF, AND HF SOUND BROADCASTING

(Question 44/10, Study Programme 44A/10)

(1970-1974-1982)

1. Introduction

In an amplitude-modulation double-sideband sound broadcasting system the bandwidth of emission is approximately twice the audio-frequency bandwidth of the programme and, therefore, greatly influences the quality of reception. On the other hand, for a given frequency separation between adjacent channels, a limitation of the bandwidth of emission is desirable to avoid mutual interference.

The difference between the transmitted bandwidth for amplitude-modulation sound broadcasting and the receiver bandwidth has led to research [CCIR, 1966-69a and b; Netzband and Süverkrübbe, 1968; Süverkrübbe, 1969; Petke, 1973] aimed at improving the whole transmission system. It appears that it would be useful to fix values for the audio-frequency bandwidth of the programme to be radiated as well as for the overall response of the receivers and to obtain these values by the use of band-limiting filters. If both these bandwidths are nearly equal and are suitably related to the channel spacing the transmission system provides for the full utilization of the transmitted bandwidth as well as for the most favourable protection against adjacent channel interference [Eden, 1967].

2. Assessment of the necessary bandwidth of emission

Obviously the bandwidth of emission as well as the passband of the receivers should be chosen in such a way that there is no unnecessary impairment of reception quality or any increase in adjacent channel interference [Netzband and Süverkrübbe, 1968]. In this respect a good solution would be to make the channel spacing, the bandwidth of emission and the receiver passband of equal value. Moreover, ideally there should be rectangular limitation of the bandwidth of emission and the received selectivity curve and no non-linear distortion in the transmitter. Under these conditions no adjacent channel interference would occur.

In general, however, these requirements are not met. In many cases the bandwidth of emission exceeds the channel spacing by a considerable amount. It can be seen from Recommendation 560 that excessive adjacent channel interference will result from such operational conditions. Hence, it can be concluded that this type of interference can be reduced if the bandwidth of emission is adapted to the channel spacing.

3. General considerations

3.1 There exists a well-known interrelation between system bandwidth, carrier spacing and adjacent-channel radio-frequency protection ratio [Süverkrübbe, 1969; Petke, 1973].

3.2 The theoretically obtainable optimum value of protection against adjacent channel interference can be assessed by using an ideal receiver with rectangular passband characteristics. In this case the radio-frequency protection ratio is mainly determined by non-linear distortion in the transmitter.

3.3 A theoretical study of the energy spectrum including out-of-band radiation caused by transmitter non-linearities is contained in [Kettel, 1968]. Experimental investigations of the energy spectrum of a high-power transmitter operating in band 6 (MF) [CCIR, 1966-69c] show that the term occupied bandwidth as defined in Article 1, No. 147 of the Radio Regulations does not give an adequate indication of the effects of bandwidth limitation on adjacent channel interference.

4. Relationship between AF bandwidth, RF protection ratio and channel spacing

4.1 *Measurement results*

Measurements of the radio-frequency protection ratios for the case of various values of audio-frequency bandwidths, which are equal at both transmitter and receiver, and at different channel spacings have been carried out in the Federal Republic of Germany [Süverkrübbe, 1969] using the objective two-signal measuring method given in Recommendation 559 and Report 794. For the measurements a high quality commercial receiver with an almost ideal passband characteristic was used. The interrelation between the parameters involved is shown in Fig. 1. For a given channel spacing there are many pairs of values of audio-frequency bandwidths and adjacent channel protection ratios. If, however, two of the parameters have been chosen, the third is definitely fixed.

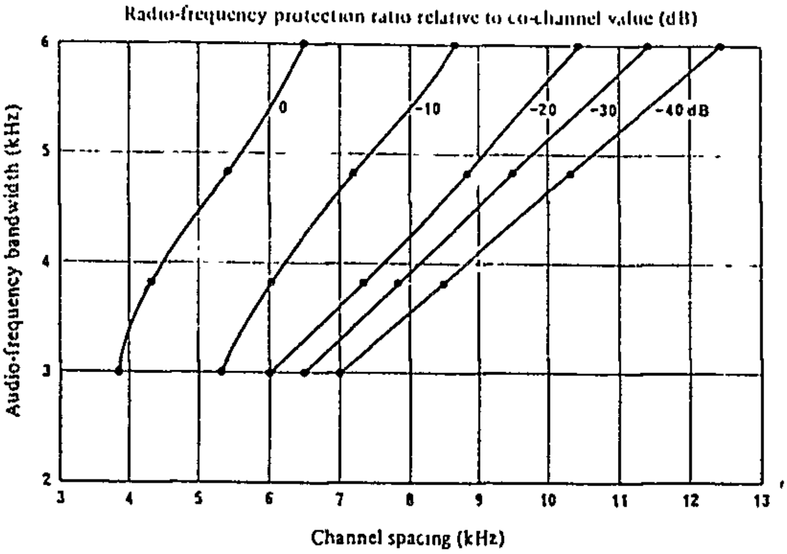

FIGURE 1 – *Use of the frequency spectrum*

4.2 *Computation results*

The relationship between system bandwidth, adjacent channel protection ratio and channel spacing can be determined by means of the numerical method (Recommendation 559).

Studies carried out were based on the assumption that both the carrier spacing and the adjacent channel protection ratio are predetermined values. Using Recommendation 560, a relative value of the radio-frequency protection ratio of −26 dB corresponding to a channel spacing of 9 kHz has been assumed. Thereby due account has been taken of the characteristics of current types of receivers.

Any amplitude-modulation sound-broadcasting system has, in principle, the same effect on the reception quality as a low-pass filter. Amplitude-modulation systems designed in conformity with the channel spacing and protection ratio requirements mentioned above may, therefore, differ to some extent in bandwidth and rate of cut-off of the overall amplitude/frequency response. The investigations carried out were, therefore, extended to cover this aspect of the problem of the quality of reception.

It was assumed that the influence on the overall amplitude/frequency response of the entire system was equally distributed between the transmitting and receiving ends. This approach should, however, be considered as a first attempt only and additional studies will have to be carried out for different conditions. As a result of the calculations made it was found that any one of the three overall amplitude/frequency response curves shown in Fig. 3 would provide satisfactory adjacent-channel protection in an 9 kHz channelling system. The curves of Fig. 2 present pairs of values for the bandwidth, *b*, and rate of cut-off, a_0, required at either end of the AM sound-broadcasting system. The solid curve is only valid if use is being made of a notch filter in the receiver to eliminate the beat-note between adjacent channel carriers, whereas the broken line applies to the case where there is no notch filter. The particular points in Fig. 2 numbered ①, ② or ③ correspond to terminal equipment characteristics that would provide the overall amplitude/frequency response curves, A, B or C, respectively, in Fig. 3.

The results obtained are in close agreement with Fig. 1 which should be considered to provide limiting values, since it applies to the ideal case of rectangular passband characteristics. The system bandwidth thus decreases rapidly with decreasing rate of cut-off.

4.3 *Listening tests*

The influence of reproduction quality of an amplitude-modulation sound-broadcasting system with 9 kHz channel spacing and a relative protection-ratio value of −26 dB for adjacent channel interference can be simulated by using three specified low-pass filters. The passband characteristics of these filters are those of curves A, B and C in Fig. 3.

Subjective listening tests then show quite clearly that a better subjective quality impression can be obtained with frequency response curves A and B than with curve C. However, the difference in quality obtained with curves A and B is very small, a fact which may be of considerable economic interest, since the rate of cut-off of the receiver is 20 dB/octave less with curve B than with curve A

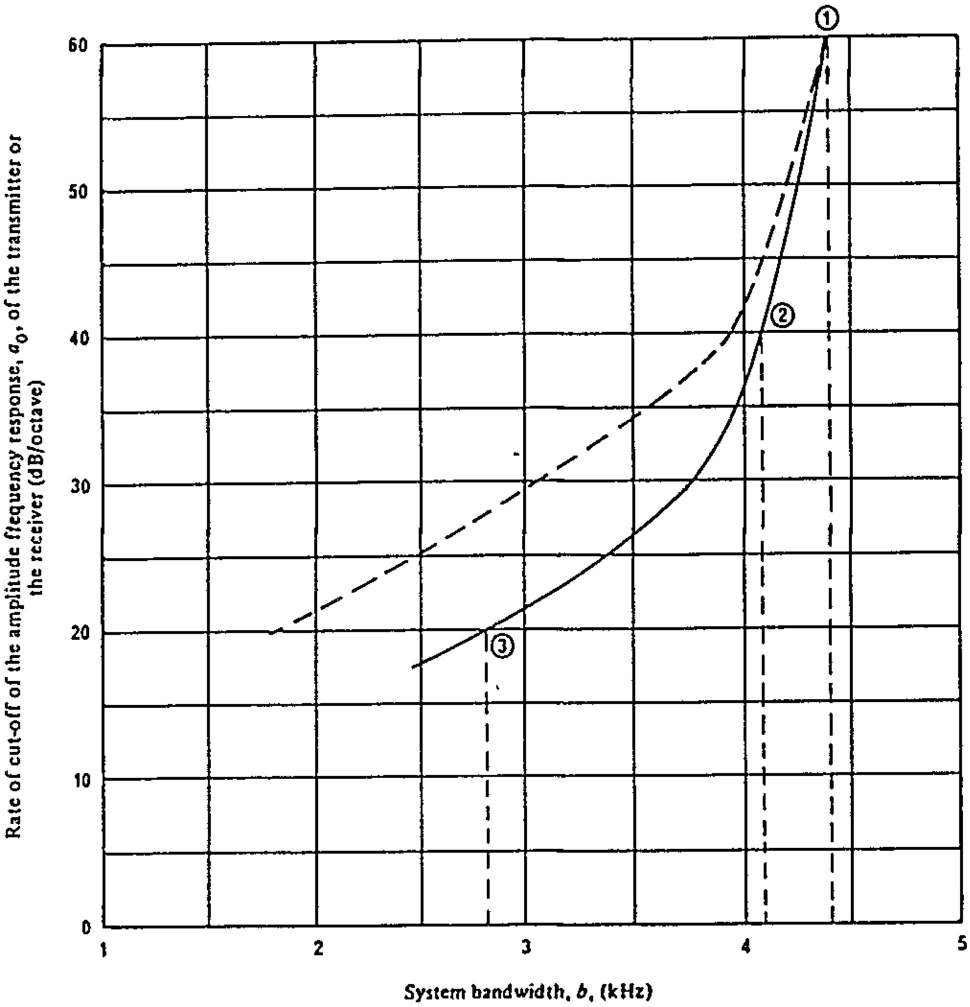

FIGURE 2 – *Characteristics of an amplitude-modulation sound-broadcasting system for optimum quality of reproduction*

Basic assumptions:
Channel spacing: 9 kHz
Relative adjacent-channel protection ratio: – 26 dB

———— characteristics including the effect of a notch filter for elimination of the carrier beat

— — — — characteristics without notch filter

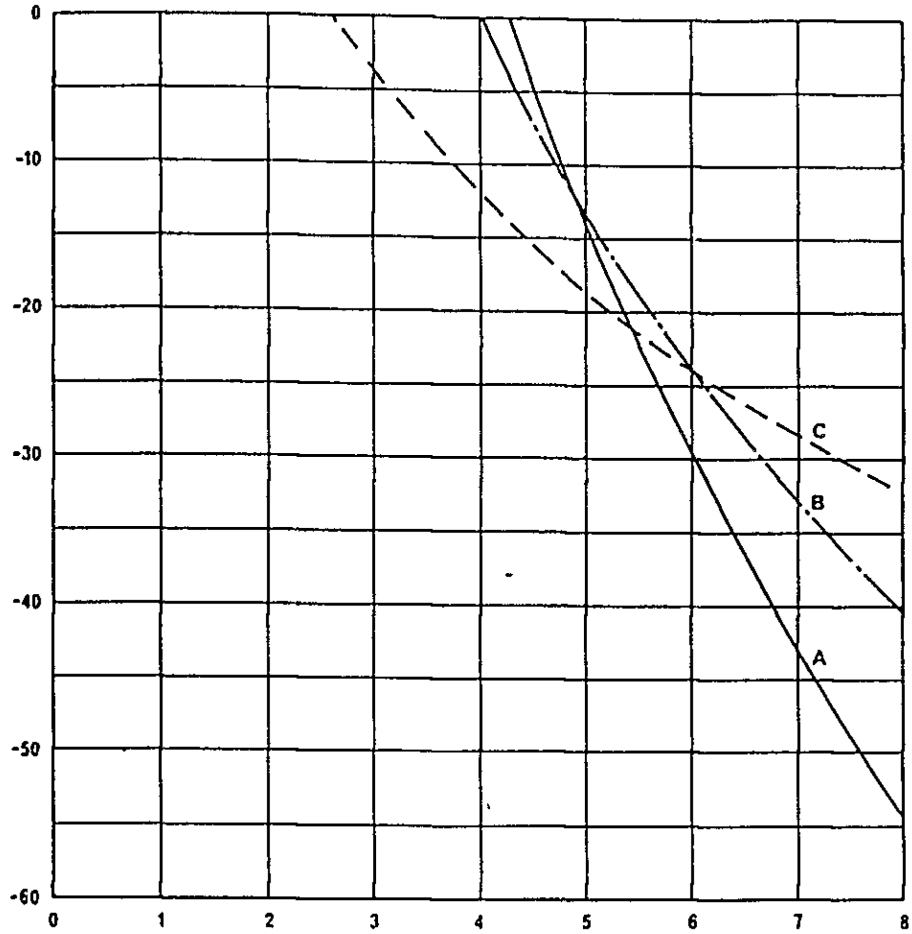

FIGURE 3 – *Overall amplitude/frequency response for an amplitude-modulation sound-broadcasting system for optimum quality of reproduction*

Curve A: overall rate of cut-off for system – 120 dB per octave
B · overall rate of cut-off for system – 80 dB per octave
C: overall rate of cut-off for system – 40 dB per octave

5. Radio-frequency and intermediate-frequency passband characteristics of current types of receiver

Receiver characteristics have been collated in various countries and are partly reproduced in Report 333 (New Delhi, 1970). Radio-frequency and intermediate-frequency passband values between the 6 dB points are quoted ranging between 5 and 10 kHz. It should be noted that the reproduced audio-frequency bands are about half these values. The highest values mentioned are those of "first category" receivers in the U.S.S.R. [CCIR 1966-69d] with variable selectivity.

