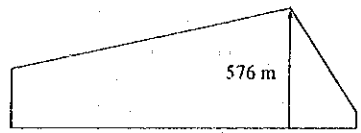
TANAY – TAYABAS LEVEL DIAGRAM FOR DESIGNING THE RADIO COMMUNICATION CIRCUIT ( )

Number of Profile
( )

No. 5

Height (MSL)	530	m	Height (MSL)	157	m
Height of Antenna	15	m	Height of Antenna	15	m
Total Height	545	m	Total Height	172	m



(TANAY) ← 63.9 km → (TAYABAS)

Items		Estimated Level Diagram			Level Diagram of Propergation Test		
		Calculated Value	Corrected Value	Remarks	Calculated Value	Measured Value	Remarks
Feeder Loss (Tx)	db	- 2.5	- 2.5	m	- 2.5	←	8D–2V 25 m
Antenna Gain (Tx)	db	11.0	11.0		11.0	←	
Free Space Loss	db	- 112.1	- 112.1		- 112.1	←	
Additional Loss	S1 db	- 27.0	- 27.0		- 27.0	- 27.0	
	S2 db						
	S3 db						
	db		- 2.4			(- 2.4)	Compensatory Value
Antenna Gain (Rx)	db	11.0	11.0		11.0	←	
Feeder Loss (Rx)	db	- 2.5	- 2.5	m	- 2.5	←	8D–2V 25 m
Loss of Others	db						
Total Loss	db	- 122.1	- 124.5		- 122.1		
Transmitting Power	db/w	13.98	13.98	w	13.98	13.98	25 w
Receiving Power	db/w	- 108.12	- 110.52		(1) -108.1 db/w	(2) -110.5 dB/W	
Threshold Level	db/w	- 144.7	- 144.7	B 12 KHz F 9.5 db	(1) 34.6 db/μ (2) 32.2 db/μ		
Threshold Margin	db	36.58	34.18		- 2.4 db/μ		
Threshold S/N	db	21.2	21.2	mo r/ch B KHz			
Standard S/N	db	57.78	55.38				
Estimated Fading Loss	db	6.4	6.4				
Frequency				150.20 MHz			

S/N = 59 [dB]

Measured Value of Field Strength	Antenna Height of Receiver	Antenna Height of Transmitter
25.7 dB/μ	13.0 m	15.0 m
29.2	12.0	
30.7	11.0	
29.2	7.0	
30.7	6.0	
32.2	5.0	
31.2	4.0	
30.7	3.8	

(Received at TANAY)

Remarks:

Measured Date: D 22 M Nov. Y 1981
150.20 MHz
Instrument: Field Strength Meter ML–518A
Transmitter: FM Transceiver JHV–225

Noted Date: D 12 M Nov. Y 1981 Station:

TAYABAS--TANAY MEASURED FIELD STRENGTH OF VHF RADIO WAVE (1)

Date: Week (Sun.) Day 22 Month Nov. Year 1981 (Rainy, Cloudy)

Measured at N 14°02' E121°35' TAYABAS Height (MSL) 157 m

Instrument Field Strength Meter Model: ML 518A (Anritsu)

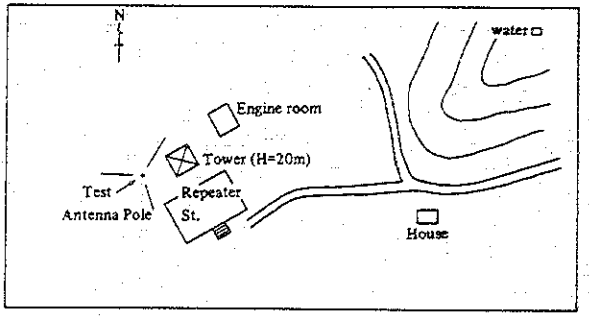
Measured by Fukui, Igarashi, Fontano, Maraña, Marales, and Santos

Frequency 150.20 MHz, MHz

Transmitted at N 14°33'53" E121°21'07" TANAY Height (MSL) 530 m

Transmitter FM Transceiver 150 MHz, 25W Model: JHV-225 (JRC)

SKETCH OF MEASURING PLACE IN TANAY



Time	Transmitting Station	Measured Field Strength Value (db)	Receiving Antenna						Transmitting Antenna						Output Power	
			Polarization	Type	Height Above the Ground (m)	Direction (deg.)	Location	Length of Coaxial Feeder (m)	Polarization	Type	Height Above the Ground (m)	Direction (deg.)	Location	Length of Coaxial Feeder (m)	Forward Power (W)	Reflected Power (W)
08:30	TANAY	15.7	H	8 ELE YAGI	3.8	345	Tayabas Weather Station	25 (8D-2V) 1 (5D-2V)	H	8 ELE YAGI	3.8	170	FFWS Repeater Station	25 (8D-2V) 1 (5D-2V)	25.0	0.22
		16.0			4.0											
		17.7			5.0											
		20.2			6.0											
		22.7			7.0											
		24.9			8.0											
		27.0			9.0											
		27.7			10.0											
		28.9			11.0											
		29.4			12.0											
		30.2			13.0											
		31.2			14.0											
08:40		* 31.4			15.0											

Remarks

Receiving Antenna Height at Tayabas for Tanay (up)

* Max. 31.4 db, 15.0 m

TAYABAS—TANAY MEASURED FIELD STRENGTH OF VHF RADIO WAVE (2)

Measured by Fukui, and 5 the others

Week Day Month Year
Date: (Sun.) 22 Nov. 1981 (Rainy, Cloudy)

Frequency 150.20 MHz, MHz

Measured at TAYABAS Height (MSL) 157 m

Transmitted at TANAY Height (MSL) 530 m

Instrument ML 518A

Transmitter JHV-225

SKETCH OF MEASURING PLACE IN TAYABAS

See the Appendix IV.

Time	Transmitting Station	Measured Field Strength Value (db)	Receiving Antenna						Transmitting Antenna						Output Power	
			Polarization	Type	Height Above the Ground (m)	Direction (deg.)	Location	Length of Coaxial Feeder (m)	Polarization	Type	Height Above the Ground (m)	Direction (deg.)	Location	Length of Coaxial Feeder (m)	Forward Power (W)	Reflected Power (W)
08:40	TANAY	30.7	H	8 ELE YAGI	14.0	345	Tayabas Weather	25 (8D-2V) 1 (5D-2V)	H	8 ELE YAGI	3.8	170	FFWS Repeater	25 (8D-2V) 1 (5D-2V)	25.0	0.22
		30.2		"	13.0		Station						Station			
		29.2			12.0											
		28.5			11.0											
		27.2			10.0											
		26.5			9.0											
		23.7			8.0											
		20.7			7.0											
		17.7			6.0											
		15.4			5.0											
		14.0			4.0											
08:46		13.2			3.8											

Remarks

Receiving Antenna Height at Tayabas for Tanay (down)

Max. 31.4 db 15.0 m

TAYABAS—TANAY MEASURED FIELD STRENGTH OF VHF RADIO WAVE (3)

SKETCH OF MEASURING PLACE IN ——

Measured by Fukui, and 5 the others

Week Day Month Year
Date: (Sun.) 22 Nov. 1981 (Rainy, Cloudy)

Frequency 150.20 MHz, MHz

Measured at TAYABAS Height (MSL) 157 m

Transmitted at TANAY Height (MSL) 530 m

Instrument ML 518A

Transmitter JHV–225

Time	Transmitting Station	Measured Field Strength Value (db)	Receiving Antenna						Transmitting Antenna						Output Power	
			Polarization	Type	Height Above the Ground (m)	Direction (deg.)	Location	Length of Coaxial Feeder (m)	Polarization	Type	Height Above the Ground (m)	Direction (deg.)	Location	Length of Coaxial Feeder (m)	Forward Power (W)	Reflected Power (W)
08:50	TANAY	31.7	H	8 ELE YAGI	5.0	345	Tayabas Weather	25 (8D–2V) 1 (5D–2V)	H	8 ELE YAGI	3.8	170	FFWS Repeater	25 (8D–2V) 1 (5D–2V)	25.0	0.22
		* 31.7					Station				4.0		Station			
		31.7									5.0					
		30.2									6.0					
		27.2									7.0					
		24.2									8.0					
		25.7									9.0					
		27.7									10.0					
		29.2									11.0					
		29.2									12.0					
		26.2									13.0					
		26.2									14.0					
09:00		28.9									15.0					

Remarks

Transmitting Antenna Height at Tanay for Tayabas (up)

* Max. 31.7 db, 4.0 m

TAYABAS--TANAY MEASURED FIELD STRENGTH OF VHF RADIO WAVE (4)

SKETCH OF MEASURING PLACE IN ——

Date: Week (Sun.) Day 22 Month Nov. Year 1981 (Rainy, Cloudy)

Measured by Fukui, and 5 the others

Frequency 150.20 MHz, MHz

Measured at TAYABAS Height (MSL) 157 m

Transmitted at TANAY Height (MSL) 530 m

Instrument ML 518A

Transmitter JHV-225

Time	Transmitting Station	Measured Field Strength Value (db)	Receiving Antenna						Transmitting Antenna						Output Power	
			Polarization	Type	Height Above the Ground (m)	Direction (deg.)	Location	Length of Coaxial Feeder (m)	Polarization	Type	Height Above the Ground (m)	Direction (deg.)	Location	Length of Coaxial Feeder (m)	Forward Power (W)	Reflected Power (W)
09:00	TANAY	28.9	H	8 ELE YAGI	5.0	345	Tayabas Weather Station	25 (8D-2V) 1 (5D-2V)	H	8 ELE YAGI	15.0	170	FFWS Repeater Station	25 (8D-2V) 1 (5D-2V)	25.0	0 22
		26.7									14.0					
		25.2									13.0					
		28.7									12.0					
		30.2									11.0					
		29.4									10.0					
		27.0									9.0					
		24.2									8.0	Remarks				
		28.2									7.0	Transmitting Antenna Height at Tanay for Tayabas (down)				
		30.4									6.0					
		* 31.2									5.0	* Max. 31.2 db, 5.0 m				
		30.7									4.0					
09:10		29.8									3.8					

TAYABAS—TANAY MEASURED FIELD STRENGTH OF VHF RADIO WAVE (5)

SKETCH OF MEASURING PLACE IN ——

Date: Week (Sun.) Day 22 Month Nov. Year 1981 (Rainy, Cloudy)

Measured by Fujii, Suzuki, Bito-On, Garcia, Prenda, Cruz

Frequency 150.20 MHz, MHz

Measured at TANAY Height (MSL) 530 m

Transmitted at TAYABAS Height (MSL) 157 m

Instrument ML 518A

Transmitter JHV–225

Time	Transmitting Station	Measured Field Strength Value (db)	Receiving Antenna						Transmitting Antenna						Output Power	
			Polarization	Type	Height Above the Ground (m)	Direction (deg.)	Location	Length of Coaxial Feeder (m)	Polarization	Type	Height Above the Ground (m)	Direction (deg.)	Location	Length of Coaxial Feeder (m)	Forward Power (W)	Reflected Power (W)
09:10	TAYABAS	–	H	8 ELE YAGI	5.0	170	FFWS Repeater Station	25 (8D–2V) 1 (5D–2V)	H	8 ELE YAGI	15.0	345	Tayabas Weather Station	25 (8D–2V) 1 (5D–2V)	24 2	0 28
		–			Best Trans. Height						14.0					
		–									13.0					
		–									12.0					
		30.2									11.0					
		29.2									10.0					
		27.7									9.0					
		26.2									8.0					
		23.3									7.0					
		21.7									6.0					
		18.7									5.0					
		17.2									4.0					
09:20		16.7									3.8					

Remarks

Transmitting Antenna Height at Tayabas for Tanay (down)

TAYABAS—TANAY MEASURED FIELD STRENGTH OF VHF RADIO WAVE (6)

SKETCH OF MEASURING PLACE IN ——

Measured by Fujii, and 5 the others

Date: Week (Sun.) Day 22 Month Nov. Year 1981 (Rainy, Cloudy)

Frequency 150.20 MHz, MHz

Measured at TANAY Height (MSL) 530 m

Transmitted at TAYABAS Height (MSL) 157 m

Instrument ML 518A

Transmitter JHV–225

Time	Transmitting Station	Measured Field Strength Value (db)	Receiving Antenna						Transmitting Antenna						Output Power	
			Polarization	Type	Height Above the Ground (m)	Direction (deg.)	Location	Length of Coaxial Feeder (m)	Polarization	Type	Height Above the Ground (m)	Direction (deg.)	Location	Length of Coaxial Feeder (m)	Forward Power (W)	Reflected Power (W)
09:20	TAYABAS	16.2	H	8 ELE YAGI	5.0	170	FFWS Repeater Station	25 (8D–2V) 1 (5D–2V)	H	8 ELE YAGI	4.0	345	Tayabas Weather Station	25 (8D–2V) 1 (5D–2V)	24.2	0 28
		18.7			Best Trans. Height						5.0					
		21.2									6.0					
		23.7									7.0					
		26.2									8.0					
		27.2									9.0					
		28.7									10.0					
		29.2									11.0	Remarks				
		30.2									12.0					
		30.7									13.0	Transmitting Antenna Height at Tayabas for Tanay (up)				
		31.2									14.0					
09:30		* 32.2									15.0	* Max. 32.2 db, 15.0 m				

TAYABAS—TANAY MEASURED FIELD STRENGTH OF VHF RADIO WAVE (7)

SKETCH OF MEASURING PLACE IN ——

Measured by Fujii, and 5 the others

Date: Week (Sun.) Day 22 Month Nov. Year 1981 (Rainy, Cloudy)

Frequency 150.20 MHz, MHz

Measured at TANAY Height (MSL) 530 m

Transmitted at TAYABAS Height (MSL) 157 m

Instrument ML 518A

Transmitter JHV--225

Time	Transmitting Station	Measured Field Strength Value (db)	Receiving Antenna						Transmitting Antenna						Output Power	
			Polarization	Type	Height Above the Ground (m)	Direction (deg.)	Location	Length of Coaxial Feeder (m)	Polarization	Type	Height Above the Ground (m)	Direction (deg.)	Location	Length of Coaxial Feeder (m)	Forward Power (W)	Reflected Power (W)
09:45	TAYABAS	32.2	H	8 ELE YAGI	3.8	170	FFWS Repeater Station	25 (8D--2V) 1 (5D--2V)	H	8 ELE YAGI	15.0	345	Tayabas Weather Station	25 (8D--2V) 1 (5D--2V)	24.2	0.28
		32.2			4.0						Best Trans. Height					
		* 32.7			5.0											
		31.7			6.0											
		29.7			7.0											
		26.2			8.0											
		26.7			9.0											
		29.7			10.0											
		30.7			11.0											
		28.7			12.0											
		24.2			13.0											
		25.7			14.0											
09:55		28.2			15.0											

Remarks

Receiving Antenna Height at Tanay for Tayabas (up)

* Max. 32.7 db, 5.0 m

TAYABAS—TANAY MEASURED FIELD STRENGTH OF VHF RADIO WAVE (8)

SKETCH OF MEASURING PLACE IN ——

Measured by Fujii, and 5 the others

Date: Week (Sun.) Day 22 Month Nov. Year 1981 (Rainy, Cloudy)

Frequency 150.20 MHz, MHz

Measured at TANAY Height (MSL) 530 m

Transmitted at TAYABAS Height (MSL) 157 m

Instrument ML 518A

Transmitter JHV–225

Time	Transmitting Station	Measured Field Strength Value (db)	Receiving Antenna						Transmitting Antenna						Output Power	
			Polarization	Type	Height Above the Ground (m)	Direction (deg.)	Location	Length of Coaxial Feeder (m)	Polarization	Type	Height Above the Ground (m)	Direction (deg.)	Location	Length of Coaxial Feeder (m)	Forward Power (W)	Reflected Power (W)
09:55	TAYABAS	28.2	H	8 ELE YAGI	15.0	170	FFWS Repeater	25 (8D–2V) 1 (5D–2V)	H	8 ELE YAGI	15.0	345	Tayabas Weather	25 (8D–2V) 1 (5D–2V)	24.2	0.28
		27.2			14.0		Station				Best Trans. Height		Station			
		25.7			13.0											
		29.2			12.0											
		30.7			11.0											
		30 2			10.0											
		27.7			9.0											
		26.2			8.0											
		29.2			7.0											
		30.7			6.0											
		* 32.2			5.0											
		31.2			4.0											
10:05		30.7			3.8											

Remarks

Receiving Antenna Height at Tanay for Tayabas (down)

* Max. 32.2 db, 5.0 m

N = - 14 Tr. Tayabas H = 15 m

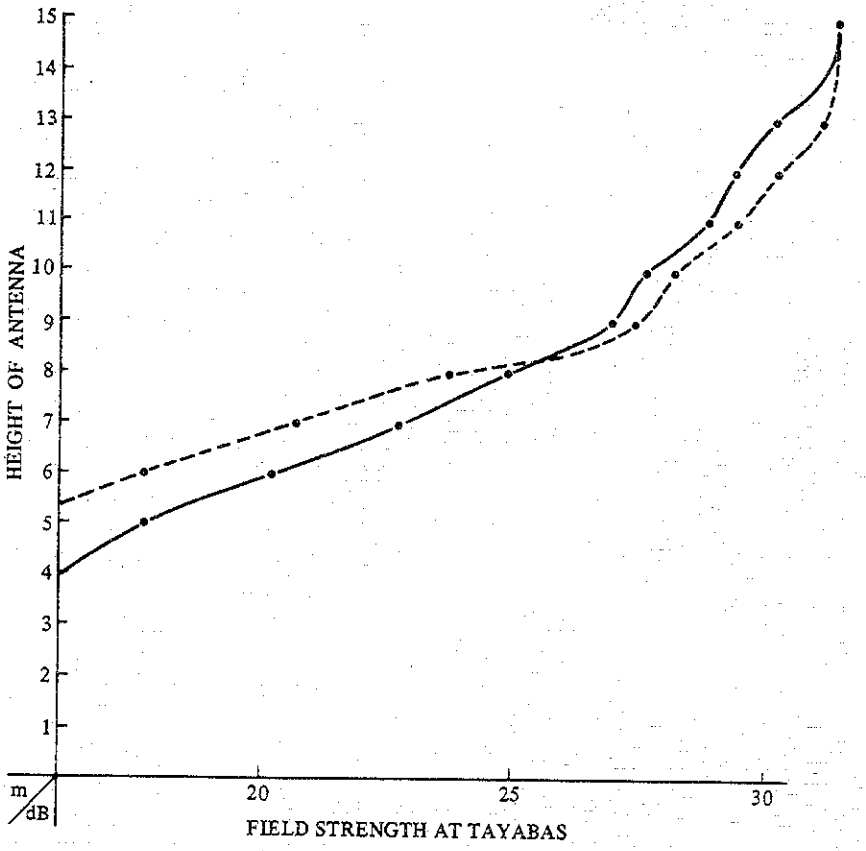
C = - 65 Re. Tanay H = 5 m

S = - 6

S/N = 59 dB

TAYABAS –TANAY HEIGHT PATTERN OF FIELD STRENGTH

TRANSMITTING POWER
FREQUENCY 150.20 MHz FORWORD 25.0 W.
ANTENNA 8 Ⓨ D. REFLECTED 0.22 W.



RECEIVING ANTENNA HEIGHT AT TAYABAS FOR TANAY

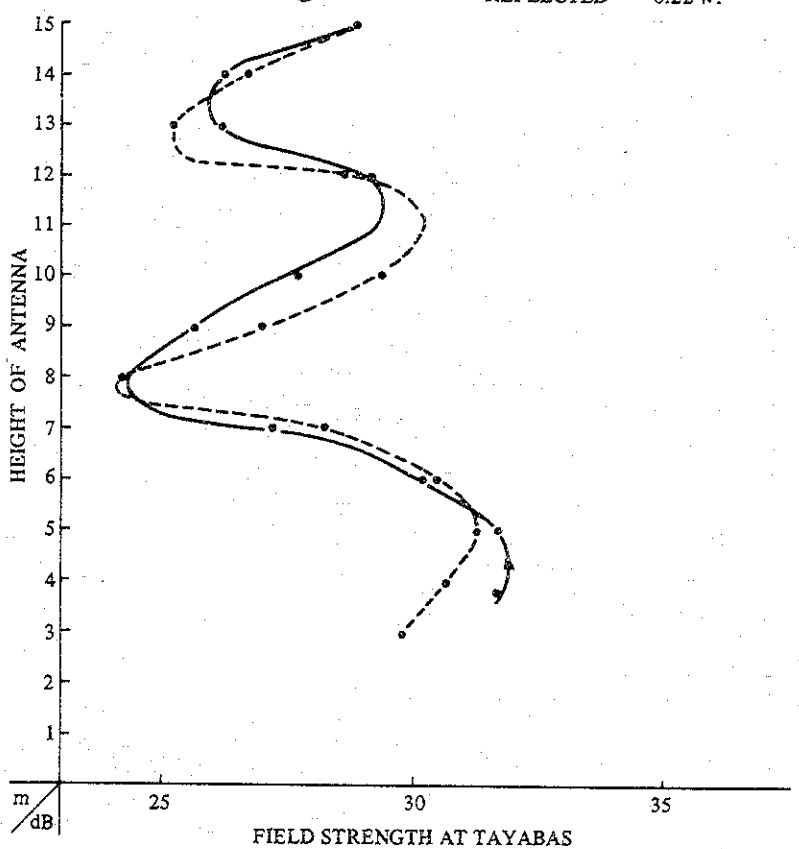
F.S.M.

INSTRUMENT ML 518A (ANRITSU)

MEASURED DATE D 22 M NOV. Y 1981 MEASURER FUKUI, IGARASHI

TAYABAS – TANAY HEIGHT PATTERN OF FIELD STRENGTH

TRANSMITTING POWER
FREQUENCY 150.20 MHz FORWORD 25.0 W.
ANTENNA 8 Ⓨ D. REFLECTED 0.22 W.



TRANSMITTING ANTENNA HEIGHT AT TANAY FOR TAYABAS

F.S.M.

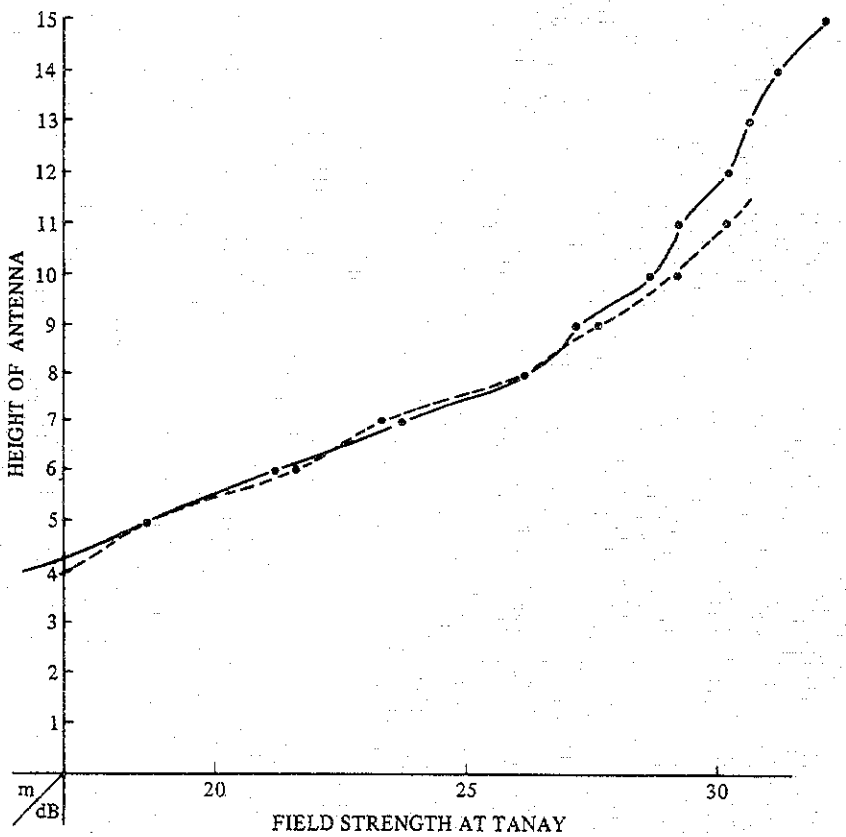
INSTRUMENT ML 518A (ANRITSU)

MEASURED DATE D 22 M NOV. Y 1981 MEASURER FUKUI, IGARASHI

TAYABAS – TANAY HEIGHT PATTERN OF FIELD STRENGTH

TRANSMITTING POWER

FREQUENCY 150.20 MHz FORWORD 24.2 W.
ANTENNA 8 Ⓨ. D. REFLECTED 0.28 W.



TRANSMITTING ANTENNA HEIGHT AT
TAYABAS FOR TANAY F.S.M.

