THE REPUBLIC OF THE PHILIPPINES

REPORT

FOR

THE FLOOD FORECASTING SYSTEMS IN THE AGNO, BICOL AND CAGAYAN RIVER BASINS

— APPENDIX — II —

(MULTIPLEX TELECOMMUNICATION NETWORK)

MARCH 1978

JAPAN INTERNATIONAL COOPERATION AGENCY

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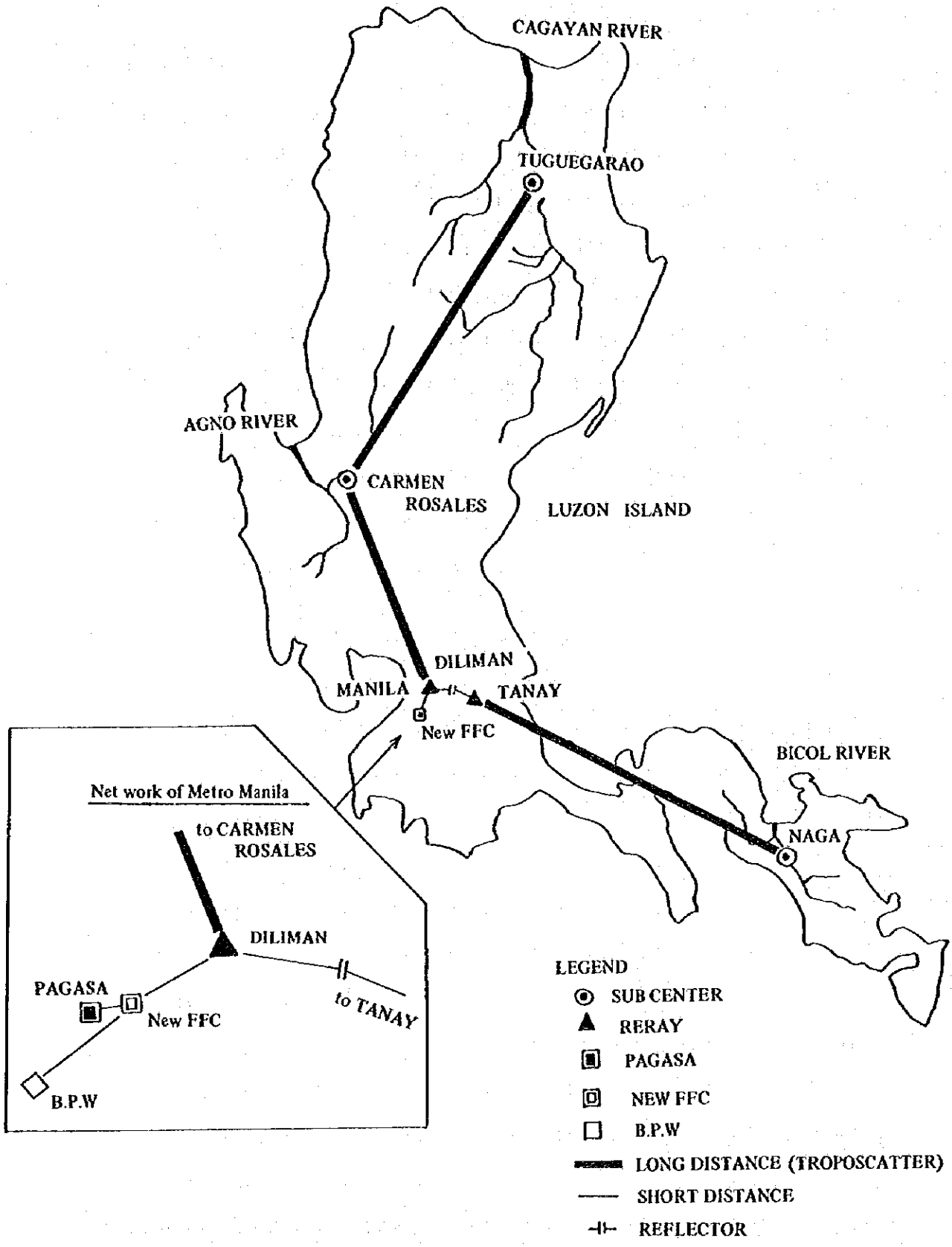
Location Map



Multiplex Telecommunication Network AGNO, BICOL and CAGAYAN RIVER Basins

1. Summary

1-1. Purpose of Survey

The report for establishment of the Flood Forecasting Systems in the Agno, Bicol and Cagayan Basins, Luzon Island, Philippines has been presented already. Regarding the multiplex telecommunication network, it proposes the necessity for conducting radio propagation tests and on-site surveys before implementing the Systems due to the fact that the report has dealt with the desk planning only.

In pursuance to the proposal, and as supplementary purposes of the report for the Systems, a survey mainly for radio propagation tests has been conducted in order to have basic data for design of multiplex telecommunication network by studying and analysing the data obtained in comparison with the desk calculations.

1-2. Outline of Survey Results

(1) After the radio propagation tests for the spans Diliman-Carmen Rosales, Carmen Rosales-Tuguegarao and Tanay-Naga which are all out of line of sight, it has been confirmed that each span has bigger propagation loss than expected values and great variations in receiving field intensities.
Therefore, it has become necessary to have the parabola antennas bigger in diameter and to increase the transmitter output power in some spans.

(2) It has been known that Naga and Carmen Rosales where subcenters will be installed are located at low land adjacent to the Agno River and the Bicol River respectively and liable to be inundated at the time of flood.
Therefore, due attention must be paid to the construction of building, the layout of equipment and etc.

It should be noted that the flood forecasting center (FFC) which had been expected to be located within the present PAGASA building will be moved to the proposed site of new PAGASA building (hereinafter called New FFC), approximately 1.2 km away from the present building due to its narrowness for accommodation of planned facilities, according to informed sources. For this reason, necessity has arisen to change the composition of multiplex telecommunication network.

It should also be noted that the originally planned 400 MHz band frequencies are already used widely around Metro Manila area, and in view of the difficulty of getting frequency allocation, it has become necessary to employ 800 MHz or 7000 MHz band frequencies instead of 400 MHz frequencies after discussions with the Philippine Telecommunication Control Bureau, PAGASA and the other Authories concerned.

1-3. Outline of Plan for Multiplex Telecommunication Network

Based on the results of present survey, the previously submitted report which contains only the desk calculations has been revised as follows;

(1) New FFC-PAGASA

A 800 MHz band multiplex telecommunication link will be provided between New FFC and PAGASA in addition to the original plan. Therefore, additional multiplex telecommunication equipment, antenna, steel tower, power facilities and etc. are required.

(2) New FFC-Diliman

The originally planned 400 MHz band system has been changed to a 7000 MHz system due to the reason of frequency allocation problem. Therefore, the changes are made in the specifications of multiplex equipment, antenna and etc.

(3) Diliman - Tanay

In the same manner as New PPC - Diliman, a 7000MHz band system will be employed.

This span, however, is screened by the mountains existing on the radio path, and therefore, needs reflectors.

Consequently, besides the change of types of multiplex telecommunication equipment and antenna system, the addition of 2 sets of reflector is required for this span.

(4) Diliman - Carmen Rosales

Originally, this span was planned to use frequency diversity system of 400 MHz band, 50W output power transmitter and with 6mφ parabola antenna. However, due to the problem of frequency allocation, the plan has been changed to use 800 MHz band 100W transmitter and 10mφ parabola antenna. Further, besides the change of types of multiplex telecommunication equipment and antenna system, it has become necessary to install a larger antenna tower.

(5) Carmen Rosales - Tuguegarao

This span has great propagation loss in its radio path, and is required to use frequencies within 400MHz band.

Although originally the frequency diversity system was planned, it is proposed to change it to the space diversity system which requires only 2 radio frequencies as the former needs 4 radio frequencies which may pose the problem for allocation.

After the radio propagation test, it has been known that a parabola antenna of 10mφ is required in addition to the already proposed 6mφ antenna. Therefore, in total, 2 sets each of 10mφ antenna, antenna tower, feeder are required additionally.

(6) Tanay - Naga

This span was originally planned to use frequency diversity system of 400MHz band, 50W output power transmitter and 6mϕ antenna. However, due to the problem of frequency allocation and also after the radio propagation test, the plan has to be changed to have 800MHz band transmitter with 10mϕ antennas. Consequently, besides the changes of types of multiplex telecommunication equipment and antenna system, the antenna tower should also be changed to a larger type.

The multiplex telecommunication network, after being summed up from the foregoing, is shown in Fig. 1-1, and the comparisons between the original and the revised plans are tabulated in Table 1-1.

Fig. 1-1 Multiplex Telecommunication Network

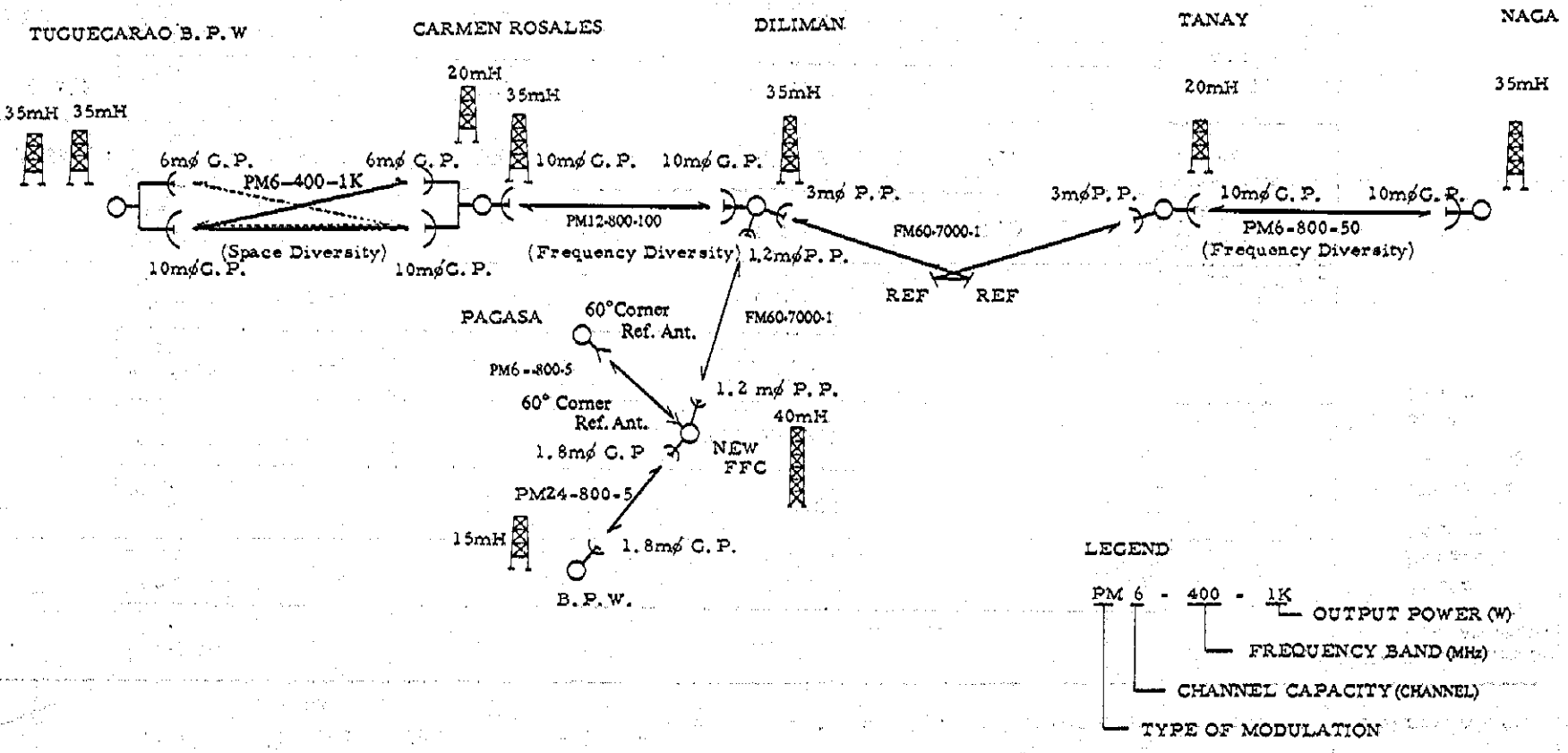


Table 1-1. Comparisons between Previously Planned Value and Revised Value

Span	Item	Frequency (MHz)	Transmitting Power (W)	Type of Antenna	Type of Diversity	Remarks	Abbreviation
New FFC – PAGASA	Original Plan	—	—	—			G.P: Grid Parabora Antenna P.P: Plate Parabola Antenna F.D: Frequency Diversity S.D: Space Diversity
	Revised Plan	800	5	60° Corner Reflector			
New FFC – DILIMAN	Original Plan	400	10	5 ele YAGI			
	Revised Plan	7,000	1	1.2 mφ P.P			
DILIMAN – TANAY	Original Plan	400	10	3 mφ G.P			
	Revised Plan	7,000	1	3 mφ P.P		Reflector x 2	
DILIMAN – CARMEN ROSALES	Original Plan	400	50	6 mφ G.P	F.D	Tropo-Scatter Communications	
	Revised Plan	800	100	10 mφ G.P	F.D		
CARMEN ROSALES – TUGUEGARAO	Original Plan	400	1,000	6 mφ G.P	F.D	ditto	
	Revised Plan	400	1,000	6 mφ G.P 10 mφ G.P	S.D		
TANAY – NAGA	Original Plan	400	50	6 mφ G.P	F.D	ditto	
	Revised Plan	800	50	10 mφ G.P	F.D		
New FFC – B P W	Original Plan	400	10	3 ele YAGI			
	Revised Plan	800	5	1.8 mφ G.P			

1-4. Cost for Multiplex Telecommunication Network

(1) The revisions of cost caused by the modifications and additions of originally planned equipment and materials are listed in comparison as follows;

Unit (US$)

Span	Revised Amount	Originally Planned Amount	Increase (Decrease)
New FFC-PAGASA	65,000		65,000
New FFC-Diliman	336,000	303,000	33,000
Diliman-Tanay	138,000	71,000	67,000
Diliman-Carmen Rosales	445,000	287,000	158,000
Carmen Rosales-Tuguegarao	513,000	440,000	73,000
Tanay-Naga	425,000	296,000	129,000
New FFC-BPW	216,000	208,000	8,000
Total	2,138,000	1,605,000	533,000

Note: The exchange rate for above is based on US$1=¥291.
The local currency portion should be increased in accordance with above changes for foundation work of 4 antenna towers and 2 reflector towers.

(2) The increase of cost caused by the revision of original plan should be appropriated from the contingency or counter-measured by leaving the implementation of HF back-up system and VHF patrol system to a future program. The latter case, however, should be decided after studies of reliability of multiplex telecommunication network and its operational conditions.

1-5. Others

The 7000 MHz band system to be installed for New FFC-Diliman and Diliman-Tanay spans requires line-of-sight conditions for its radio path.

For the span Diliman-Tanay, a reflector is required, and for selection of its installation point, it is necessary to make survey in order to secure line-of-sight.

2. Introduction

2-1. Purpose of Survey

The present survey is intended to supplement the previously submitted report as proposed in it; namely to carry out the radio propagation tests and reconnoiter the span routes and the proposed radio station sites for the multiplex telecommunication network of the planned Flood Forecasting System which connects FFC and BPW with subcenters in the basins of the Agno, Bicol and Cagayan rivers.

