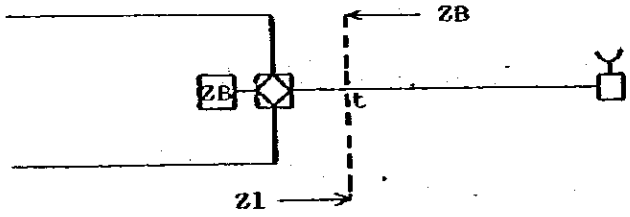
2－2　バランスリターンロス

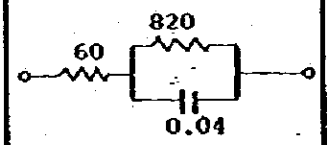
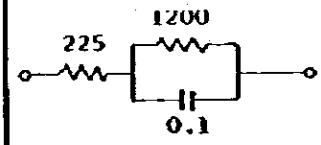
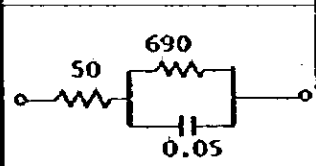
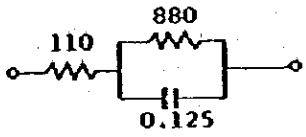
下図に示す2線／4線ハイブリッド終端器のt点におけるバランスリターンロス(B.RL)は次式で表わされる。

$$B.RL = 20 \log \left| \frac{Z_B}{Z_B} + \frac{Z1}{Z1} \right| \qquad (dB)$$



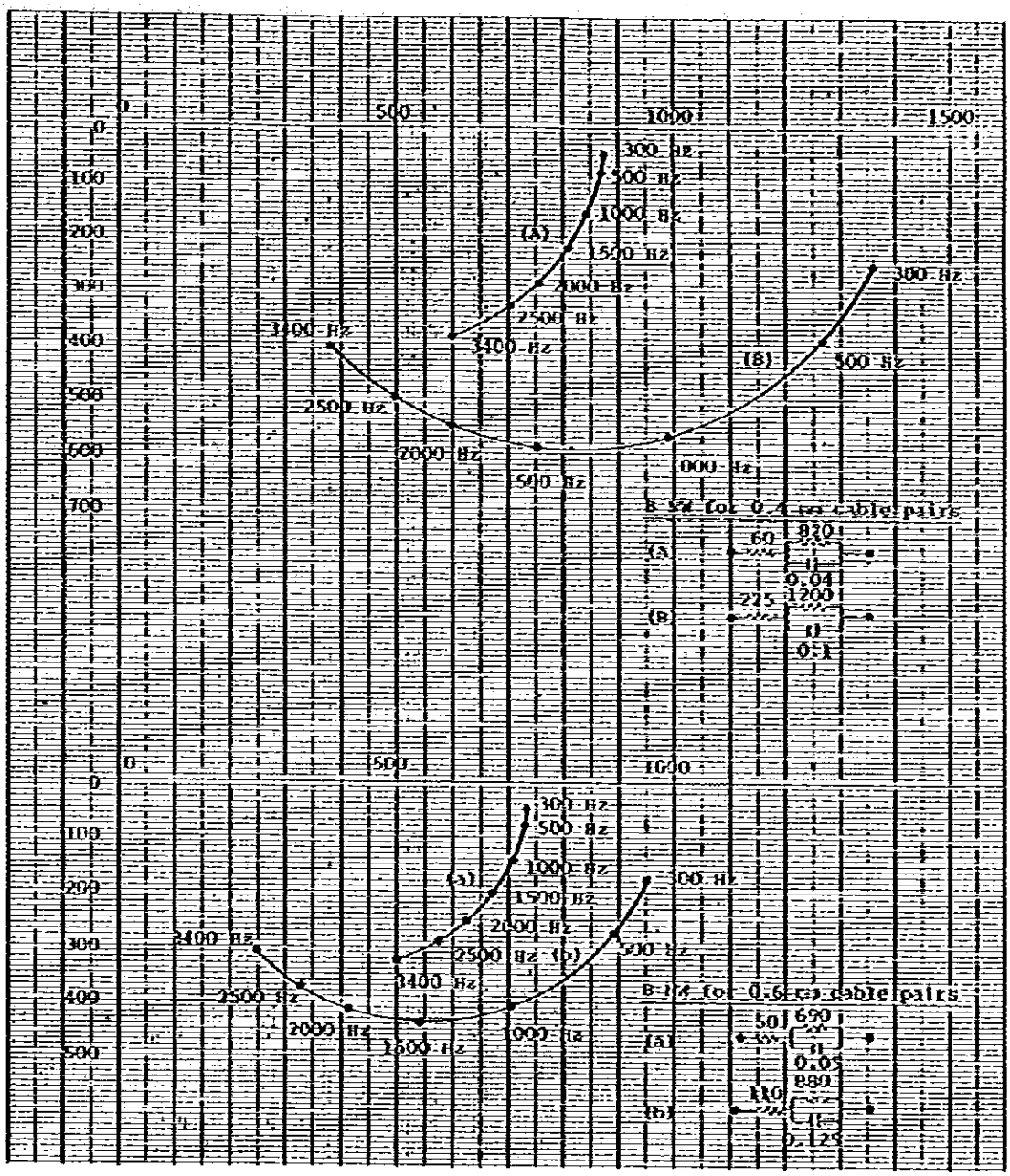
ここでZ_Bは平衡網である。

平衡網回路として下図のごとく、0．4㎜ケーブル用と0．6㎜ケーブル用にそれぞれ2種類のタイプを考慮する。

	短距離加入者用		中・遠距離加入者用	
0．4㎜ケーブル	A		B	
0．6㎜ケーブル	a		b	

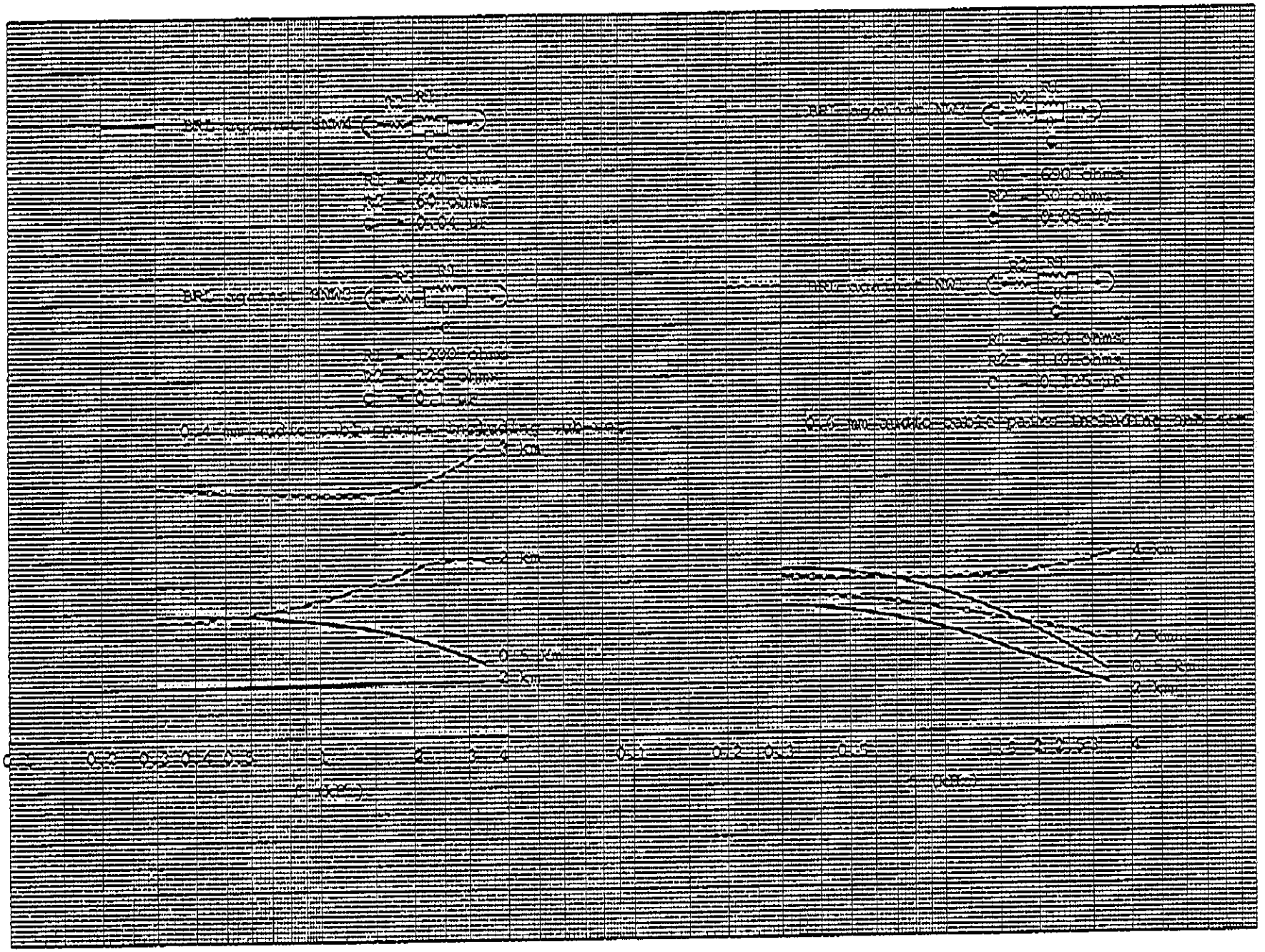
【注】各素子の単位：抵抗はohm，コンデンサはμFである。

これら平衡網のインピーダンス周波数特性を図AN－１５－２に示す。



図AN－15－2　　平衡網のインピーダンス周波数特性

バランスリターンロスを０．４㎜および０．６㎜ケーブル対について計算した結果を図AN－１５－３に示す。



図AN－15－3　　バランスリターンロス周波数特性

2－3　反響バランスリターンロス

反響バランスリターンロスは2－2節で計算されたバランスリターンロスの500Hz－2，500Hz帯域内の平均電力比である。図AH－15－3から、0．4㎜および0．6㎜ケーブル対とも、ケーブル長0．5～3k㎞の範囲で16dB以上の反響バランスリターンロスが得られる。

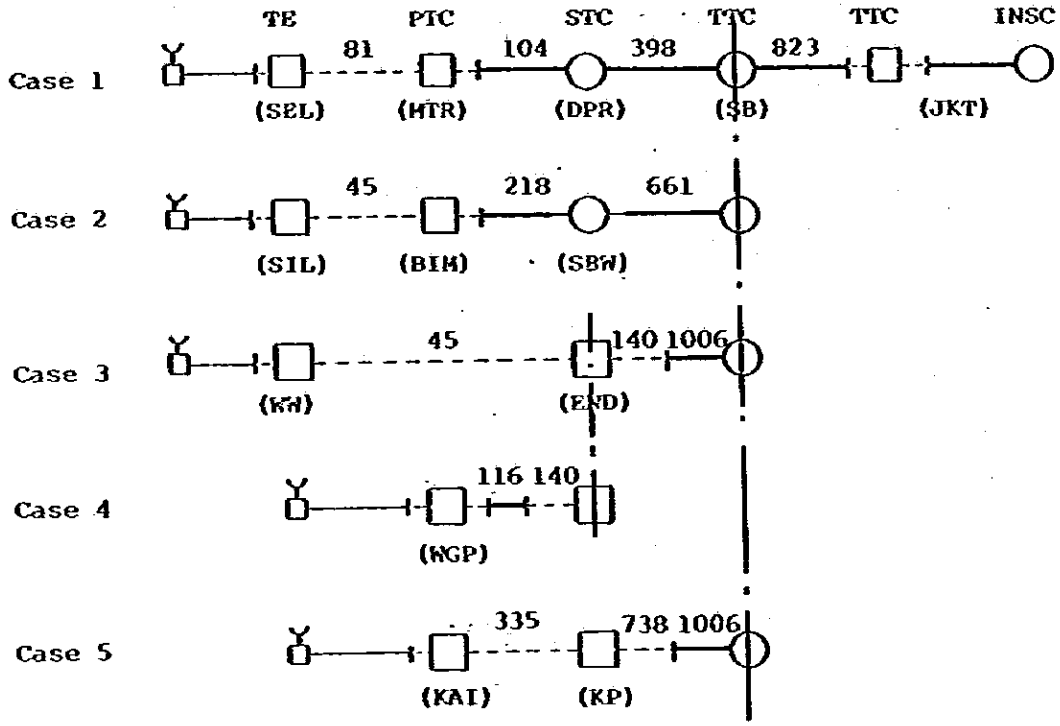
加入者線路長距離分布として、0．5k㎞～3k㎞の線路長の加入者は50%以上であろうと仮定すると、反響バランスリターンロスの平均値は16dB以上と推定出来る。

3　安定度と反響

本節では、第1段階における網構成について、安定度と反響の観点より伝送損失を考察する。

3－1　国際接続呼の国内回線構成

国際接続呼の国内回線構成は下図のごとくなろう。



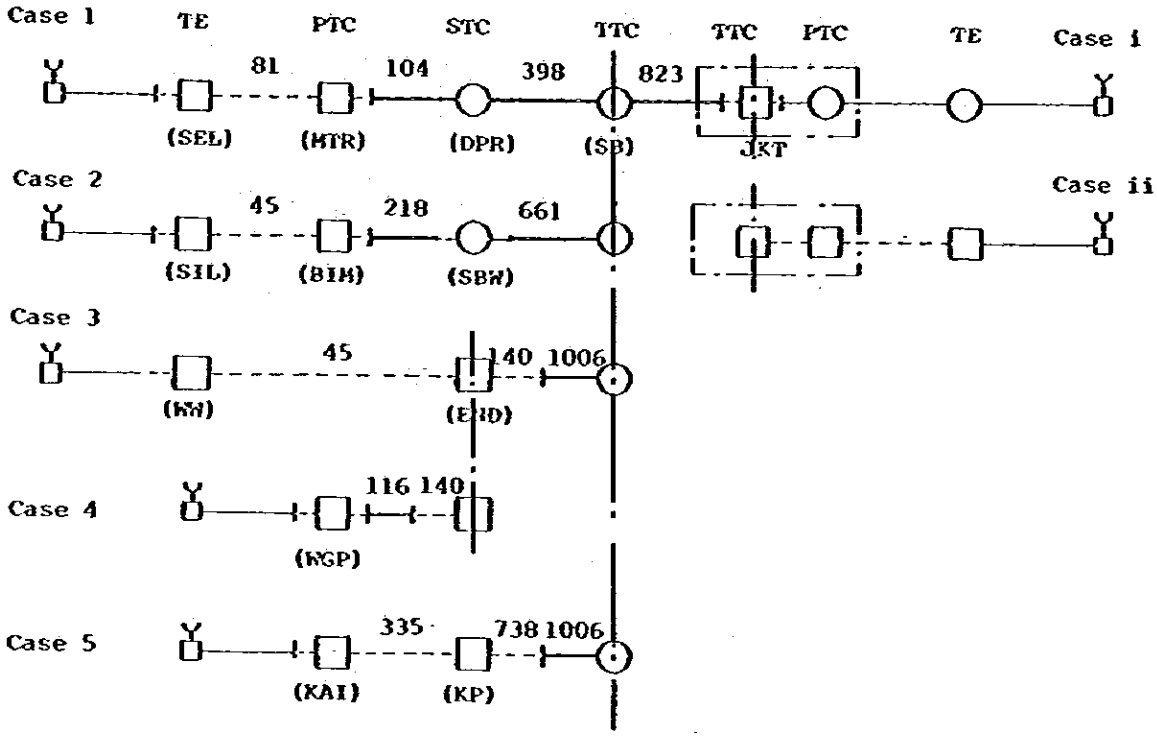
Note: Figures indicate transmission line length (km).

Legend:

- ○ Analogue switching
- □ Digital switching
- ——— Analog 4-wire circuit
- ——— Analog 2-wire circuit
- ----- Digital circuit
- —|-- A/D converter (with 2W/4W terminating set)
- —|-- A/D converter (without 2W/4W terminating set)
- ——— 2W/4W terminating set

3－2 国内接続呼の回線構成

本プロジェクト地域内に発着するほとんどの長距離呼の対地は Surabaya ならびに Jakarta である。よって本検討に際しては、Jakarta 首都圏までの回線構成を考慮対象とする。この場合の回線構成は下図のごとくなろう。



[注] 数字は伝送路長（km）を示す。

3－3　安定度

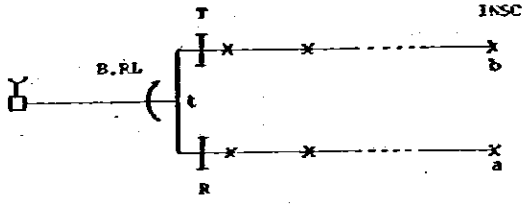
3－3－1　国際接続呼の国内回線

(1) 経路a－t－bの伝送損失平均値

CCITT 勧告 G.122の1．2節によりその平均値は、

$LOSS_{a-t-b} \geqq (10+n)$ dB

を満足せねばならない。この条件は、下図の回線構成についての勧告である。ただし、nはアナログ4線式回線数である。



よって$LOSS_{a-t-b}$は

$LOSS_{a-t-b} = LOSS_{a-t} + B.RL + LOSS_{t-b}$

で表わせる。

上図のパッドTおよびRの値については、CCITT 勧告 G．121に従い、T=R=3dBとし、検討を進める。

3－1節で示した回線構成についての上記条件式は次のとおりである。

ケース1＆4　　$6+B.RL \geqq 10+4$ (dB)

ケース2　　STC がアナログ2線式交換機のため検討対象外とする。

ケース3＆5　　$6+B.RL \geqq 10+3$ (dB)

2－3節で述べたごとく、伝送帯域300～3,400Hz内でバランスリターンロスは16dB以上であるから上記いずれの条件式も満足する。

(2) 経路a－t－bの最小伝送損失値

最小伝送損失値に関して CCITT 勧告 G．122の1．1節により、

$$LOSS_{a-t-b} \geqq 6+\sum_{i=1}^{n} Xi$$

ただし

Xi ： i番目の4線式回線の両伝送方向損失の和

n ：4線式回線の国内部分のリンク数

前項(1)と同様に、各ケースについても、この条件式をみると、

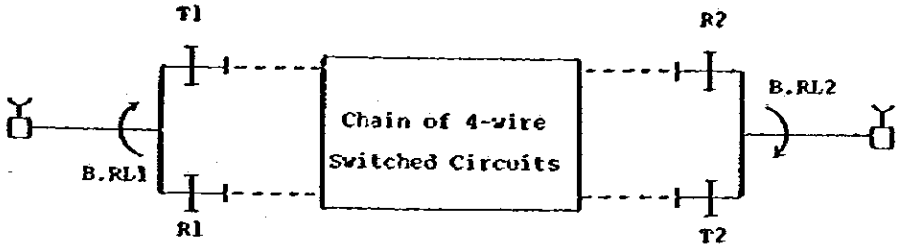
ケース1，3，4＆5　　$6+B.RL \geqq 6$ (dB)

となって、この条件は満たされる。

3－3－2　国内接続呼の回線

(1) 4線ループ損失の平均値

本接続呼の回線構成の等価回路を次のごとく表わす。



4線式回線の接続系のループ損失平均値は、2（10+n）dB以上確保されるべきであろう。すなわち、

$(R_1+T_1+B.RL_1)+(R_2+T_2+B.RL_2) \geqq 2\ (10+n)$ dB

の条件を満足すべきであろう。

4線ループ損失平均値の条件は、

ケース1＆4　　$12+(B.RL_1+B.RL_2) \geqq 26$dB

ケース3＆5　　$12+(B.RL_1+B.RL_2) \geqq 24$dB

よって $(B.RL_1+B.RL_2)$ が前者の場合14dB以上、後者の場合12dB以上であれば条件を満足する。2－3節で述べたごとく、BRL_1の平均値は16dB以上であるから前記各条件式を満足する。

(2) 4線ループ損失の最小値

前項(1)の等価回路に従って4線ループ損失の最小値の条件は次のとおりである。

$$(R_1+T_1+B.RL_1)+(R_2+T_2+B.RL_2) \geqq 2\left[6+\sum_{i=1}^{n}Xi\right](dB)$$

4線ループ損失が最小となる条件は、被呼者側の2線側が開放状態、すなわち $B.RL_2=0$のときである。よって上記条件式は、次のごとく表わせる。

$$(R_1+T_1+R_2+T_2)+B.RL_1 \geqq 2\left[6+\sum_{i=1}^{n}Xi\right](dB)$$

R=T=3dBについて求めると

$12+B.RL_1 \geqq 12$ (dB)