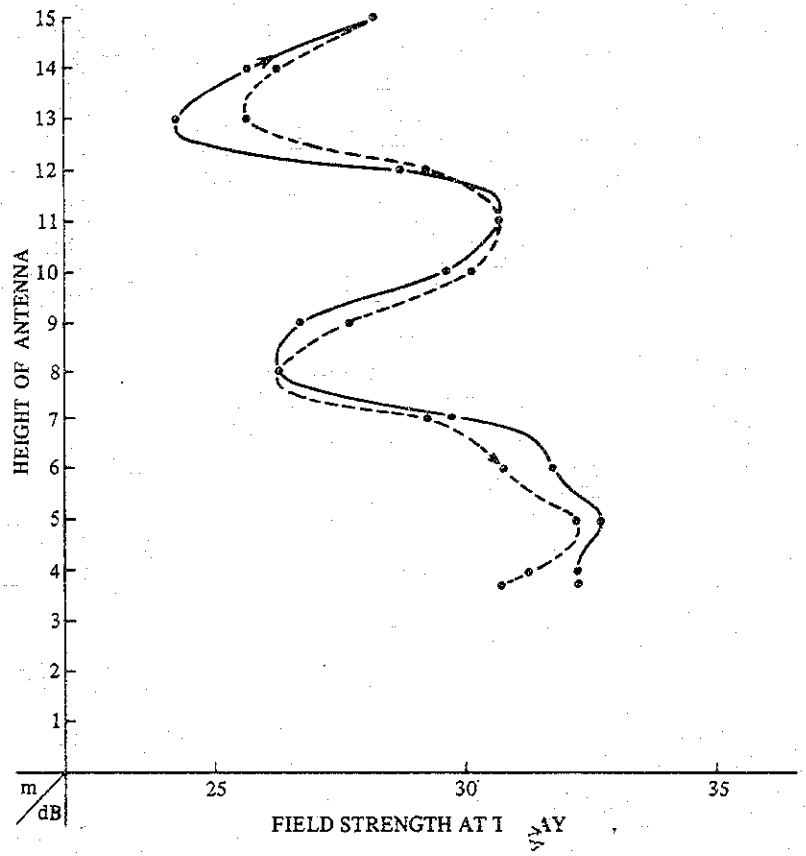
INSTRUMENT ML 518A

MEASURED DATE D 22 M NOV. Y 1981 MEASURER FUJII, SUZUKI

TAYABAS – TANAY HEIGHT PATTERN OF FIELD STRENGTH

TRANSMITTING POWER

FREQUENCY 150.20 MHz FORWORD 24.2 W.
ANTENNA 8 Ⓨ. D. REFLECTED 0.28 W.

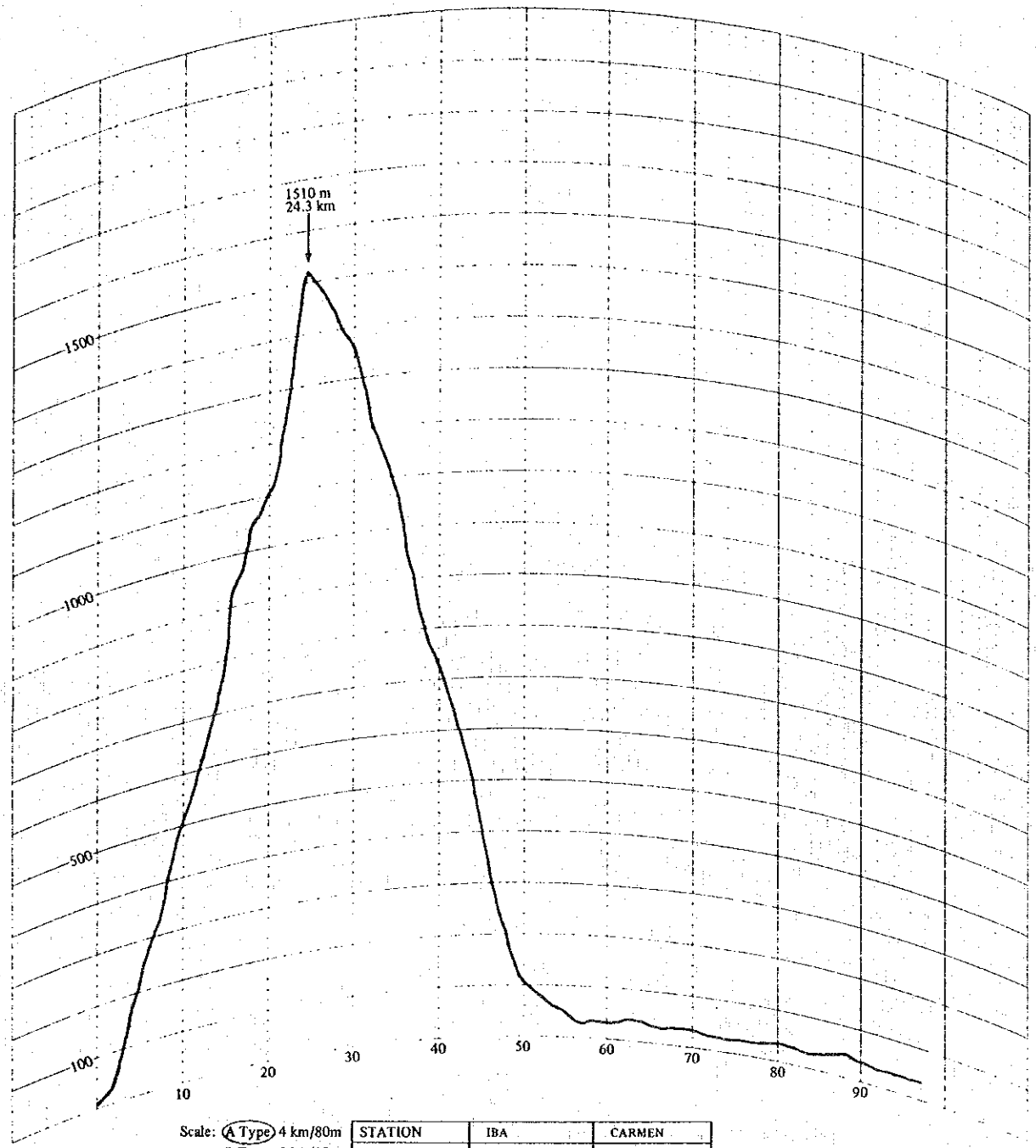


RECEIVING ANTENNA HEIGHT AT
TANAY FOR TAYABAS F.S.M.

INSTRUMENT ML 518A

MEASURED DATE D 22 M NOV. Y 1981 MEASURER FUJII, SUZUKI

PROFILE



Scale: (A Type) 4 km/80m
B Type. 2 km/20m
C Type. 1 km/ 5m

STATION	IBA		CARMEN	
			SUB CENTER	
PLACE	N	15° 20'	N	15° 53' 21"
	E	119° 58'	E	120° 36' 31"
HEIGHT(M.S.L)	4 m		25 m	
DISTANCE	96.5 km			

Date: 24 Nov. 1981

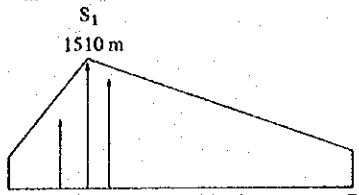
No. 6

IBA – CARMEN ROSALES LEVEL DIAGRAM FOR DESIGNING THE RADIO COMMUNICATION CIRCUIT ( )

Number of Profile ( )

No. 6

Height (MSL)	4	m	Height (MSL) 25 m
Height of Antenna	15	m	Height of Antenna 15 m
Total Height	19	m	Total Height 40 m



(IBA) ← 96.5 km → (CARMEN ROSALES)

Items		Estimated Level Diagram			Level Diagram of Propergation Test		
		Calculated Value	Corrected Value	Remarks	Calculated Value	Measured Value	Remarks
Feeder Loss (Tx)	db	- 2.5	- 2.5	m	- 2.5	←	8D–2V 25 m
Antenna Gain (Tx)	db	11.0	11.0		11.0	←	
Free Space Loss	db	- 115.8	- 115.8		- 115.8	←	
Additional Loss	S1 db	- 33.0					
	S2 db		- 36.0		- 36.0	- 36.0	
	S3 db						
	db	- 3.0	- 3.2			(- 3.2)	Compensatory Value
Antenna Gain (Rx)	db	11.0	11.0		11.0	←	
Feeder Loss (Rx)	db	- 2.5	- 2.5	m	- 2.5	←	8D–2V 25 m
Loss of Others	db	–					
Total Loss	db	- 134.8	- 138.0		- 134.8	- 138.0	
Transmitting Power	db/w	13.98	13.98	w	13.98	13.98	25 w
Receiving Power	db/w	- 120.82	- 124.02		(1) -120.8 db/w	(2) -124.0 dB/W	
Threshold Level	db/w	- 144.7	- 144.7	B 12 KHz F 9.5 db	(1) 21.9 db/μ (2) 18.7 db/μ		
Threshold Margin	db	23.88	20.68		- 3.2 db/μ		
Threshold S/N	db	21.2	21.2	mo r/ch B KHz			
Standard S/N	db	45.1	41.9				
Estimated Fading Loss	db	9.7	9.7				
Frequency				150.20 MHz			

S/N = 43 dB

Measured Value of Field Strength	Antenna Height of Receiver	Antenna Height of Transmitter
12.7	7.0 m	7.0 m
12.2	8.0	
14.2	9.0	
14.7	10.0	
15.7	11.0	
16.7	12.0	
16.7	13.0	
17.7	14.0	
18.7	15.0	

(Received at CARMEN)

Remarks:

Measured Date: D 27 M Nov. Y 1981
150.20 MHz

Instrument: Field Strength Meter ML–518A

Transmitter: FM Transceiver JHV–225

Noted Date: D 24 M Nov. Y 1981 Station:

CARMEN—IBA MEASURED FIELD STRENGTH OF VHF RADIO WAVE (1)

Measured by Fukui, Igarashi, Fontano, Maraña, Morales, Santos

Date: Week (Fri.) Day 27 Month Nov. Year 1981 (Fair)

Frequency 150.20 MHz, MHz

Measured at IBA N 15°20′ E119°58′ Height (MSL) 4 m

Transmitted at CARMEN N 15°53′21″ E120°36′31″ Height (MSL) 25 m

Instrument Field Strength Meter Model: ML 518A (Anritsu)

Transmitter FM Transceiver 150MHz 25W Model: JHV–225 (JRC)

SKETCH OF MEASURING PLACE IN CARMEN

See the Appendix IV.

Time	Transmitting Station	Measured Field Strength Value (db)	Receiving Antenna						Transmitting Antenna						Output Power	
			Polarization	Type	Height Above the Ground (m)	Direction (deg.)	Location	Length of Coaxial Feeder (m)	Polarization	Type	Height Above the Ground (m)	Direction (deg.)	Location	Length of Coaxial Feeder (m)	Forward Power (W)	Reflected Power (W)
08:20	CARMEN	14.7	H	8 ELE YAGI	3.8	30°	Iba Weather Station	25 (8D–2V) 1 (5D–2V)	H	8 ELE YAGI	8.0	220°	FFS Sub-Center	25 (8D–2V) 1 (5D–2V)	24.2	0.2
		14.4			4.0											
		15.5			5.0											
		18.0			6.0											
		* 18.7			7.0											
		* 18.7			8.0											
		17.4			9.0											
		14.2			10.0											
		7.7			11.0											
		–			12.0											
		8.0			13.0											
		13.2			14.0											
08:25		16.0			15.0											

Remarks

Receiving Antenna Height at Iba for Carmen (up)

Max: 18.7 db 7.0 – 8.0 m

CARMEN—IBA MEASURED FIELD STRENGTH OF VHF RADIO WAVE (2)

Date: Week (Fri.) Day 27 Month Nov. Year 1981 (Fair)

Measured by Fukui, and 5 the others

Frequency 150.20 MHz, MHz

Measured at IBA Height (MSL) 4 m

Transmitted at CARMEN Height (MSL) 25 m

Instrument ML 518A

Transmitter JHV–225

SKETCH OF MEASURING PLACE IN IBA

See the Appendix IV.

Time	Transmitting Station	Measured Field Strength Value (db)	Receiving Antenna						Transmitting Antenna						Output Power	
			Polarization	Type	Height Above the Ground (m)	Direction (deg.)	Location	Length of Coaxial Feeder (m)	Polarization	Type	Height Above the Ground (m)	Direction (deg.)	Location	Length of Coaxial Feeder (m)	Forward Power (W)	Reflected Power (W)
08:25	CARMEN	16.0	H	8 ELE YAGI	15.0	30°	Iba Weather	25 (8D–2V) 1 (5D–2V)	H	8 ELE YAGI	8.0	220°	FFS Sub-Center	25 (8D–2V) 1 (5D–2V)	24.2	0.2
		14.4			14.0		Station									
		8.2			12.0											
		–			12.0											
		8.0			11.0											
		13.9			10.0											
		16.7			9.0											
		18.2			8.0											
		* 18.9			7.0											
		* 18.9			6.0											
		16.7			5.0											
		15.2			4.0											
08:30		14.7			3.8											

Remarks

Receiving Antenna Height at Iba for Carmen (down)

Max. 18.9 db, 6.0 – 7.0 m

CARMEN—IBA MEASURED FIELD STRENGTH OF VHF RADIO WAVE (3)

SKETCH OF MEASURING PLACE IN ——

Measured by Fujii, Suzuki & 4 others

Date: Week (Fri.) Day 27 Month Nov. Year 1981 (Fair)

Frequency 150.20 MHz, MHz

Measured at CARMEN Height (MSL) 25 m

Transmitted at IBA Height (MSL) 4 m

Instrument ML 518A

Transmitter JHV–225

Time	Transmitting Station	Measured Field Strength Value (db)	Receiving Antenna						Transmitting Antenna						Output Power	
			Polarization	Type	Height Above the Ground (m)	Direction (deg.)	Location	Length of Coaxial Feeder (m)	Polarization	Type	Height Above the Ground (m)	Direction (deg.)	Location	Length of Coaxial Feeder (m)	Forward Power (W)	Reflected Power (W)
08:30	IBA	10.7	H	8 ELE YAGI	3.8	220	FFS Sub-Center	25 (8D–2V) 1 (5D–2V)	H	8 ELE YAGI	8.5	30	Iba Weather	25 (8D–2V) 1 (5D–2V)	27.5	0.8
		10.7			4.0								Station			
		12.7			5.0											
		12.7			6.0											
		12.7			7.0											
		14.2			8.0											
		13.7			9.0											
		15.7			10.0											
		16.2			11.0											
		17.2			12.0											
		18.2			13.0											
		18.7			14.0											
08:37		* 19.7			* 15.0											

Remarks

Receiving Antenna Height at Carmen for Iba (up)

Max. 19.7 db, 15.0 m

CARMEN—IBA MEASURED FIELD STRENGTH OF VHF RADIO WAVE (4)

SKETCH OF MEASURING PLACE IN ——

Measured by Fujii, Suzuki & 4 others

Week Day Month Year
Date: (Fri.) 27 Nov. 1981 (Fair)

Frequency 150.20 MHz, MHz

Measured at CARMEN Height (MSL) 25 m

Transmitted at IBA Height (MSL) 4 m

Instrument ML 518A

Transmitter JHV–225

Time	Transmitting Station	Measured Field Strength Value (db)	Receiving Antenna						Transmitting Antenna						Output Power	
			Polarization	Type	Height Above the Ground (m)	Direction (deg.)	Location	Length of Coaxial Feeder (m)	Polarization	Type	Height Above the Ground (m)	Direction (deg.)	Location	Length of Coaxial Feeder (m)	Forward Power (W)	Reflected Power (W)
08:37	IBA	18.7	H	8 ELE YAGI	14.0	220	FFS Sub-Center	25 (8D–2V) 1 (5D–2V)	H	8 ELE YAGI	8.5	30	Iba Weather Station	25 (8D–2V) 1 (5D–2V)	27.5	0.8
		17.2			13.0											
		16.7			12.0											
		16.7			11.0											
		14.7			10.0											
		14.2			9.0											
		12.2			8.0											
		10.2			7.0											
		8.7			6.0											
		7.2			5.0											
		5.2			4.0											
08:45		4.7			3.8											

Remarks

Receiving Antenna Height at Carmen for Iba (down)

Max. 19.7 db, 15.0 m

CARMEN—IBA MEASURED FIELD STRENGTH OF VHF RADIO WAVE (5)

SKETCH OF MEASURING PLACE IN ——

Date: Week (Fri.) Day 27 Month Nov. Year 1981 (Fair)

Measured by Fukui, and 5 the others

Frequency 150.20 MHz, MHz

Measured at IBA Height (MSL) 4 m

Transmitted at CARMEN Height (MSL) 25 m

Instrument ML 518A

Transmitter JHV–225

Time	Transmitting Station	Measured Field Strength Value (db)	Receiving Antenna						Transmitting Antenna						Output Power	
			Polarization	Type	Height Above the Ground (m)	Direction (deg.)	Location	Length of Coaxial Feeder (m)	Polarization	Type	Height Above the Ground (m)	Direction (deg.)	Location	Length of Coaxial Feeder (m)	Forward Power (W)	Reflected Power (W)
08:50	CARMEN	10.2	H	8 ELE YAGI	7.0	30	Iba Weather Station	25 (8D–2V) 1 (5D–2V)	H	8 ELE YAGI	3.8	220	FFS Sub-Center	25 (8D–2V) 1 (5D–2V)	24.2	0.2
		10.7									4.0					
		11.2									5.0					
		12.7									6.0					
		14.2									7.0					
		11.2									8.0					
		14.7									9.0					
		16.2									10.0	Remarks				
		17.0									11.0					
		17.4									12.0	Transmitting Antenna Height at Carmen for Iba (up)				
		15.7									13.0	Max. 19.0 db, 15.0 m				
		18.2									14.0					
09:00		19.0									15.0					

CARMEN—IBA MEASURED FIELD STRENGTH OF VHF RADIO WAVE (6)

SKETCH OF MEASURING PLACE IN ——

Measured by Fukui, and 5 the others

Date: Week (Fri.) Day 27 Month Nov. Year 1981 (Fair)

Frequency 150.20 MHz, MHz

Measured at IBA Height (MSL) 4 m

Transmitted at CARMEN Height (MSL) 25 m

Instrument ML 518A

Transmitter JHV–225

Time	Transmitting Station	Measured Field Strength Value (db)	Receiving Antenna						Transmitting Antenna						Output Power	
			Polarization	Type	Height Above the Ground (m)	Direction (deg.)	Location	Length of Coaxial Feeder (m)	Polarization	Type	Height Above the Ground (m)	Direction (deg.)	Location	Length of Coaxial Feeder (m)	Forward Power (W)	Reflected Power (W)
09:00	CARMEN	19.0	H	8 ELE YAGI	7.0	30	Iba Weather Station	25 (8D–2V) 1 (5D–2V)	H	8 ELE YAGI	15.0	220	FFS Sub-Center	25 (8D–2V) 1 (5D–2V)	24.2	0.2
		18.7									14.0					
		18.5									13.0					
		17.2									12.0					
		16.5									11.0					
		15.7									10.0					
		14.0									9.0					
		13.7									8.0					
		14.2									7.0					
		12.2									6.0					
		10.2									5.0					
09:10		8.2									4.0					

Remarks

Transmitting Antenna Height at Carmen for Iba (down)

Max. 19.0 db, 15.0 m

CARMEN---IBA MEASURED FIELD STRENGTH OF VHF RADIO WAVE (7)

SKETCH OF MEASURING PLACE IN ——

Measured by Fujii, Suzuki & 4 others

Week Day Month Year
Date: (Fri.) 27 Nov. 1981 (Fair)

Frequency 150.20 MHz, MHz

Measured at CARMEN Height (MSL) 25 m

Transmitted at IBA Height (MSL) 4 m

Instrument ML 518A

Transmitter JHV-225

Time	Transmitting Station	Measured Field Strength Value (db)	Receiving Antenna						Transmitting Antenna						Output Power	
			Polarization	Type	Height Above the Ground (m)	Direction (deg.)	Location	Length of Coaxial Feeder (m)	Polarization	Type	Height Above the Ground (m)	Direction (deg.)	Location	Length of Coaxial Feeder (m)	Forward Power (W)	Reflected Power (W)
09:15	IBA	17.2	H	8 ELE YAGI	15.0	220	FFS Sub-Center	25 (8D-2V) 1 (5D-2V)	H	8 ELE YAGI	3.8	30	Iba Weather	25 (8D-2V) 1 (5D-2V)	27.5	0.8
		16.7			(The Best Receiving						4.0		Station			
		18.7			Height)						5.0					
		19.7									6.0					
		20.7									7.0					
		20.2									8.0					
		18.7									9.0					
		16.2									10.0					
		10.2									11.0					
		- 4.8									12.0					
		10.7									13.0					
		15.7									14.0					
09:24		17.7									15.0					

Remarks

Transmitting Antenna Height at Iba for Carmen (up)

Max. 20.7 db, 7.0 m

CARMEN—IBA MEASURED FIELD STRENGTH OF VHF RADIO WAVE (8)

SKETCH OF MEASURING PLACE IN ——

Date: Week (Fri.) Day 27 Month Nov. Year 1981 (Fair)

Measured by Fujii, and 5 the others

Frequency 150.20 MHz, MHz

Measured at CARMEN Height (MSL) 25 m

Transmitted at IBA Height (MSL) 4 m

Instrument ML 518A

Transmitter JHV–225

Time	Transmitting Station	Measured Field Strength Value (db)	Receiving Antenna						Transmitting Antenna						Output Power	
			Polarization	Type	Height Above the Ground (m)	Direction (deg.)	Location	Length of Coaxial Feeder (m)	Polarization	Type	Height Above the Ground (m)	Direction (deg.)	Location	Length of Coaxial Feeder (m)	Forward Power (W)	Reflected Power (W)
09:24	IBA	15.7	H	8 ELE YAGI	15.0	220	FFS Sub-Center	25 (8D–2V) 1 (5D–2V)	H	8 ELE YAGI	14.0	30	Iba Weather	25 (8D–2V) 1 (5D–2V)	27.5	0.8
		9.7									13.0		Station			
		- 2.8									12.0					
		10.2									11.0					
		15.2									10.0					
		18.9									9.0					
		19.7									8.0					
		* 20.2									7.0					
		19.7									6.0					
		19.2									5.0					
		16.7									4.0					
09:30		16.2									3.8					

Remarks

Transmitting Antenna Height at Iba for Carmen (down)

Max. 20.2 db, 7.0 m

CARMEN—IBA MEASURED FIELD STRENGTH OF VHF RADIO WAVE (9)

SKETCH OF MEASURING PLACE IN ——

Measured by Fujii, and 5 the others

Week Day Month Year

Date: (Fri.) 27 Nov. 1981 (Fair)

Frequency 150.20 MHz, MHz

Measured at CARMEN Height (MSL) 25 m

Transmitted at IBA Height (MSL) 4 m

Instrument ML 518A

Transmitter JHV–225

Time	Transmitting Station	Measured Field Strength Value (db)	Receiving Antenna						Transmitting Antenna						Output Power	
			Polarization	Type	Height Above the Ground (m)	Direction (deg.)	Location	Length of Coaxial Feeder (m)	Polarization	Type	Height Above the Ground (m)	Direction (deg.)	Location	Length of Coaxial Feeder (m)	Forward Power (W)	Reflected Power (W)
09:33	IBA	19.7	H	8 ELE YAGI	15.0	220	FFS Sub-Center	25 (8D–2V) 1 (5D–2V)	H	8 ELE YAGI	7.0	30	Iba Weather Station	25 (8D–2V) 1 (5D–2V)	27.5	0.8
		19.7			14.0						(The Best Transmitting Height)					
		18.4			13.0											
		17.7			12.0											
		18.2			11.0											
		16.2			10.0											
		15.7			9.0											
		15.2			8.0											
		13.7			7.0											
		13.7			6.0											
		12.2			5.0											
		11.2			4.0											
09:40		11.2			3.8											

Remarks

Receiving Antenna Height at Carmen for Iba (down)

Max. 19.7 dB, 14.0 – 15 m

CARMEN—IBA MEASURED FIELD STRENGTH OF VHF RADIO WAVE (10)

SKETCH OF MEASURING PLACE IN ——

Measured by Fukui, and 5 the others

Date: Week (Fri.) Day 27 Month Nov. Year 1981 (Fair)

Frequency 150.20 MHz, MHz

Measured at CARMEN Height (MSL) 25 m

Transmitted at IBA Height (MSL) 4 m

Instrument ML 518A

Transmitter JHV–225

Time	Transmitting Station	Measured Field Strength Value (db)	Receiving Antenna						Transmitting Antenna						Output Power	
			Polarization	Type	Height Above the Ground (m)	Direction (deg.)	Location	Length of Coaxial Feeder (m)	Polarization	Type	Height Above the Ground (m)	Direction (deg.)	Location	Length of Coaxial Feeder (m)	Forward Power (W)	Reflected Power (W)
09:40	IBA	9.2	H	8 ELE YAGI	4.0	220	FFS Sub-Center	25 (8D–2V) 1 (5D–2V)	H	8 ELE YAGI	7.0	30	Iba Weather	25 (8D–2V) 1 (5D–2V)	27.5	0.8
		11.2			5.0						(The Best Transmitting		Station			
		10.7			6.0						Height)					
		12.7			7.0											
		12.2			8.0											
		14.2			9.0											
		14.7			10.0											
		15.7			11.0											
		16.7			12.0											
		16.7			13.0											
		17.7			14.0											
09:45		* 18.7			15.0											

Remarks

Receiving Antenna Height at Carmen for Iba (up)

Max. 18.7 dB, 15.0 m

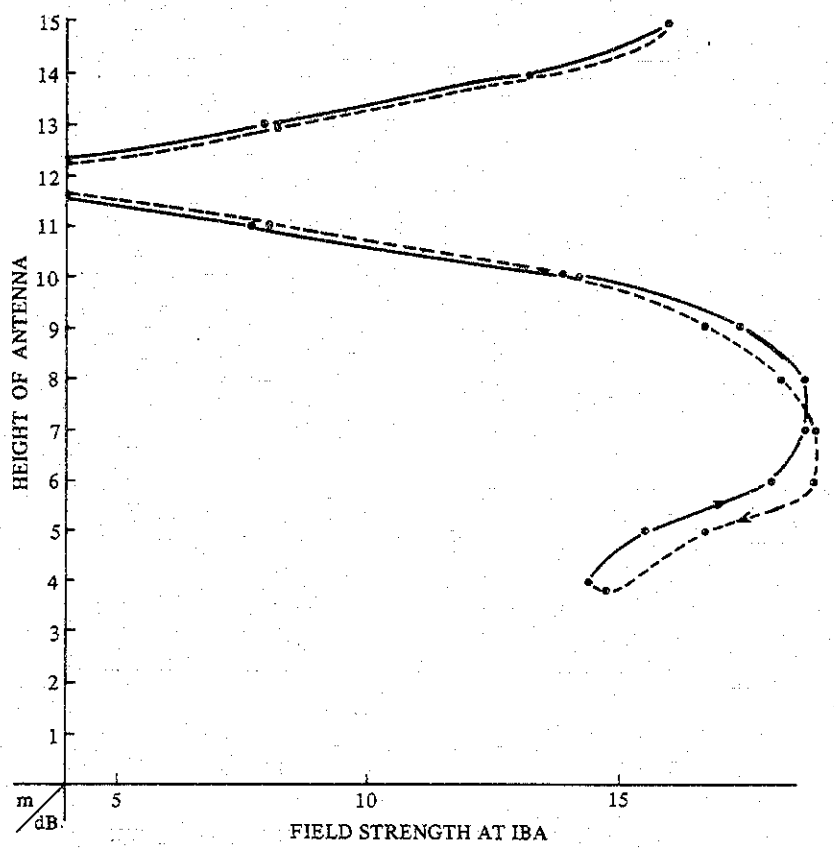
N = - 15 dB
C = - 51 dB
S = - 8 dB

Tx at Iba H = 7.0 [m]
Rx at Carmen H = 15.0 [m]

S/N = 43 dB

CARMEN – IBA HEIGHT PATTERN OF FIELD STRENGTH

TRANSMITTING POWER
FREQUENCY 150.20 MHz FORWORD 24.2 W.
ANTENNA 8 ELE Ⓨ D. REFLECTED 0.2 W.