2-2. Organization of Survey Team

The following members have organized the survey team;

Team Leader	Shigeki Yoshioka, Head of Electricity and Telecommunication Section, Kanto Regional Construction Bureau, Ministry of Construction.
Telecommunication Expert	* Mitsuru Shimizu, Electricity and Telecommunication Section, Minister's Secretariate, Ministry of Construction.
"	* Shuji Suga, Association of Electrical Engineering.
"	Hideo Komuro, Association of Electrical Engineering.
"	Hiromichi Komaki, Association of Electrical Engineering.
"	Toshitsugu Itagaki, Association of Electrical Engineering.
"	Shigeru Nagasawa, Association of Electrical Engineering.
"	* Yoshiharu Nakagawa, Association of Electrical Engineering.

Note: The persons marked with * are also the second survey team members.

2-3. Schedule of Survey

The survey has been conducted under the following schedule;

(1) Period of survey at proposed station sites and river basins.

52 days from October 10 to November 30, 1977.

(2) Detailed schedule of survey.

As per Table 2-1.

2-4. Equipment and Materials for Survey

The equipment and materials used for the survey are shown Table 2-2.

Table 2-1 Detailed Schedule of Survey

Month	10																				11				
Week	1							2							3						4				
Day	(9)	10	11	12	13	14	15	(16)	17	18	19	20	21	22	(23)	24	25	26	27	28	29	(30)	31	1	2	3	4	5
Contents of Work	Departure of 1st party from Tokyo to Manila		Preparation for survey by 1st party					Departure of remaining party from Tokyo to Manila		Preparation for discussion		CARMENROSALES-TUGUEGARAO										DILIMAN-CARMENROSALES				
											Move and set-up for test				Radio propagation test						Removal, move and set-up			Radio propagation test		

Month	11																							12		
Week	5							6							7							8				
Day	(6)	7	8	9	10	11	12	(13)	14	15	16	17	18	19	(20)	21	22	23	24	25	26	(27)	28	29	30	1	2	3
Contents of Work							DILIMAN-TANAY Radio propagation test																		Return to Tokyo			
			TANAY-NAGA																									
	Removal, move and set up						Radio propagation test	Removal, move and arrangement for transportation							Survey at NewFPC-BPW, DILIMAN, TANAY													
																		Production of report									
																						Report and discussion						

Table 2-2. Equipment and Materials for Survey

	Name	Description	Q'ty	Remarks
1.	Radio Transmitter Receiver Equipment			
	400 MHz Band Transmitter	392 MHz 100W	1 set	
	400 MHz Band radiotelephone	468.95 MHz 4W	2 sets	
	HF SSB Transceiver	1~8 MHz 10W	2 sets	With 2 sets of antenna.
	VHF Transceiver	152.275 MHz 10W	2 sets	
2.	Antenna			
	Parabola Antenna	400 MHz 6 mφ grid	2 sets	
	Yagi Antenna	400 MHz 12-element	2 sets	
	ditto	400 MHz 8-element	2 sets	
	ditto	150 MHz 3-element	2 sets	With 10m poles and feeder.
	Coaxial Cable	RG-17/U 40 m	2 sets	
	ditto	8D-2W 25 m	2 sets	
	Antenna Mast	Panzer mast RO16	4 sets	With accessories.
	Antenna Fixtures	For parabola antenna	2 sets	
	ditto	For Yagi antenna	2 sets	
3.	Measuring Instruments			
	Electric Field Strength Meter	ARM-5705A	1 set	
	Field Intensity Meter	230 MHz ~ 470 MHz	1 set	
	Low Noise Amplifier	400 MHz NF: 3 dB G: 20 dB	1 set	
	Frequency Counter	10 ~ 550 MHz	1 set	
	Self Recorder	CDR-12A Electronic type	1 set	
	Through-type Watt Meter	50 ~ 400 MHz 50W/150W	1 set	
	Terminal-type Watt Meter	400 MHz 200W	1 set	

Name	Description	Q'ty	Remarks
Transistor Radio	All-wave	1 set	
Atmospheric Pressure Meter	Aneroid type	2 sets	
Altimeter		1 set	
Temperature/Humidity Meter		2 sets	
Pocket Compass	With tri-legs	1 set	
Transit	With tri-legs	2 sets	
Measure Tape	50 m	2 pcs.	
Voltage Regulator	Input 100V, output 0 ~ 130V 1 KVA	1 set	
ditto	Input 100V, output 0 ~ 240V 2 KVA	1 set	
Engine Generator	1.2 KVA AC 100V	1 set	
ditto	300 VA AC 100V	1 set	
Battery Charger	DC 24V, 12V	1 set	
4. Tools, Others			
Winch	Manual 2 ton	1 pc.	
Electric Dril	100V 13 mmϕ	2 pcs.	
Bolt Clipper	13 mmϕ	2 pcs.	
Vice	1 ton	4 pcs.	
Wrench	17 mm	4 pcs.	
Socket Wrench Set	8 ~ 23 mm	2 sets	
Spanner Set	8, 10, 12, 14, 17 21 mm	2 sets	
Steel Pulley	1 ton	4 pcs.	
Safety Belt		6 pcs.	
Helmet		10 pcs.	
Power Cable	Reeled 50 m	2 pcs.	
Anchor	Big type (No. 6)	20 pcs.	
ditto	Small type (No. 4)	20 pcs.	

Name	Description	Q'ty	Remarks
Wire with Stand		12 pcs.	
Recording Paper	For CDR-12A	15 rolls	
Crane		2 vehicles	Borrowed in the Philippines.

3. Survey Conducted

3-1. Spans Surveyed

3-1-1. Radio Propagation Tests and Spans Tested

The radio propagation tests and line of sight surveys have been carried out for the following spans whose routes are shown in Fig. 3-1;

(1) Spans out of line of sight (long distance spans)

A. Diliman - Carmen Rosales

B. Carmen Rosales - Tuguegarao

C. Tanay - Naga

(2) Spans within line of sight (short distance spans)

A. New FFC - Diliman

B. Diliman - Tanay

C. New FFC - Tanay

D. New FFC - BPW

E. PAGASA (FFC) - BPW

F. PAGASA (FFC) - Diliman

3-1-2. Profiles

The profiles have been produced for the following spans by use of the map of 1:50000;

A. Diliman	- Carmen Rosales	Fig. 3-2
B. Carmen Rosales	- Tuguegarao	Fig. 3-3
C. Tanay	- Naga	Fig. 3-4
D. New FFC	- Diliman	Fig. 3-5
E. Diliman	- Tanay	Fig. 3-6
F. Diliman - Ref. Point	- Tanay	Fig. 3-7
G. New FFC	- Tanay	Fig. 3-8
H. New FFC - Ref. Point	- Tanay	Fig. 3-9
I. New FFC	- BPW	Fig. 3-10

Fig. 3–1 Radio Propagation Tests and Spans Tested

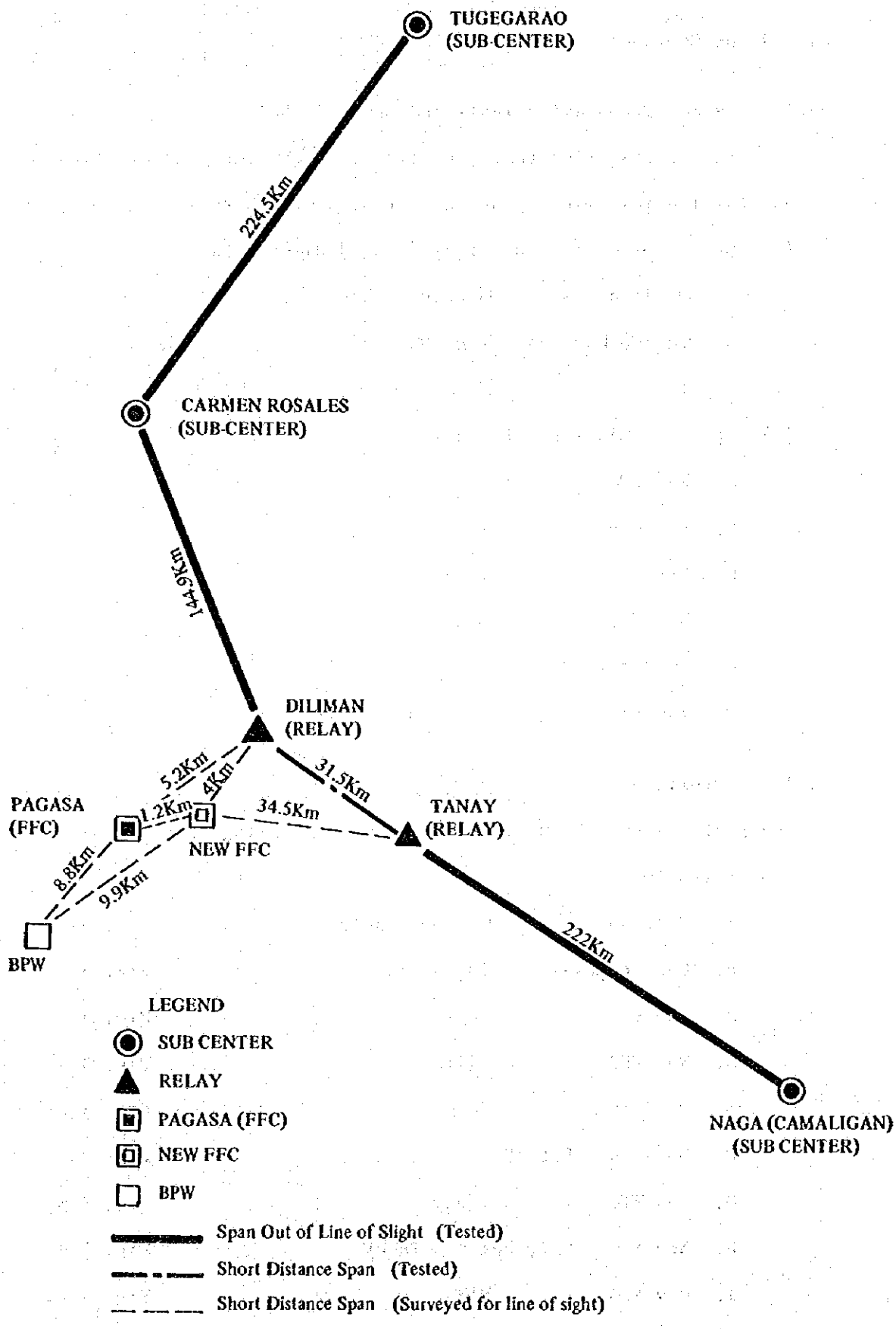


Fig. 3-2 Diliman-Carmen Rosales Terrain Profile (K=4/3)

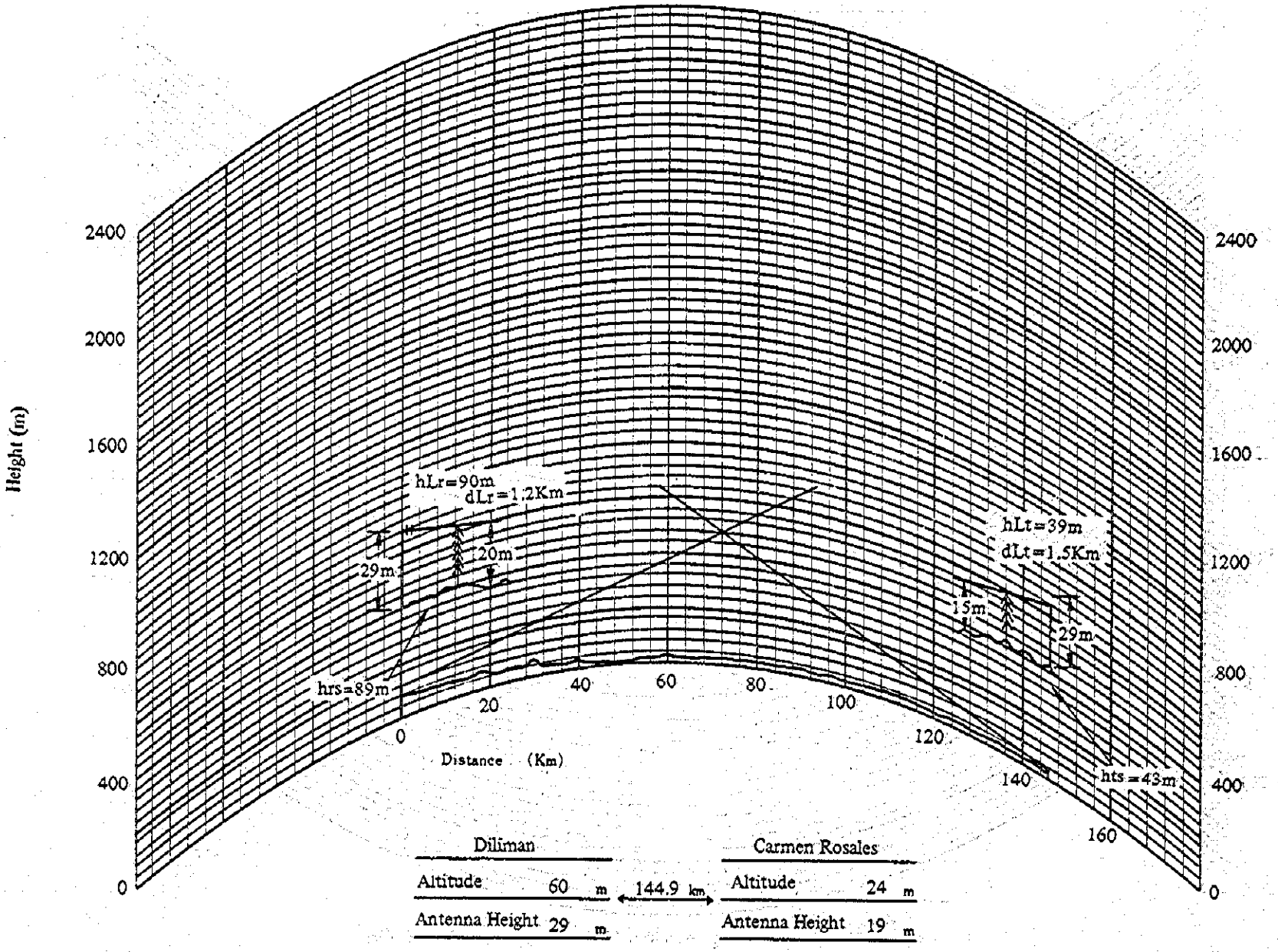


Fig. 3-3 Carmen Rosales-Tuguegarao Terrain Profile (K=4/3)