となり、条件を満足する。

3－4　反響

3－4－1　国際接続呼の国内回線

反響の観点からみた経路a-t-bの伝送損失平均値は、CCITT 勧告 G．１２２の２節により、

$$ECHO\ LOSS_{a\text{-}t\text{-}b} \geqq (15+n)\ (dB)$$

の条件を満足すべきである。

ここでR＝T＝３dBについて上記条件式を整理すると

$$6+Echo\ B.RL \geqq (15+n)\ (dB)$$

３－１節に示した回線構成における、上記条件式は次のとおりとなる。

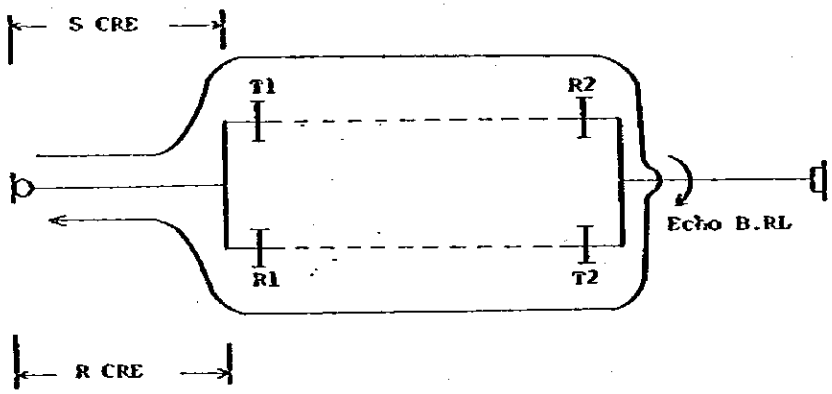
ケース１＆４　　６＋Echo B.RL ≧ １９dB

ケース３＆５　　６＋Echo B.RL ≧ １８dB

Echo B.RL の平均値は１６dBであるから、これらの条件は満足される。

3－4－2　国内接続呼の回線

送話者エコーの反響経路と損失は次のとおり。



反響経路損失＝SCRE＋T_1＋R_2＋Echo B.RL＋T_2＋R_1＋RCRE

反響経路損失と伝送遅延時間との関係についてはCCITT G．１３１で勧告しているので、この勧告を適用する。

伝送遅延時間算出に当っては、次の伝送方式別の伝播時間（片方向）を使用した。

地上無線方式	３．５ms／１，０００km
アナログ音声変復調器	１．３３ms／組
PCM CODEC	０．３ms／組
ディジタル交換機	５．５ms／局

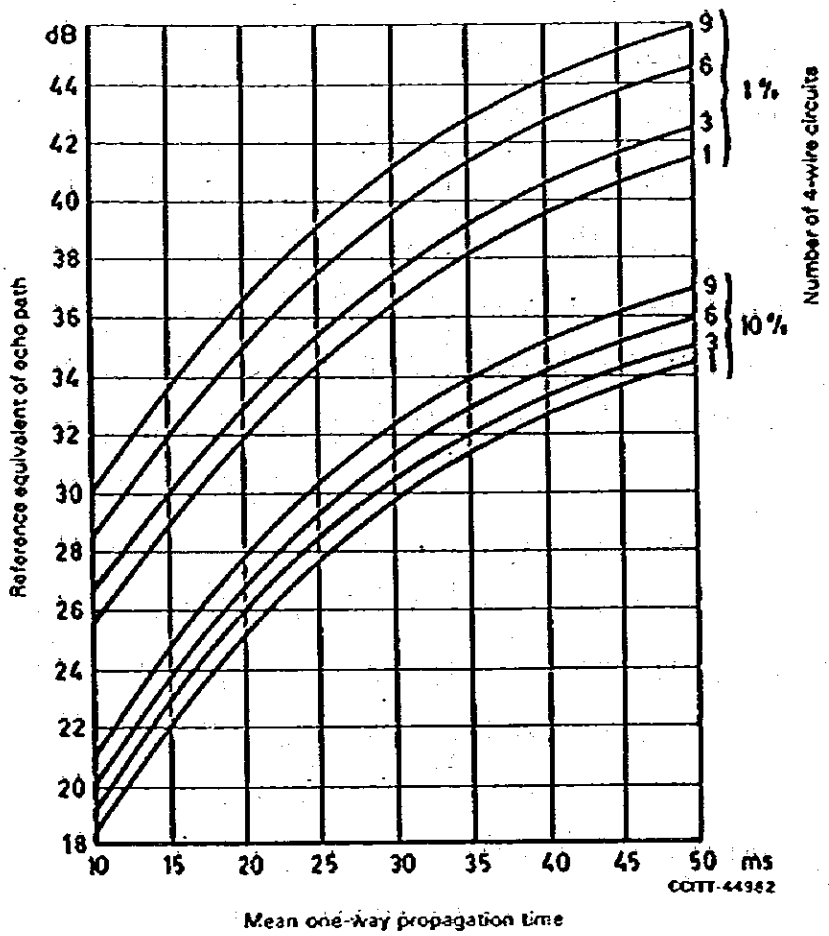
3－2節で述べた回線構成について伝送遅延時間と許容反響経路通話当量をFIGURE 2／G．１３１（CCITT 勧告 G．１３１）より求めた結果は下表のとおりである。なお、FIGURE 2／G．１３１を図AN－１５－４として添付する。

(イ) Jakarta 側がケースiの場合

		ｹｰｽ1	ｹｰｽ3	ｹｰｽ4	ｹｰｽ5
片方向伝播時間(ms)		11.1	11.9	14.3	15.1
アナログ伝送路リンク数		3	2	3	2
許容反響経路	１０%	20.2	20.5	22.5	23
損失(最小値)(dB)	１%	27.4	27.6	29.6	30.2

(ロ) Jakarta 側がケースiiの場合

		ｹｰｽ1	ｹｰｽ3	ｹｰｽ4	ｹｰｽ5
片方向伝播時間(ms)		12.3	13.1	15.5	16.2
アナログ伝送路リンク数		3	2	3	2
許容反響経路	１０%	21.2	21.3	23.4	23.4
損失(最小値)(dB)	１%	28.3	28.4	30.4	30.4



Note 1 – The percentages refer to the probability of encountering objectionable echo.

Note 2 – The reference equivalent of the echo path is here defined as the sum of:

- the values of the transmission loss in the two directions of transmission between the 2-wire end of the talking subscriber's line in the terminal local exchange and the 2-wire terminals of the 4W/2W terminating set at the listener's end;
- the mean value of the echo balance return loss at the listener's end; and
- the simultaneous-minimum sending and receiving reference equivalents of subscribers' telephone sets and lines at the talker's local exchange.

FIGURE 2/G.131

Echo tolerance curves

図AN－15－4　許容反響曲線

国際接続呼の国内部分の回線に関して、CCITT G.１２１の第３節で、国際交換点までの送話通話当量（SCRE）が7dB以上であるべきことを勧告している。よってもし、Tパッドを４dBとすれば、加入者系に与えられるSCREは

$$SCRE \geqq 3dB$$

を満足しなければならない。

PERUNTEL 仕様の電話機（図AN－１５－５参照）と０．４mmケーブルとの組合せでは、約2Km以下の加入者線路長の場合、CCITT G.１２１，第３節の勧告を満たすためパッドを更に挿入する必要があろう。挿入箇所としては電話機とし、ここでの検討では３dBパッドと仮定する。０．４mmケーブル以外の場合もSCREが３dB以上になる様、近距離加入者系にはパッド挿入を考慮する。

これらの条件により反響経路損失の通話当量と許容値との関係は次の様になる。

$SCRE = 3dB$

$RCRE = -2.5dB$

$T_1 = R_1 = T_2 = R_2 = 4dB$

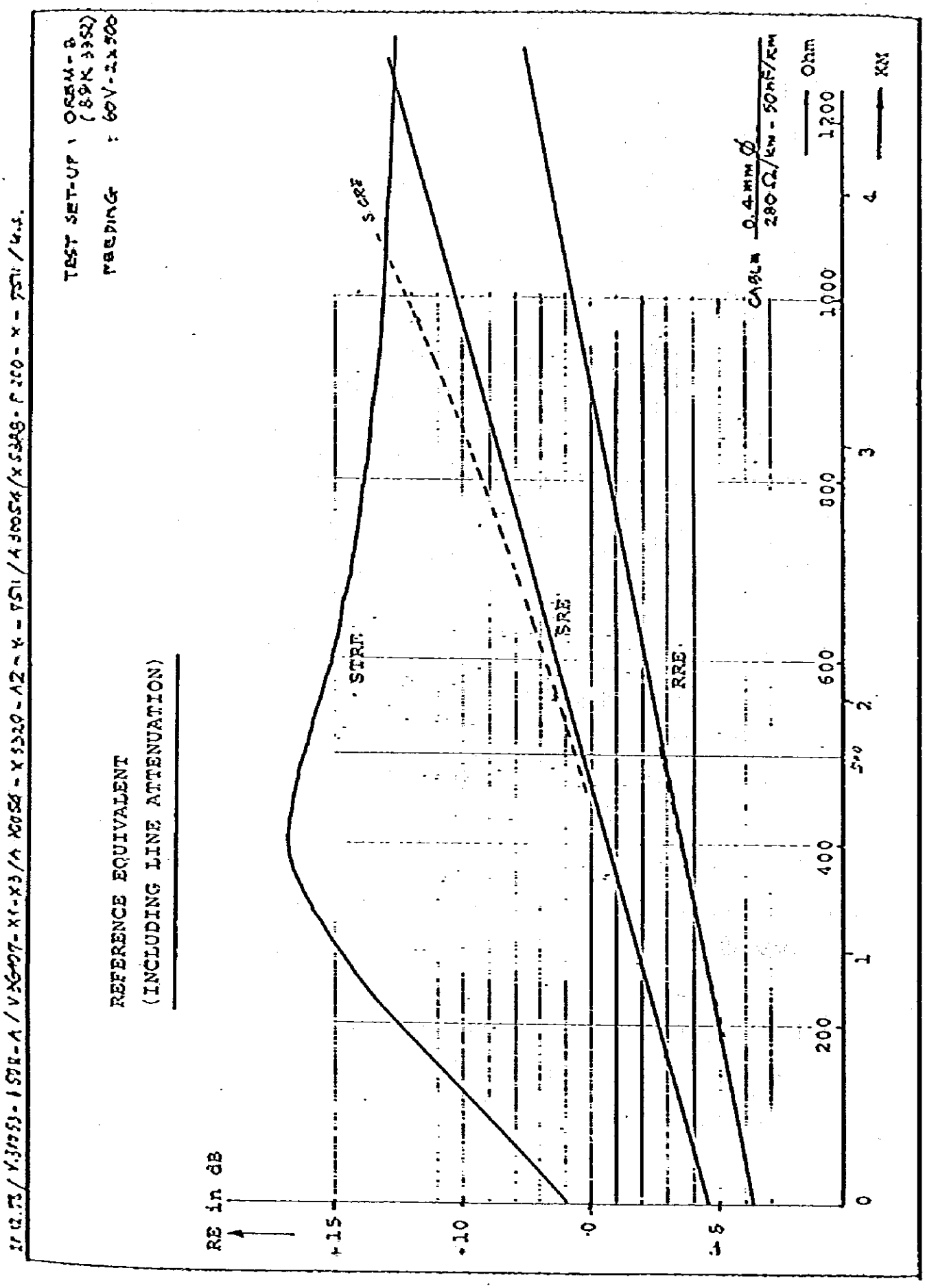
これを反響経路損失式に代入すると、

１６．５＋Echo B.RL ≧ 許容反響経路通話当量

この条件式について、前述（イ）項（ロ）項の場合を検討する。

（ロ）項の場合、Echo B.RL の平均値は１６dB以上であり、それぞれの接続例にわたって１％の危険率を満足する。すなわちエコーサプレッサは不要であろう。

（イ）項の場合、すなわち被呼者側の集中局交換機および市内交換機がアナログ形２線交換機の場合、Echo B.RL の平均値が問題となる。もし、ディジタル市外中継交換機の2W／4W終端器に２線式線路のインピーダンスに見合う平衡網を、２－２節および２－３節と同様な考え方で設備すれば Echo B.RL の平均値として１６dB以上確保出来よう。この場合、それぞれの接続例にわたって１％危険率を満足し、エコーサプレッサは不要であろう。

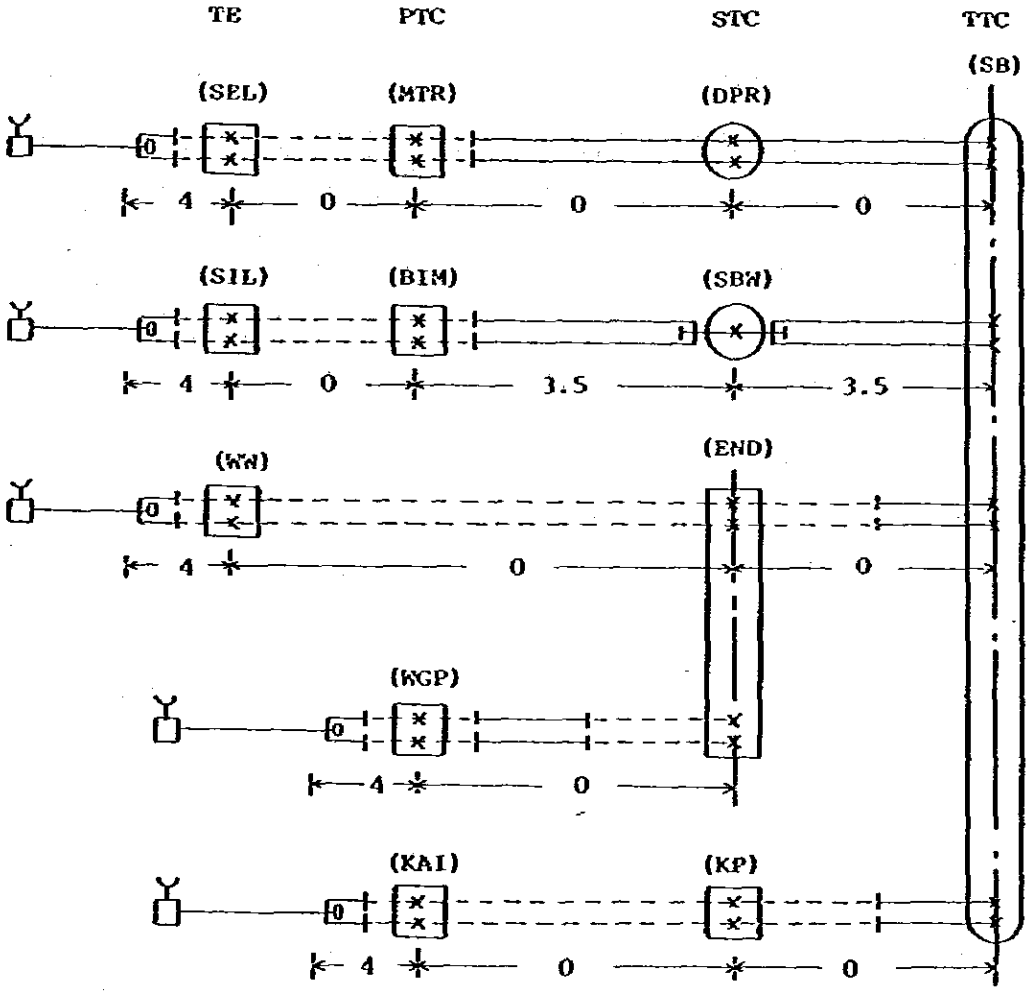


図AN－15－5　PERUMTEL仕様の加入者ループ通話当量

(No.01/S01/Subditpran/1/80)

4　伝送損失配分計画

前節までの検討から設定された各種条件下で、安定度より反響の方が厳しく回線の伝送損失に影響することが分かる。よって T, R パッドの値として4dBを採用するものとして伝送損失配分を次のとおりとする。



Legend:

- Digital switching
- Analog 4W switching
- Analog 2W switching
- 2W/4W terminating unit with a mean balance network
- 2W/4W terminating unit with an individual balance network
- Analog circuit
- Digital circuit
- A/D codec
- Telephone set

Unit: dB

5 結論

本検討は、実現可能な仮定のうえで行われている。例えば、反響バランスリターンロスの平均値を16dB、加入者ループ系の最小通話当量を3dB（送話系）、−2．5dB（受話系）、パッドTおよびRをそれぞれ4dB等と仮定して検討された。これは、加入者系の実態に基づいたものではないので、本検討は伝送計画の一考察に過ぎない。

本来の伝送損失配分計画を策定するに当っては、ディジタル加入者交換機の仕様の確立、全国の加入者系インピーダンスの実態調査などが不可欠であるため、本プロジェクトの様な一地域の伝送路網整備計画で検討出来る性質のものではない。電気通信網の基準となる伝送損失配分計画は、その計画策定のためのプロジェクトで検討され、立案されるべきであろう。

１６．太陽電池方式の適用例

太陽電池方式を自立電源局に適用する場合の具体例を次に示す。

(1) 所要太陽電池出力（Ps）の算出

所要太陽電池出力（Ps）の算出は、次式に示すとおりである。

$$Ps = Lv \times \frac{1}{SV} \times \frac{1}{Ch} \times Cl \times Sf$$

ただし　Ps　：　所要太陽電池出力（Watts）

Lv　：　負荷平均消費電力（Watts）

SV　：　日照量率（＝日照時間率×照射角度率）

ここで日照時間率は、年間日照時間と年間総時間との比である。

Ch　：　充電効率

Cl　：　損失係数

Sf　：　安全係数

本地域における平均年間日照時間は表AN－１６－１に示すとおりであり、これら３都市の平均をとると、年間日照時間は２，１８０時間である。

なお、参考資料として、過去１０年間の本地域の２２地点の月別降雨日数を表AN－１６－２に示す。

上記年間日照時間２，１８０時間の場合、日照時間率は０．２５である。

照射角度率は、本地域では、１／２と想定される。この場合の日照量率（SV）は

$$SV = 0.25 \times 1/2 = 0.125$$

である。

従って、充電効率（Ch）＝０．９５、損失係数（Cl）＝１．１、安全係数（Sf）＝１．１とした場合の所要太陽電池出力（Ps）は、負荷平均消費電力（Lv）の約１０倍である。すなわち、負荷平均電力１２０Wの場合の所要太陽電池出力は１．２kwである。

(2) 太陽電池の必要モジュール数（N）の算出

太陽電池の必要モジュール数（N）は、次式によって算出される。

$$N = Lv / Pm'$$

ただし　N　：太陽電池の必要モジュール数

Lv　：平均負荷消費電力

Pm'：太陽電池１モジュールによる平均充電々力（＝α・Pm）

ここで、Pm ：太陽電池モジュールが快晴時１００mW/cm^2のエネルギーの太陽光に直面した時の定格出力。本計画では、４０Wを想定した。

α ：補正係数

αは次の条件を考慮に入れ決定する。

－太陽電池に対する太陽光の入射角は時間とともに余弦曲線に従って変化する。

－夜間は充電が行われない。

－日によって天候の変化があり、雨天曇天時には、充電々力は極端に小さくなる。

－季節、緯度および設置場所によって、日照時間、太陽高度が変わる。

実験・経験的にαは通常０．１の値を採用している。

従って、この場合のPm'は4W（＝０．１x４０W）であり、平均負荷消費電力が１２０Wの場合のNは３０ヶである。また、設置所要面積は、約１８平方米であるが、太陽入射方向に樹木、建物等の障害物がない様に配置することが必要である。

(3) ２次蓄電池容量(C)の算出

２次蓄電池容量（C）は、次式によって算出される。

$$C = \frac{QL \times 24H \times D \times d}{0.7 \times Ft}$$

ただし C ：２次蓄電池容量

QL ：平均負荷消費電流

D ：不日照日数

本計画では、連続１５日を不日照日数と想定した。

d ：蓄電池自己放電補正値（鉛蓄電池の場合：　１．０６）

0.7 ：太陽電池の充電量の補正係数

蓄電池に対する充電々流が小さいため、短時間率充電の時と同様な活性充電が出来ないので、補正を行う必要がある。

Ft ：周辺温度変化に伴う蓄電池容量の減少を補正する係数（鉛蓄電池の場合：０．８５）

従って、平均負荷消費電力が１２０Wの場合、２４V蓄電池の所要容量は上式より約３，２００AHとなる。

(4) 設備諸元

上述の適用例に示すごとく、負荷平均消費電力が１２０W、年間日照時間２，１８０時間および連続不日照日数１５日の場合、太陽電池方式の設備諸元は、次の様になる。

－所要太陽電池出力　：　１．２kW

－太陽電池必要モジュール数　：　３０ヶ

(P_M'＝４Wの時)

－所要設置面積　：　約１８平方米

－所要２次蓄電池容量　：　約３，２００AH (２４V)

表AN－16－1　月間日照時間率（％表示）

	Kupang					Maumere		Waingapu	
	1971	1972	1977	1978	1979	1978	1979	1978	1979
Jan.	-	77	43	74	52	51	71	-	63
Feb.	-	58	33	40	69	57	64	-	62
Mar.	-	47	50	51	57	73	60	-	53
April	-	91	73	57	90	74	92	-	-
May	87	-	78	57	84	84	73	88	82
June	93	-	58	93	91	81	84	59	70
July	91	-	65	54	96	79	92	65	88
Aug.	98	-	62	61	99	84	96	75	96
Sep.	96	-	57	90	96	93	93	85	92
Oct.	77	-	65	94	65	85	91	89	-
Nov.	53	-	58	77	92	-	-	73	91
Dec.	57	-	38	60	59	-	68	54	-

Remarks:

Figures of above table indicate the average sunshine volume rate per day.

