THE REPUBLIC OF THE PHILIPPINES

THE FEASIBILITY STUDY
ON
THE DEVELOPMENT PROJECT
ON
THE METEOROLOGICAL TELECOMMUNICATION SYSTEM

FINAL REPORT
(APPENDIX)

JANUARY 1985

JAPAN INTERNATIONAL COOPERATION AGENCY

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Appendix A. Study Results and Analytic Evaluation

Appendix A (*1) Calculation method of receiving input power, corrective value based on the test and atmospheric refractivity

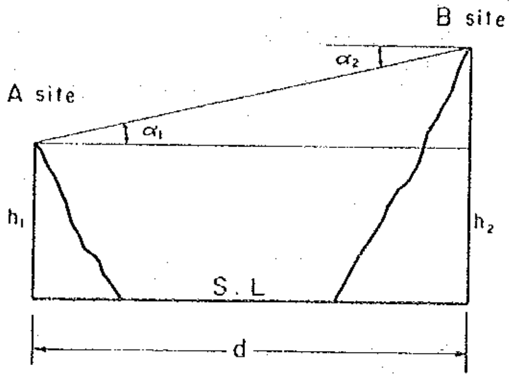
Atmospheric refractivity on the ground surface:

$$N(s) = \left(\frac{77.6}{273 + T}\right) \times \left(P + \frac{4810 \times e_s \times Rh}{273 + T}\right)$$

T : Temperature (°C), P: Atmospheric pressure (mb)
Rh: Relative humidity
e_s: Saturation vapor pressure (mb)

Receiving power for the OH communication generally varies every moment by fading. Therefore, if the standard receiving power is assumed to be the receiving power at a time rate of 50%, then the receiving power levels obtained at certain intervals within a certain time period must be accumulated to determine the accumulative percentage of the receiving power with respect to time rate. This time we used a personal computer for this analysis and processing. Of these accumulative percentage values, the receiving power levels at a time rate of 50% are picked up for further calculation of the accumulative percentage in order to obtain the standard receiving power (level at a time rate of 50%) for the radio link subjected to the propagation test. The difference between this value and the estimated standard value on the site for propagation tests is "the corrective value based on the propagation test."

Appendix A (*2) Calculation method of the height of an obstruction on the propagation route



$$\tan\alpha_1 = -\left(\frac{h_1 - h_2}{d} + \frac{d}{2Ka}\right)$$

$$\tan\alpha_2 = -\left(\frac{h_2 - h_1}{d} + \frac{d}{2Ka}\right)$$

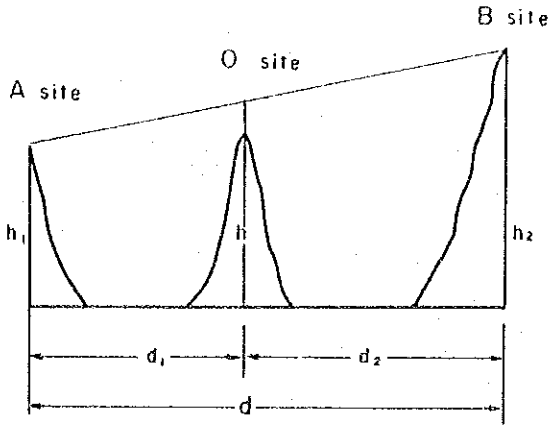
$\alpha_1, \alpha_2 > 0$: angle of elevation

$\alpha_1, \alpha_2 < 0$: angle of depression

d: Distance between A and B sites
h_1: Height above sea level of A site
h_2: Height above sea level of B side
α_1: Vertical angle of B site viewed from A site
α_2: Vertical angle of A site viewed from B site
a : Radius of earth (6370 km)
K : Refractive index of light (1.15)

In practice, the height above the sea level of one of the two sites is measured with a pocket altimeter. α is measured with a transit compass while d is actually measured or determined with a map.

Appendix A (*3) Method of calculating the minimum required antenna height



h_1: Height above sea level of A site
h_2: Height above sea level of B site
h : Height above sea level of O site
d : Distance between A and O sites
d_1: Distance between O and B sites
d_2: Distance between A and B sites
a : Radius of earth (6370 km)
K : Refractive index of radiowave (4/3)

$$h_1 = \frac{hd-h_2d_1}{d_2} + \frac{d_1d}{2Ka}$$

The following must also be taken into consideration:

- The first Fresnel's zone is ensured against obstructions except for 800 MHz-band routes.
- The correction of 7 meters is added to the determined height of an obstruction above the sea level to allow for the height of trees and measurement errors.
- The possible future raising or lowering of the height due to the leveling of ground of each site is not taken into consideration.

Appendix A (*4) Terrain profile, system data sheet, receiving power and fading rise/depth and receiving power with respect to time rate

(*4) 1

Terrain profile: Fig. A.1, (1/19) - (19/19)

The heights above sea level of the points of test and survey, the antenna heights, and the heights above sea level of obstructions determined through measurement and site survey are overwritten on the terrain profile made during map survey.

(*4) 2

System data sheet for propagation test: Table A.1, (1/11) - (11/11)

For each radio link subjected to the 800 MHz-band propagation test, the estimated values on site for the propagation test are written into the system data sheet on map for the propagation test.

"The estimated values on map for the propagation test" are the standard receiving power levels calculated before the test is actually made on the site. These values are referred to check whether the specifications for devices and materials used for the test are valid or invalid and whether the test is possible or impossible. "The estimated values on site for the propagation test" are the standard receiving power levels calculated according to the specifications used for the actual test. Based upon these calculated standard receiving power values, "the corrective values based on the propagation test" are calculated.

(*4) 3

Receiving power and fading rise/depth: Fig. A.3, (1/32) - (32/32)

Based upon the accumulative percentage values of the receiving power with respect to time rate that are output from the personal computer for each measurement time interval, the receiving power at time rates of 1%, 5%, 50%, 95%, 99%, and 99.95% is graphed while the differences between the receiving power at time rates of 1%, 5% 95%, and 99.95% and the receiving power at a time rate of

50% are expressed as the "fading rise and depth" which are also graphed.

The above data allow us to determine the quantitative and qualitative receiving power variations with time.

(*4) 4

Receiving power with respect to time rate: Fig. A.4, (1/22) - (22/22)

Of the accumulative percentage values of receiving power with respect to time rate that are output from the personal computer for each measurement time interval, representative data are plotted on a normalized probability chart.

Appendix A (*5) Results of measurement on obstructions on selected routes

(*5) 1

The results of measurement of obstructions between BALOD and CAPACUAN are shown in Fig. A.1 (5/19). The measurement results are as follows.

° Obstruction measurements on the BALOD side (including tree heights)

h : Height above sea level of BALOD (from measurement with a pocket altimeter) + Transit compass height = 53m + 1.5m

α_1: +1°32'20" (by transit compass)

d : 1.26km (measured with a map)

$$h_2 : d.\tan\alpha_1 + h_1 + \frac{d^2}{2Ka} = 1,260m \times \tan(1°32'20") + (53m + 1.5M + \frac{(1260)^2}{2x1.15x6370000}) = 88.5m$$

° Obstruction measurements on the CAPACUAN side (including tree heights)

h_2: Height above sea level of CAPACUAN (by pocket altimeter) + Transit compass height = 310m + 1.5m

α_2: -40'30" (by transit compass)

d : 8.2km (by a map)

$$h_1 = d.\ \tan\alpha_2 + h_2 + \frac{d_2}{2Ka} = 219.5m$$

(*5) 2

An unobstructed view from CAPACUAN to TINAMBACAN was confirmed as had been expected from the map survey. The terrain profile is shown in Fig. A.1 (6/19).

(*5) 3

A site survey was performed at the 490m highland site of the BALOD-490m highland-TINAMBACAN route. However, the view from this site to the other site could not be checked, and no measurement data could be obtained.

(*5) 4

The data regarding the 800 MHz-band propagation test with the BALOD-CAPACUAN route is as follows.

° System data sheet for the 800 MHz-band propagation test ..... Table A.1, (5/11)

° Height and Rotation antenna pattern ..... Fig. A.6, A.7

(*5) 5

For the approach links, MALABOG-LEGASPI, BALOD-CATARMAN, DANAO-MACTAN Radar, and MALASAG-CAGAYAN DE ORO, the test was performed on the two links: MALABOGLEGASPI and DANAO MACTAN RADAR. The results are shown in Fig. A.1, (9/19 - 11/19).
A site survey on the BALOD-CATARMAN and MALASAG-CAGAYAN DE ORO links revealed little problem, and measurement was not made on these links.

Appendix A (*6) Evaluation of the minimum required antenna height

(*6) 1

BALOD-CAPACUAN-TINAMBACAN

h_1: Minimum required antenna height at the BALOD station

h : Height above sea level of propagation route at obstruction point (Height above sea level of obstruction + Measurement errors and tree height (7m) + Depth of first Fresnel's zone at obstruction point)

d : Distance between BALOD and CAPACUAN

h_2: Antenna height above sea level at CAPACUAN

d_1: Distance between BALOD and obstruction

d_2: Distance between CAPACUAN and obstruction

ß : Altitude at BALOD

° Minimum required antenna height at the BALOD station, if a back-to-back coupling antenna system is used at CAPACUAN:

$$h_1 = \frac{hd-h_2d_1}{d_2} + \frac{d_1d}{2Ka} - \beta = \frac{(88.5^m+7.4+7^m)\times 25700^m-1260^m\times(310^m+15^m)}{24440m}$$

$$+ \frac{1260m \times 25700m}{2\times 4/3\times 6370000m} - 53m$$

$$= 40.4m$$

* Between BALOD and CAPACUAN, the minimum required antenna height at the BALOD station with respect to the obstruction 17.5km distant from BALOD is 39.8m. Therefore, the minimum required antenna height at the BALOD station is 40.4m. In this case, an antenna height of 15m is assumed at CAPACUAN.

* Since a line of sight is ensured between CAPACUAN and TINAMBACAN, the antenna height is 15m at CAPACUAN while 10m at TINAMBACAN.

° BALOD station minimum required antenna height, if a reflector plate (tower height of reflector 5m) is installed at CAPACUAN:

$$h_1 = \frac{(219.5m + 15.8m + 7m) x 25700m - 17500m \times (310m+15m)}{8200m}$$

$$+ \frac{17500m \times 25700m}{2x4/3+6370000m} - 53m$$

$$= 60.6m$$

* Between BALOD and CAPACUAN, the minimum required antenna height at the BALOD station with respect to the obstruction 1.26km distant from BALOD is 40.9m.

(*6) 2

BALOD-490m highland-TINAMBACAN

h_1: Minimum required antenna height at the BALOD station or TINAMBACAN station

h : Height above sea level of propagation route at the obstruction point

d : Distance between BALOD and the 490m highland site or between TINAMBACAN and the 490m highland site

h_2: Antenna height above sea level at the 490m highland site

d_1: Distance between BALOD and the obstruction or between TINAMBACAN and the obstruction

d_2: Distance between the 490m highland site and the obstruction

ß : Altitude at TINAMBACAN

BALOD station minimum required antenna height if a back-to-back coupling antenna system is used at 490m highland site:

$$h_1 = \frac{(80m+20m+8m) x 24500m - (490m+15m) x 1500m}{23000m}$$

$$+ \frac{1500m \times 24500m}{2 \times 4/3 \times 6370000m} - 53m$$

$$= 31.3m$$

TINAMBACAN station minimum required antenna height if a back-to-back coupling antenna system is used at the 490m highland site:

$$h_1 = \frac{(300m+20m+15.4m) \times 21000m - (496m+15m) \times 10500m}{10500m}$$

$$+ \frac{10500m \times 21000m}{2 \times 4/3 \times 6370000m} - 145m$$

$$= 33.8m$$

* The antenna height at the 490m highland site is 15m.

° Minimum required antenna height at the BALOD station if a reflector plate is installed in the 490m highland site:

$$h_1 = \frac{(432m + 70m + 9.1m) \times 24500m - (490m+5m) \times 22500m}{2000m}$$

$$+ \frac{22500m \times 24500m}{2 \times 4/3 \times 6370000m} - 53m$$

$$= 59.2m$$

* The minimum required antenna height with respect to the other obstruction between BALOD and the 490m highland site is 31.9m.

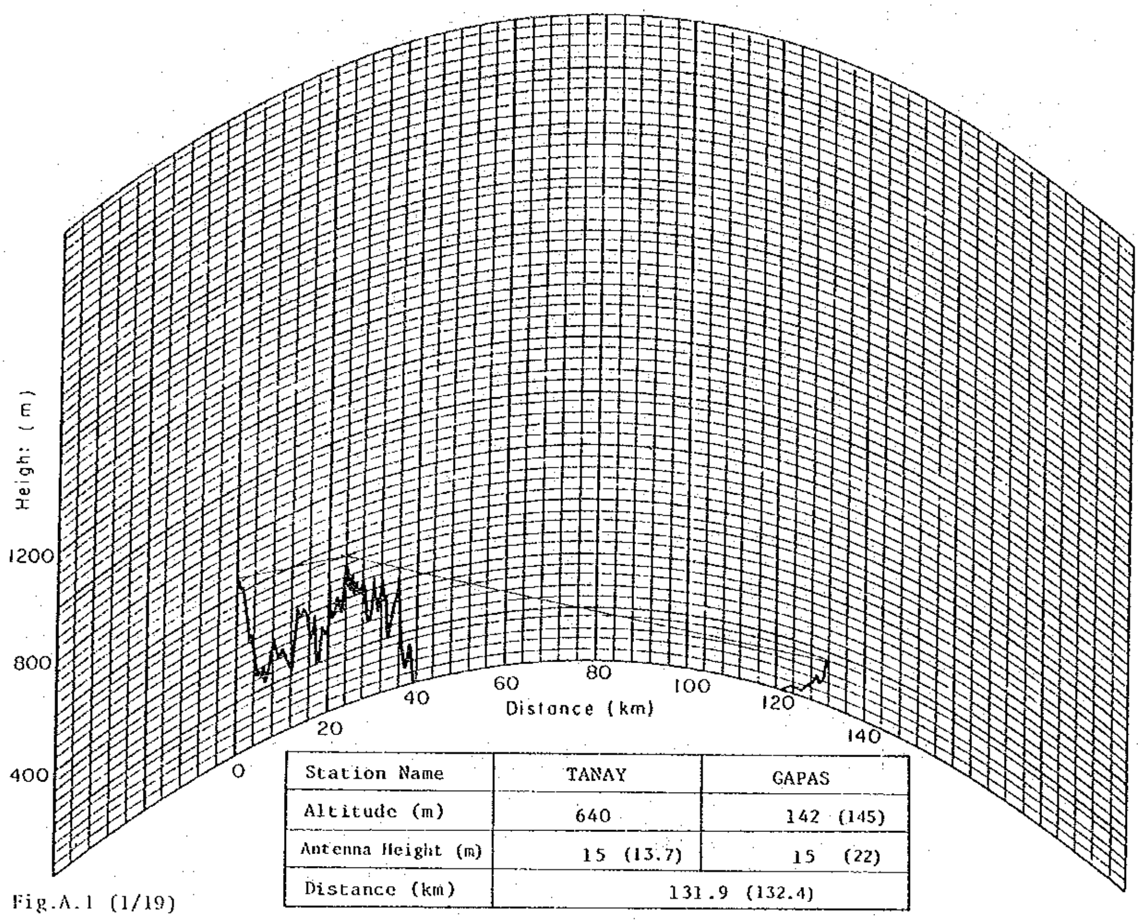
° Minimum required antenna height at the TINAMBACAN station if a reflector plate is installed in the 490m highland site:

$$h_1 = \frac{(300m+20m+15.4m) \times 21000m - (490m+5m) \times 10500m}{10500m}$$

$$+ \frac{10500m \times 21000m}{2 \times 4/3 \times 6370000m} - 145m$$

$$= 43.8m$$

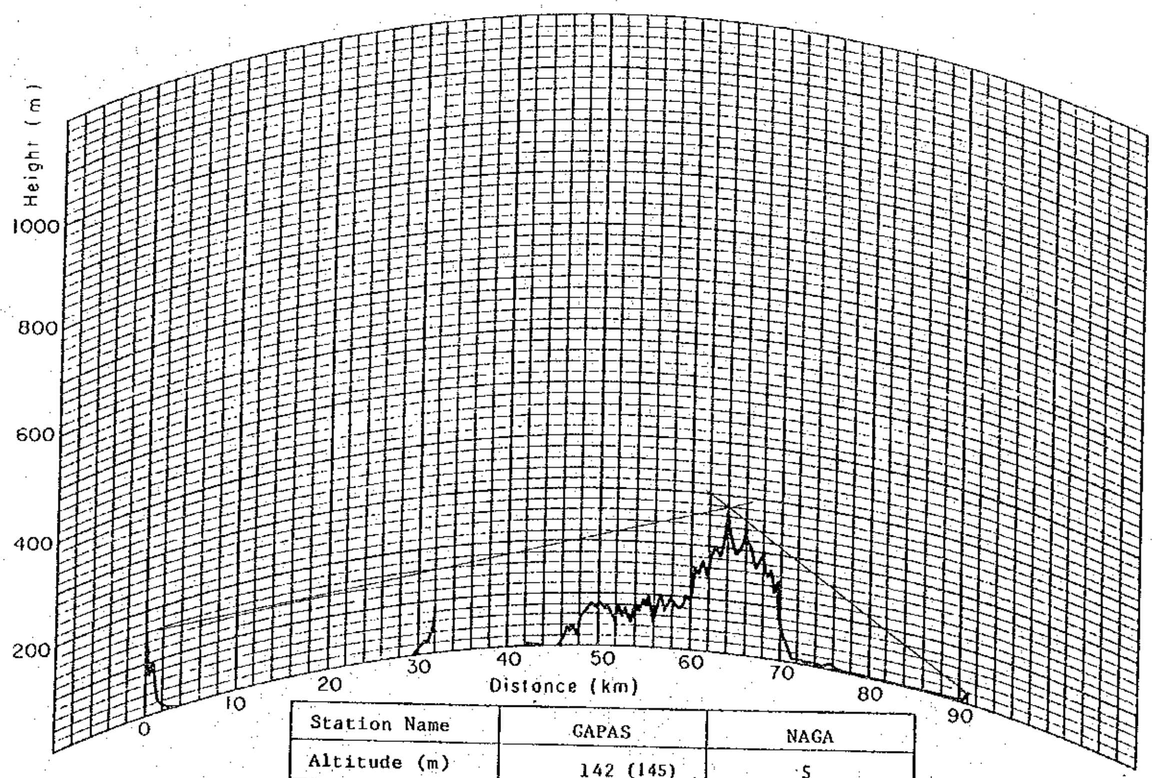
Profile



Station Name	TANAY	GAPAS
Altitude (m)	640	142 (145)
Antenna Height (m)	15 (13.7)	15 (22)
Distance (km)	131.9 (132.4)	

Fig.A.1 (1/19)

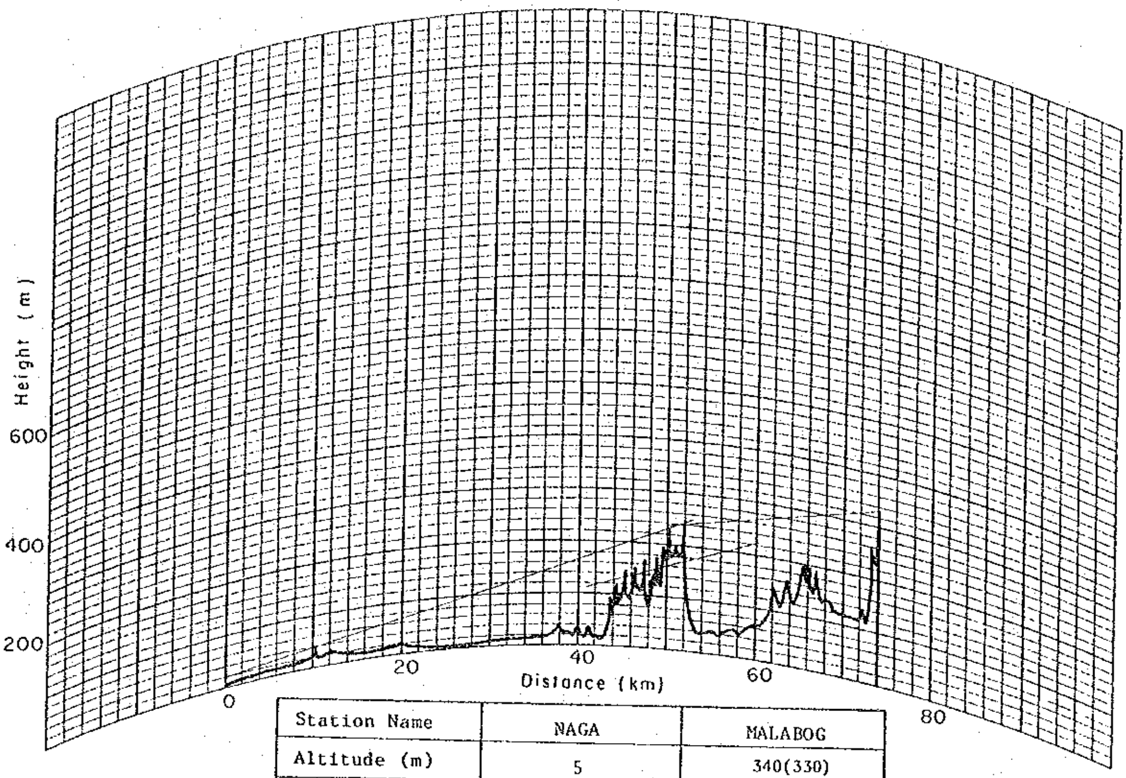
Profile



Station Name	GAPAS	NAGA
Altitude (m)	142 (145)	5
Antenna Height (m)	15 (22)	15 (27.8)
Distance (km)	91.0 (90.5)	

Fig.A.1 (2/19)

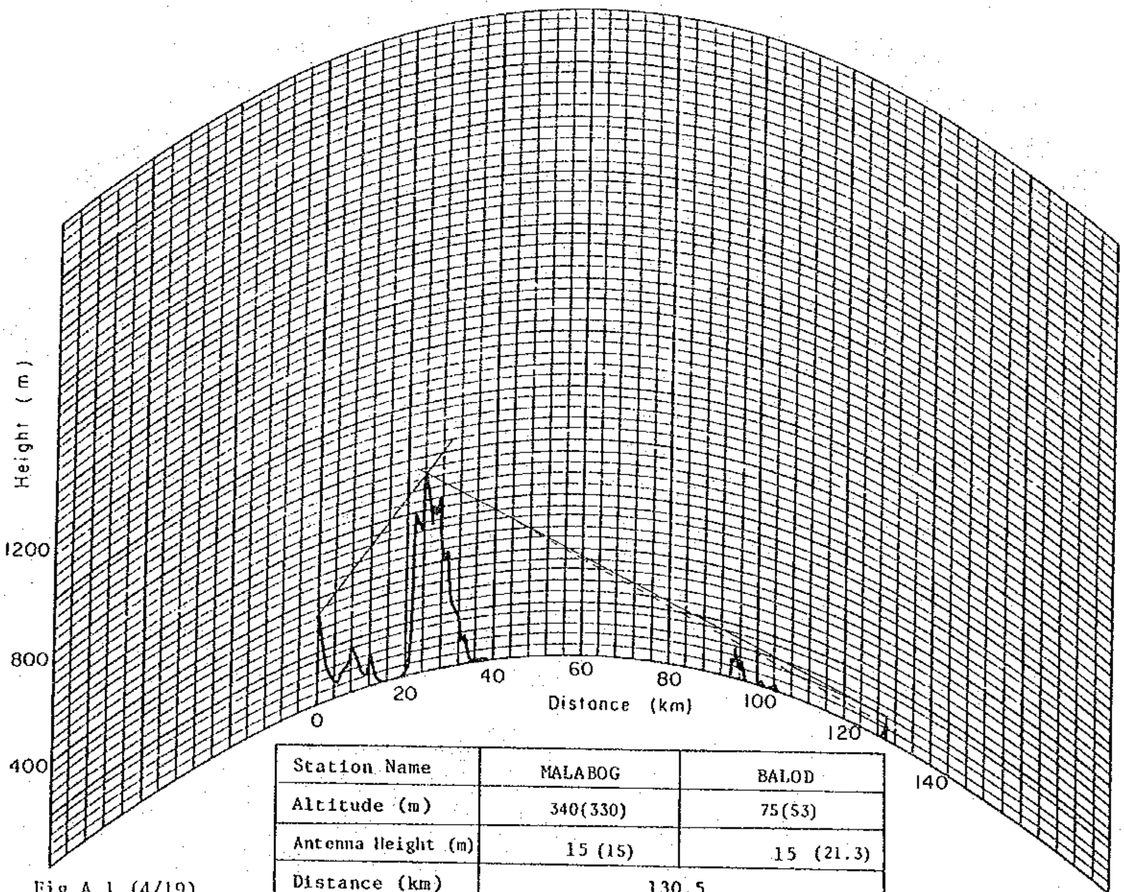
Profile



Station Name	NAGA	MALABOG
Altitude (m)	5	340(330)
Antenna Height (m)	15 (22.85)	15(22)
Distance (km)	74.2	

Fig.A.1 (3/19)

Profile



Station Name	MALABOG	BALOD
Altitude (m)	340(330)	75(53)
Antenna Height (m)	15 (15)	15 (21.3)
Distance (km)	130.5	

Fig.A.1 (4/19)

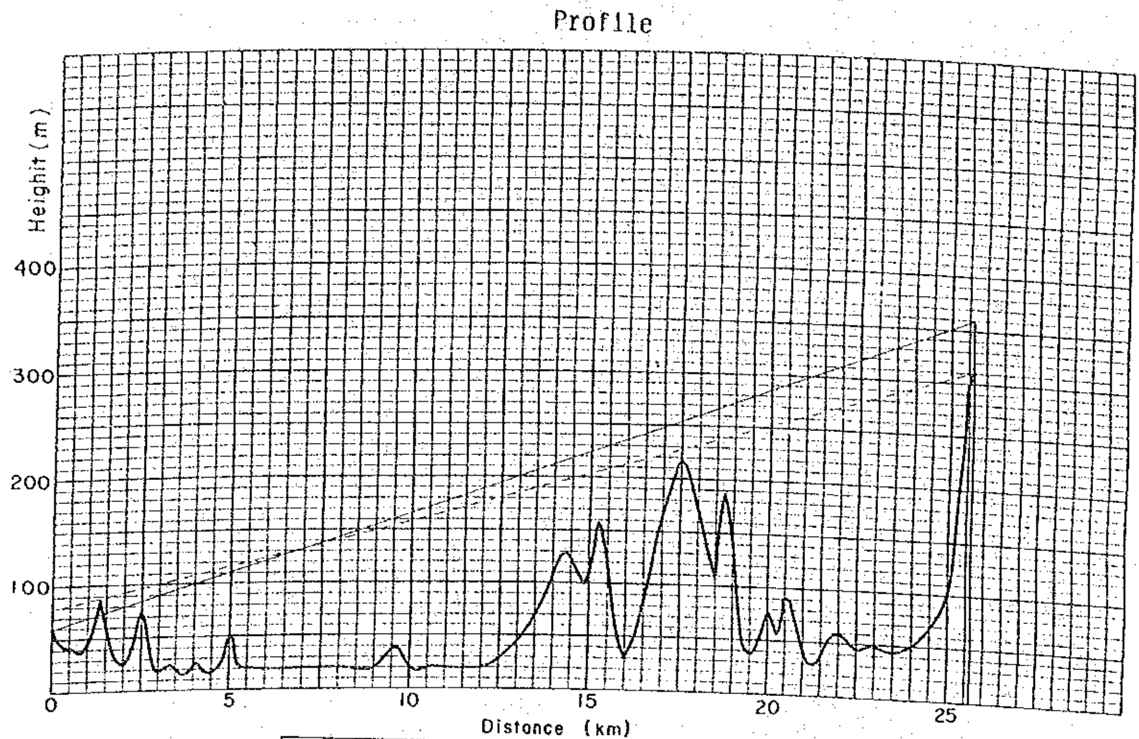


Fig. A.1 (5/19)

Station Name	BALOD	CAPACUAN
Altitude (m)	60(53)	360(310)
Antenna Height (m)		
Distance (km)	25.7	