It is known that there are many receivers with even smaller passbands than those mentioned in the above references. It has, however, been indicated that in some areas there exist receivers with larger passbands.

6. Use of bandwidth limitation in operational practice

Even though the use of bandwidth limitation has been common practice for many years, the public reaction to the effect on programme quality has been negligible. On the other hand, improved reception has been reported in many cases where adjacent channel interference had previously been severe.

According to the Geneva Plan, a large number of transmitters are not operating in bands 5 (LF) and 6 (MF) with a limited bandwidth. In the LF band 50.6% of the total number of transmitters has a bandwidth of emission equal to or less than 10 kHz, whereas in the MF band this value is only 11.3%.

7. A bandwidth-saving overtone transmission and reception system

A new method has been described [Gassman, 1972 and 1973], applicable in bands 5 (LF), 6 (MF) and 7 (HF), which allows improved sound quality at the receiver while the audio-frequency modulating signal is restricted in bandwidth. The system is based on the fact that the human ear is unable to identify overtone frequencies above about 4 kHz in relation to the fundamental tone.

The improvement of the sound quality is effected by the addition of artificial overtones generated in the receiver. The amplitudes of the overtones are controlled by a pilot tone at the upper end of the audio-frequency passband. The pilot tone carries the information on the amplitude of the overtones and the necessary synchronizing signal in the form of a single-sideband modulation.

8. Out-of-band spectrum of double-sideband sound-broadcasting emissions

Recommendation 328, § 3.5.1, gives the limit curves for the level of the out-of-band radiation of amplitude modulated double-sideband broadcast emissions. The curves have no fixed relation to the level of the carrier since this relation depends on:

- the modulation factor of the transmitter (r.m.s. value);
- the necessary bandwidth of the emission;
- the bandwidth of the spectrum analyser.

However, the limit curves have a fixed relationship to the maximum level of the sideband components which depends only on the power distribution within the sidebands.

Detailed information on the corresponding values is contained in Report 325.

9. Necessary bandwidth of emissions in band 7 (HF)

9.1 Listening tests have been made on the quality of reception obtainable on short waves and the effects of a reduction of the necessary bandwidth. From these tests it has been deduced that, although there will be some loss in quality if the audio-frequency band is limited, this loss is not serious. Studies in band 6 (MF) have shown that there is a relationship between system bandwidth, carrier spacing and the adjacent-channel radio-frequency protection ratio. Receivers used for reception in band 7 (HF) will, in general, have the same selectivity characteristics as those used for reception in band 6 (MF).

9.2 In band 7 (HF), 5 kHz channelling is common. Some administrations considered it desirable that the bandwidth of the audio-frequency modulating signal used in band 7 (HF) should be 4.5 kHz and should in no case exceed 5 kHz. This matter requires further study.

10. *Conclusions*

10.1 Figure 1 shows the relationship between the adjacent-channel radio-frequency protection ratio, the channel spacing and the audio-frequency bandwidth and assumes that the audio-frequency bandwidth of the radiated programme is the same as that reproduced by the receiver. When two of the three parameters are selected, the third is definitely fixed. In general the channel spacing will be given and a particular value of radio-frequency protection ratio will be required. Then the full audio-frequency bandwidth as taken from Fig. 1 can be transmitted but full use of the bandwidth of the radiated signal can only be made if the receivers have selectivity characteristics corresponding to that of the audio-frequency filter at the transmitter.

10.2 The predetermination of values of channel spacing and adjacent-channel protection ratio in an amplitude-modulation sound-broadcasting system is equivalent to a determination of the quality of audio-frequency reproduction. For example, in the case of 9 kHz channel spacing and −26 dB adjacent-channel protection ratio, Fig. 2 shows that, with reasonable values for the rate of cut-off, an audio-frequency bandwidth of 4.4 kHz can hardly be exceeded. Moreover, it is evident from this figure that decreasing rates of cut-off imply decreasing values of audio-frequency bandwidth.

From subjective listening tests it is apparent that, within the predetermined limits shown in Fig. 2, the reception quality mainly depends on the audio-frequency bandwidth. However, when approaching the limits, a slight increase in audio-frequency bandwidth may imply a substantial increase in rate of cut-off, whereas the increase in reception quality may hardly be noticeable.

Similar studies for 8 and 10 kHz channel spacings led to corresponding results showing the same tendencies. The apportionment of the overall amplitude/frequency response equally to the transmitter and receiver does not necessarily correspond to optimum conditions. On the contrary, computations indicate that the adjacent-channel protection ratio is more sensitive to a modification of the amplitude/frequency response at the receiving end than at the transmitting end of the system. From an economic point of view, however, it may be undesirable to improve receiver selectivity. Further studies are necessary before a final decision can therefore be made.

RECOMMENDATION 412-3 *

PLANNING STANDARDS FOR FM SOUND BROADCASTING AT VHF

(Question 46/10, Study Programme 46L/10)

(1956-1959-1963-1974-1978-1982)

The CCIR

UNANIMOUSLY RECOMMENDS

that the following planning standards should be used for frequency-modulation sound broadcasting in band 8 (VHF):

* The Director, CCIR, is requested to bring this Recommendation to the attention of the IEC, so that it may inform manufacturers of FM receivers accordingly Serious difficulties have been encountered in introducing stereophonic FM services planned according to the standards given in this Recommendation Special attention should be directed to § 2.3 which sets out the problems which will arise if the required design characteristics of such receivers are not met.

1. Minimum usable field strength

In the presence of interference from industrial and domestic equipment (for limits of radiation from such equipments refer to Recommendation 433, which gives the relevant CISPR recommendations) a satisfactory service requires a median field strength (measured 10 m above ground level) of at least:

1.1 *for the monophonic service:*

48 dB(μV/m) in rural areas,

60 dB(μV/m) in urban areas,

70 dB(μV/m) in large cities;

1.2 *for the stereophonic service:*

54 dB(μV/m) in rural areas,

66 dB(μV/m) in urban areas,

74 dB(μV/m) in large cities.

Note. – In the absence of interference from industrial and domestic equipment, a field strength (measured 10 m above ground level) of at least 34 dB(μV/m) or 48 dB(μV/m) can be considered to give an acceptable monophonic or stereophonic service, respectively. These field-strength values apply when an outdoor antenna is used for monophonic reception, or a directional antenna with appreciable gain for stereophonic reception (pilot-tone system, as defined in Recommendation 450).

2. Protection ratios

2.1 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.

2.2 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.

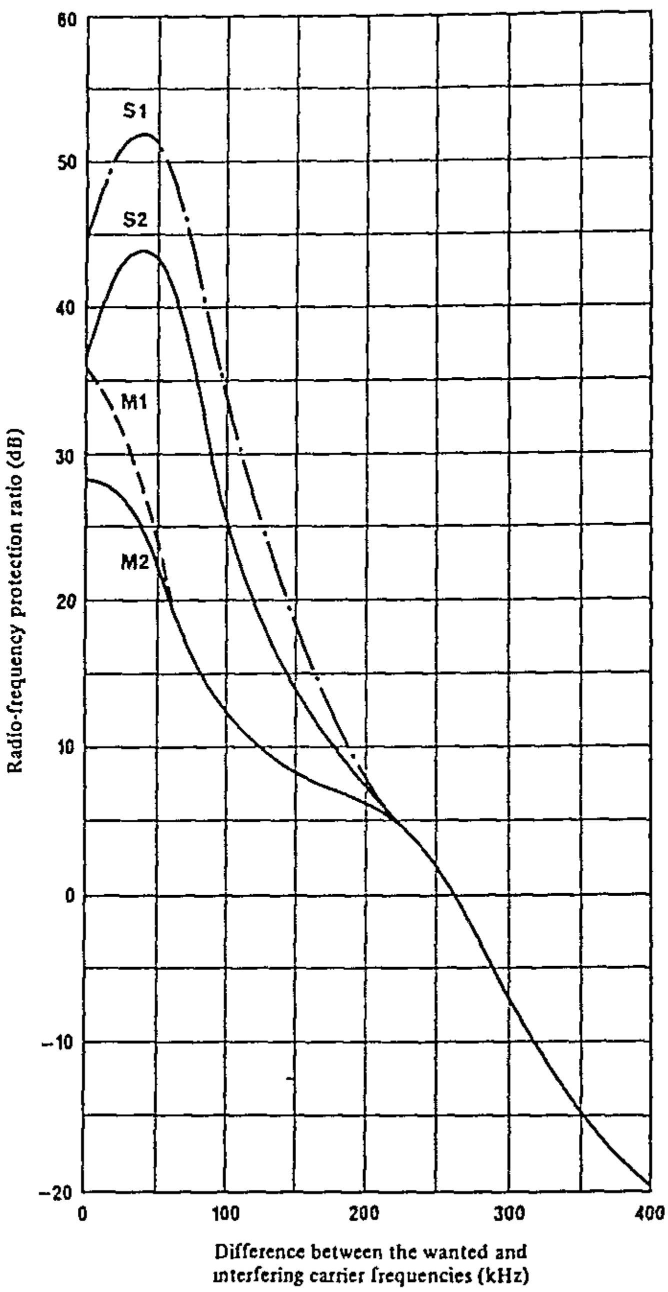

FIGURE 1 – *Radio-frequency protection ratio required by broadcasting services in band 8 (VHF) at frequencies between 87.5 MHz and 108 MHz using a maximum frequency deviation of ± 75 kHz*

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)

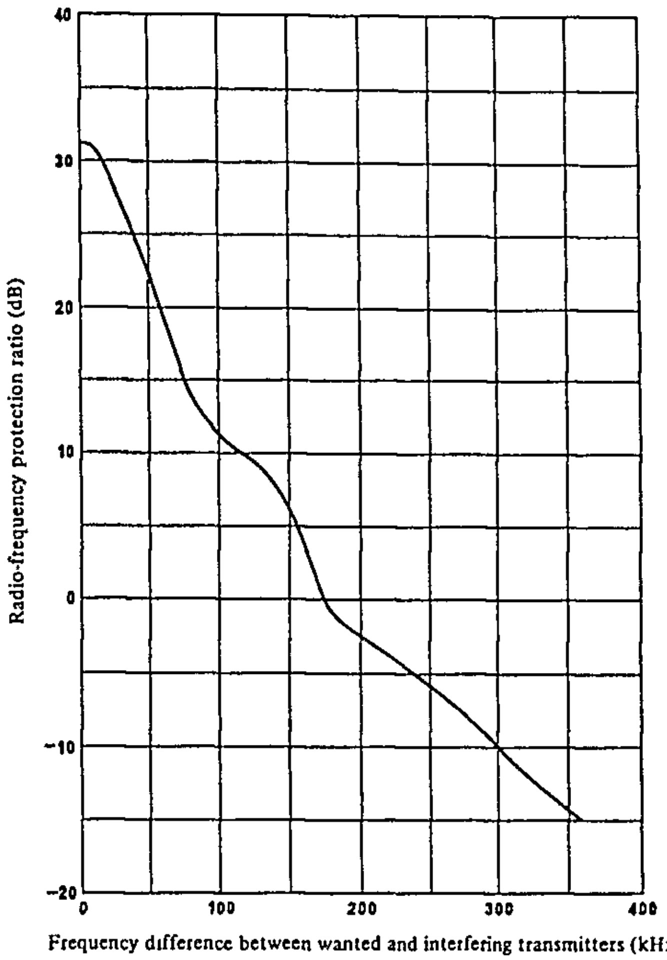

FIGURE 2 – *Radio-frequency protection ratios for monophonic sound broadcasting in band 8 (VHF) using a maximum frequency deviation of ± 50 kHz*

Tropospheric interference (protection for 99% of the time)

TABLE I

Frequency spacing, (kHz)	Radio-frequency protection ratio (dB)			
	Monophonic		Stereophonic	
	Steady interference	Tropospheric interference	Steady interference	Tropospheric interference
0	36	28	45	37
25	31	27	51	43
50	24	22	51	43
75	16	16	45	37
100	12	12	33	25
150	8	8	18	14
200	6	6	7	7
250	2	2	2	2
300	− 7	− 7	− 7	− 7
350	− 15	− 15	− 15	− 15
400	− 20	− 20	− 20	− 20

2.3 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.

2.4 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 1 – The protection-ratio curves in Fig. 1 were originally determined by subjective evaluation of interference effects. As subjective tests are rather time-consuming an objective measuring method was developed (see Report 796) and found to yield results which are in fair agreement with those of subjective tests.

Note 2 – In determining the characteristics of the filters whose phase response is important in the preservation of channel separation at high audio frequencies, reference should be made to Report 293, particularly Table I and Figs. 2, 3 and 4.

Note 3 – 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.

RECOMMENDATION 450-1

TRANSMISSION STANDARDS FOR FM SOUND BROADCASTING AT VHF

(Question 46/10)

(1982)

The CCIR

UNANIMOUSLY RECOMMENDS

that for FM sound broadcasting in band 8 (VHF) the following transmission standards should be used:

1. Monophonic transmissions

1.1 *RF signal*

The radio-frequency signal consists of a carrier frequency-modulated by the sound signal to be transmitted, after pre-emphasis, with a maximum frequency deviation equal to:

± 75 kHz or ± 50 kHz.