For instance, sunshine hours in Jan. 1972 at Kupang are as follows:

8 hours x 30 days x 77% = 184.8 hours

表AN－16－2　月別降雨日数

	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Total	Remarks
1. Nusa Tenggara Barat														
Ampenan	13.9	15.0	11.6	8.8	6.3	3.1	2.6	1.7	1.0	5.9	10.1	15.2	95.2	1961 - 1970
Taliwang	11.1	9.7	10.5	6.3	3.8	2.1	1.2	1.2	2.5	6.0	8.3	14.1	76.9	1962 - 1970
Alas	12.7	13.7	12.6	8.3	5.0	1.9	2.2	1.1	2.1	4.9	8.3	11.6	84.4	1961 - 1970
Utan	17.2	13.8	12.7	7.7	3.0	0.6	0.9	0.9	0.4	2.0	3.3	12.1	74.6	1961 - 1970
Lenangguar	14.3	13.7	13.0	7.0	3.7	2.6	2.0	1.2	1.8	5.4	8.4	13.9	87.0	1962 - 1970
Lunyukbesar	17.3	12.1	9.2	5.0	5.4	3.2	4.0	3.3	2.7	6.3	7.0	12.8	88.3	1964 - 1970
Sumbawabesar	14.2	15.4	12.6	6.9	2.3	1.2	0.8	0.2	0.3	3.5	6.7	14.0	78.1	1963 - 1970
Mayohilir	6.1	6.8	4.5	3.1	0.9	0.1	1.0	0.0	0.0	1.3	2.4	4.4	30.6	1961 - 1969
Lape	12.1	14.6	10.8	5.0	4.1	1.0	0.9	0.0	0.1	1.4	5.2	13.9	69.1	1961 - 1970
Plampang	14.1	16.0	13.3	4.7	3.1	1.5	0.9	0.3	1.0	2.2	6.2	11.2	74.5	1964 - 1970
Ampang	15.6	16.1	10.4	5.1	3.9	1.5	1.2	0.7	1.0	3.6	5.0	14.9	79.0	1962 - 1970
Wawo/Indria	15.2	13.6	11.7	6.8	3.0	1.8	1.8	0.6	0.2	2.2	4.4	11.5	72.8	1961 - 1970
Karumbu	13.4	11.5	7.0	2.9	3.6	2.2	2.4	0.7	0.1	1.1	2.1	8.4	55.4	1961 - 1970
2. Nusa Tenggara Timur														
Waikabubak	17.9	18.4	18.6	12.0	6.8	3.7	2.3	2.0	3.1	7.6	13.0	18.1	123.5	1961 - 1970
Waibakul	15.2	18.9	16.4	10.0	8.3	5.4	4.6	3.1	3.2	7.6	14.6	15.0	122.3	1962 - 1970
Waikelowo	19.1	17.7	18.7	14.1	7.8	4.6	2.1	3.3	4.1	9.7	15.4	18.6	135.2	1961 - 1970
Waingapu	14.8	14.8	14.0	4.3	2.5	1.3	0.9	0.3	0.2	1.1	2.9	10.2	67.2	1962 - 1970
Pacar	20.6	20.7	18.0	14.0	7.0	6.4	0.2	3.3	7.6	13.5	15.7	19.5	146.5	1961 - 1969
Lengkoajang	23.3	16.9	20.9	10.0	8.9	4.7	4.2	2.0	3.6	6.4	12.9	19.7	133.5	1961 - 1970
Larantuka	14.0	13.6	9.1	4.9	2.1	0.8	1.3	0.1	0.1	2.4	5.6	9.1	63.1	1961 - 1970
Seba	10.0	11.4	6.3	2.3	1.5	0.0	0.0	0.0	0.0	0.8	3.3	7.0	42.6	1962 - 1970
Soe	16.0	14.0	11.5	5.6	8.3	5.8	4.0	1.8	1.0	3.6	8.6	11.1	91.3	1962 - 1968

17. バス プロファイル

1 幹線ルート

Poco Ranakah	—	Volo Bobo
Volo Bobo	—	K.Ndora
K.Ndora	—	Tokoropi
Tokoropi	—	Lepe Mbusu
Lepe Mbusu	—	I.Nggai
I.Nggai	—	I.Vengot
I.Vengot	—	I.Pasengdaeng
I.Pasengdaeng	—	Hanga Vite
Hanga Vite	—	Batang Lol
Batang Lol	—	Regiar
Regiar	—	T.Aina
Bikoun	—	T.Aina
T.Ulamnotu	—	Bikoun
Soe	—	T.Ulamnotu
Upuba	—	Soe
Kupang	—	Upuba

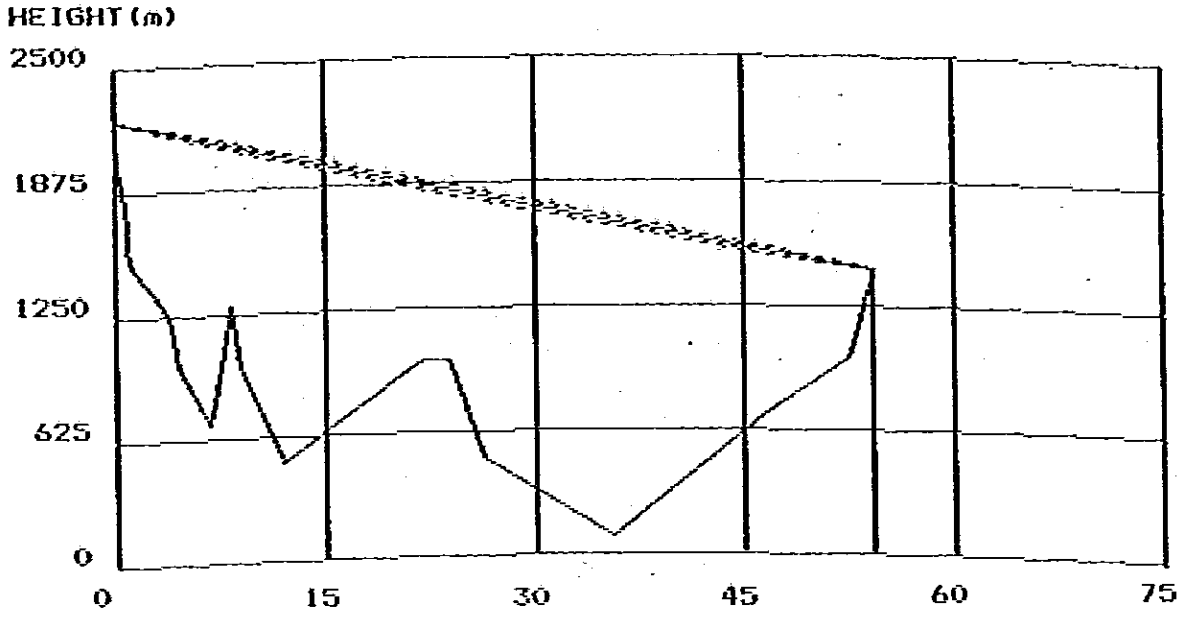
2 支線ルート

I.Nggai	—	Mauzere
I.Pasengdaeng	—	Larantuka
Regiar	—	Laling
Laling	—	Kalabahi
T.Ulamnotu	—	Kefamenanu
Sikoemana	—	O.Oesai
O.Oesai	—	Batoengolo
Prainghoar	—	Pilautamanu
Pilautamanu	—	Paraingmahara
Paraingmahara	—	Vailiang

3 Nusa Tenggara Barat

Doronae	—	Monggo
Monggo	—	Dompu
BT.Jorongkoak	—	Lab-Balat

POCBOB (1.33 RADIUS)



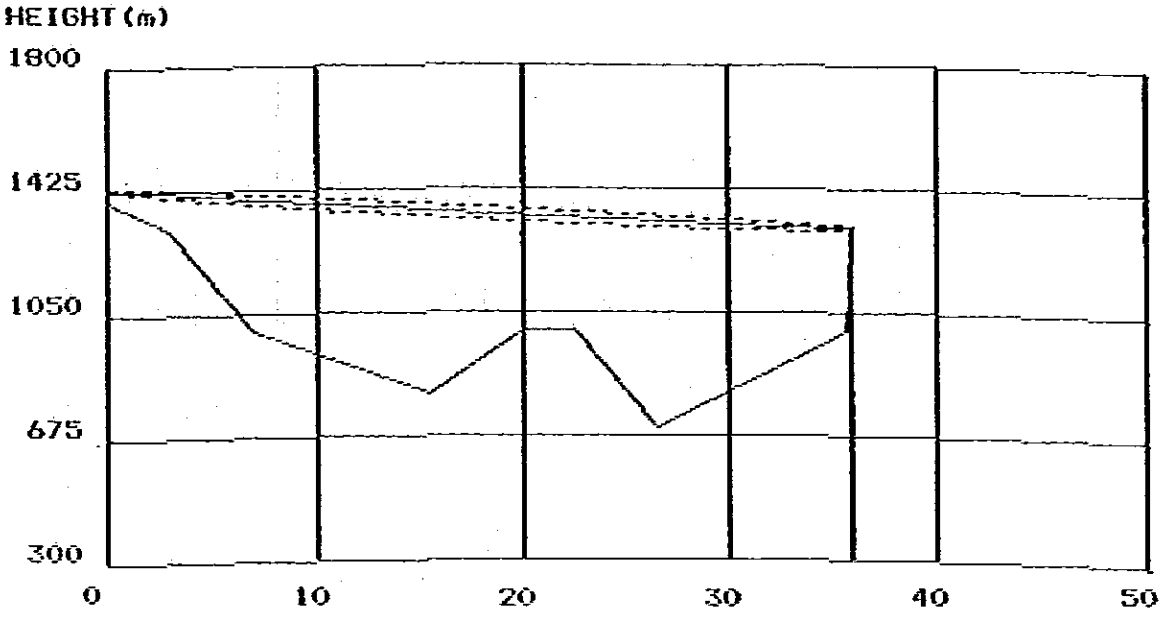
DISTANCE : 54.3 km

SITE NAME : Poco Ranakah
GROUND LEVEL : 2200 m

SITE NAME : Wolo Bobo
GROUND LEVEL : 1400 m

T. Roughness	:	531.8 m	Frequency	:	6770 MHz
Ant. Height(1)	:	30.0 m	Ant. Height(2)	:	30.0 m
Critical Point	:	24.0 km	Ridge Height	:	1000.0 m
Tree Height	:	20.0 m	Fresnel Dip	:	24.4 m
Clearance	:	813.5 m	Clearance Fac.	:	33.4
Free Space Loss	:	143.8 dB	Ridge Loss	:	0.0 dB
Total Loss	:	143.8 dB			

BOBNDR (1.33 RADIUS)



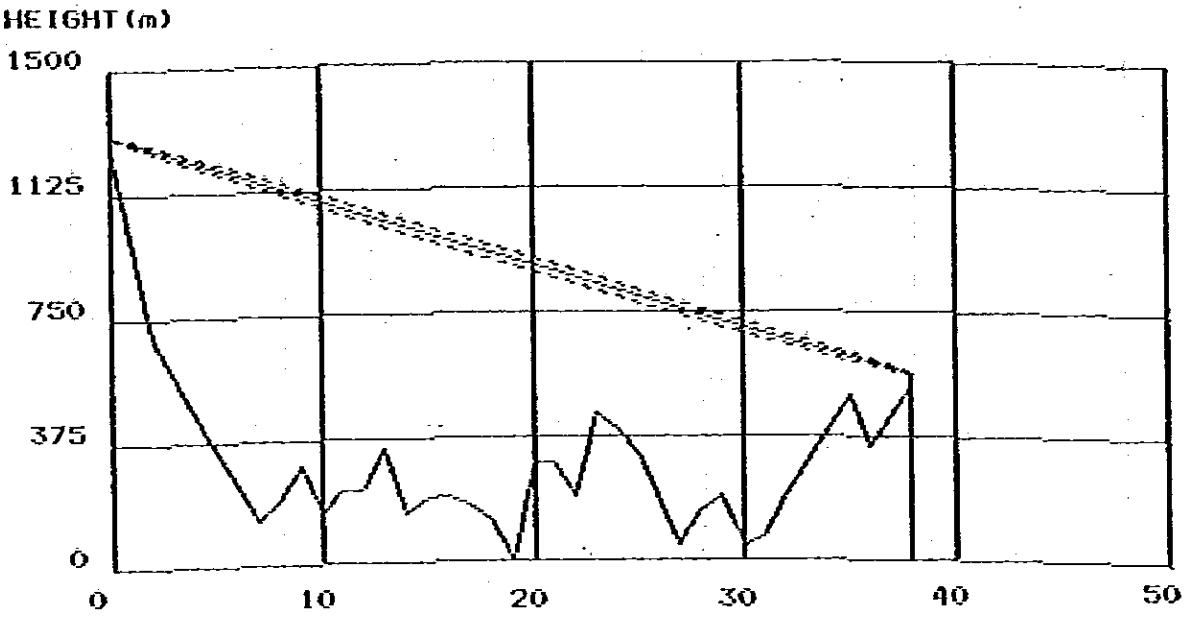
DISTANCE : 36 km

SITE NAME : Wolo Bobo
GROUND LEVEL : 1400 m

SITE NAME : K.Ndora
GROUND LEVEL : 1270 m

T. Roughness	:	216.5 m	Frequency	:	6770 MHz
Ant. Height(1)	:	30.0 m	Ant. Height(2)	:	30.0 m
Critical Point	:	3.0 km	Ridge Height	:	1300.0 m
Tree Height	:	20.0 m	Fresnel Dip	:	11.0 m
Clearance	:	93.3 m	Clearance Fac.	:	8.5
Free Space Loss	:	140.2 dB	Ridge Loss	:	0.0 dB
Total Loss	:	140.2 dB			

NDRTOK (1.33 RADIUS)



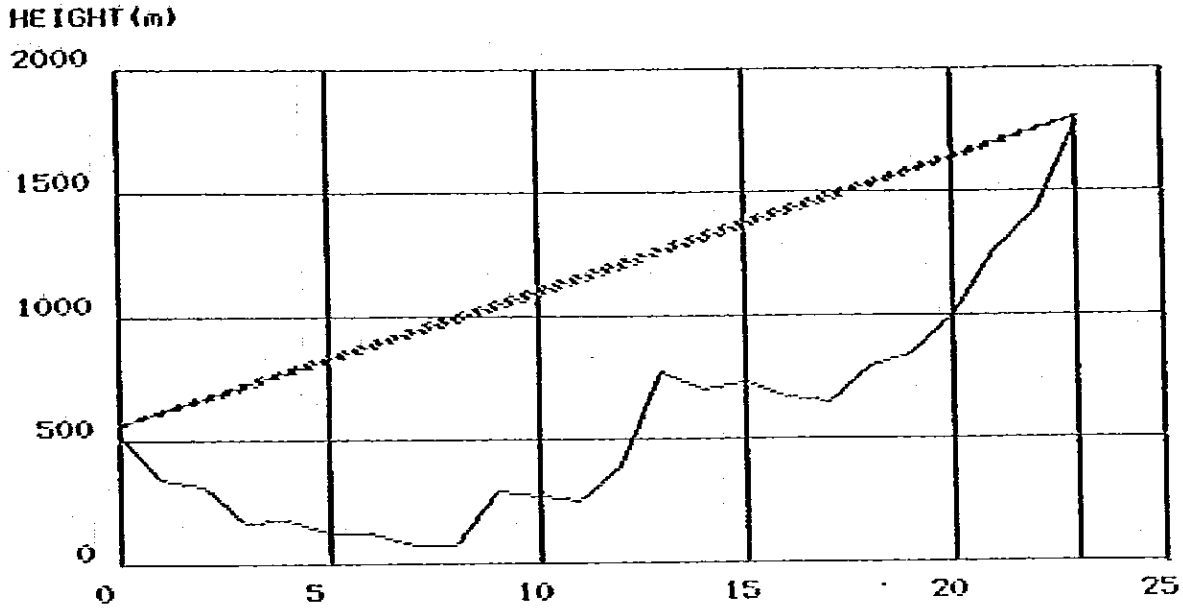
DISTANCE : 37.9 km

SITE NAME : K.Ndora
GROUND LEVEL : 1270 m

SITE NAME : Tokoropi
GROUND LEVEL : 530 m

T. Roughness	:	225.1 m	Frequency	:	6770 MHz
Ant. Height(1)	:	30.0 m	Ant. Height(2)	:	30.0 m
Critical Point	:	35.0 km	Ridge Height	:	500.0 m
Tree Height	:	20.0 m	Fresnel Dip	:	10.9 m
Clearance	:	90.6 m	Clearance Fac.	:	8.3
Free Space Loss	:	140.6 dB	Ridge Loss	:	0.0 dB
Total Loss	:	140.6 dB			

TOKLEP (1.33 RADIUS)



DISTANCE : 23 km

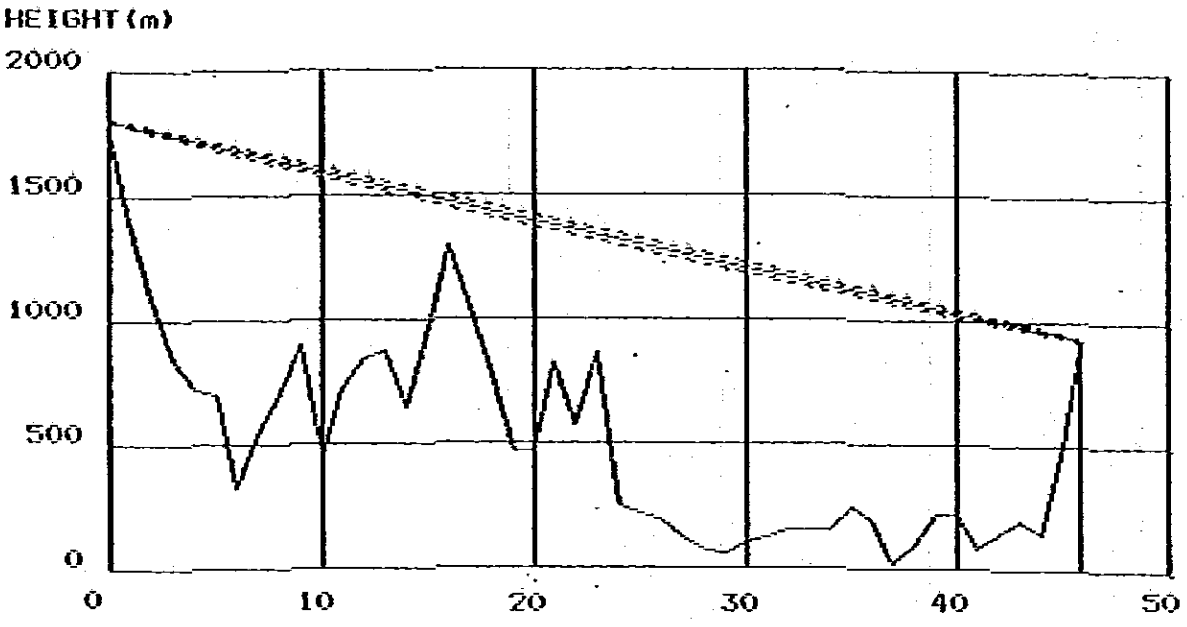
SITE NAME : Tokoropi
GROUND LEVEL : 530 m

SITE NAME : Lepe Mbusu
GROUND LEVEL : 1770 m

T. Roughness	:	368.5 m
Ant. Height(1)	:	30.0 m
Critical Point	:	13.0 km
Tree Height	:	20.0 m
Clearance	:	458.2 m
Free Space Loss	:	136.3 dB
Total Loss	:	136.3 dB

Frequency	:	6770 MHz
Ant. Height(2)	:	30.0 m
Ridge Height	:	775.0 m
Fresnel Dip	:	15.8 m
Clearance Fac.	:	29.0
Ridge Loss	:	0.0 dB

LEPNGG (1.33 RADIUS)



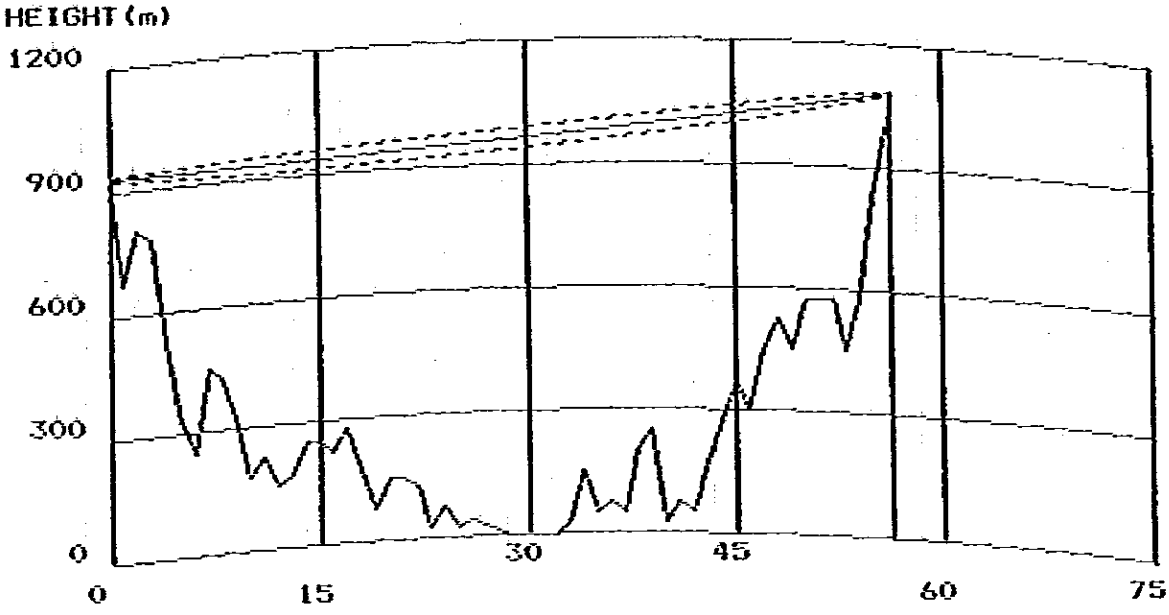
DISTANCE : 45.8 km

SITE NAME : Lepe Mbusu
GROUND LEVEL : 1770 m

SITE NAME : I.Nggai
GROUND LEVEL : 900 m

T. Roughness	:	406.7 m	Frequency	:	6770 MHz
Ant. Height(1)	:	30.0 m	Ant. Height(2)	:	30.0 m
Critical Point	:	16.0 km	Ridge Height	:	1300.0 m
Tree Height	:	20.0 m	Fresnel Dip	:	21.5 m
Clearance	:	147.9 m	Clearance Fac.	:	6.9
Free Space Loss	:	142.3 dB	Ridge Loss	:	0.0 dB
Total Loss	:	142.3 dB			

NGGWEN (1.33 RADIUS)