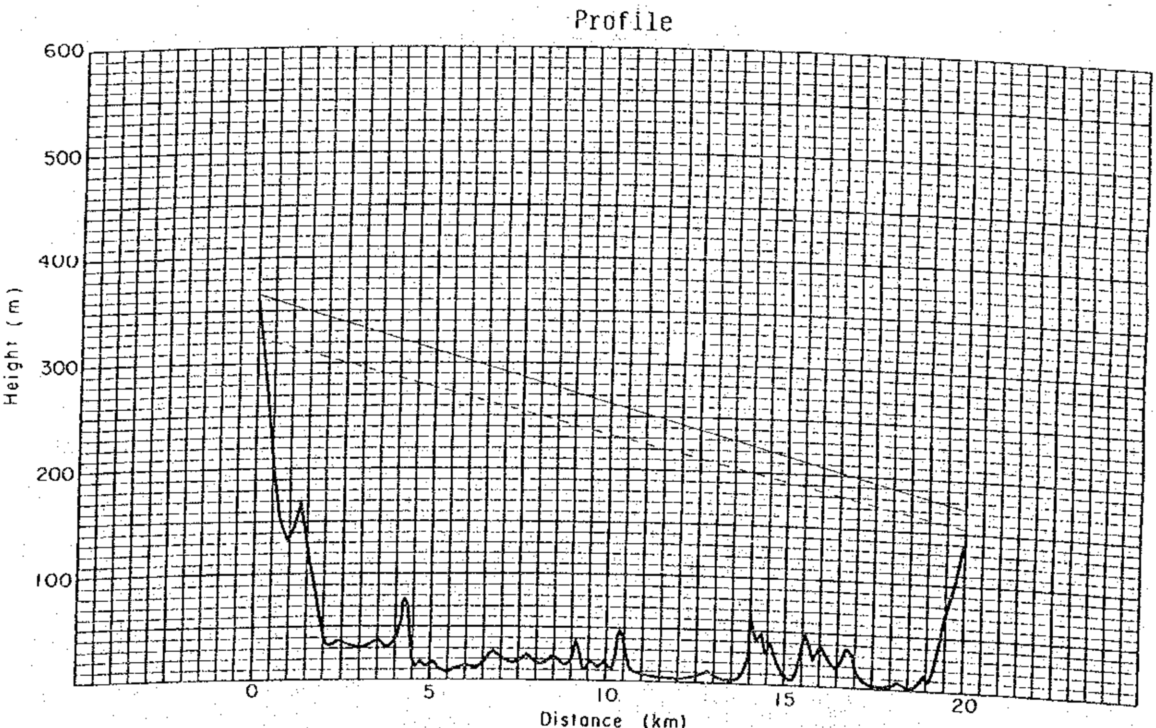
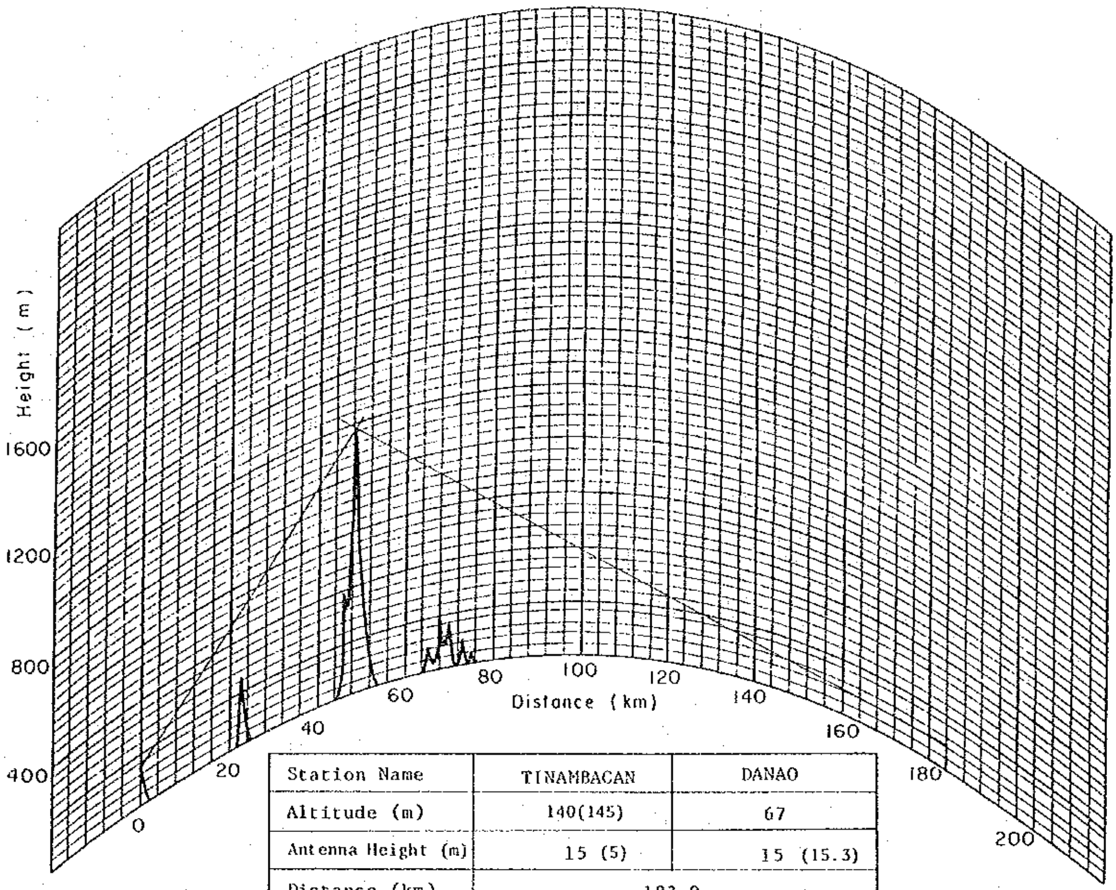


Fig.A.1(6/19)

Station Name	CAPACUAN	TINAMBACAN
Altitude (m)	360(310)	140(145)
Antenna Height (m)	7 (15)	35 (10)
Distance (km)	20.0	

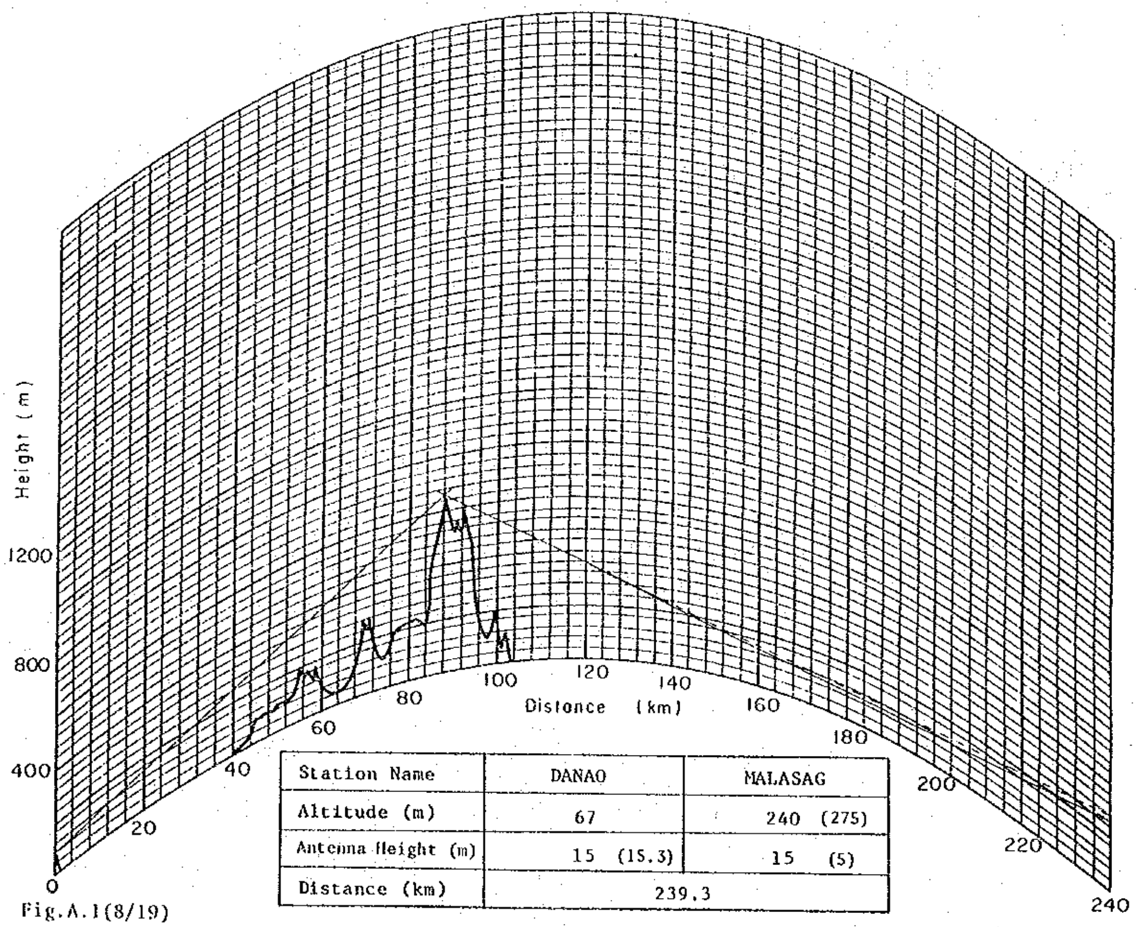
Profile



Station Name	TINAMBACAN	DANAO
Altitude (m)	140(145)	67
Antenna Height (m)	15 (5)	15 (15.3)
Distance (km)	183.9	

Fig.A.1(7/19)

Profile



Station Name	DANAO	MALASAG
Altitude (m)	67	240 (275)
Antenna Height (m)	15 (15.3)	15 (5)
Distance (km)	239.3	

Fig.A.1(8/19)

Profile

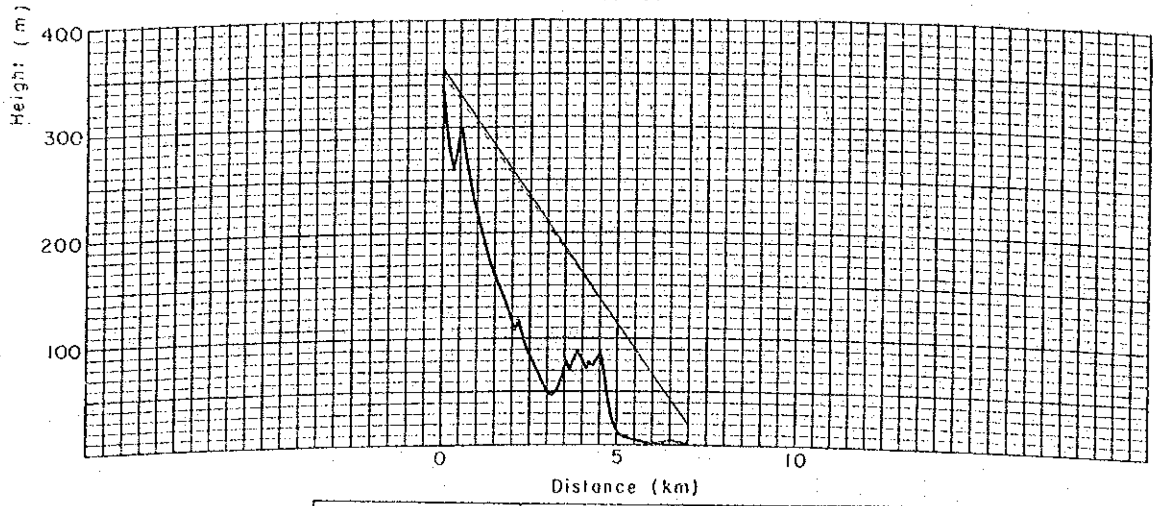
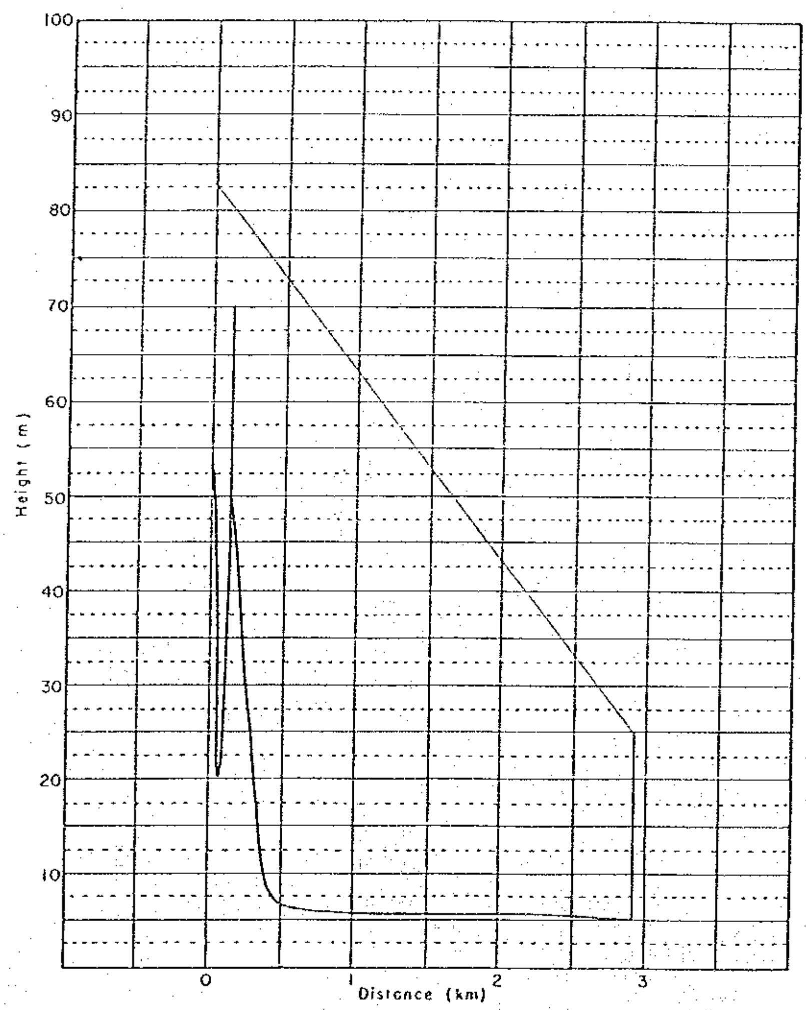


Fig. A.1(9/19)

Station Name	MALABOG-I	LEGASPI
Altitude (m)	340(330)	5
Antenna Height (m)	15 (20)	15 (20)
Distance (km)	7.0	

Profile



Station Name	BALOD	CATARMAN
Altitude (m)	53	5
Antenna Height (m)	30	20
Distance (km)	2.9	

Fig. A.1(10/19)

Profile

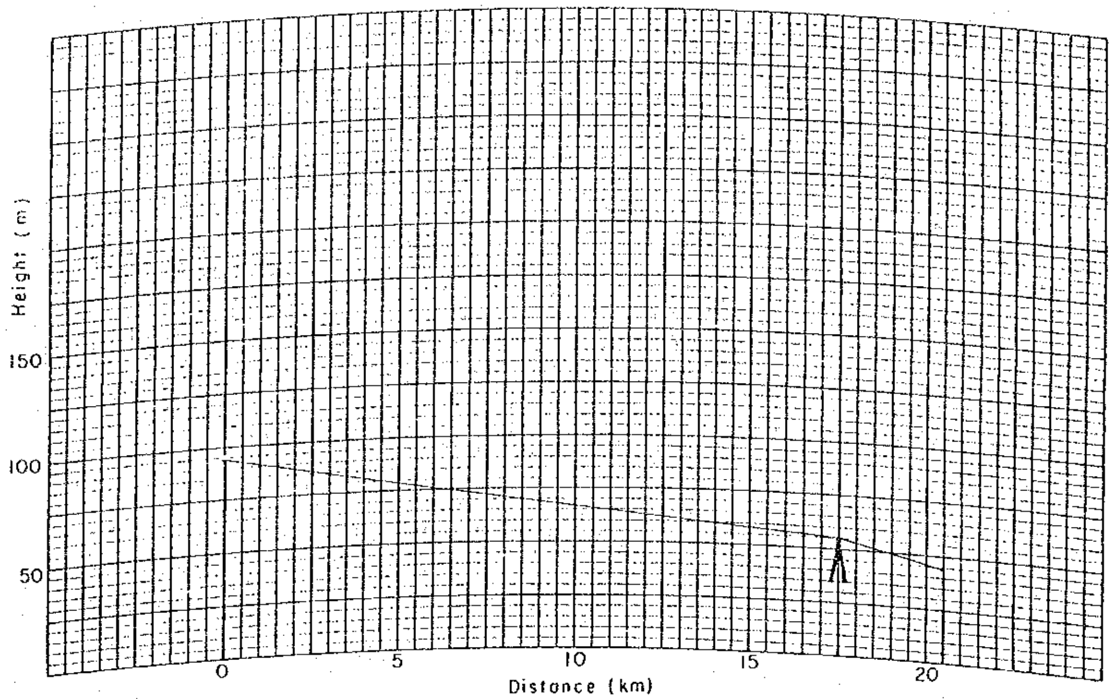
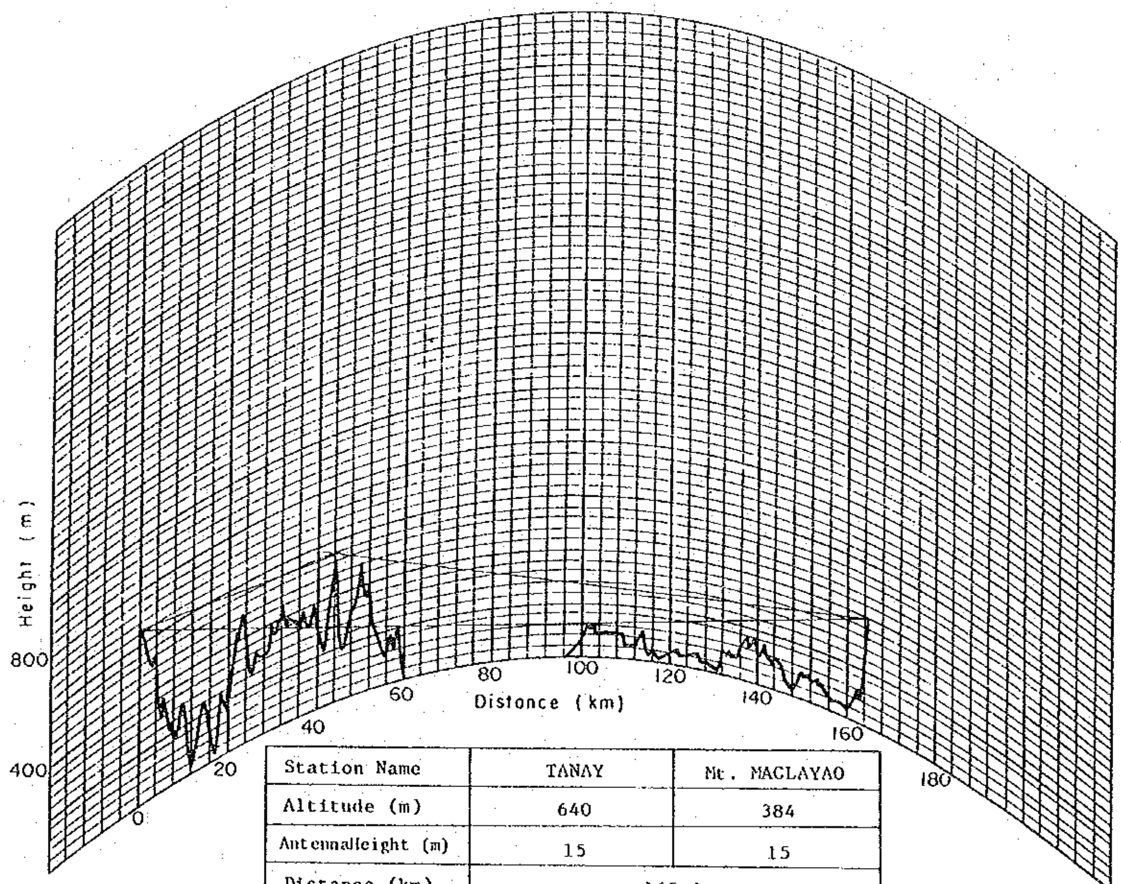


Fig.A.1(11/19)

Station Name	DANAO	MACTAN RADAR
Altitude (m)	67	24.8
Antenna Height (m)	20	20
Distance (km)	20.5	

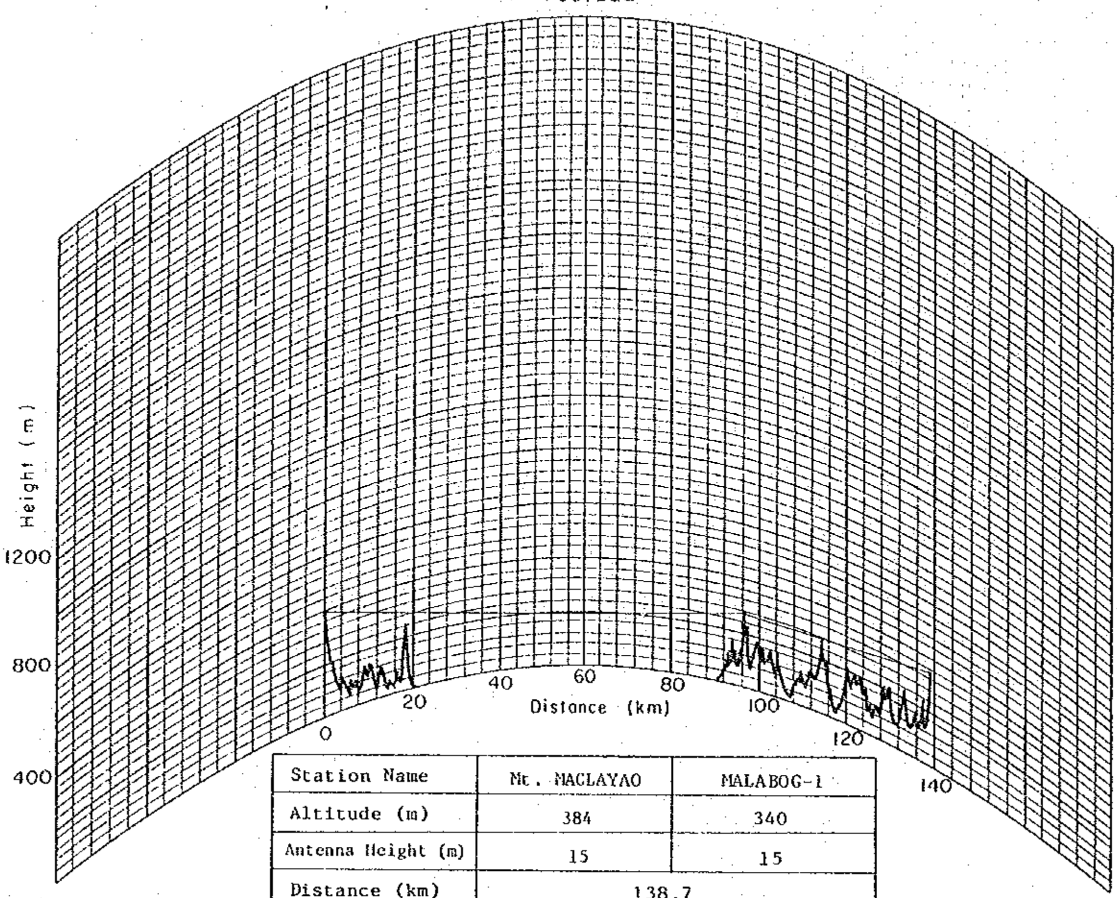
Profile



Station Name	TANAY	Mt. MACLAYAO
Altitude (m)	640	384
AntennaHeight (m)	15	15
Distance (km)	165.4	

Fig. A.1(12/19)

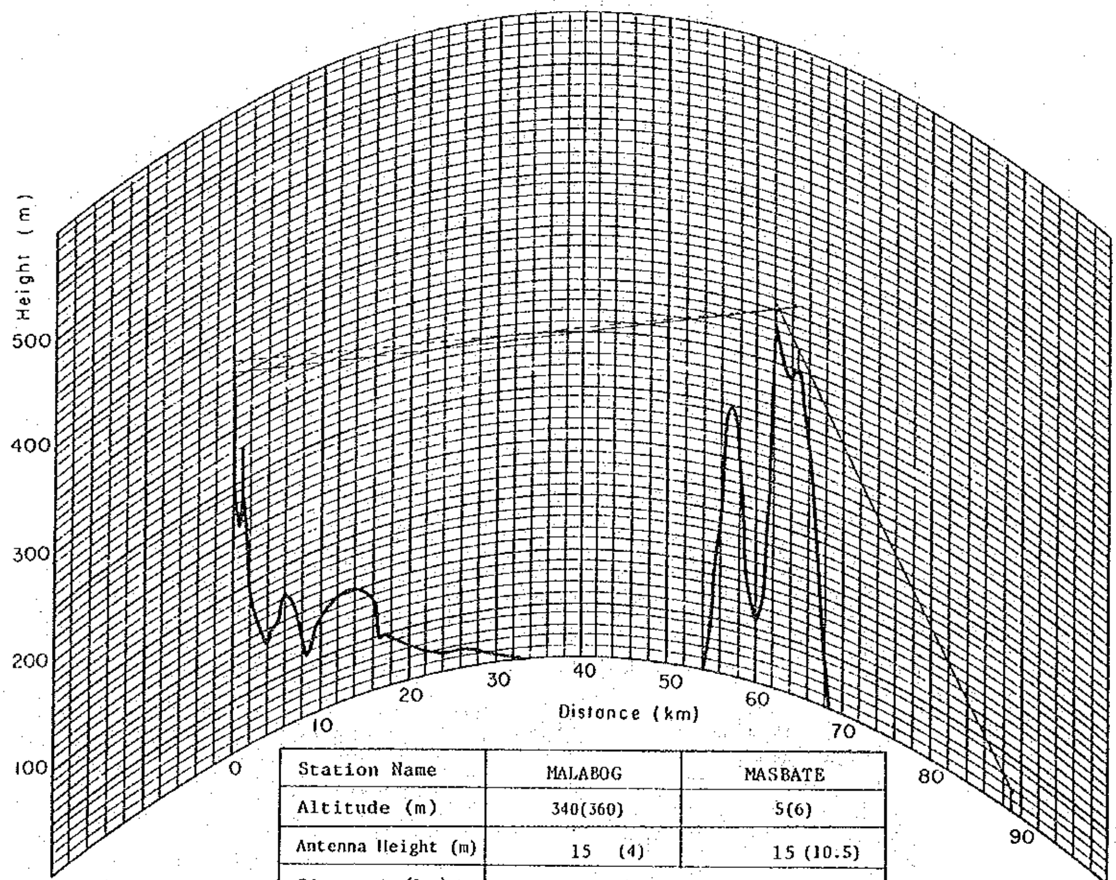
Profile



Station Name	Mt. MACLAYAO	MALABOG-1
Altitude (m)	384	340
Antenna Height (m)	15	15
Distance (km)	138.7	

Fig.A.1(13/19)

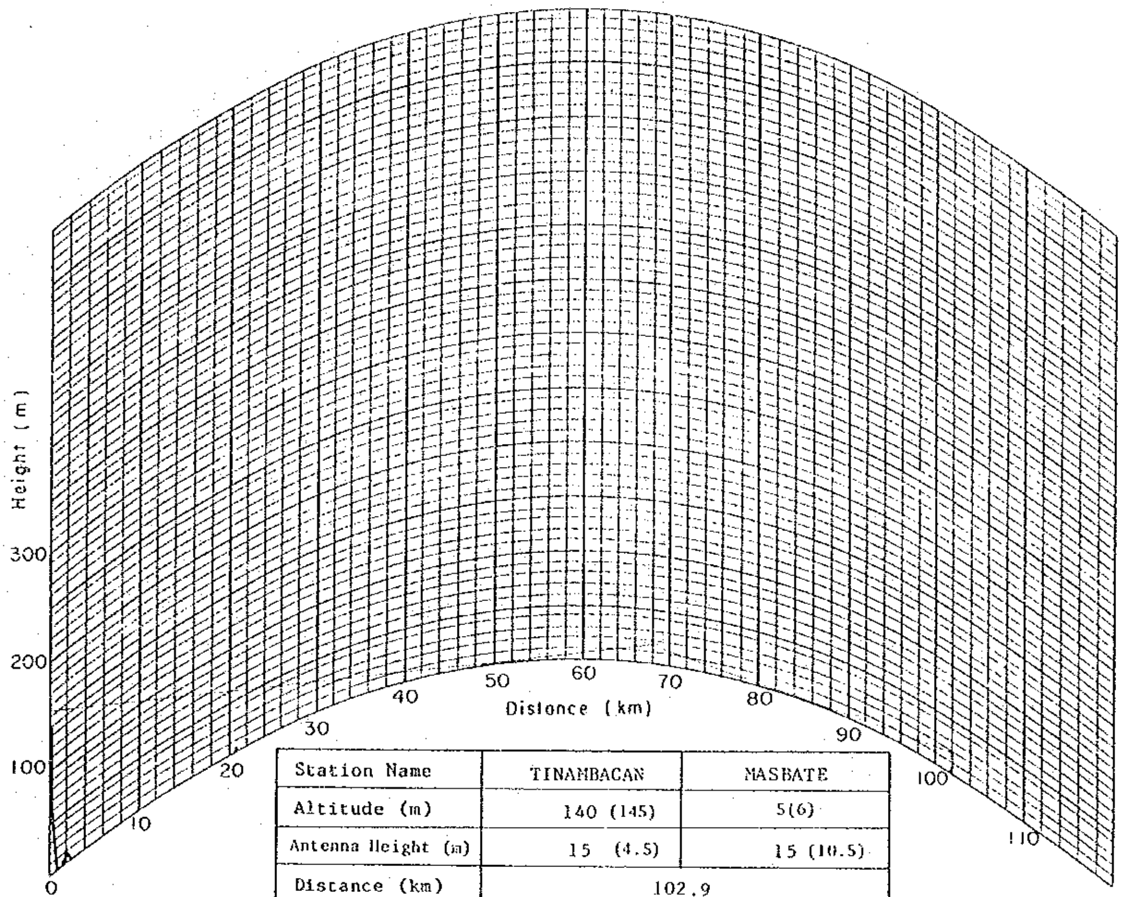
Profile



Station Name	MALABOG	MASBATE
Altitude (m)	340(360)	5(6)
Antenna Height (m)	15 (4)	15 (10.5)
Distance (km)	88.7	