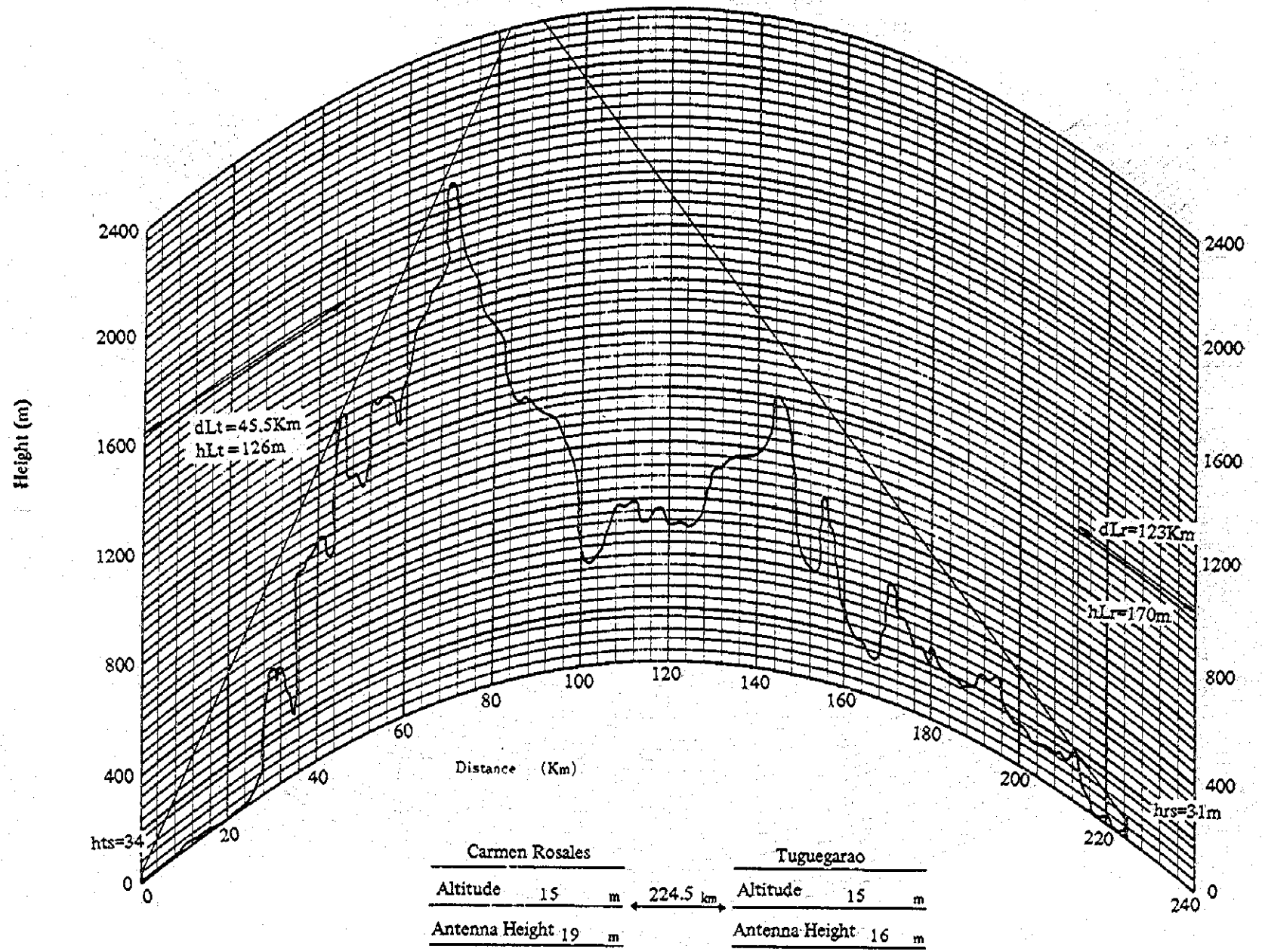


Fig. 3-4 Tanay-Naga Terrain Profile (K=4/3)

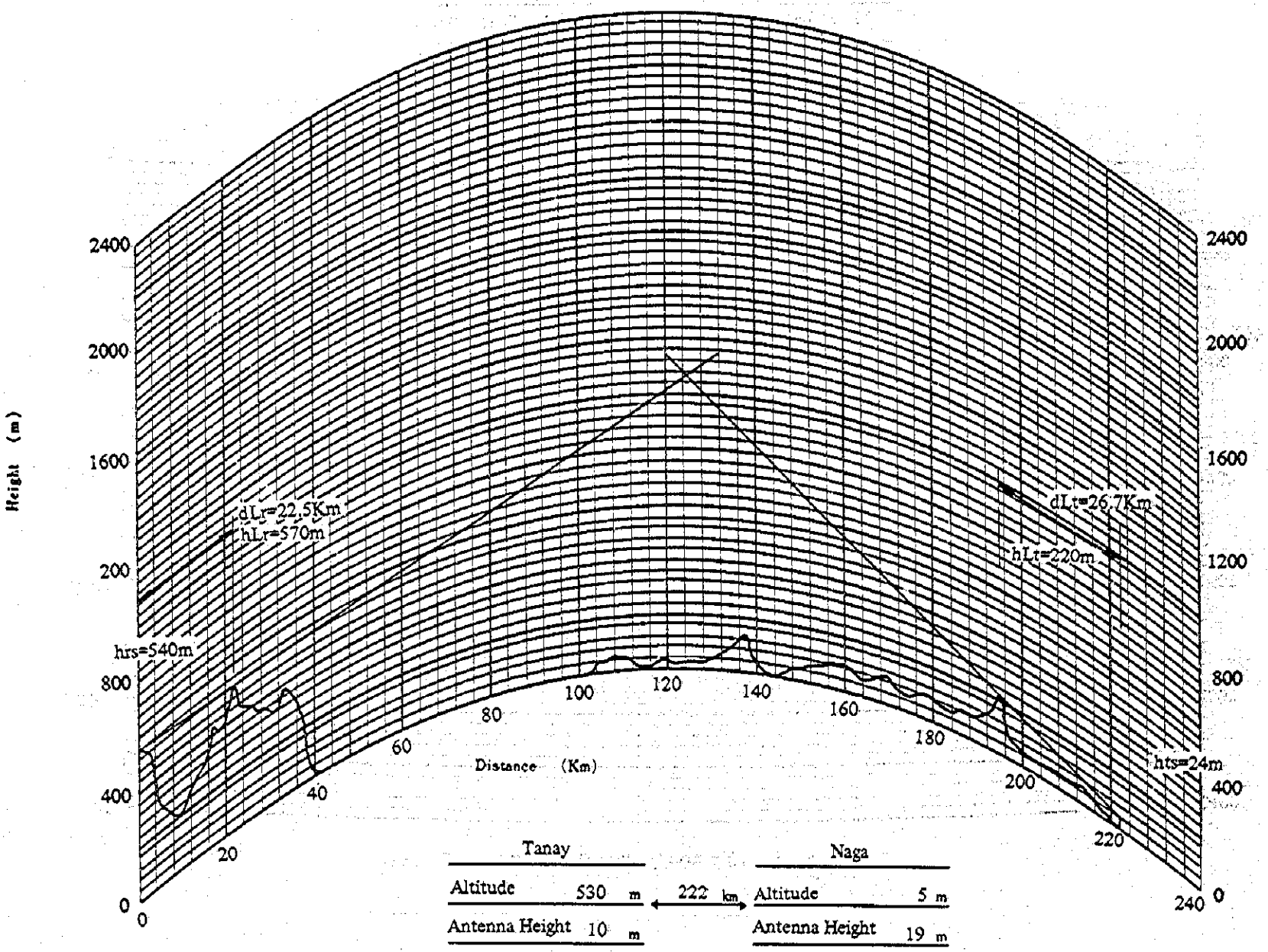


Fig. 3-5 New FFC-Diliman Terrain Profile (K=4/3)

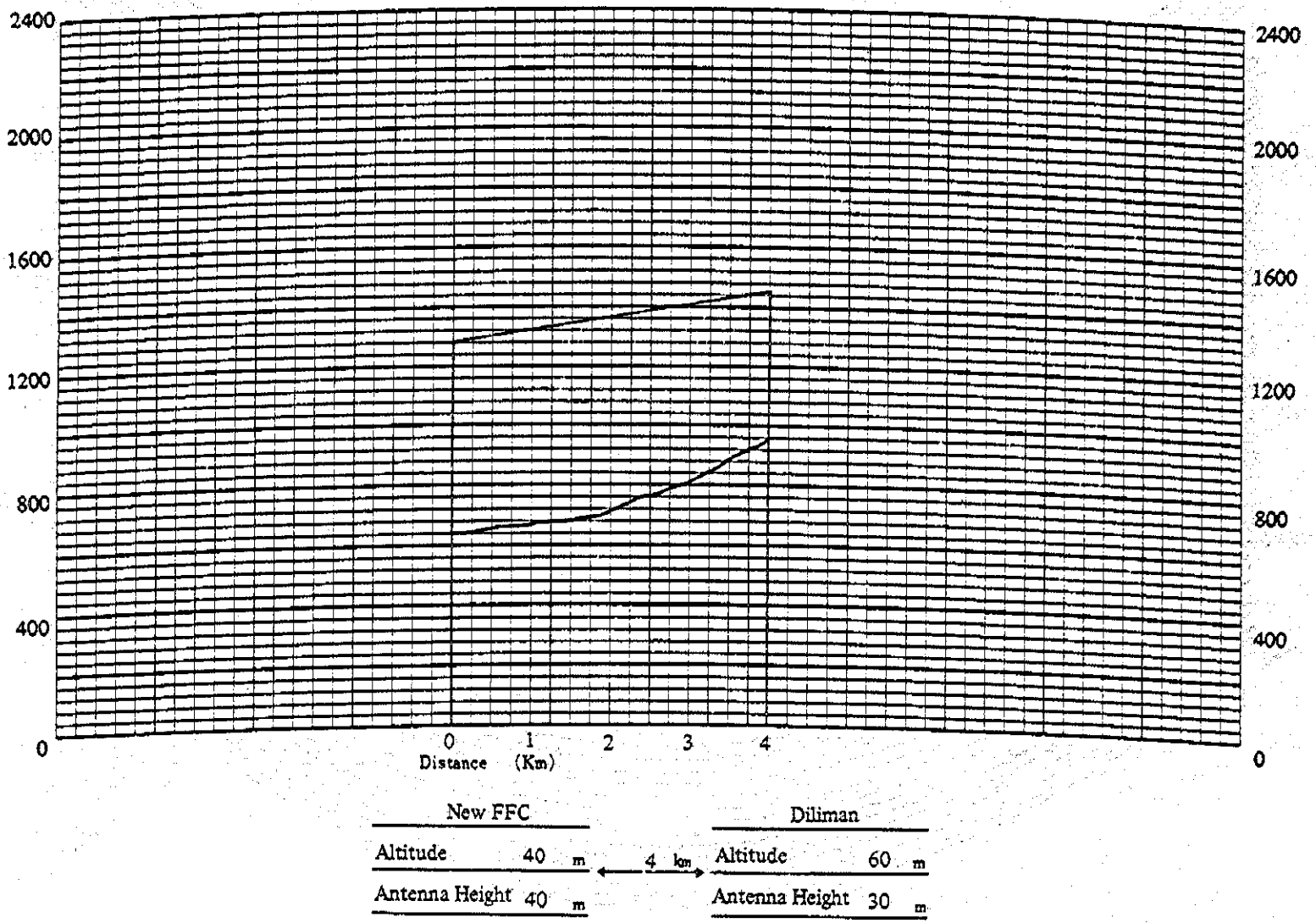


Fig. 3-6 Diliman-Tanay Terrain Profile (K=4/3)

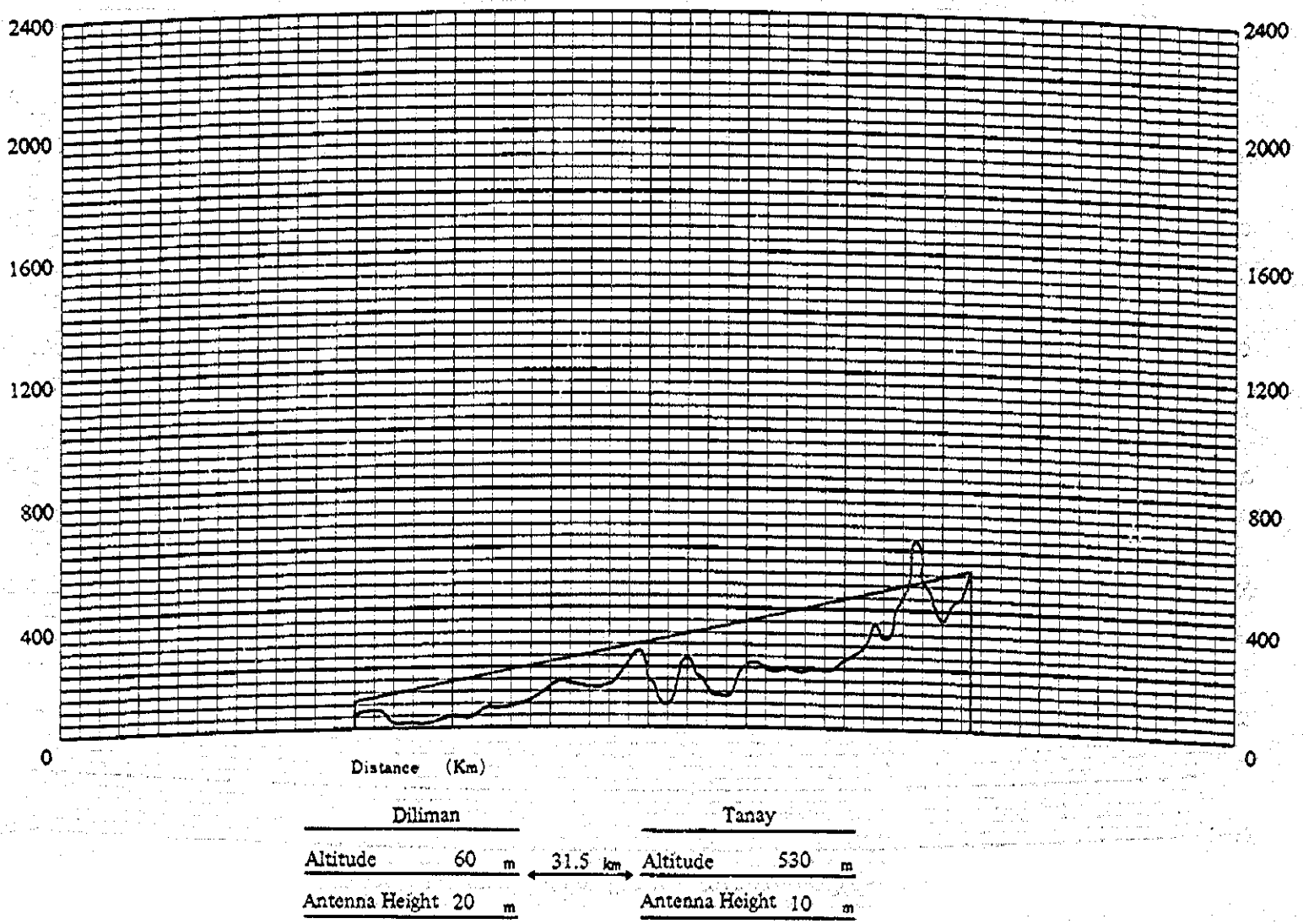


Fig. 3-7 Diliman-Ref, Point-Tanay Terrain Profile (K=4/3)