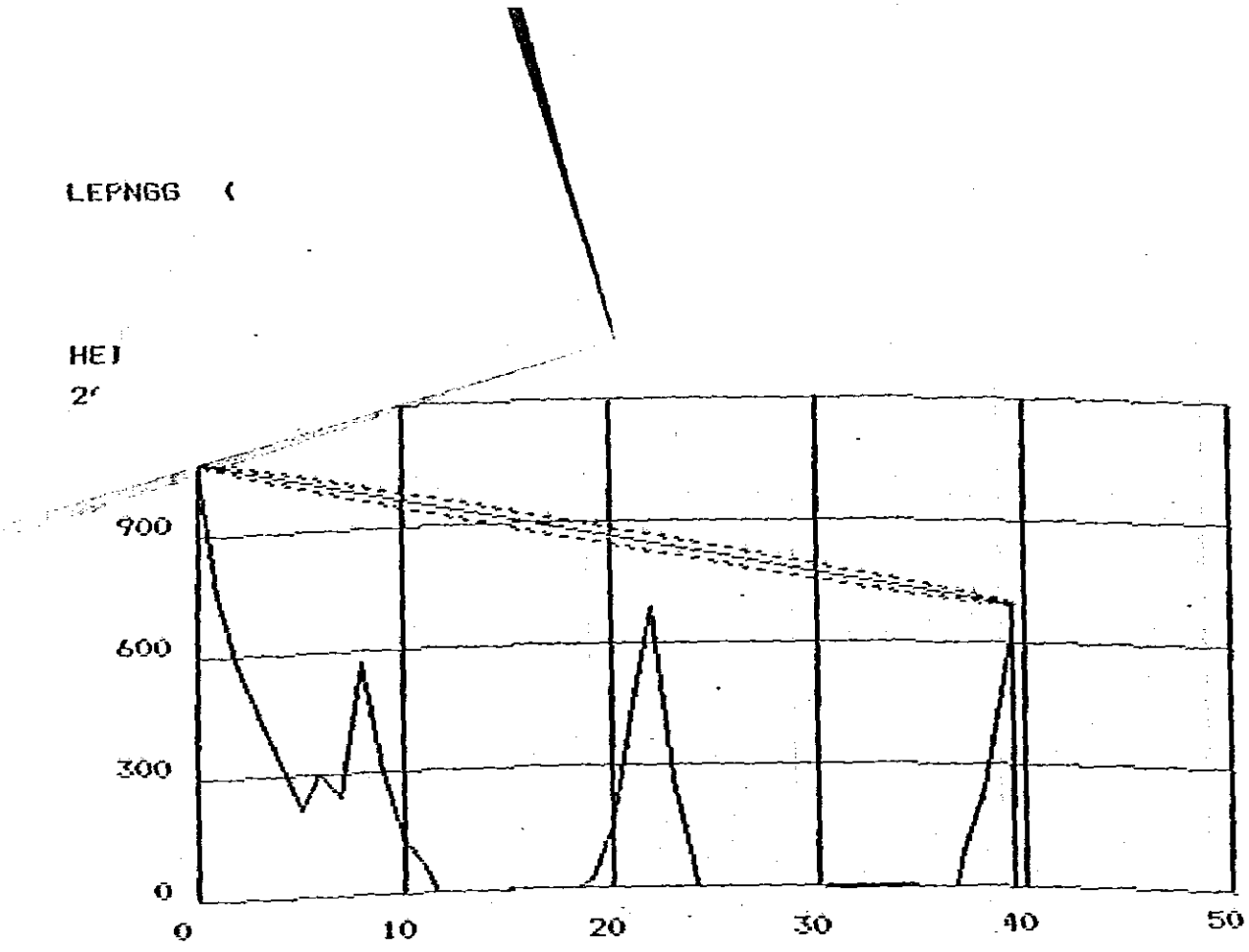


DISTANCE : 56.3 km

SITE NAME : I.Nggai
GROUND LEVEL : 900 m

SITE NAME : I.Wengot
GROUND LEVEL : 1050 m

T. Roughness	:	236.2 m	Frequency	:	6770 MHz
Ant. Height(1)	:	30.0 m	Ant. Height(2)	:	30.0 m
Critical Point	:	2.0 km	Ridge Height	:	800.0 m
Tree Height	:	20.0 m	Fresnel Dip	:	9.2 m
Clearance	:	108.9 m	Clearance Fac.	:	11.8
Free Space Loss	:	144.1 dB	Ridge Loss	:	0.0 dB
Total Loss	:	144.1 dB			



DISTANCE : 39.5 km

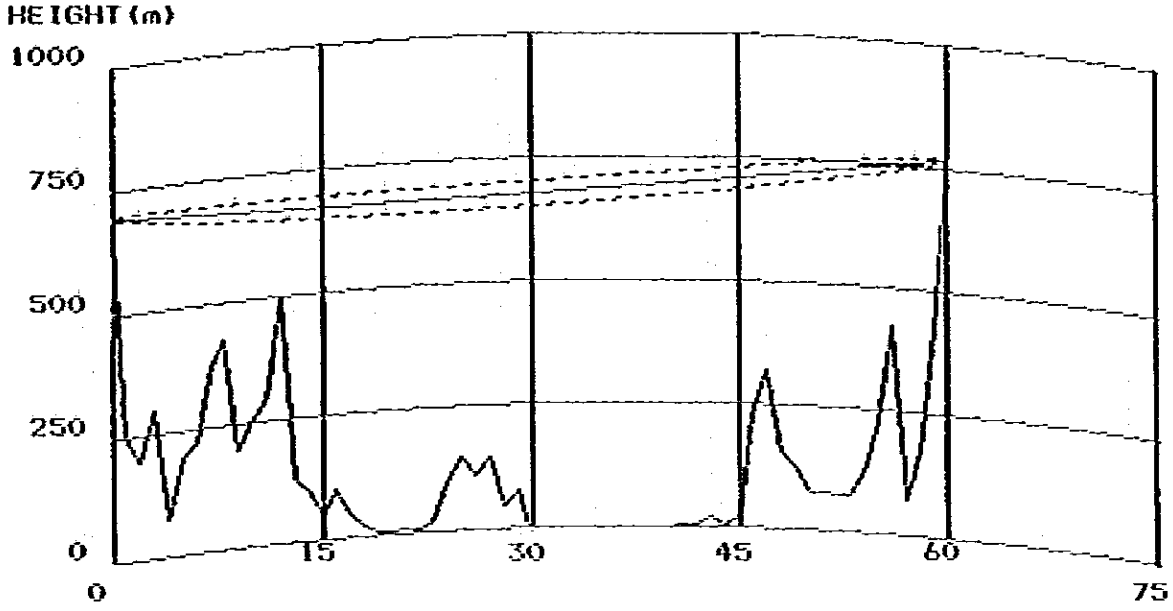
SITE NAME : I.Wengot
GROUND LEVEL : 1050 m

SITE NAME : I.Pasengdaeng
GROUND LEVEL : 660 m

T. Roughness	:	270.0 m
Ant. Height(1)	:	30.0 m
Critical Point	:	22.0 km
Tree Height	:	20.0 m
Clearance	:	130.1 m
Free Space Loss	:	141.0 dB
Total Loss	:	141.0 dB

Frequency	:	6770 MHz
Ant. Height(2)	:	30.0 m
Ridge Height	:	690.0 m
Fresnel Dip	:	20.8 m
Clearance Fac.	:	6.3
Ridge Loss	:	0.0 dB

PASWIT (1.33 RADIUS)



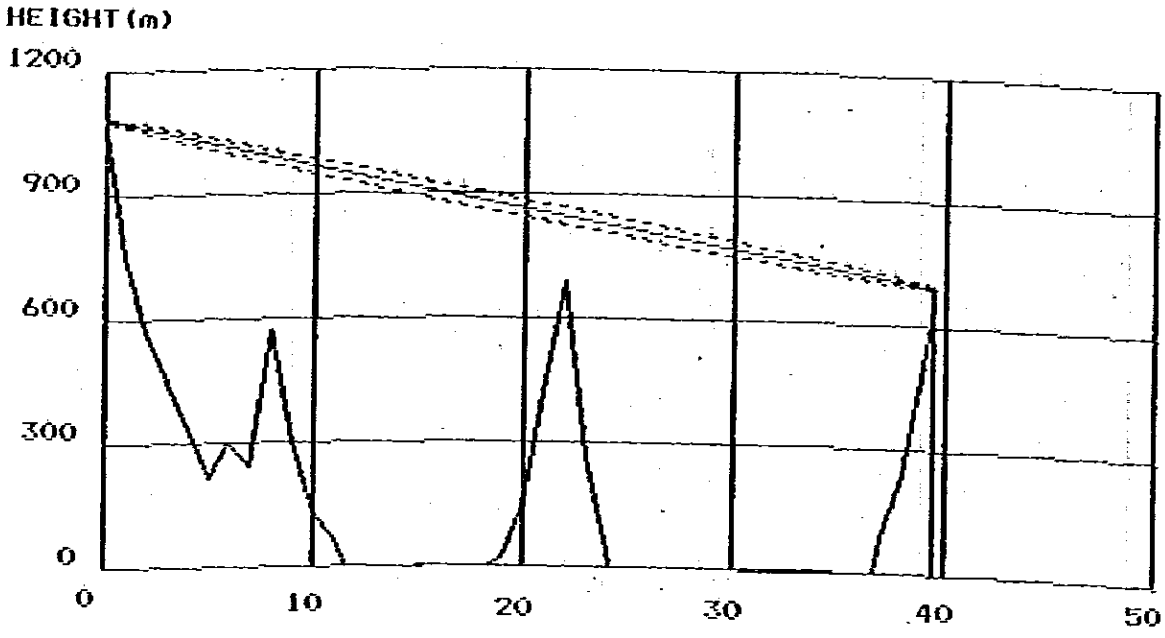
DISTANCE : 59.9 km

SITE NAME : I.Pasengdaeng
GROUND LEVEL : 660 m

SITE NAME : Hanga Wite
GROUND LEVEL : 735 m

T. Roughness	:	149.4 m	Frequency	:	6770 MHz
Ant. Height(1)	:	30.0 m	Ant. Height(2)	:	30.0 m
Critical Point	:	12.0 km	Ridge Height	:	500.0 m
Tree Height	:	20.0 m	Fresnel Dip	:	20.6 m
Clearance	:	151.1 m	Clearance Fac.	:	7.3
Free Space Loss	:	144.6 dB	Ridge Loss	:	0.0 dB
Total Loss	:	144.6 dB			

WENPAS (1.33 RADIUS)



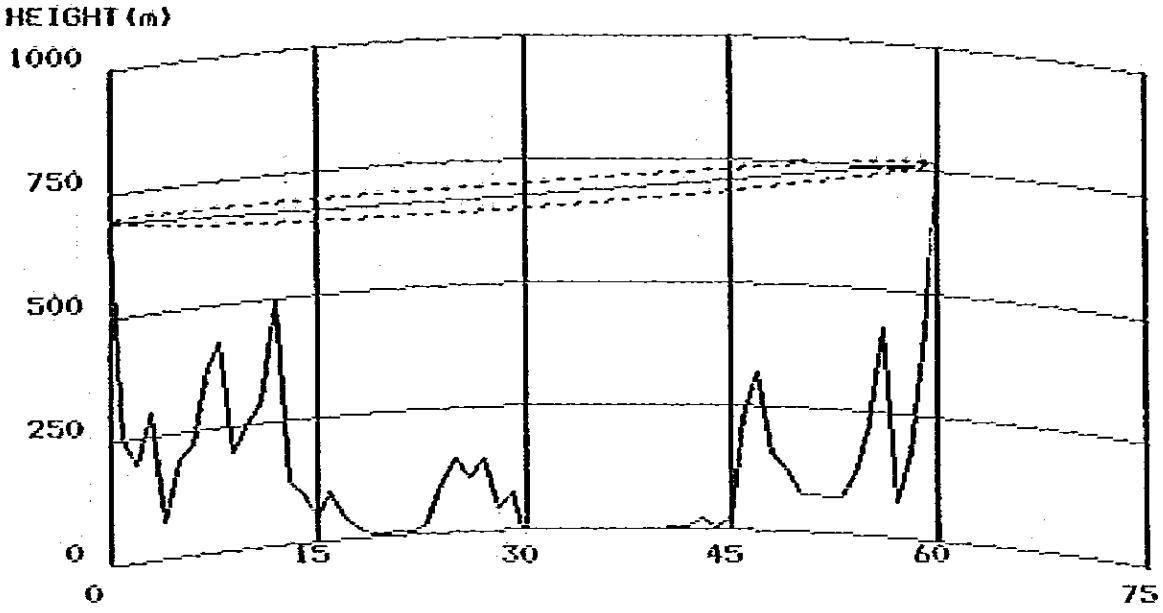
DISTANCE : 39.5 km

SITE NAME : I.Wengot
GROUND LEVEL : 1050 m

SITE NAME : I.Pasengdaeng
GROUND LEVEL : 660 m

T. Roughness	:	270.0 m	Frequency	:	6770 MHz
Ant. Height(1)	:	30.0 m	Ant. Height(2)	:	30.0 m
Critical Point	:	22.0 km	Ridge Height	:	690.0 m
Tree Height	:	20.0 m	Fresnel Dip	:	20.8 m
Clearance	:	130.1 m	Clearance Fac.	:	6.3
Free Space Loss	:	141.0 dB	Ridge Loss	:	0.0 dB
Total Loss	:	141.0 dB			

PASWIT (1.33 RADIUS)

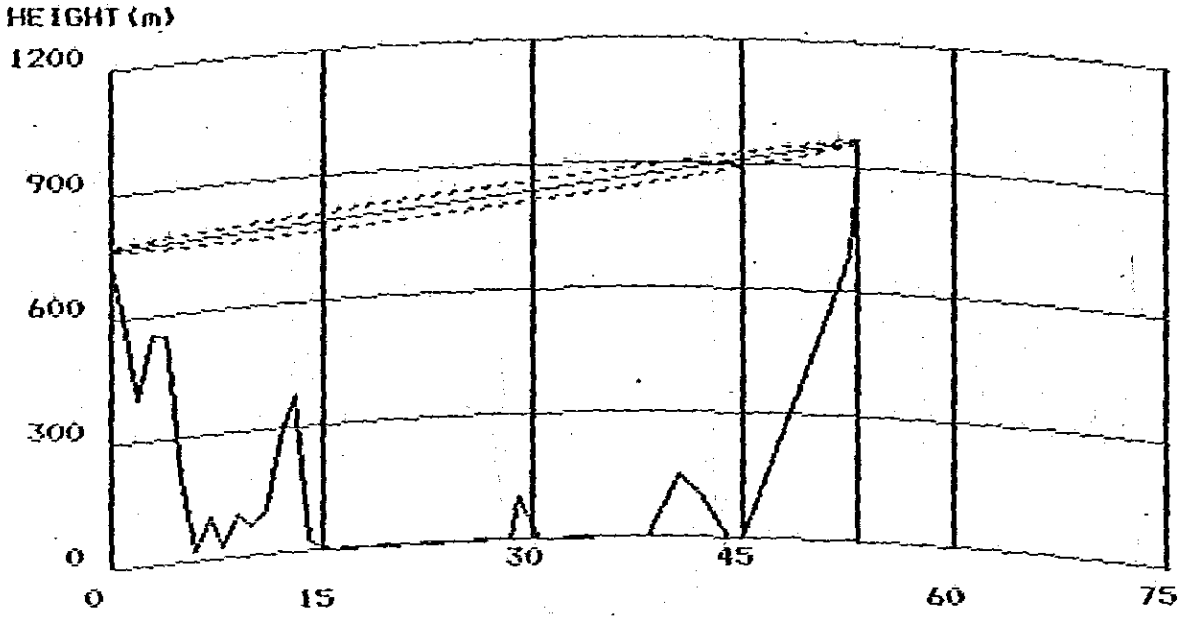


DISTANCE : 59.9 km

SITE NAME : I.Pasengdaeng	SITE NAME : Hanga Wite
GROUND LEVEL : 660 m	GROUND LEVEL : 735 m

T. Roughness	:	149.4 m	Frequency	:	6770 MHz
Ant. Height(1)	:	30.0 m	Ant. Height(2)	:	30.0 m
Critical Point	:	12.0 km	Ridge Height	:	500.0 m
Tree Height	:	20.0 m	Fresnel Dip	:	20.6 m
Clearance	:	151.1 m	Clearance Fac.	:	7.3
Free Space Loss	:	144.6 dB	Ridge Loss	:	0.0 dB
Total Loss	:	144.6 dB			

WITBAT (1.33 RADIUS)



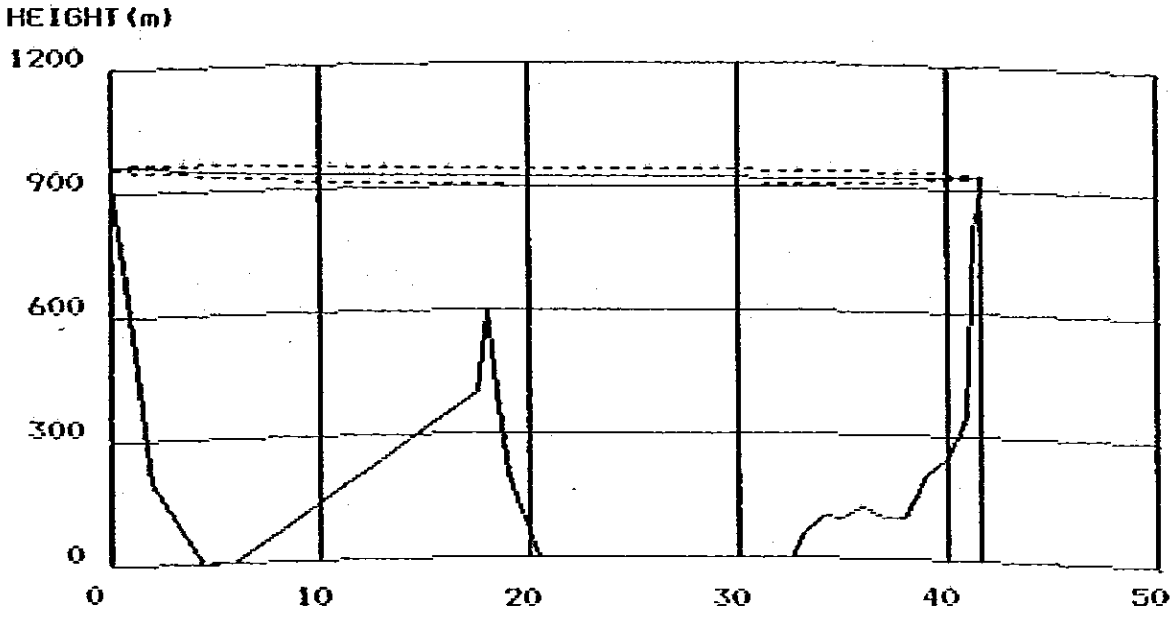
DISTANCE : 53.3 km

SITE NAME : Hanga Wite
GROUND LEVEL : 735 m

SITE NAME : Batang Loi
GROUND LEVEL : 930 m

T. Roughness	:	235.6 m	Frequency	:	6770 MHz
Ant. Height(1)	:	30.0 m	Ant. Height(2)	:	30.0 m
Critical Point	:	4.0 km	Ridge Height	:	550.0 m
Tree Height	:	20.0 m	Fresnel Dip	:	12.8 m
Clearance	:	198.0 m	Clearance Fac.	:	15.5
Free Space Loss	:	143.6 dB	Ridge Loss	:	0.0 dB
Total Loss	:	143.6 dB			

BATREG (1.33 RADIUS)

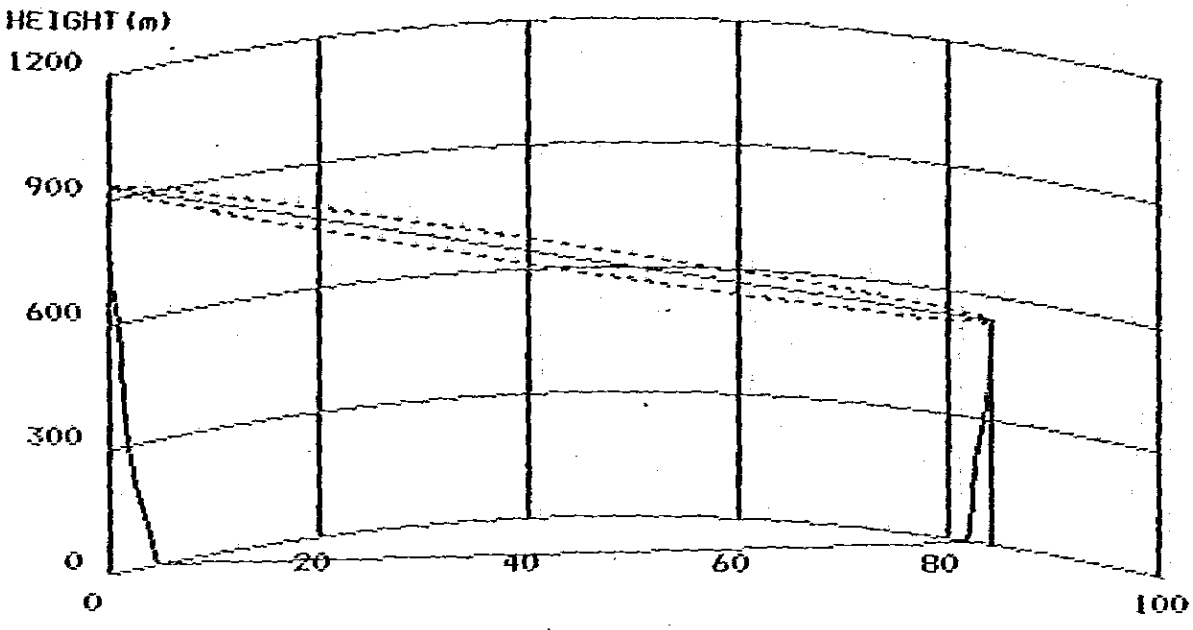


DISTANCE : 41.6 km

SITE NAME : Batang Lol	SITE NAME : Regiar
GROUND LEVEL : 930 m	GROUND LEVEL : 900 m

T. Roughness	:	264.0 m	Frequency	:	6770 MHz
Ant. Height(1)	:	30.0 m	Ant. Height(2)	:	30.0 m
Critical Point	:	18.0 km	Ridge Height	:	600.0 m
Tree Height	:	20.0 m	Fresnel Dip	:	21.3 m
Clearance	:	301.9 m	Clearance Fac.	:	14.2
Free Space Loss	:	141.5 dB	Ridge Loss	:	0.0 dB
Total Loss	:	141.5 dB			