Fig. A.1(14/19)

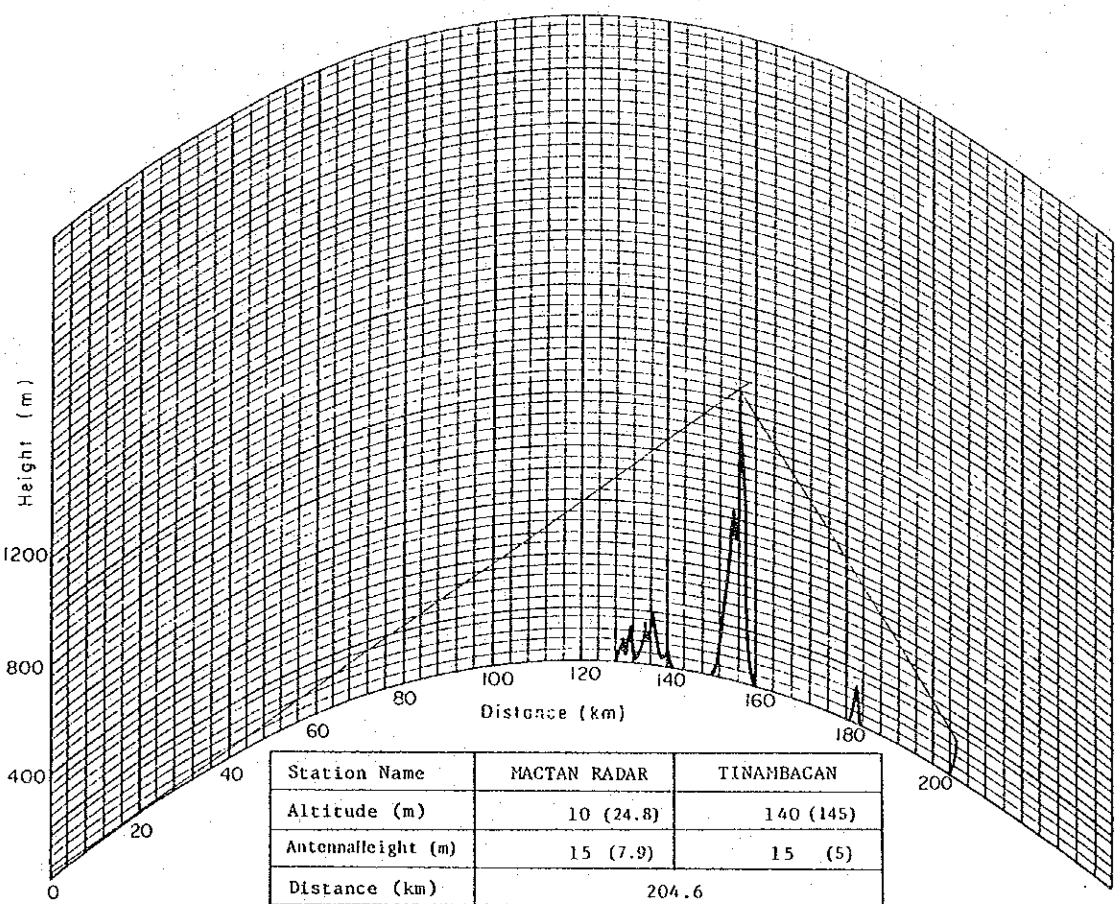
Profile



Station Name	TINAMBACAN	MASBATE
Altitude (m)	140 (145)	5(6)
Antenna Height (m)	15 (4.5)	15 (10.5)
Distance (km)	102.9	

Fig. A.1(15/19)

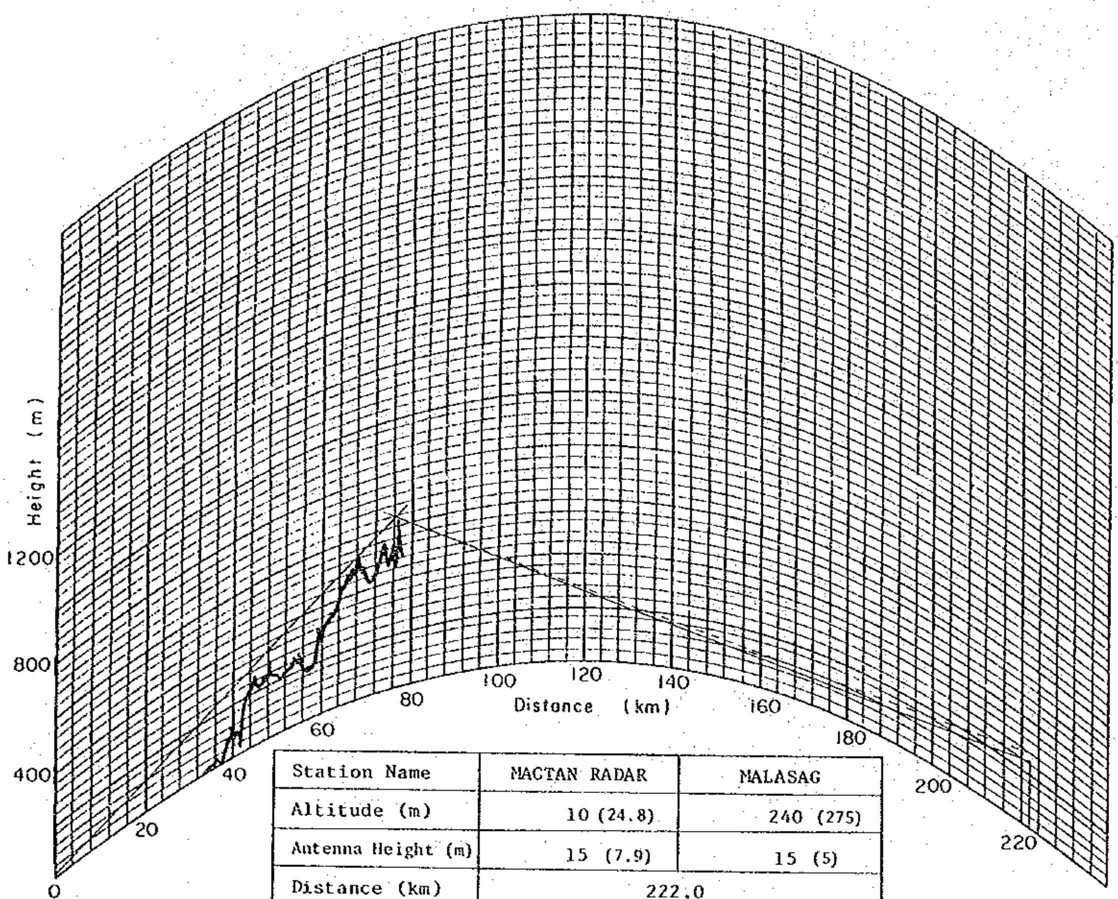
Profile



Station Name	MACTAN RADAR	TINAMBACAN
Altitude (m)	10 (24.8)	140 (145)
AntennaHeight (m)	15 (7.9)	15 (5)
Distance (km)	204.6	

Fig.A.1(16/19)

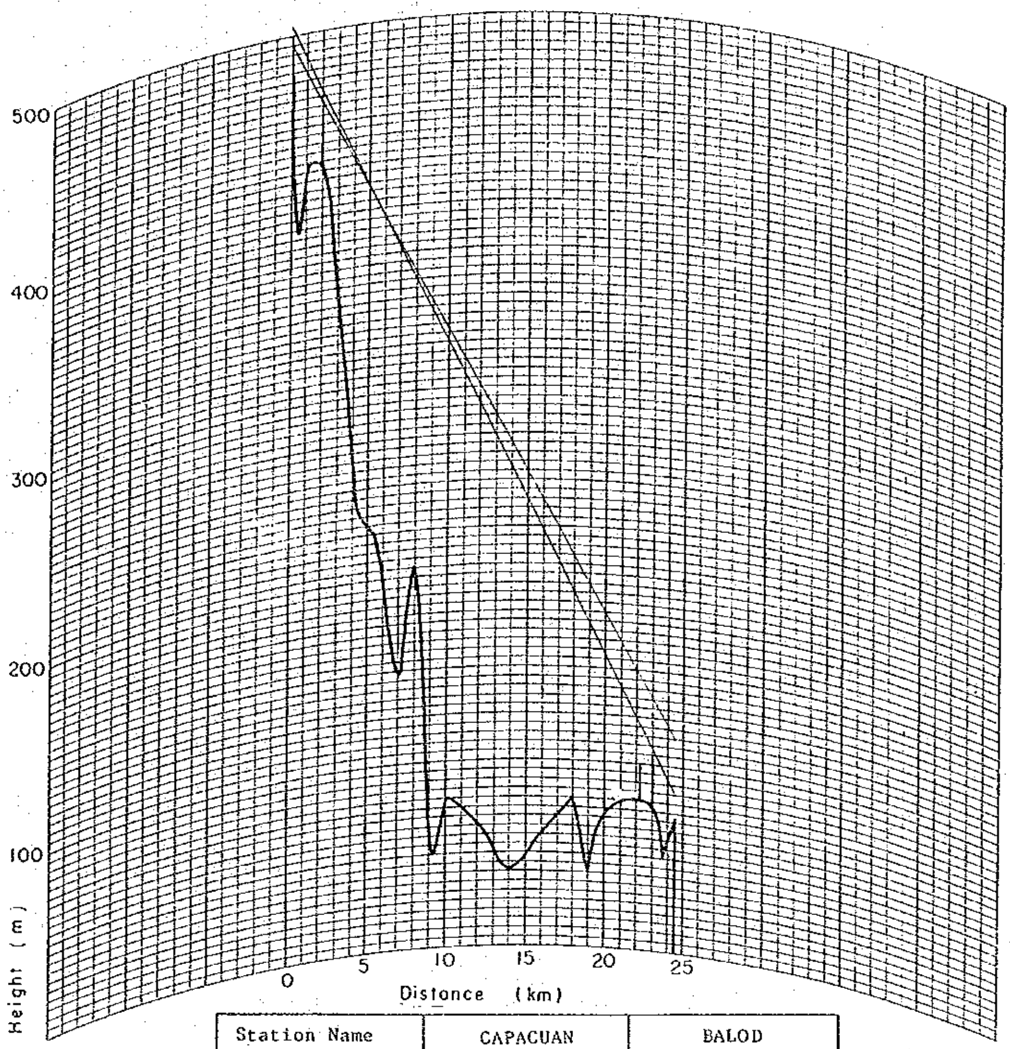
Profile



Station Name	MACTAN RADAR	MALASAG
Altitude (m)	10 (24.8)	240 (275)
Antenna Height (m)	15 (7.9)	15 (5)
Distance (km)	222.0	

Fig.A.1(17/19)

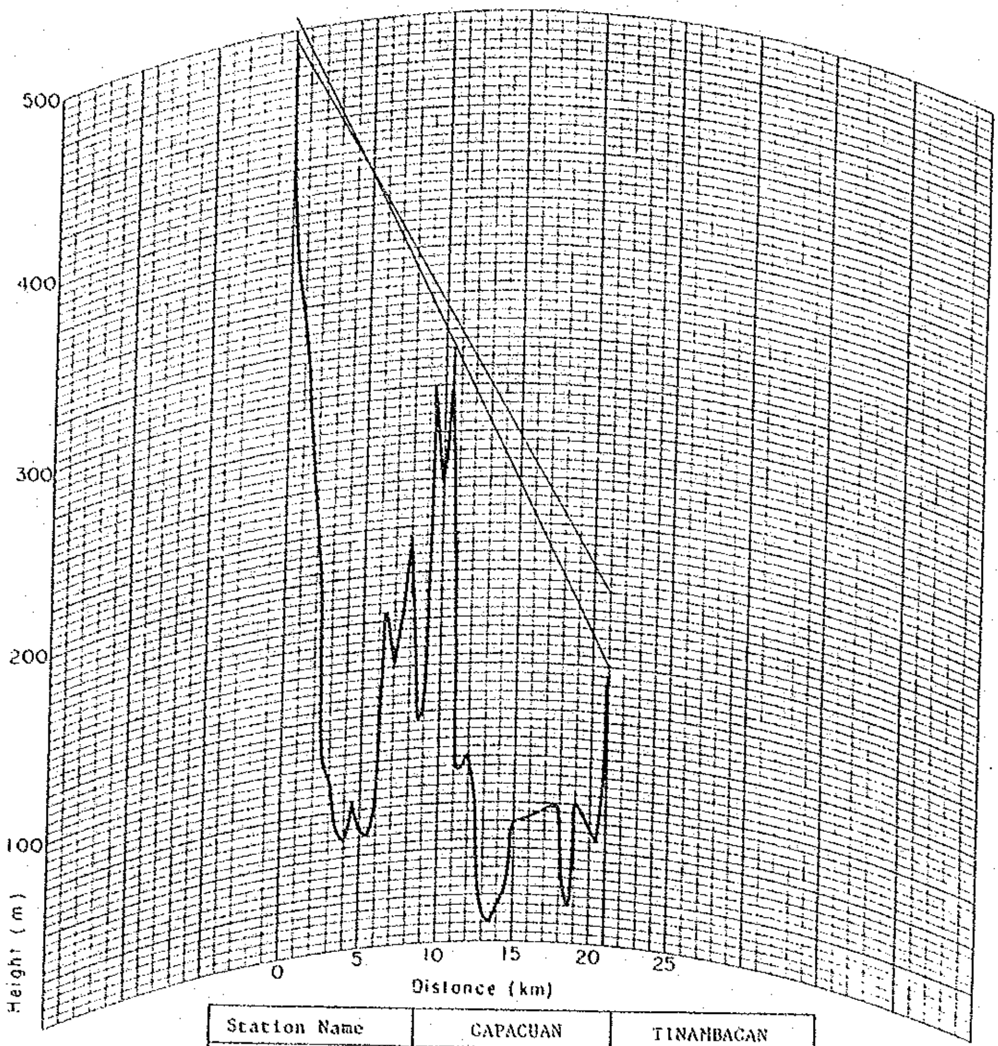
Profile



Station Name	CAPACUAN	BALOD
Altitude (m)	490	55
Antenna Height (m)	-	15
Distance (km)	24.5	

Fig.A.1(18/19)

Profile



Station Name	CAPACUAN	TINAMBACAN
Altitude (m)	490	145
Antenna Height (m)		
Distance (km)	21.0	

Fig.A.1 (19/19)

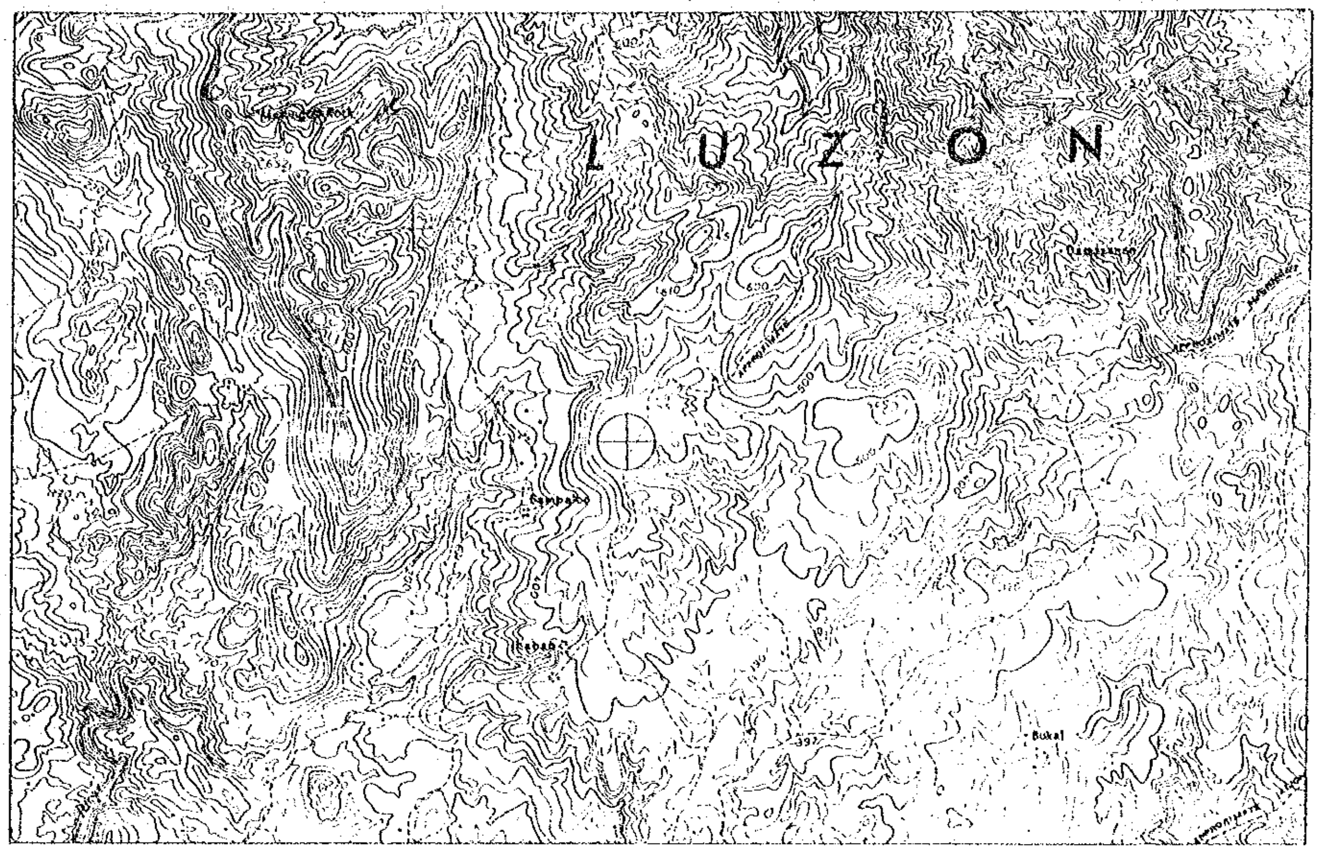


Fig.A.2(1/12) TANAY 1/50,000

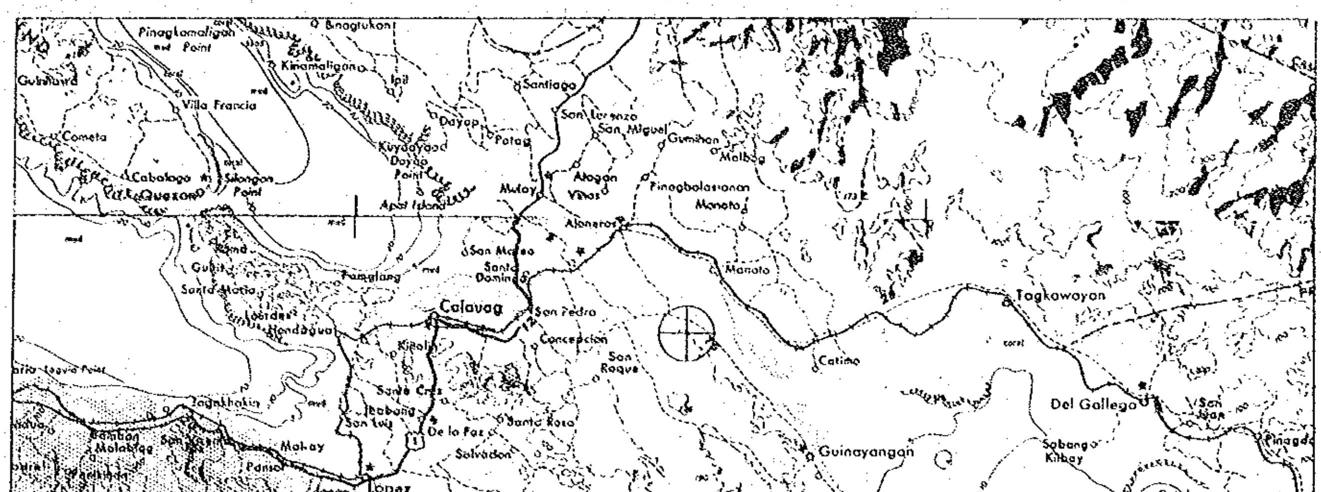


Fig.A.2(2/12) GAPAS 1/250,000

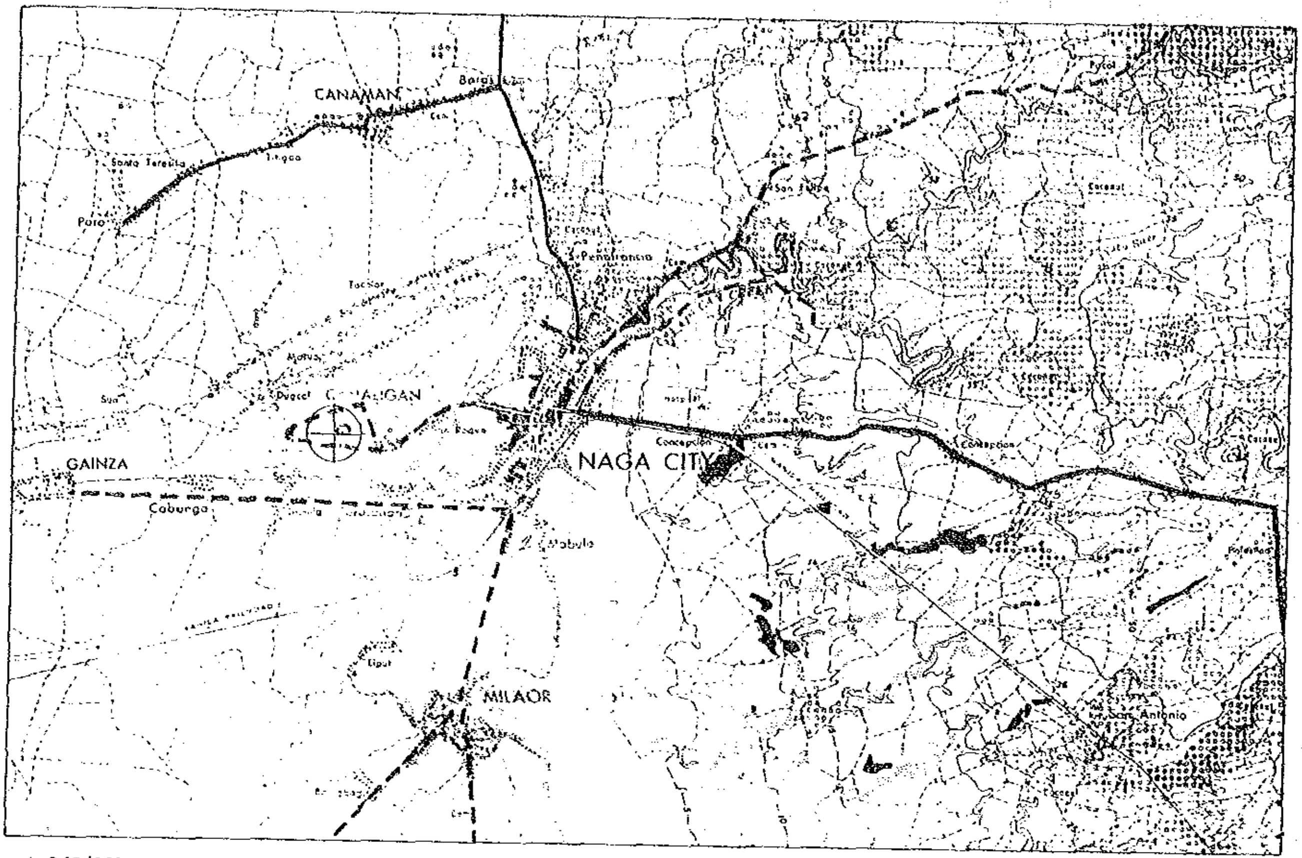


Fig.A.2(3/12)

1/50,000

NAGA

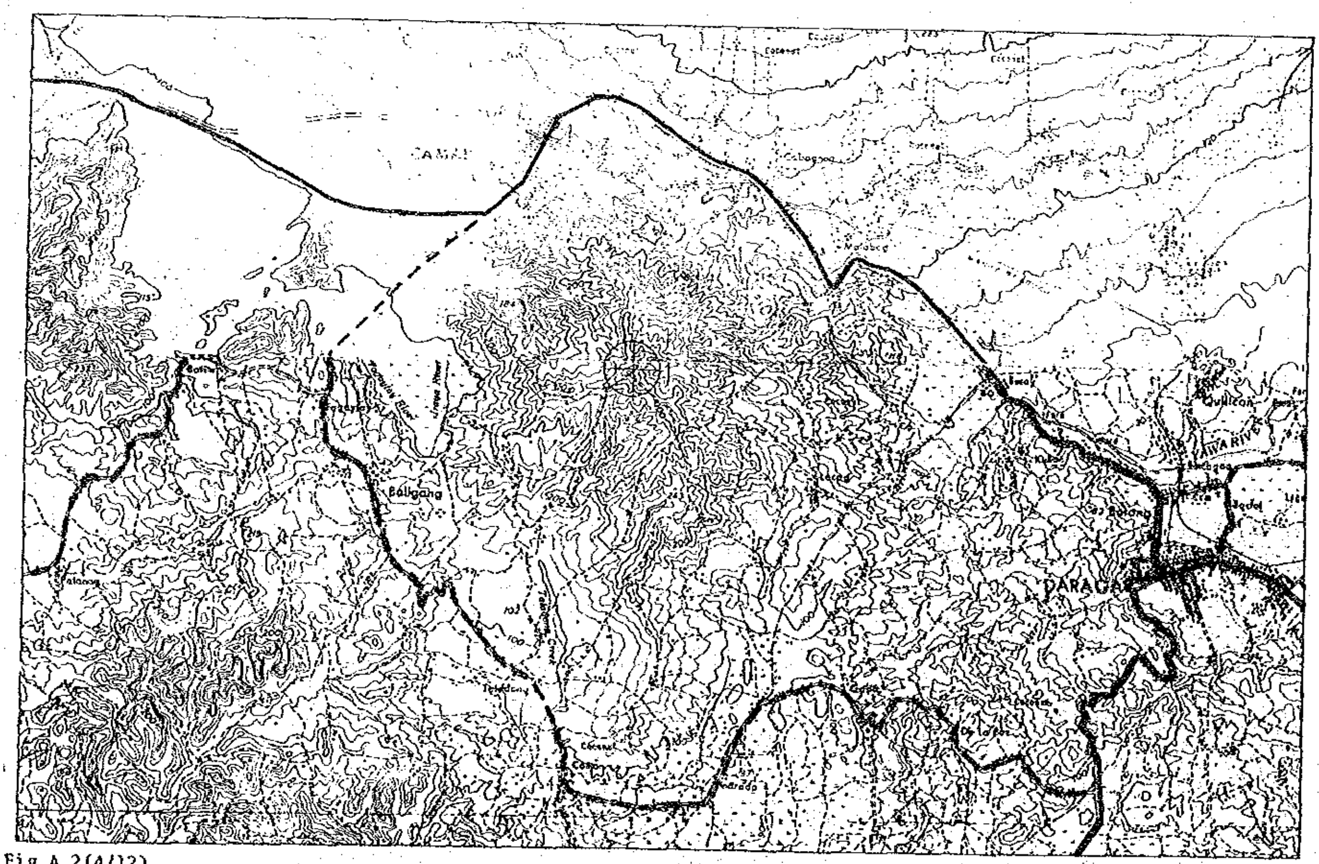


Fig.A.2(4/12)