RECEIVING ANTENNA HEIGHT AT IBA FOR CARMEN

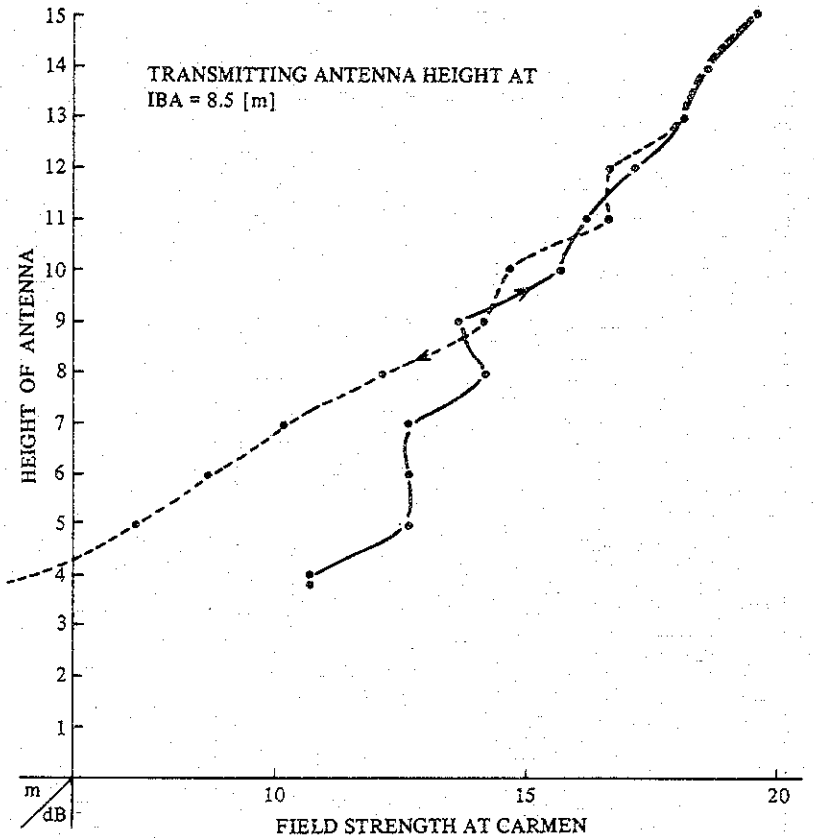
F.S.M.

INSTRUMENT ML 518A (ANRITSU)

MEASURED DATE D 27 M NOV. Y 1981 MEASURER FUKUI, IGARASHI

CARMEN – IBA HEIGHT PATTERN OF FIELD STRENGTH

TRANSMITTING POWER
FREQUENCY 150.20 MHz FORWORD 27.5 W.
ANTENNA 8 ELE Ⓨ D. REFLECTED 0.8 W.



RECEIVING ANTENNA HEIGHT AT CARMEN FOR IBA

F.S.M.

INSTRUMENT ML 518A (ANRITSU)

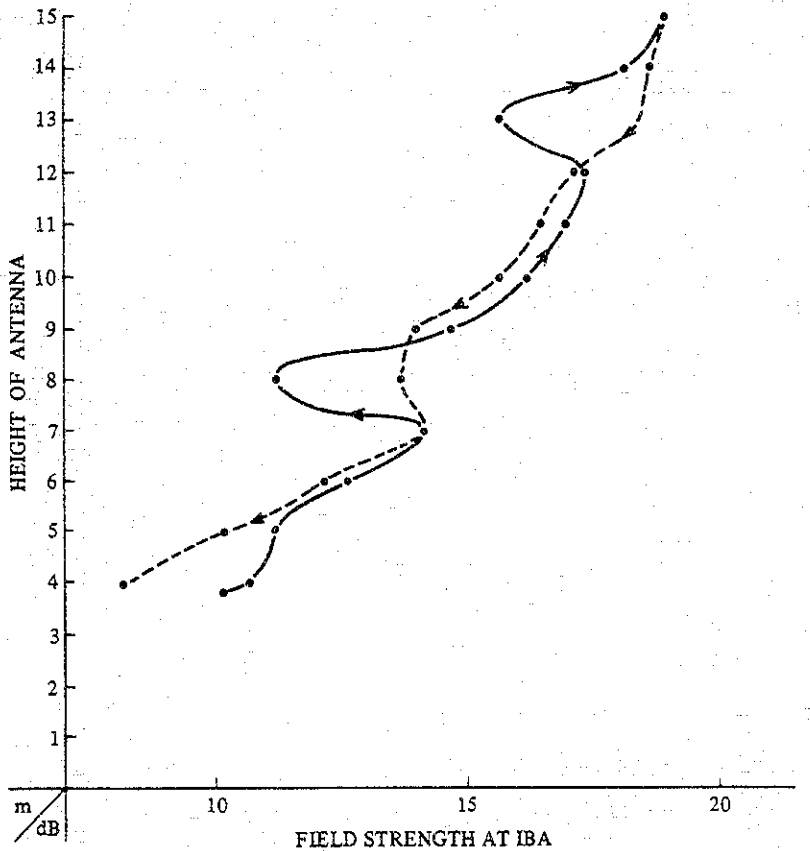
MEASURED DATE D 27 M NOV. Y 1981 MEASURER FUJII, SUZUKI

CARMEN – IBA HEIGHT PATTERN OF FIELD STRENGTH

TRANSMITTING POWER

FREQUENCY 150.20 MHz FORWORD 24.2 W.

ANTENNA 8 ELE Ⓨ D. REFLECTED 0.2 W.



TRANSMITTING ANTENNA HEIGHT AT CARMEN FOR IBA

F.S.M.

INSTRUMENT ML 518A (ANRITSU)

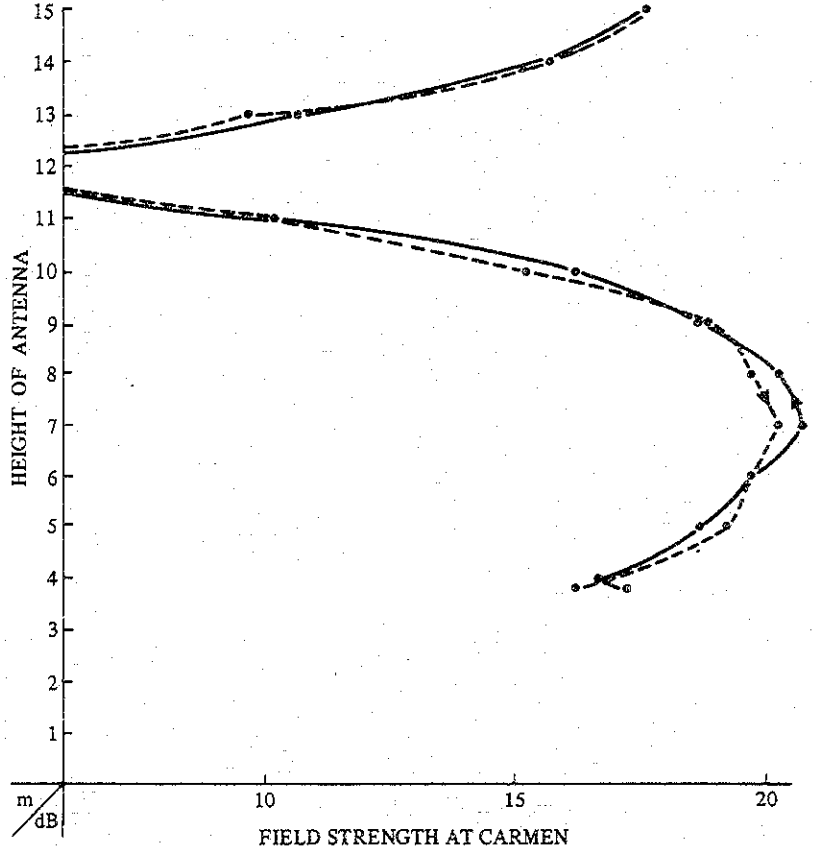
MEASURED DATE D 27 M NOV. Y 1981 MEASURER FUKUI, IGARASHI

CARMEN – IBA HEIGHT PATTERN OF FIELD STRENGTH

TRANSMITTING POWER

FREQUENCY 150.20 MHz FORWORD 27.5 W.

ANTENNA 8 ELE Ⓨ D. REFLECTED 0.8 W.



TRANSMITTING ANTENNA HEIGHT AT IBA FOR CARMEN

F.S.M.

INSTRUMENT ML 518A (ANRITSU)

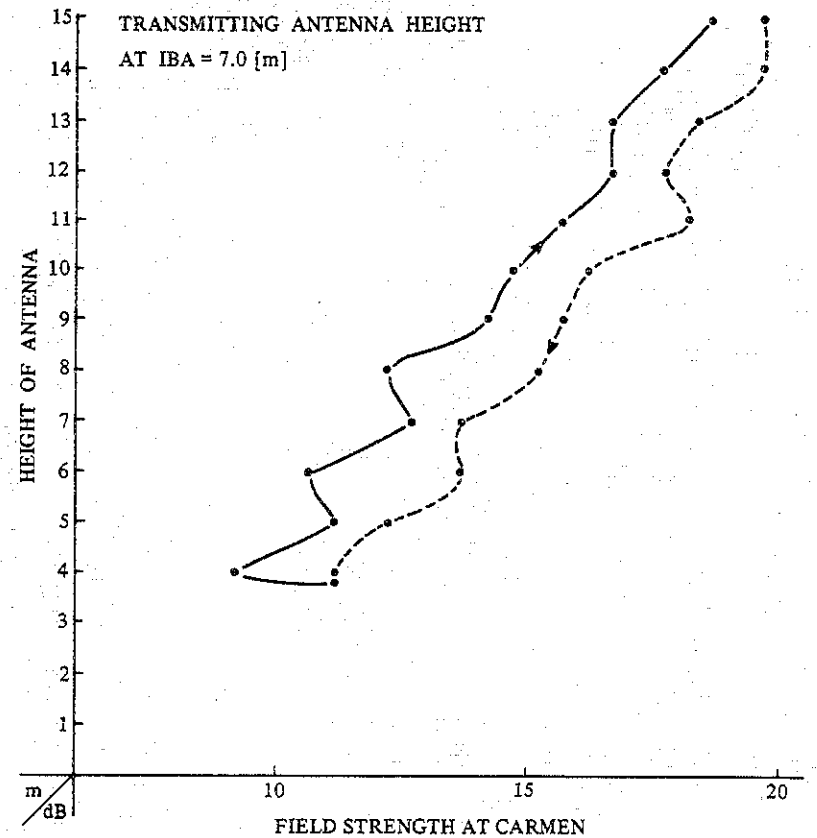
MEASURED DATE D 27 M NOV. Y 1981 MEASURER FUJII, SUZUKI

CARMEN – IBA HEIGHT PATTERN OF FIELD STRENGTH

FREQUENCY 150.20 MHz
ANTENNA 8 ELE Ⓨ D.

TRANSMITTING POWER
FORWORD 27.5 W.
REFLECTED 0.8 W.

TRANSMITTING ANTENNA HEIGHT
AT IBA = 7.0 [m]

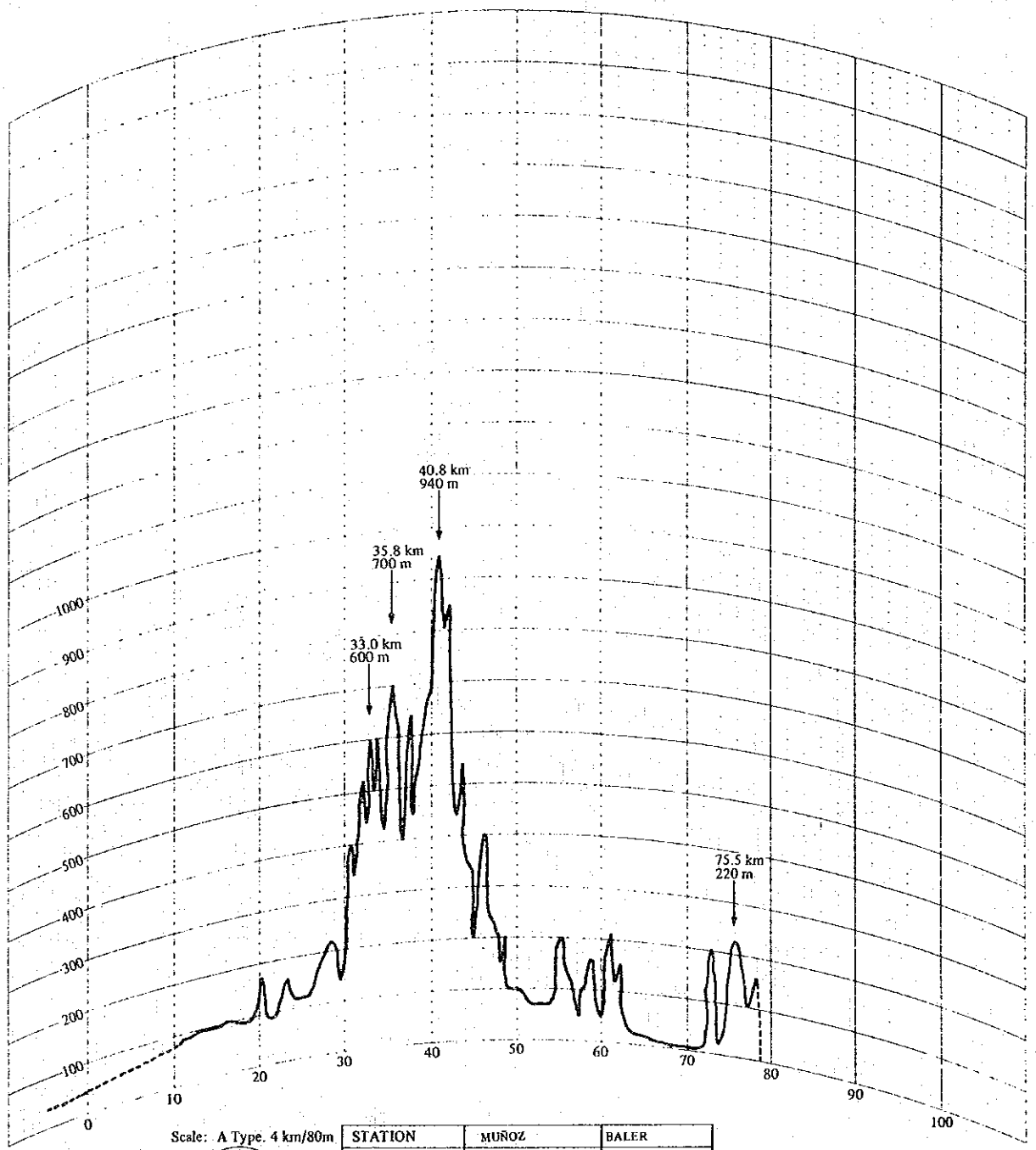


RECEIVING ANTENNA HEIGHT AT CARMEN FOR IBA

INSTRUMENT ML 518A (ANRITSU)

MEASURED DATE D 27 M NOV. Y 1981 MEASURER FUJII, SUZUKI

PROFILE



Scale: A Type. 4 km/80m
(B Type) 2 km/20m
C Type. 1 km/ 5m

STATION	MUÑOZ			BALER	
PLACE	SYNOPTIC STATION			RADER STATION	
	N	UNKNOWN		N	15° 45' 03''
	E			E	121° 37' 51''
HEIGHT(M.S.L)	40 m			155 m	
DISTANCE	78.0 km				

Date: 24 Nov. 1981

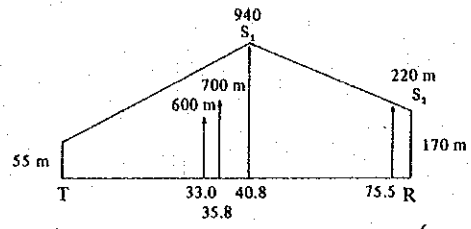
No. 7

MUÑOZ – BALER LEVEL DAIGRAM FOR DESIGNING THE RADIO COMMUNICATION CIRCUIT ( )

Number of Profile
( )

No. 7

Height (MSL)	40	m	Height (MSL)	155	m
Height of Antenna	15	m	Height of Antenna	15	m
Total Height	55	m	Total Height	170	m



(MUÑOZ) ← 78.0 → (BALER)

Items		Estimated Level Diagram			Level Diagram of Propergation Test		
		Calculated Value	Corrected Value	Remarks	Calculated Value	Measured Value	Remarks
Feeder Loss (Tx)	db	- 2.5		m			
Antenna Gain (Tx)	db	11.0					
Free Space Loss	db	- 113.8					
Additional Loss	S1 db	- 29.3	- 39.3				
	S2 db	- 7.0					
	S3 db						
	db	- 3.0					
Antenna Gain (Rx)	db	11.0					
Feeder Loss (Rx)	db	- 2.5					
Loss of Others	db						
Total Loss	db	- 136.1					
Transmitting Power	db/w	13.98					
Receiving Power	db/w	- 122.12					
Threshold Level	db/w	- 144.7		B KHz F db	(1) -)(2)		
Threshold Margin	db	22.58					
Threshold S/N	db	21.2		mo r/ch B KHz			
Standard S/N	db	43.78					
Estimated Fading Loss	db	- 7.8					
Frequency				150 MHz			

Measured Value of Field Strength	Antenna Height of	
	Receiver	Transmitter

Remarks: To be available theoretically

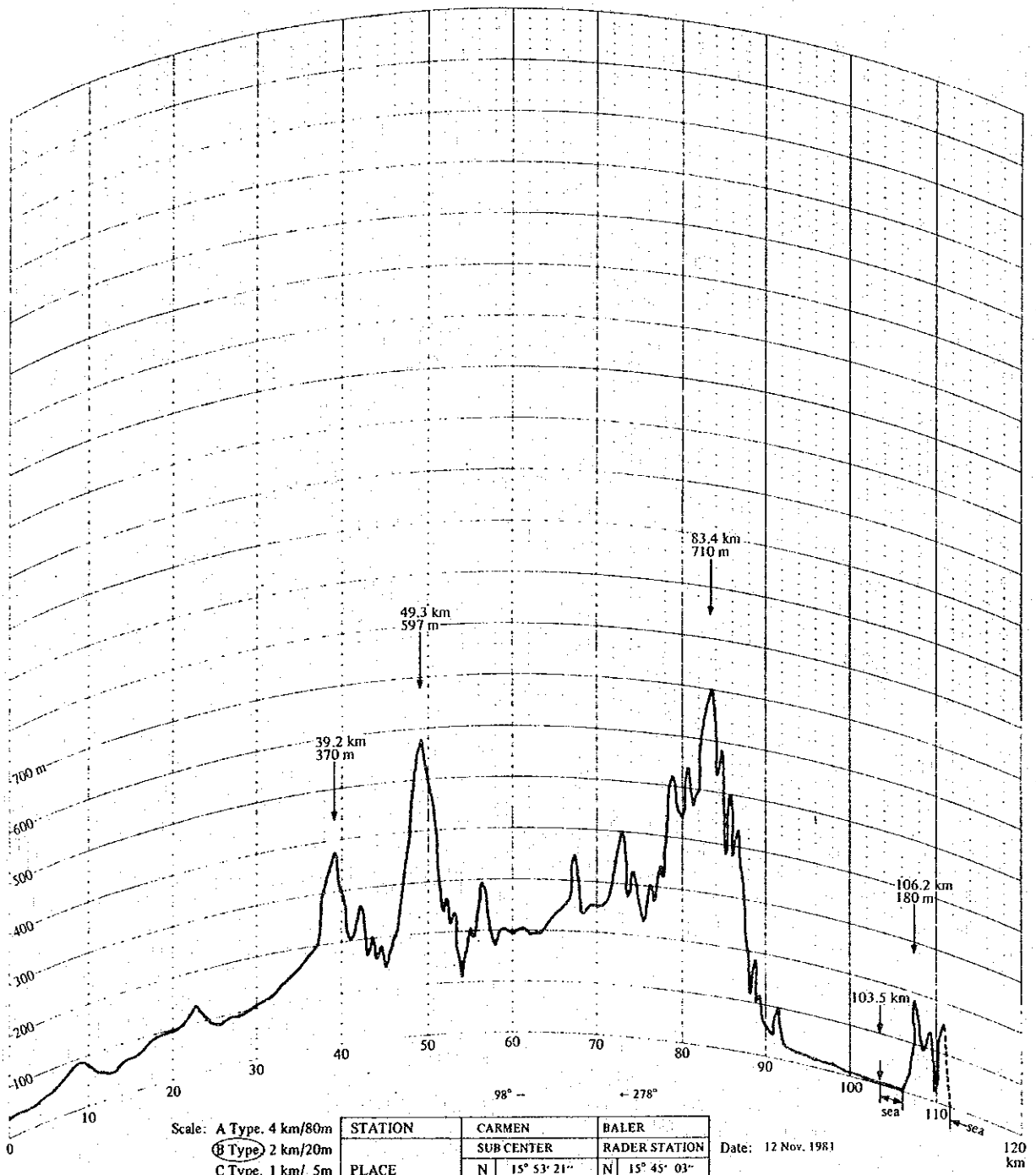
Measured Date:

Instrument:

Transmitter:

Noted Date: D 24 M Nov. Y 1981 Station:

PROFILE



Scale: A Type. 4 km/80m
(B Type) 2 km/20m
C Type. 1 km/. 5m

STATION	CARMEN		BALER	
PLACE	SUB CENTER		RADER STATION	
	N	15° 53' 21"	N	15° 45' 03"
	E	120° 36' 31"	E	121° 37' 51"
HEIGHT(M.S.L)	25 m		155 m	
DISTANCE	110.2 km			

Date: 12 Nov. 1981

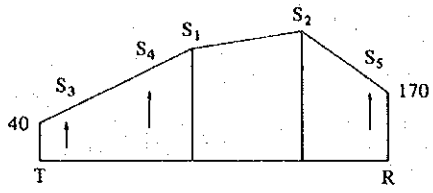
No. 8

CARMEN – BALER LEVEL DIAGRAM FOR DESIGNING THE RADIO COMMUNICATION CIRCUIT ( )

Number of Profile
( )

No. 8

Height (MSL)	25	m	Height (MSL)	155	m
Height of Antenna	15	m	Height of Antenna	15	m
Total Height	40	m	Total Height	170	m



(CARMEN) ⟵ 110.2 km ⟶ (BALER)

Items		Estimated Level Diagram			Level Diagram of Propergation Test		
		Calculated Value	Corrected Value	Remarks	Calculated Value	Measured Value	Remarks
Feeder Loss (Tx)	db	- 2.5		m			
Antenna Gain (Tx)	db	11.0					
Free Space Loss	db	- 116.8					
Additional Loss	S1 db	- 18.0					
	S2 db	- 24.7	- 52.7				
	S3 db	- 6.0 - 3.0					
	db	- 1.0					
Antenna Gain (Rx)	db	11.0					
Feeder Loss (Rx)	db	- 2.5		m			
Loss of Others	db						
Total Loss	db	- 152.5					
Transmitting Power	db/w	14.0		w			
Receiving Power	db/w	- 138.5					
					(1) db/μ	Measured Value of Field Strength	Antenna Height of
Threshold Level	db/w	- 144.7		B KHz F db	(2) db/μ		Receiver / Transmitter
Threshold Margin	db	6.2			db/μ		
Threshold S/N	db	21.2		mo r/ch B KHz			
Standard S/N	db	27.4					
Estimated Fading Loss	db	- 11.0					
Frequency				150 MHz			

Remarks: Not to be available link theoretically

Measured Date:

Instrument:

Transmitter:

Noted Date: D 12 M Nov. Y 1981 Station:

APPENDIX IV

RESULT OF THE SITE SURVEY FOR RADIO STATIONS

CONTENTS

Table of Survey Items for Radio Station (Field Survey) 1.