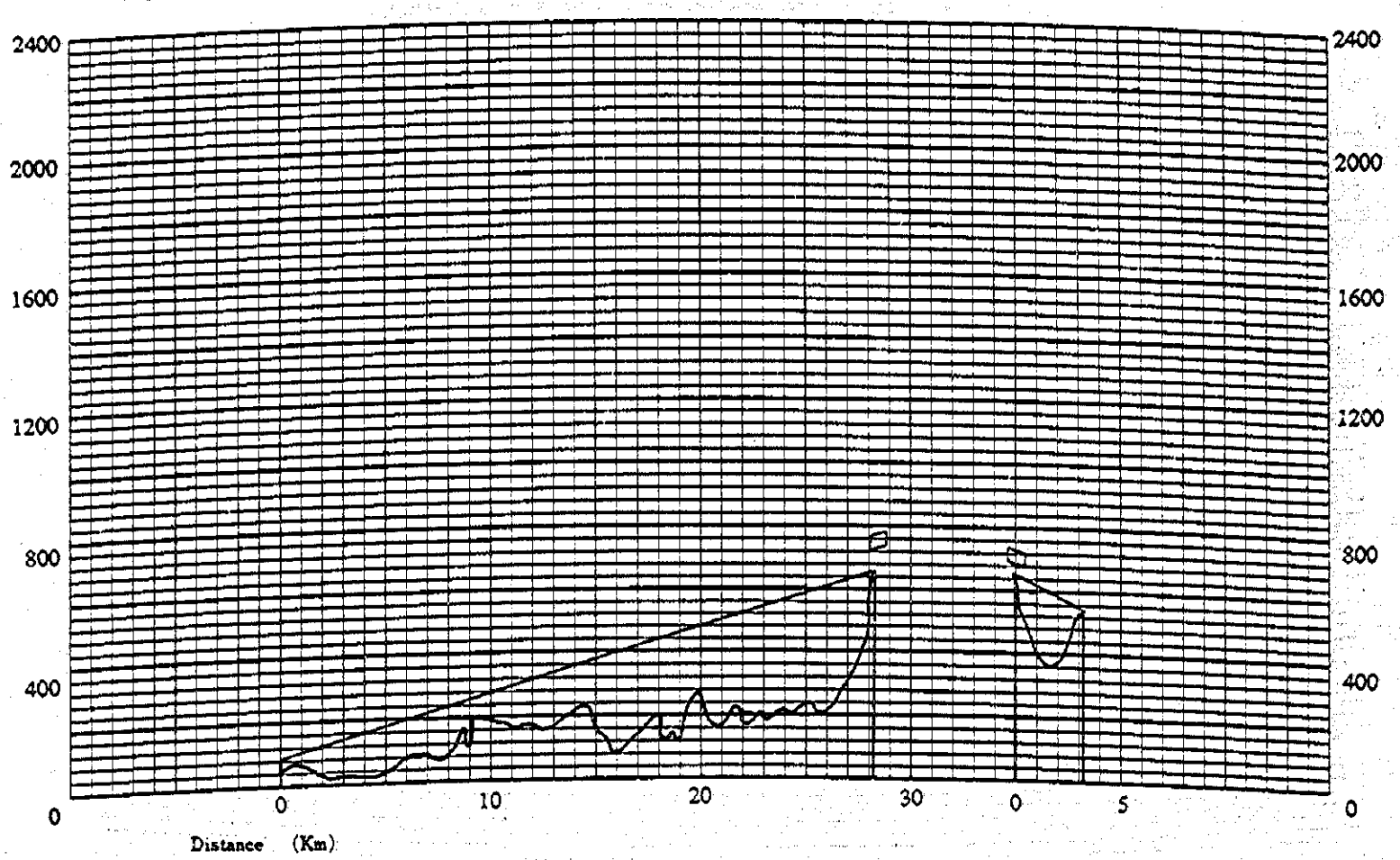


Fig. 3-8 New FFC-Tanay Terrain Profile (K=4/3)

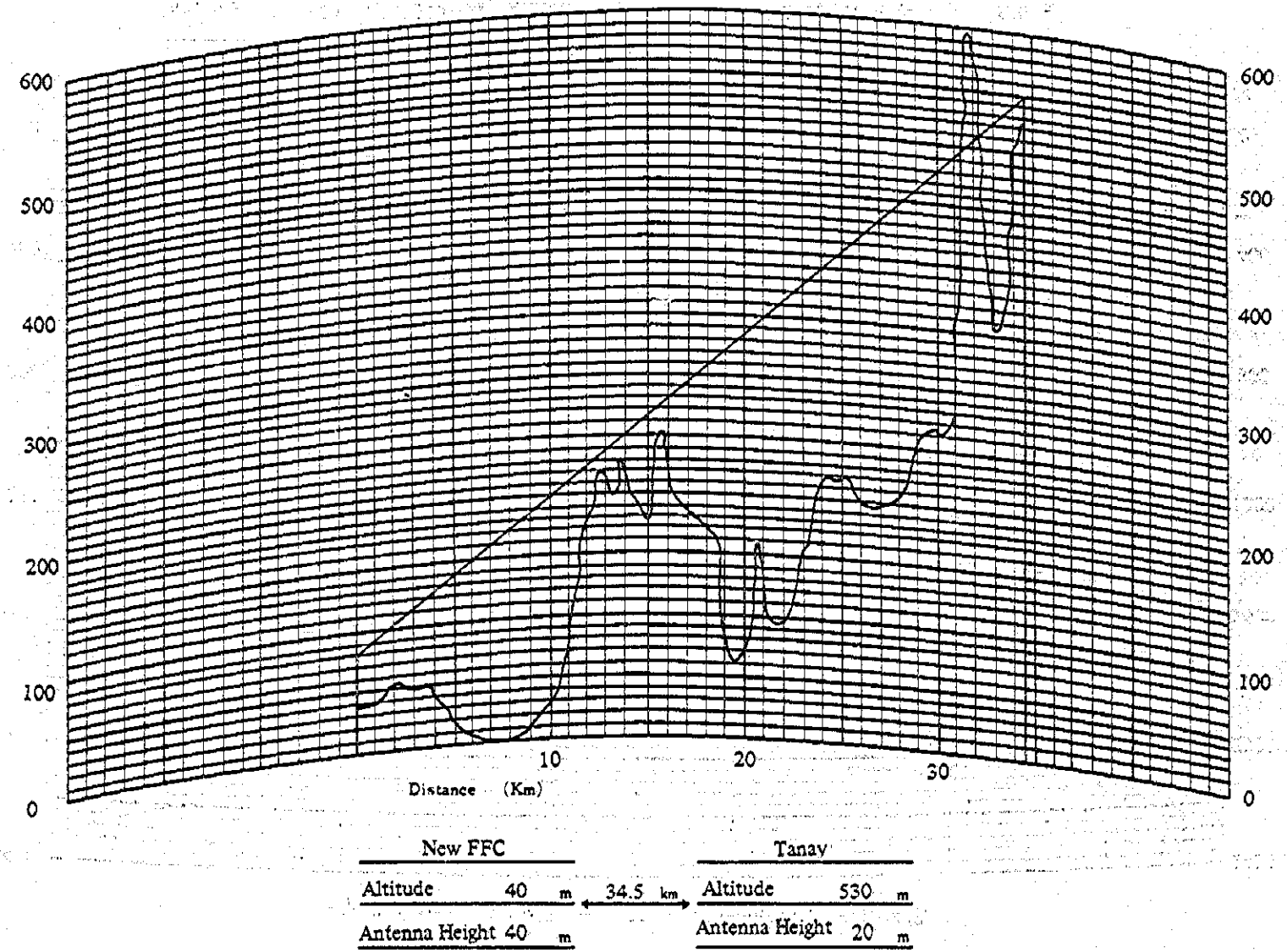


Fig. 3-9 New FFC-Ref. Point-Tanay Terrain Profile (K=4/3)

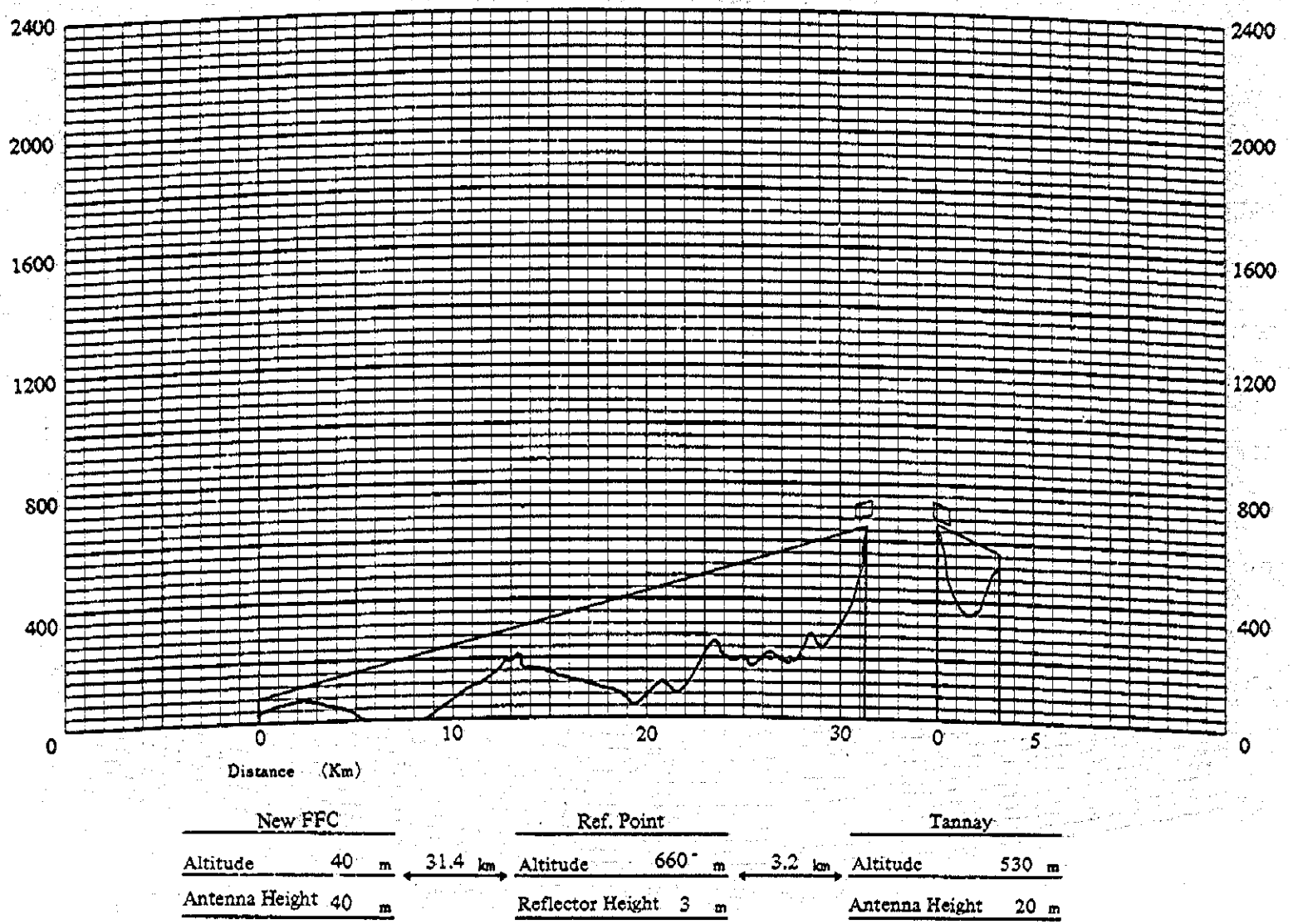
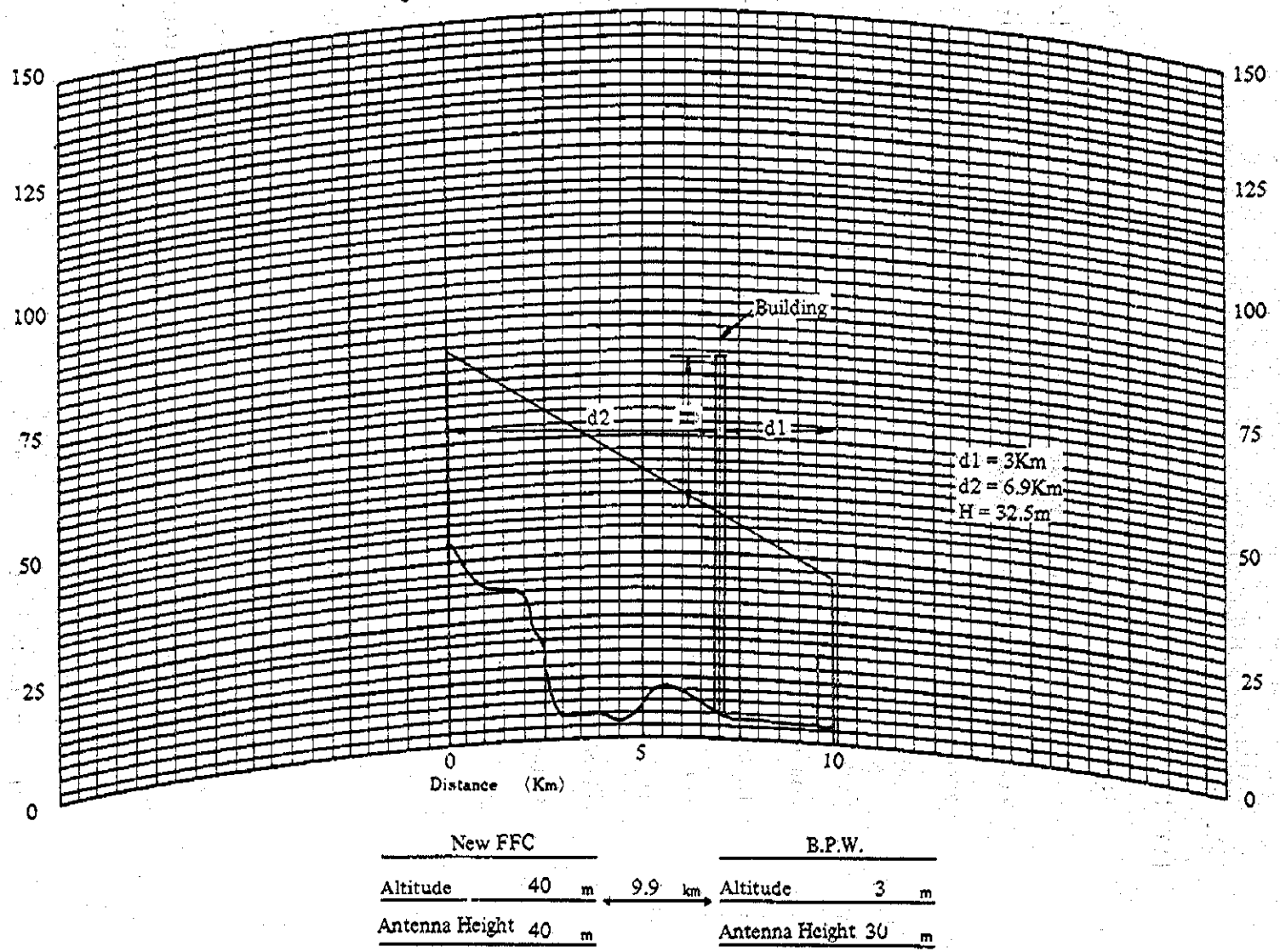


Fig. 3-10 New FFC-BPW Terrain Profile (K=4/3)



3-2. Details of Survey

3-2-1. Spans out of Line of Sight

(1) Method for Radio Propagation Test

The spans, Diliman (relay station) - Carmen Rosales (Agno Subcenter), Carmen Rosales - Tuguegarao (Cagayan Subcenter), and Tanay (relay station) - Naga (Bicol Subcenter) are all long and out of line of sight. Therefore, big type antennas (6mφ grid parabola and 12-element Yagi), 400MHz band high power transmitter and receiver, low noise amplifier, electric field strength meter, self recorder and etc. have been used for testing the radio propagation conditions in these spans for many hours. The equipment and materials formed for the tests are shown in Fig. 3-11.

After the tests, the propagation loss for each span has been calculated by analysis of measured data.

Brief explanation for test of each span is as follows;

1) Diliman - Carmen Rosales

The transmitting equipment was set up at Carmen Rosales with 6mφ grid parabola antenna (19m height), and the receiving equipment at Diliman with 12-element Yagi antenna (29m height) for testing and recording the receiving field strength.