1/50,000

MALABOG

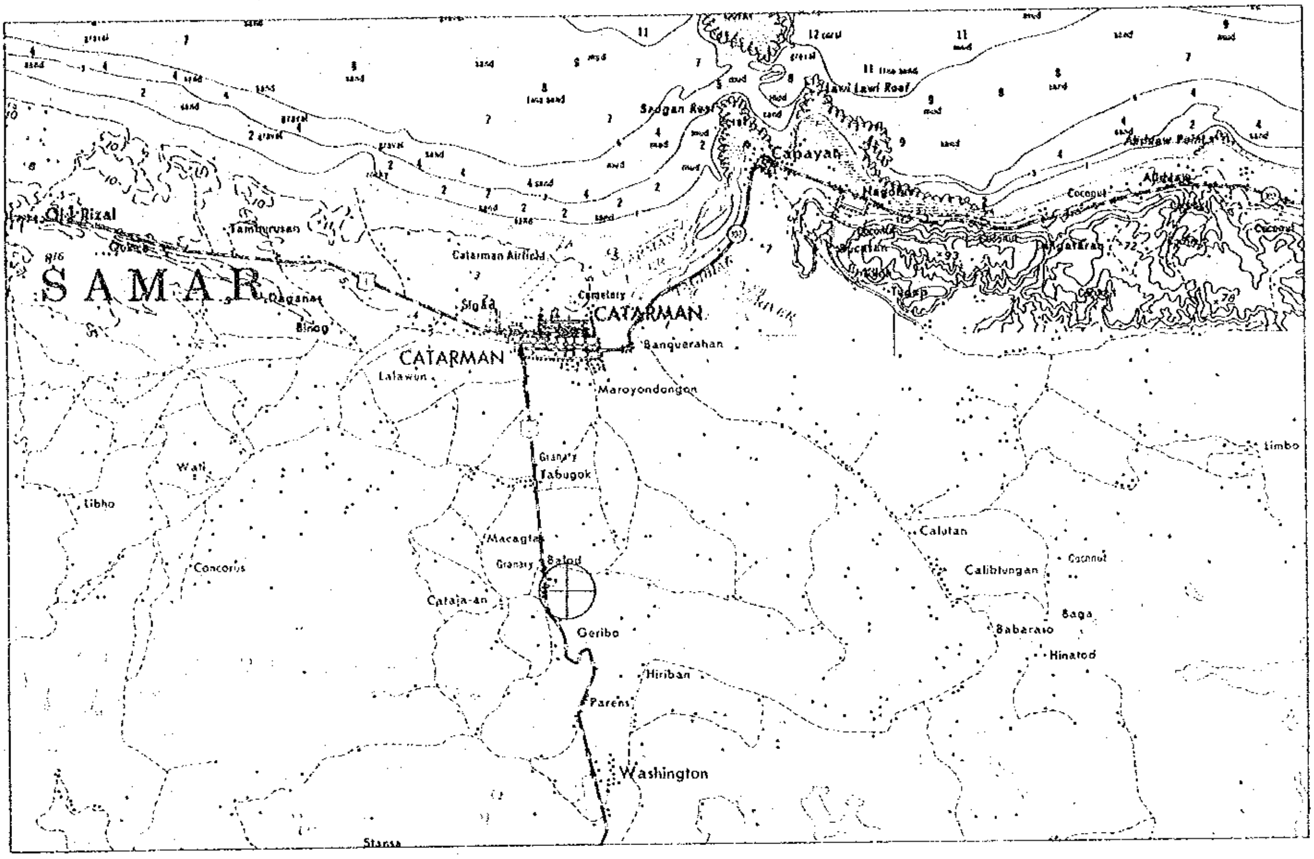


Fig.A.2(5/12) 1/50,000

BALOD

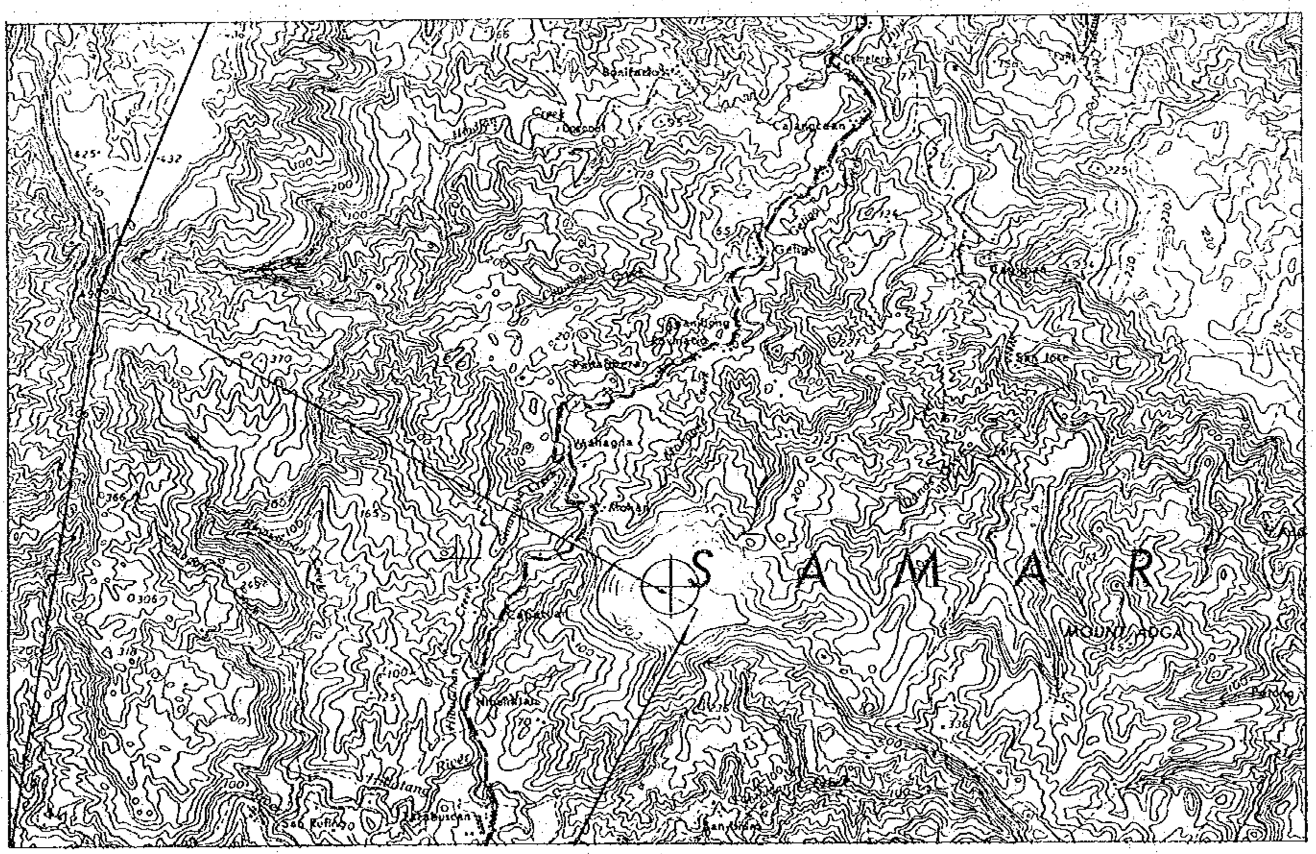


Fig.A.2(6/12) 1/50,000

CAPACUAN

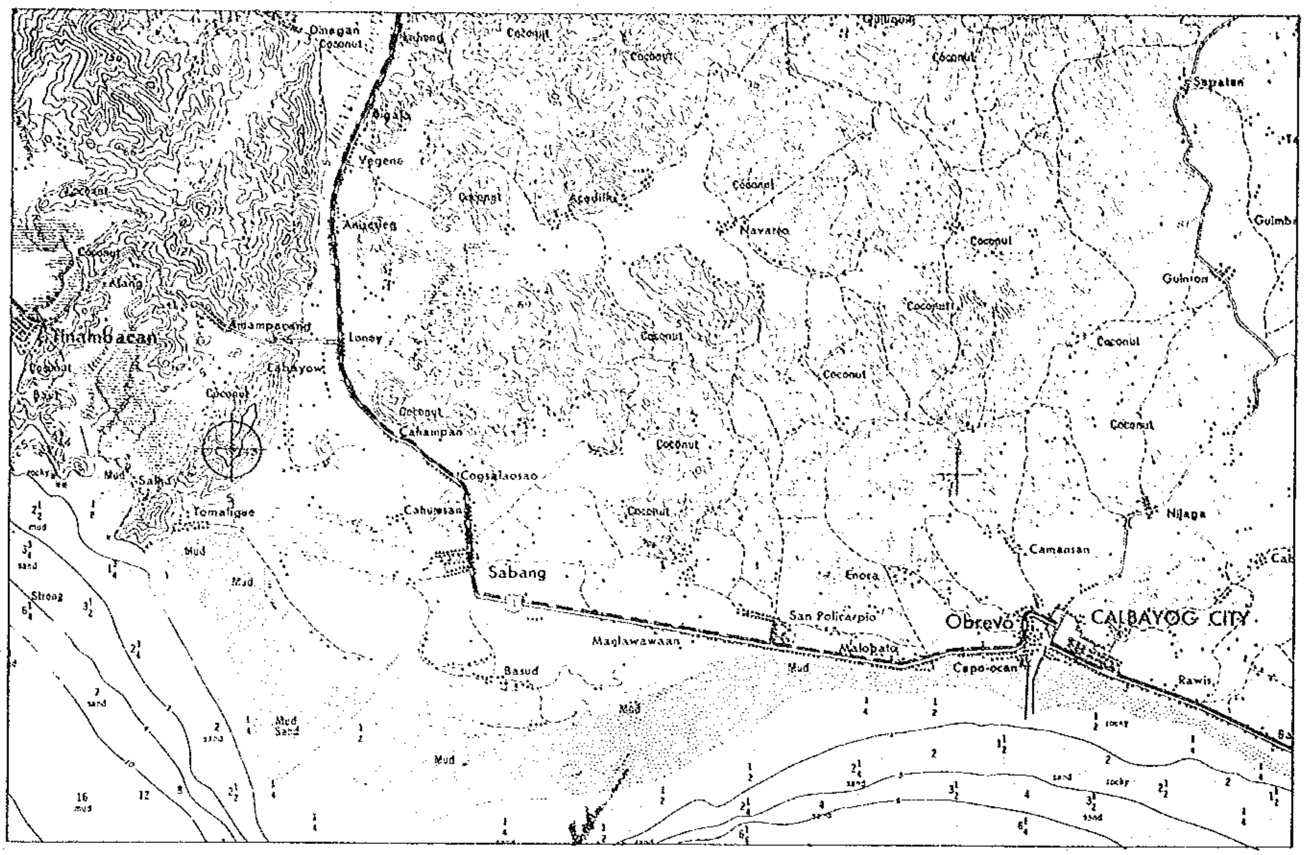


Fig.A.2 (7/12) 1/50,000

TINAMBACAN

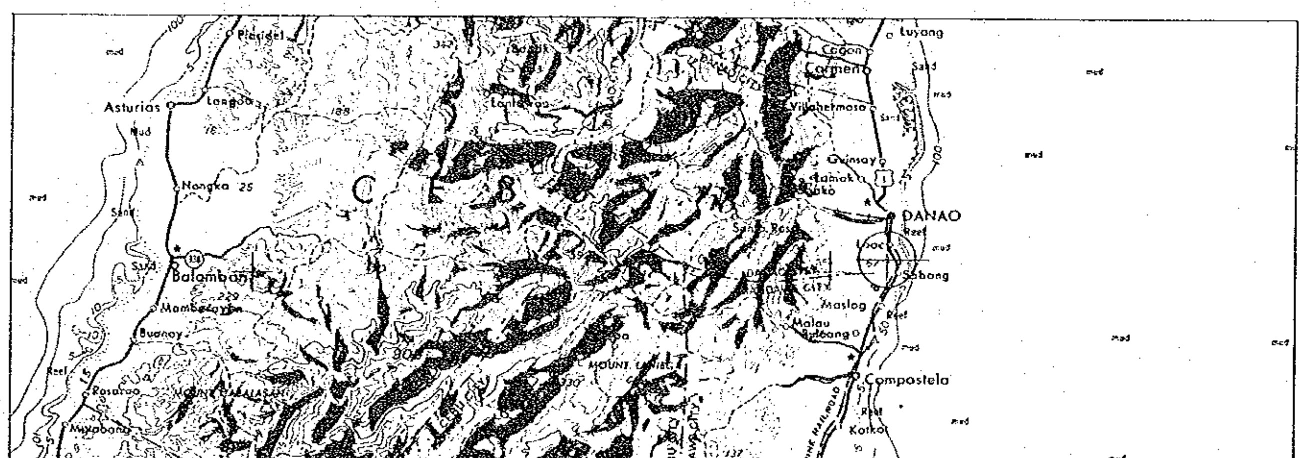


Fig.A.2(8/12) 1/250,000

DANAO

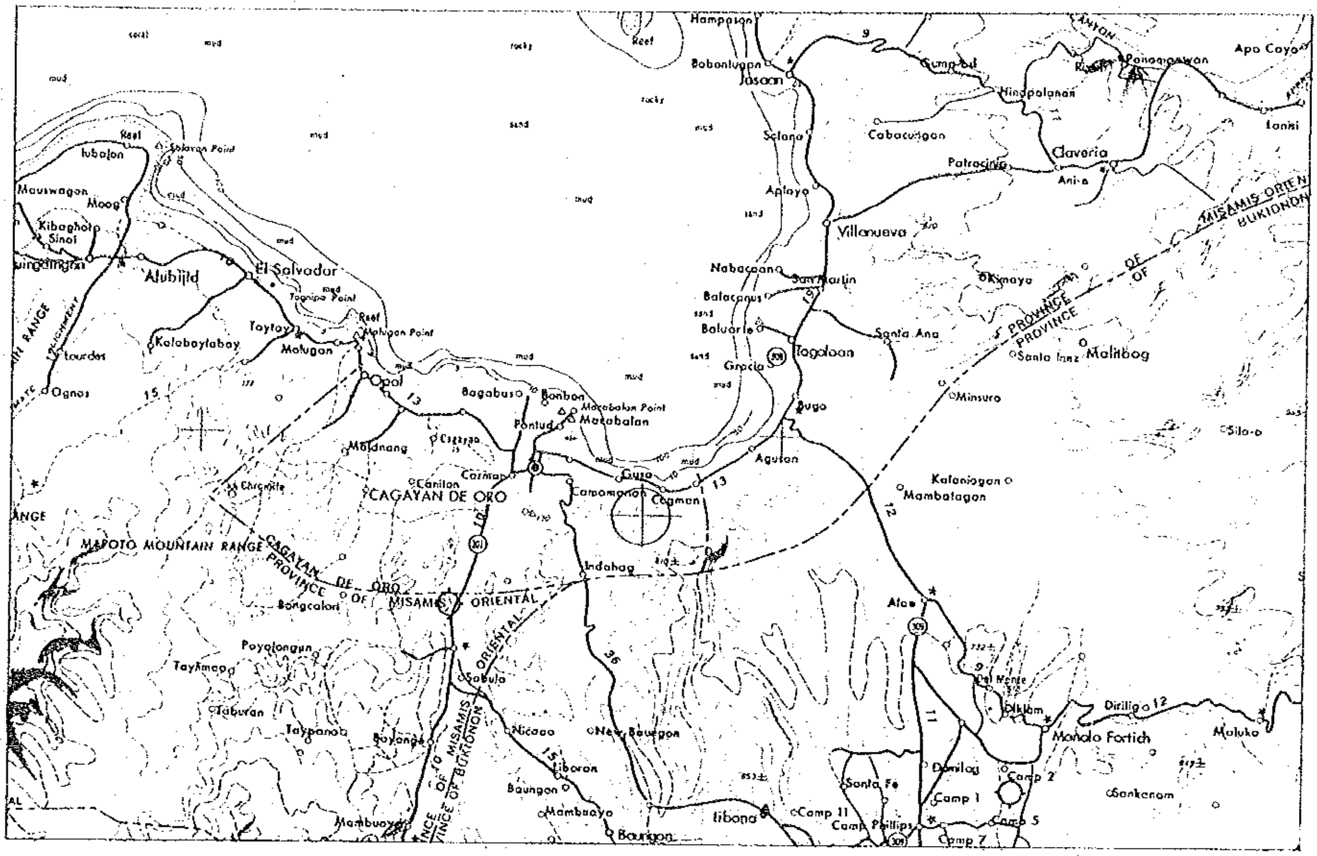


Fig.A.2(9/12)

1/250,000

CAGAYAN DE ORO

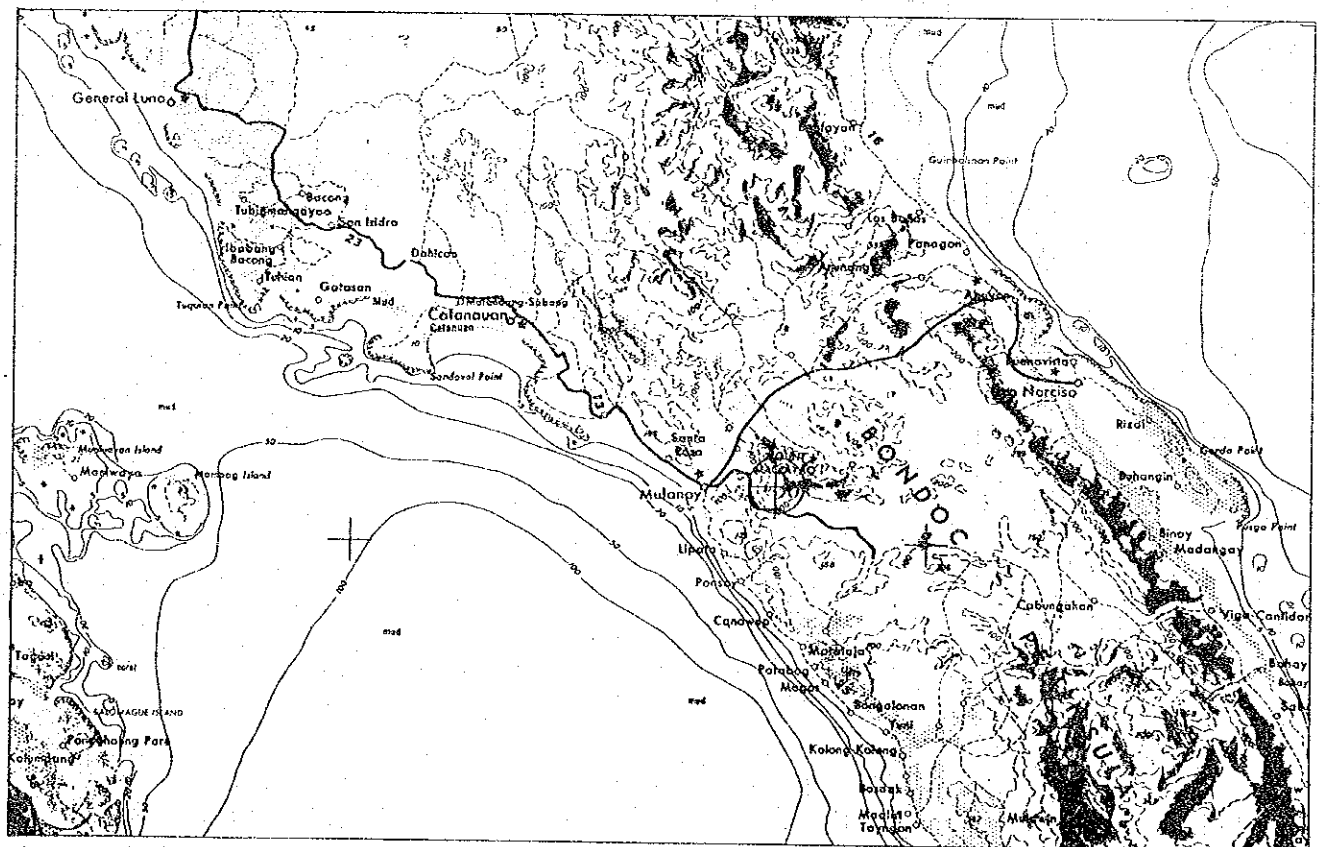


Fig.A.2(10/12)

1/250,000

MACLAYAO

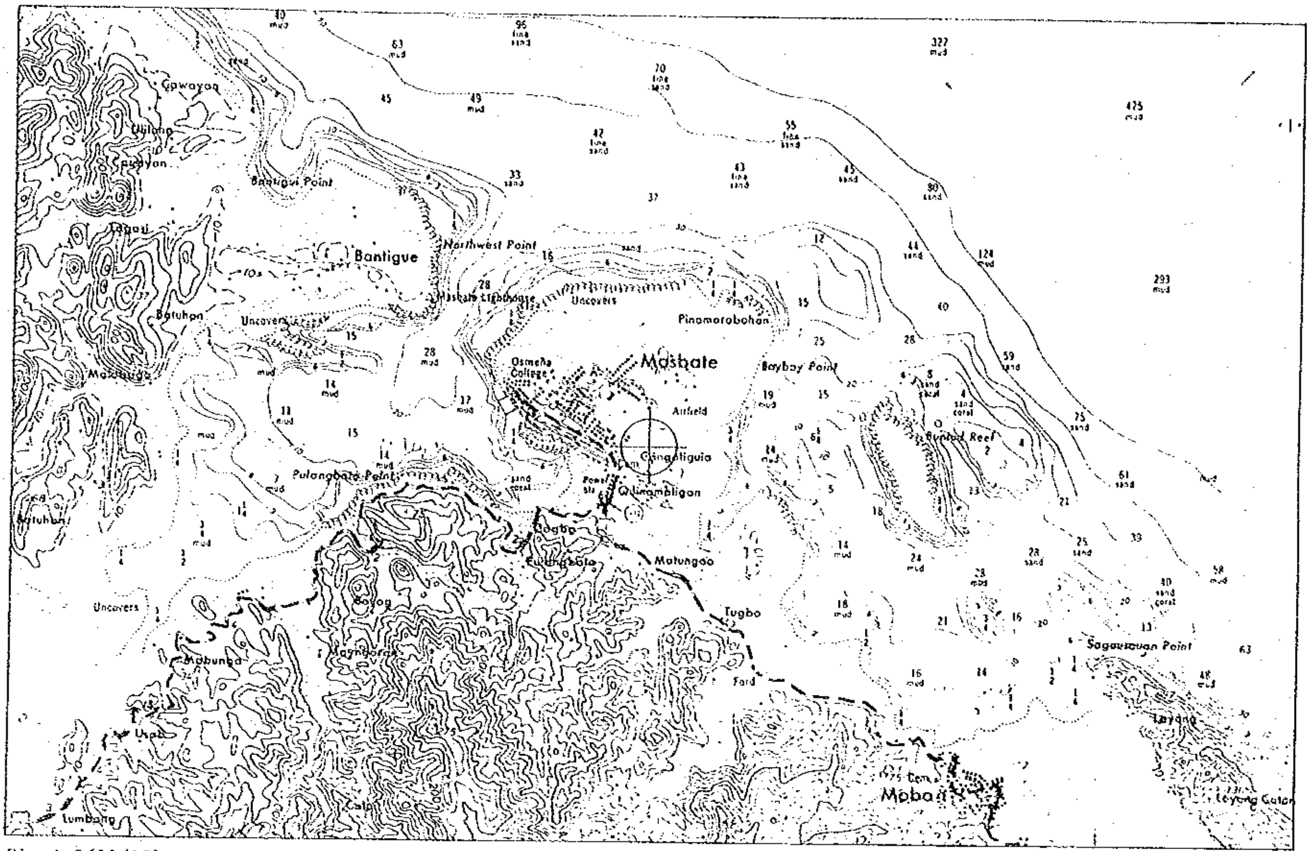


Fig.A.2(11/12)

1/50,000

MASBATE

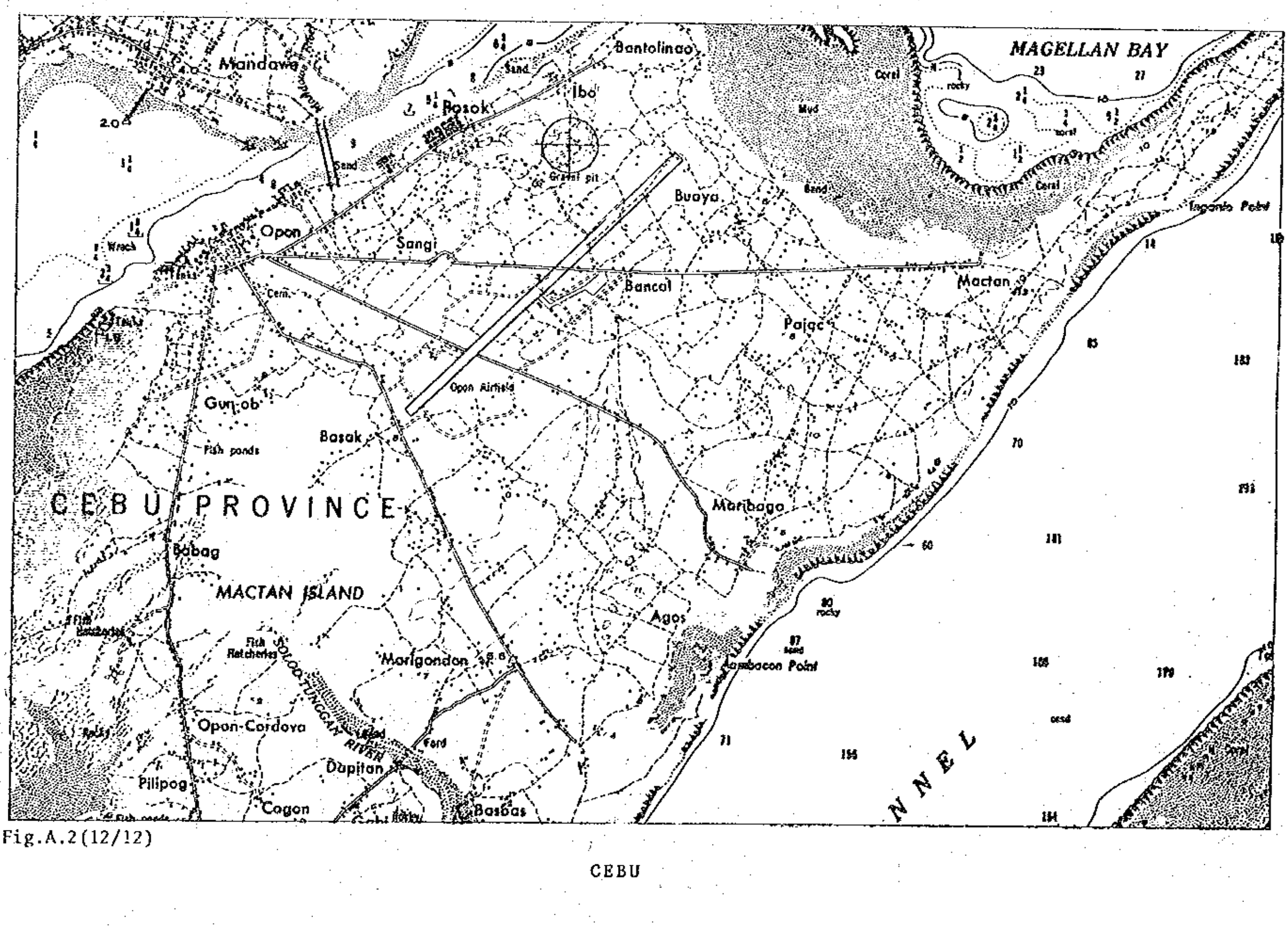
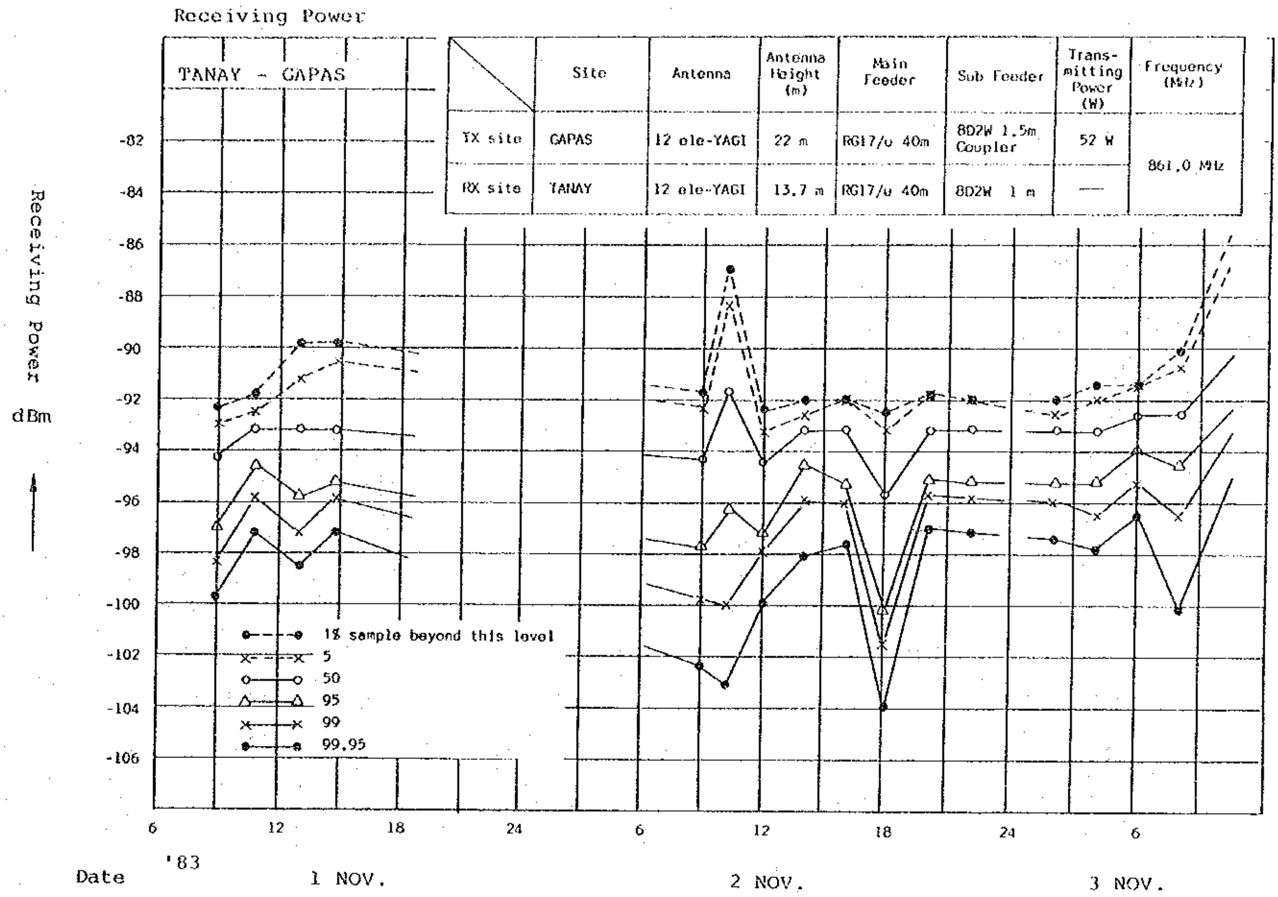