Station: DUCAN (APARRI RADAR) Surveyors: Date 1 November 81

Item		Judge-ment	Remarks
1. Picture of Route	1-1 Span Distances and Above the Sea Level		15 KM to APARRI 30 M
	1-2 Relative Figure of Established Radio Circuit		none (HF SSB station and radar station are existing)
	1-3 Outline of Direction Angle		90° for APARRI
2. Place of Candidacy	2-1 Established Station or New		The new 150 MHZ VHF link will be established
	2-2 Geology		gentle hilly terrain clayey
	2-3 Latitude and Longitude		18° 22′ N 121° 37′ E
	2-4 Above the Sea Level		30M
	2-5 Direction Angle		90° for APARRI
	2-6 Area of Site (Estimate)		Approximately 1 HA
	2-7 Owner (Private, Government-owned or public)		Government owned
	2-8 Topography and Geology etc. (Outline)		gentle hilly terrain, clayey
	2-9 Take-able Point of Water for Construction		available near the site
	2-10 Others		
3. Road	3-1 Present of Road (Path and Driveway)		partly rough road
	3-2 Length of the New Road Needed (km)		none

Item		Judge-ment	Remarks
	3-3 Length of Road to be repaired (km)		none
	3-4 Figure of Outline (include Established Road)		see the FIG attached
4. Tower	4-1 Established or New Establish		a 10 mH tower will be needed for the new 150MHZ VHF link
	4-2 Antenna Height from the Ground, or the roof		approximately 10 mH will be needed
	4-3 Need of Radome		none (established for RADAR antenna)
	4-4 Propriety of Antenna-Load		will be designed as the occasion demands
5. Power Supply, Electric Power Line	5-1 Length of Exclusive New Power Line (km)		none
	5-2 Obstructive Condition of Commercial Power		cut off more than several times a month for 1 to 2 hours a time on an average.
	5-3 Present State of Used Power in the Established Station		220V, 1ϕ, 60 HZ (220V, 1ϕ, 35 KVA 60HZ E.G. is existing)
6. Station House	6-1 Necessity of New, Extension and Established etc.		none
	6-2 Figure of Present Outline of Established House		see the FIG. attached
7. Propa-gation Path of Relations	7-1 Profile		no need
	7-2 Testing of Line of Sight		line of sight
	7-3 Outline of Topography around Reflection Points		
	7-4 Outline of Topography near the Station		gentle hilly
	7-5 Kinds of Propagation Path Models		free space propagation

Item		Judge-ment	Remarks
8. Vechiles	8-1 Necessity of Particular Cars		none
	8-2 Necessity of Car Sheds		none
9. Mainte-nance	9-1 Minimum time for Mainte-nance		approximately 4 hours from TUGUEGARAO
10. Informa-tion Figure of Road to the Sta-tion	10-1 Map around Place of Candi-dacy		see the FIG attached
	10-2 Map of Road to the Station		ditto
	10-3 Direction of Neighbouring Stations Established		none
11. Others	11-1 Amount of Rainfall in a Year		approximately 2250 mm
	11-2 Means of Wind-Speed and Main Wind Direction		NE/06 KNOTS
	11-3 Poisonous Gas		none
	11-4 Harmful Establishments		none
	11-5 Kinds of Near Radio Station Systems		none
	11-6 Communication Traffic of Relative Area		none
	11-7 Condition of Traffic		generally good
	11-8 Present Public Order		peaceful
	11-9 Others		

DUCAN RADAR (APARRI RADAR) STATION $S = \frac{1}{667}$

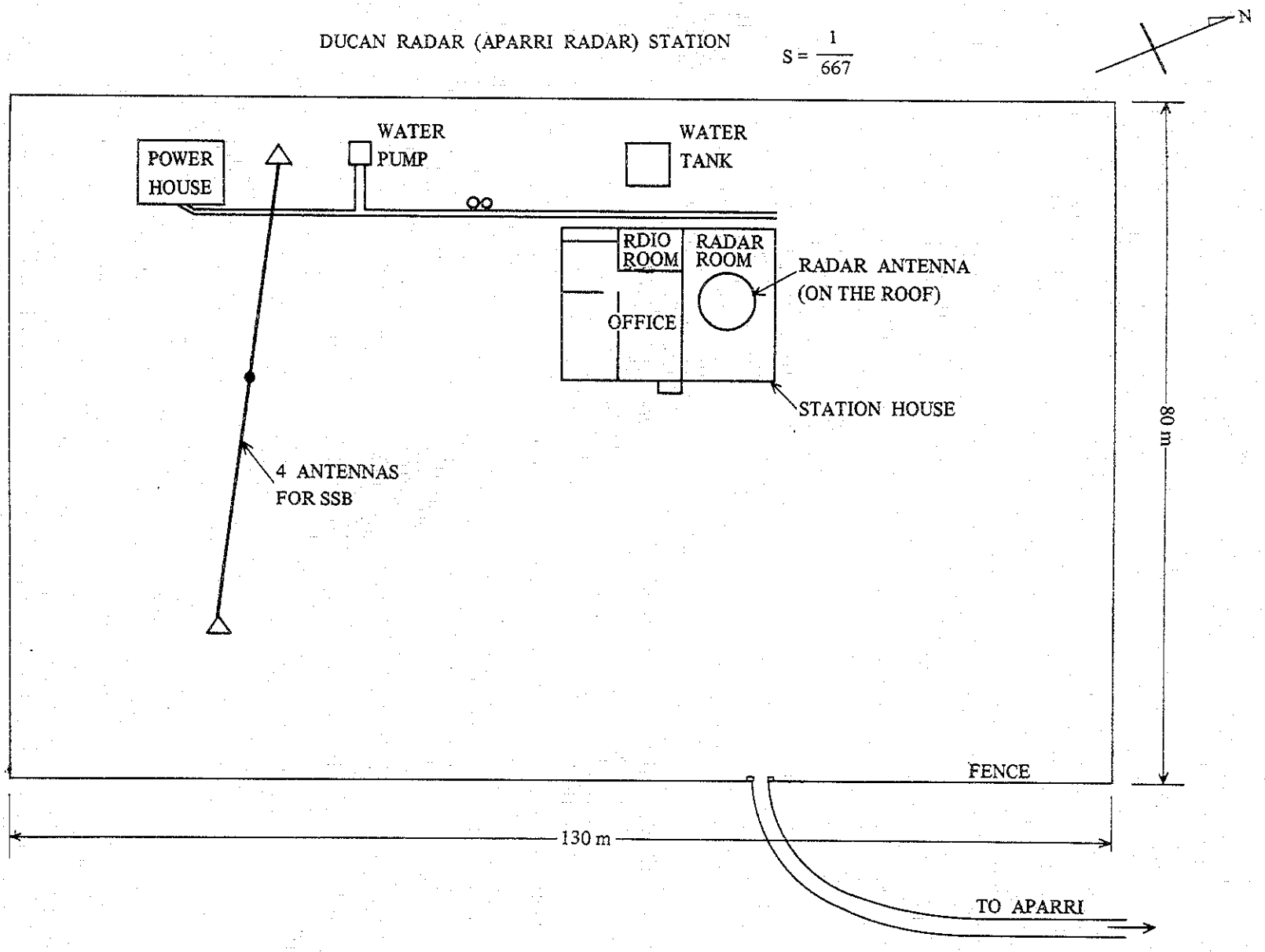


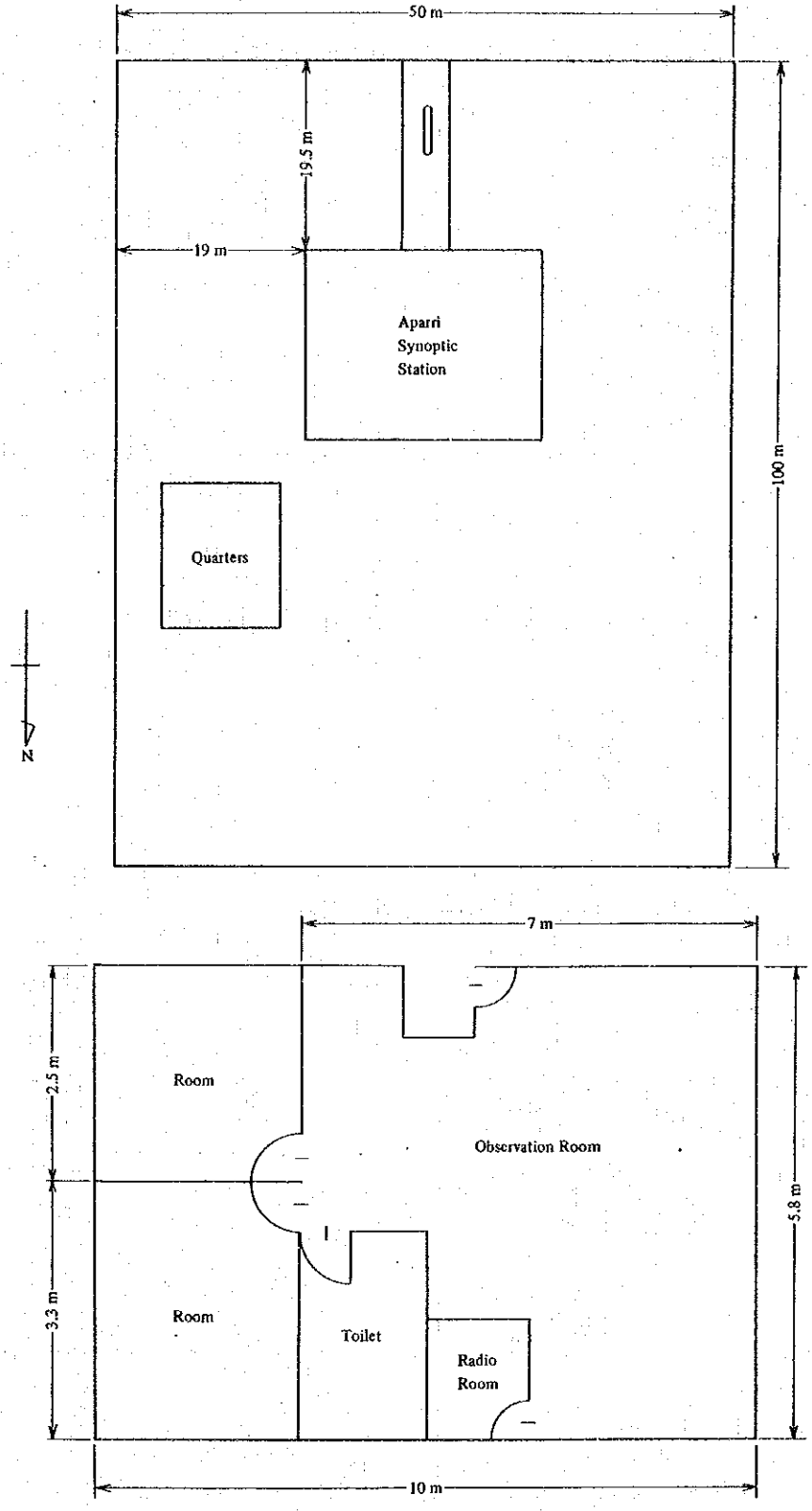
Table of Survey Items for Radio Station (Field Survey) 2.

Station: APARRI Surveyors: _____ Date 31 November 81

Item			Judge-ment	Remarks
1. Figure of Route	1-1	Span Distance and Above the Sea Level		79.4 KM to TUGUEGARAO 2M
	1-2	Relative Figure of Established Radio Circuit		none (a HF SSB station is existing)
	1-3	Outline of Direction Angle		350° for TUGUEGARAO
2. Place of Candidacy	2-1	Established Station or New		The new 150MHZ VHF link for DUCAN (APARRI RADAR) & TUGUEGARAO will be established
	2-2	Geology		plan terrain near the sea shore, sandy
	2-3	Latitude and Longitude		18° 21' 43"N 121° 37' 45"E
	2-4	Above the Sea Level		2M
	2-5	Direction Angle		350° for TUGUEGARAO
	2-6	Area of Site (Estimate)		approximately 1 HA
	2-7	Owner (Private, Government-owned or public)		government owned
	2-8	Topography and Geology etc (Outline)		plane terrain near the sea shore, sandy
	2-9	Take-able Point of Water for Construction		available near the site
	2-10	Others		
3. Road	3-1	Present of Road (Path and Driveway)		good

Item			Judge-ment	Remarks
	3-2	Length of the New Road Needed (km)		none
	3-3	Length of Road to be repaired (km)		none
	3-4	Figure of Outline (include Established Road)		see the FIG attached
4. Tower	4-1	Established or New Establish		Two 20 mH towers will be needed for the new 150 MHZ VHF link.
	4-2	Antenna Height from the Ground, or the roof		more than 15 mH will be needed
	4-3	Need of Radome		none
	4-4	Propriety of Antenna-Load		will be designed as the occasion demands
5. Power Supply, Electric Power Line	5-1	Length of Exclusive New Power Line (km)		none
	5-2	Obstructive Condition of Commercial Power		cut off more than several times a month, for 1 to 2 hours a time on an average.
	5-3	Present State of Used Power in the Established Station		220V, 1ϕ fluctuating voltage A.V.R. is needed
6. Station House	6-1	Necessity of New, Extension and Established etc.		none
	6-2	Figure of Present Outline of Established House		see the FIG attached
7. Propa-gation Path of Relations	7-1	Profile		see the profile for the new link TUGUEGARAO-APARRI
	7-2	Testing of Line of Sight		none mountain diffraction path to TUGUEGARAO
	7-3	Outline of Topography around Reflection Points		

Item			Judge-ment	Remarks
	7-4	Outline of Topograph near the Station		plane terrain near the seashore
	7-5	Kinds of Propagation Path Models		mountain diffraction path, see the profile for TUGUEGARAO-APARRI
8. Vehicles	8-1	Necessity of Particular Cars		none
	8-2	Necessity of Car Sheds		none
9. Mainte-nance	9-1	Minimum time for Mainte-nance		approximately 3 hours from TUGUEGARAO
10. Informa-tion Figure of Road to the Sta-tion	10-1	Map around Place of Candi-dacy		see the FIG attached
	10-2	Map of Road to the Station		see the FIG attached
	10-3	Direction of Neighbouring Stations Established		none
11. Others	11-1	Amount of Rainfall in a Year		2251.3 mm
	11-2	Means of Wind-Speed and Main Wind Direction		NE/6 KNOTS
	11-3	Poisonous Gas		none
	11-4	Harmful Establishments		none
	11-5	Kinds of Near Radio Station Systems		none
	11-6	Communication Traffic of Relative Area		none
	11-7	Condition of Traffic		good
	11-8	Present Public Order		peaceful
	11-9	Others		



FLOOR PLAN
APARRI SYNOPTIC STATION

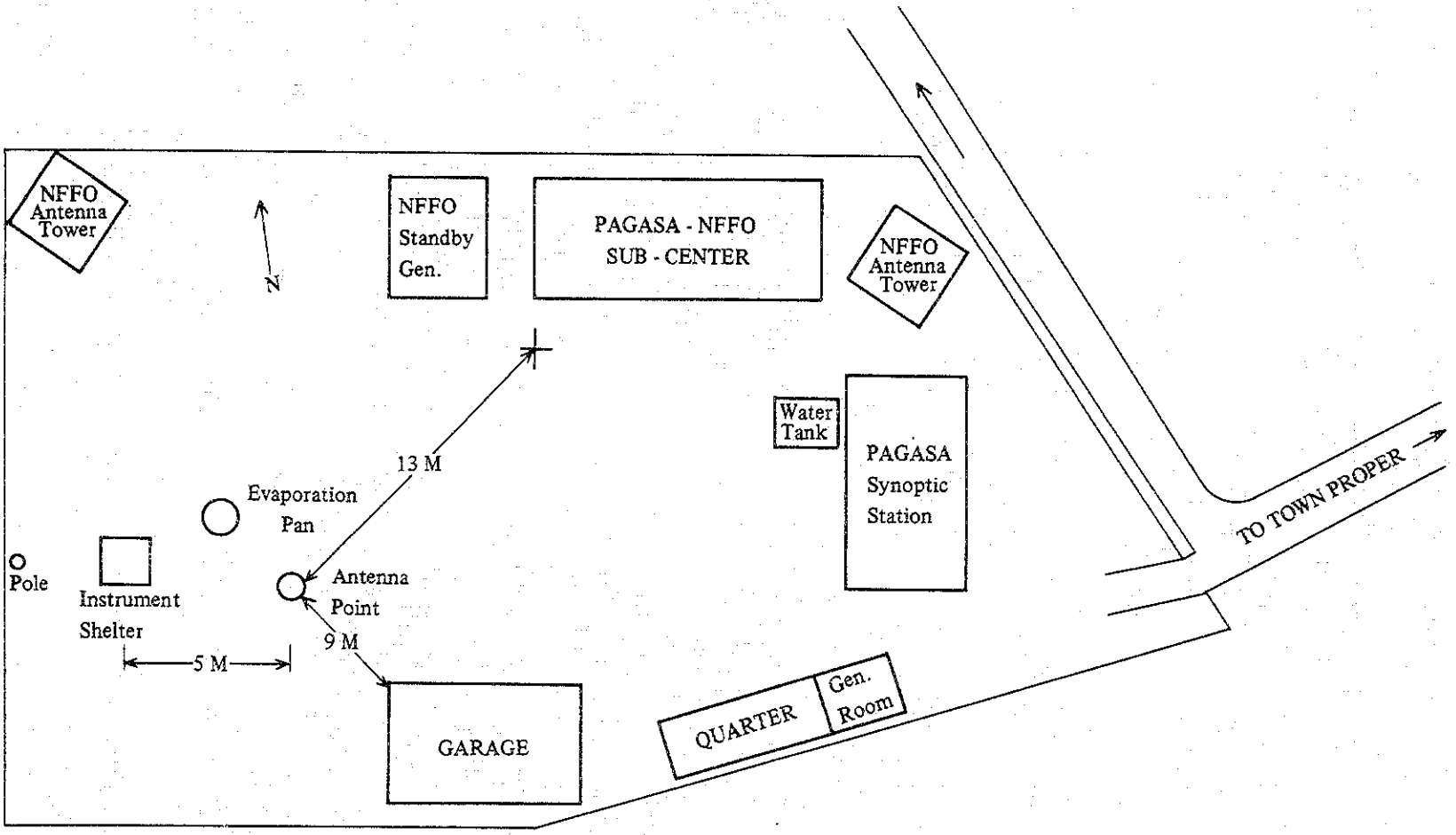
Table of Survey Items for Radio Station (Field Survey) 3.

Station: TUGUEGARAO Surveyors: Date 30 October 81

Item			Judge-ment	Remarks
1. Picture of Route	1-1	Span Distance and Above the Sea Level		79.4 KM to APARRI
	1-2	Relative Figure of Established Radio Circuit		the new 150MHZ VHF link will be connected with existing F.F.S (F.F.S. 400MHZ TROPOSCATTER for CARMEN ROSALES is existing)
	1-3	Outline of Direction Angle		355° for APARRI
2. Place of Candidacy	2-1	Established Station or New		The new 150MHZ VHF link will be established (F.F.S on 400 MHZ & 150 MHZ is existing)
	2-2	Geology		slightly rocky
	2-3	Latitude and Longitude		17° 38' 53" N 121° 45' 34"E
	2-4	Above the Sea Level		61M
	2-5	Direction Angle		355°for APARRI
	2-6	Area of Site (Estimate)		Approximately 0.4 HZ
	2-7	Owner (Private, Government-owned or Public)		Government-owned
	2-8	Topography and Geology etc. (Outline)		gentle hilly terrain, slightly rocky
	2-9	Take-able Point of Water for Construction		available at near the station
	2-10	Others		Ranked as the F.F.S SUB SENTER
3. Road	3-1	Present of Road (Path and Driveway)		good condition

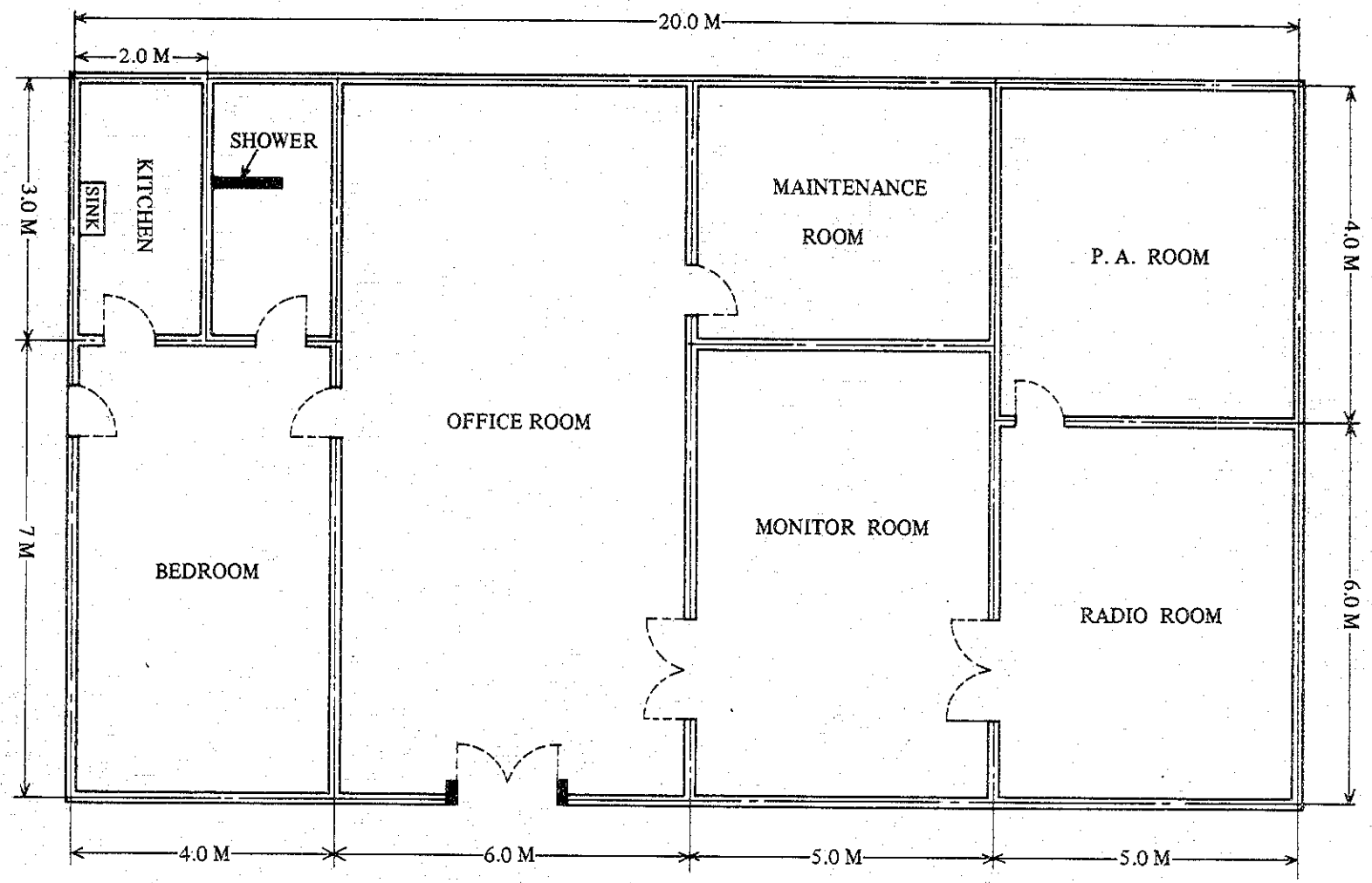
Item			Judgement	Remarks
	3-2	Length of the New Road Needed (km)		none
	3-3	Length of Road to be repaired (km)		none
	3-4	Figure of Outline (include Established Road)		see the FIG attached
4. Tower	4-1	Established or New Establish		The two 35M height towers are existing for FFS
	4-2	Antenna Height from the Ground, or the roof		The three 6M ϕ G.P. are existing The part less than 30M of the towers are available for the new 150 MHZ link
	4-3	Need of Radome		none
	4-4	Propriety of Antenna-Load		possible for YAGI antenna
5. Power Supply, Electric Power Line	5-1	Length of Exclusive New Power Line (km)		none
	5-2	Obstructive Condition of Commercial Power		cut off more than several times a month, for 2 hours a time on an average.
	5-3	Present State of Used Power in the Established Station		F.F.S on the 400MHZ 1KW TROPOSCATTER for CARMEN ROSALES will be operated in the near future. 220V 3ϕ 220 V 1ϕ (220V 30KVA 3ϕ dual stand-by E.G. is existing)
6. Station House	6-1	Necessity of New, Extension and Established etc.		The established for F.F.S is available
	6-2	Figure of Present Outline of Established House		see the FIG attached
7. Propagation Path of Relations	7-1	Profile		see the profile for the new link TUGUEGARAO-APARRI
	7-2	Testing of Line of Sight		none mountain diffraction path to APARRI

Item			Judge-ment	Remarks
	7-3	Outline of Topography around Reflection Points		
	7-4	Outline of Topography near the Station		gentle hilly terrain
	7-5	Kinds of Propagation Path Models		mountain diffraction path, see the profile for TUGUEGARAO-APARRI
8. Vehicles	8-1	Necessity of Particular Cars		none
	8-2	Necessity of Car Sheds		none
9. Maintenance	9-1	Minimum time for Maintenance		none
10. Information Figure of Road to the Station	10-1	Map around Place of Candidacy		see the FIG. attached
	10-2	Map of Road to the Station		ditto
	10-3	Direction of Neighbouring Stations Established		none
11. Others	11-1	Amount of Rainfall in a Year		1715.7 mm
	11-2	Means of Wind-Speed and Main Wind Direction		N/3 KNOTS
	11-3	Poisonous Gas		none
	11-4	Harmful Establishments		none
	11-5	Kinds of Near Radio Station Systems		F.F.S 400MHZ 1KW SS-PM 5/6 CH TROPOSCATTER for CARMEN ROSALES is in the site.
	11-6	Communication Traffic of Relative Area		2 CHS out of F.F.S are available for the new 150MHZ VHF link
	11-7	Condition of Traffic		smooth
	11-8	Present Public Order		peaceful
	11-9	others		



NFFO, TUGUEGARAO SUB CENTER
TUGUERAO, CAGAYAN

12 - 8 - 81
Garcia, E.h.