1.2 *Pre-emphasis of the sound signal*

The pre-emphasis characteristic of the sound signal is identical to the admittance-frequency curve of a parallel resistance-capacitance circuit having a time constant of:

50 µs or 75 µs.

Note 2. – In Europe, the pre-emphasis is 50 µs. In the United States, it is 75 µs

2. Stereophonic transmissions

2.1 *Polar-modulation system*

2.1.1 *RF signal*

The radio-frequency signal consists of a carrier frequency-modulated by a baseband signal, known in this case as the "stereophonic multiplex signal", with a maximum frequency deviation equal to:

± 75 kHz or ± 50 kHz (see Note 1, § 1).

2.1.2 *Stereophonic multiplex signal*

This signal is produced as follows:

2.1.2.1 A signal M is formed equal to one half of the sum of the left-hand signal, A, and the right-hand signal, B, corresponding to the two stereophonic channels. This signal, M, is pre-emphasized in the same way as monophonic signals (see § 1).

Note 1. – M is a "compatible" signal in the sense that the stereophonic transmission may be received by a monophonic receiver equipped for the same maximum frequency deviation and the same pre-emphasis.

2.1.2.2 A signal S is produced equal to one half of the difference between signals A and B mentioned above. This signal, S, is pre-emphasized in the same way as signal M. The pre-emphasized signal, S, is used for the amplitude modulation of a sub-carrier at 31.25 kHz; the spectrum of the amplitude-modulated sub-carrier is formed so that the sub-carrier amplitude is reduced by 14 dB and the spectral components of the given modulating signal appear to be transformed as follows:

$$\overline{K}(f) = \frac{1 + j\,6.4\,f}{5 + j\,6.4\,f}$$

where f is equal to each frequency component in kHz.

2.1.2.3 The stereophonic multiplex signal is the sum of:

- the pre-emphasized signal, M;
- the sideband spectral components which are the product of amplitude-modulated unsuppressed carrier by a pre-emphasized signal S additionally transformed from the law $\overline{K}(f)$:
- the sub-carrier with the amplitude reduced by 14 dB.

2.1.2.4 The amplitudes of the various components of the stereophonic multiplex signal, referred to the maximum amplitude of that signal (which corresponds to the maximum frequency deviation) are:

- signal M: maximum value 80% (A and B being equal, and in phase);
- signal S: maximum value 80% (A and B being equal but of opposite phase);
- reduced sub-carrier at 31.25 kHz, maximum residual amplitude 20%

2.1.2.5 The frequency modulation is arranged in such a way that positive values of the multiplex signal correspond to a positive frequency deviation of the main carrier and negative values to negative frequency deviation

2.2 *Pilot-tone system*

2.2.1 *RF signal*

The radio frequency signal consists of a carrier frequency-modulated by a baseband signal, known in this case as the "stereophonic multiplex signal", with a maximum frequency deviation equal to:

± 75 kHz or ± 50 kHz (see Note 1, § 1).

2.2.2 *Stereophonic multiplex signal*

This signal is produced as follows:

2.2.2.1 A signal *M* is formed equal to one half of the sum of the left-hand signal, *A*, and the right-hand signal, *B*, corresponding to the two stereophonic channels. This signal, *M*, is pre-emphasized in the same way as monophonic signals (see § 1) (see Note 1, § 2).

2.2.2.2 A signal *S* is produced equal to one half of the difference between signals *A* and *B* mentioned above. This signal, *S*, is pre-emphasized in the same way as signal *M*. The pre-emphasized signal, *S*, is used for the suppressed-carrier amplitude modulation of a sub-carrier at 38 kHz ± 4 Hz.

Note 2. – The same effect is obtained by pre-emphasizing the left-hand signal *A* and the right-hand signal *B* before encoding. For technical reasons this procedure is sometimes preferred.

2.2.2.3 The stereophonic multiplex signal is the sum of:

- the pre-emphasized signal, *M*;
- the sidebands of the suppressed sub-carrier amplitude modulated by the pre-emphasized signal, *S*;
- a "pilot signal" with a frequency of 19 kHz exactly one-half the sub-carrier frequency

2.2.2.4 The amplitudes of the various components of the stereophonic multiplex signals referred to the maximum amplitude of that signal (which corresponds to the maximum frequency deviation) are:

- signal *M*: maximum value 90% (*A* and *B* being equal and in phase);
- signal *S*: maximum value of the sum of the amplitudes of the two sidebands: 90% (which corresponds to *A* and *B* being equal and of opposite phase);
- pilot signal: 8 to 10%;
- sub-carrier at 38 kHz suppressed: maximum residual amplitude 1%.

2.2.2.5 The relative phase of the pilot signal and the sub-carrier is such that, when the transmitter is modulated by a multiplex signal for which *A* is positive and $B = -A$, this signal crosses the time axis with a positive slope each time the pilot signal has an instantaneous value of zero. The phase tolerance of the pilot signal should not exceed ± 3° from the above state. Moreover, a positive value of the multiplex signal corresponds to a positive frequency deviation of the main carrier.

2.2.3 *Baseband signal in the case of a supplementary signal transmission*

If, in addition to the monophonic or stereophonic programme, a supplementary monophonic programme and/or supplementary information signals are transmitted and the maximum frequency deviation is ± 75 kHz, the following additional conditions must be met:

2.2.3.1 The insertion of the supplementary programme or signals in the baseband signal must permit compatibility with existing receivers, i.e. these additional signals must not affect the reception quality of the main monophonic or stereophonic programmes.

2.2.3.2 The baseband signal consists of the monophonic signal or stereophonic multiplex signal described above and having an amplitude of not less than 90% of that of the maximum permitted baseband signal value, and of the supplementary signals having a maximum amplitude of 10% of that value.

2.2.3.3 For a supplementary monophonic programme, the sub-carrier and its frequency deviation must be such that the corresponding instantaneous frequency of the signal remains between 53 and 76 kHz.

2.2.3.4 For supplementary information signals, the frequency of any additional sub-carrier must be between 15 and 23 kHz or between 53 and 76 kHz.

2.2.3.5 Under no circumstances may the maximum deviation of the main carrier by the total base signal exceed ± 75 kHz.

REPORT 628-2

AUTOMATIC MONITORING AND CONTROL OF TELEVISION OPERATION

(Question 15/11)

(1974-1978-1982)

1. Use of insertion reference signals (IRS) in the television studio complex

1.1 *Purpose of insertion reference signals*

Study Programme 12A/11 recognizes the possibility of using insertion signals as a reference and certification tool for adjustment of the waveform characteristics of a distorted programme signal, so that the original characteristics of the picture may be restored. Such insertion signals are called "insertion reference signals".

1.2 *Insertion points*

Insertion reference signals are inserted on the video signal at all certification points, that is, at all points where qualified personnel are present who can verify that the technical parameters of the programme signal are correct and that the content of the programme picture, as seen on a picture monitor, is also correct. The insertion reference signals stay with the programme signal at all times, and may only be erased and replaced at recertification points down-stream (if any).

As an example, the outputs of film and slide scanners, television cameras or vision mixers, etc., can be certification points; at these points technical personnel check that the inserted IRS are undistorted and that the programme signal parameters are correct. In particular, they verify that the level of the programme peak white does not exceed the level of the white bar in the IRS.

1.3 *Correction points*

Automatic correctors that can correct most of the linear distortions of the IRS signals are available on the market. The correctors may be used for instance automatically to correct luminance level, chrominance level, burst amplitude and sync amplitude, etc.

An automatic correction by means of IRS can be effected on the output of the switcher in the continuity suites that feed the distribution networks of television links; in this way, all signals distributed on the networks conform to the standard and to the artistic intention of the programme director. It should be noted that in the USA particular insertion reference signals (VIR) are fed throughout the television system, down to the user's television receiver, which could incorporate an IRS correction circuit.

Manual correction with IRS may be carried out at recertification points; this occurs in the case of a studio vision mixer that corrects, switches on the output and recertifies a remote signal such as one coming from a film scanner.

IRS may also be used to advantage to trim the alignment of television tape-machines when playing programme tapes. The output of television tape-machines can thus be considered to some extent as a correction point.

1.4 *Waveform of the national insertion reference signals*

Many countries believe that the waveforms adopted for IRS should preferably be the same as certain of the waveforms adopted for international insertion test signals (ITS) [CCIR, 1978-82a]. However, it may not be necessary to adopt all the ITS waveforms for certification purposes [CCIR, 1978-82b; Zaccarian, 1978]. Other countries prefer to use a different and much simpler waveform for the insertion reference signal. In any case, it is important to make sure that, at the input to the international distribution network, the IRS are deleted after they have been used to make the necessary corrections. This is in order to ensure that there is no possibility of confusion with ITS which may subsequently be inserted, in accordance with Recommendation 473.

The EBU has recommended [CCIR, 1978-82a] that its member organizations operating with 625-line 50 field television systems and wishing to introduce IRS should employ the signals shown in Figs. 1 and 2 (taken from Recommendation 473), preferably inserted in lines 17 and 330 respectively. If, for reasons of economy, it is desired to use only one of these signals, the signal shown in Fig. 1 should be inserted only in line 17, or alternatively, the signal shown in Fig. 2 should be inserted only in line 330.

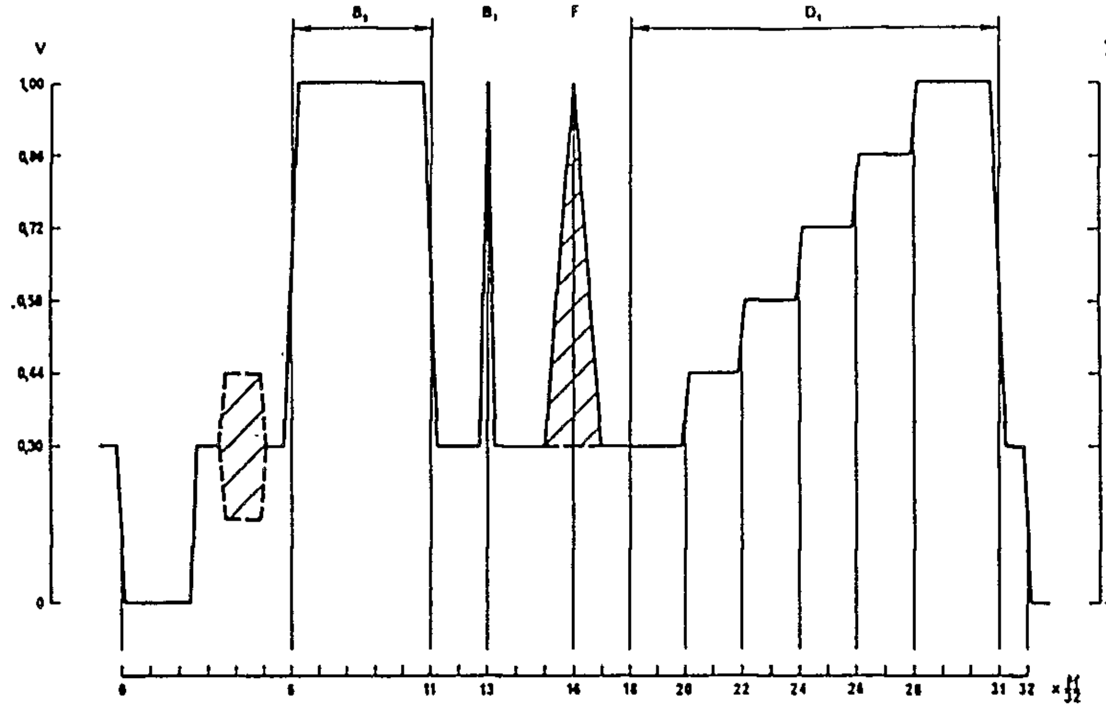

FIGURE 1 – *IRS signals recommended by the EBU for insertion in line 17*

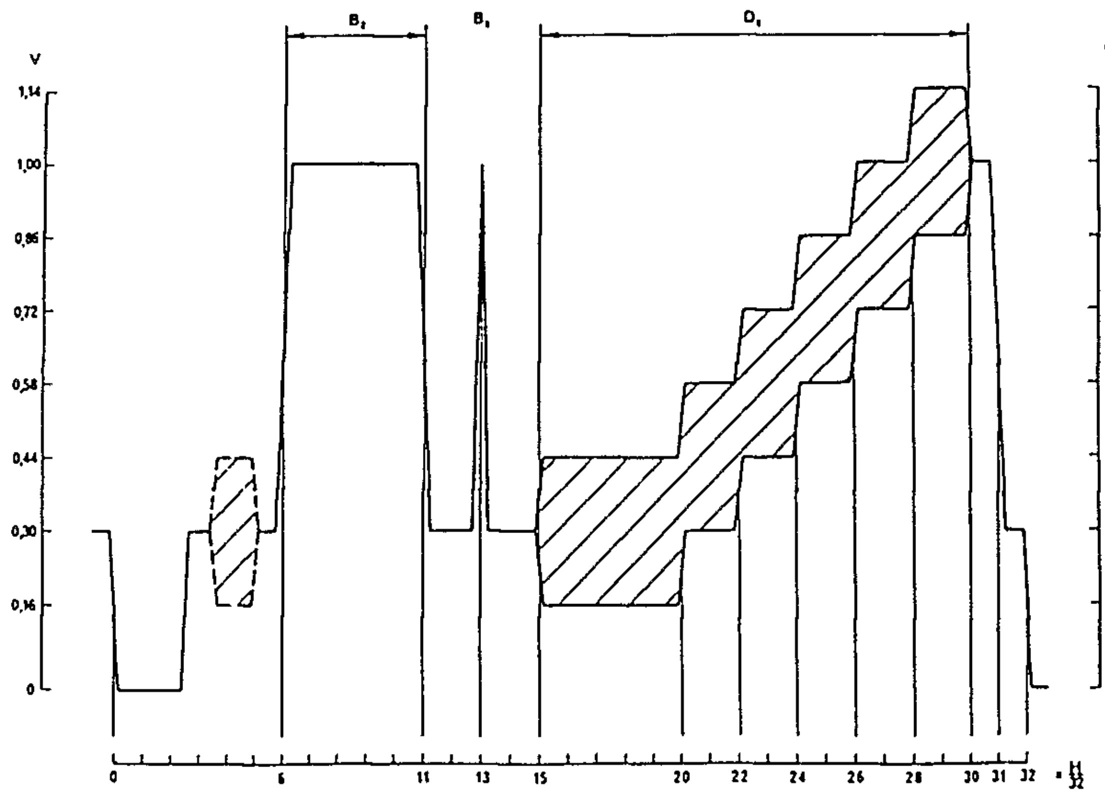

FIGURE 2 – *IRS signals recommended by the EBU for insertion in line 330*

2. **Use of insertion test signals (ITS) for the automatic monitoring of television transmitting stations**

During recent years, it has been the custom to design transmitting stations for unattended operation. This has led to a growing demand for automatic measuring systems capable of checking transmitter performance and providing alarms and status information for control stations. This automatic equipment is generally arranged to measure important characteristics of the television signal such as the synchronizing pulses, blanking intervals and the main features of an insertion test signal located in the field-blanking period. The equipment may also check the frequency of the vision and sound carriers and, in some cases, the continuity of the sound channel may be checked by detecting the presence of a super audio pilot signal. In the case of transposers, the insertion test signal measurement results may be regarded as sufficient evidence of correct operation of the sound channel.