REGAIN (1.33 RADIUS)

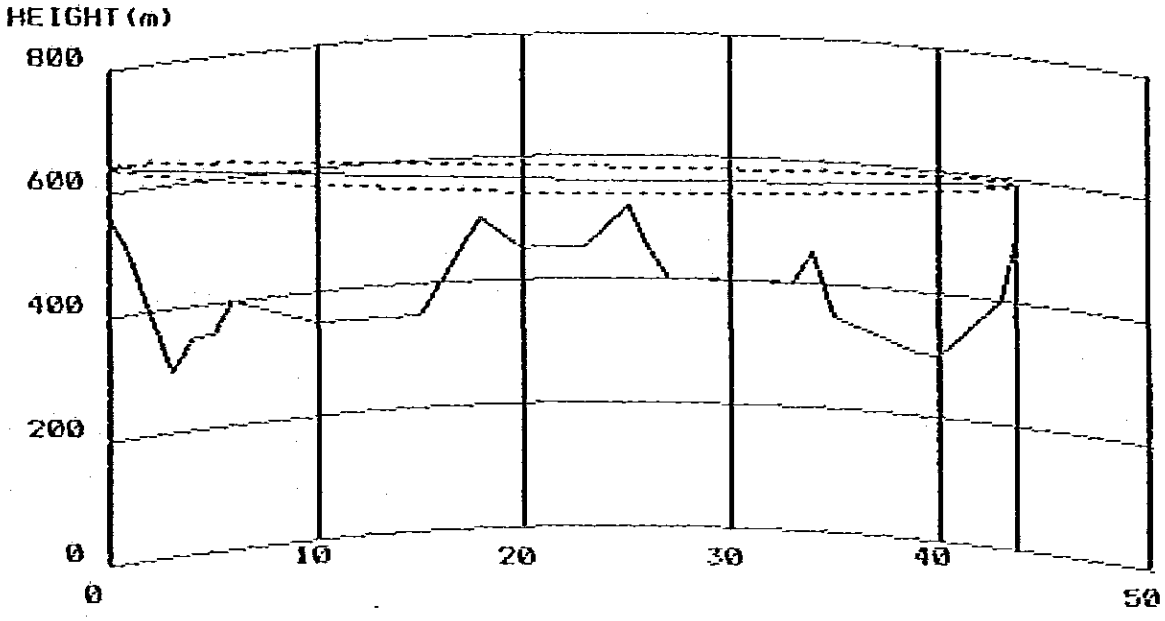


DISTANCE : 84.2 km

SITE NAME : Regiar	SITE NAME : T.Aina
GROUND LEVEL : 900 m	GROUND LEVEL : 510 m

T. Roughness	:	274.9 m	Frequency	:	6770 MHz
Ant. Height(1)	:	30.0 m	Ant. Height(2)	:	30.0 m
Critical Point	:	0.2 km	Ridge Height	:	800.0 m
Tree Height	:	20.0 m	Fresnel Dip	:	3.0 m
Clearance	:	108.1 m	Clearance Fac.	:	36.3
Free Space Loss	:	147.6 dB	Ridge Loss	:	0.0 dB
Total Loss	:	147.6 dB			

BIKAIN` (.67 RADIUS)



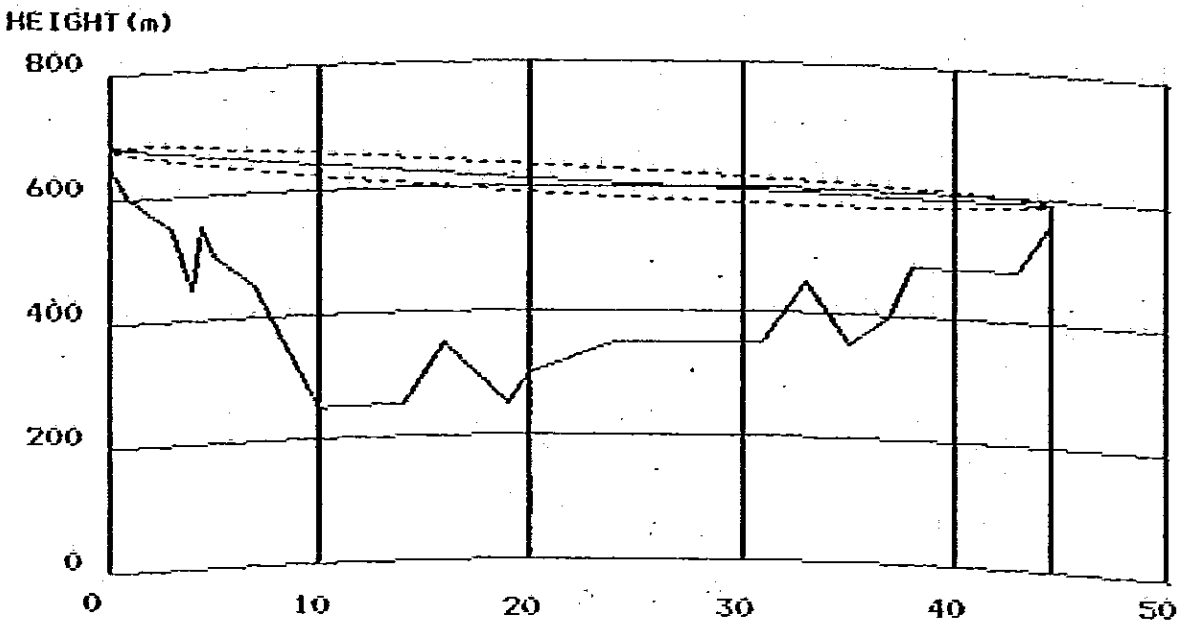
DISTANCE : 43.7 km

SITE NAME : Bikoun
GROUND LEVEL : 560 m

SITE NAME : T.Aina
GROUND LEVEL : 510 m

T. Roughness	:	69.3 m	Frequency	:	6770 MHz
Ant. Height(1)	:	80.0 m	Ant. Height(2)	:	80.0 m
Critical Point	:	25.0 km	Ridge Height	:	520.0 m
Tree Height	:	20.0 m	Fresnel Dip	:	21.8 m
Clearance	:	16.6 m	Clearance Fac.	:	0.8
Free Space Loss	:	141.9 dB	Ridge Loss	:	0.0 dB
Total Loss	:	141.9 dB			

. ULABIK (1.33 RADIUS)



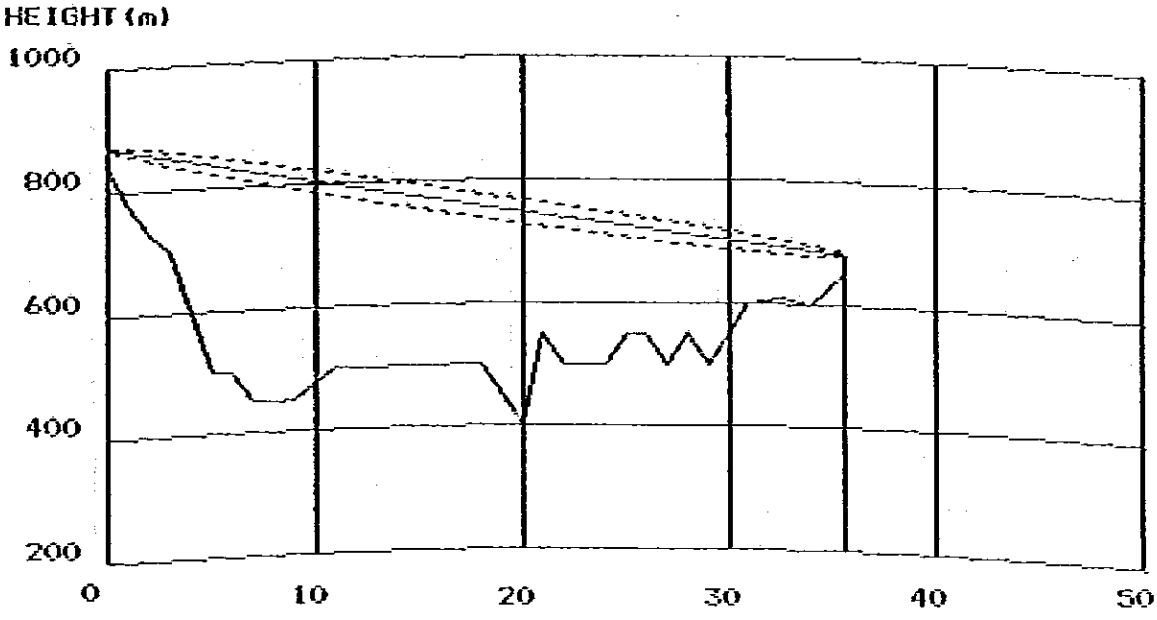
DISTANCE : 44.6 km

SITE NAME : T.Ulamnotu
GROUND LEVEL : 650 m

SITE NAME : Bikoun
GROUND LEVEL : 560 m

T. Roughness	:	112.9 m	Frequency	:	6770 MHz
Ant. Height(1)	:	30.0 m	Ant. Height(2)	:	30.0 m
Critical Point	:	38.0 km	Ridge Height	:	480.0 m
Tree Height	:	20.0 m	Fresnel Dip	:	15.8 m
Clearance	:	88.5 m	Clearance Fac.	:	5.6
Free Space Loss	:	142.1 dB	Ridge Loss	:	0.0 dB
Total Loss	:	142.1 dB			

SOEULA (1.33 RADIUS)



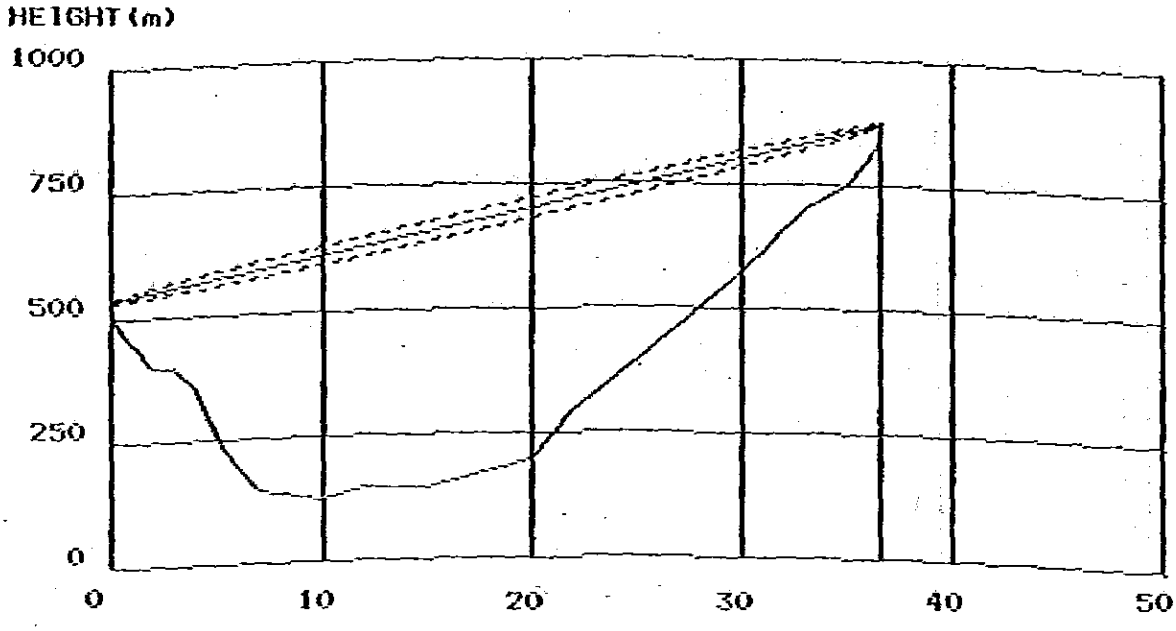
DISTANCE : 35.6 km

SITE NAME : Soe
GROUND LEVEL : 840 m

SITE NAME : T.Ulamnotu
GROUND LEVEL : 650 m

T. Roughness	:	105.2 m	Frequency	:	6770 MHz
Ant. Height(1)	:	30.0 m	Ant. Height(2)	:	30.0 m
Critical Point	:	32.5 km	Ridge Height	:	610.0 m
Tree Height	:	20.0 m	Fresnel Dip	:	11.2 m
Clearance	:	60.6 m	Clearance Fac.	:	5.4
Free Space Loss	:	140.1 dB	Ridge Loss	:	0.0 dB
Total Loss	:	140.1 dB			

UPUSOE (1.33 RADIUS)



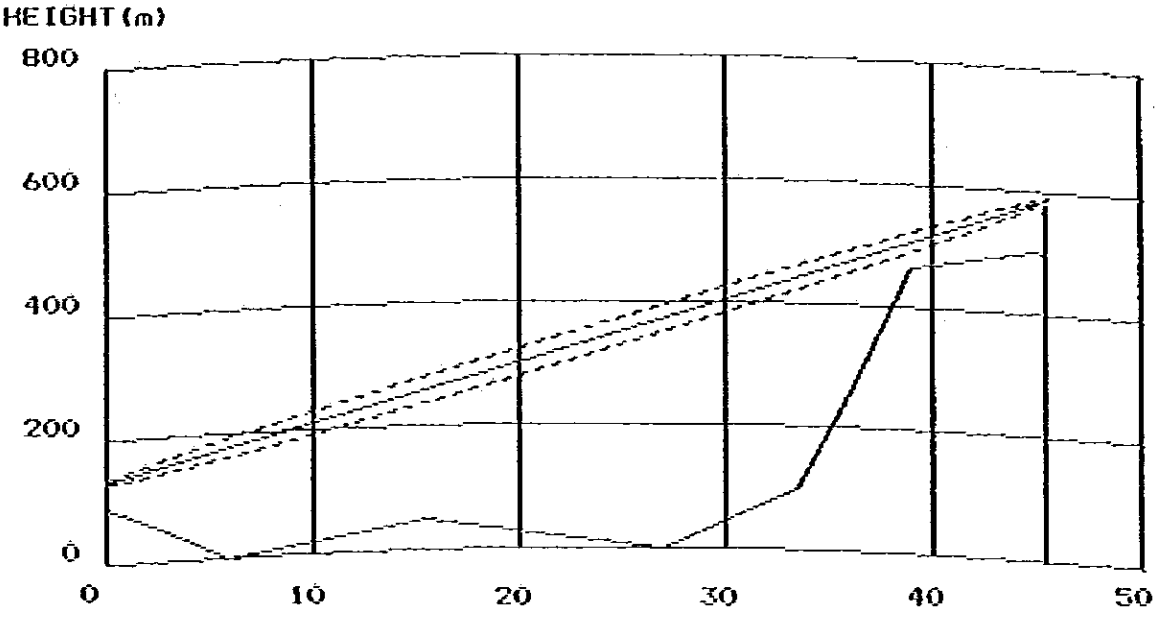
DISTANCE : 36.6 km

SITE NAME : Upuba
GROUND LEVEL : 504 m

SITE NAME : Soe
GROUND LEVEL : 840 m

T. Roughness	:	221.1 m	Frequency	:	6770 MHz
Ant. Height(1)	:	30.0 m	Ant. Height(2)	:	30.0 m
Critical Point	:	36.0 km	Ridge Height	:	800.0 m
Tree Height	:	20.0 m	Fresnel Dip	:	5.1 m
Clearance	:	43.2 m	Clearance Fac.	:	8.5
Free Space Loss	:	140.3 dB	Ridge Loss	:	0.0 dB
Total Loss	:	140.3 dB			

KUPUPU (1.33 RADIUS)



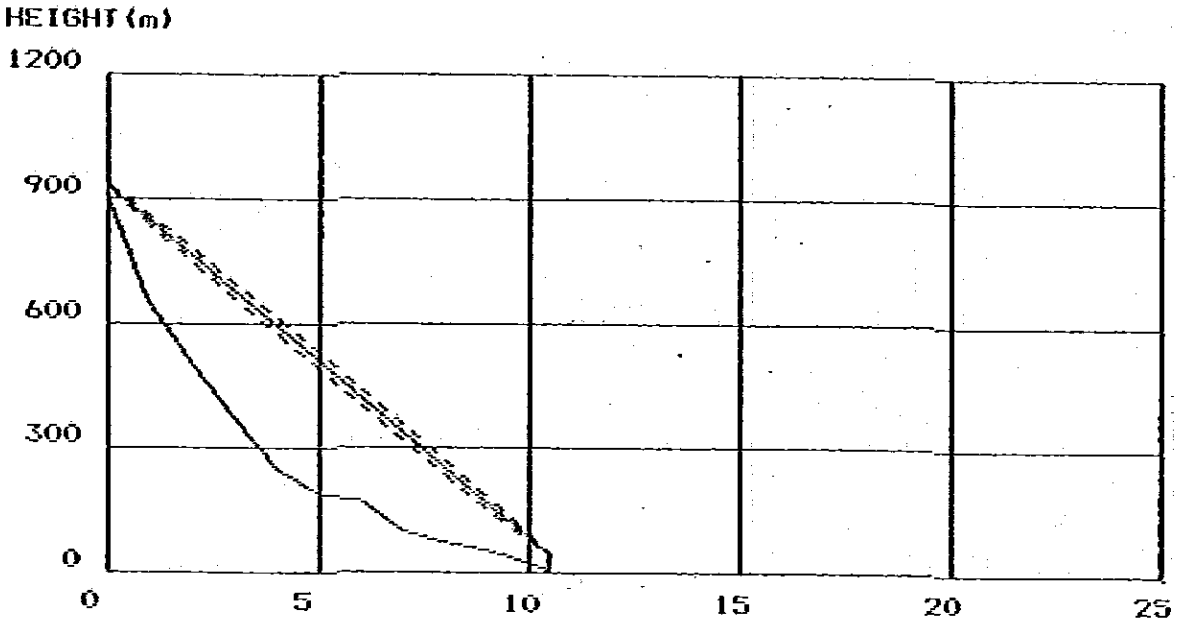
DISTANCE : 45.5 km

SITE NAME : Kupang
GROUND LEVEL : 90 m

SITE NAME : Upuba
GROUND LEVEL : 504 m

T. Roughness	:	182.3 m	Frequency	:	6770 MHz
Ant. Height(1)	:	40.0 m	Ant. Height(2)	:	80.0 m
Critical Point	:	39.0 km	Ridge Height	:	463.0 m
Tree Height	:	20.0 m	Fresnel Dip	:	15.7 m
Clearance	:	21.2 m	Clearance Fac.	:	1.3
Free Space Loss	:	142.2 dB	Ridge Loss	:	0.0 dB
Total Loss	:	142.2 dB			

NGGMAU (1.33 RADIUS)



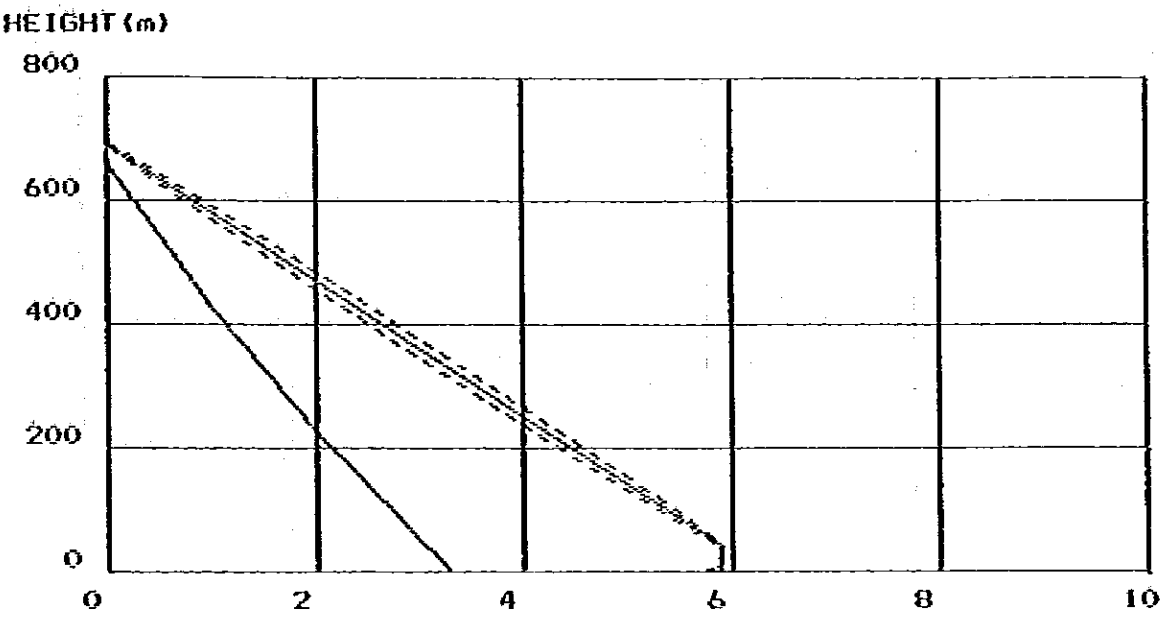
DISTANCE : 10.5 km

SITE NAME : I.Nggai
GROUND LEVEL : 900 m

SITE NAME : Maumere
GROUND LEVEL : 10 m

T. Roughness	:	264.4 m	Frequency	:	2000 MHz
Ant. Height(1)	:	30.0 m	Ant. Height(2)	:	30.0 m
Critical Point	:	9.0 km	Ridge Height	:	60.0 m
Tree Height	:	20.0 m	Fresnel Dip	:	13.9 m
Clearance	:	86.3 m	Clearance Fac.	:	6.2
Free Space Loss	:	118.9 dB	Ridge Loss	:	0.0 dB
Total Loss	:	118.9 dB			

PASLAR (1.33 RADIUS)