The recording lasted for 56 hours. Part of the records are shown in Fig. 3-12 (daytime recording) and Fig. 3-13 (night time recording). The test operations are seen in Photo 3-1 and Photo 3-2.

2) Carmen Rosales - Tuguegarao

At Carmen Rosales the transmitting equipment was set up with 6mφ grid parabola antenna (19m height) and at Tuguegarao the receiving equipment also with 6mφ grid parabola antenna (16m height). The testing and recording lasted for 88 hours.

Part of the receiving field intensities tested and recorded are shown in Fig. 3-14 (daytime recording) and Fig. 3-15 (night time recording).

The photoes showing the test operations are attached at Photo 3-3 and Photo 3-4.

3) Tanay - Naga

At Naga, 12-element Yagi antenna (16m height) was equipped with, and at Tanay, 6mφ grid parabola antenna (10m height). The testing and recording were made for approximately 52 hours. Fig. 3-16 (daytime) and Fig. 3-17 (night time) show respectively part of the recordings. The test operations are shown in photoes (Refer to Photo 3-5 and Photo 3-6).

(2) Personnel engaged in Radio Propagation Test

The following numbers of personnel engaged in the radio propagation test, being divided into 2 groups for transmission and reception;

Telecommunication Engineers, Civil Engineers & Technicians		10 (from PAGASA and BPW)
Driver		3 (from PAGASA)
Construction Contractor	(approx.)	5 (from local firms)
Telecommunication Expert		3 (from Survey Team)

(3) Calculation of Propagation Loss

The propagation loss for each span is obtained by the following equation;

$$Lp = Pt + (GAt + GAr) - (Lft + Lfr) - (Pr - 113) \text{ ..... dB (Equation 1)}$$

where

Lp	:	propagation loss	dB
Pt	:	transmitting antenna power	dBm
GAt	:	transmitting antenna gain	dB (Gis)
GAr	:	receiving antenna gain	dB (Gis)
Lft	:	transmitting feeder loss	dB

Lfr : receiving feeder loss dB

Pr : measured field intensity dBμV

113 : changed value of dBm and dBμV (0dBμV = -113dBm)

The system circuit design is made by measuring the receiving field intensity (Pr) and then calculating the propagation loss (Lp) by Equation 1.

In the case of an out-of-line-of-sight span (troposcatter path), the receiving field intensity (Pr) varies depending on the season, hour and climatical conditions, and further fading phenomina are observed. Therefore, long hours continuous testing and recording of receiving field intensity are performed, and its medium value (50%) is taken as the measured value (Pr.) With this value calculated by Equation 1, Lp is obtained.

The main characteristics of the equipment used for the radio propagation test are as the following table;

Item / Span	Output Power Pt	Antenna Gain		Feeder Loss	
		Transmit. Side GAt	Receiv. Side GAr	Transmit. Side Lft	Receiv. Side Lfr
DILIMAN CARMEN ROSALES	80W (49dBm)	G.P.B.R. 6mφ (25.5dB)	YAGI 12ELE (14.0dB)	RG-17/U 40m (3.2dB)	RG-17/U 40m 8D-2W 25m (7.2dB)
CARMEN ROSALES TUGUEGARAO	80W (49dBm)	G.P.B.R. 6mφ (25.5dB)	G.P.B.R. 6mφ (25.5dB)	RG-17/U 40m (3.2dB)	RG-17/U 40m (3.2dB)
TANAY NAGA	80W (49dBm)	YAGI 12ELE (14.0dB)	G.P.B.R. 6mφ (25.5dB)	RG-17/U 40m (3.2dB)	RG-17/U 40m (3.2dB)

The propagation loss is calculated as follows by applying above values into Equation 1:

A. DILIMAN - CARMEN ROSALES

$$Lp = 49 + (25.5 + 14) - (3.2 + 7.2) - (Pr - 113) = 191.1 - Pr \quad (dB\mu V)$$

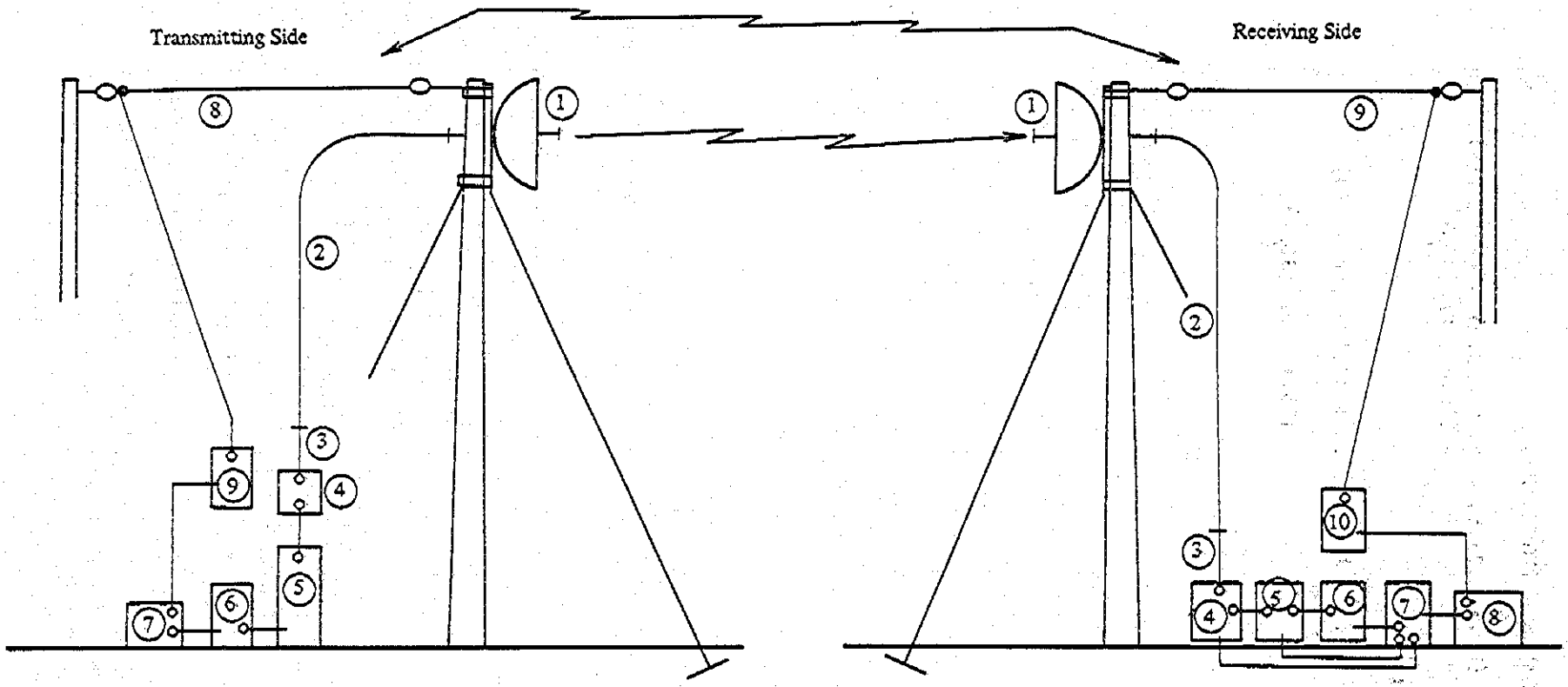
B. CARMEN ROSALES - TUGUEGARAO

$$Lp = 49 + (25.5 + 25.5) - (3.2 + 3.2) - (Pr - 113)$$
$$= 206.6 - Pr \ (dB\mu V)$$

C. TANAY - NAGA

$$Lp = 49 + (25.5 + 14) - (3.2 + 3.2) - (Pr - 113)$$
$$= 195.1 - Pr \ (dB\mu V)$$

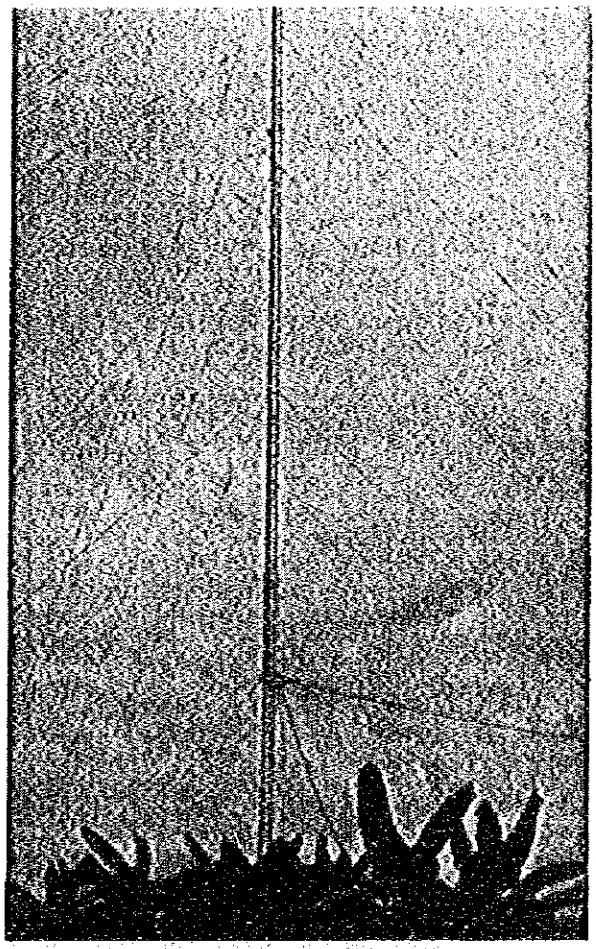
Fig. 3-11 Composition of Equipment & Materials used for Radio Propagation Test



① Grid Parabola Antenna (6mφ)
② Coaxial Cable RG-17/U
③ Coaxial Cable 8D-2W
④ Through-type Power Meter
⑤ 400MHz Band Transmitter
⑥ Voltage Regulator
⑦ Engine Generator (1.2KVA)
⑧ HF Antenna
⑨ HF SSB Transceiver

① Grid Parabola Antenna (6mφ)
② Coaxial Cable RG-17/U
③ Coaxial Cable 5D-2V
④ Low Noise Amplifier
⑤ Field Intensity Meter
⑥ Self Recorder
⑦ Voltage Regulator
⑧ Engine Generator (1.2KVA)
⑨ HF Antenna
⑩ HF SSB Transceiver

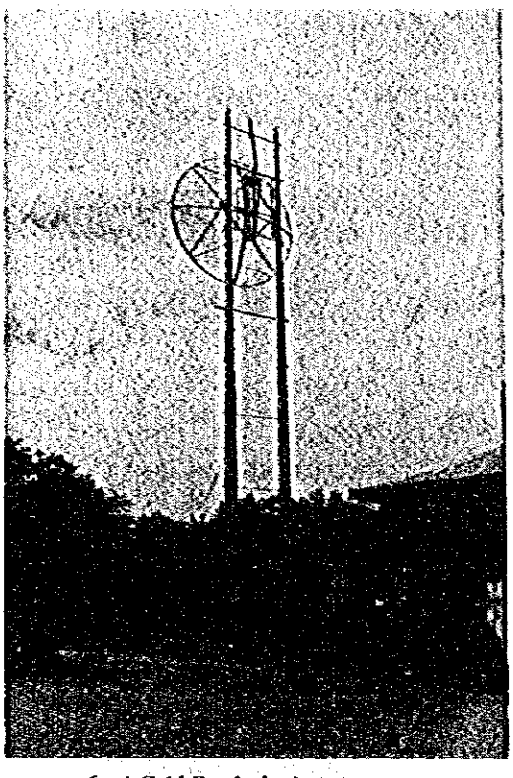
Photo 3-1 Diliman-Carmen Rosales (Diliman)



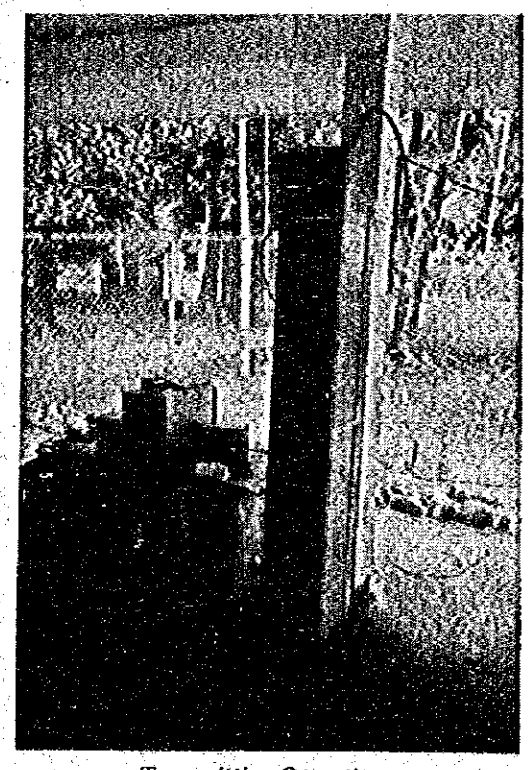
Antenna Mast, 29m high
aboye the ground, equipped
with 12-element Yagi antenna

Receiving Operation

Photo 3-2 Diliman-Carmen Rosales (Carmen Rosales)

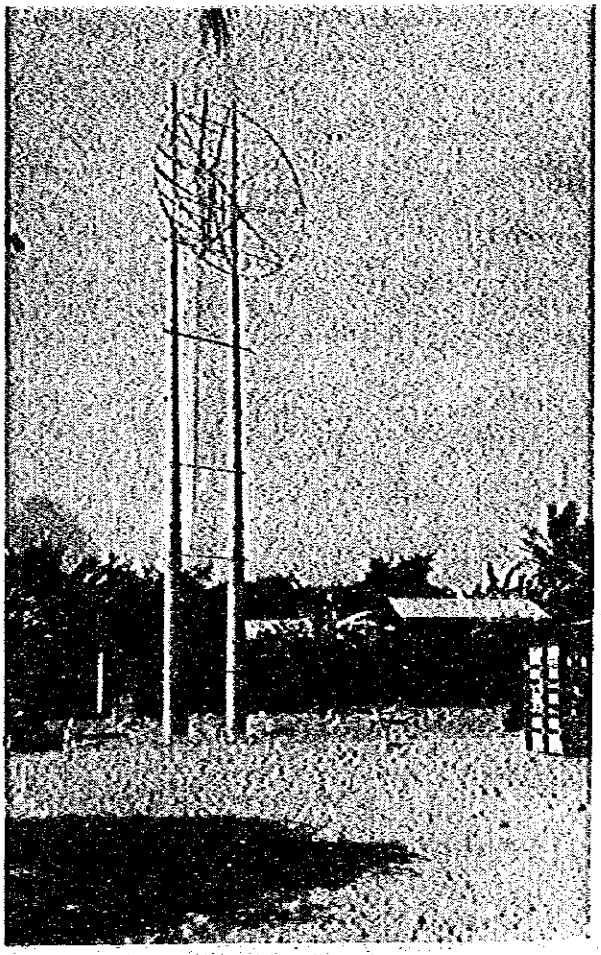


6mϕ Grid Parabola Antenna
installed at 19m height

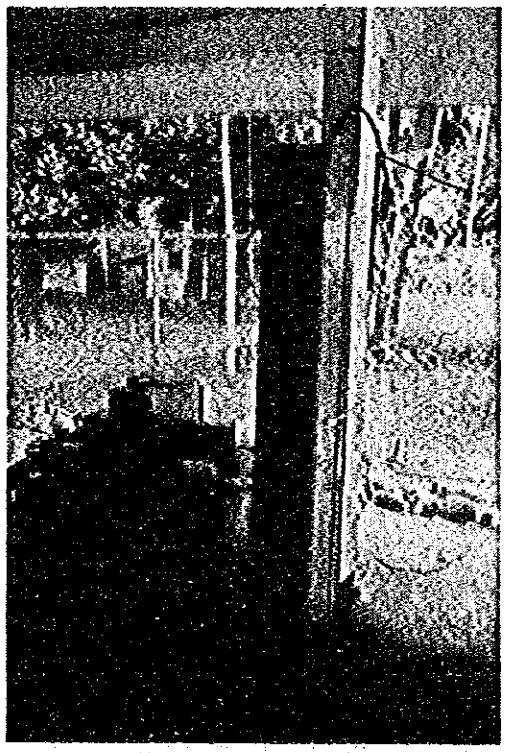


Transmitting Operation

Photo 3-3 Carmen Rosales-Tuguegarao (Carmen Rosales)