The facilities needed for the automatic monitoring of a network of broadcasting stations may either be located at each of the stations to be monitored, or, in another method, a central master station may employ a more comprehensive system which is able to make measurements by direct reception of the remote stations. While the transmitter is in programme service, it is convenient to monitor the radio-frequency signal by feeding the measuring system from a high quality receiver or demodulator. A similar set of measurements may be needed for the point to point link network which distributes the signal to the main transmitting stations. Both sets of measurements may often be performed by the same operational system which is able therefore to supervise the link networks as well as the transmitters.

The recent emergence of the integrated circuit micro-processor has led to the design of equipment which allows wholly digital measuring techniques to be applied to on-site test line parameter analysis and noise measurement [James and Watson, 1975]. This approach results not only in greater versatility, but affords appreciable economies in both size and cost over comparable analogue measuring equipment capable of taking executive corrective action.

Report 411 discusses automatic methods of measuring and supervising video test signals. The methods decribed are equally applicable to the monitoring of transmitting stations.

Table 2-8-10

RECOMMENDATION 469-3 (Abstracts)

STANDARDS FOR THE INTERNATIONAL EXCHANGE OF TELEVISION PROGRAMMES ON MAGNETIC TAPE

(Question 18/11, Study Programme 18M/11)

(1970-1974-1978-1982)

The CCIR

UNANIMOUSLY RECOMMENDS

that the magnetic recordings used for the international exchange of television programmes should meet the following standards:

◎ **Specification for programme sound recording**

○ *General*

The sound reference level shall correspond to a recorded short circuit flux of 100 ± 10 nWb/m of track width, (r.m.s.), at 1000 Hz. (In some countries, a 400 Hz reference tone is used.) Normal operational practice will result in programme peaks corresponding to a maximum short circuit flux between 250 and 310 nWb/m, (r.m.s.), i.e. about 9 dB above reference level. These maximum recorded levels correspond to the subjective overload level for television tape materials currently used for the international exchange of programmes.

Note 1. – In the case of Type B recordings a sound reference level corresponding to a short circuit flux of 90 ± 5 nWb/m is presently employed. However, the question of increasing this value to 100 nWb/m is under review.

Note 2. – When the programme peaks are measured by means of a programme meter, due account should be taken of the integration time of the instrument (see Report 292).

○ *Transverse-track recording*

The television programme sound shall be recorded on the audio track only. In accordance with IEC Publication 94, the recording characteristic corresponds to a time constant of 35 μs, for a speed of 38.1 cm/s (15 in./s) (Many countries use an additional time constant of 2000 μs.)

○ *Type B and Type C recording*

The monophonic sound signal shall be recorded on audio track 1. For stereophonic recording, audio track 1 shall carry the left channel and audio track 2 the right channel.

Note – In Type B recording, audio track 1 is the edge track and audio track 2 the inner track. In Type C recording, audio track 1 is the inner track and audio track 2 the edge track.

◎ **Specification for cue signal recording**

In the case of transverse-track recording, the cue track should not contain information which needs to be reproduced for the exchange of broadcast programmes, except by mutual agreement, when a time and control code signal, or contributions to the final programme sound, such as sound effects, may be recorded on the cue track.

Editing

Electronic editing

Editing of tapes intended for the international exchange of programmes should be carried out electronically.

Electronic editing shall maintain an off-tape synchronizing pulse train with a phase relationship to the playback reference of the machine sufficiently close to avoid visible disturbance of the picture.

Mechanical editing splices

Tapes for international exchange should not contain mechanical editing splices. However, in the case of transverse-track recording only, and where, by prior arrangement, tapes are exchanged which contain such splices, the splices should be in accordance with good operational practices (see EBU Publication Tech 3084-1975).

Composition and duration of leaders and trailers

Leader and trailer sections should be located on the tape in conformity with the sequence shown in Table I.

TABLE I

Tape section		Duration (s)	Picture	Sound (on any channel carrying programme sound)	Control track signal
Leader	Protection leader	10 (minimum)	*Blank tape*		
Leader	Alignment leader	60 (minimum)	Alignment signal([1])	1000 Hz at reference level([2])	Uninterrupted
Leader	Optional	5 (maximum)	Blank tape		
Leader	Identification leader	15 (minimum)	Programme identification	Spoken identification preferred, or silence	Uninterrupted
Leader	Cue-up leader	8	Black or cue([4])	Silence or cue	
Leader		2	Black ([4])	Silence	
Programme([3])		Playing time of programme	*Programme*		
Run-out trailer		30 (minimum)	Black ([4])	Silence	

([1]) Examples of suitable alignment signals for transverse-track recordings in 625-lines, 50 field/s systems are given in Annex I

([2]) See § 2 I

([3]) Where the time and control code is recorded on the assigned longitudinal track (see § 3), the time indication of the programme start should be shown on the label accompanying the tape (see § 8 3)

([4]) In the case of colour recordings the black signal should be colour black. It is desirable that the colour field sequence (8 fields in PAL, 4 fields in NTSC) should continue uninterrupted in relation to the beginning and end of the programme recording

◎ Programme identification

o At least the following information should be supplied with each recorded television tape:

- name of the organization which made the recording;
- title of programme, or title, sub-title and episode number;
- total number of spools, and number of the spool in the sequence when the programme is contained on more than one spool;
- reference number (library number) of programme or of tape;
- total playing-time, and playing-time of the programme material recorded on the tape;
- in the case of 25.4 mm (one-inch) recording: the format, i.e., Type B or Type C;
- line and field system (625/50 or 525/60);
- in the case of transverse-track recording, the recording standard ("high band" or "low band");
- indication of the colour system, for colour recordings;
- which audio tracks have been used;
- the content of each audio track;
- in the case of Type C recordings, whether the sync. track is recorded.

The information required in § 8.1 shall be provided in at least one of the official languages of the ITU.

The information required in § 8.1 shall be provided on labels affixed both to the programme spool and its container.

ANNEX

EXAMPLE OF TEST SIGNALS FOR USE IN ADJUSTING TELEVISION TAPE MACHINES

(625-line systems)

The present EBU recommendation for test signals to be used in adjusting transverse-track television tape machines for 625-line television systems, is shown below. Test signals for Type B and Type C recordings have not yet been specified

In the original EBU recommendation for reference tapes, it is required that the recording be made on a specific type of television tape, which is chosen because it is representative of the tapes currently found in operation.

1. *Test signals to be recorded on the leaders of television tapes*

The alignment video signal on the tape leader indicated in § 5 of this Recommendation, for adjusting the reproducing machine so that the best picture quality may be obtained, should conform with the following specifications:

1.1 for monochrome television recording and SECAM colour television recordings:

- a black-level bar, a white-level bar and, if desired, a Gaussian pulse;
- a frequency "multi-burst";
- a grey-scale or a "saw-tooth" signal.

These signals should appear simultaneously. The part of the picture carrying each signal should be greater than the area scanned by one complete revolution of the head wheel:

1.2 for PAL colour television recordings:

- on the upper part (at least one third) of the picture, a conventional test pattern of colour bars;
- on the lower part (at least one third) of the picture, a uniform area having the same signal as the red bar.

Note. – The colour bar signal chosen for the leader is of the type 100/0/75/0 (according to the nomenclature of Recommendation 471). In the United Kingdom it is of the type 100/0/100/0 and may be followed by a length of dubbed colour bars.

2. Signals to be recorded on the EBU reference tapes

Two types of reference tapes for television tape machines have been standardized for the member organizations of the EBU. They are intended to satisfy two different requirements:

- the physical embodiment of the recording standards used (see § 2.1);
- verification of the characteristics and rapid operational alignment of television tape-machines (see § 2.2).

Tapes of these two types shall have the following characteristics:

2.1 *Primary-standard reference tape*

This tape consists of five successive parts, each of them having a duration of three minutes. The different parts are recorded with the following signals occupying the full frame:

2.1.1 a multiburst signal consisting of six bursts at different frequencies, as specified by the CCIR for insertion in line 18; but preceded by a signal giving the white- and black-reference levels;

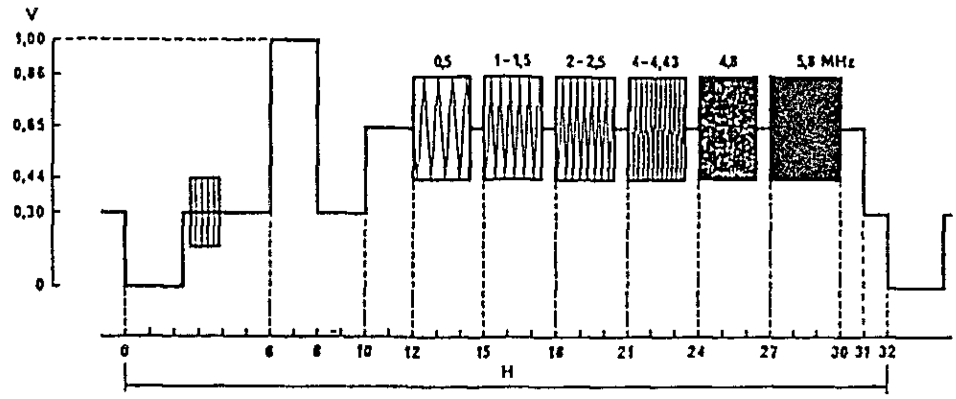

FIGURE 1

2.1.2 the signal specified by the CCIR for insertion in line 17, consisting of the following components: luminance bar, $2T$ sine-squared pulse, composite $20T$ pulse and 5-riser luminance staircase without chrominance signal;

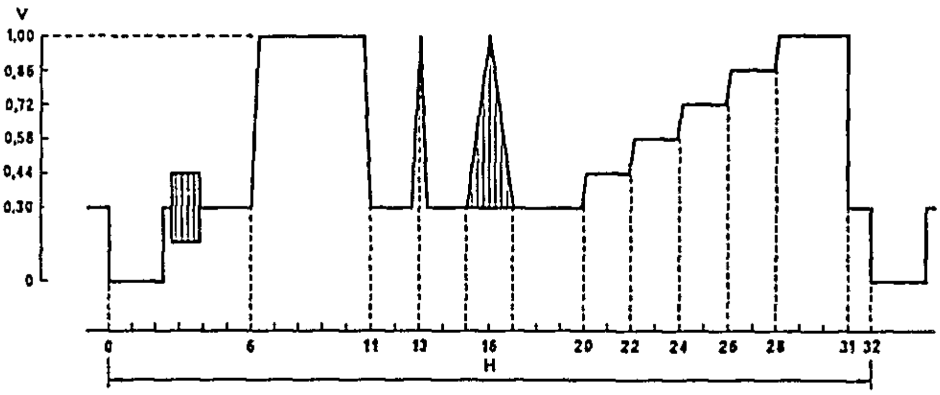

FIGURE 2

2.1.3 the signal specified by the CCIR for insertion in line 330 and consisting of the following components: luminance bar, $2T$ sine-squared pulse and 5-riser luminance staircase with superimposed sub-carrier;

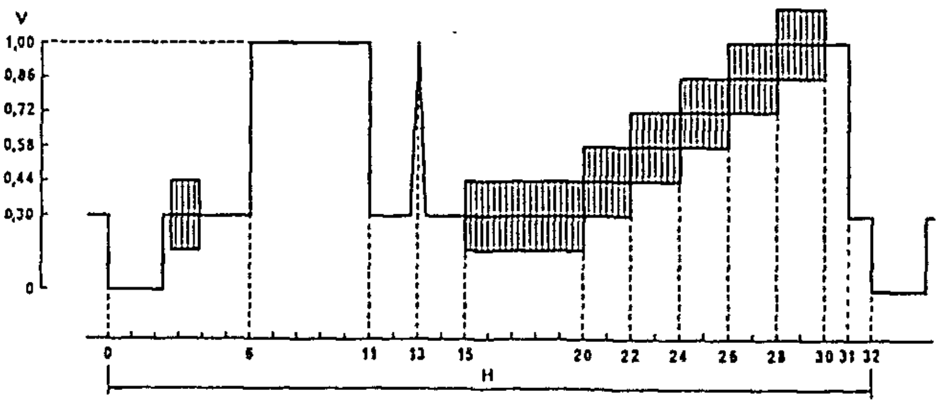

FIGURE 3

2.1 4 a uniform area generated by a sub-carrier of 0 7 V (peak-to-peak) on a luminance level of 50% of the black-to-white transition extending from the beginning to the end of the line (this signal is intended for measurements of moire and for verification of the correct reproduction of the phase of the colour sub-carrier):

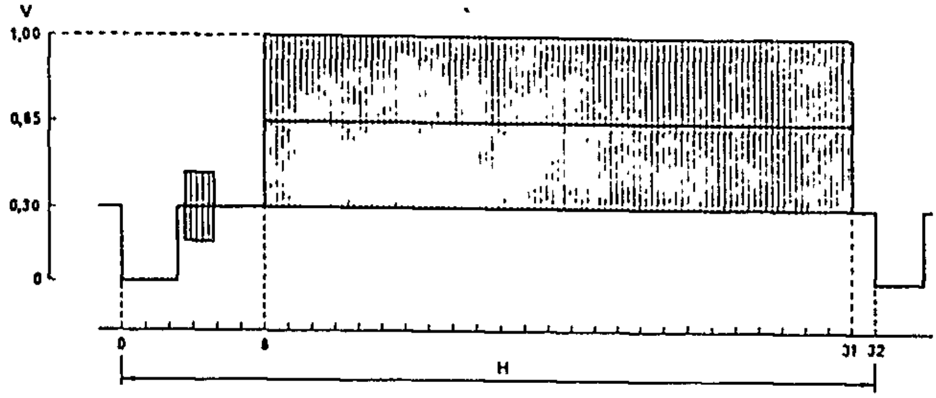

FIGURE 4

2.1.5 a uniform grey area obtained with a luminance level of 30% of the black-to-white transition (this signal is intended for noise measurement).