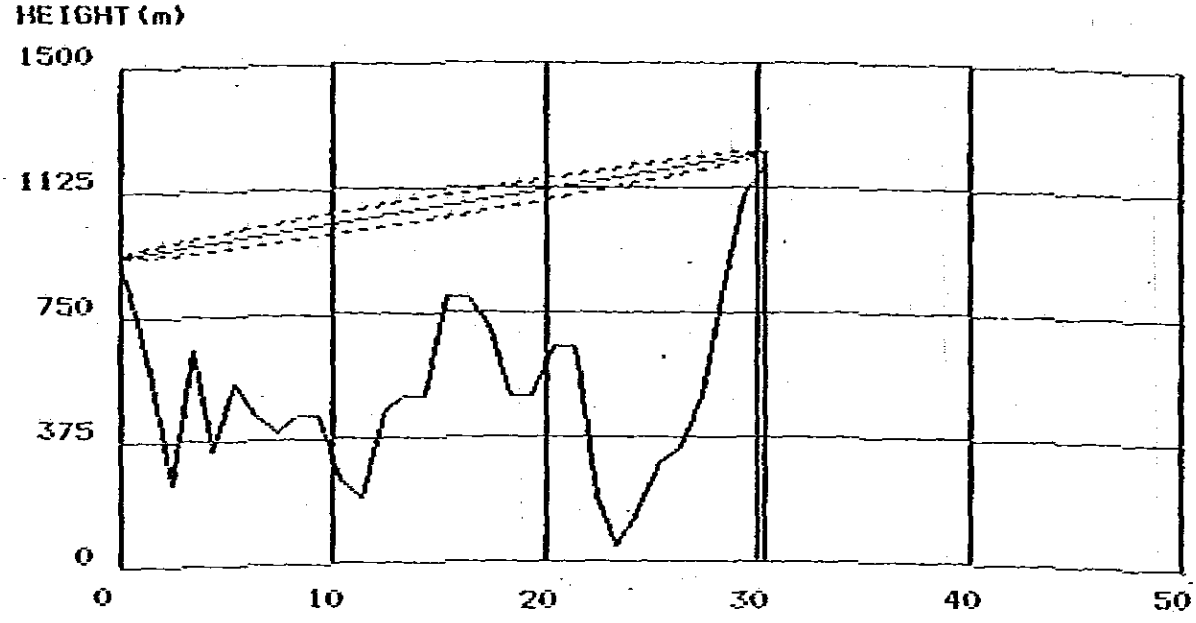
DISTANCE : 5.9 km

SITE NAME : I.Pasengdaeng
GROUND LEVEL : 660 m

SITE NAME : Larantuka
GROUND LEVEL : 10 m

T. Roughness	:	254.4 m	Frequency	:	2000 MHz
Ant. Height(1)	:	30.0 m	Ant. Height(2)	:	30.0 m
Critical Point	:	5.7 km	Ridge Height	:	0.0 m
Tree Height	:	20.0 m	Fresnel Dip	:	5.4 m
Clearance	:	42.0 m	Clearance Fac.	:	7.8
Free Space Loss	:	113.9 dB	Ridge Loss	:	0.0 dB
Total Loss	:	113.9 dB			

REGLAL (1.33 RADIUS)



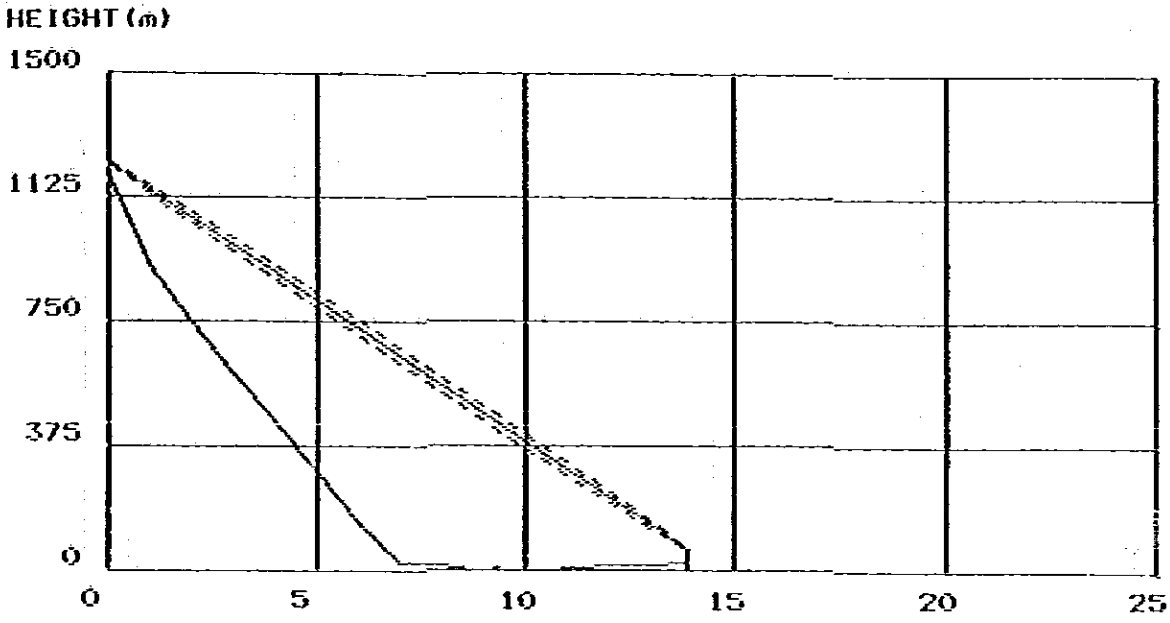
DISTANCE : 30.4 km

SITE NAME : Regiar
GROUND LEVEL : 900 m

SITE NAME : Laling
GROUND LEVEL : 1200 m

T. Roughness	:	238.5 m	Frequency	:	2000 MHz
Ant. Height(1)	:	30.0 m	Ant. Height(2)	:	30.0 m
Critical Point	:	15.4 km	Ridge Height	:	800.0 m
Tree Height	:	20.0 m	Fresnel Dip	:	33.8 m
Clearance	:	248.3 m	Clearance Fac.	:	7.4
Free Space Loss	:	128.1 dB	Ridge Loss	:	0.0 dB
Total Loss	:	128.1 dB			

LALKAR (1.33 RADIUS)



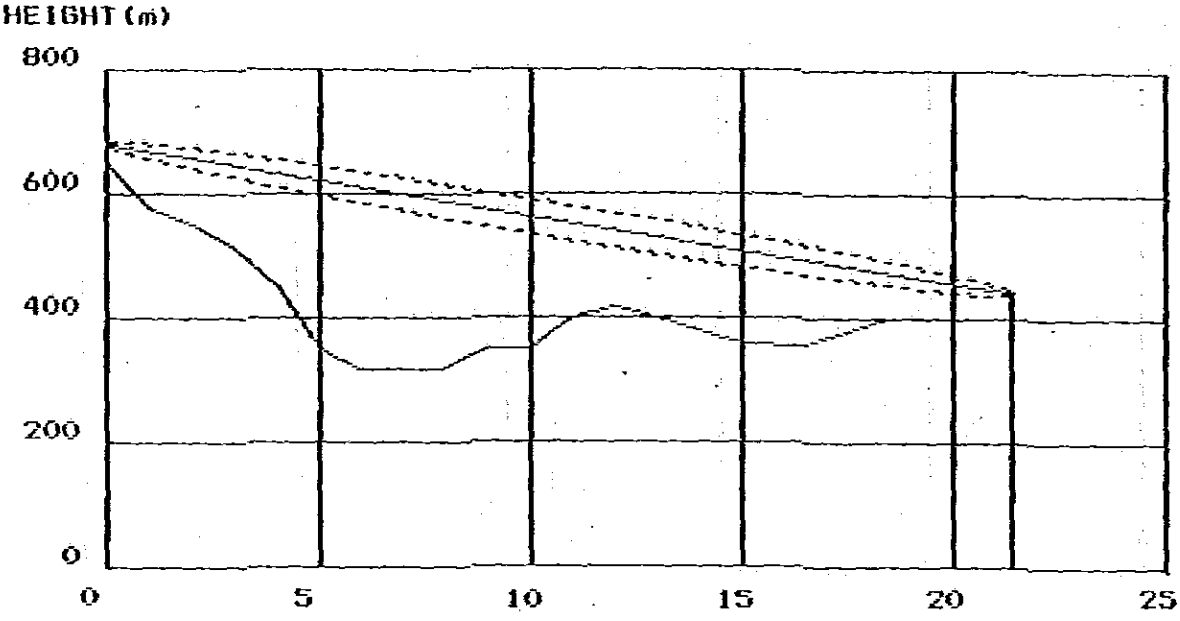
DISTANCE : 13.9 km

SITE NAME : Laling
GROUND LEVEL : 1200 m

SITE NAME : Karabahi
GROUND LEVEL : 30 m

T. Roughness	:	377.8 m	Frequency	:	2000 MHz
Ant. Height(1)	:	30.0 m	Ant. Height(2)	:	30.0 m
Critical Point	:	13.0 km	Ridge Height	:	20.0 m
Tree Height	:	20.0 m	Fresnel Dip	:	11.2 m
Clearance	:	95.1 m	Clearance Fac.	:	8.5
Free Space Loss	:	121.3 dB	Ridge Loss	:	0.0 dB
Total Loss	:	121.3 dB			

ULAKEF (1.33 RADIUS)



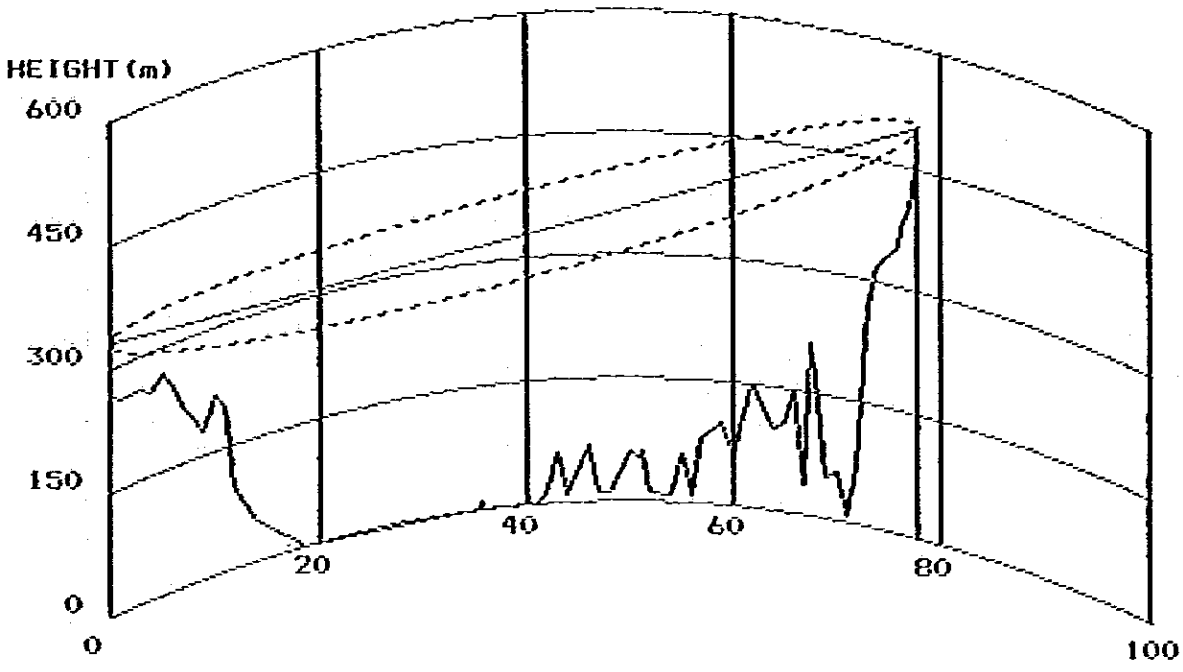
DISTANCE : 21.4 km

SITE NAME : T.Ulamnotu
GROUND LEVEL : 650 m

SITE NAME : Kefamenanu
GROUND LEVEL : 400 m

T. Roughness	:	91.7 m	Frequency	:	2000 MHz
Ant. Height(1)	:	30.0 m	Ant. Height(2)	:	40.0 m
Critical Point	:	20.0 km	Ridge Height	:	400.0 m
Tree Height	:	20.0 m	Fresnel Dip	:	14.0 m
Clearance	:	34.0 m	Clearance Fac.	:	2.4
Free Space Loss	:	125.1 dB	Ridge Loss	:	0.0 dB
Total Loss	:	125.1 dB			

SIKOES (1.33 RADIUS)

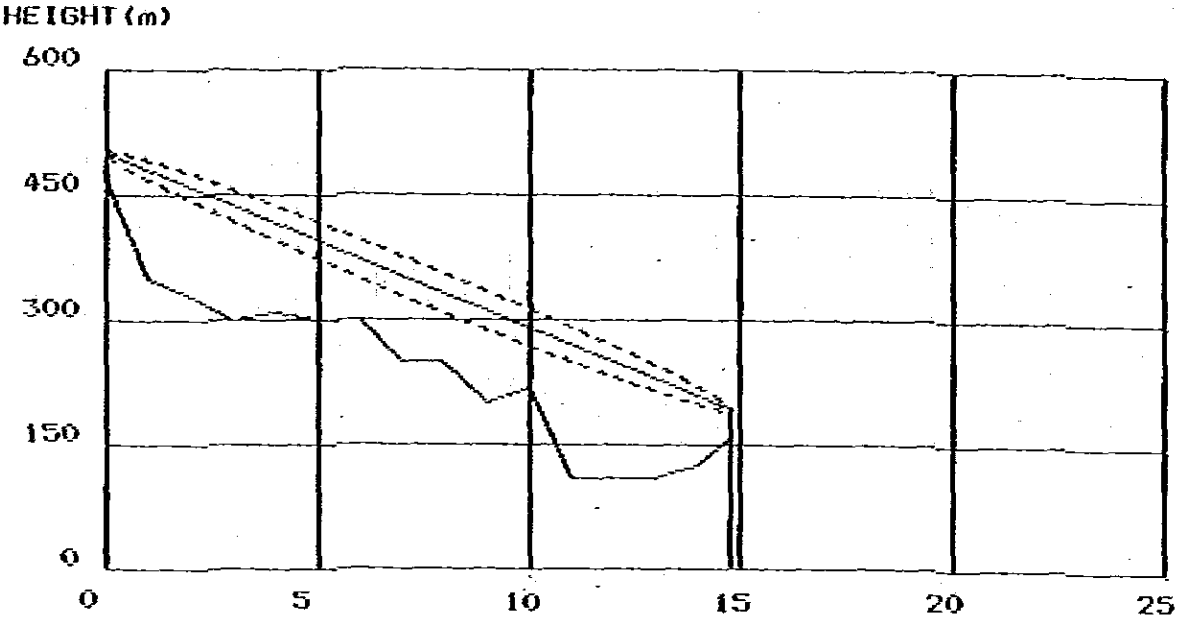


DISTANCE : 77.9 km

SITE NAME : Sikoemana	SITE NAME : D.Oesai
GROUND LEVEL : 270 m	GROUND LEVEL : 470 m

T. Roughness	:	118.5 m	Frequency	:	2000 MHz
Ant. Height(1)	:	60.0 m	Ant. Height(2)	:	30.0 m
Critical Point	:	5.0 km	Ridge Height	:	270.0 m
Tree Height	:	20.0 m	Fresnel Dip	:	26.5 m
Clearance	:	29.4 m	Clearance Fac.	:	1.1
Free Space Loss	:	136.3 dB	Ridge Loss	:	0.0 dB
Total Loss	:	136.3 dB			

OESBAT (1.33 RADIUS)



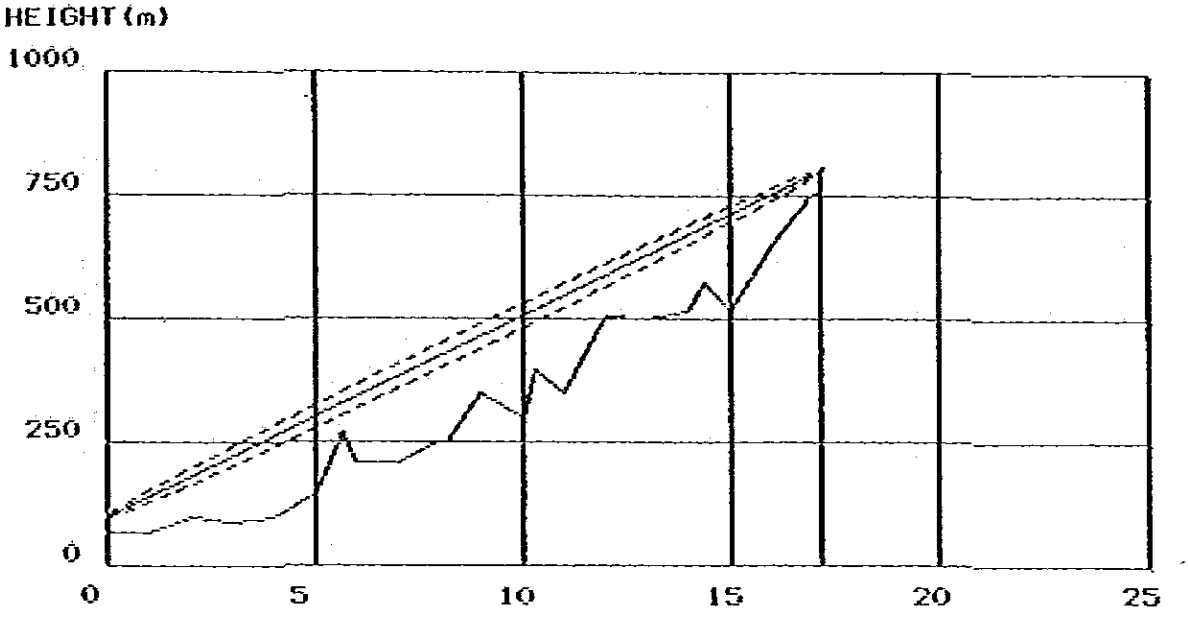
DISTANCE : 14.8 km

SITE NAME : D.Oesai
GROUND LEVEL : 470 m

SITE NAME : Batoengolo
GROUND LEVEL : 160 m

T. Roughness	:	97.5 m	Frequency	:	2000 MHz
Ant. Height(1)	:	30.0 m	Ant. Height(2)	:	30.0 m
Critical Point	:	10.0 km	Ridge Height	:	220.0 m
Tree Height	:	25.0 m	Fresnel Dip	:	22.1 m
Clearance	:	42.7 m	Clearance Fac.	:	1.9
Free Space Loss	:	121.9 dB	Ridge Loss	:	0.0 dB
Total Loss	:	121.9 dB			

PRAPIL (1.33 RADIUS)



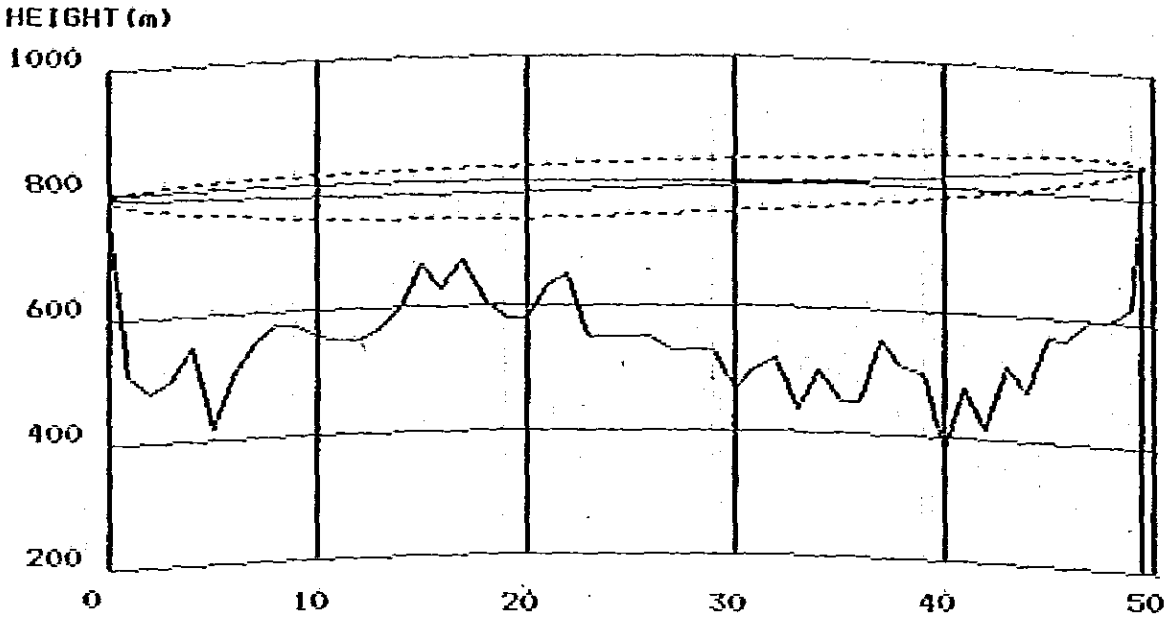
DISTANCE : 17.2 km

SITE NAME : Prainghoar
GROUND LEVEL : 70 m

SITE NAME : Pilautamanu
GROUND LEVEL : 760 m

T. Roughness	:	198.1 m	Frequency	:	2000 MHz
Ant. Height(1)	:	30.0 m	Ant. Height(2)	:	40.0 m
Critical Point	:	5.7 km	Ridge Height	:	270.0 m
Tree Height	:	20.0 m	Fresnel Dip	:	23.9 m
Clearance	:	38.1 m	Clearance Fac.	:	1.6
Free Space Loss	:	123.2 dB	Ridge Loss	:	0.0 dB
Total Loss	:	123.2 dB			

PILPAR (1.33 RADIUS)