Fig.A.2(12/12)

CEBU



	Site	Antenna	Antenna Height (m)	Main Feeder	Sub Feeder	Trans-mitting Power (W)	Frequency (MHz)
TX site	GAPAS	12 ele-YAGI	22 m	RG17/u 40m	8D2W 1.5m Coupler	52 W	861.0 MHz
RX site	TANAY	12 ele-YAGI	13.7 m	RG17/u 40m	8D2W 1 m	—	

Fig.A.3(1/32)

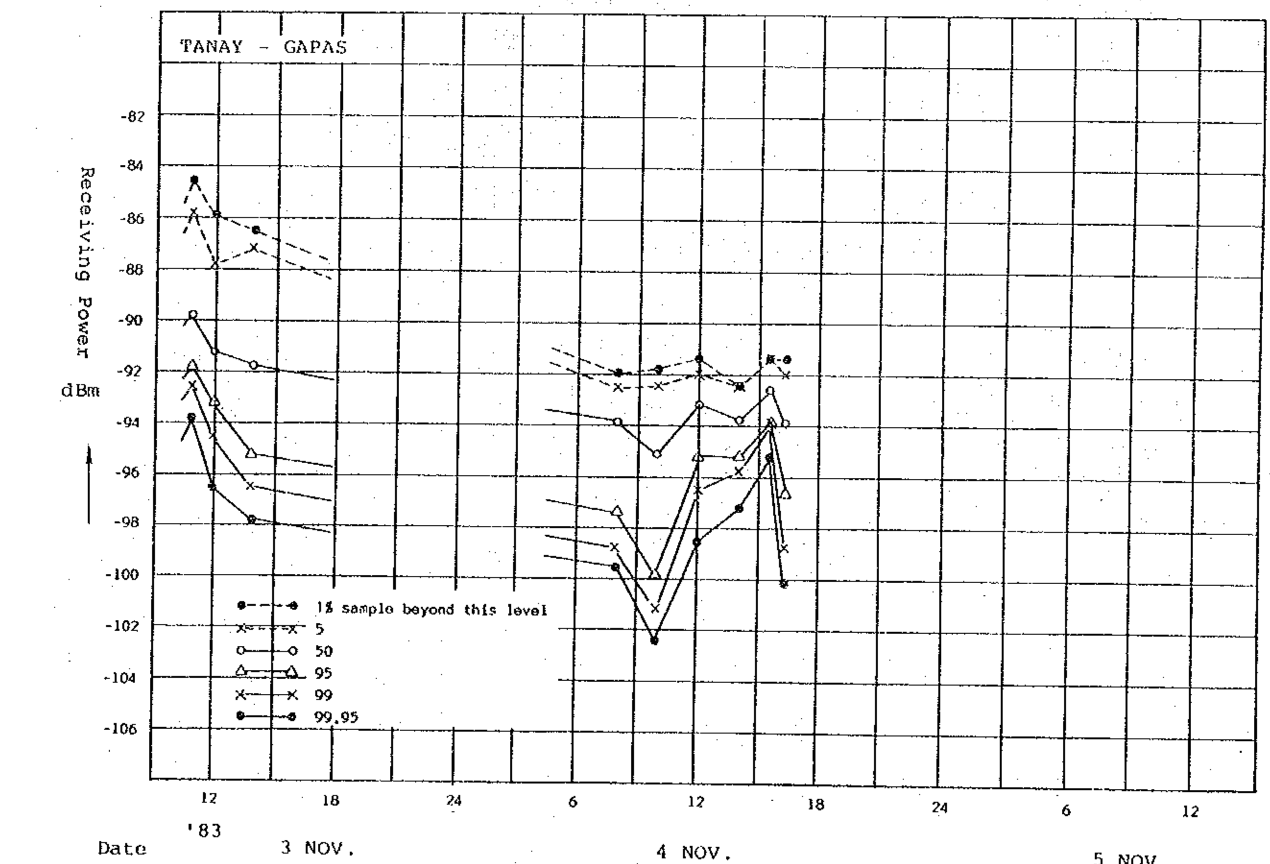


Fig.A.3(2/32)

Fading Rise, Depth

	Site	Antenna	Antenna Height (m)	Main Feeder	Sub Feeder	Trans-mitting Power (W)	Frequency (MHz)
TX site	GAPAS	12 ele-YAGI	22 m	RG17/u 40m	8D2W 1.5m Coupler	52 W	861.0 MHz
RX site	TANAY	12 ele-YAGI	13.7 m	RG17/u 40m	8D2W 1 m	—	

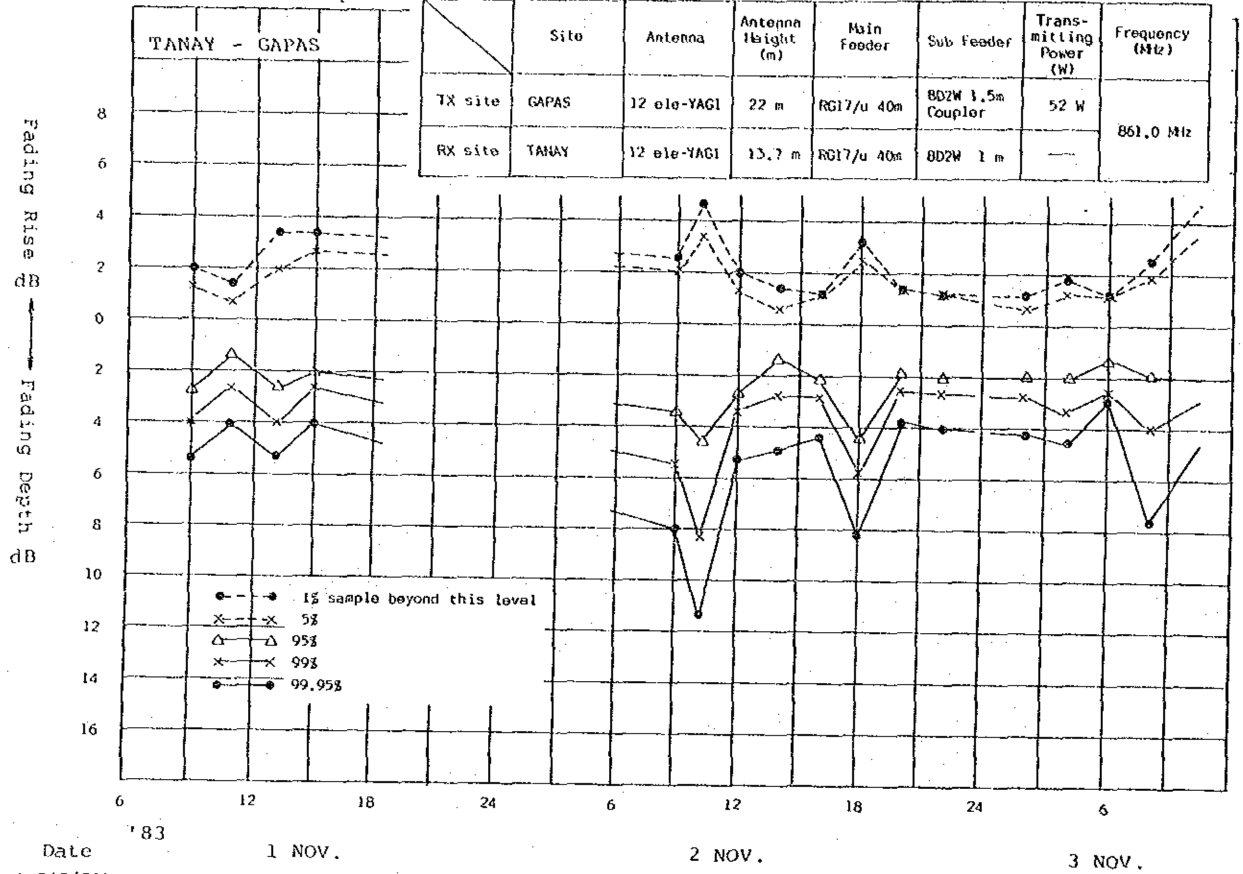


Fig.A.3(3/32)

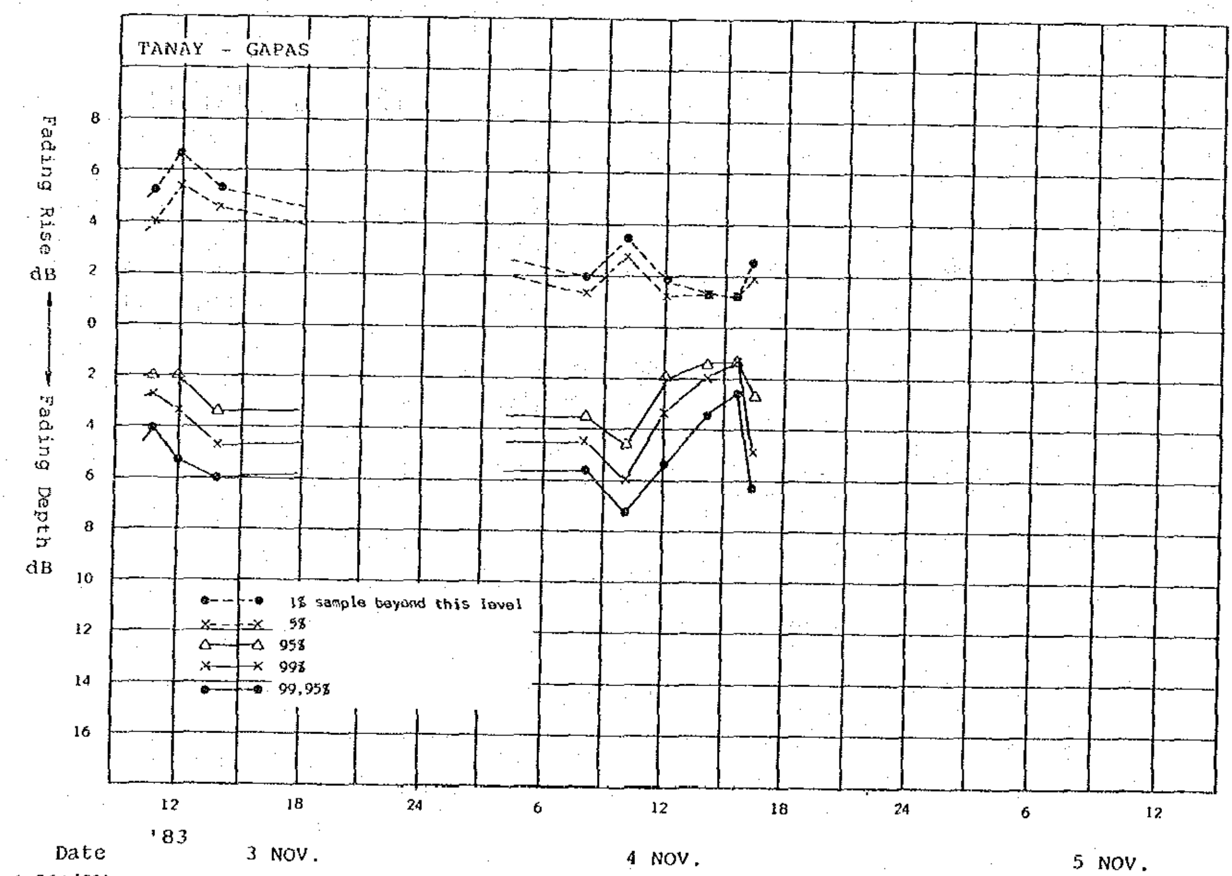
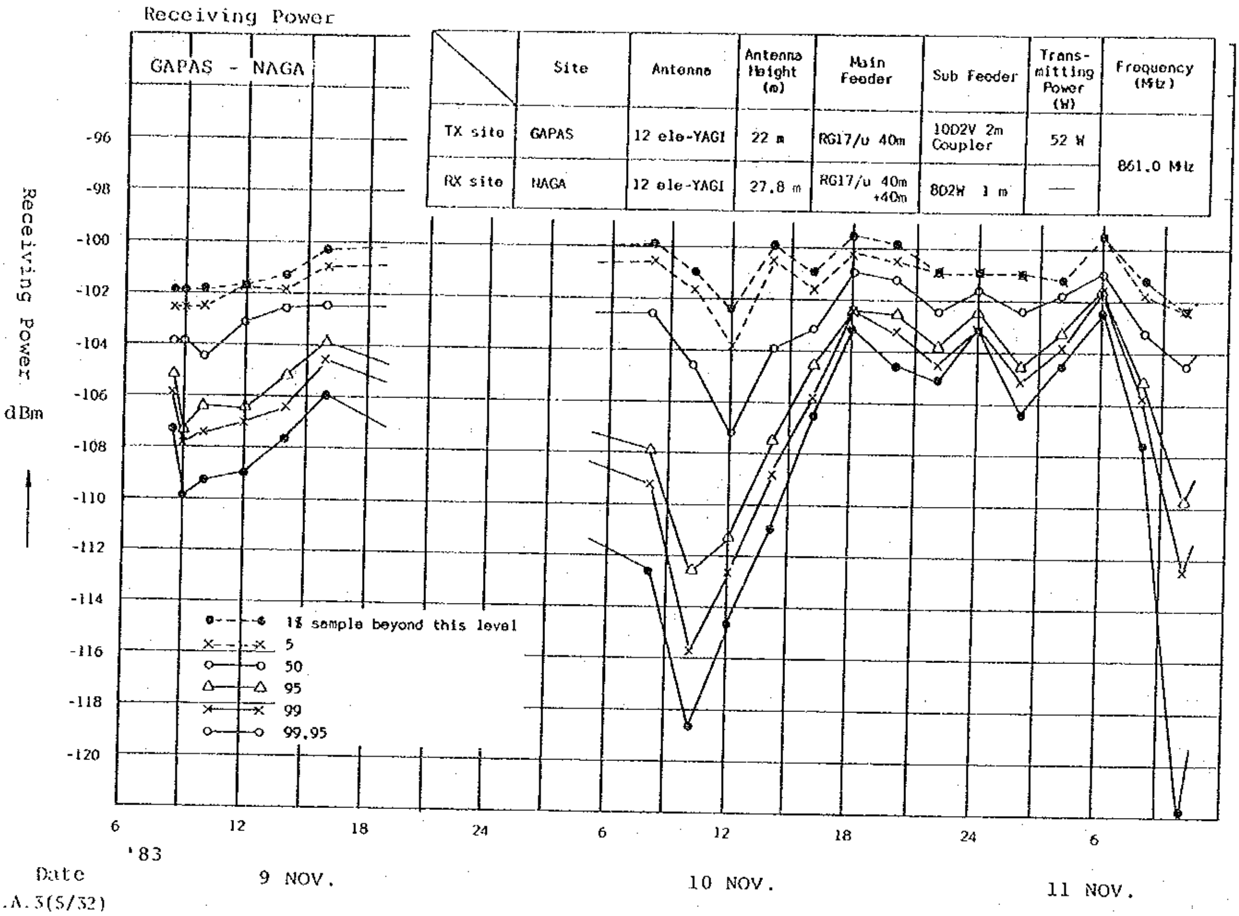


Fig. A.3(4/32)



	Site	Antenna	Antenna Height (m)	Main Feeder	Sub Feeder	Trans-mitting Power (W)	Frequency (MHz)
TX site	GAPAS	12 ele-YAGI	22 m	RG17/u 40m	10D2V 2m Coupler	52 W	861.0 MHz
RX site	NAGA	12 ele-YAGI	27.8 m	RG17/u 40m +40m	8D2W 1 m	—	

Fig.A.3(5/32)

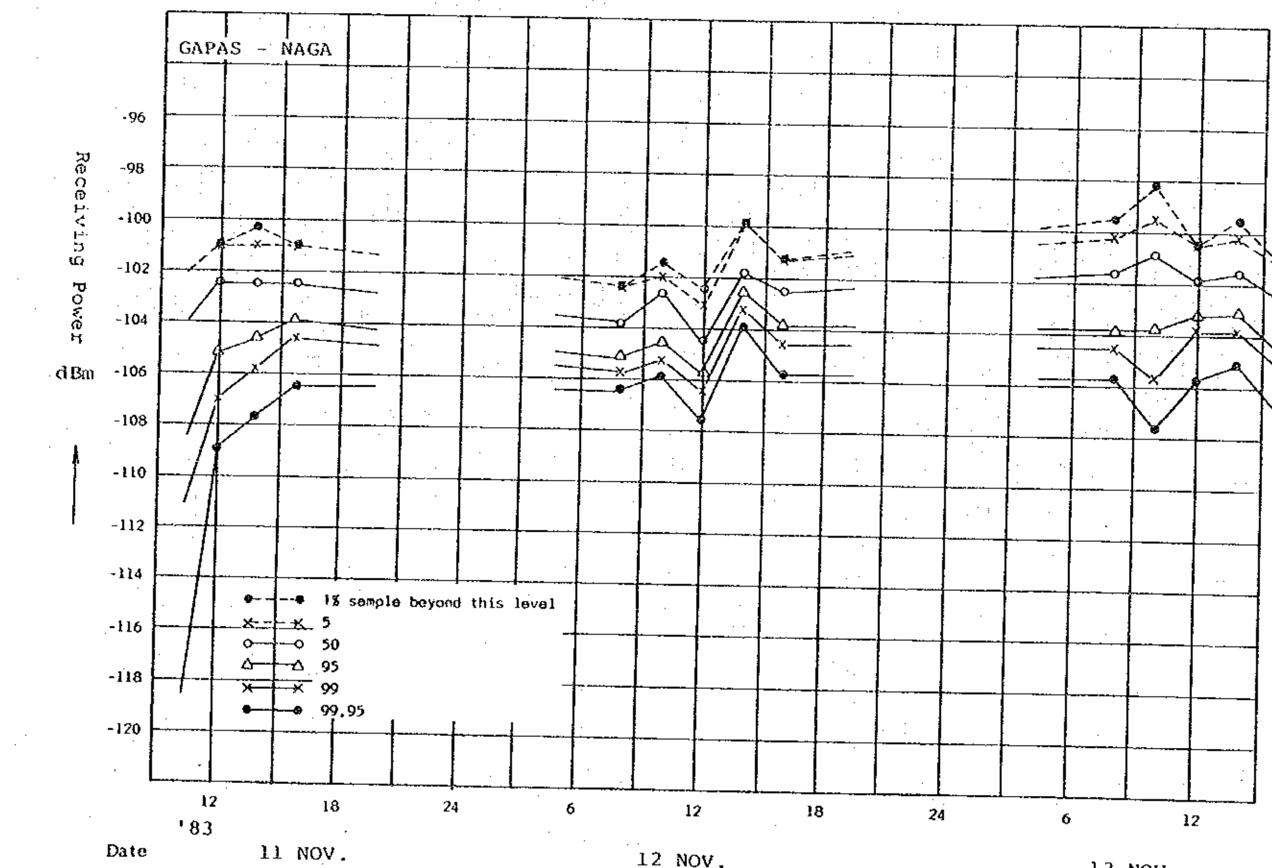


Fig.A.3 (6/32)

	Site	Antenna	Antenna Height (m)	Main Feeder	Sub Feeder	Trans-mitting Power (W)	Frequency (MHz)
TX site	GAPAS	12 ele-YAGI	22 m	RG17/u 40m	10D2V 2m Coupler	52 W	861.0 MHz
RX site	NAGA	12 ele-YAGI	27.8 m	RG17/u 40m +40m	8D2W 1 m	—	

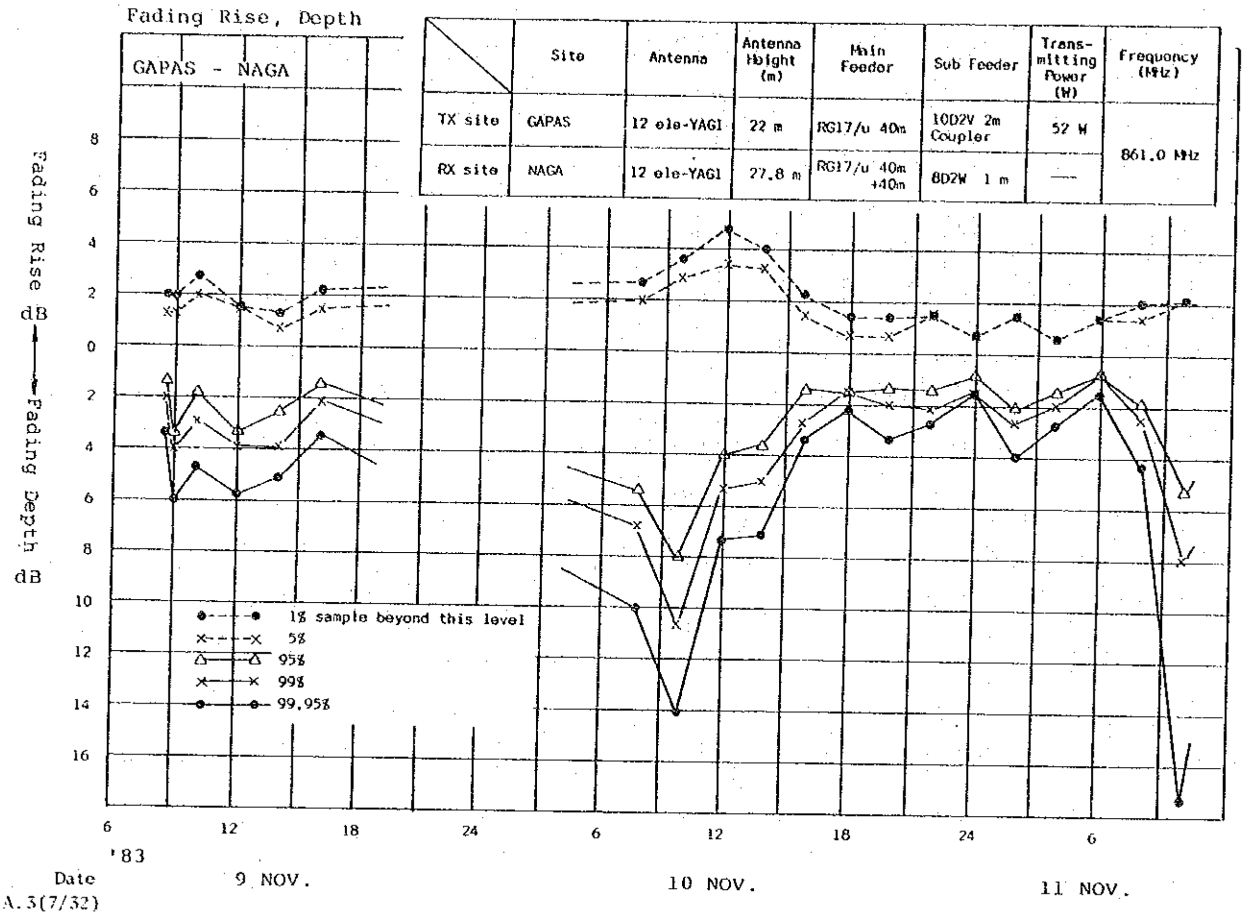


Fig.A.3(7/32)

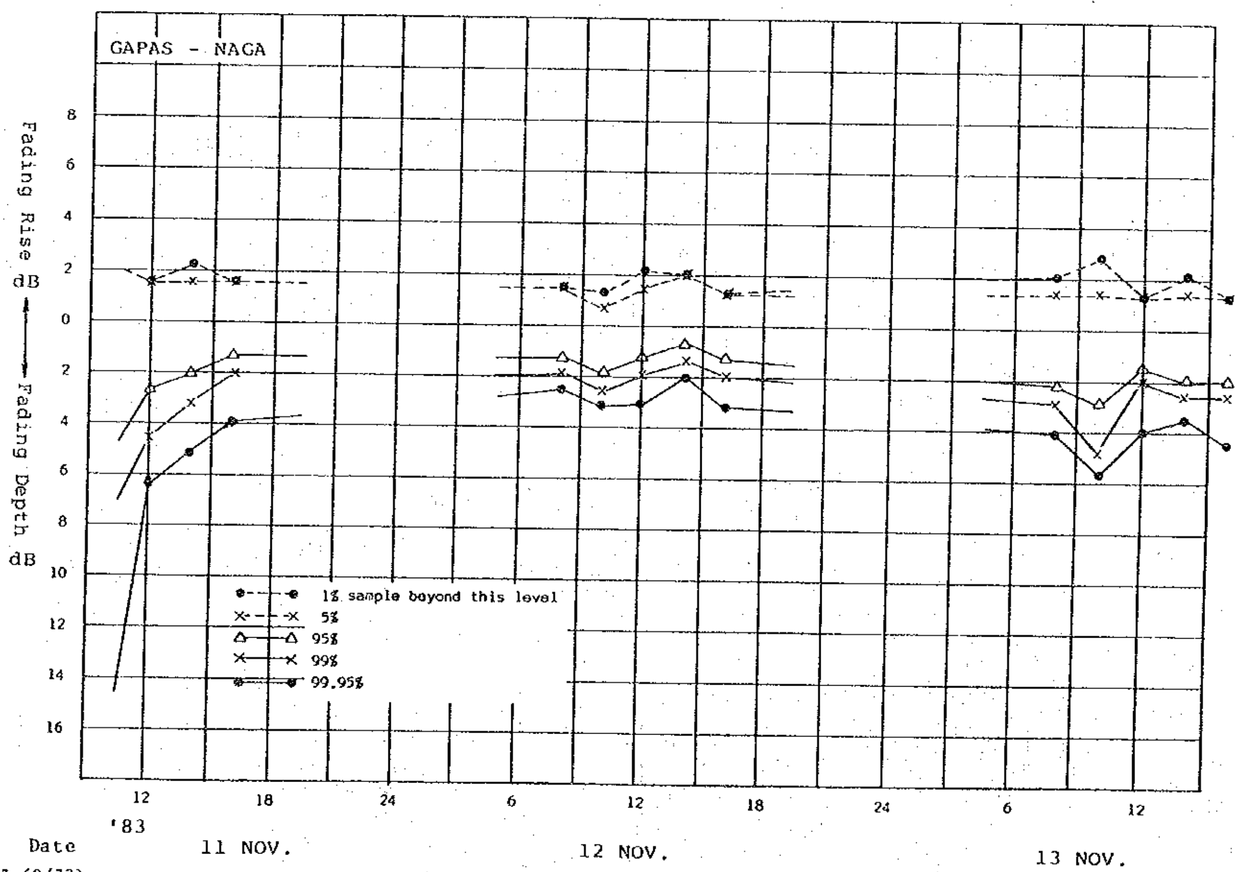
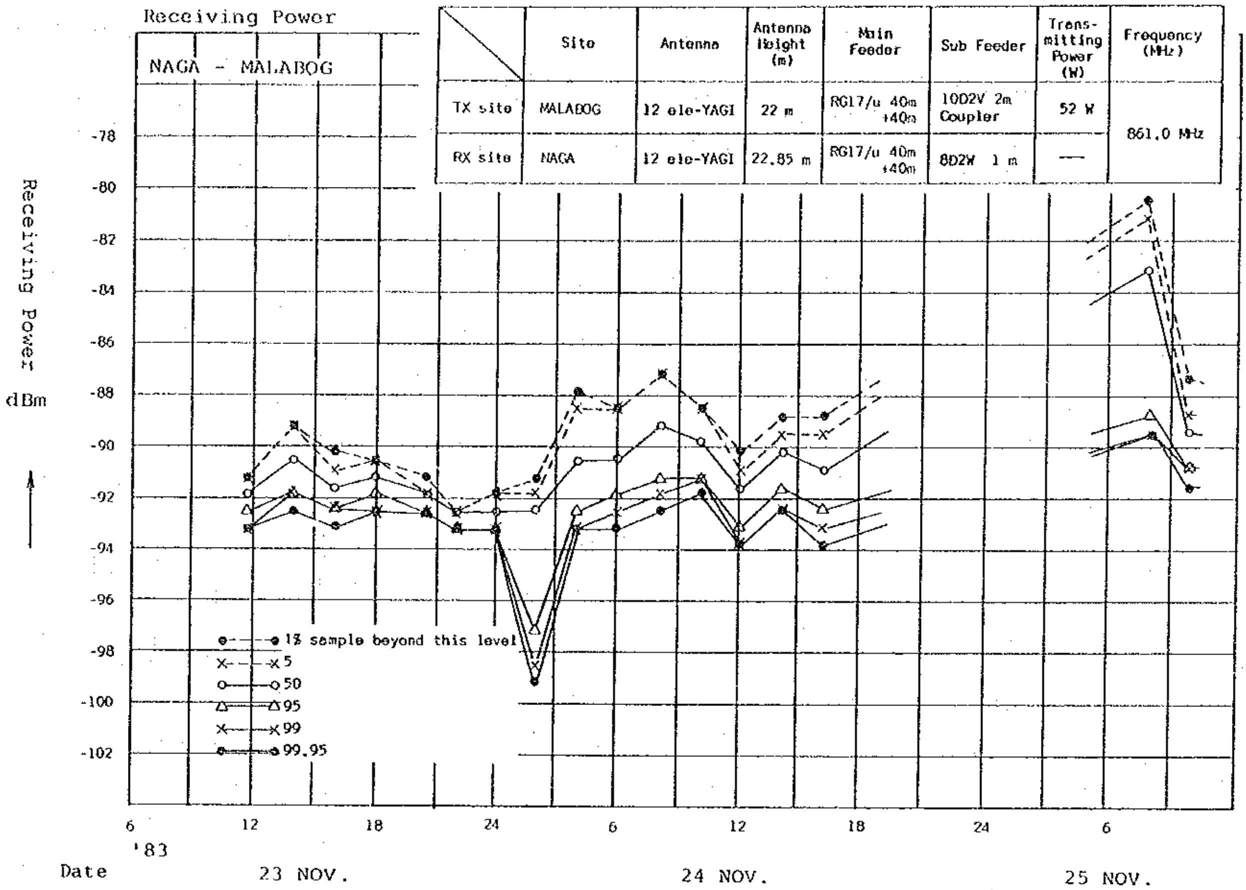