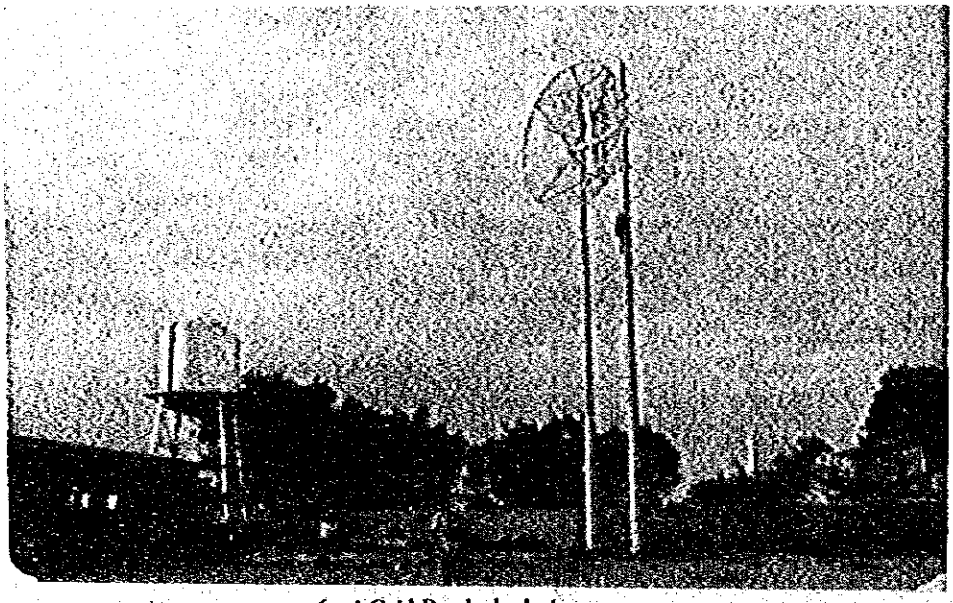


6mφ Grid Parabola Antenna
installed at 19m height

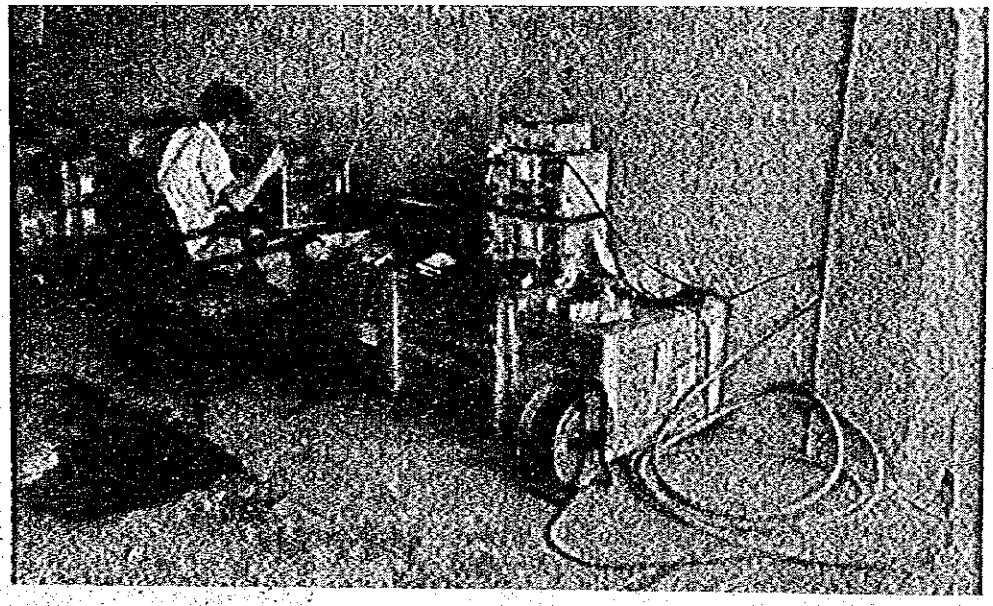


Transmitting Operation

Photo 3-4 Carmen Rosales-Tuguegarao (Tuguegarao)

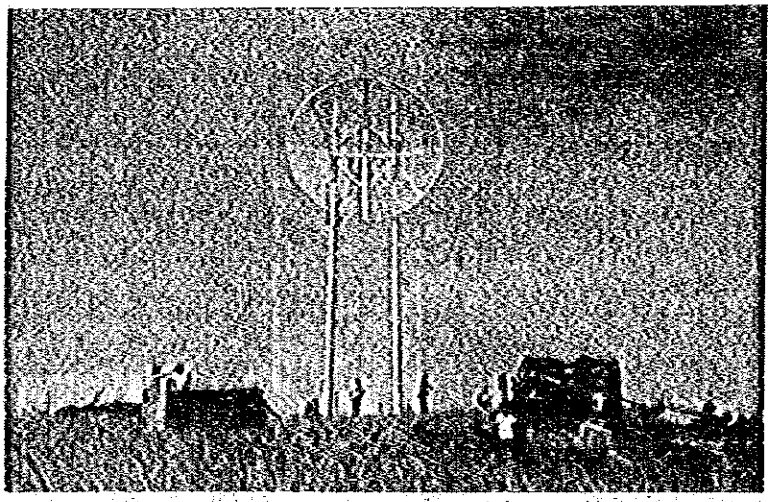


6mϕ Grid Parabola Antenna
installed at 16m height

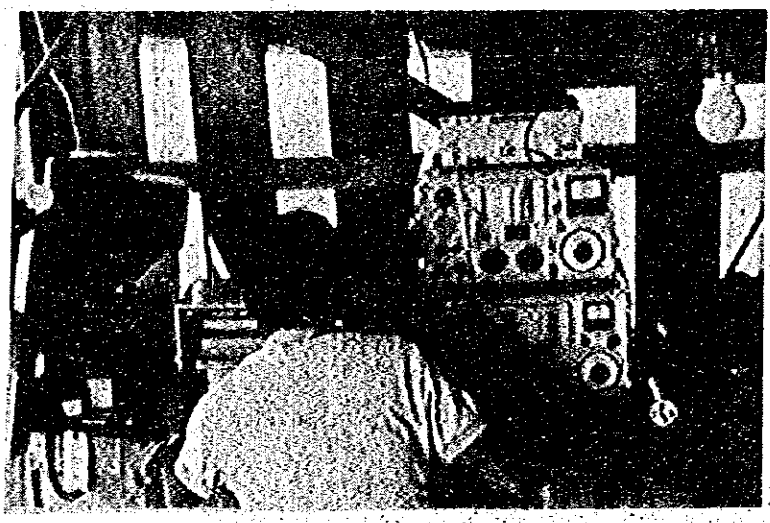


Receiving Operation

Photo 3-5 Tanay-Naga (Tanay)

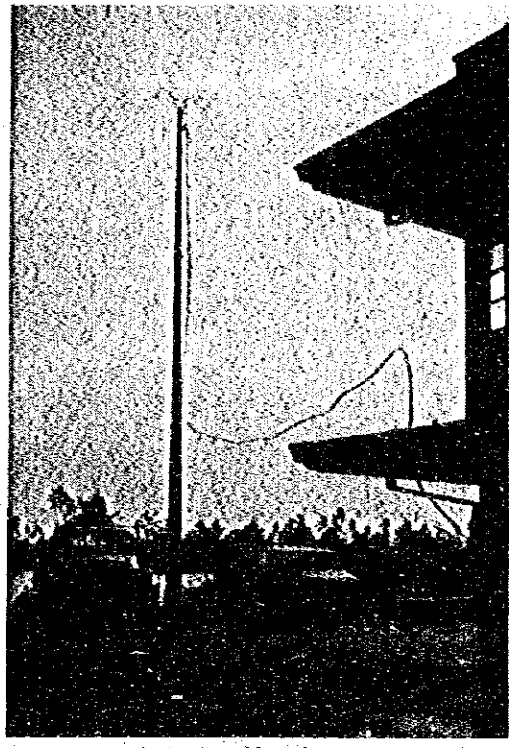


6mϕ Grid Parabola Antenna
installed at 10m height

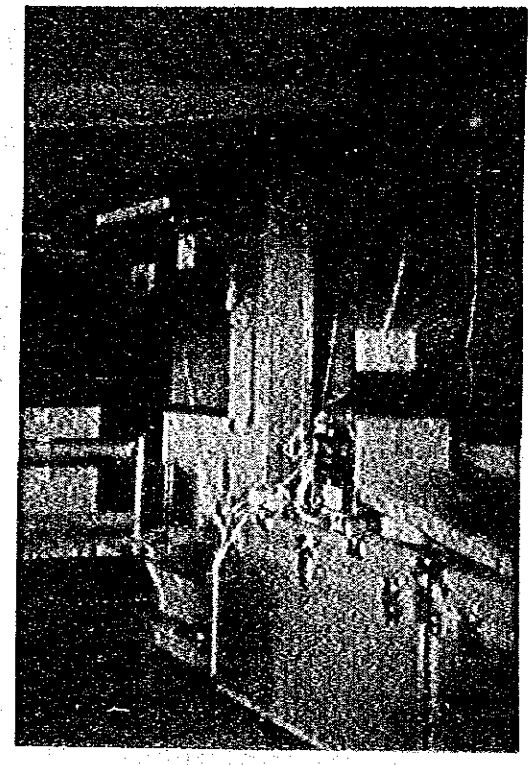


Receiving Operation

Photo 3-6 Tanay-Naga (Naga)



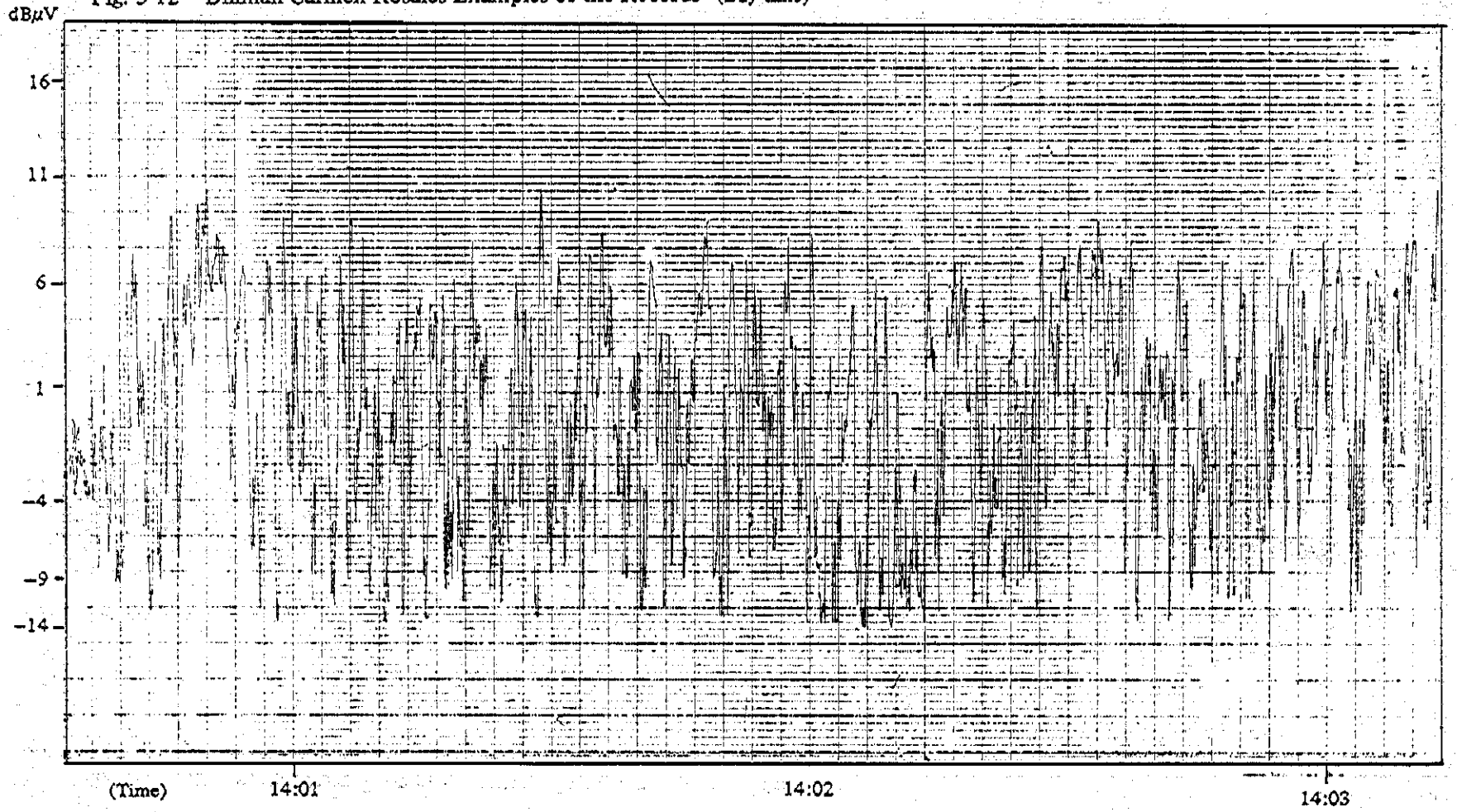
12-element Yagi Antenna
installed at 16m height



Transmitting Operation

Engine Generator (1.2KVA)

Fig. 3-12 Diliman-Carmen Rosales Examples of the Records (Day time)



Nov. 4 1977 12:00 180mm/Min

Scale 1/2

Fig. 3-13 Diliman-Carmen Rosales Examples of the Records (Night time)