FLOOR PLAN:
NFFO, TUGUEGARAO SUB- CENTER

12 - 10 - 81
garcia, Eh.

Table of Survey Items for Radio Station (Field Survey) 4.

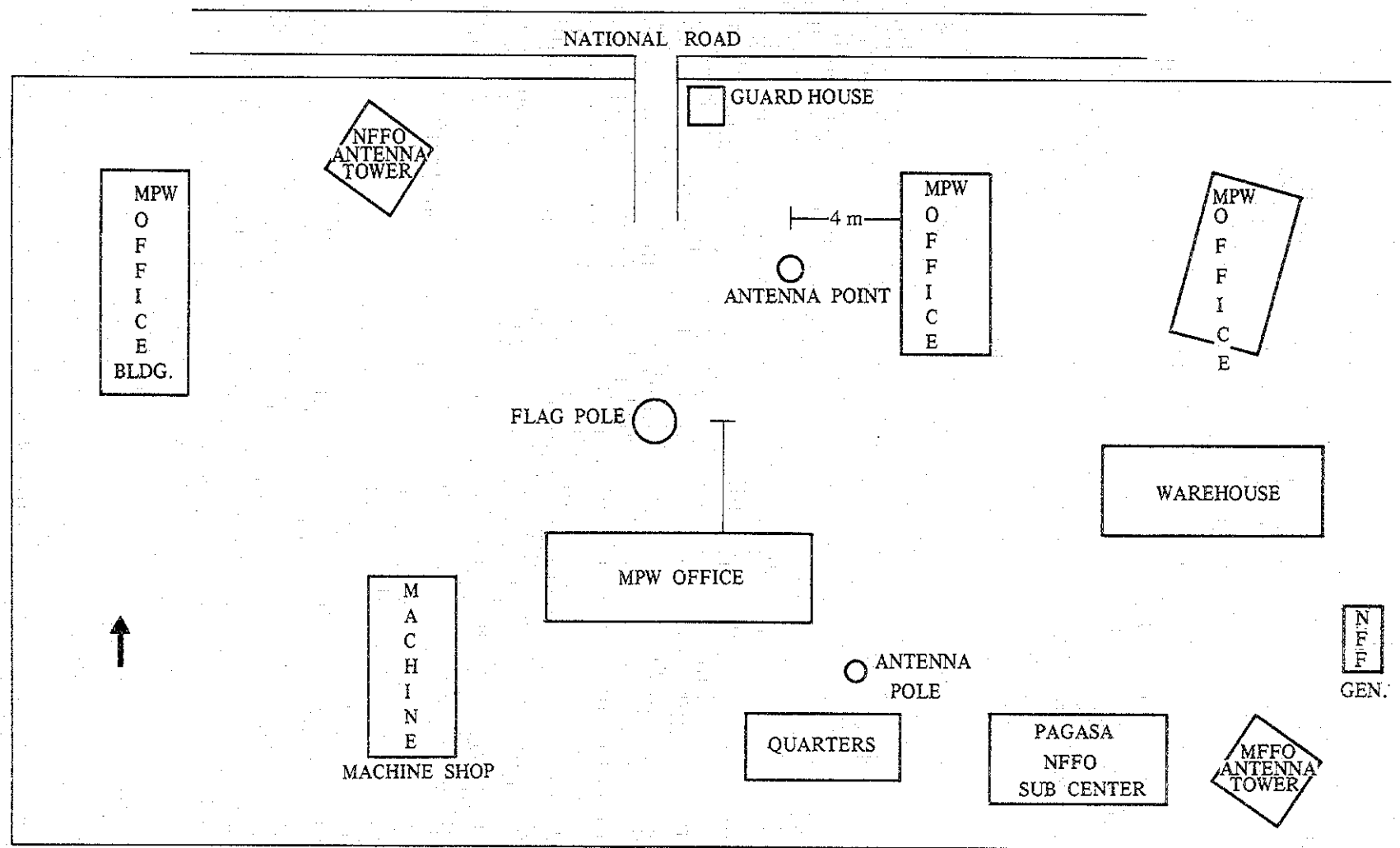
Station: CARMEN ROSALES Surveyors: _____ Date 27 November 81

Item			Judge-ment	Remarks
1. Picture of Route	1-1	Span Distance and Above the Sea Level		96.5 KM to IBA. 38 Km to DAGUPAN, 58 KM to BAGUIO 41 Km to MUÑOS 25 M
	1-2	Relative Figure of Established Radio Circuit		The new 150MHZ VHF link will be connected with existing F.F.S F.F.S 800 MHZ for SCIENCE GARDEN & 400 MHZ for TUGUEGARAO are existing
	1-3	Outline of Direction Angle		227° for IBA, 316° for DAGUPAN 5° for BAGUIO, 122° for MUÑOS
2. Place of Candidacy	2-1	Established Station or New		The new 150MHZ VHF link will be established (F.F.S on 800 MHZ & 400 MHZ is existing)
	2-2	Geology		plane terrain, clayey
	2-3	Latitude and Longitude		15° 53′ 21″ N 120° 36′ 31″ E
	2-4	Above the Sea Level		25 m
	2-5	Direction Angle		see the Item 1-3
	2-6	Area of Site (Estimate)		approximately 0.8HA including M.P.W.
	2-7	Owner (Private, Government-owned or public)		government owned
	2-8	Topography and Geology etc. (Outline)		plane terrain, clayey
	2-9	Take-able Point of Water for Construction		available in the site
	2-10	Others		ranked as the F.F.S SUB CENTER
3. Road	3-1	Present of Road (Path and Driveway)		good

Item			Judge-ment	Remarks
	3-2	Length of the New Road Needed (km)		none
	3-3	Length of Road to be repaired (km)		none
	3-4	Figure of Outline (include Established Road)		see the FIG attached
4. Tower	4-1	Established or New Establish		a 25m H tower & a .35m H tower are existing
	4-2	Antenna Height from the Ground, or the roof		a 10m ϕ G.P. & three 6m ϕ G.P. are existing The part less than 20m of each tower is available
	4-3	Need of Radome		none
	4-4	Propriety of Antenna-Load		possible for YAGI type antenna
5. Power Supply, Electric Power Line	5-1	Length of Exclusive New Power Line (km)		none
	5-2	Obstructive Condition of Commercial Power		cut off more than several times a month for 1 to 2 hours a time on an average.
	5-3	Present State of Used Power in the Established Station		F.F.S on the 400 MHZ 1KW TROPOSCATTER for TUGUEGARAO will be operated in near future. 220V, 3ϕ, 60HZ (220V, 40KVA, 3ϕ 60HZ E.G. for F.F.S is existing)
6. Station House	6-1	Necessity of New, Extension and Established etc.		none
	6-2	Figure of Present Outline of Established House		see the FIG attached
7. Propa-gation Path of Relations	7-1	Profile		see the profile for the new link CARMEN-IBA
	7-2	Testing of Line of Sight		none mountain diffraction path to IBA

Item			Judge-ment	Remarks
	7-3	Outline of Topography around Reflection Points		
	7-4	Outline of Topography near the Station		plane terrain
	7-5	Kinds of Propagation Path Models		mountain diffraction path see the profile for CARMEN ROSALES-IBA
8. Vehicles	8-1	Necessity of Particular Cars		none
	8-2	Necessity of Car Sheds		none
9. Maintenance	9-1	Minimum time for Maintenance		none
10. Information Figure of Road to the Station	10-1	Map around Place of Candidacy		see the FIG attached
	10-2	Map of Road to the Station		ditto
	10-3	Direction of Neighbouring Stations Established		none
11. Others	11-1	Amount of Rainfall in a Year		
	11-2	Means of Wind-Speed and Main Wind Direction		
	11-3	Poisonous Gas		none
	11-4	Harmful Establishments		none
	11-5	Kinds of Near Radio Station		F.F.S 400 MHZ, 1KW, SS-PM, 5/6 CH, TROPOSCATTER for TUGUEGARAO & 800 MHZ, 70 W, SS-PM, 11/12 CH TROPOSCATTER for SCIENCE GARDEN are in the site
	11-6	Communication Traffic of Relative Area		2 ch on 400 MHZ for TUGUEGARAO & 2 CH on 800 MHZ for SCIENCE GARDEN out of F.F.S. are available for the new 150MHZ VHF link

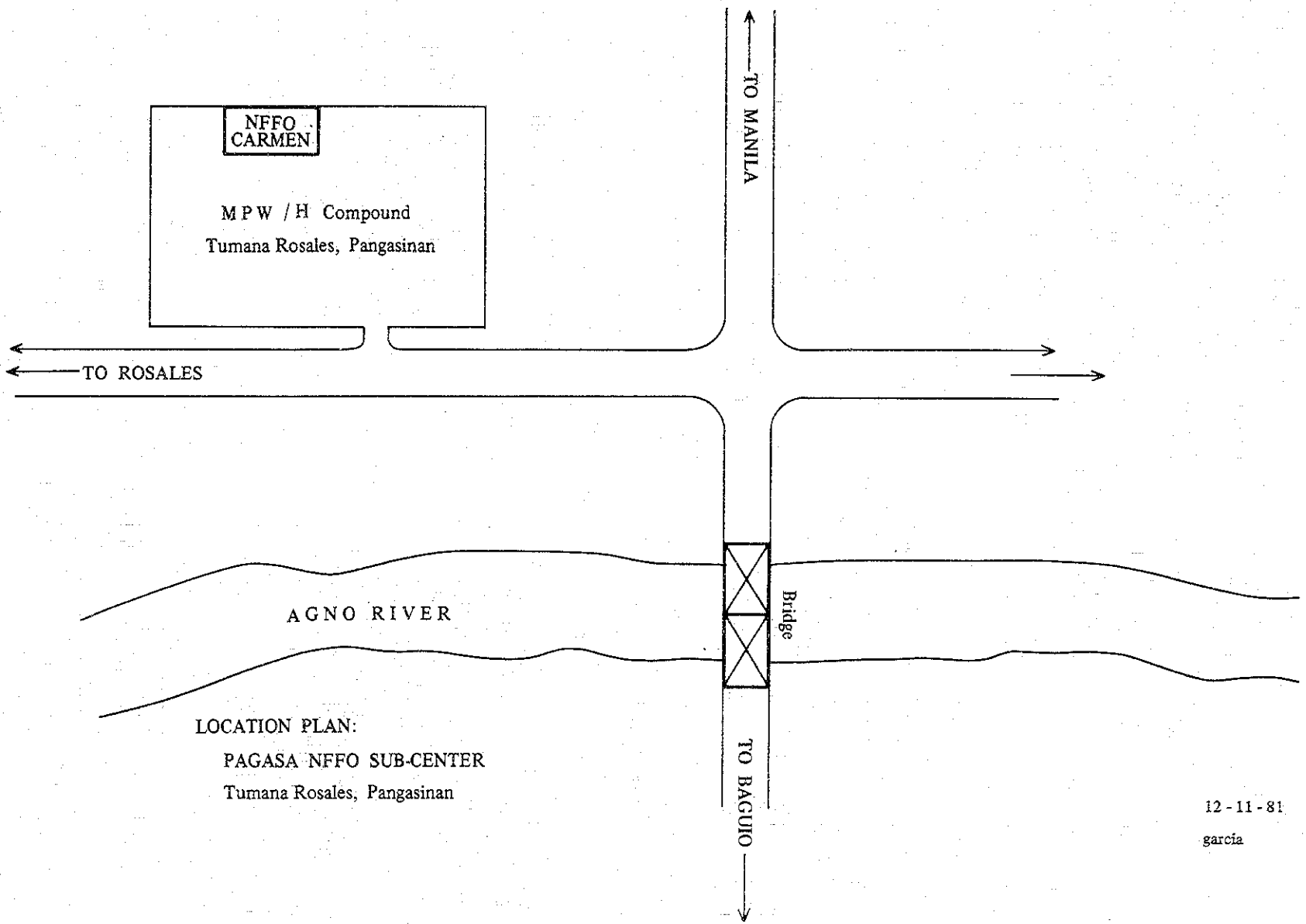
Item		Judge-ment	Remarks
	11-7 Condition of Traffic		good
	11-8 Present Public Order		peaceful
	11-9 Others		



NFFO, CARMEN ROSALES SUB CENTER
TUMANA, PANGASINAN

18-9-81

garcia, E.h.



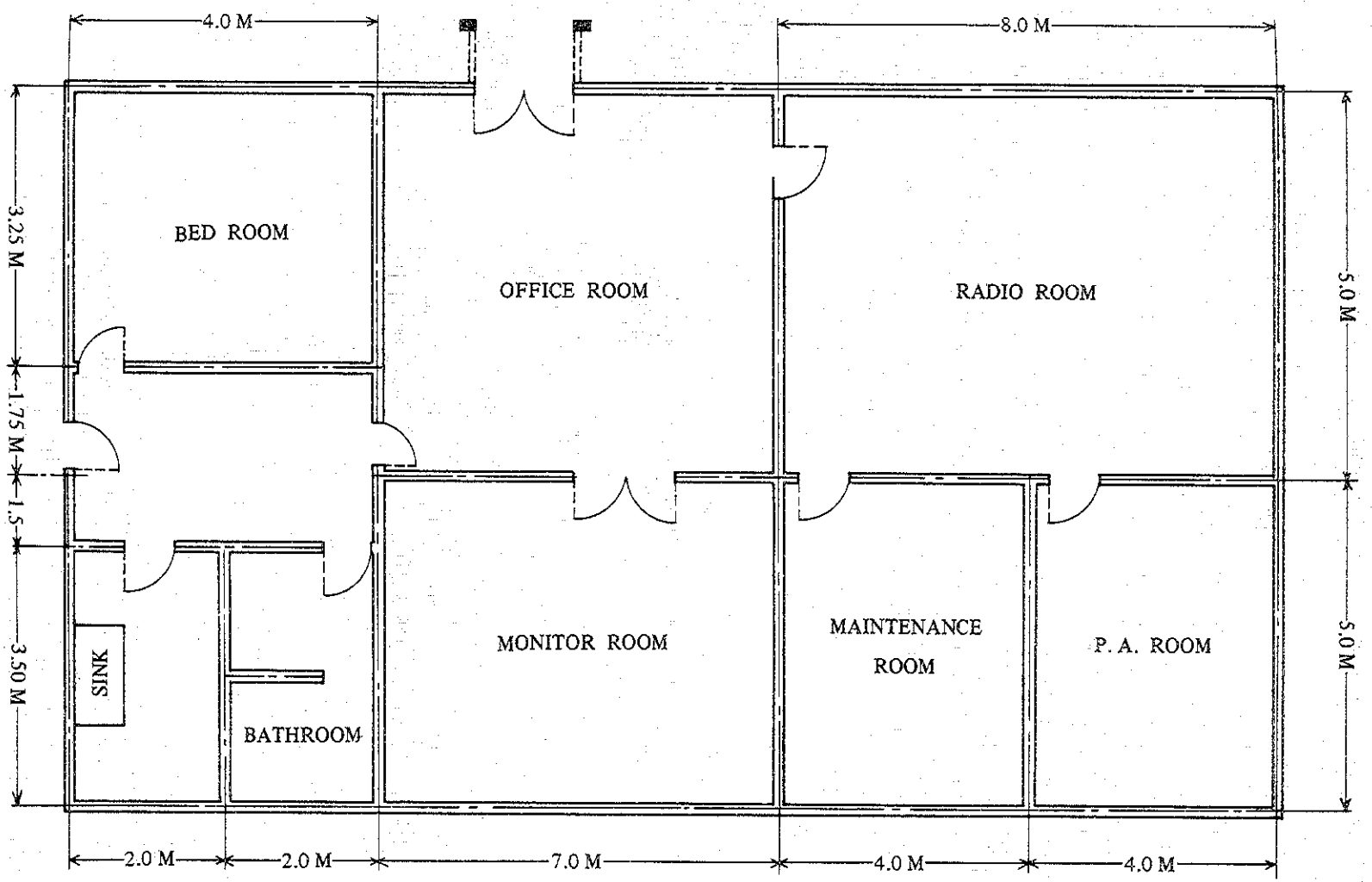
LOCATION PLAN:

PAGASA NFFO SUB-CENTER

Tumana Rosales, Pangasinan

12 - 11 - 81

garcia



FLOOR PLAN:
NFFO, CARMEN ROSALES

SUB-CENTER

12 - 10 - 81
garcia, E.h.

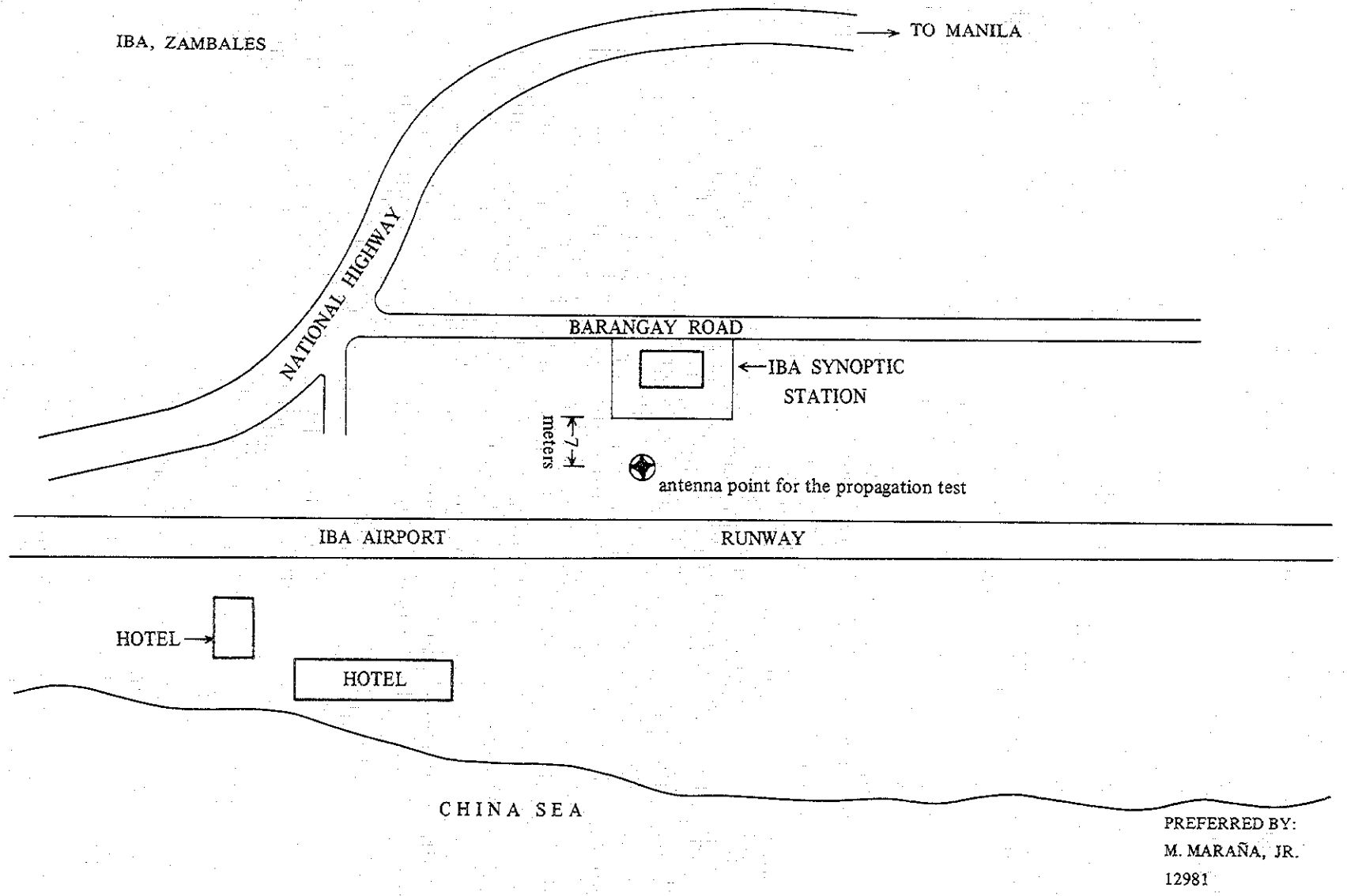
Table of Survey Items for Radio Station (Field Survey) 5.