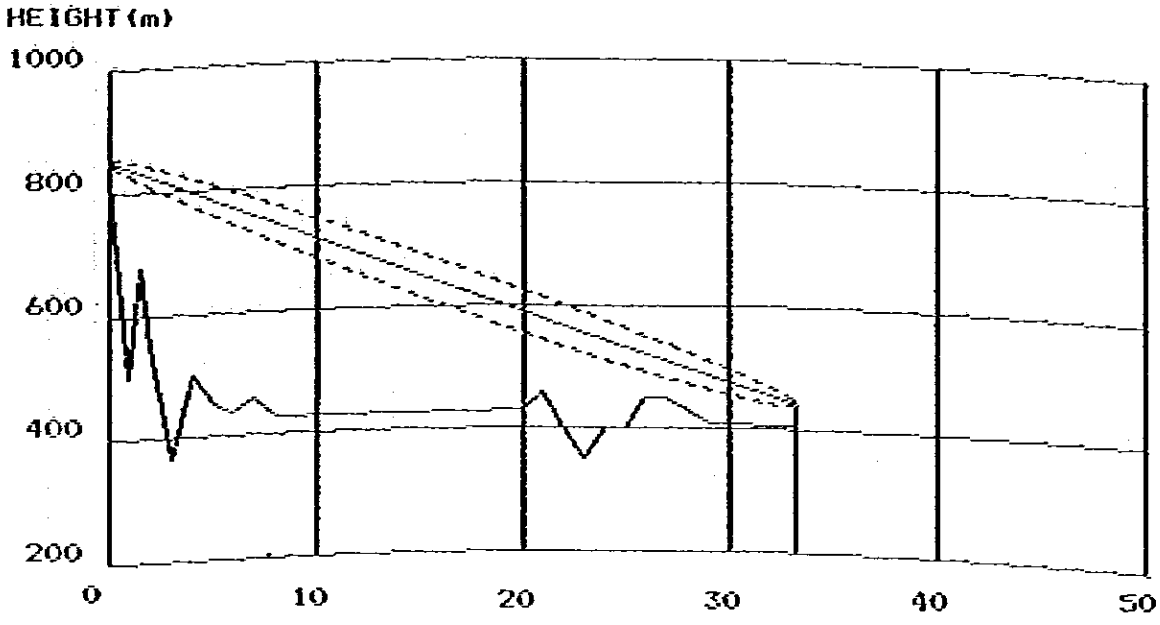
DISTANCE : 49.5 km

SITE NAME : Pilautamanu
GROUND LEVEL : 760 m

SITE NAME : Paraingmahara
GROUND LEVEL : 820 m

T. Roughness	:	72.3 m	Frequency	:	2000 MHz
Ant. Height(1)	:	30.0 m	Ant. Height(2)	:	30.0 m
Critical Point	:	17.0 km	Ridge Height	:	675.0 m
Tree Height	:	20.0 m	Fresnel Dip	:	40.9 m
Clearance	:	83.0 m	Clearance Fac.	:	2.0
Free Space Loss	:	132.4 dB	Ridge Loss	:	0.0 dB
Total Loss	:	132.4 dB			

PARWAI (1.33 RADIUS)



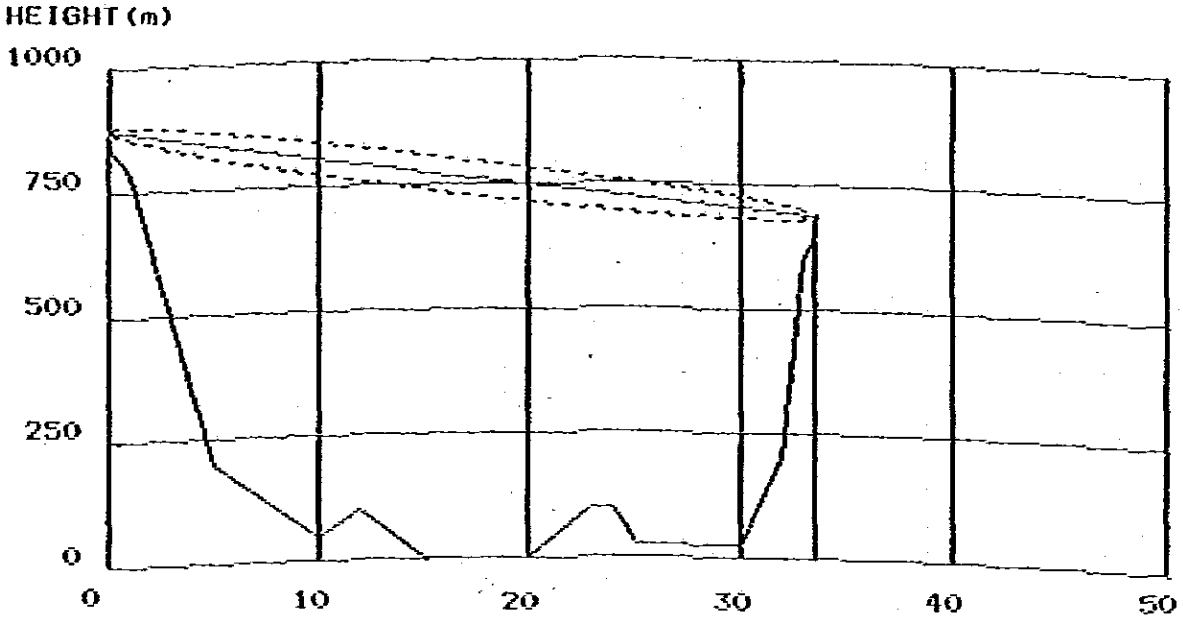
DISTANCE : 33.2 km

SITE NAME : Paraingmahala
GROUND LEVEL : 820 m

SITE NAME : Wailiang
GROUND LEVEL : 410 m

T. Roughness	:	105.5 m	Frequency	:	2000 MHz
Ant. Height(1)	:	30.0 m	Ant. Height(2)	:	30.0 m
Critical Point	:	27.0 km	Ridge Height	:	450.0 m
Tree Height	:	20.0 m	Fresnel Dip	:	27.5 m
Clearance	:	36.7 m	Clearance Fac.	:	1.3
Free Space Loss	:	128.9 dB	Ridge Loss	:	0.0 dB
Total Loss	:	128.9 dB			

DORMON (1.33 RADIUS)



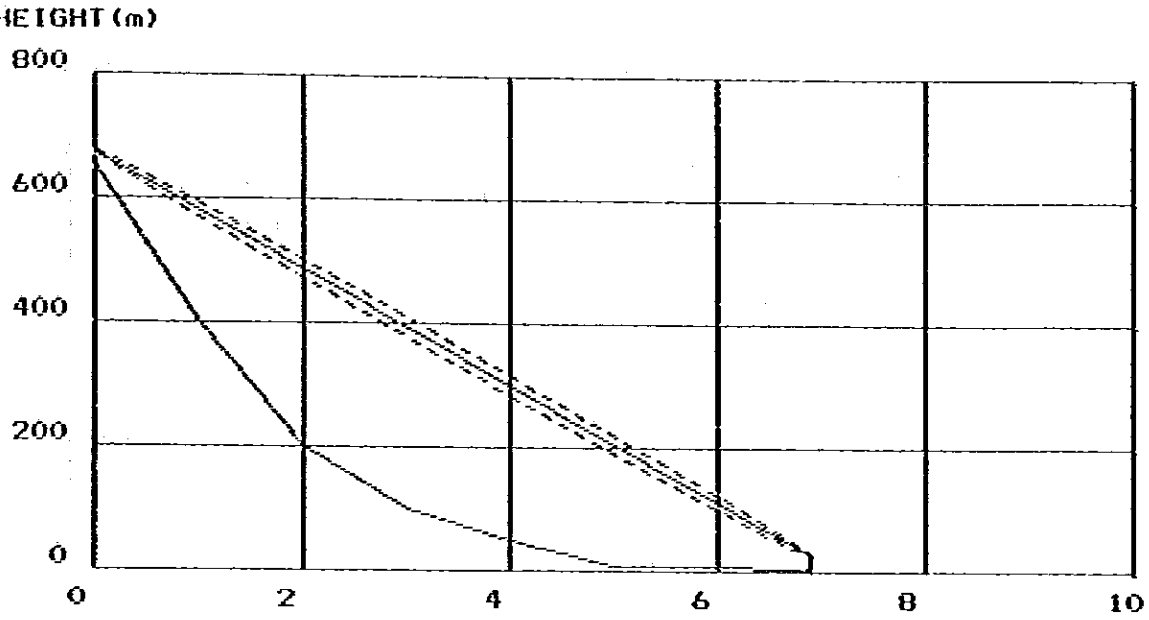
DISTANCE : 33.6 km

SITE NAME : Doronae
GROUND LEVEL : 843 m

SITE NAME : Monggo
GROUND LEVEL : 655 m

T. Roughness	:	291.0 m	Frequency	:	2000 MHz
Ant. Height(1)	:	30.0 m	Ant. Height(2)	:	30.0 m
Critical Point	:	1.0 km	Ridge Height	:	800.0 m
Tree Height	:	20.0 m	Fresnel Dip	:	12.1 m
Clearance	:	45.5 m	Clearance Fac.	:	3.8
Free Space Loss	:	129.0 dB	Ridge Loss	:	0.0 dB
Total Loss	:	129.0 dB			

MONDOM (1.33 RADIUS)

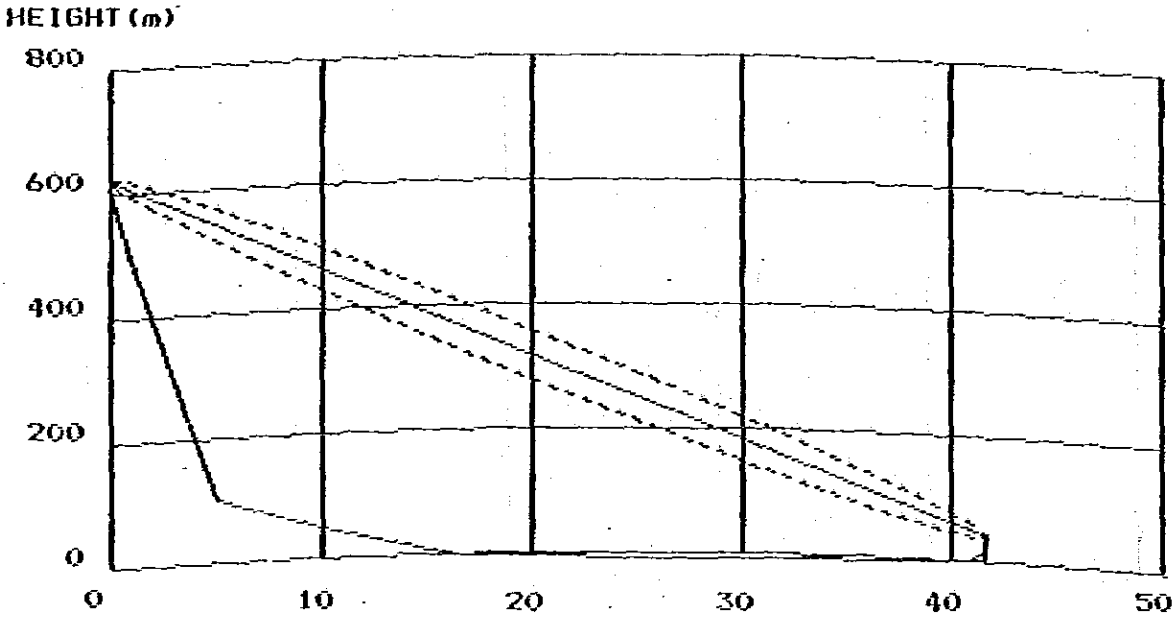


DISTANCE : 6.9 km

SITE NAME : Monggo	SITE NAME : Dompu
GROUND LEVEL : 655 m	GROUND LEVEL : 5 m

T. Roughness	:	219.7 m	Frequency	:	2000 MHz
Ant. Height(1)	:	20.0 m	Ant. Height(2)	:	20.6 m
Critical Point	:	6.7 km	Ridge Height	:	5.0 m
Tree Height	:	20.0 m	Fresnel Dip	:	5.4 m
Clearance	:	18.8 m	Clearance Fac.	:	3.5
Free Space Loss	:	115.3 dB	Ridge Loss	:	0.0 dB
Total Loss	:	115.3 dB			

JORLAB (1.33 RADIUS)



DISTANCE : 41.6 km

SITE NAME : BT.Jorongkoak
GROUND LEVEL : 600 m

SITE NAME : Lab-Balat
GROUND LEVEL : 20 m

T. Roughness	:	222.8 m	Frequency	:	2000 MHz
Ant. Height(1)	:	20.0 m	Ant. Height(2)	:	20.0 m
Critical Point	:	41.0 km	Ridge Height	:	0.0 m
Tree Height	:	20.0 m	Fresnel Dip	:	9.4 m
Clearance	:	26.9 m	Clearance Fac.	:	2.9
Free Space Loss	:	130.9 dB	Ridge Loss	:	0.0 dB
Total Loss	:	130.9 dB			

18. Scope of Work

SCOPE OF WORK
FOR
THE FEASIBILITY STUDY
ON
TERRESTRIAL TRANSMISSION NETWORK DEVELOPMENT
IN
THE NUSA TENGGARA AREA
OF
THE REPUBLIC OF INDONESIA

Agreed upon between
DIRECTORATE GENERAL OF POSTS AND TELECOMMUNICATIONS,
The Government of Indonesia
and
JAPAN INTERNATIONAL COOPERATION AGENCY

April , 1983

IR. ROLLIN
Deputy Director General
Directorate General of Posts and
Telecommunications.

TATSUO KAWANO
Leader
JICA Preliminary Study Team

I. INTRODUCTION

In response to the request of the Government of Indonesia, the Government of Japan has decided to conduct a feasibility study on the terrestrial transmission system in the Nusa Tenggara area of the Republic of Indonesia (hereinafter referred to as "the Study") as a part of its technical cooperation programmes to foreign countries.

The Japan International Cooperation Agency (JICA), the official agency responsible for the implementation of technical cooperation programmes of the Government of Japan, will carry out the Study in close cooperation with the Government of the Republic of Indonesia and the authorities concerned.

II. OBJECTIVE OF THE STUDY

The objective of the Study is to verify the technical and economic feasibility of developing a terrestrial transmission system in the Study area as the target year of 2005, with due consideration of the coexistence with the satellite transmission system.

III. SCOPE OF THE STUDY

1. Study Area

   Nusa Tenggara Barat and Nusa Tenggara Timur

2. Outline of the Study

   1). Collection and review of existing data/information, including those of the satellite system, relevant to the Study

   2). Field survey for terrestrial transmission network

   3). Interview and discussion with relevant Government departments and agencies

   4). Technical and economic evaluation of various alternatives including a submarine cable system between Ende and Kupang

   5). Preparation of a basic system design on the optimum terrestrial transmission network and its implementation program

6). Estimation of the project cost

7). Financial and economic analysis of the project

IV. STUDY SCHEDULE

The whole work will be conducted in accordance with the attached tentative study schedule.

V. REPORTS

JICA will prepare and submit the following reports in English to the Government of Indonesia.

1) Inception Report
   - 20 copies
   - at the beginning of the field survey

2) Progress Report
   - 20 copies
   - at the end of the field survey

3) Draft Final Report
   - 20 copies
   - within three months after the submission of the Progress Report
   - by the end of the stay of the Study Team in Indonesia, the Government of Indonesia will provide JICA with its comments on the Draft Final Report

4) Final Report
   - 50 copies
   - within two months after the explanation of the Draft Final Report.

VI. UNDERTAKING OF THE GOVERNMENT OF INDONESIA

1) to provide the Study Team with available data and information relevant to the Study

2) to provide suitable office space with necessary equipment and services

3) to ensure the transportation to carry out the field survey

4) to assign official counterparts during the field survey

5) to allow the Study Team to take all data and documents related to the Study including photographs out of Indonesia to Japan in accordance to the security regulation of the Government of Indonesia.

6) to exempt the Study Team from income tax and charges on allowances aid to the members of the Japanese Study Team for their services in connection with the implementation of the study

7) to provide necessary facilities to the Study Team for the remittances as well as utilization of funds introduced into Indonesia from Japan in connection with the implementation of the Study

8) to bear claims, if any arises, against the members of the Study Team resulting from occuring in the course of, or otherwise connected with the discharge of their duties in the implementation of the Study, except when such claims arise from gross negligence or willful misconduct on the part of the members

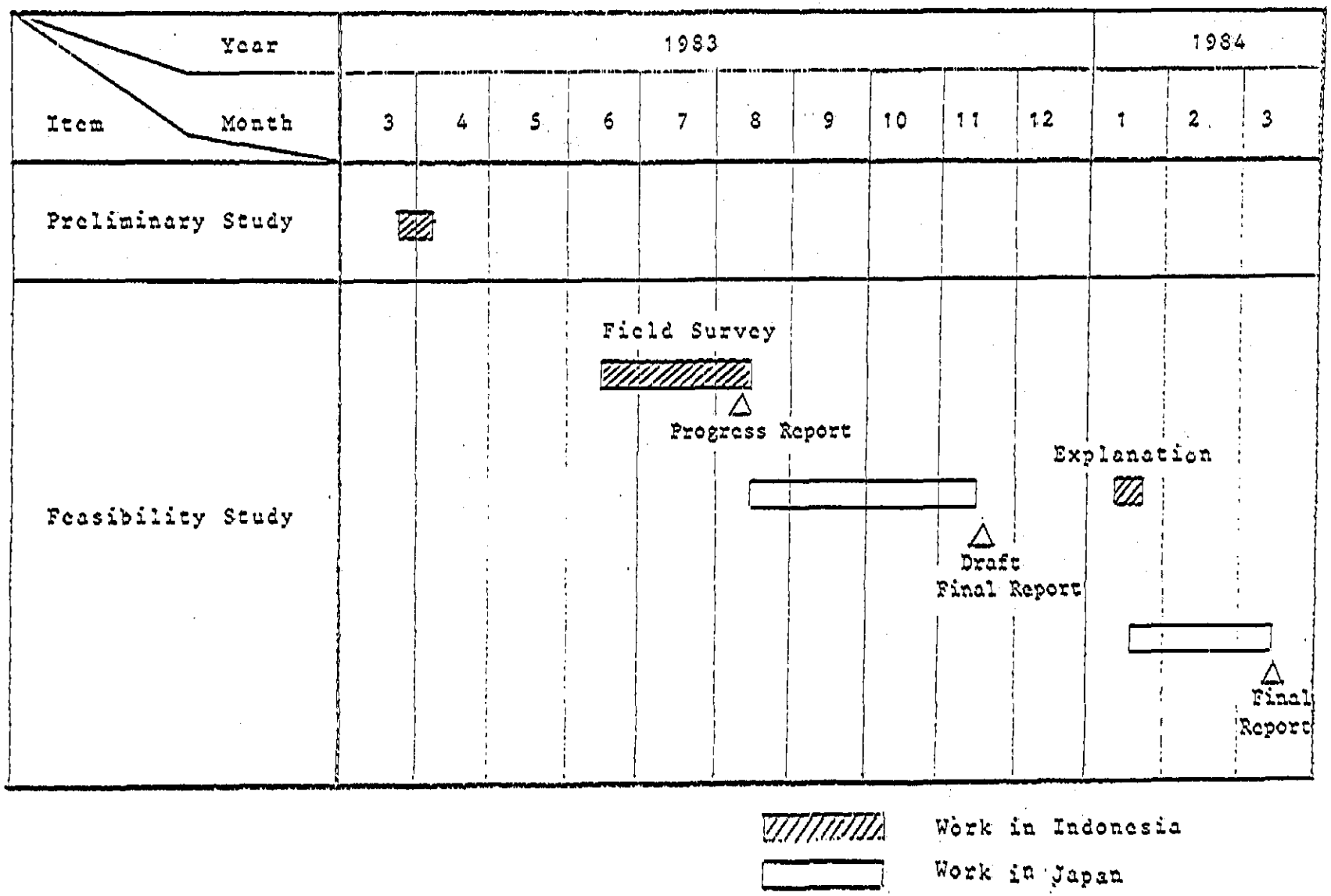
9) to take necessary measures regarding the security of the Study Team

VII. UNDERTAKING OF THE GOVERNMENT OF JAPAN

1) to send, at its own expense, Japanese Study Team to the Republic of Indonesia

2) to perform technology transfer to the Indonesian counterpart personnel in the course of the field survey and relevant work.

STUDY SCHEDULE (Tentative)



19. 打合せ議事録

MINUTES OF MEETING

CONCERNING

THE DRAFT FINAL REPORT ON FEASIBILITY STUDY

FOR

THE NUSA TENGGARA AREA TERRESTRIAL TRANSMISSION NETWORK PROJECT

The JICA Study Team headed by Mr. Akira AIKEI and the Team of DITJEN POSTEL and PERUMTEL headed by Mr. Agus DARMAN/Mr. H.V.R. SARAGIH held the meetings concerning the captioned report on January 19 and 25, 1984, at the conference room of DITJEN POSTEL. A list of attendants is in ANNEX.

Main items discussed are as follows:

1. In the meeting held on January 19, 1984, the JICA Study Team briefed DITJEN POSTEL on the Draft Final Report.

   It was mutually agreed that detailed explanation and discussion on the report would be made between the JICA Study Team and the Team of PERUMTEL at PERUMTEL Offices, Bandung.

2. In the meeting held on January 25, 1984, the JICA Study Team reported to DITJEN POSTEL the result of meetings held by the JICA Study Team and the Team of PERUMTEL on January 21 and 23, 1984, at PERUMTEL Offices, Bandung.

DITJEN POSTEL approved the minutes of the meeting, which were mutually agreed between the JICA Study Team and the Team of PERUMTEL. The said minutes are attached hereto.

Jakarta, January 25, 1984

Confirmed and signed by:

R.I. SOEMARDI
Director of Planning
DITJEN POSTEL

愛敬 彬

AKIRA AIKEI
Leader,
JICA Study Team

ANNEX ATTENDANTS TO THE MEETING (1/2)

January 19, 1984, at the conference room of DITJEN POSTEL, Jakarta.