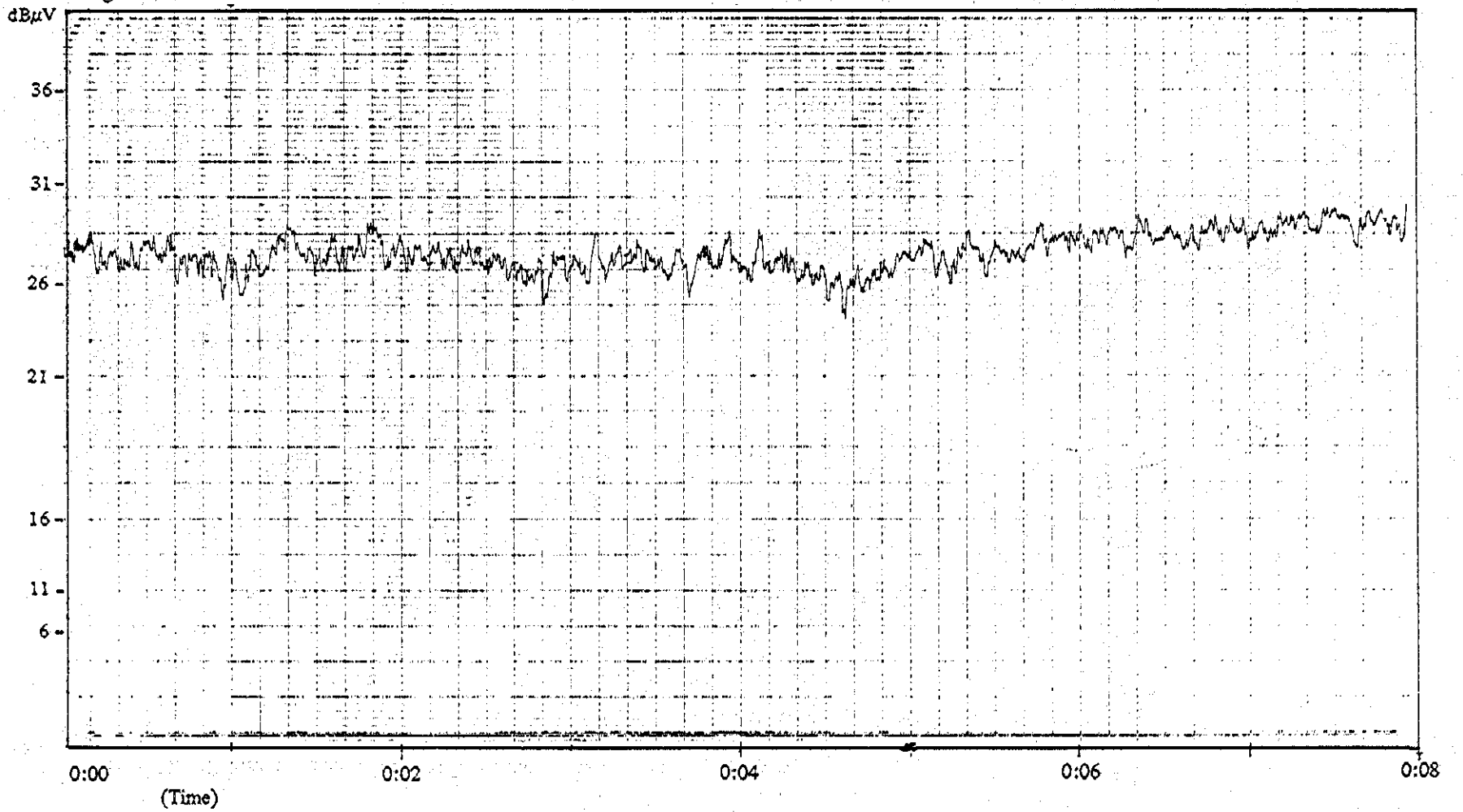
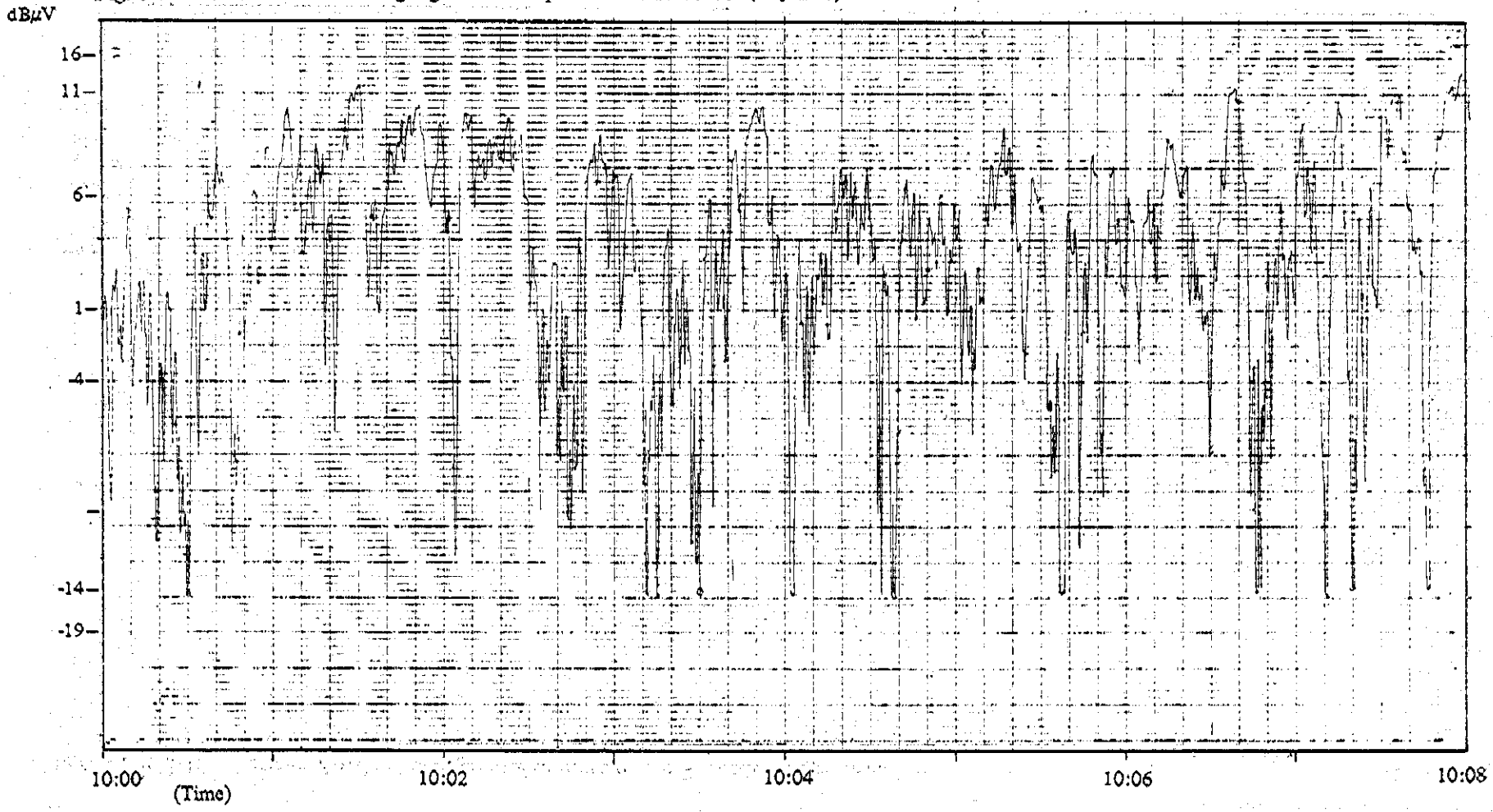
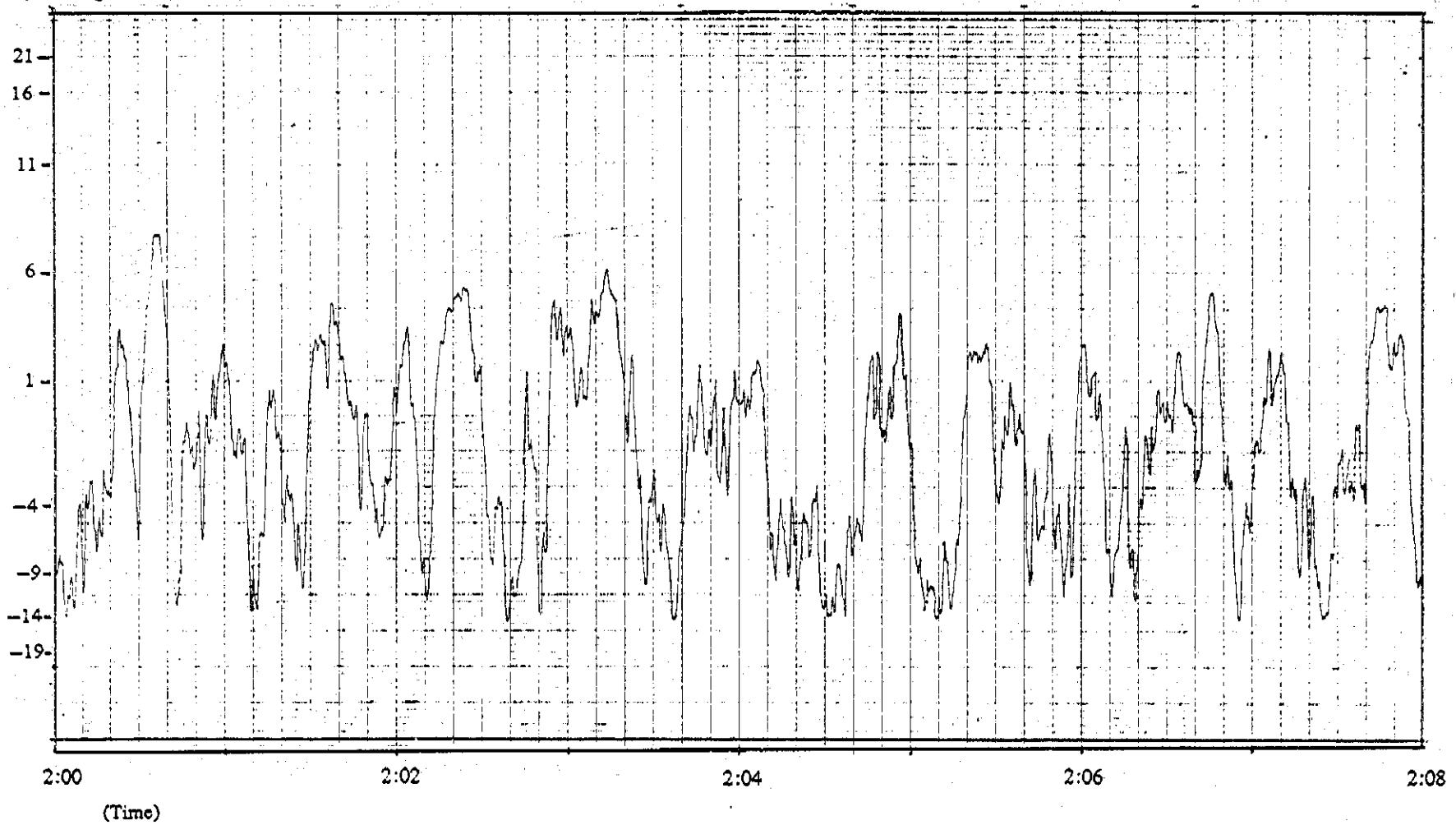


Fig. 3-14 Carmen Rosales-Tuguegarao Examples of the Records (Day time)



dBμV Fig. 3-15 Carmen Rosales-Tuguegarao Examples of the Records (Night time)



Oct.26 1977 2:00 60mm/Min
Scale 1/2

Fig. 3-16 Tanay-Naga Examples of the Records (Daytime)

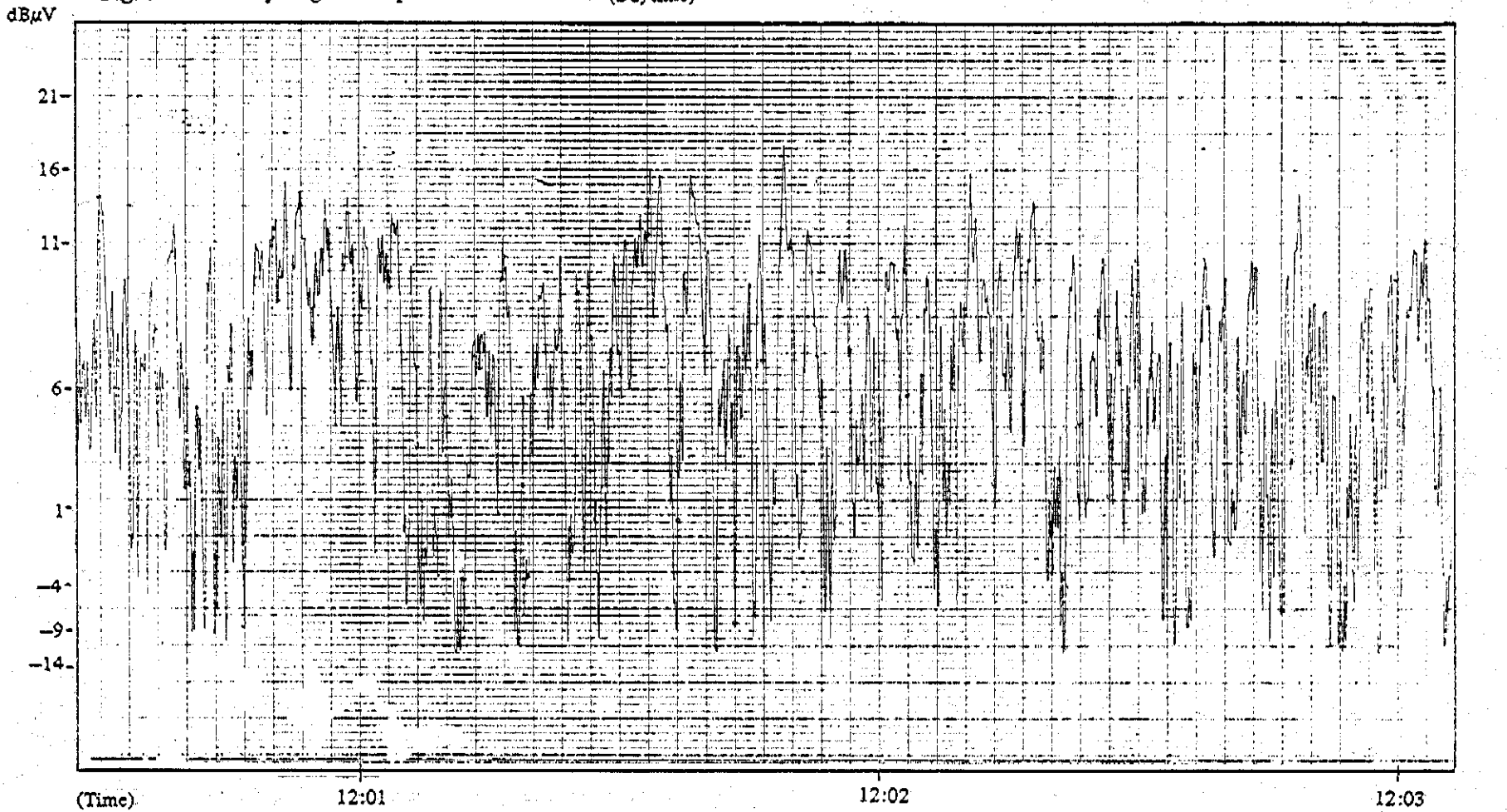
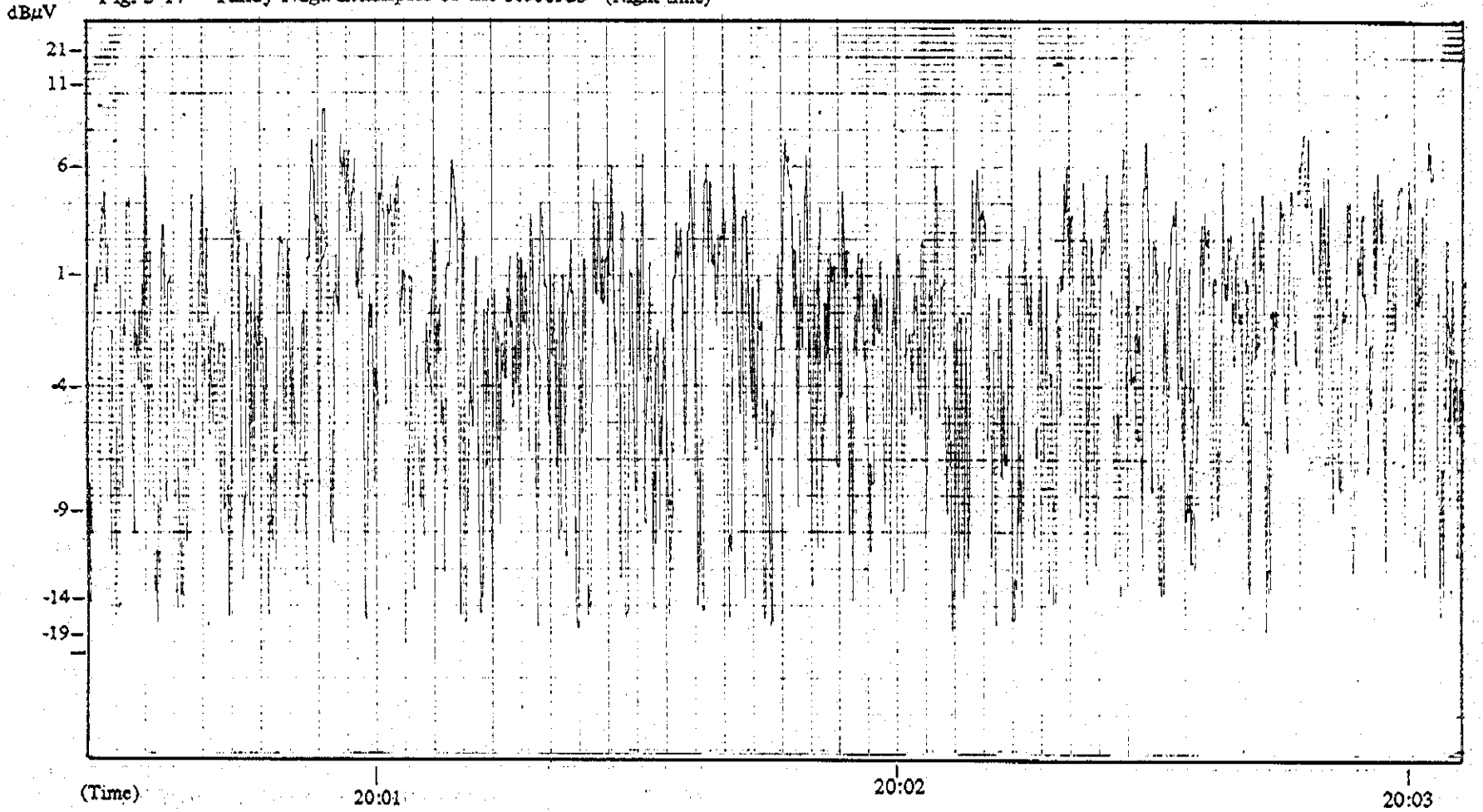