Station: IBA Surveyors: Date 27 November 81

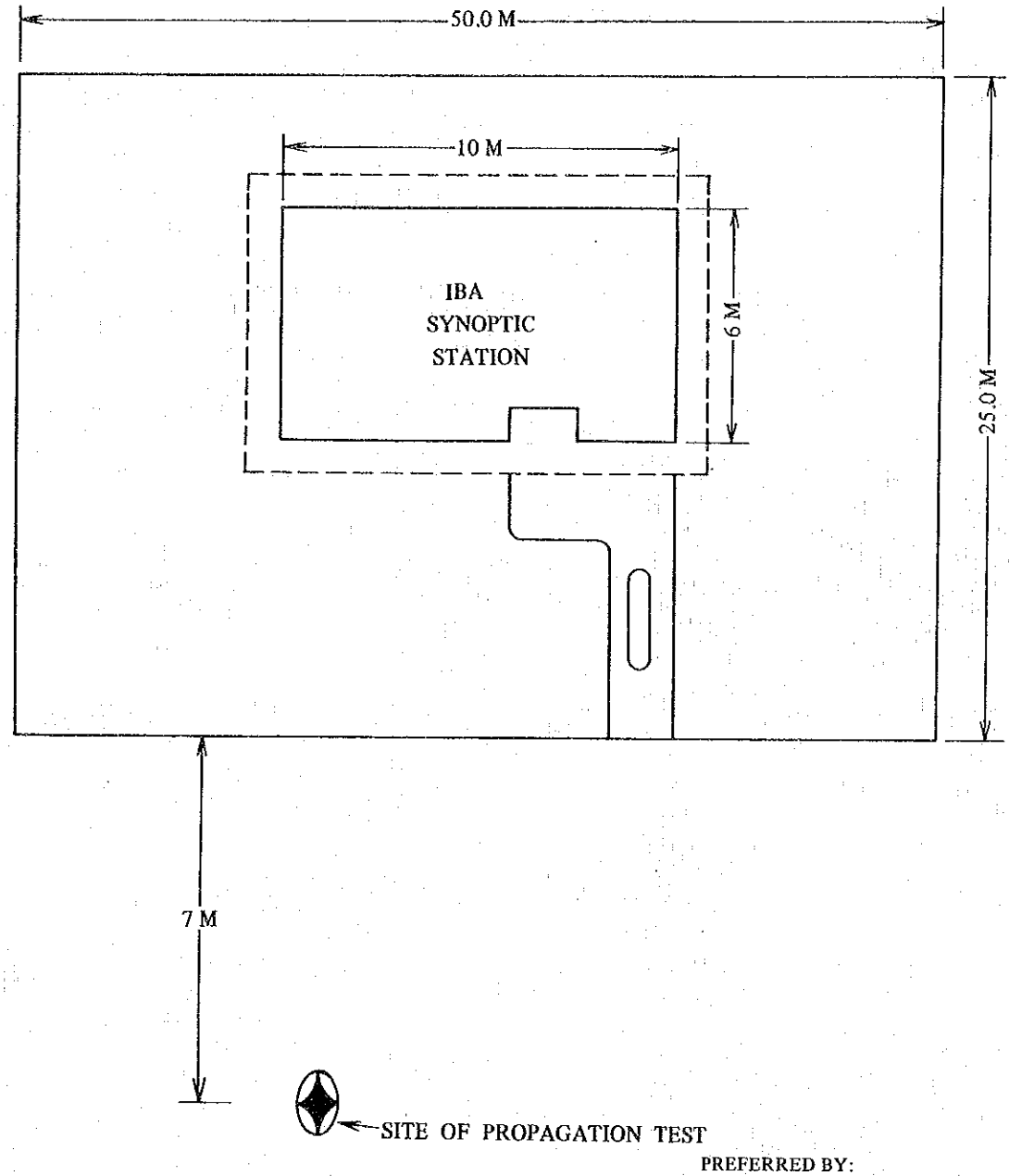
Item			Judge-ment	Remarks
1. Picture of Route	1-1	Span Distance and Above the Sea Level		96.5 KM to CARMEN ROSALES 4M
	1-2	Relative Figure of Established Radio Circuit		none (a HF SSB station is existing)
	1-3	Outline of Direction Angle		47° for CARMEN ROSALES
2. Place of Candidacy	2-1	Established Station or New		The new 150 MHZ VHF link for CARMEN ROSALES will be established
	2-2	Geology		flat terrain sandy
	2-3	Latitude and Longitude		15° 20' N 119° 58' E
	2-4	Above the Sea Level		4 M
	2-5	Direction Angle		47° for CARMEN ROSALES
	2-6	Area of Site (Estimate)		50M X 25M
	2-7	Owner (Private, Government-owned or public)		government owned
	2-8	Topography and Geology etc. (Outline)		flat terrain sandy
	2-9	Take-able Point of Water for Construction		available
	2-10	Others		
3. Road	3-1	Present of Road (Path and Driveway)		dirt road needs improvement
	3-2	Length of the New Road Needed (km)		none

Item			Judge-ment	Remarks
	3-3	Length of Road to be repaired (km)		500 m
	3-4	Figure of Outline (include Established Road)		see the FIG attached
4. Tower	4-1	Established or New Establish		a 20 mH tower will be needed for the new 150 MHZ VHF link
	4-2	Antenna Height from the Ground, or the roof		more than 15 mH will be needed
	4-3	Need of Radome		none
	4-4	Propriety of Antenna-Load		will be designed as the occasion demands
5. Power Supply, Electric Power Line	5-1	Length of Exclusive New Power Line (km)		none
	5-2	Obstructive Condition of Commercial Power		brown out sometimes
	5-3	Present State of Used Power in the Established Station		220V, 1ϕ 60 HZ fluctuating voltage AVR is needed
6. Station House	6-1	Necessity of New, Extension and Established etc.		none
	6-2	Figure of Present Outline of Established House		see the FIG attached
7. Propa-gation Path of Relations	7-1	Profile		see the profile for the new link CARMEN ROSALES-IBA
	7-2	Testing of Line of Sight		none mountain diffraction path to CARMEN ROSALES
	7-3	Outline of Topography around Reflection Points		
	7-4	Outline of Topography near the Station		flat terrain near the seashore, sandy

Item			Judge-ment	Remarks
	7-5	Kinds of Propagation Path Models		mountain diffraction path
8. Vehicles	8-1	Necessity of Particular Cars		none
	8-2	Necessity of Car Sheds		none
9. Maintenance	9-1	Minimum time for Maintenance		approximately 4 hours from PAGASA or CARMEN ROSALES
10. Information Figure of Road to the Station	10-1	Map around Place of Candidacy		see the FIG attached
	10-2	Map of Road to the Station		ditto
	10-3	Direction of Neighbouring Stations Established		none
11. Others	11-1	Amount of Rainfall in a Year		3672.2 mm
	11-2	Means of Wind-Speed and Main Wind Direction		W/4 KNOTS
	11-3	Poisonous Gas		none
	11-4	Harmful Establishments		none
	11-5	Kinds of Near Radio Station Systems		none
	11-6	Communication Traffic of Relative Area		none
	11-7	Condition of Traffic		smooth
	11-8	Present Public Order		peaceful
	11-9	Others		



PREFERRED BY:
M. MARAÑA, JR.
12981



PREFERRED BY:

M. MARAÑA, JR 121081

Table of Survey Items for Radio Station (Field Survey) 6.

Station: DILIMAN (QUEZON CITY) (DOMESTIC COMMUNICATION OFFICE) Surveyors: _____ Date 9 November 81

Item			Judge-ment	Remarks
1. Picture of Route	1-1	Span Distance and Above the Sea Level		line of sight to PAGASA CENTRAL OFFICE 48 M
	1-2	Relative Figure of Established Radio Circuit		The new Communication Sub Center for VISAYAS and MINDANAO will be established in the near future
	1-3	Outline of Direction Angle		170° for CEBU
2. Place of Candidacy	2-1	Established Station or New		The new OH station for Cebu will be established in the near future
	2-2	Geology		plane terrain ordinary soil
	2-3	Latitude and Longitude		
	2-4	Above the Sea Level		48M
	2-5	Direction Angle		170° for CEBU
	2-6	Area of Site (Estimate)		120m X 80m
	2-7	Owner (Private, Government-owned or public)		Government owned
	2-8	Topography and Geology etc. (Outline)		plane terrain, ordinary soil
	2-9	Take-able Point of Water for Construction		available
	2-10	Others		
3. Road	3-1	Present of Road (Path and Driveway)		good

Item			Judge-ment	Remarks
	3-2	Length of the New Road Needed (km)		none
	3-3	Length of Road to be repaired (km)		none
	3-4	Figure of Outline (include Established Road)		
4. Tower	4-1	Established or New Establish		Two 35 mH towers will be needed
	4-2	Antenna Height from the Ground, or the roof		more than 35 mH will be needed
	4-3	Need of Radome		none
	4-4	Propriety of Antenna-Load		will be designed as the occasion demands
5. Power Supply, Electric Power Line	5-1	Length of Exclusive New Power Line (km)		none
	5-2	Obstructive Condition of Commercial Power		stable
	5-3	Present State of Used Power in the Established Station		220V 1ϕ 60HZ stable
6. Station House	6-1	Necessity of New, Extension and Established etc.		The new station house including E.G. will be needed
	6-2	Figure of Present Outline of Established House		see the FIG attached
7. Propa-gation Path of Relations	7-1	Profile		none
	7-2	Testing of Line of Sight		none
	7-3	Outline of Topography around Reflection Points		
	7-4	Outline of Topography near the Station		plane terrain ordinary soil

Item			Judge-ment	Remarks
	7-5	Kinds of Propagation Path Models		Tropospheric scattering propagation path
8. Vehicles	8-1	Necessity of Particular Cars		none
	8-2	Necessity of Car Sheds		none
9. Maintenance	9-1	Minimum time for Maintenance		none
10. Information Figure of Road to the Station	10-1	Map around Place of Candidacy		see the FIG attached
	10-2	Map of Road to the Station		
	10-3	Direction of Neighbouring Stations Established		
11. Others	11-1	Amount of Rainfall in a Year		
	11-2	Means of Wind-Speed and Main Wind Direction		
	11-3	Poisonous Gas		none
	11-4	Harmful Establishments		none
	11-5	Kinds of Near Radio Station Systems		none
	11-6	Communication Traffic of Relative Area		none
	11-7	Condition of Traffic		good
	11-8	Present Public Order		peaceful
	11-9	Others		

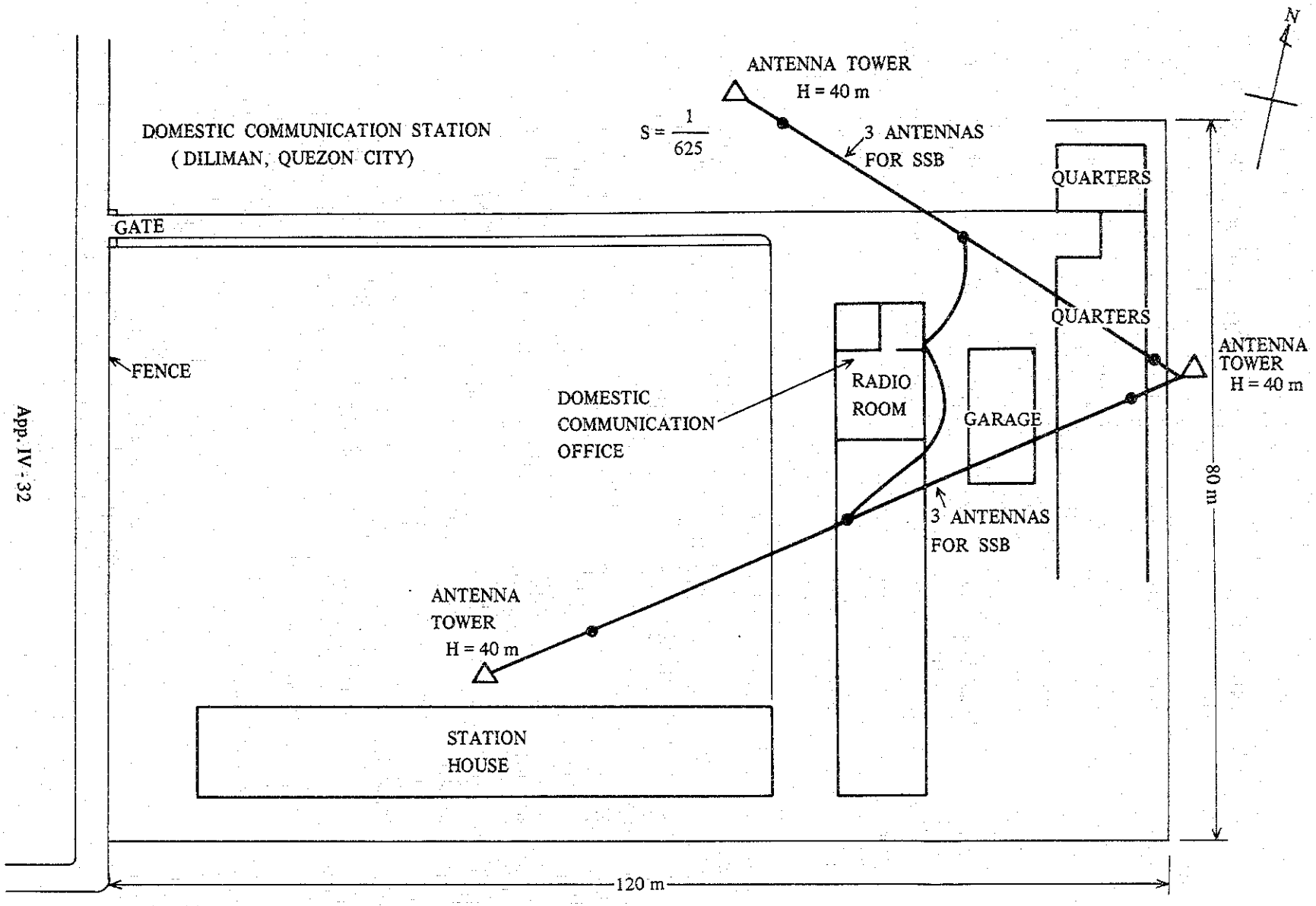

DOMESTIC COMMUNICATION STATION
(DILIMAN, QUEZON CITY)
S = 1/625
ANTENNA TOWER
H = 40 m
3 ANTENNAS
FOR SSB
QUARTERS
GATE
QUARTERS
FENCE
ANTENNA
TOWER
H = 40 m
DOMESTIC
COMMUNICATION
OFFICE
RADIO
ROOM
GARAGE
3 ANTENNAS
FOR SSB
ANTENNA
TOWER
H = 40 m
STATION
HOUSE
80 m
120 m
N

Table of Survey Items for Radio Station (Field Survey) 7.

Station: SCIENCEGARDEN (QUEZON CITY) Surveyors: Date 3 November 81

Item			Judge-ment	Remarks
1. Picture of Route	1-1	Span Distance and Above the Sea Level		line of sight to PAGASA CENTRAL OFFICE 48 M
	1-2	Relative Figure of Established Radio Circuit		The new 800 MHZ multiplex link for PAGASA C.O. will be established and connected with existing F.F.S. (F.F.S 800 MHZ TROPOSCATTER for CARMEN ROSALES and 7 GHZ multiplex link for TANAY are existing)
	1-3	Outline of Direction Angle		246° for PAGASA C.O.
2. Place of Candidacy	2-1	Established Station or New		existing station for F.F.S
	2-2	Geology		plane terrain, ordinary soil
	2-3	Latitude and Longitude		14° 38′ 45″ N PAGASA 14° 38′ 31″ N 121° 02′ 35″ E 121° 01′ 53″ E
	2-4	Above the Sea Level		48 M
	2-5	Direction Angle		246° for PAGASA C.O.
	2-6	Area of Site (Estimate)		see the FIG attached
	2-7	Owner (Private, Government-owned or public)		government owned
	2-8	Topography and Geology etc. (Outline)		plane terrain, ordinary soil
	2-9	Take-able Point of Water for Construction		available
	2-10	Others		

Item			Judge-ment	Remarks
3. Road	3-1	Present of Road (Path and Driveway)		good
	3-2	Length of the New Road Needed (km)		none
	3-3	Length of Road to be repaired (km)		none
	3-4	Figure of Outline (include Established Road)		see the FIG. attached
4. Tower	4-1	Established or New Establish		established
	4-2	Antenna Height from the Ground, or the roof		less than 20 mH will be needed for 800 MHZ multiplex link for PAGASA C.O.
	4-3	Need of Radome		none
	4-4	Propriety of Antenna-Load		possible for 800 MHZ YAGI type antenna
5. Power Supply, Electric Power Line	5-1	Length of Exclusive New Power Line (km)		none
	5-2	Obstructive Condition of Commercial Power		stable
	5-3	Present State of Used Power in the Established Station		220V, 1Ø 60HZ stable
6. Station House	6-1	Necessity of New, Extension and Established etc.		none
	6-2	Figure of Present Outline of Established House		see the FIG attached
7. Propa-gation Path of Relations	7-1	Profile		none (line of sight for PAGASA C.O.)
	7-2	Testing of LIne of Sight		ditto
	7-3	Outline of Topography around Reflection Points		

Item			Judge-ment	Remarks
	7-4	Outline of Topography near the Station		plane terrain ordinary soil
	7-5	Kinds of Propagation Path Models		line of sight propagation path
8. Vehicles	8-1	Necessity of Particular Cars		none
	8-2	Necessity of Car Sheds		none
9. Maintenance	9-1	Minimum time for Maintenance		10 minutes by car from PAGASA C.O.
10. Information Figure of Road to the Station	10-1	Map around Place of Candidacy		see FIG attached
	10-2	Map of Road to the Station		ditto
	10-3	Direction of Neighbouring Stations Established		
11. Others	11-1	Amount of Rainfall in a Year		
	11-2	Means of Wind-Speed and Main Wind Direction		
	11-3	Poisonous Gas		none
	11-4	Harmful Establishments		none
	11-5	Kinds of Near Radio Station Sysmtes		
	11-6	Communication Traffic of Relative Area		unknown
	11-7	Condition of Traffic		smooth
	11-8	Present Public Order		peaceful
	11-9	Others		The new proposed 800 MHZ multiplex link for PAGASA C.O. will be connected with existing FFS at NFFC

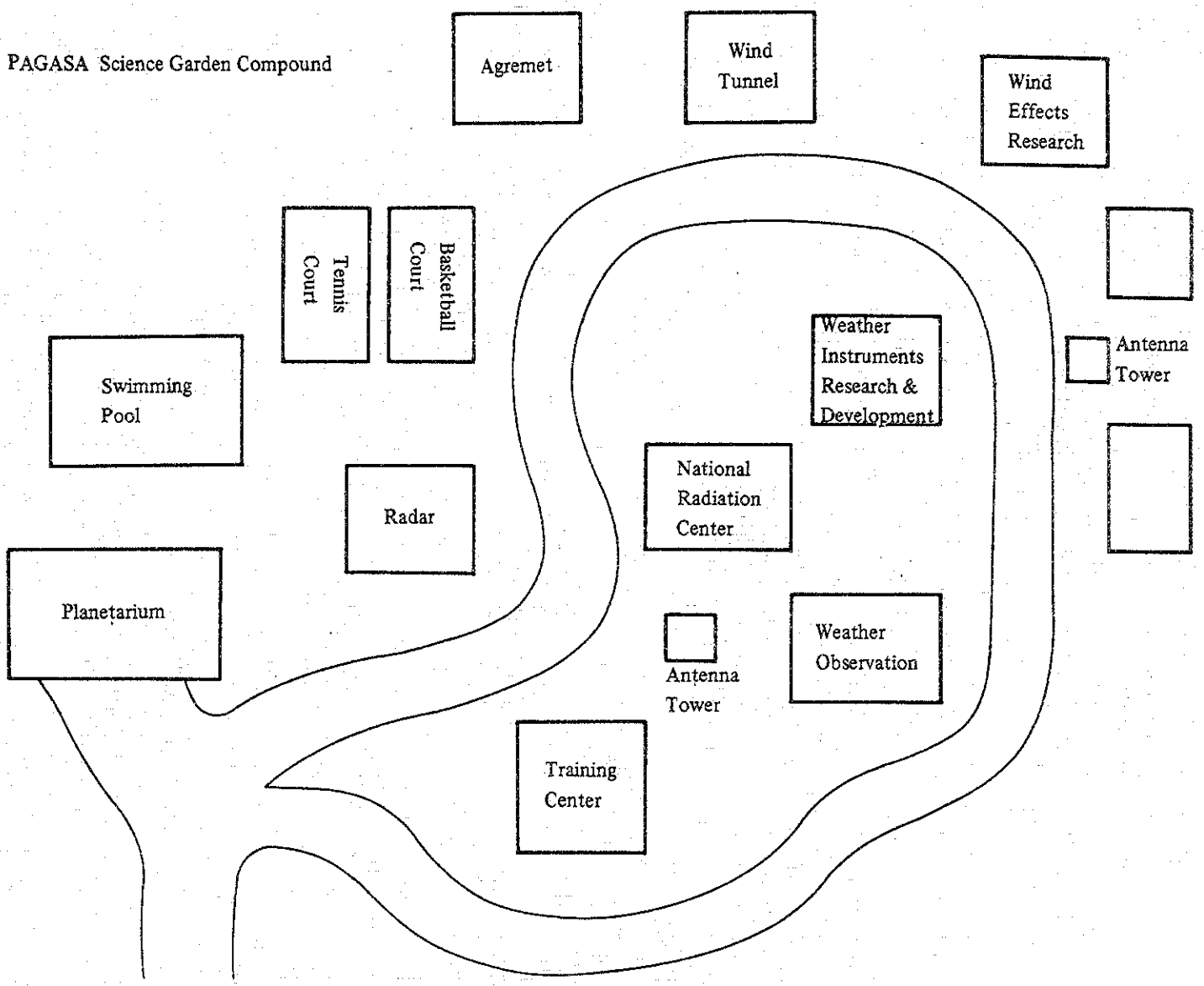

PAGASA Science Garden Compound
Agremet
Wind Tunnel
Wind Effects Research
Tennis Court
Basketball Court
Swimming Pool
Weather Instruments Research & Development
Antenna Tower
National Radiation Center
Radar
Planetarium
Weather Observation
Antenna Tower
Training Center

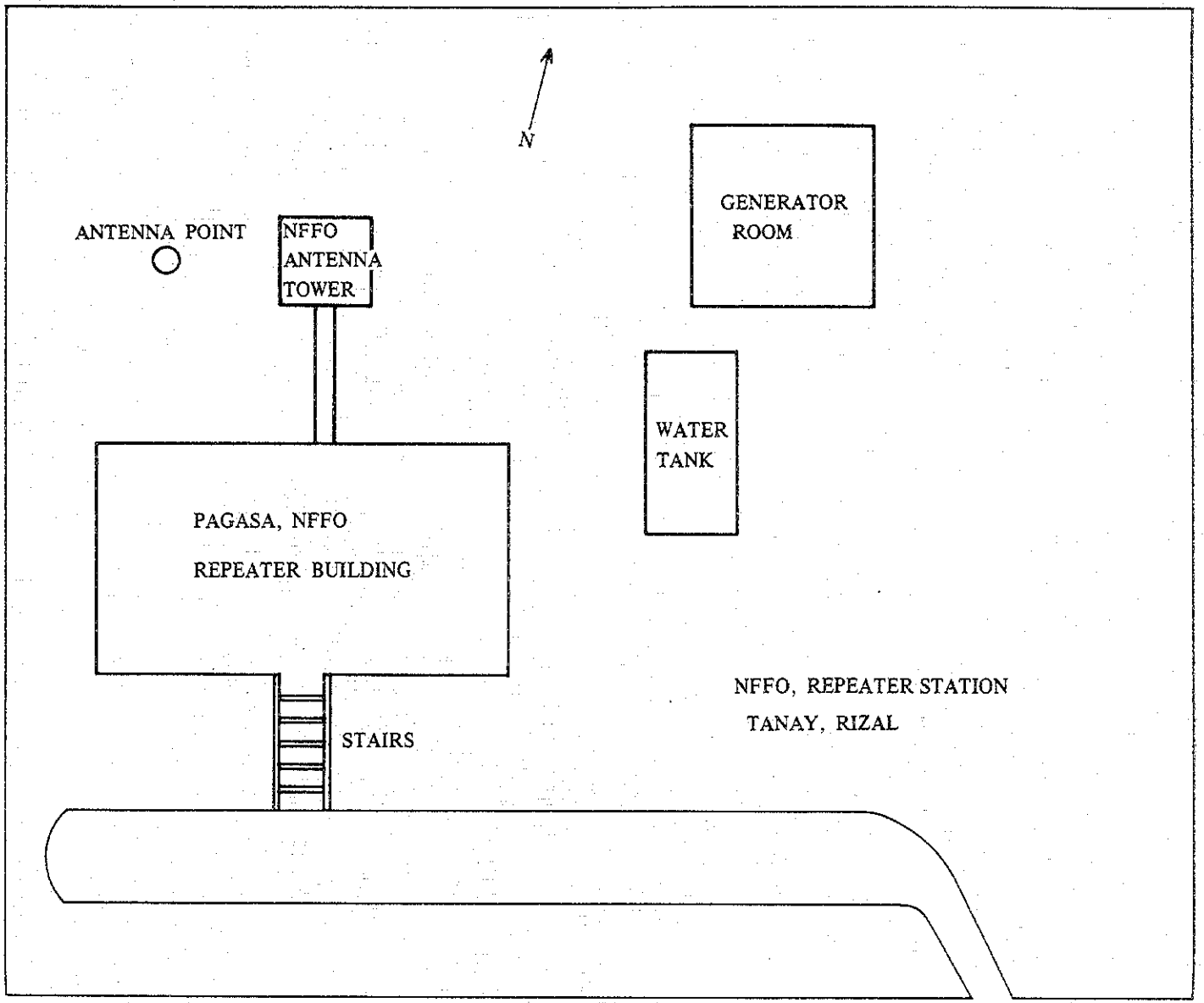
Table of Survey Items for Radio Station (Field Survey) 8.