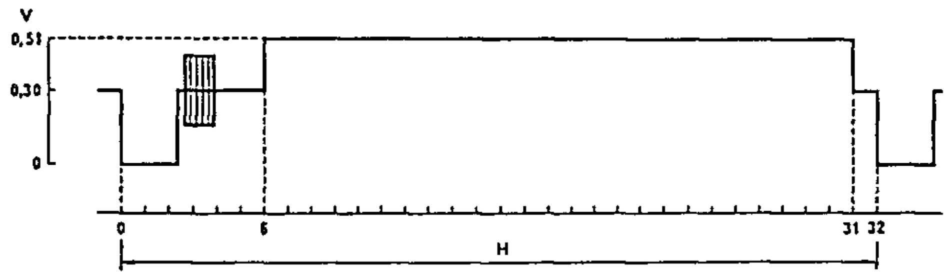

FIGURE 5

All these signals shall include the standard PAL alternating sub-carrier burst during the line-blanking interval. The phase of the sub-carrier used in § 2.1 3 and 2.1.4 shall correspond to the $B-Y$ axis referred to the PAL burst.

The recording of these signals shall conform to all the characteristics specified in the relevant EBU, CCIR and IEC documents.

The various recorded sections shall be separated by 15 s of black. The beginning and the end of the tape shall also consist of 15 s periods of black

The cue track shall be without any recording.

The sound track shall be recorded with alternate announcements in French and English, thus: "EBU reference-tape – bande-étalon de l'UER", followed by the indication of the serial number of the tape, the date of the recording and the name of the manufacturer.

2.2 *Alignment tape for quick verification of the machines*

This operational reference tape shall be recorded with a picture divided into two equal halves in the following way:

2.2.1 the upper half of the picture shall consist of the CCIR insertion signal specified for line 330 repeated on each line. luminance bar, $2T$ sine-squared pulse and 5-riser luminance staircase with *superimposed sub-carrier*,

2.2 2 the lower half of the picture shall consist of the type 100/0/75/0 colour-bar signal (conforming to Recommendation 471)

Both these signals shall include the standard PAL alternating sub-carrier burst during the line-blanking interval. The phase of the sub-carrier used in § 2.2.1 shall correspond to the *B-Y* axis referred to the PAL burst.

The recording of these signals shall conform to all the characteristics specified in the relevant EBU, CCIR and IEC documents.

The cue track shall be without any recording.

The sound track shall be recorded with alternate announcements in French and English, thus: "EBU alignment tape – bande de réglage UER", these announcements being interrupted with a few seconds of 1000 Hz tone at the reference level of 100 nWb/m as indicated in this Recommendation.

Table 2-8-11

REPORT 412-3

TRANSMISSION TIME DIFFERENCES BETWEEN THE SOUND AND VISION COMPONENTS OF A TELEVISION SIGNAL

(Study Programme 21A/CMTT)

(1966-1970-1974-1978)

1. Introduction

In the early days of long-distance television transmission, when the video and sound were transmitted via different facilities, there occasionally existed a perceptible lack of simultaneity between sound and vision. Over the intervening years, the networks have been improved. Today, even though the sound and vision of a television programme may be transmitted via different facilities, the transmission velocities used, are such that little or no lack of simultaneity between sound and vision is experienced.

With the advent of satellite-communication systems, where the sound and vision signals may be transmitted via different media, difficulties may exist at the receiver location because of the lack of synchronization of sound and vision.

2. Conclusions based on observer reaction

Studies of observer reaction to non-simultaneous presentation of pictures and associated sound were reported in [CCIR, 1963-66a and b; CCIR, 1966-69]. General conclusions may be drawn from these experiments.

2.1 *Qualitative conclusions*

The observer is more sensitive to sound advances than to sound delays with respect to the correlated visible action.

Observer tolerance to sound/vision time differences varies according to the nature of the action. For example, the objectionable effects of the more easily correlated actions and sounds (such as the percussive sound produced by an object being struck) are detected at considerably shorter time differences than are lip motions of a speaker and the corresponding sounds. For scenes of people moving about, correlation between sound and action becomes more difficult for the observer to detect.

2.2 *Quantitative conclusions*

Although the conditions under which the experiments in Canada, the United States of America and the Federal Republic of Germany were conducted differed widely, the results were in broad agreement. In terms of these results, it is possible to derive some provisional figures for overall tolerance to the lack of simultaneity between the sound and the picture.

2.2.1 *Sound delayed*

For sound delayed with respect to vision, 140 ms will produce, approximately, a "just perceptible impairment" for 50% of the observers.

2.2.2 *Sound advanced*

For sound advanced with respect to vision, 70 ms will produce, approximately, a "just perceptible impairment" for 50% of the observers.

2.2.3 The above figures based upon the experiments in Canada and the United States of America are more stringent than necessary in some circumstances, but they allow for some evidence that sensitivity to sound/vision time differences might be greater for some languages than for English in which the first experiments were conducted

The experiments in the Federal Republic of Germany [CCIR, 1966-69] have confirmed the above figures using a percussion test which constitutes the most critical case. Moreover, it was found that the tolerances depend very little on the different programme material used. Hence the conclusion may be drawn that the same holds true for other programme material and languages which were not included in the tests

3. The problem of division of time differences among the links of a built-up connection

The figures cited in § 2.2 must be divided between acoustic links (sources to studio microphone, and television receiver to observer) and electrical links The electrical links may in turn be subdivided between the broadcasting facilities and the telecommunications transmission networks. Very little information is available on which a practical division may be based, but this is being studied under Question 35/11.

As an example, in the United States of America, where a variety of programme material is transmitted, it has been found economically feasible on transmission networks to limit sound delay relative to the vision component of a television programme by not more than 50 ms, and sound advance by not more than 25 to 30 ms, at the receiving location. The advance or delay of sound of a television signal that may be introduced because of the difference in transmission velocities on network facilities, can be determined. The advance or delay figures of sound indicated are primarily concerned with the long-distance portion of the network and do not include the inter-city or other contributing sources to the time difference of sound and vision components of the television signal. Other electrical and acoustic links make up the remainder of the sound/vision time difference.

4. Responsibility for making necessary corrections of time differences (Study Programme 21A/CMTT)

If the sound and vision components of a television signal are transmitted along the same route, and by the same method, there will be no perceptible time difference between the two signals. Where such common routing is not feasible Administrations are urged to provide circuits resulting in time difference values as low as possible.

If, in spite of this, considerable time differences should occur, it should normally be the responsibility of the broadcasting authorities concerned to make the necessary corrections.

This arrangement seems to be most appropriate for the following reasons:

- as the two channels only have to coincide at the source and at the destination there is a greater flexibility for routing of channels;
- in general, broadcasting authorities will have various possibilities open to them to effect such corrections so that there is no need for the Administration and/or recognized private operating agencies to provide such equipment.

5. Methods of controlling time differences between sound and vision signals on long-distance connections

In a circuit of 2500 * km, the delays are as follows:

- for an individual modulation/demodulation equipment for high-quality sound transmission over carrier links (15 kHz): less than 3 ms;
- for modulation/demodulation equipment for sound transmission on a television circuit, e.g. systems given in Report 488: a few microseconds;
- where sections forming the circuit wholly comprise one of the following transmission media:
  - free space: 8.3 ms;
  - radio-relay links: 8.4 ms;
  - coaxial pair 2.6/9.5 mm (CCITT standard): 8.9 ms;
  - coaxial pair 1.2/4.4 mm (CCITT standard): 10.0 ms;
  - loaded lines:
    - 6.4 kHz bandwidth: 52.0 ms;
    - 10 kHz bandwidth: 40.0 ms;
    - 15 kHz bandwidth: 25.0 ms.

The time differences mentioned in § 2 will not be exceeded in practical applications if the following rules are observed:

- in the case of satellite transmissions, both the picture and the sound components should be transmitted via the same satellite;
- for terrestrial transmission, the television-sound circuit should not employ significant lengths, (e.g. not more than 100 km), of the following:
  - loaded circuits,
  - audio-frequency or carrier-frequency circuits, the basic delay of which is substantially increased by delay equalization.

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* The length of 2500 km corresponds to the length of the hypothetical reference circuit for television given in Recommendation 567, and also to the length of the hypothetical reference circuit for sound-programme transmission given in Recommendation 502.

6. Further work

Contributions are invited from various Administrations based on experience and practice with regard to the following:

- the minimum time-difference which is generally considered practicable to achieve in long circuits;
- new experiments which introduce conditions beyond those previously used.

With regard to methods of controlling sound/vision time differences arising on the long-distance circuits, Administrations are invited to study § 5 above to determine its suitability as a basis for a new Recommendation.

REFERENCES

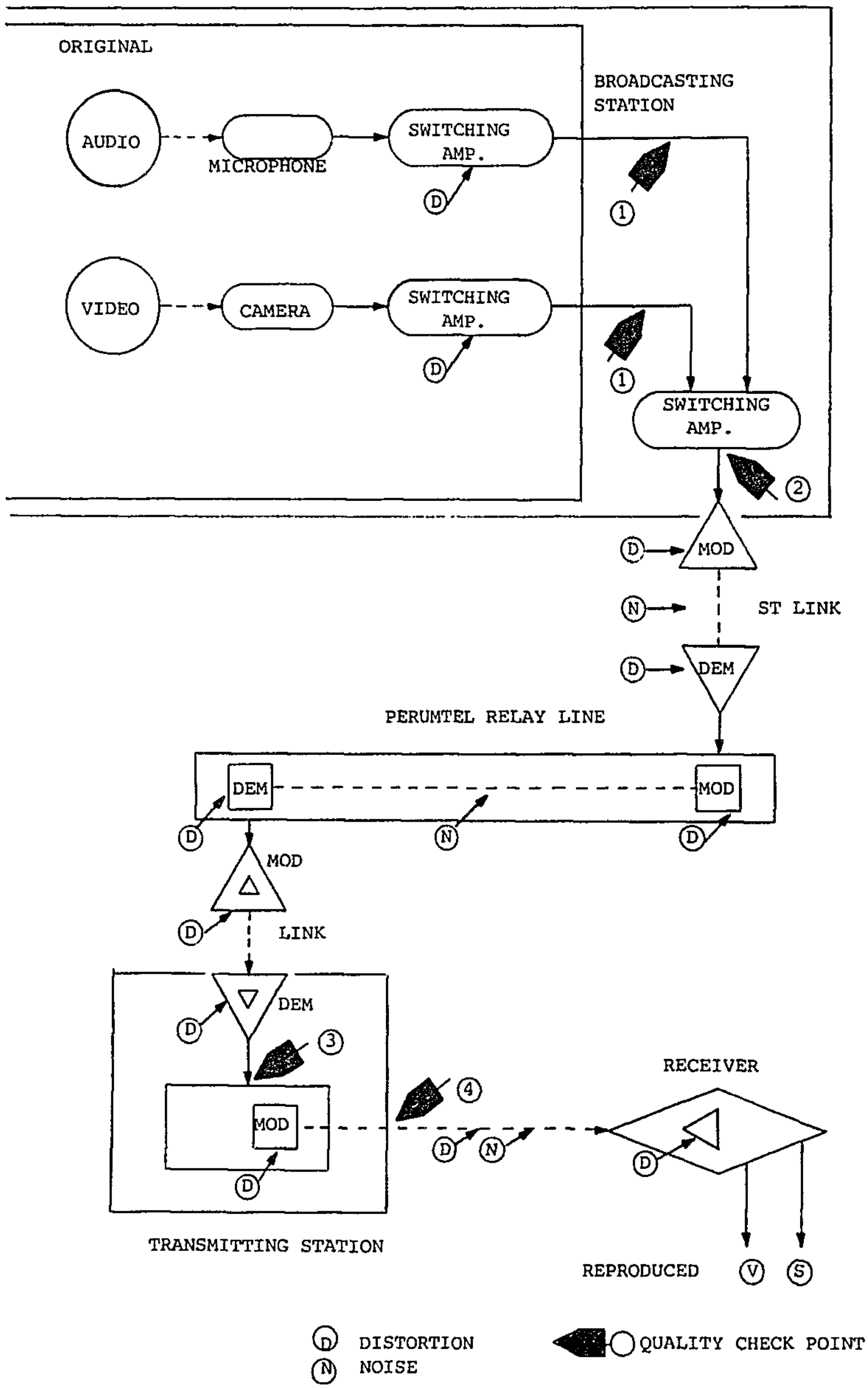
CCIR Documents

[1963-66]. a. CMTT/1 (Canada); b. CMTT/12 (United States of America).