DITJEN POSTEL

Ir. Agus Darman	- Director of Planning
Mr. R.I. Soemardi Bc.T.T.	- Staff of Planning Division
Mr. H.V.R. Saragih Bc.T.T.	- "
Mr. Sutarto	- "
Mr. M. Malano	- "

DEPARPOSTEL

Mr. Rai Sardjana Bc.T.T.	- Staff
Drs. Soetoso	- Staff of Bureau I

PERUMTEL

Mr. Roesmijanto Bc.T.T.	- Chief, Terrestrial Transmission Planning Division C
Ir. Tjahjono D.H.	- Chief, Terrestrial Transmission Planning Division B
Mr. Azwar Mohamad Bc.T.T.	- Chief, Terrestrial Transmission Planning Division E
Ir. Budiwasisto	- Staff of Coordination Planning Division
Mr. Yasin Rivai Bc.T.T.	- Staff of Terrestrial Transmission Planning Division C
Mr. Jajat Suprijatna Bc.T.T.	- Staff of Terrestrial Transmission Planning Division E

JICA Study Team

Mr. Akira AIKEI	- Leader
Mr. Takashi SUZUKI	
Mr. Junichi KOMADA	
Mr. Mikio DANNO	
Mr. Minoru TATEMATSU	- Coordinator
Mr. Yasuo SUZUKI	- First Secretary, Embassy of Japan
Mr. Tatsuichi HIDAKA	- Resident Representative, NTT Jakarta Office
Mr. Ken INOMATA	- Assistant Resident Representative, JICA Jakarta Office

ANNEX. ATTENDANTS TO THE MEETING (2/2)

January 25, 1984, at the conference room of DITJEN POSTEL, Jakarta.

DITJEN POSTEL

Mr. H.V.R. Saragih Bc.T.T.	- Staff of Planning Division
Mr. Sutarto	- Staff of Planning Division
Mr. M. Malano	- Staff of Planning Division

PERUMTEL

Mr. Azwar Mohamad Bc.T.T.	- Chief, Terrestrial Transmission Planning Division E
Mr. Budiwasisto	- Staff of Coordination Planning Division
Mr. Jajat Suprijatna Bc.T.T.	- Staff of Terrestrial Transmission Planning Division E

JICA Study Team

Mr. Akira AIKEI	- Leader
Mr. Takashi SUZUKI	
Mr. Junichi KOMADA	
Mr. Mikio DANNO	
Mr. Minoru TATEMATSU	- Coordinator
Mr. Tatsuichi HIDAKA	- Resident Representative, NTT Jakarta Office

MINUTES OF MEETING
CONCERNING
THE DRAFT FINAL REPORT ON FEASIBILITY STUDY
FOR
THE NUSA TENGGARA AREA
TERRESTRIAL TRANSMISSION NETWORK PROJECT

The JICA Study Team headed by Mr. Akira Aikei and the Team of PERUMTEL headed by Mr. Roesmijanto made discussion on the Draft Final Report of the captioned Feasibility Study on January 21 and 23, 1984, at PERUMTEL Offices located at Jl. Hassanudin No.7, Jl. Cendana No. 16 and Jl. Supratman No. 48, Bandung.

A list of attendants is in ANNEX.

The JICA Team made explanation on the Feasibility Study Report and made discussion with the PERUMTEL Team.

As the result , concerning the formulation of the Final Report, both parties have agreed and confirmed the following :

1. The presented Draft Final Report has been approved as the Final Report by both parties.
2. For the finalization of the report, necessary editorial modifications will be made.

Bandung, January 23, 1984

Confirmed and signed by :

Roesmijanto
Chief
Terrestrial Transmission
Planning Division C

愛敬彬
Akira AIKEI
Leader
JICA Study Team

ANNEX ATTENDANTS TO THE MEETING (1/3)

January 21, 1984, at the conference room of PERUMTEL, Bandung.

PERUMTEL:

Mr. Roesmijanto Bc.TT	- Chief, Terrestrial Transmission Planning Division C
Ir. Tjahjono D.H.	- Chief, Terrestrial Transmission Planning Division B
Mr. Azwar Mohamad Bc.TT	- Chief, Terrestrial Transmission Planning Division E
Ir. Budiwasisto	- Staff of Coordination Planning Division
Mr. Yasin Rivai Bc.TT	- Staff of Terrestrial Transmission Planning Division C
Mr. Jajat Suprijatna Bc.TT	- Staff of Terrestrial Transmission Planning Division E
Ir. Gadang R.	- Staff of Cable Planning Division
Mr. Soewito Bc.TT	- Staff of Cable Planning Division
Drs. Endang Rachmat	- Staff of Financial Division

JICA Study Team:

Mr. Akira AIKEI	- Leader
Mr. Takashi SUZUKI	
Mr. Junichi KOMADA	
Mr. Mikio DANNO	
Mr. Minoru TATEMATSU	- Coordinator

JTM:

Mr. Takao IWASHIMIZU	- Leader of JTM

ANNEX ATTENDANTS TO THE MEETING (2/3)

January 23, 1984, at the conference room of PERUMTEL, Bandung

PERUMTEL

Drs. Sutjito Bc.A.T.	- Chief, Capital Management Division
Drs. I. Nangah Seroma	- Staff of Capital Management Division
Drs. Endang Rachmat	- Staff of Financial Division

JICA Study Team

Mr. Mikio DANNO

ANNEX ATTENDANTS TO THE MEETING (3/3)

January 23, 1984, at the conference room of PERUMTEL, Bandung

PERUMTEL

Mr. Roesmijanto Bc.T.T.	- Chief, Terrestrial Transmission Planning Division C
Ir. Tjahjono D.H.	- Chief, Terrestrial Transmission Planning Division B
Ir. Budiwasisto	- Staff of Coordination Planning Division
Mr. Yasin Rivai Bc.T.T.	- Staff of Terrestrial Transmission Planning Division C
Ir. Dewi Arumi	- Staff of Switching Planning Division

JICA Study Team

Mr. Akira AIKEI	- Leader
Mr. Takashi SUZUKI	
Mr. Junichi KOMADA	
Mr. Mikio DANNO	
Mr. Minoru TATEMATSU	- Coordinator

JTM

Mr. Takao IWASHIMIZU	- Leader of JTM

MINUTES OF MEETING

CONCERNING

THE PROGRESS REPORT ON FEASIBILITY STUDY

FOR

THE NUSA TENGGARA TERRESTRIAL TRANSMISSION NETWORK PROJECT

IN

THE REPUBLIC OF INDONESIA

The JICA Study Team headed by Mr. Akira AIKEI and DITJEN. POSTEL and PERUMTEL personnel headed by Ir. Agus Darman held the meeting concerning the captioned report on September 21, 1983 at the conference room of DITJEN. POSTEL.

Attendants to this meeting are shown in Attachment-1.

Team Leader of JICA expressed his sincere thanks for the DITJEN. POSTEL's and PERUMTEL's kind cooperation during the study work.

JICA Study Team explained the outlines of Progress Report.
During the meeting, the report was discussed and mutually agreed.

JICA Study Team reported the result of meeting held on September 16, 1983 at PERUMTEL Headquarters, Bandung, and DITJEN. POSTEL approved the minutes of the meeting. The above-mentioned minutes are attached as Attachment-2.

POSTEL requested JICA Study Team to study the application of Solar Cell System and this study will be included in Draft Final Report.

Jakarta, September 22, 1983

Confirmed and signed by:

Ir. AGUS DARMAN
Director of Planning
DITJEN. POSTEL

AKIRA AIKEI
Leader
JICA Study Team

ATTENDANTS TO THE MEETING

September 21, 1983 at the conference room of DITJEN. POSTEL, Jakarta.

POSTEL:

Ir. Agus Darman	- Director, Planning Division
Mr. Moher Malano	- Staff of Planning Division
Mr. Sutarto	- Staff of Planning Division

PERUMTEL:

Ir. Abdul Muhaimin	- Chief, Terrestrial Transmission Planning Division
Mr. Azwar Mohammad Bc.T.T.	- Staff of Terrestrial Transmission Planning Division
Ir. Mulia Tambunan	- Staff of Terrestrial Transmission Planning Division
Mr. Yayat Suprijatna Bc.T.T.	- Staff of Terrestrial Transmission Planning Division
Ir. Budiwasisto	- Staff of Coordination Planning Division
Ir. Andreas Peranginangin	- Staff of Satellite Transmission Planning Division
Ir. Iwan Krisnadi	- Staff of Satellite Transmission Planning Division
Ir. Suradji	- Staff of Satellite Transmission Planning Division
Ir. Mas'ud Bc.T.T.	- Staff of Production Planning Division
Mr. Loeshir Arif JEC	- Staff of Telegraph and Telephone Exchange Planning Division
Ir. Dewi Arumi	- Staff of Telegraph and Telephone Exchange Planning Division

JICA STUDY TEAM:

Mr. Akira AIKEI	- Leader
Mr. Kazutomo OSAWA	- Sub-Leader
Mr. Takashi SUZUKI	- Survey Leader
Mr. Kazuo MORITA	
Mr. Kinya SUZUKI	
Mr. Satoru KUSHIDA	
Mr. Junichi KOMADA	

Mr. Yoshihide HIRATA

Mr. Mikio DANNO

Mr. Katsuhiko KAKEI - Coordinator

NTTPC

Mr. Tatsuichi HIDAKA - Resident Representative in Jakarta.

MINUTES OF MEETING CONCERNING THE PROGRESS REPORT ON FEASIBILITY STUDY FOR THE NUSA TENGGARA TERRESTRIAL TRANSMISSION NETWORK PROJECT IN THE REPUBLIC OF INDONESIA

The JICA Study Team headed by Mr. Akira AIKEI and PERUMTEL personnel concerning this Project headed by Ir. Abdul Mhaimin made discussion on Progress Report of the captioned Feasibility Study on 15 th September, 1983, at the conference room of PERUMTEL Headquarters in Bandung.

Attendants to this meeting are shown in Attachment-1.

Team Leader of JICA expressed his sincere thanks for the PERUMTEL's kind cooperation during the study work.

JICA Study Team explained the outlines of Progress Report.

During the meeting, following points were discussed and mutually agreed.

1. In the meeting at WITEL VIII on 2nd August, 1983, WITEL VIII requested to establish the terrestrial transmission link for the Alas exchange in this Project. After the discussion, however, the terrestrial transmission link to Alas is not to be included in this Project because Alas is not classified as primary centre.

2. As for the Traffic distribution between terrestrial and satellite links, the distribution ratio which is mentioned in ANNEX VI of Progress Report is applied (attached as Attachment - 2).

   In the case of direct routes between secondary centres, the same ratio as the above is applied

3. Terrestrial transmission link for Seba, which is located in Sawu island, is not applied from the technical and economical points of view.
   Establishment of satellite link is to be planned by PERUMTEL.

4. Transmission links for Waikabubak and Larantuka are not included in initial construction of this Project since the digital automatic switching system will not be installed before 1985.

5. Transmission link will be established by analogue system in following sections from the economical viewpoint, because these links are branched from existing analogue system.

   i) Dorongae - Dompu
   ii) Bf. Jorongkoak - Taliwang
   iii) Poco Ranakah - Waingapu
   iv) Poco Ranakah - Ruteng

Bandung, September 19, 1983

Confirmed and signed by :

ABDUL MURAIMIN	AKIRA AIKEI
PRANTRA	LEADER
PERUMTEL	JICA STUDY TEAM

ATTENDANTS TO THE MEETING

September 16, 1983 at the conference room of PERUMTEL Headquarter, Bandung.

PERUMTEL

Ir. Abdul Muhaimin	-	Chief, Terrestrial Transmission Planning Division.
Ir. Azwar Mohammad Bc.TT	-	Staff of Terrestrial Transmission Planning Division.
Ir. Mulia Tambunan	-	Staff of Terrestrial Transmission Planning Division.
Ir. K.Andreas Peranginangin	-	Staff of Satellite Transmission Planning Division.
Ir. Iwan Krisnadi	-	Staff of Satellite Transmission Planning Division.
Ir. Suradji	-	Staff of Satellite Transmission Planning Division.
Mr. Loeshir Arif. JEC	-	Staff of Telegraph and Telephone Exchange Planning Division.
Mr. Chumaidi Bc.TT	-	Staff of Production Planning Division.
Mr. A.Djunaedi	-	Staff of Production Planning Division.
Ir. Budi Wasisto	-	Staff of Coordination Planning Division.
Mr. Soewito	-	Staff of Cable Planning Division.
Mr. Nelson	-	Staff of Building Planning Division.
Mr. Muhammad Iljas	-	Staff of Data Analysis and Evaluation Division.

JICA STUDY TEAM

Akira AIKEI	-	Leader
Kazutomo OSAWA	-	Sub-Leader
Takashi SUZUKI	-	Survey Leader
Kazuo MORITA		

Kinya SUZUKI

Satoru KUSHIDA

Junichi KOMADA

Yoshihide HIRATA

Mikio DANNO

Katsuhiko KAKEI - Coordinator

JTM (Japan Telecommunications Mission)

Takao IWASHIMIZU - Leader of JTM

ANNEX-VI

TRAFFIC DISTRIBUTION TO SATELLITE/TERRESTRIAL SYSTEM

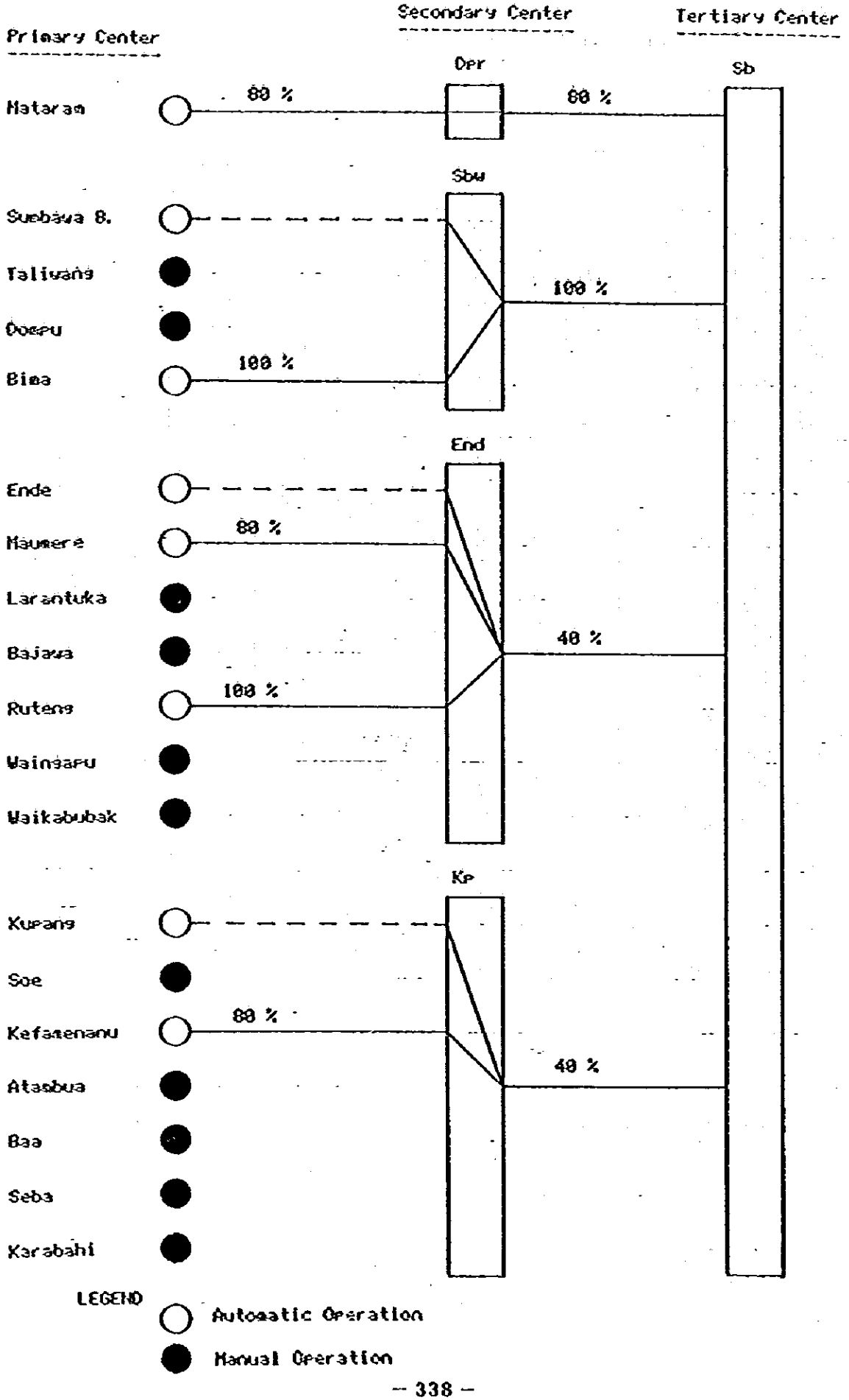
Trunk Exchanges in NTT and NTT

Area Code	Exchange Name	Existing			Repelita IV			Remarks
		Switching Sys.		SBS/SBK	Switching Sys.		SBS/SBK	
		Auto	Man.		Auto	Man.		
364	Mataraa	O		SBS	O		SBS	
371	Sumbawa B.	O			O			
372	Taliwang		O			O		
373	Dompu		O			O	SBK	
374	Bima		O		O			
381	Ende		O	SBK	O		SBK	
382	Maumere		O	SBK	O		SBK	
383	Larantuka		O	SBK		O	SBK	
384	Bajawa					O		
385	Rutena		O		O			
386	Waingapu		O	SBS		O	SBS	
387	Waikabubak		O	SBK		O	SBK	
391	Kupang	O		SBS	O		SBS	
392	Soe		O			O	SBK	
393	Kefamenanu		O		O		SBK	
394	Atambua		O	SBK		O	SBK	
395	Baa		O			O		
396	Seba					O	SBK*	
397	Karabahi		O	SBK		O	SBK	

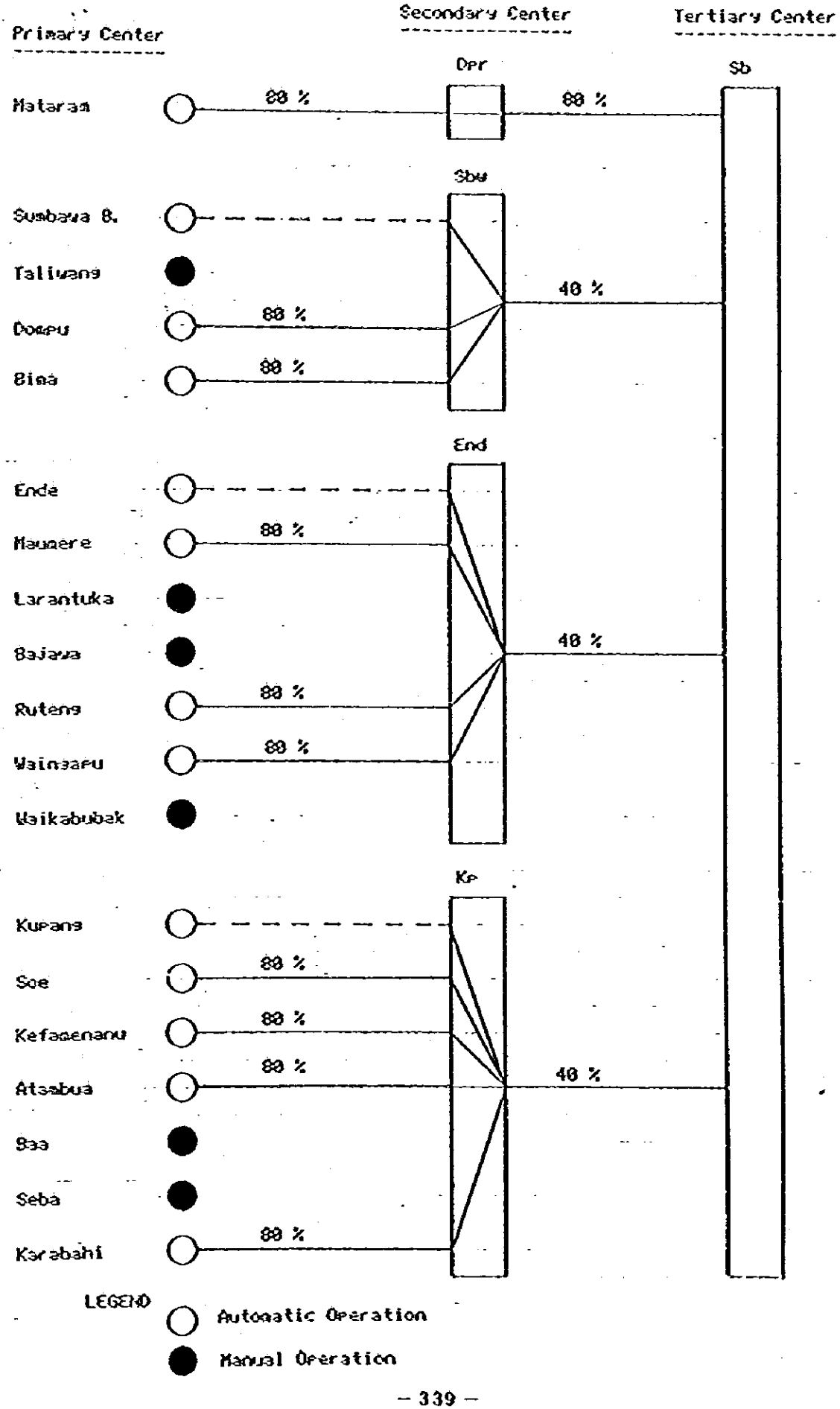
Traffic Distribution between Satellite Link and Terrestrial Link

Crow-flight Distance	Satellite	Terrestrial
less than 500 km	20 %	80 %
more than 500 km	60 %	40 %

Traffic Distribution to Terrestrial Links for SLDD Calls (Year: 1998)



Traffic Distribution to Terrestrial Links for SLDD Calls (Year: 1995)



Traffic Distribution to Terrestrial Links for SLDD Calls (Year After 2000)