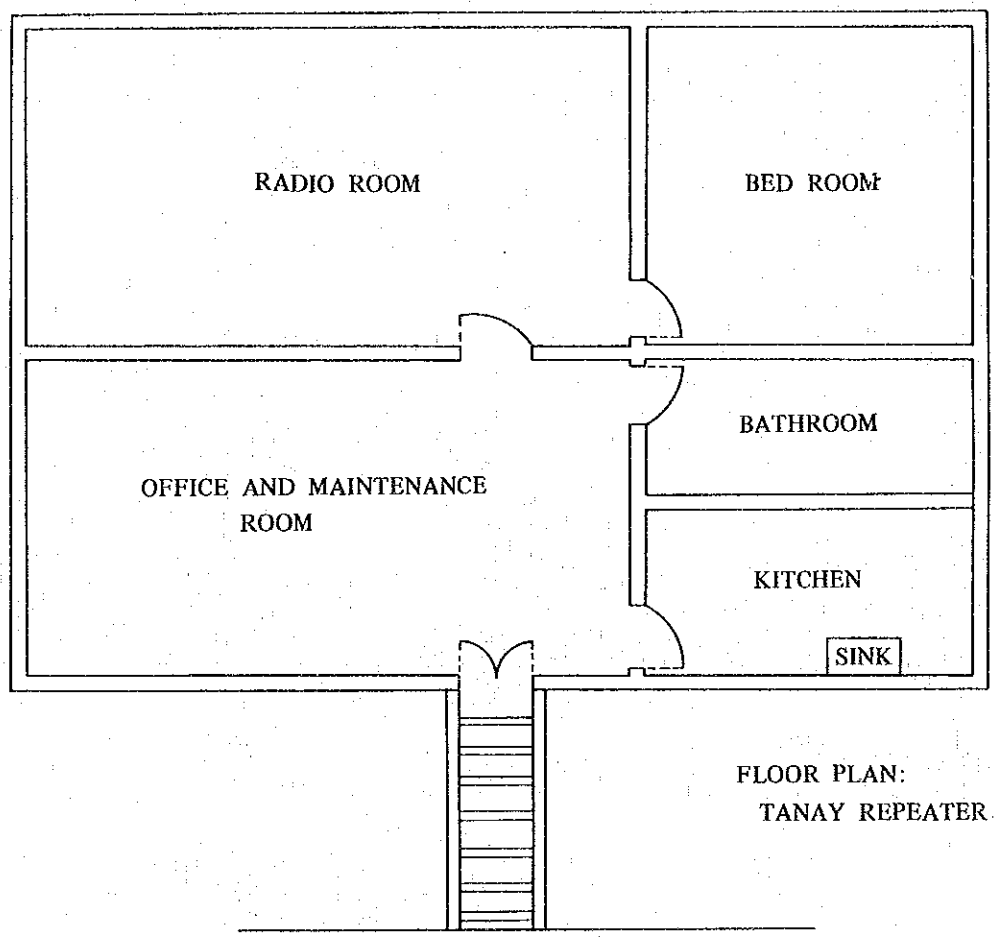
Station: TANAY F.F.S. RELAY Surveyors: Date 22 November 81

Item			Judge-ment	Remarks
1. Picture of Route	1-1	Span Distance and Above the Sea Level		63.9 Km to TAYABAS 530 M
	1-2	Relative Figure of Established Radio Circuit		The new 150MHZ VHF link will be connected with existing F.F.S. F.F.S 800MHZ for NAGA & 7GHZ for SCIENCE GARDEN are existing
	1-3	Outline of Direction Angle		170° for TAYABAS
2. Place of Candidacy	2-1	Established Station or New		The new 150 MHZ VHF link will be established (F.F.S, on 800MHZ & 7GHZ are existing)
	2-2	Geology		mountainous terrain The existing station is situated on a hill
	2-3	Latitude and Longitude		14° 33' 53" N 121° 21' 07" E
	2-4	Above the Sea Level		530 M
	2-5	Direction Angle		170° for TAYABAS
	2-6	Area of Site (Estimate)		approximately 600 M^2
	2-7	Owner (Private, Government-owned or public)		owned
	2-8	Topography and Geology etc. (Outline)		mountainous terrain clayey
	2-9	Take-able Point of Water for Construction		available near the station
	2-10	Others		
3. Road	3-1	Present of Road (Path and Driveway)		muddy for several KMs when it rains. steap slopes near the site

Item			Judge-ment	Remarks
	3-2	Length of the New Road Needed (km)		none
	3-3	Length of Road to be repaired (km)		none
	3-4	Figure of Outline (include Established Road)		see the FIG attached
4. Tower	4-1	Established or New Establish		a 20M height tower for F.F.S. is existing
	4-2	Antenna Height from the Ground, or the roof		a 3MØ G.P. are existing The part less than 15 MH of the tower is available
	4-3	Need of Radome		none
	4-4	Propriety of Antenna-Load		possible for YAGI type antenna
5. Power Supply, Electric Power Line	5-1	Length of Exclusive New Power Line (km)		no existing power line at present (a new commercial power line for F.F.S. is planning)
	5-2	Obstructive Condition of Commercial Power		unknown
	5-3	Present State of Used Power in the Established Station		unknown (220V, 10KVA, 1Ø 60HZ dual stand-by E.G. for F.F.S. is existing)
6. Station House	6-1	Necessity of New, Extension and Established etc.		The established for F.F.S. is available
	6-2	Figure of Present Outline of Established House		see the FIG attached
7. Propagation Path of Relations	7-1	Profile		see the profile for the new link TANAY-TAYABAS
	7-2	Testing of Line of Sight		none mountain diffraction path to TAYABAS
	7-3	Outline of Topography around Reflection Points		

Item			Judge-ment	Remarks
	7-4	Outline of Topography near the Station		mountainous terrain hilly
	7-5	Kinds of Propagation Path Models		mountain diffraction path see the profile for TANAY-TAYABAS
8. Vehicles	8-1	Necessity of Particular Cars		necessary for muddy road
	8-2	Necessity of Car Sheds		none
9. Maintenance	9-1	Minimum time for Maintenance		less than 3 hours from PAGASA C.O.
10. Information Figure of Road to the Station	10-1	Map around Place of Candidacy		see the FIG attached
	10-2	Map of Road to the Station		ditto
	10-3	Direction of Neighbouring Stations Established		none
11. Others	11-1	Amount of Rainfall in a Year		
	11-2	Means of Wind-Speed and Main Wind Direction		
	11-3	Poisonous Gas		none
	11-4	Harmful Establishments		none
	11-5	Kinds of Near Radio Station Systems		F.F.S. 800MHZ 70W SS-PM, 5/6 CH & 7GHZ 1W, SS-PM, 6/12 CH multiplex for NAGA & SCIENCE GARDEN are in the site
	11-6	Communication Traffic of Relative Area		2 CH for NAGA and 3 CH for SCIENCE GARDEN are available for the new 150MHZ VHF link
	11-7	Condition of Traffic		smooth, except for several KMs when it rains
	11-8	Present Public Order		peaceful
	11-9	Others		


N
ANTENNA POINT
NFFO
ANTENNA
TOWER
GENERATOR
ROOM
WATER
TANK
PAGASA, NFFO
REPEATER BUILDING
STAIRS
NFFO, REPEATER STATION
TANAY, RIZAL



FLOOR PLAN:
TANAY REPEATER STATION

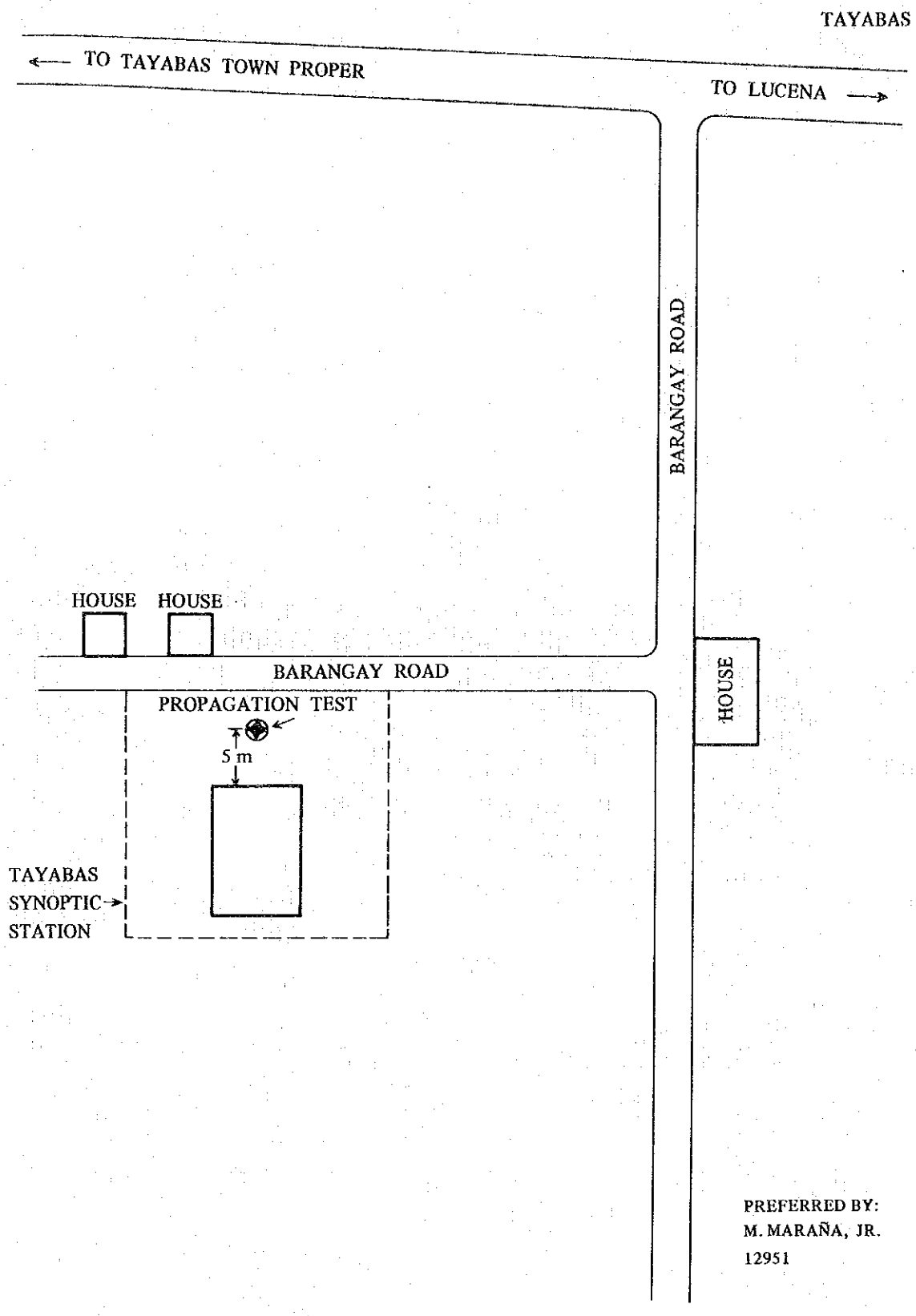
Table of Survey Items for Radio Station (Field Survey) 9.

Station: TAYABAS Surveyors: _____ Date 22 November 81

Item			Judge-ment	Remarks
1. Picture of Route	1-1	Span Distance and Above the Sea Level		63.9 KM to TANAY 157 M
	1-2	Relative Figure of Established Radio Circuit		none (a HF SSB station is existing)
	1-3	Outline of Direction Angle		345° for TANAY
2. Place of Candidacy	2-1	Established Station or New		The new 150 MHZ VHF link for TANAY will be established
	2-2	Geology		rocky soil
	2-3	Latitude and Longitude		14° 02′ N 121° 35′ E
	2-4	Above the Sea Level		157 M
	2-5	Direction Angle		345° for TANAY
	2-6	Area of Site (Estimate)		approximately 1 HA
	2-7	Owner (Private, Government-owned or public)		Government owned
	2-8	Topography and Geology etc. (Outline)		sloping towards ESE rocky soil
	2-9	Take-able Point of Water for Construction		plenty of water available
	2-10	Others		
3. Road	3-1	Present of Road (Path and Driveway)		dirt road
	3-2	Length of the New Road Needed (km)		needs improvement

Item			Judge-ment	Remarks
	3-3	Length of Road to be repaired (km)		100 M
	3-4	Figure of Outline (include Established Road)		see the FIG attached
4. Tower	4-1	Established or New Establish		a 20 MH tower will be needed for the new 150MHZ VHF link
	4-2	Antenna Height from the Ground, or the roof		more than 15 MH will be needed
	4-3	Need of Radome		none
	4-4	Propriety of Antenna-Load		will be designed as the occasion demands
5. Power Supply, Electric Power Line	5-1	Length of Exclusive New Power Line (km)		none
	5-2	Obstructive Condition of Commercial Power		cut off more than 3 times a month, for 78 hours a month on an average
	5-3	Present State of Used Power in the Established Station		220V, 1ϕ, 60 HZ fluctuating voltage A.V.R is needed
6. Station House	6-1	Necessity of New, Extension and Established etc.		none
	6-2	Figure of Present Outline of Established House		see the FIG attached
7. Propa-gation Path of Relations	7-1	Profile		see the profile for the new link-TAYABAS-TANAY
	7-2	Testing of Line of Sight		none mountain diffraction path to TANAY
	7-3	Outline of Topography around Reflection Points		
	7-4	Outline of Topography near the Station		rocky soil

Item			Judge-ment	Remarks
	7-5	Kinds of Propagation Path Models		mountain diffraction path
8. Vehicles	8-1	Necessity of Particular Cars		none
	8-2	Necessity of Car Sheds		none
9. Maintenance	9-1	Minimum time for Maintenance		approximately 4 hours from PAGASA
10. Information Figure of Road to the Station	10-1	Map around Place of Candidacy		see the FIG attached
	10-2	Map of Road to the Station		ditto
	10-3	Direction of Neighbouring Stations Established		none
11. Others	11-1	Amount of Rainfall in a Year		2267.8 mm
	11-2	Means of Wind-Speed and Main Wind Direction		NE/5 KNOTS
	11-3	Poisonous Gas		none
	11-4	Harmful Establishments		none
	11-5	Kinds of Near Radio Station Systems		none
	11-6	Communication Traffic of Relative Area		none
	11-7	Condition of Traffic		moderate
	11-8	Present Public Order		peaceful
	11-9	Others		


TAYABAS
TO TAYABAS TOWN PROPER
TO LUCENA
BARANGAY ROAD
HOUSE
HOUSE
BARANGAY ROAD
HOUSE
PROPAGATION TEST
5 m
TAYABAS
SYNOPTIC
STATION
PREFERRED BY:
M. MARAÑA, JR.
12951

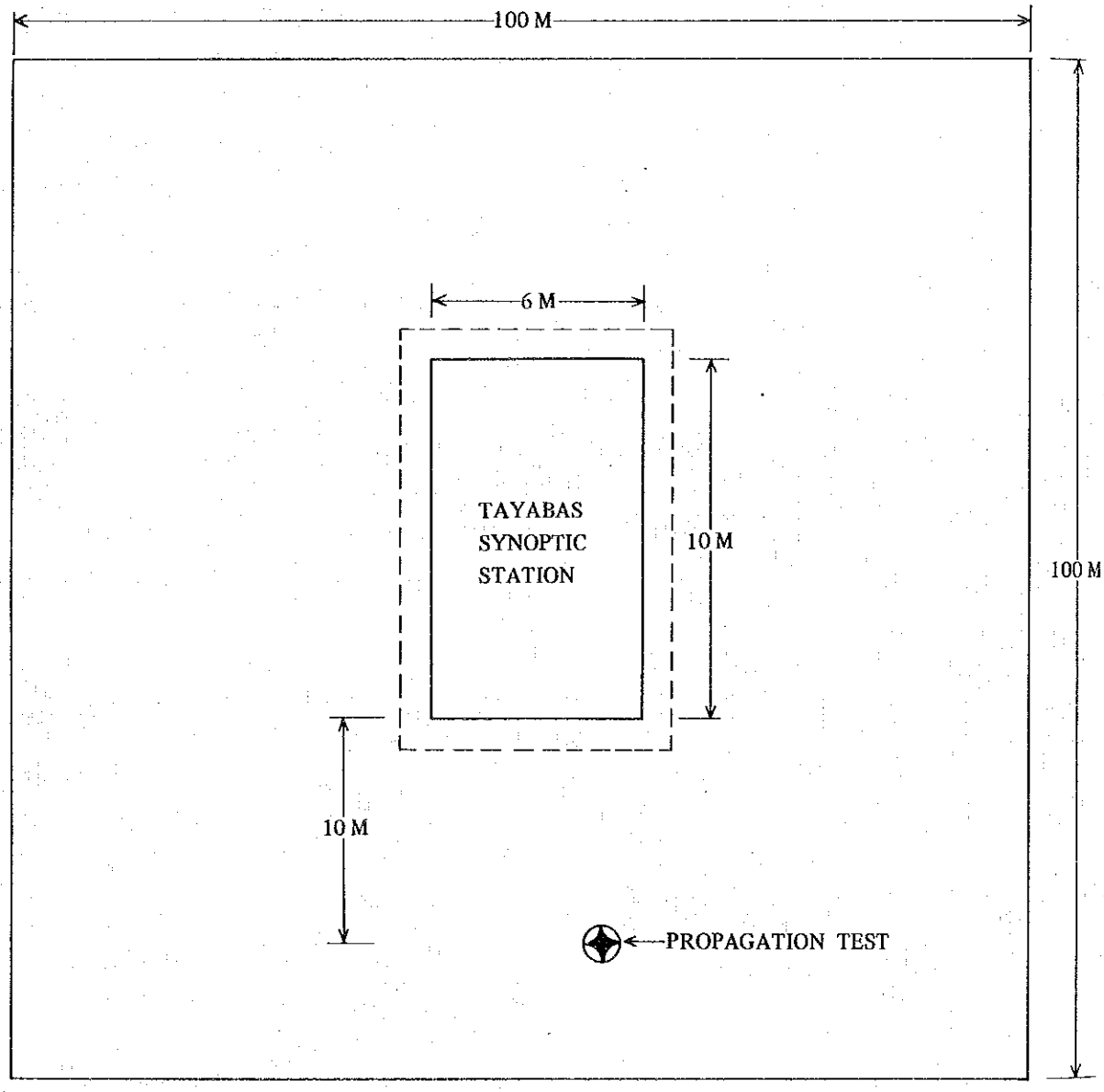

100 M
6 M
TAYABAS
SYNOPTIC
STATION
10 M
100 M
10 M
PROPAGATION TEST

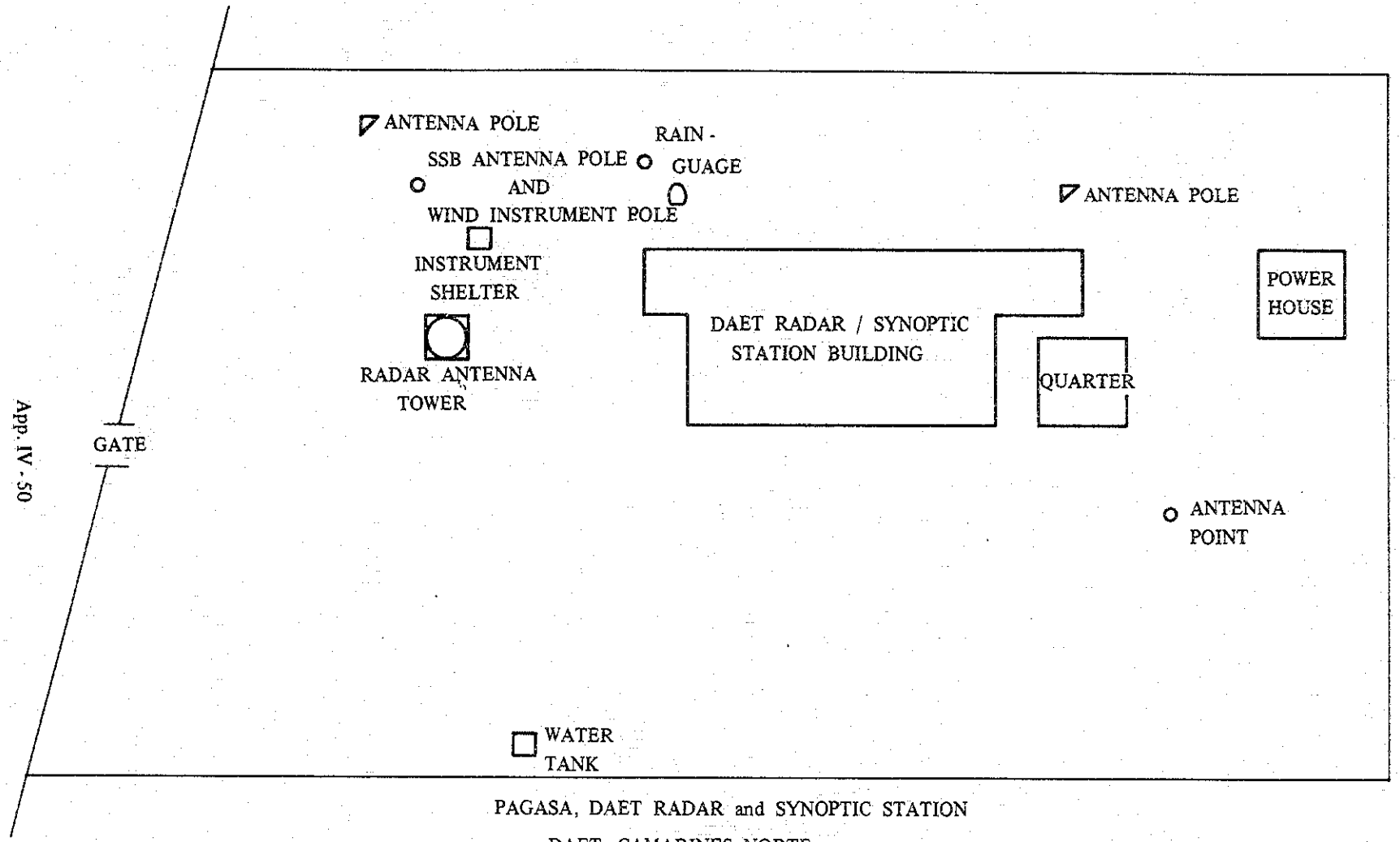
Table of Survey Items for Radio Station (Field Survey) 10.