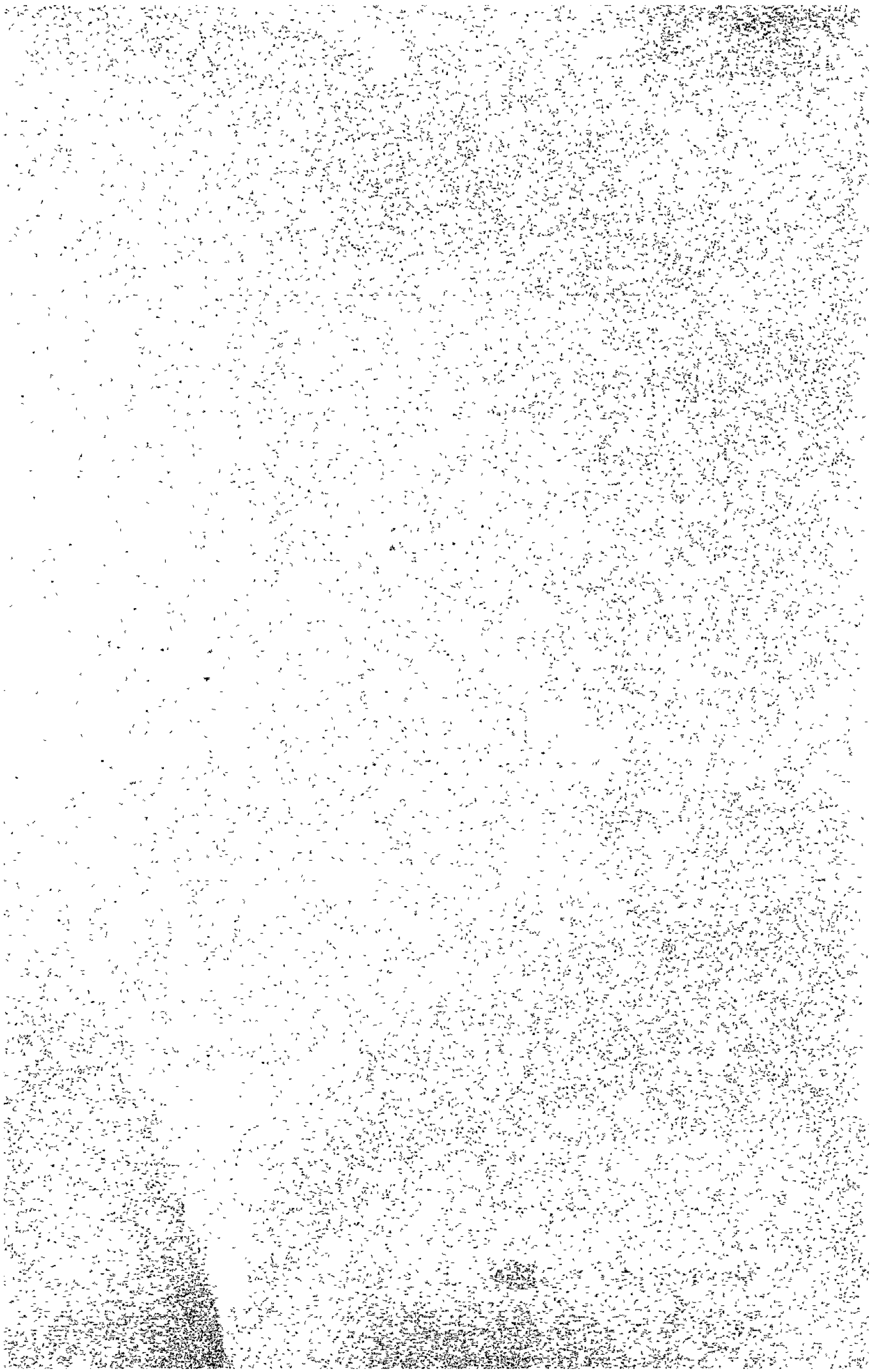
[1966-69]: CMTT/55 (Federal Republic of Germany).

Fig. 2-8-1

Model Route of Radio/TV Signal from Station to Receiver



第９章　　要　員　計　画



第9章　要 員 計 画

第１部のラジオ，テレビ全国放送のための番組制作設備，送信設備の拡充計画の完結時における要員増加の予測については，第４編第４章の要員計画において一括記述するが，第１部に関連する部分を抜粋すると以下のとおりである。

９－１　送信設備関係要員

ラジオ，テレビ送信設備関係要員……………３５３名

内訳は以下各項のとおり。

(1)　中，短波送信所要員……………１６１名

ＲＮ－Ｉ放送を２４時間体制とするため各放送所の勤務を３交替から４交替制に改めることによる増員

小 電 力 局	３名×３８局＝１１４名
大 電 力 局	４名×１０局＝　４０名
ジャカルタ	７名
計	１６１名

(2)　海外放送用短波送信所……………５７名

内　訳

所　　長	1
技 師 長	1
管理事務	3
線表勤務（４交替制）	
番　　組	5
送信技術	25
電　　力	10
保　　守	12

(3)　ＦＭ放送所……………１１１名

テレビ送信所併設３７局*

１局当り１名２交替……………３名

3名×37局=111名

注：局数が増加することがあるが，要員は特に増加しない。

(4) 新設TV放送所……………24名

無人運用として保守要員を基幹局12局に2名ずつ増員する。

2名×12局=24名

(5) その他の送信機増設局には増員しない。

9－2　演奏設備関係要員

ラジオ，テレビ演奏設備要員……………297名

内訳は以下各項のとおり。

(1) ジャカルタ中央局……………72名

a. RN－Ⅰ番組系統の24時間放送，RN－ⅡおよびⅢ番組系統の放送開始に備えて，本計画期間中にモノラル用スタジオ5室，ステレオ用スタジオ6室を増加するのに伴なう番組制作要員の増加を66名とする。

［1チーム3名（P. D., ミクサー，アナウンサー）として
1スタジオを2チームが交代して使用するとして
3名×2（チーム）×11（室）=66名］

b. ジャカルタ番組運行要員……………6名

(2) 地方局……………180名

地方局のスタジオ増設に伴なう補十分として，

ヌサンタラ局	各5名× 5(局)=	25名
リージョナル－Ⅰ	各4名×26(局)=	104名
リージョナル－Ⅱ	各3名×17(局)=	51名
	計	180名

(3)　ＭＰＵ運用要員……………４５名

ＭＰＵ運用要員１チーム５名として９局分

９－３　一般管理要員……………１３名

送信設備関係３５３名，演奏設備関係２９７名，計６５０名の要員増加に伴なう管理要員として増員分の２％を考え１３名。

９－４　要員増加合計……………６６３名

第10章　建設，運用経費

第１０章　建設，運用経費

１０－１　建 設 経 費

(1) 第４編の実施計画の第２章建設経費において述べた建設経費の算出条件に従って積算した建設経費総額は内貨分を含めて約2,０１３億Rpである。

(2) その内訳はTable ２－１０－１のとおりであり，５か年計画の各年次における機器の経費はTable ２－１０－２のとおりである。

１０－２　運 用 経 費

上記の建設の結果，新たに開設する放送施設数に比例して増加する運用経費の増加分および放送時間増に伴なう運用経費の増加分を過去の実績に基いて推定し算出した総額は約１４1.2億Rpである。

(1) 送信設備関係 …………… 2,2３８ mRp

a. 中波放送時間の３５％延長

過去実績総額 4,7４４mRp × 0.３５ = 1,6６０mRp

b. ＦＭ放送所開設

5 kW局 ……………	9	2１.2 × 9 =	1９0.8mRp
3 kW局 ……………	8	8.4 × 8 =	6７.2mRp
0.5 kW局 ……………	１２	4.0 × １２ =	４8.0mRp
0.3 kW局 ……………	5	4.0 × 5 =	２0.0mRp
0.1 kW局 ……………	3	4.0 × 3 =	１2.0mRp
		計	３３8.0mRp

c. ＴＶ送信所新設

１００Ｗ局……………５０局　4.8 × ５０ = ２４0.0mRp

(2) 番組制作関連運用経費 …………… 5,3００mRp

ジャカルタにおけるラジオ番組制作量，テレビ番組制作量の増加を過去の実績総量のそれぞれ３０％，１０％と想定して算出すると，ラジオ関係3,3００mRp，テレビ関係2,０００mRpとなる。

(3)　番組伝送回線借用量 …………… 4,500mRp

本計画の実施により増加する番組伝送パラパ回線は次のとおりである。

7kHz広帯域番組伝送回線………………… 2回線

テレビ番組伝送回線………………………… 1回線

専用電話回線網……………………………… 1系統

上記各回線の借用料はテレビ番組回線を除き実績がないので，パラパ衛星のトランスポンダ借用料を参考に推定した。

a.	テレビ番組伝送回線	3,520mRp
b.	ラジオ番組広帯域回線	980mRp（b.＋c.）
c.	専用電話回線網	
	計	4,500mRp

(4)　テープ複製，分配 …………… 1,200mRp

教育番組分配用テープ　　30,000本

ステレオ番組分配用　　　50,000本

を年間に消費するとして，テープ購入輸送経費を積算する。

15,000Rp × 80,000 = 1,200mRp

(5)　人件費 …………… 881.8mRp

要員増663名に対する人件費は前年度実績1名平均年133万Rpとして約881.8mRpとなる。

(6)　以上合計……………14，119.8 mRp

Table 2-10-1

Construction Cost

PROJECT	FOREIGN CURRENCY	LOCAL CURRENCY			
	EQUIPMENT COST AT INDONESIAN PORT	LAND	BUILDING & STRUCTURE	ROAD	TRANS PORTATION
1. MW. SW. TRANSMITTING FACILITIES	14,176.0		1,192.0		284.0
2. OVERSEAS SW. SERVICE	5,600.0	800.0	1,200.0	40.0	300.0
3. FM TRANSMITTING FACILITIES	15,224.0		366.0		
4. TV TRANSMITTING FACILITIES	15,324.0	1,000.0	4,000.0		
5. RADIO STUDIO FACILITIES	54,862.4		1,250.0		
6. TV STUDIO FACILITIES	26,020.0		648.0		
7. PROGRAM TRANSMISSION NETWORK	32,000.0				
SUB-TOTAL		1,800.0	8,656.0	40.0	584.0
	163,206.4	11,080.0			
CONSULTANT FEE (5%)	8,160.3	554.0			
(A) TOTAL	171.366.7	11,634.0			
(B) CONTINGENCY (10%)	17,137.0	1,163.0			
(A) + (B)	188,503.7	12,797.0			
GRAND TOTAL	201,300.7mRp				

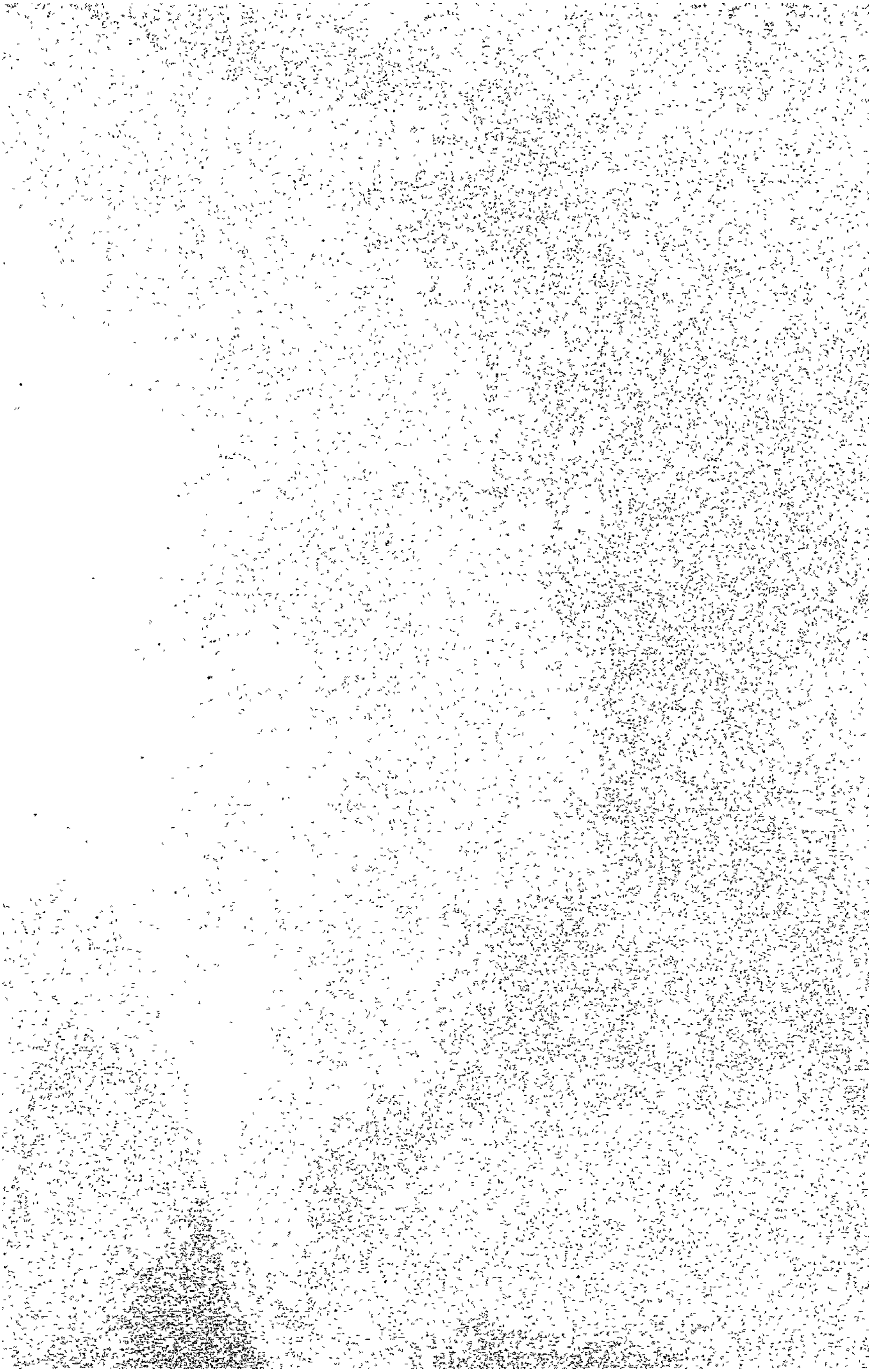
CONSTRUCTION COST (EQUIPMENT)