Fig.A.3 (8/32)



	Site	Antenna	Antenna Height (m)	Main Feeder	Sub Feeder	Trans-mitting Power (W)	Frequency (MHz)
TX site	MALABOG	12 ele-YAGI	22 m	RG17/u 40m +40m	10D2V 2m Coupler	52 W	861.0 MHz
RX site	NAGA	12 ele-YAGI	22.85 m	RG17/u 40m +40m	8D2W 1 m	—	

Fig.A.3 (9/32)

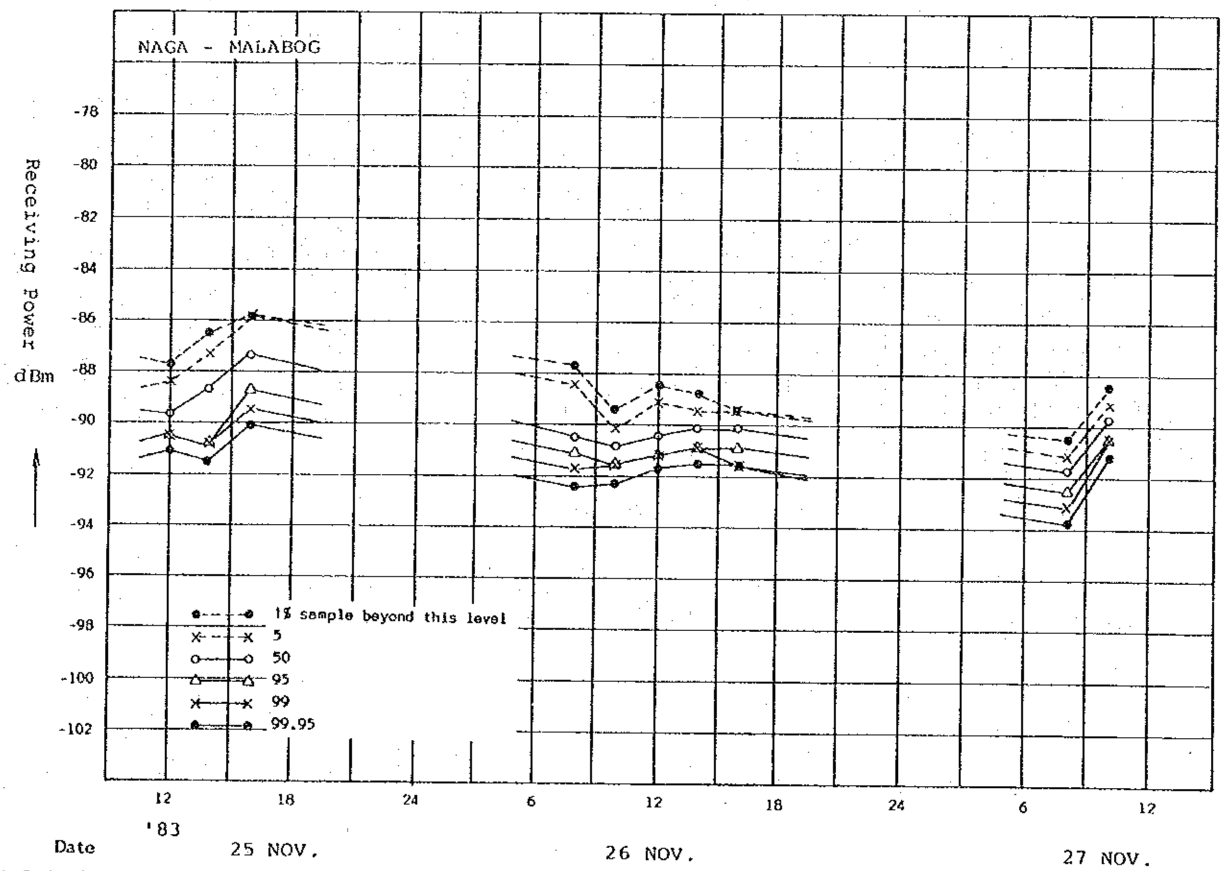
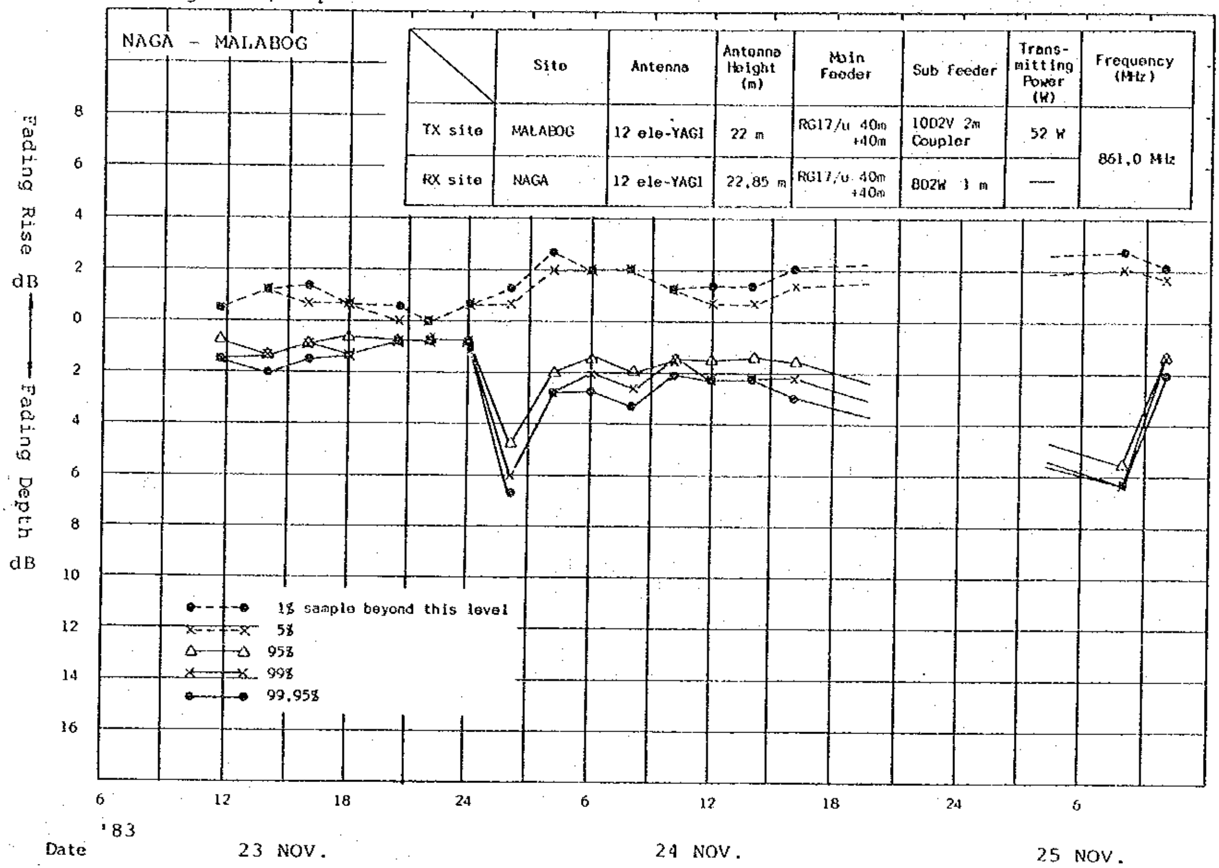


Fig.A.3 (10/32)

Fading Rise, Depth



	Site	Antenna	Antenna Height (m)	Main Feeder	Sub Feeder	Trans-mitting Power (W)	Frequency (MHz)
TX site	MALABOG	12 ele-YAGI	22 m	RG17/u 40m +40m	10D2V 2m Coupler	52 W	861.0 MHz
RX site	NAGA	12 ele-YAGI	22.85 m	RG17/u 40m +40m	8D2W 3 m	—	

Fig.A.3 (11/32)

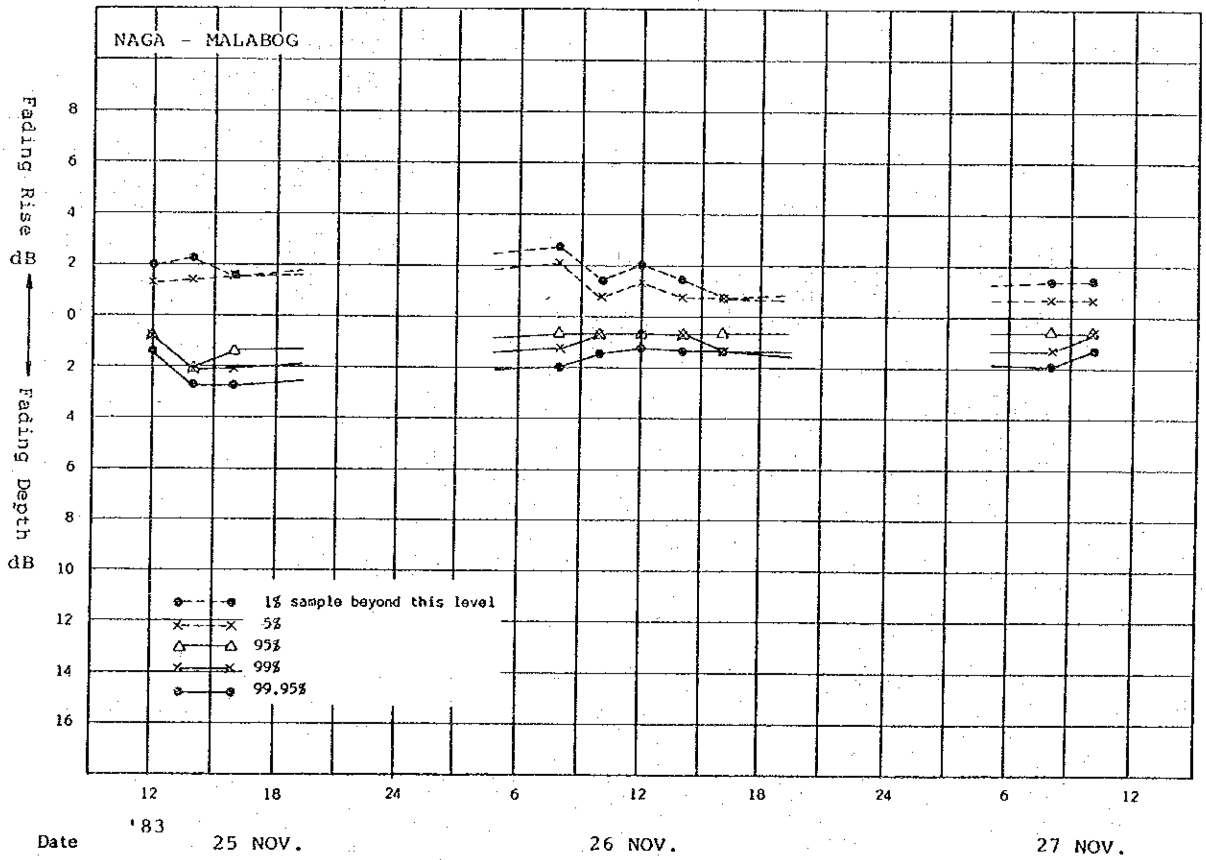


Fig.A.3 (12/32)

Receiving Power

	Site	Antenna	Antenna Height (m)	Main Feeder	Sub Feeder	Trans-mitting Power (W)	Frequency (MHz)
TX site	MALABOG	6.0mφG.P	15 m	RG17/u 40+40 m	10D2V 2m	52 W	861.0 MHz
RX site	BALOD	12 ele-YAGI	21.3 m	RG17/u 40m	8D2W 1 m	---	

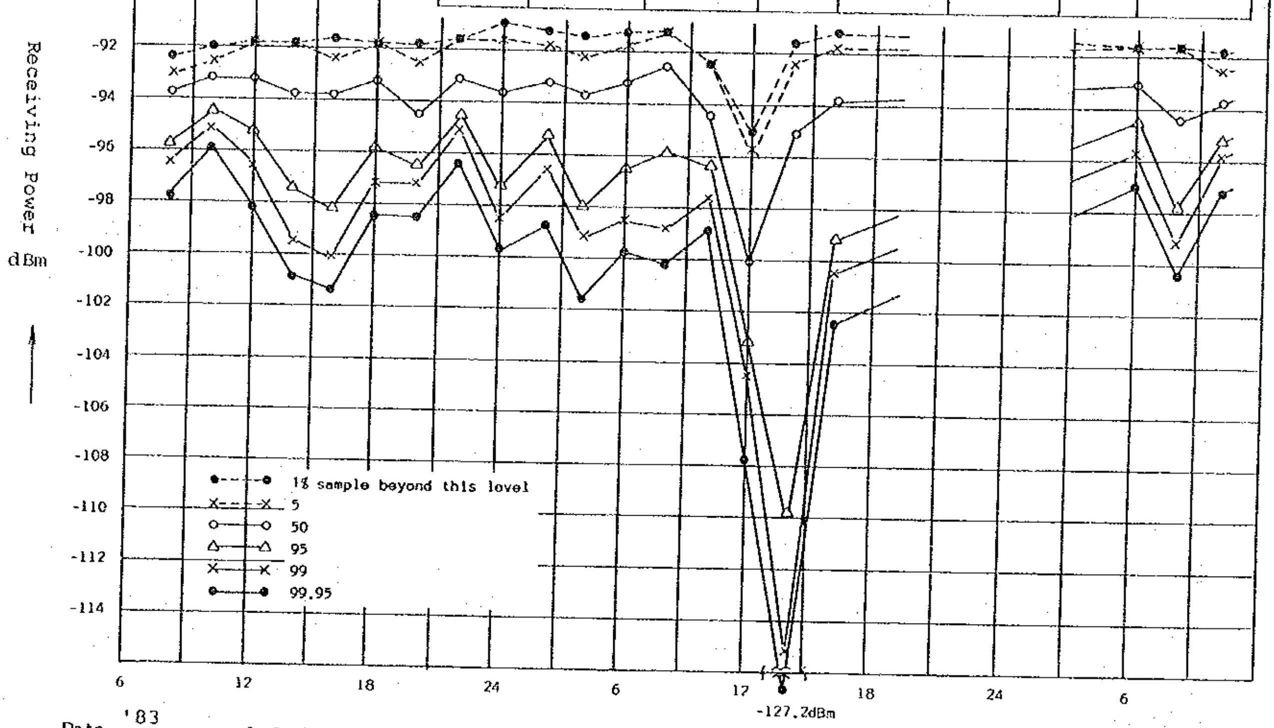


Fig.A.3 (13/32)

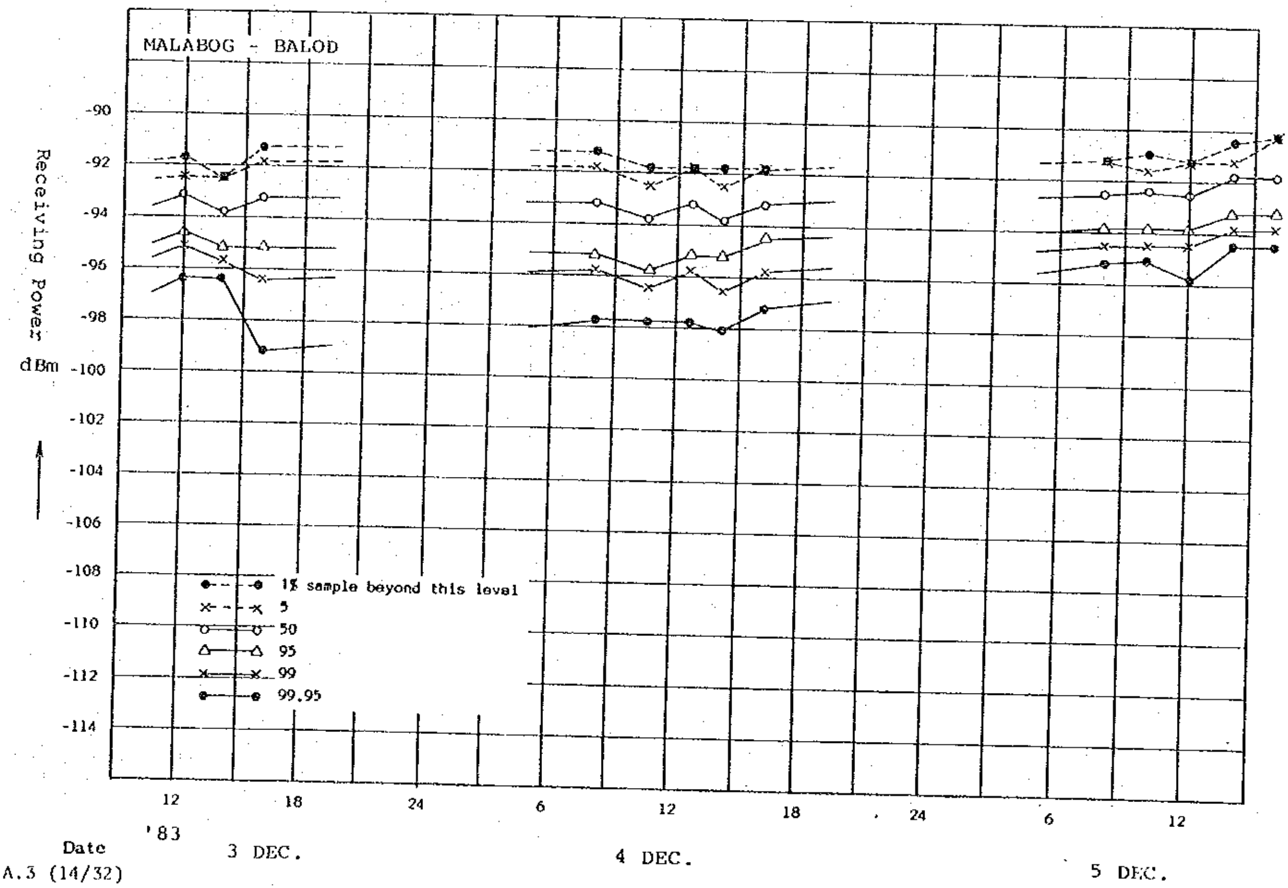


Fig.A.3 (14/32)

	Site	Antenna	Antenna Height (m)	Main Feeder	Sub Feeder	Trans-mitting Power (W)	Frequency (MHz)
TX site	MALABOG	6.0mφG.P	15 m	RG17/u 40+40m	10D2V 2m	52 W	861.0 MHz
RX site	BALOD	12 ele-YAGI	21.3 m	RG17/u 40m	8D2W 1 m	—	

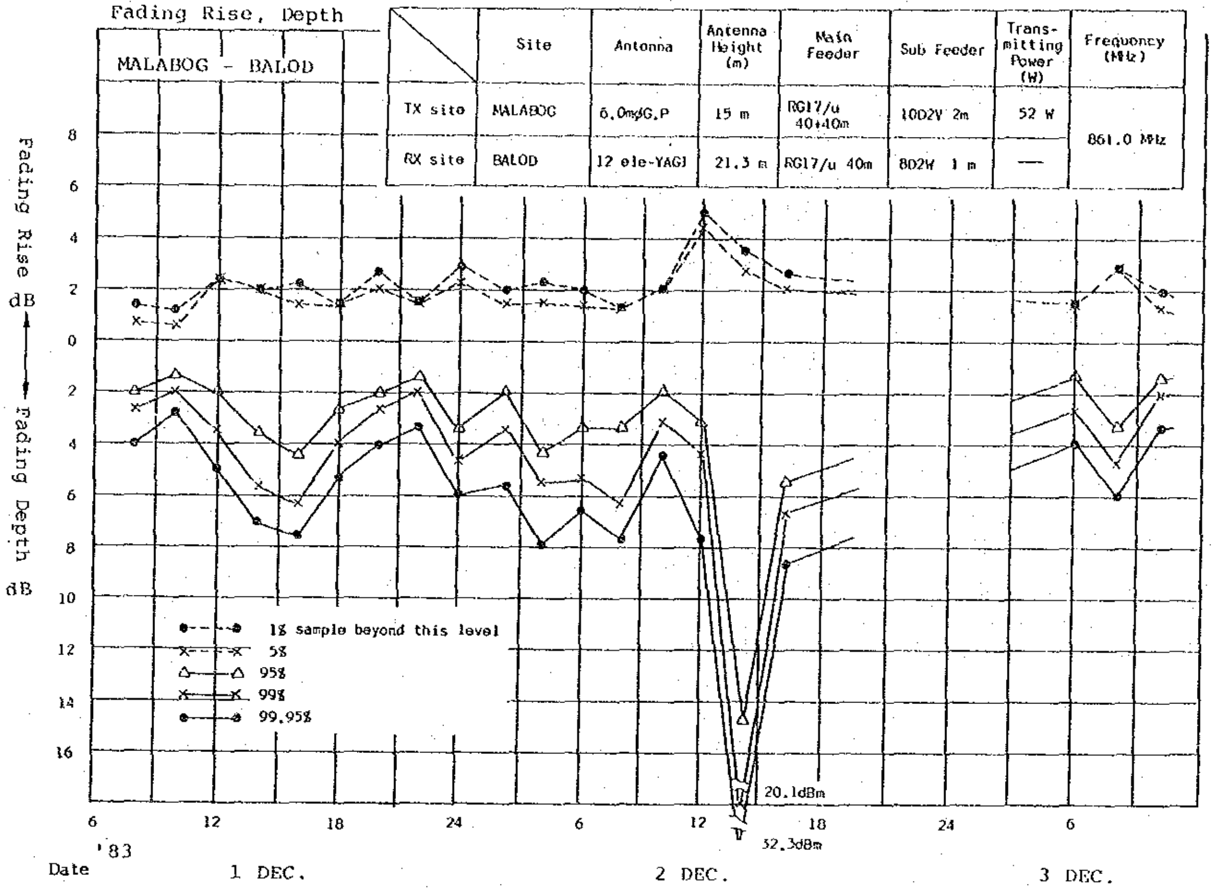


Fig.A.3 (15/32)

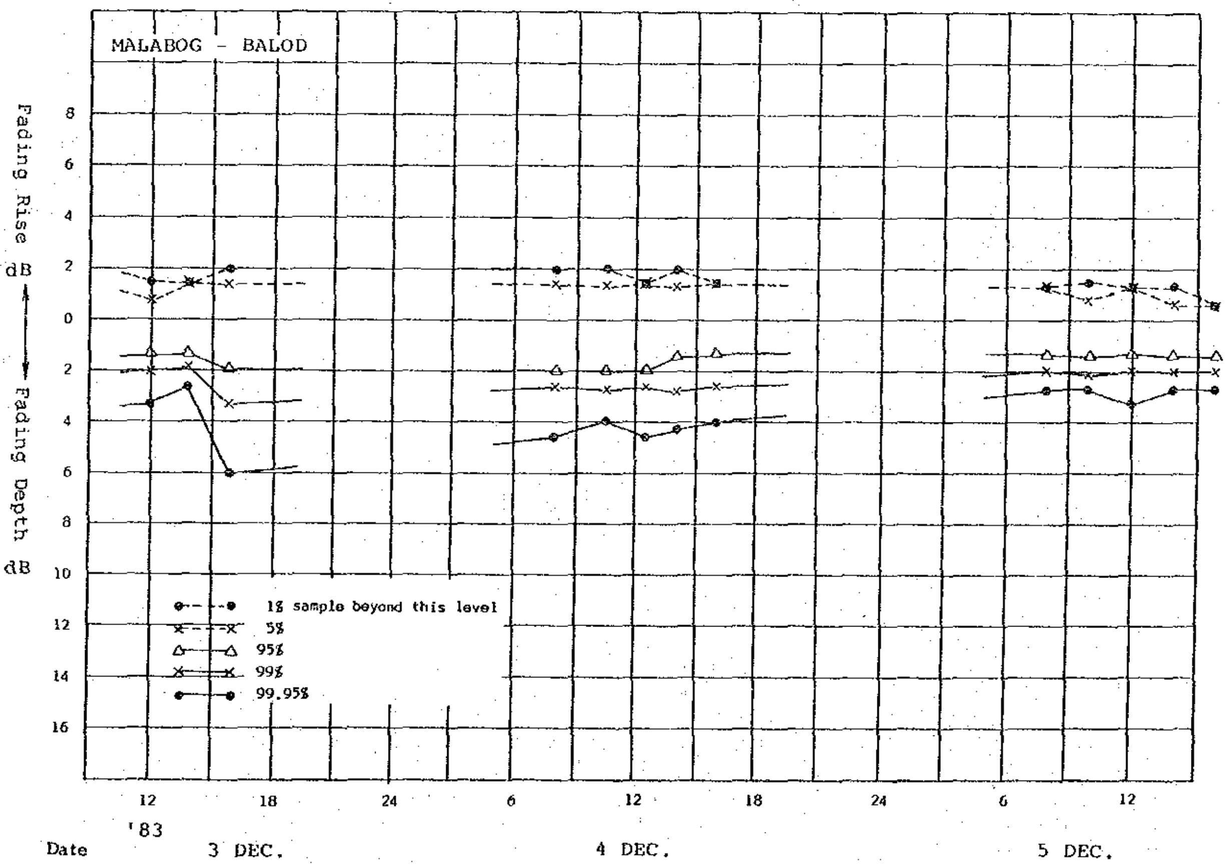
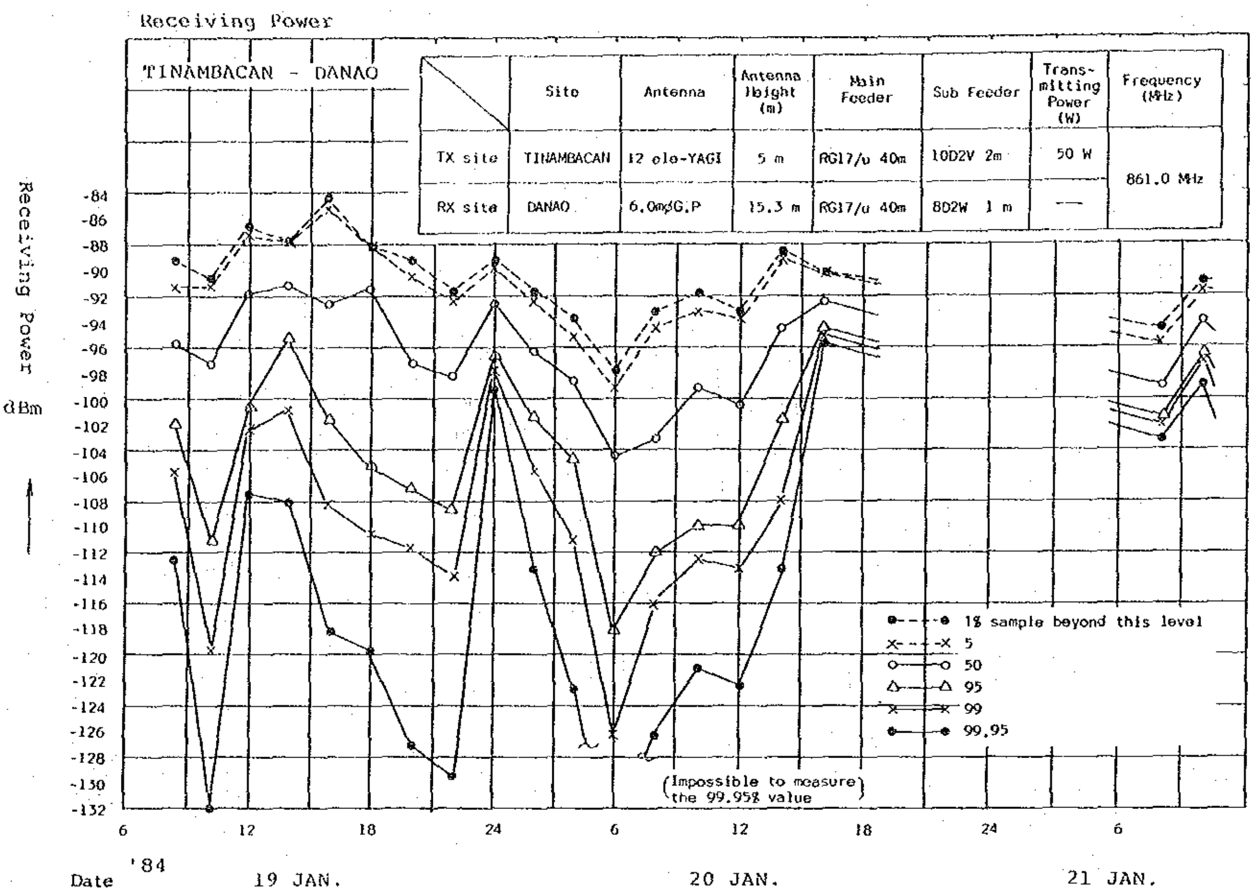