Fig. 3-17 Tanay-Naga Examples of the Records (Night time)



Nov.11 1977 20:00 180mm/Min

Scale 1/2

3-2-2. Spans within Line of Sight

(1) Spans Tested and Surveyed

The spans having line of sight are New FFC - Diliman, New FFC - Tanay, New FFC - BPW, Diliman - Tanay and PAGASA - BPW.

Out of above spans, Diliman - Tanay has been tested for radio propagation and surveyed for line of sight, and the other spans have been checked for line of sight only.

According to informed sources, the proposed Flood Forecasting Systems' Center will be installed at the new building of PAGASA (tentatively called New FFC). Therefore, the present survey has been conducted under the consideration of above information.

Although the 400MHz band multiplex telecommunication system had been intended originally for use in the spans within line of sight, studies have been made for taking up 800MHz or 7000MHz band system after the discussions with the Philippine Telecommunication Control Bureau and PAGASA which have disclosed that the frequency allocation of 400MHz band in Manila and nearby areas is very congested and its future allocation is difficult.

1) New FFC - Diliman

The span, New FFC - Diliman is short in distance, and there will be no problem in propagation if 400MHz or 800MHz band is used for the telecommunication system. However, in case 7000MHz band system is to be used instead, the antenna height of New FFC should be 30m ~ 40m from the ground in consideration of possible obstacles such as buildings and trees existing on the radio path.

2) Diliman - Tanay

The testing has been made by use of 400MHz band transmitter/receiver and field intensity meter to measure the propagation

loss. The result is shown in Table 3-1, from which it is known that 400MHz or 800MHz band can constitute the required link. However, due to the fact that the frequency allocation for 400MHz or 800MHz band is difficult, surveys have been made for possibility of using 7000MHz band system.

This span is screened by a mountain existing between Diliman and Tanay. Therefore, a reflector should be located at a point having line of sight to both ends, and the reconnaissance has been made to look for such point.

The suitable point for the reflector is in approx. 3.2km north-west to Tanay as shown in Fig. 3-18. The profile produced by the map of 1:50000 is as per Fig. 3-7.

At the time for survey for confirming line of sight, Tanay relay station was within sight, however, Diliman and New PPC were not seen due to the smog prevailed to these directions.

Therefore, it is necessary to confirm the line of sight for these two directions in future.

Reference is made to Photo 3-7 for the suitable point for the reflector installation.

3) New PPC - Tanay

There is no radio propagation problem for this span if 400MHz or 800MHz band is used. However, due to the frequency allocation problem as stated above, surveys and studies have to be made for employing 7000MHz band. It is required, therefore, to look for a suitable point for installation of reflector.

4) New PPC - BPW

This span goes through the central part of Manila City, having many high buildings to hinder the radio path and screen line of sight.

For the present, there is no problem for radio propagation of 400MHz or 800MHz band. However, in view of possibility that more high buildings will come out in the radio path in future, ample margins should be secured in the system circuit design. If 7000MHz band is to be used, the antenna height should be more than 100m from the ground.

However, it will be impossible for BPW to have such a high tower within its site or on its office building due to its limited space.

In view of above, it is not a good idea to use 7000MHz band.

5) PAGASA - BPW

At present, this span is hindered by Manila Royal Hotel existing between the two points, and no line of sight is secured.

400MHz or 800MHz band has no propagation problem for this short span. However, 7000MHz band multiplex system has the same problems as stated in above 4).

Table 3-1. DILIMAN - TANAY
PROPAGATION TEST DATA SHEET

		Calculation		Measurement	
	Span	DILIMAN - TANAY		DILIMAN - TANAY	
	Altitude	70m	530m	70m	530mm
	Antenna Height	20m	10m	20m	10m
	Distance	31.5km		31.5km	
①	Transmitting Feeder Loss	-4dB	8D-2W, 25m	-4dB	8D-2W, 25m
②	Receiving Feeder Loss	-4dB	8D-2W, 25m	-4dB	8D-2W, 25m
③	Transmitting Antenna Gain	+12.5dB	8 ELE YAGI	+12.5dB	8 ELE YAGI
④	Receiving Antenna Gain	+12.5dB	8 ELE YAGI	+12.5dB	8 ELE YAGI
⑤	Propagation Loss	-149.5dB	(⑤.① + ⑤.②)	-150.7dB	(⑥-①-②-③-④)
⑤.①	Free Space Loss	-114.5dB	400MHz 31.5km		
⑤.②	Shadow Loss	-35dB			
⑤.③	Corrective Value	-		-1.2dB	
⑥	Span Loss	-132.5dB	(①+②+③+④+⑤)	-133.7dB	(⑧-⑦)
⑦	Transmitting Power	+34.7dBm	3W	+34.7dBm	3W
⑧	Receiving Power	-97.8dBm (15.2dBμV)	(⑥+⑦)	-99dBm (14dBμV)	Measured Value
	Note				

Fig. 3-18 Proposed Reflector Site

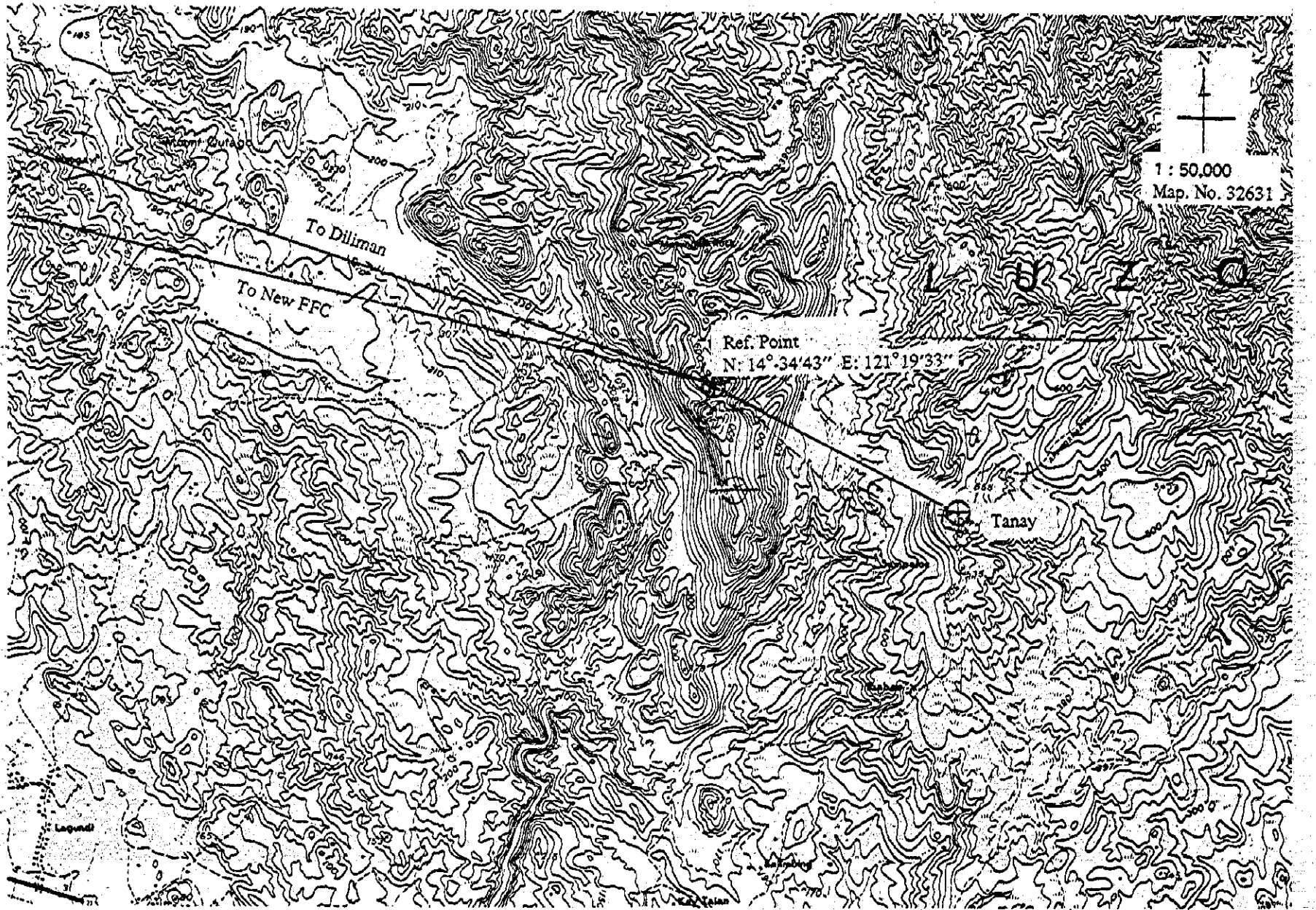
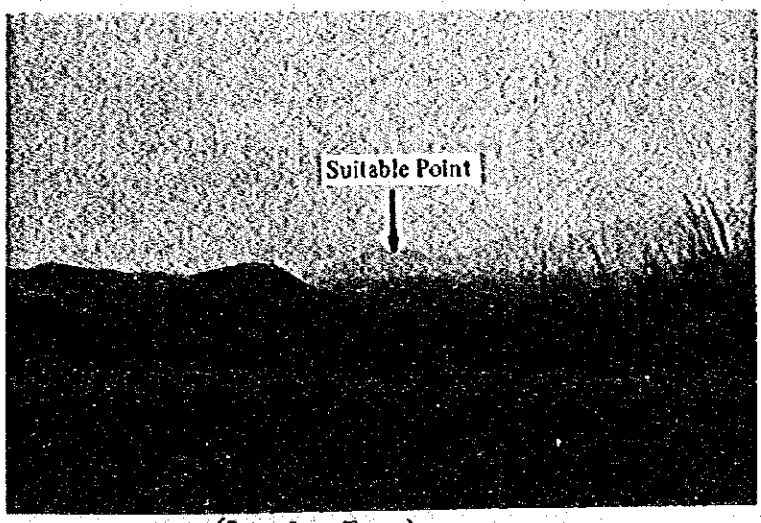
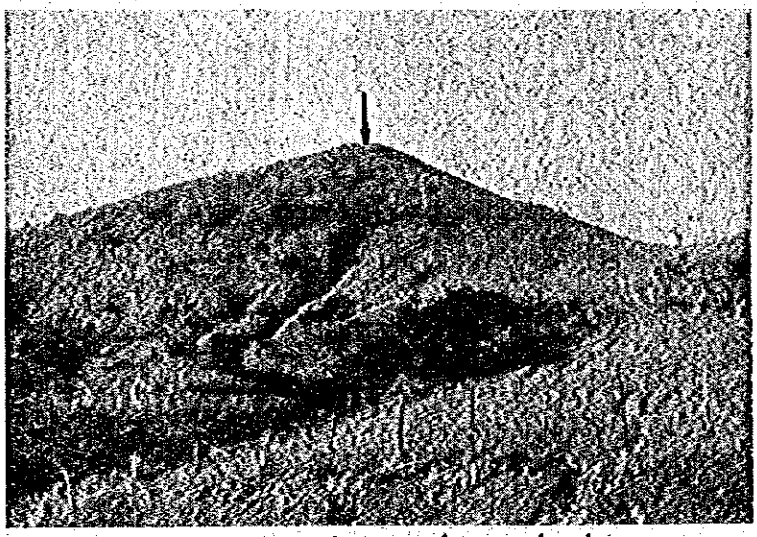


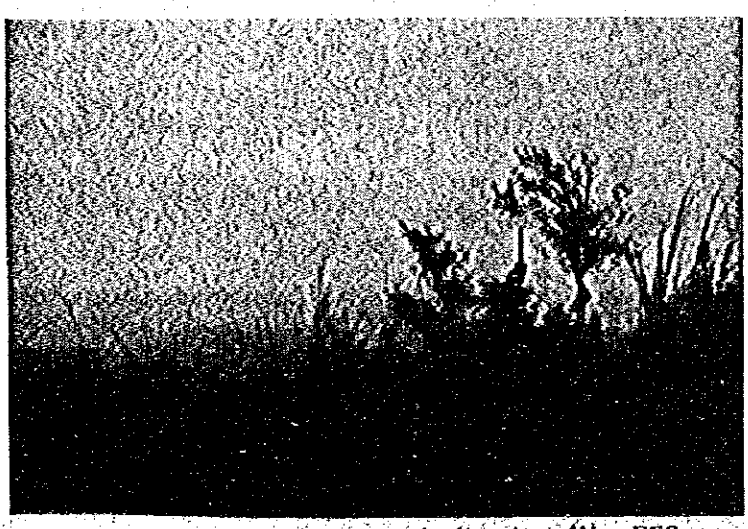
Photo 3-7 Suitable Point for Reflector Installation



(Seen from Tanay)



Same point as above seen from nearby place.



Seen from the suitable point to the direction of New-FFC.