Table 2-10-2

(UNIT mRp)

PROJECT	FISCAL YEAR					TOTAL
	84/85	85/86	86/87	87/88	88/89	
1. MW. SW. TRANSMITTING FACILITIES	3,428.0	3,176.0	3,472.0	2,412.0	1,688.0	14,176.0
2. OVERSEAS SW. SERVICE			560.0	5,040.0		5,600.0
3. FM TRANSMITTING FACILITIES	4,620.0	2,516.0	2,684.0	2,148.0	3,256.0	15,224.0
4. TV TRANSMITTING FACILITIES	3,189.6	3,085.6	3,033.6	3,033.6	2,981.6	15,324.0
5. RADIO STUDIO FACILITIES	7,997.2	8,288.4	15,368.8	13,683.2	9,524.8	54,862.4
6. TV STUDIO FACILITIES	2,328.0	5,584.0	8,536.0	5,376.0	4,196.0	26,020.0
7. PROGRAMME TRANSMISSION NETWORK			16,000.0	8,000.0	8,000.0	32,000.0
SUB-TOTAL	21,562.8	22,650.0	49,654.4	39,692.8	29,646.4	163,206.4
CONSULTANT FEE(5%)						8,160.3
(A) TOTAL						171,366.7
(B) CONTINGENCY						17,137.0
(A) + (B)						188,503.7

第2部　TVN－Ⅱ放送網建設計画



第２部　ＴＶＮ－Ⅱ放送網建設計画

本計画は第１部のラジオ，テレビ総合計画と関連をもつものであるが，本計画期間中には局限された地域に対してＴＶＮ－Ⅱ放送をサービスするにとどめたため，全国放送と区別して第２部にまとめた。

第1章　番組計画

第1章　番組計画

1－1　現在ジャカルタにおいて第二テレビ放送として18時から30分間英語ニュースを放送している。これを土台として教育番組を中心とする本格的なTVN－Ⅱ放送番組を編成し，本計画期間中に下記の8都市においても視聴できるようにする。

1. ウジュンパンダン	5. パレンバン
2. メダン	6. デンパサル
3. スラバヤ	7. バリクパパン
4. ジョグジャカルタ	8. メナド

放送時間は当面1日13時間とし，西部標準時の午前7時から午後5時の10時間および午後7時から午前10時までの3時間を考えているが，番組制作能力の向上に応じて最終的には07：00から22：00まで連続して1日15時間の放送を行う。

1－2　番組の編成と制作

(1) 教育番組は情報省と他省との分担協力によって放送される。即ち番組素材，規格はそれぞれの担当各省，番組内容，番組制作形式，番組の制作と放送は情報省が受け持つ。また，放送効果の調査は情報省を含めた合同機関によって行う。

(2) 番組制作はジャカルタにおいて行うが，TVN－Ⅰ番組の制作用スタジオの増設を待って旧テレビスタジオを教育番組制作用に転用する。

(3) 教育番組の特徴は，一般のテレビ番組のように速報性の要求度が高くなく，むしろ継続性，反復性が要求される。

したがって，事前に番組を制作しテープに収録しておけば，放送スケジュールに従ってそれを再生して送出すること，後日同じ番組を反復して再放送することができる。

第2章　番組伝送計画

第２章　番組伝送計画

(1) 学校向け番組あるいは成人向け技能教育番組はカリキュラムに従って編成，企画，制作し録画することにより，放送に使用した後その録画テープは第２年度，第３年度の同じ教科課程に反復して使用できる。

(2) この様な条件を前提として次の２つの番組伝送方法について検討する。

Ｐｌａｎ－Ⅰ　ブルンテルのパラパ回線を利用する方法

この方法によれば全国のテレビ放送局に同時に伝送することができる。

このため，パラパのテレビ伝送回線を１日１４時間専用し，
送出端局（ジャカルタ）
受信端局（本計画期間には前述の８地方局）
にそれぞれテレビ信号用変調設備，復調設備を設置すると共に，地球局とテレビ放送所間の番組伝送回線を整備する。

Ｐｌａｎ－Ⅱ　録音テープ配布による方法

上記のごとく，ＴＶＮ－Ⅱ番組を事前に制作収録して，一連のシリーズ番組として保管しておけば，それを放送計画に従って逐次再生して放送することができるので，配布すべき局数が少ない場合には経済的でかつ簡便な方法である。但し，このためにはジャカルタにおいて配布用録音テープを複製する装置が必要であり，その保管，配布業務に数人の専門職員が必要となる。一方，配布局数が増加するに従ってテープ複製作業量が増加し，複製設備も大掛りになる。本計画期間らは，配布局数が８局に留まるのでパラパ回線借用料に比べてより経済的な運用が可能である。

(3) この２案について特質を検討した結果，本５か年計画期間はPlan－Ⅱのテープ配付方式により番組を伝送し，その間にパラパ伝送回線の整備を進めるのが適当であると判断したのが適当であると判断した。

但し，演放分離局であるメダン（バンダルバルー），デンパサル（ブキットバクン）およびメナド（マカウェインベン）についてはＳＴＬ装置を設備する。このうちメナドについては予備機も設置するが，メダンとデンパサルについてはFig. 2－2－1 のように既設のＴＶＮ－Ｉ用予備装置を共通予備とする。

Cost Comparison for Five Years Operation

Table 3-2-1

I. VIDEO TAPE DISTRIBUTION SYSTEM

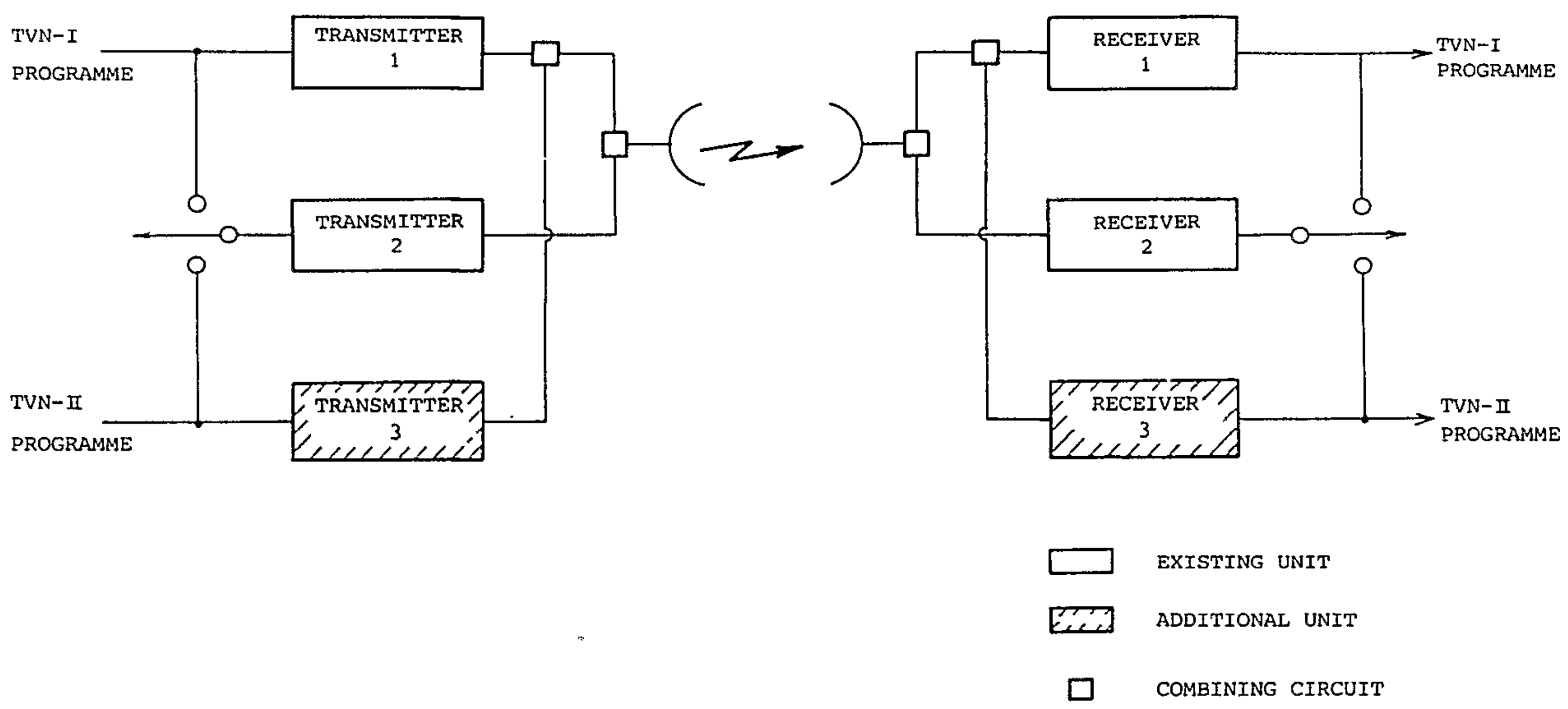
1. Construction Cost	2. Operation Cost per Year	3. Total Cost for Five Years Operation
17,578 mRp	4,065.6 mRp	20,328 mRp
a. Video Tape Duplication System at Jakarta 8,500,000 $	a. Tape Distribution Cost 550.0 mRp	
b. Playback VTR at 8 Local Stations 10,200,000 $	b. Depreciation Account 3,515.6 mRp	
c. Total 18,700,000 $ ▼ 17,578 mRp	c. Total 4,065.6 mRp	
d. Five Years Instalment 3,515.6 mRp		

II. VIDEO SIGNAL DISTRIBUTION SYSTEM VIA PALAPA NETWORK

1. Rental Fees to be paid to PERUMTEL	2. Operation Cost per Year	3. Total Cost for Five Years Operation
836,6 mRp	14,690 mRp	77,633 mRp
a. Palapa Transponder 750,000 $/year	a. Up-link (Jakarta) 73,000 $/year	
b. TX Terminal Equipment 25,645 $/year	b. Down-link (8 local stations) 14.8 m$/year	
c. RX Terminal Equipment 113,600 $/year	c. Microwave Link (9 stations) 755,500 $/year	
d. Total 889,660 $/year ▼ 836.6 mRp/year	d. Total 15,628,500 $/year ▼ 14,690 mRp/year	

Fig. 3-2-1

Common Standby STL System



第３章　　スタジオ設備整備計画

第３章　スタジオ設備整備計画

３－１　スタジオ設備

現在ジャカルタ（スナヤン）の新しいスタジオ棟内で進められている新スタジオ設備の整備が完了すると，従来のテレビスタジオ設備の一部がＴＶＮ－Ⅱ放送のための番組制作作用として転用できるようになるので，本計画期間中には新しいスタジオの整備は行なわない。

３－２　番組運行設備

ＴＶＮ－Ⅰ用番組送出設備２系統は目下ＴＶ局構内において移転整備中であるので，TVN－Ⅱ用番組送出設備１系統もこれに付接して整備することとして建設費を第４年度に計上してある。

３－３　教育番組録音テープ複製設備

１吋ＶＴＲを親機としカセットＶＴＲ（3/4吋または1/2吋）５台を子機とするテープ複製装置を２式整備する。

第４章　　伝送設備整備計画

第４章　送信設備整備計画

４－１　送 信 設 備

ＴＶＮ－Ⅱ番組を放送する送信設備は，原則としてＴＶＮ－Ⅰ用の送信設備と同等な規模とする。

４－２　送　信　所

送信所は既設のテレビ送信所構内に設け，送信条件をＴＶＮ－Ⅰと合わせると共に，鉄塔，電力線引込，取付道路の節減を図る。

既設送信所の位置，送信点地上高，送信規模および既設施設の利用範囲等をTable ３－４－１に示す。

Table 3-4-1

Existing TVN-I Transmitting Station at the Planned of TVN-II

Station	Location			Ch	Pwr. (kW)	Ant. Tower *1	Power Supply *2
	Long.	Lat.	Alt. (m)				
Medan (Bandarbaru)	98E33	3N17	760	5	10		△
Palembang	104E46	2S59	3	9	10	○	△
Yogyakarta	110E22	7S46	137	8	10		○
Surabaya	112E43	7S18	6	9	10	×	○
Denpasar (Bkt.Bakung)	115E12	8S49	130	8	5	○	△
Balikpapan	116E51	1S14	85	9	1	×	○
Ujung Pandang	119E27	5S06	3	4	1	×	○
Manado (Makaweimben)	124E57	1N18	1080	5	5	△	○