Fig.A.3 (16/32)



	Site	Antenna	Antenna Height (m)	Main Feeder	Sub Feeder	Trans-mitting Power (W)	Frequency (MHz)
TX site	TINAMBACAN	12 ele-YAGI	5 m	RG17/u 40m	10D2V 2m	50 W	861.0 MHz
RX site	DANAO	6.0mφG.P	15.3 m	RG17/u 40m	8D2W 1 m	—	

Fig.A.3 (17/32)

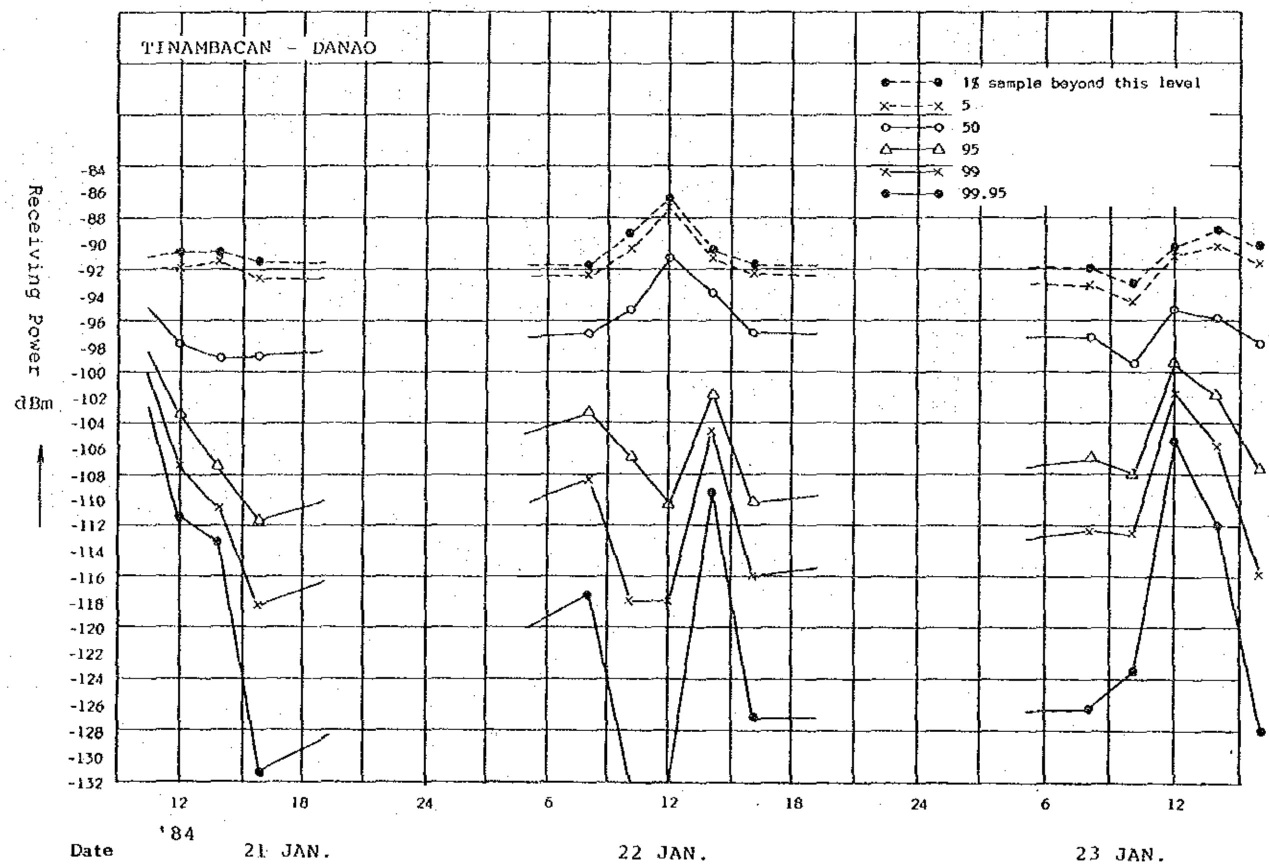
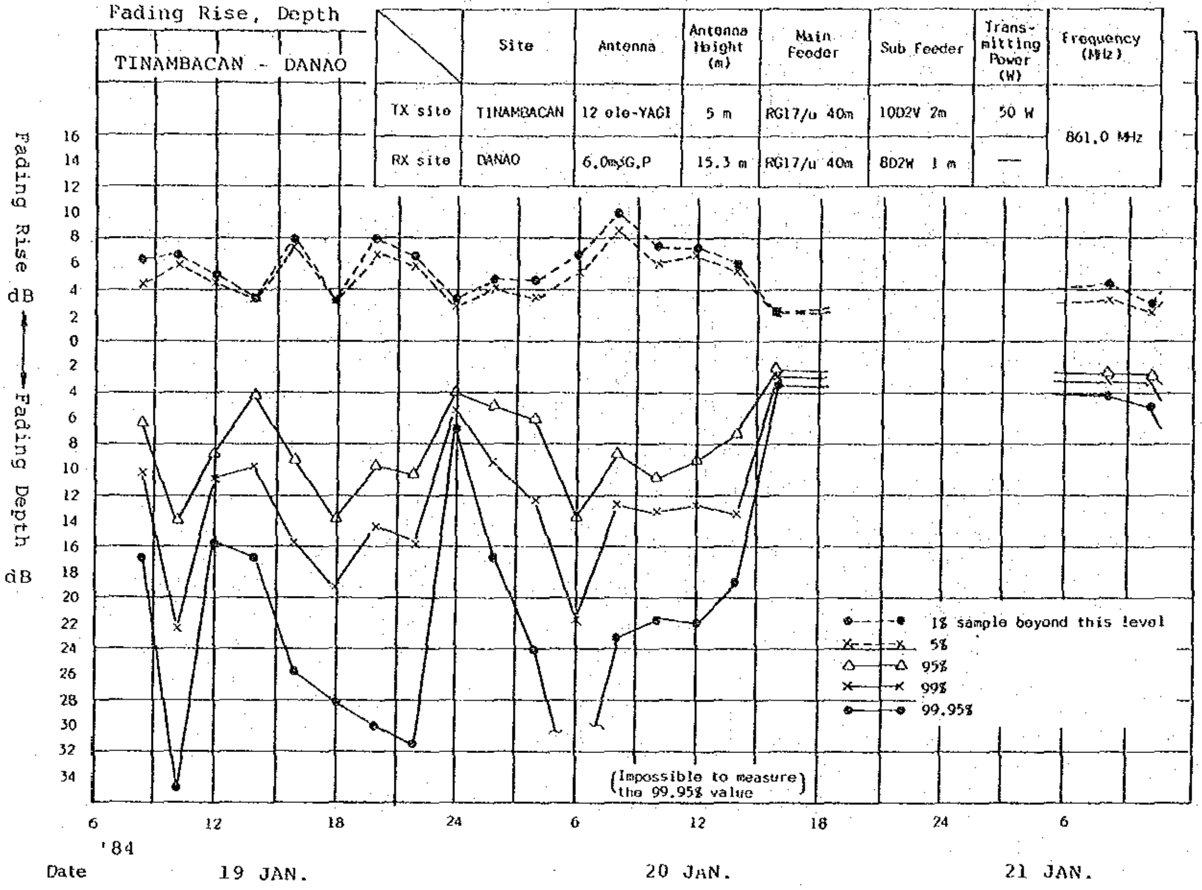


Fig.A.3 (18/32)



	Site	Antenna	Antenna Height (m)	Main Feeder	Sub Feeder	Trans-mitting Power (W)	Frequency (MHz)
TX site	TINAMBACAN	12 ele-YAGI	5 m	RG17/u 40m	10D2V 2m	50 W	861.0 MHz
RX site	DANAO	6.0mφG.P	15.3 m	RG17/u 40m	8D2W 1 m	—	

Fig.A.3 (19/32)

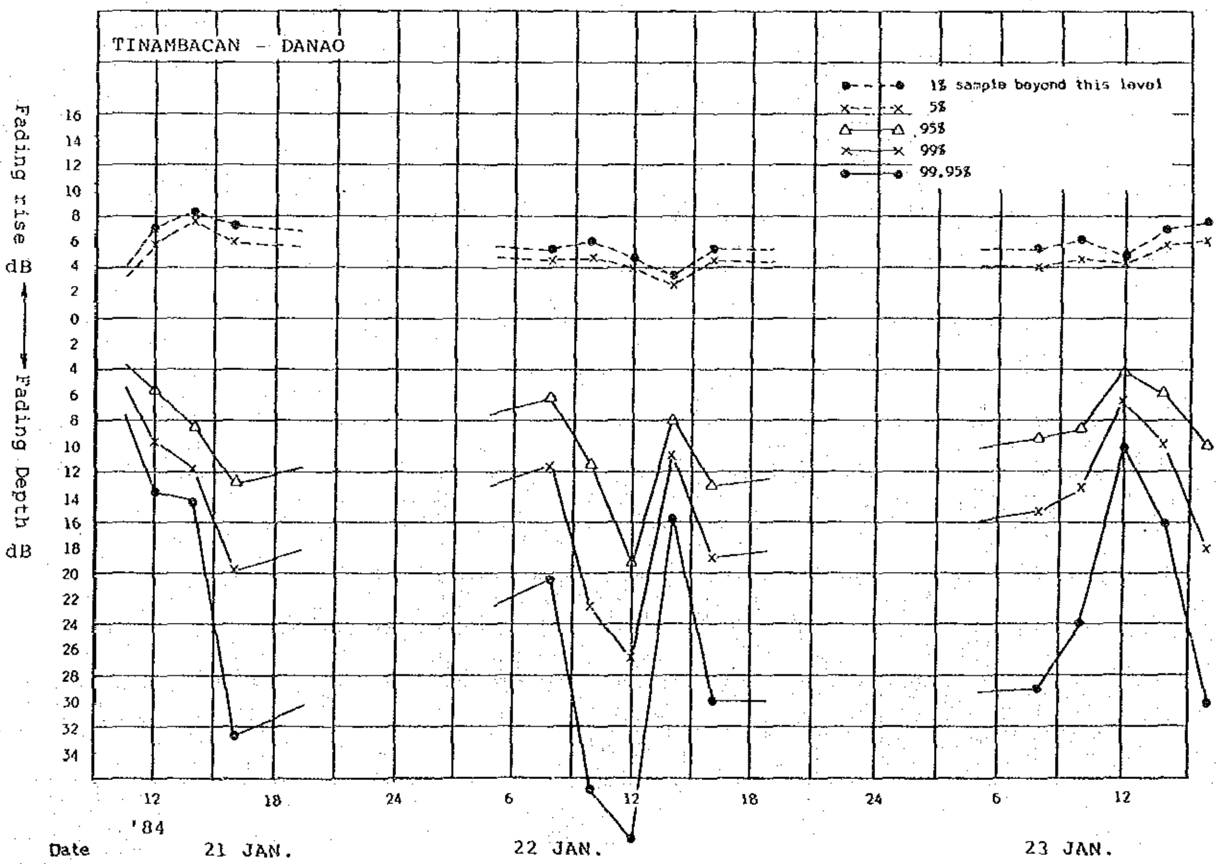


Fig.A.3 (20/32)

	Site	Antenna	Antenna Height (m)	Main Feeder	Sub Feeder	Trans-mitting Power (W)	Frequency (MHz)
TX site	MALASAG	12 ele-YAGI	5 m	RG17/u 40m	10D2V 2m	50 W	861.0 MHz
RX site	DANAO	6.0mφG.P	15.3 m	RG17/u 40m	8D2W 1 m	—	

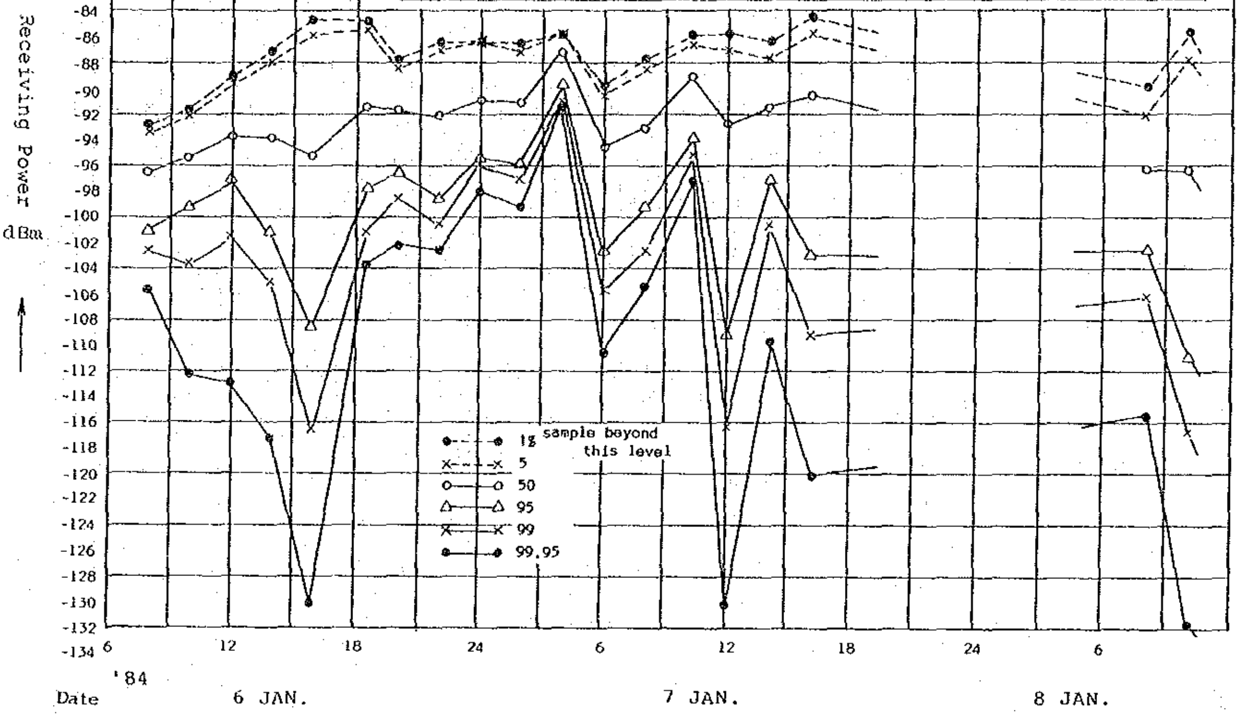


Fig.A.3 (21/32)

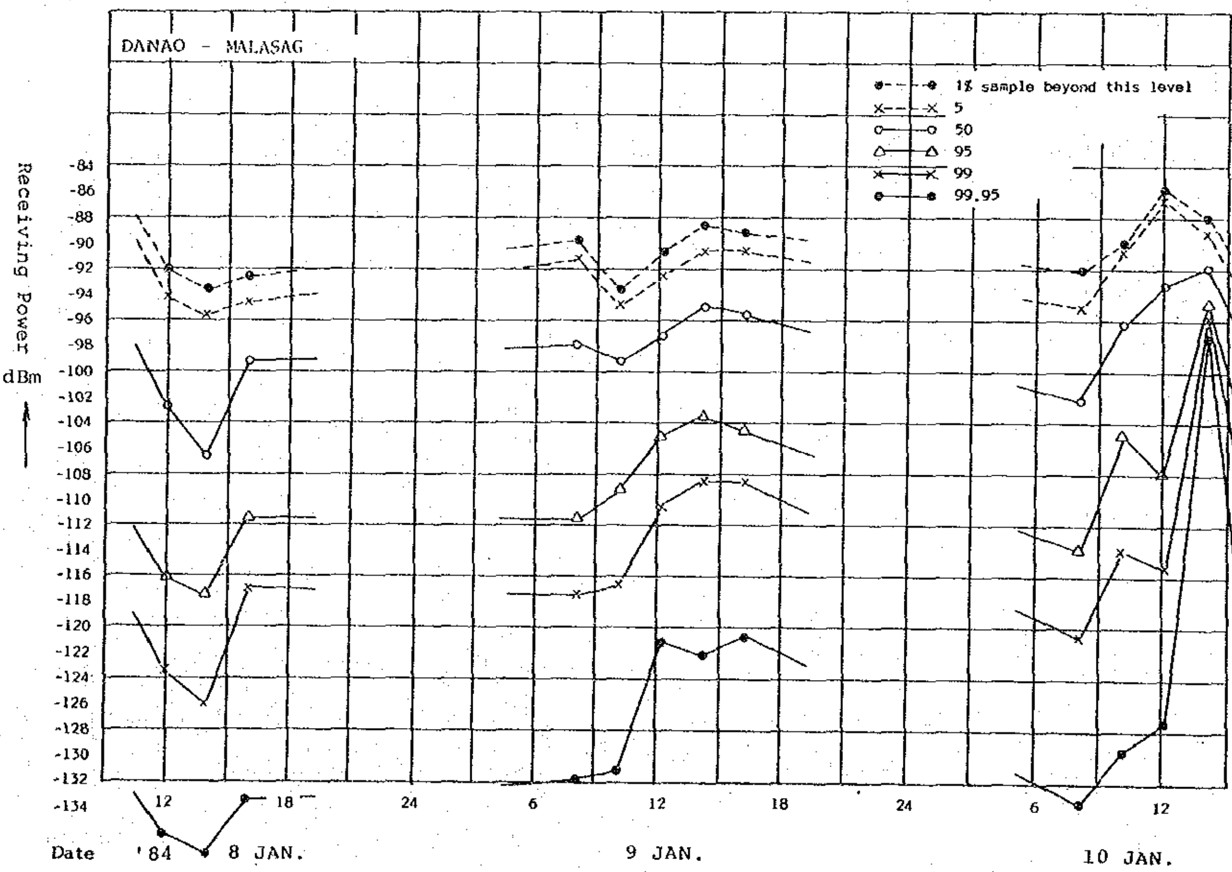


Fig.A.3 (22/32)

Fading Rise, Depth

	Site	Antenna	Antenna Height (m)	Main Feeder	Sub Feeder	Transmitting Power (W)	Frequency (MHz)
TX site	MALASAG	12 ele-YAGI	5 m	RG17/u 40m	10D2V 2m	50 W	861.0 MHz
RX site	DANAO	6.0mφG.P	15.3 m	RG17/u 40m	8D2W 1 m	—	

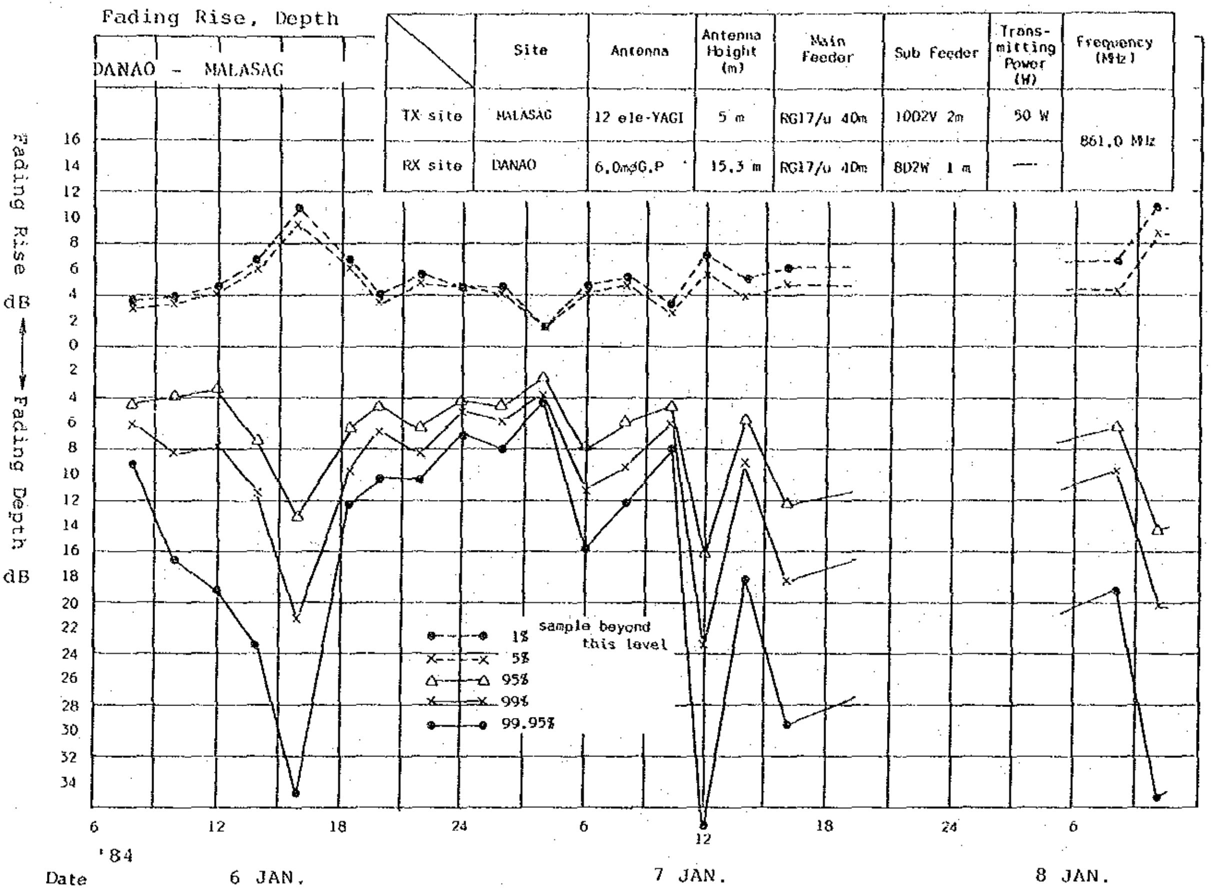


Fig.A.3(23/32)