*1 ○ Antenna commonly usable

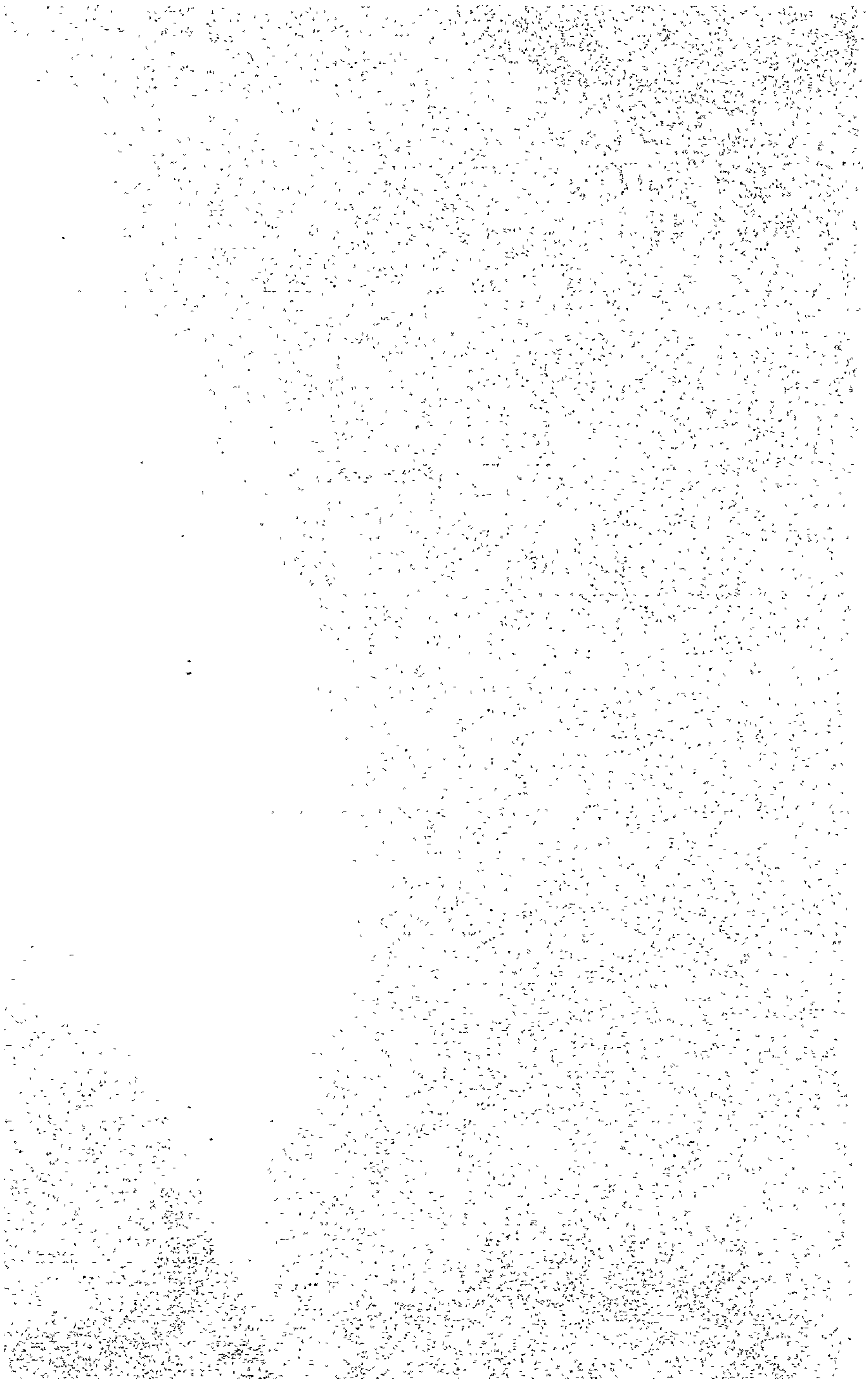
△ Tower commonly usable

× Necessary new tower and antenna

*2 ○ Enough

△ Necessary increasing power of engine generator

第5章　　周波数割当計画



第５章　周波数割当計画

５－１　割当チャンネル

ＴＶＮ－Ⅱ用送信機に割当てるチャンネルは既設テレビ送信機の運用中のチャンネルを考慮して少なくとも２チャンネル以上離すことを原則とするが，周辺既設局の放送受信に妨害を与えない場合にはできる限り隣々接チャンネルを割当て既設アンテナが共用できるようにする。

５－２　既設局チャンネルとの関係

ＴＶＮ－Ⅱ用送信機に割当てるチャンネルと既設のＴＶＮ－Ⅰ用チャンネルとのチャンネル配列関係をTable ３－５－１に示す。

５－３　割当チャンネルの検討

第２次現地調査の結果からメダンおよびジョグジャカルタについては，上記周波数割当計画の実行に一部支障をきたすおそれのあることが予見されたので，上記ＴＶＮ－Ⅱ局周辺の既設局のチャンネルおよび送信諸元を変更してもBAND－Ⅲ内のチャンネルの使用が困難であることが確認された場合には，ＵＨＦ帯（BAND－ⅣまたはⅤ）のチャンネル割当について別途検討することとする。

特にウジュン，パンダン地区において一連の中継放送局にもＴＶＮ－Ⅱの送信設備を設置し，ＴＶＮ－Ⅱ放送の効果を調査しようとする計画があるが，これを実施する場合にはUHF帯を割当ざるをえない見通しであるので，この地区におけるＵＨＦチャンネル割当例を示すと，Table ３－５－２のとおりとなる。

Table 3-5-1

Channel Allocation for TVN-II Station

Station		Channel		Power Output
		2nd	1st	
1	Medan (Bandarbaru)	11*	5	10 kW
2	Palembang	11	9	10 kW
3	Yogyakarta	4*	8	10 kW
4	Surabaya	4	9	10 kW
5	Denpasar (Bkt. Bakung)	10	8	5 kW
6	Balikpapan	11	9	1 kW
7	Ujung Pandang	11	4	1 kW
8	Manado (Makaweimben)	11	5	5 kW

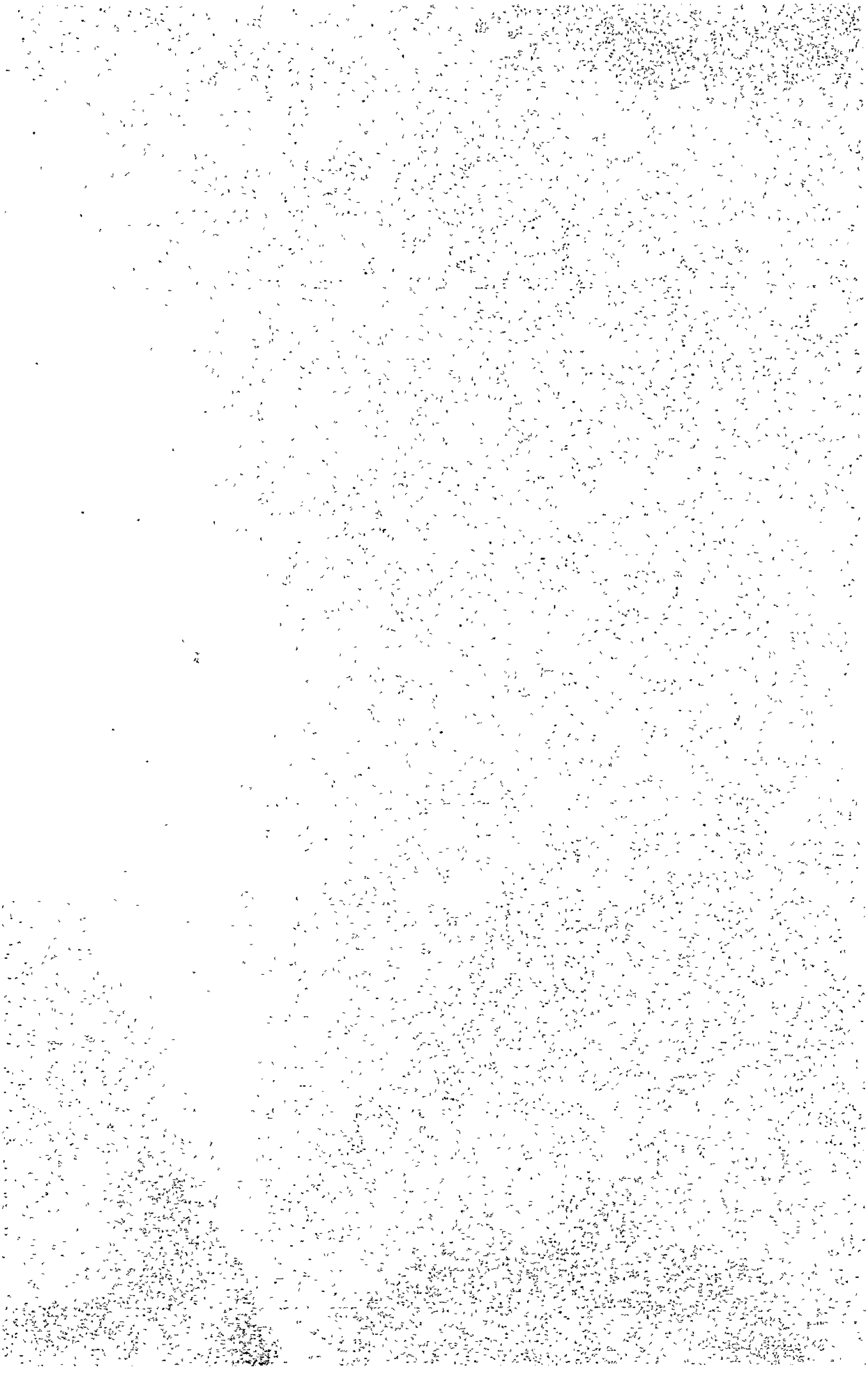
* Channel Allocation should be decided after precise measurement and examination including for surrounding stations.

Table 3-5-2

Channel Allocation for 7 Relay Stations around Ujung Pandang

	Station	Ch.	Pwr. Output
1	G. Loka	39	1 kW
2	Sinjai	41	0.3 kW
3	Tj. Butung	43	1 kW
4	G. Makadae	47	3 kW
5	Sengkang	51	1 kW
6	Baraka	53	1 kW
7	Buntutabang	49	0.15 kW

第６章　要員計画



第6章　要員計画

6－1　番組制作関係要員………１６４名

(1) 教育番組研究，開発要員…………………２０名

(2) 番組試作要員（７名×６組）……………４２名

(3) パッケージ番組制作要員…………………７０名

(4) 特殊大，小道具制作要員…………………１２名

(5) 番組運行要員………………………………２０名

ジャカルタ	４名×１＝	４名
他　の　局	２名×８＝	１６名

6－2　送信所要員………３２名

既設のＴＶＮ－１放送所の構内に増設するので，現在の送信所線表勤務班に各１名追加するとして，各局に４名，８局分として３２名。

6－3　管理要員…………４名

増員１９６名の２％として４名の一般管理要員を準備する。

以上により，ＴＶＮ－Ⅱ放送関係の要員増加は合計２００名である。

第７章　建設，運用計画

第７章　建設，運用経費

７－１　建設経費

(1) 第４編の実施計画の第２章建設経費において述べた建設経費の算出条件に従って積算した建設経費総額は約６１.７億Ｒｐである。ただし，ＴＶＮ－Ⅱ放送番組の制作設備は第１部のなかで一括計上されているので，この建設経費総額は送信設備に関連するもののみである。

(2) この内訳はTable ３－７－１のとおりであり，５か年計画の各年次における建設工程はTable ３－７－２のとおりである。

７－１　運用経費

年間約２６.１億Ｒｐ。

(1) 送信関係………１４９.６ｍＲｐ

１０ kW局…………３	２2.0 × ３＝	６6.0 mRp
５ kW局…………３	１8.4 × ３＝	５5.2 mRp
１ kW局…………２	１4.2 × ２＝	２８４ mRp
	計	１４9.6 mRp

(2) 番組制作関係…………1,６４４.０ mRp

学校放送番組除く教育番組を１日７時間制作するとして年間1,6４４mRp

(3) ビデオ・テープ配布…………５５０mRp

１局に年間約1,３７５本を消費するとして８局で１1,0００本。１本のテープにつきテープ購入，輸送，複製費を５万Ｒｐとして５５０mRp。

(4) 人件費…………２６６mRp

要員増２００ 名に対し年間１３３万Ｒｐとして２６7.3ｍＲｐ。

⑸ 番組運行要員……………………………２０名

Table 3-7-1

Construction Cost of TVN-II Transmitting Facilities

PROJECT	FOREIGN CURRENCY	LOCAL CURRENCY			
	EQUIPMENT COST AT INDONESIAN PORT	LAND	BUILDING & STRUCTURE	ROAD	TRANS-PORTATION
SECOND TV TX	5,248.0		96.0		
SUB-TOTAL	5,248.0	-	96.0	-	-
		96.0			
CONSULTANT FEE (5%)	262.4	4.8			
(A) TOTAL	5,510.4	100.8			
(B) CONTINGENCY (10%)	551.0	10.1			
(A)+(B)	6,061.4	110.9			
GRAND TOTAL	6,172.3 m Rp				

Table 3-7-2

Construction Plan of TVN-II Transmitting Station

Station	Fiscal Year				
	84/85	85/86	86/87	87/88	88/89
Medan			②		
Palembang				⑤	
Yogyakarta				④	
Surabaya			③		
Denpasar				⑥	
Ujung Pandang			①		
Balikpapan					⑦
Manado					⑧

Numerical number shows the order of priority.