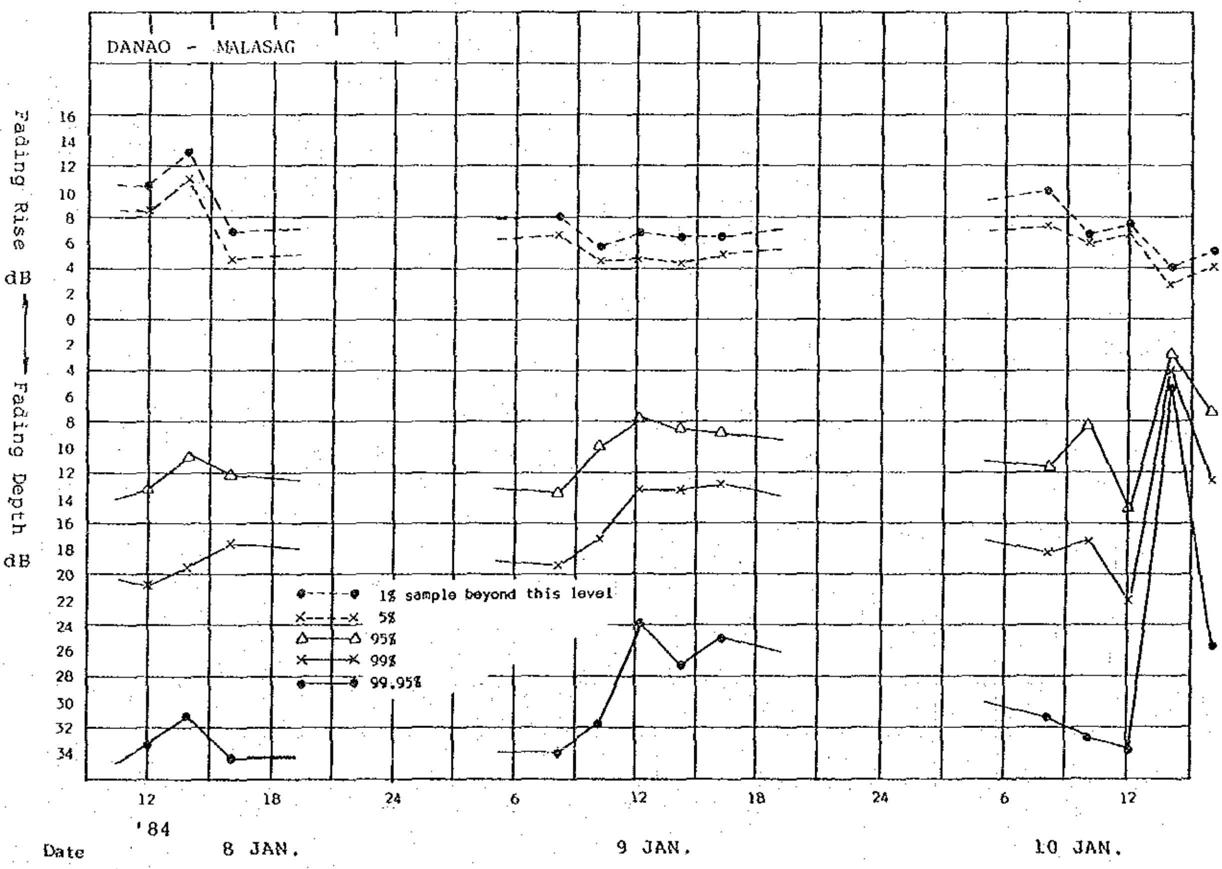
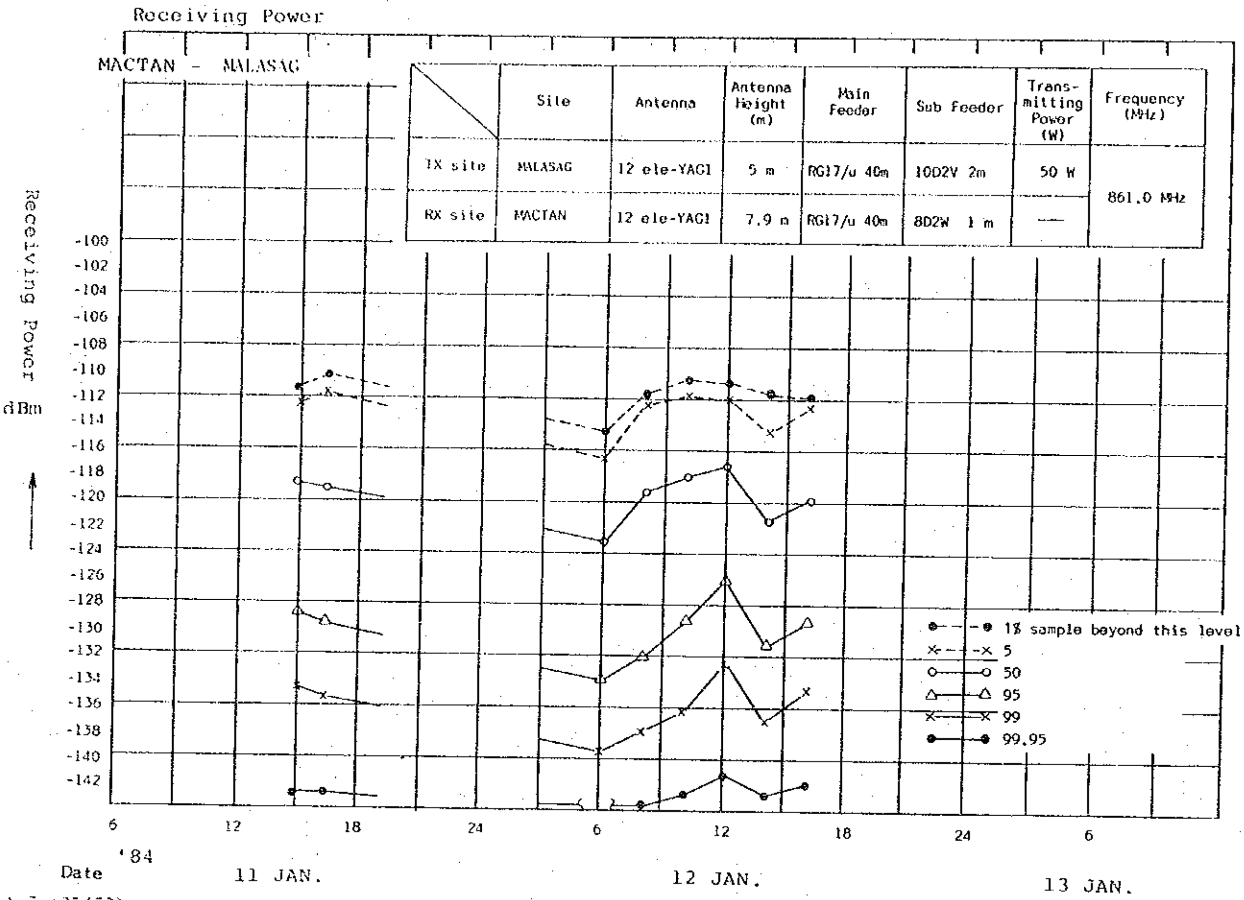
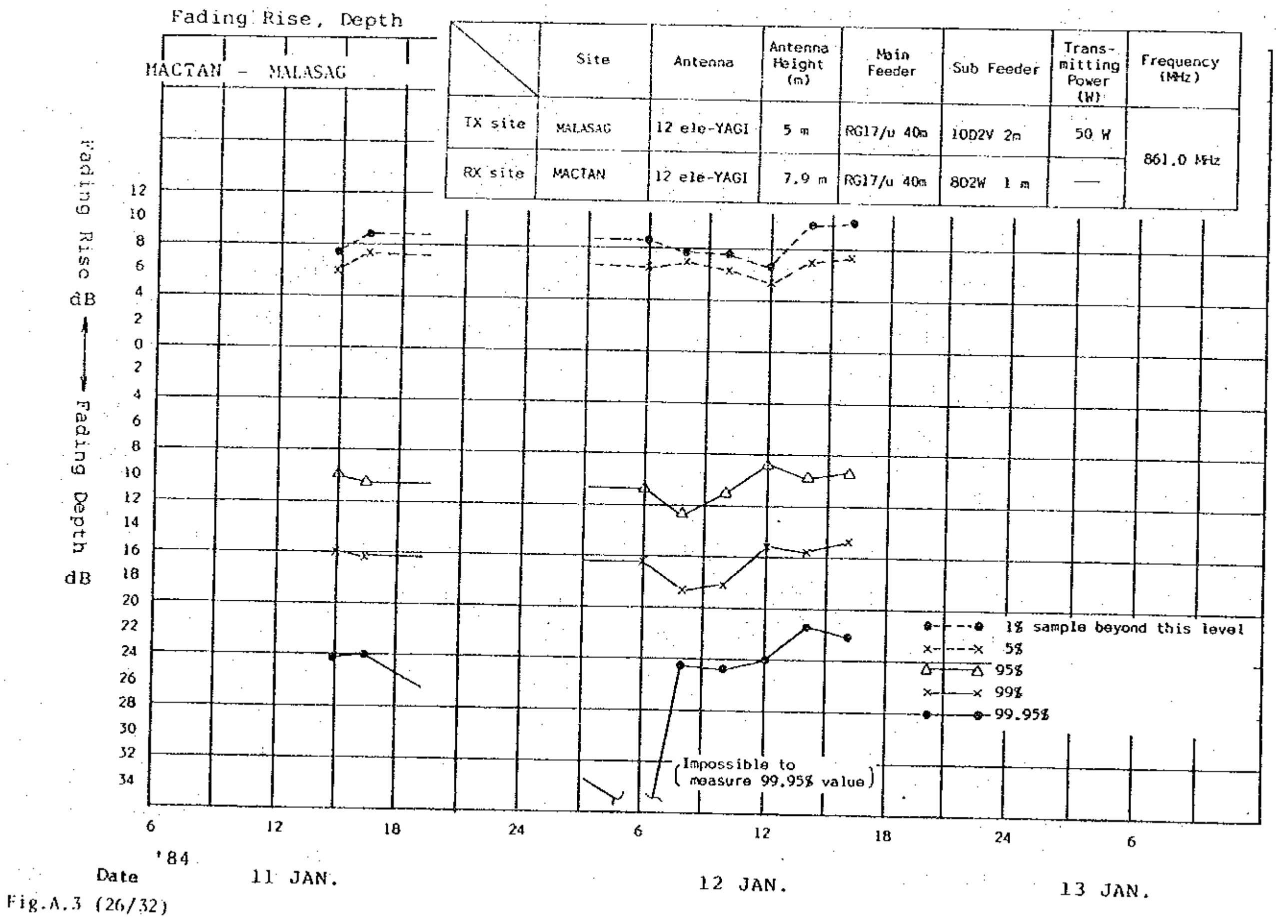


Fig.A.3 (24/32)



	Site	Antenna	Antenna Height (m)	Main Feeder	Sub Feeder	Trans-mitting Power (W)	Frequency (MHz)
TX site	MALASAG	12 ele-YAGI	5 m	RG17/u 40m	10D2V 2m	50 W	861.0 MHz
RX site	MACTAN	12 ele-YAGI	7.9 m	RG17/u 40m	8D2W 1 m	—	

Fig.A.3 (25/32)



	Site	Antenna	Antenna Height (m)	Main Feeder	Sub Feeder	Trans-mitting Power (W)	Frequency (MHz)
TX site	MALASAG	12 ele-YAGI	5 m	RG17/u 40m	10D2V 2m	50 W	861.0 MHz
RX site	MACTAN	12 ele-YAGI	7.9 m	RG17/u 40m	8D2W 1 m	—	

Fig.A.3 (26/32)

Receiving Power

TINAMBACAN - MACTAN

	Site	Antenna	Antenna Height (m)	Main Feeder	Sub Feeder	Trans-mitting Power (W)	Frequency (MHz)
TX site	TINAMBACAN	12 ele-YAGI	5 m	RG17/u 40m	10D2V 2m	50 W	861.0 MHz
RX site	MACTAN	12 ele-YAGI	7.9 m	RG17/u 40m	8D2W 1 m	----	

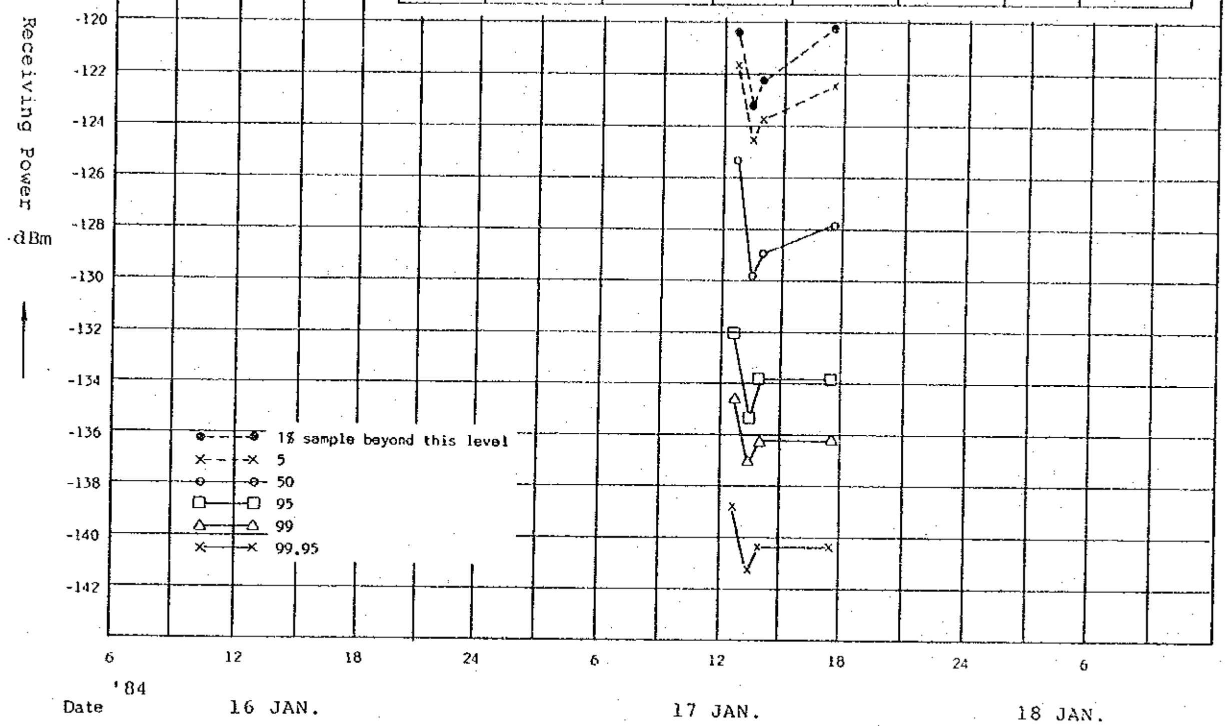


Fig.A.3 (27/32)

Fading Rise, Depth

TINAMBACAN - MACTAN

	Site	Antenna	Antenna Height (m)	Main Feeder	Sub Feeder	Trans-mitting Power (W)	Frequency (MHz)
TX site	TINAMBACAN	12 ele-YAGI	5 m	RG17/u 40m	10D2V 2m	50 W	861.0 MHz
RX site	MACTAN	12 ele-YAGI	7.9 m	RG17/u 40m	8D2W 1 m	——	

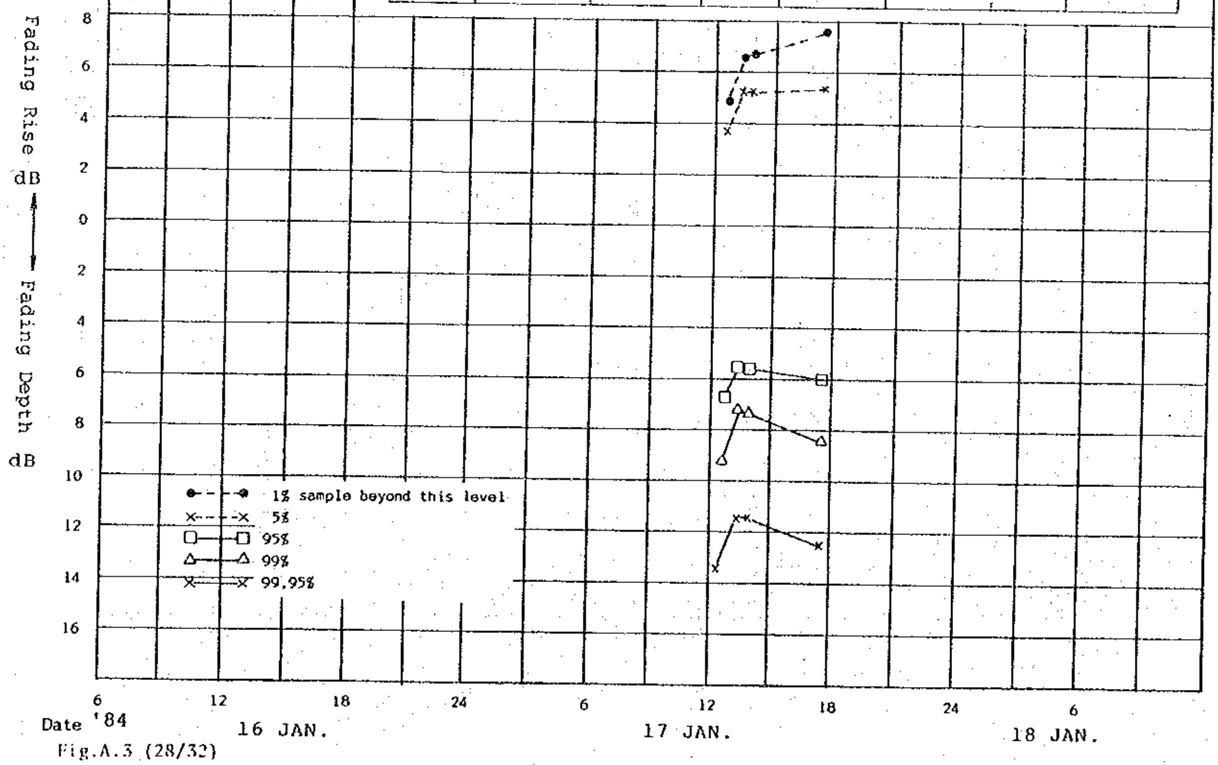


Fig.A.3 (28/32)

Receiving Power

	Site	Antenna	Antenna Height (m)	Main Feeder	Sub Feeder	Trans-mitting Power (W)	Frequency (MHz)
TX site	TINAMBACAN	12 ele-YAGI	4.5 m	RG17/u 40m	10D2V 2m	50 W	861.0 MHz
RX site	MASBATE	12 ele-YAGI	10.5 m	RG17/u 40m	8D2W 1 m	—	

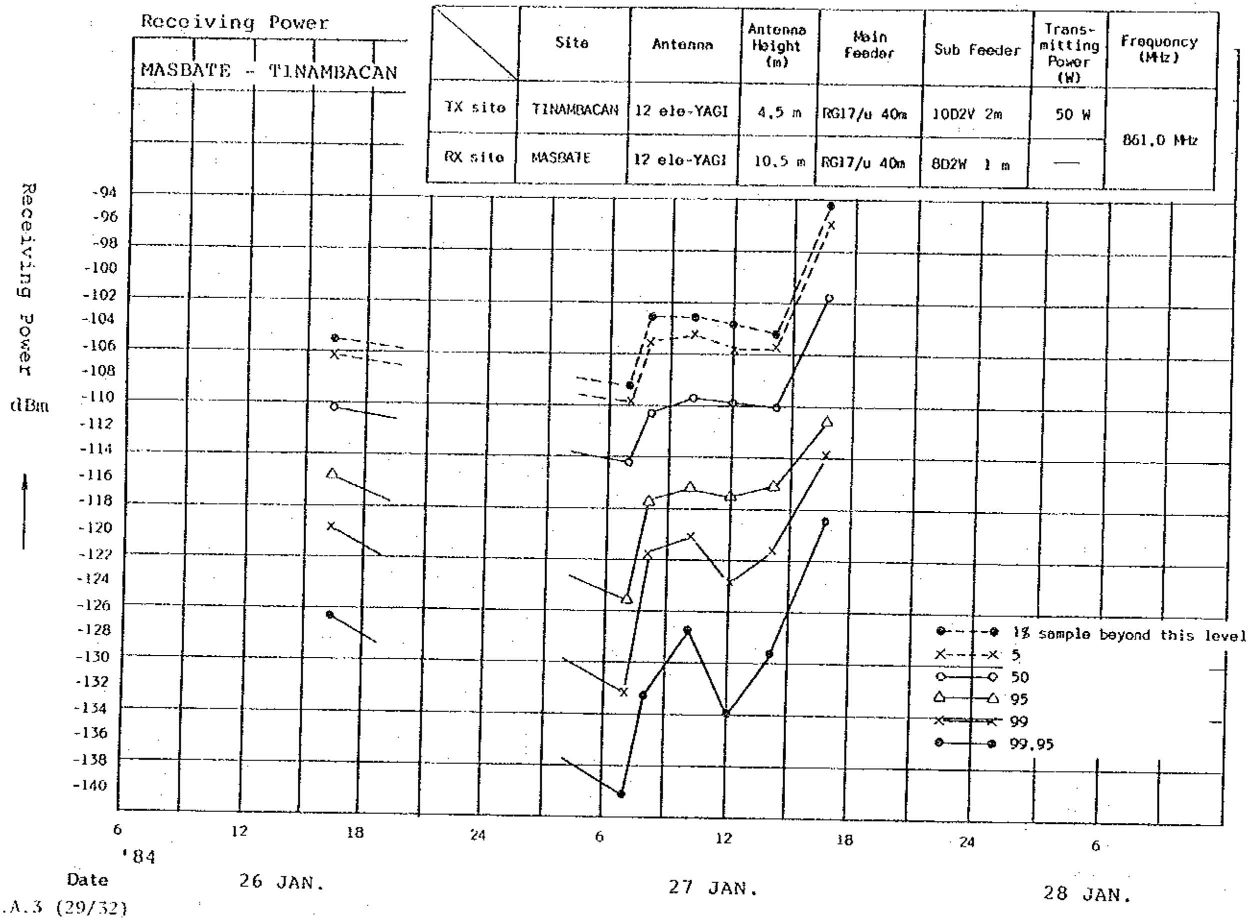


Fig.A.3 (29/32)

Fading Rise, Depth

	Site	Antenna	Antenna Height (m)	Main Feeder	Sub Feeder	Trans-mitting Power (W)	Frequency (MHz)
TX site	TINAMBACAN	12 ele-YAGI	4.5 m	RG17/u 40m	10D2V 2m	50 W	861.0 MHz
RX site	MASBATE	12 ele-YAGI	10.5 m	RG17/u 40m	8D2W 1 m	—	

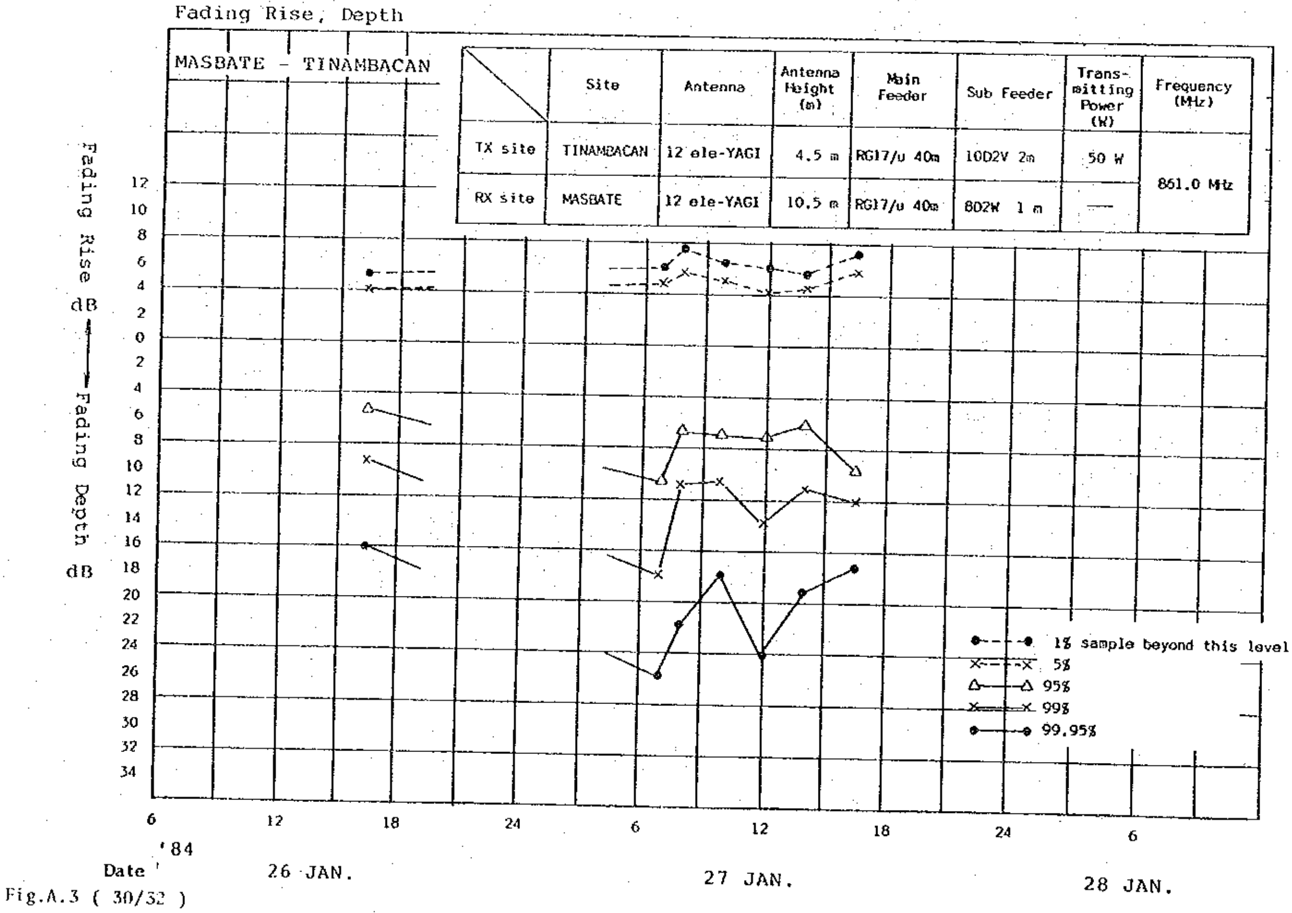
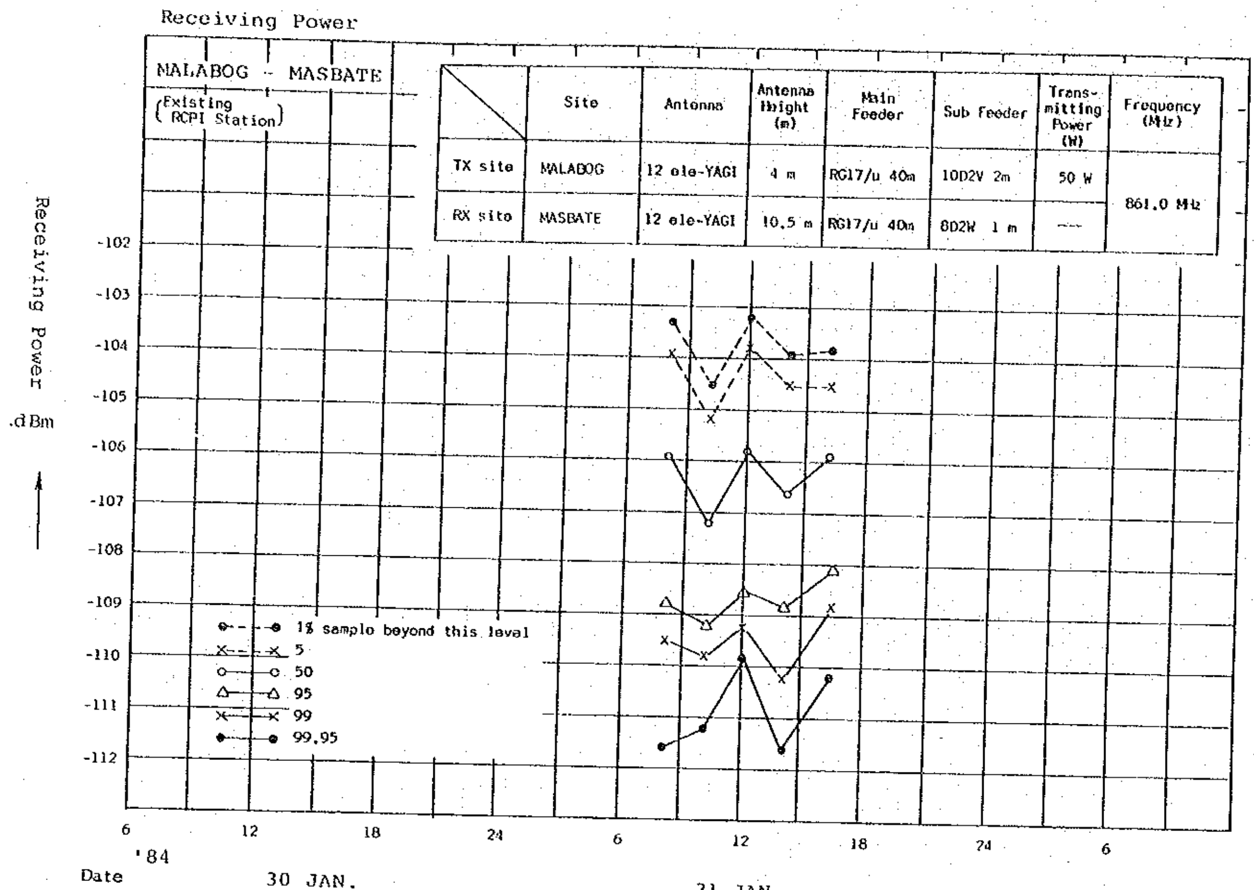
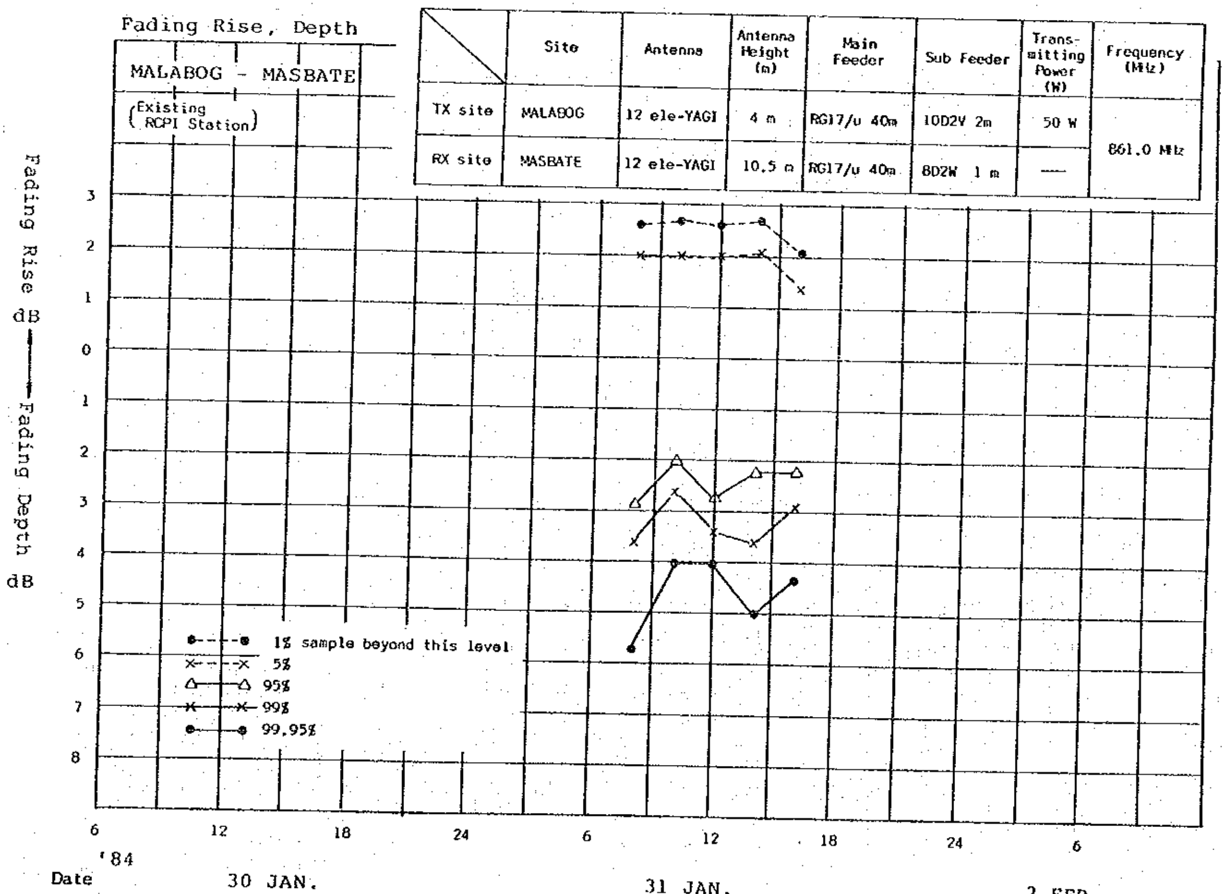


Fig.A.3 (30/32)



	Site	Antenna	Antenna Height (m)	Main Feeder	Sub Feeder	Trans-mitting Power (W)	Frequency (MHz)
TX site	MALABOG	12 ele-YAGI	4 m	RG17/u 40m	10D2V 2m	50 W	861.0 MHz
RX site	MASBATE	12 ele-YAGI	10.5 m	RG17/u 40m	8D2W 1 m	---	

Fig.A.3 (31/32)



	Site	Antenna	Antenna Height (m)	Main Feeder	Sub Feeder	Trans-mitting Power (W)	Frequency (MHz)
TX site	MALABOG	12 ele-YAGI	4 m	RG17/u 40m	10D2V 2m	50 W	861.0 MHz
RX site	MASBATE	12 ele-YAGI	10.5 m	RG17/u 40m	8D2W 1 m	---	

Fig.A.3 (32/32)