Station: DAET (RADAR) Surveyors: Date 20 November 81

Item			Judge-ment	Remarks
1. Picture of Route	1-1	Span Distance and Above the Sea Level		59.7 Km to NAGA 2M
	1-2	Relative Figure of Established Radio Circuit		none (a H F SSB station and RADAR station are existing)
	1-3	Outline of Direction Angle		160° for NAGA
2. Place of Candidacy	2-1	Established Station or New		The new 150 MHZ VHF link for NAGA will be established
	2-2	Geology		plan terrain near the seashore clayey
	2-3	Latitude and Longitude		14° 07′ 50″ N 122° 58′ 57″ E
	2-4	Above the Sea Level		2M
	2-5	Direction Angle		160° for NAGA
	2-6	Area of Site (Estimate)		approximately 3.2 HA
	2-7	Owner (Private, Government-owned or public)		government owned
	2-8	Topography and Geology etc. (Outline)		plane terrain near the seashore clayey
	2-9	Take-able Point of Water for Construction		available in the site
	2-10	Others		
3. Road	3-1	Present of Road (Path and Driveway)		muddy for about 1 KM near the site when it rains

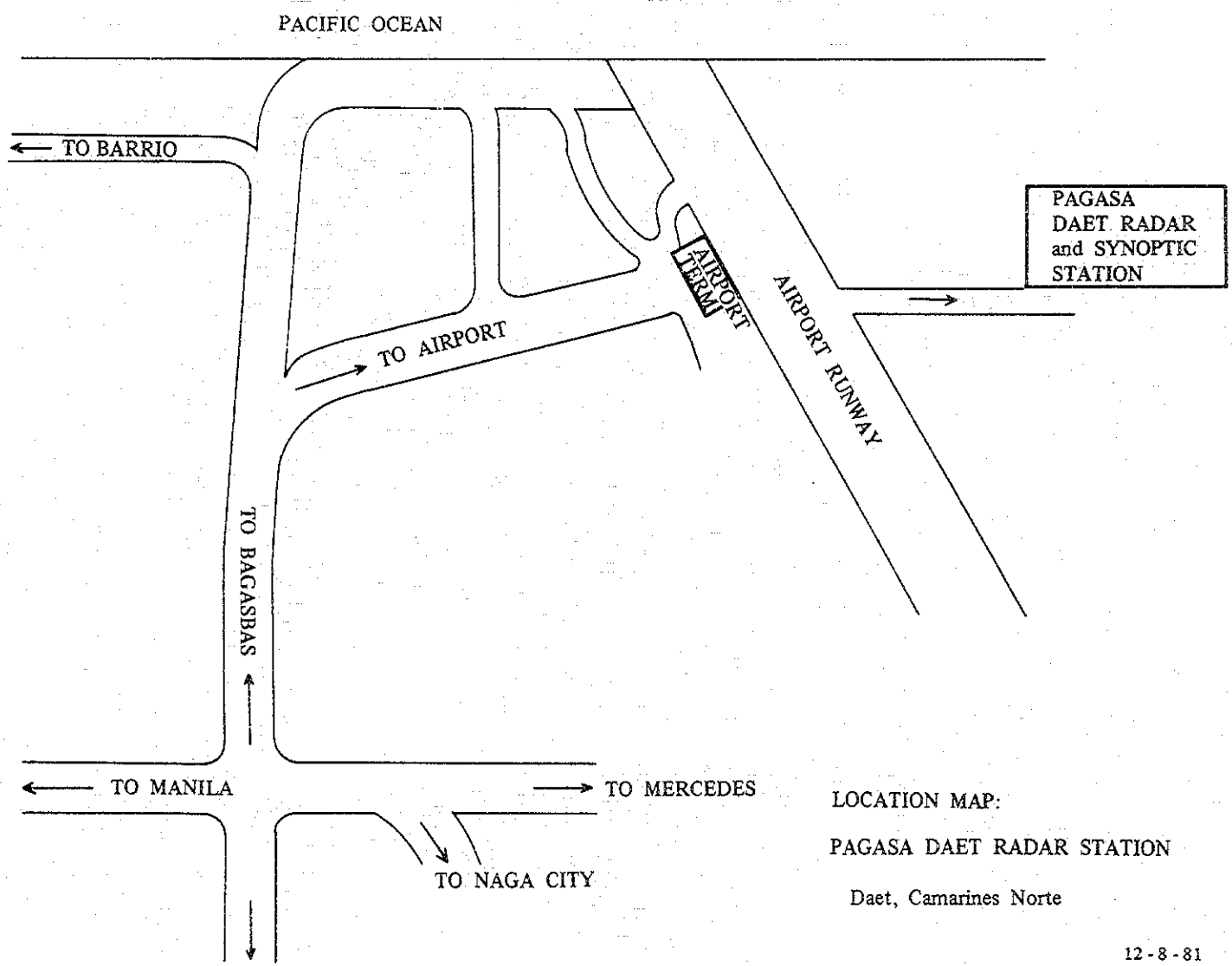
Item			Judge-ment	Remarks
	3-2	Length of the New Road Needed (km)		none
	3-3	Length of Road to be repaired (km)		none
	3-4	Figure of Outline (include Established Road)		see the FIG attached
4. Tower	4-1	Established or New Establish		a 15 mH tower will be needed for the new 150MHZ VHF link
	4-2	Antenna Height from the Ground, or the roof		more than 15 mH will be needed
	4-3	Need of Radome		none
	4-4	Propriety of Antenna-Load		will be designed as the occasion demands
5. Power Supply, Electric Power Line	5-1	Length of Exclusive New Power Line (km)		none
	5-2	Obstructive Condition of Commercial Power		cut off more than several times a month, for 2 hours a time on an average.
	5-3	Present State of Used Power in the Established Station		220V 1Ø (208/230V, 1Ø , 30 KVA, 60HZ E.G. is existing)
6. Station House	6-1	Necessity of New, Extension and Established etc.		none
	6-2	Figure of Present Outline of established House		see the FIG attached
7. Propagation Path of Relations	7-1	Profile		see the profile for the new link DAET-NAGA
	7-2	Testing of Line of Sight		none multi mountain diffraction path for NAGA
	7-3	Outline of Topography around Reflection Points		

Item			Judge-ment	Remarks
	7-4	Outline of Topography near the Station		plane terrain near the seashore
	7-5	Kinds of Propagation Path Models		multi mountain diffraction path see the profile for DAET-NAGA
8. Vehicles	8-1	Necessity of Particular Cars		none
	8-2	Necessity of Car Sheds		none
9. Maintenance	9-1	Minimum time for Maintenance		approximately 2 hours from NAGA
10. Information Figure of Road to the Station	10-1	Map around Place of Candidacy		see the FIG attached
	10-2	Map of Road to the Station		see the FIG attached
	10-3	Direction of Neighbouring Stations Established		none
11. Others	11-1	Amount of Rainfall in a Year		3599.4 mm
	11-2	Means of Wind-Speed and Main Wind Direction		NE/4 KNOTS
	11-3	Poisonous Gas		none
	11-4	Harmful Establishments		none
	11-5	Kinds of Near Radio Station Systems		none
	11-6	Communication Traffic of Relative Area		none
	11-7	Condition of Traffic		generally good
	11-8	Present Public Order		peaceful
	11-9	Others		



PAGASA, DAET RADAR and SYNOPTIC STATION

DAET, CAMARINES NORTE



LOCATION MAP:

PAGASA DAET RADAR STATION

Daet, Camarines Norte

12 - 8 - 81
Garcia, E.h.
garcia, E.h.

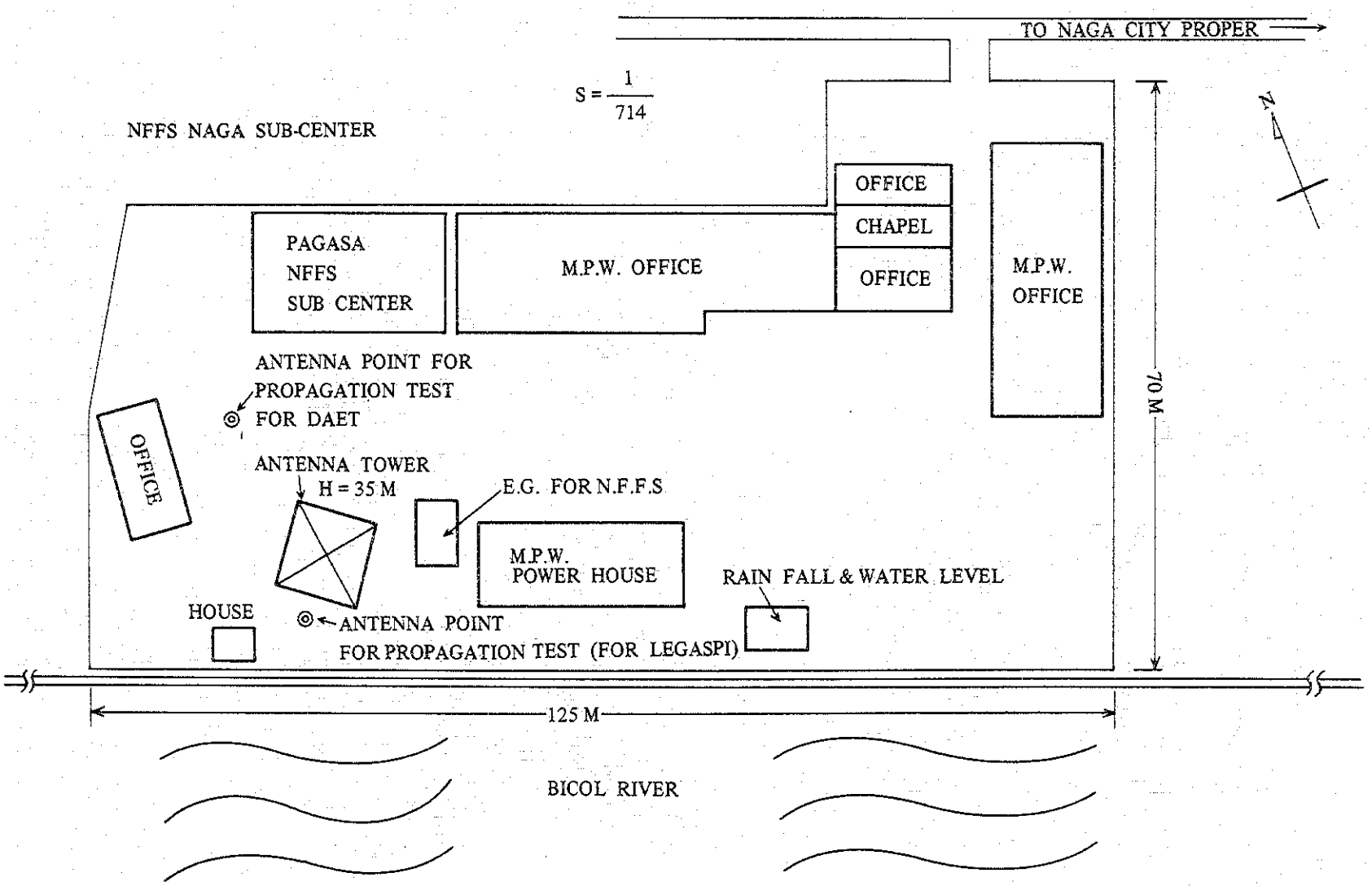
Table of Survey Items for Radio Station (Field Survey) 11.

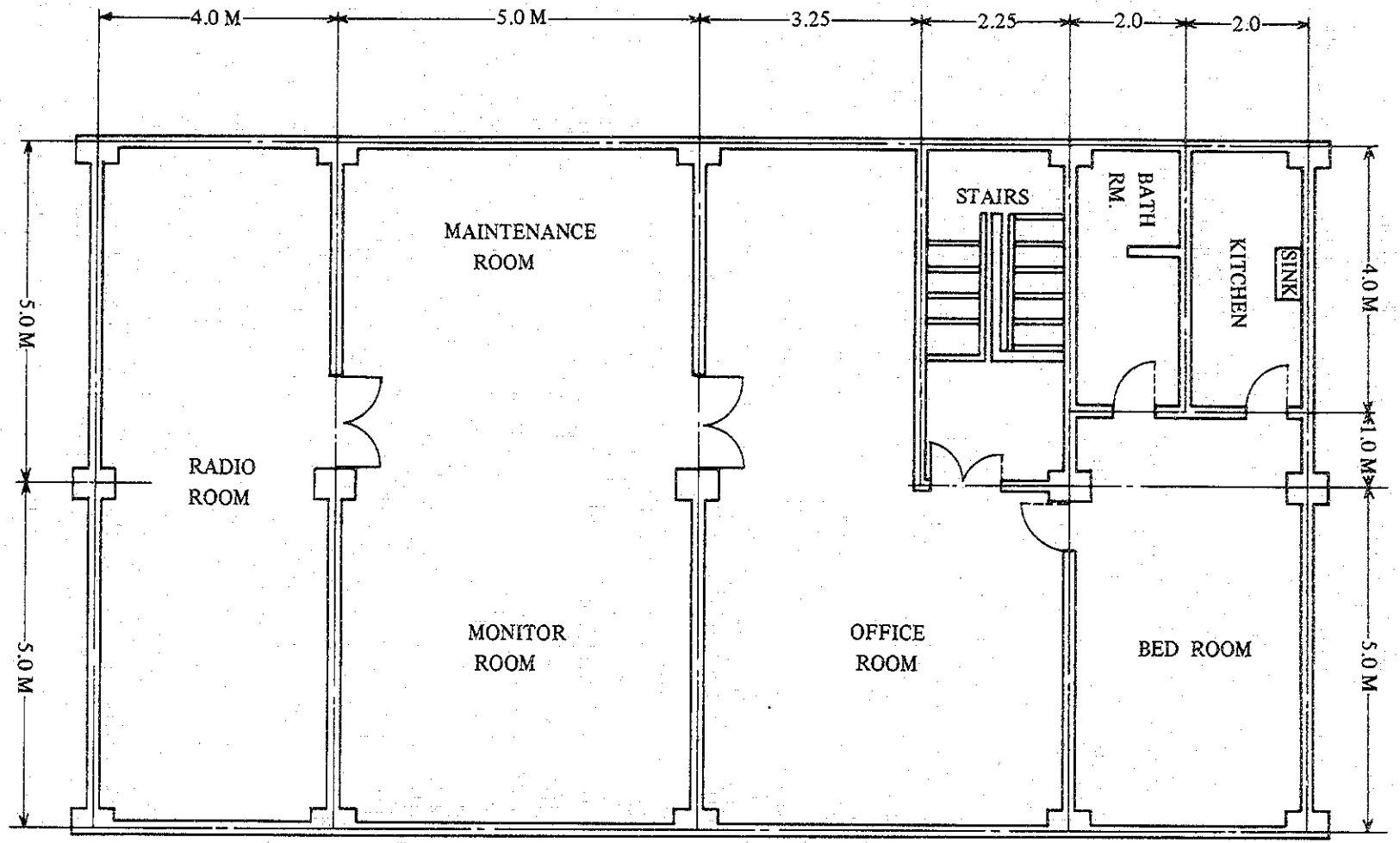
Station: NAGA (FFS SUB-CENTER) Surveyors: _____ Date 17 November 81

Item			Judge-ment	Remarks
1. Picture of Route	1-1	Span Distance and Above the Sea Level		79.6 KM to LEGASPI, 59.7 KM to DAET 2 M
	1-2	Relative Figure of Established Radio Circuit		The new 150MHZ VHF link will be connected with existing FFS (F.F.S 800 MHZ TROPOSCATTER for TANAY is existing)
	1-3	Outline of Direction Angle		142° for LEGASPI 341° for DAET
2. Place of Candidacy	2-1	Established Station or New		The new 150MHZ VHF link for LEGASPI & DAET will be established. (FFS on 800 MHZ is existing)
	2-2	Geology		plane terrain beside BICOL RIVER damp ground
	2-3	Latitude and Longitude		13° 37′ 21″ N 125° 09′ 56″ E
	2-4	Above the Sea Level		2M
	2-5	Direction Angle		142° for LEGASPI, 341° for DAET
	2-6	Area of Site (Estimate)		approximately 0.5 HA including MPW
	2-7	Owner (Private, Government-owned or public)		government owned
	2-8	Topography and Geology etc. (Outline)		plane terrain beside BICOL RIVER damp ground, sand stone
	2-9	Take-able Point of Water for Construction		available near the site
	2-10	Others		ranked as the FFS SUB CENTER
3. Road	3-1	Present of Road (Path and Driveway)		good

Item			Judge-ment	Remarks
	3-2	Length of the New Road Needed (km)		none
	3-3	Length of Road to be repaired (km)		none
	3-4	Figure of Outline (include Established Road)		see the FIG attached
4. Tower	4-1	Established or New Establish		a 35 mH tower for F.F.S is existing
	4-2	Antenna Height from the Ground, or the roof		a 6mØ G.P. is existing The part less than 30 mH of the tower is available
	4-3	Need of Radome		none
	4-4	Propriety of Antenna-Load		possible for YAGI type antenna
5. Power Supply, Electric Power Line	5-1	Length of Exclusive New Power Line (km)		none
	5-2	Obstructive Condition of Commercial Power		cut off more than several times a month, for 2 to 3 hours a time on an average.
	5-3	Present State of Used Power in the Established Station		220V 1Ø 60HZ F.F.S on the 800 MHZ, 70W, TROPOSCATTER for TANAY will be operated near the future (220V, 20KVA, 1Ø , 60HZ E.G. for F.F.S is existing)
6. Station House	6-1	Necessity of New, Extension and Established etc.		none
	6-2	Figure of Present Outline of Established House		see the FIG attached
7. Propa-gation Path of Relations	7-1	Profile		see the profile for the new link NAGA-LEGASPI NAGA-DAET
	7-2	Testing of Line of Sight		none mountain diffraction path to LEGASPI & DAET
	7-3	Outline of Topography around Reflection Points		

Item			Judge-ment	Remarks
	7-4	Outline of Topography near the Station		plane terrain beside BICOL RIVER
	7-5	Kinds of Propagation Path Models		mountain diffraction path see the profiles for NAGA-DAET NAGA-LEGASPI
8. Vehicles	8-1	Necessity of Particular Cars		none
	8-2	Necessity of Car Sheds		none
9. Maintenance	9-1	Minimum time for Maintenance		none
10. Information Figure of Road to the Station	10-1	Map around Place of Candidacy		see the FIG attached
	10-2	Map of Road to the Station		ditto
	10-3	Direction of Neighbouring Stations Established		none
11. Others	11-1	Amount of Rainfall in a Year		
	11-2	Means of Wind-Speed and Main Wind Direction		
	11-3	Poisonous Gas		none
	11-4	Harmful Establishments		none
	11-5	Kinds of Near Radio Station Systems		F.F.S 800MHZ, 70W, SS-PM, 5/6CH TROPO-SCATTER for TANAY is in the site
	11-6	Communication Traffic of Relative Area		2 cHs out of F.F.S are available for the new 150MHZ VHF link
	11-7	Condition of Traffic		smooth
	11-8	Present Public Order		peaceful
	11-9	Others		


TO NAGA CITY PROPER
S = 1/714
NFFS NAGA SUB-CENTER
N
OFFICE
CHAPEL
OFFICE
PAGASA
NFFS
SUB CENTER
M.P.W. OFFICE
M.P.W.
OFFICE
70 M
ANTENNA POINT FOR
PROPAGATION TEST
FOR DAET
OFFICE
ANTENNA TOWER
H = 35 M
E.G. FOR N.F.F.S
M.P.W.
POWER HOUSE
RAIN FALL & WATER LEVEL
HOUSE
ANTENNA POINT
FOR PROPAGATION TEST (FOR LEGASPI)
125 M
BICOL RIVER



FLOOR PLAN:

NFFO, NAGA, CAMALIGAN

SUB - CENTER

12 - 10 - 81

garcia, E.h.

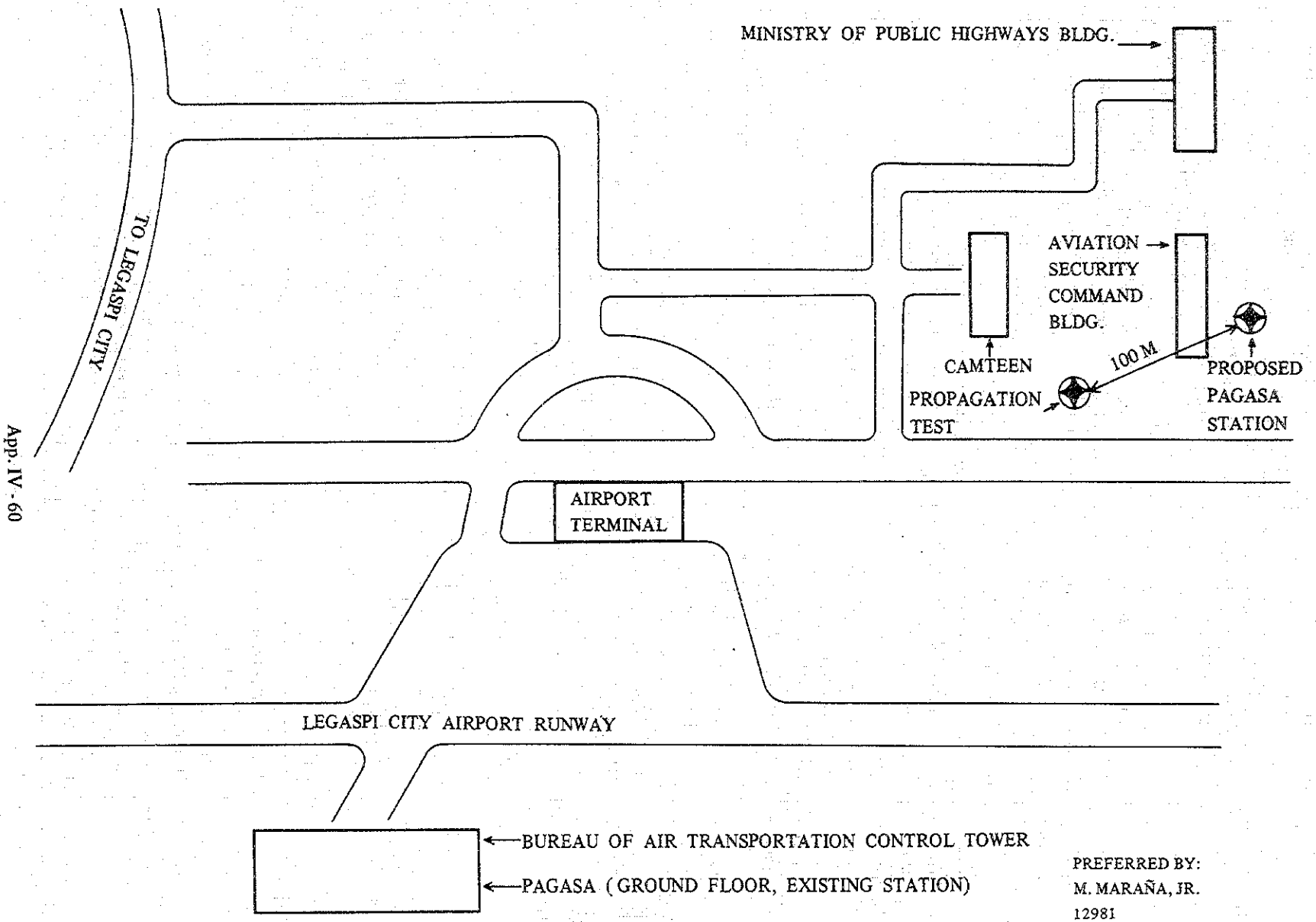
Table of Survey Items for Radio Station (Field Survey) 12.

Station: LEGASPI Surveyors: Date 17 November 81

Item			Judge-ment	Remarks
1. Picture of Route	1-1	Span Distance and Above the Sea Level		79.6 KM to NAGA 76.0 KM to VIRAC 17 M
	1-2	Relative Figure of Established Ratio Circuit		none (a HF SSB station & VHF station are existing)
	1-3	Outline of Direction Angle		330° for NAGA, 47° for VIRAC
2. Place of Candidacy	2-1	Established Station or New		The new 150MHZ VHF link for NAGA & VIRAC will be established. New site to be transferred about 1 & 1/2 KM SW of old site
	2-2	Geology		Rice field - flat terrain
	2-3	Latitude and Longitude		13° 08′ N 123° 44′ E (old site)
	2-4	Above the Sea Level		17 M
	2-5	Direction Angle		330° for NAGA, 47° for VIRAC
	2-6	Area of Site (Estimate)		approximately 2 HA
	2-7	Owner (Private, Government-owned or public)		military reservation area
	2-8	Topography and Geology etc. (Outline)		flat terrain rocks, underneath sandstone
	2-9	Take-able Point of Water for Construction		available near the site
	2-10	Others		new site is about 20 KM from the foot of the MAYON VOLCANO
3. Road	3-1	Present of Road (Path and Driveway)		good (Asphalt)

Item			Judge-ment	Remarks
	3-2	Length of the New Road Needed (km)		none
	3-3	Length of Road to be repaired (km)		none
	3-4	Figure of Outline (include Established Road)		see the FIG attached
4. Tower	4-1	Established or New Establish		two 20 mH towers will be needed for the new 150NHZ VHF links
	4-2	Antenna Height from the Ground, or the roof		more than 15 mH will be needed
	4-3	Need of Radome		none
	4-4	Propriety of Antenna-Load		will be designed as the occasion demands
5. Power Supply, Electric Power Line	5-1	Length of Exclusive New Power Line (km)		none
	5-2	Obstructive Condition of Commercial Power		no obstruction
	5-3	Present State of Used Power in the Established Station		220V 1Ø
6. Station House	6-1	Necessity of New, Extension and Established etc.		none
	6-2	Figure of Present Outline of Established House		unknown
7. Propa-gation Path of Relations	7-1	Profile		see the profile for the new link NAGA-LEGASPI no need for the new link LEGASPI-VIRAC
	7-2	Testing of Line of Sight		none line of sight for LEGASPI-VIRAC mountain diffraction path for LEGASPI-NAGA
	7-3	Outline of Topography around Reflection Points		

Item			Judge-ment	Remarks
	7-4	Outline of Topography near the Station		flat terrain rocks underneath sandstone 20 KM SSW of the MAYON VOLCANO
	7-5	Kinds of Propagation Path Models		free space path for LEGASPI-VIRAC mountain diffraction path for LEGASPI-NAGA
8. Vehicles	8-1	Necessity of Particular Cars		none
	8-2	Necessity of Car Sheds		none
9. Mainte-nance	9-1	Minimum time for Mainte-nance		approximately 1 hour from NAGA
10. Informa-tion Figure of Road to the Sta-tion	10-1	Map around Place of Candidacy		see the FIG attached
	10-2	Map of Road to the Station		see the FIG attached
	10-3	Direction of Neighbouring Stations Established		none
11. Others	11-1	Amount of Rainfall in a Year		3282.0 mm
	11-2	Means of Wind-Speed and Main Wind Direction		NE/7 KNOTS
	11-3	Poisonous Gas		none
	11-4	Harmful Establishments		none
	11-5	Kinds of Near Radio Station Systems		BUREAU OF AIR TRANSPORTATION) AVIATION SECURITY COMMAND) VHF & PHILIPPINE AIR LINES) HF MINISTRY OF PUBLIC HIGHWAYS)
	11-6	Communication Traffic of Relative Area		
	11-7	Condition of Traffic		moderate
	11-8	Present Public Order		peaceful
	11-9	Others		


MINISTRY OF PUBLIC HIGHWAYS BLDG.
TO LEGASPI CITY
AVIATION SECURITY COMMAND BLDG.
CAMTEEN
100 M
PROPAGATION TEST
PROPOSED PAGASA STATION
AIRPORT TERMINAL
LEGASPI CITY AIRPORT RUNWAY
BUREAU OF AIR TRANSPORTATION CONTROL TOWER
PAGASA (GROUND FLOOR, EXISTING STATION)
PREFERRED BY:
M. MARAÑA, JR.
12981

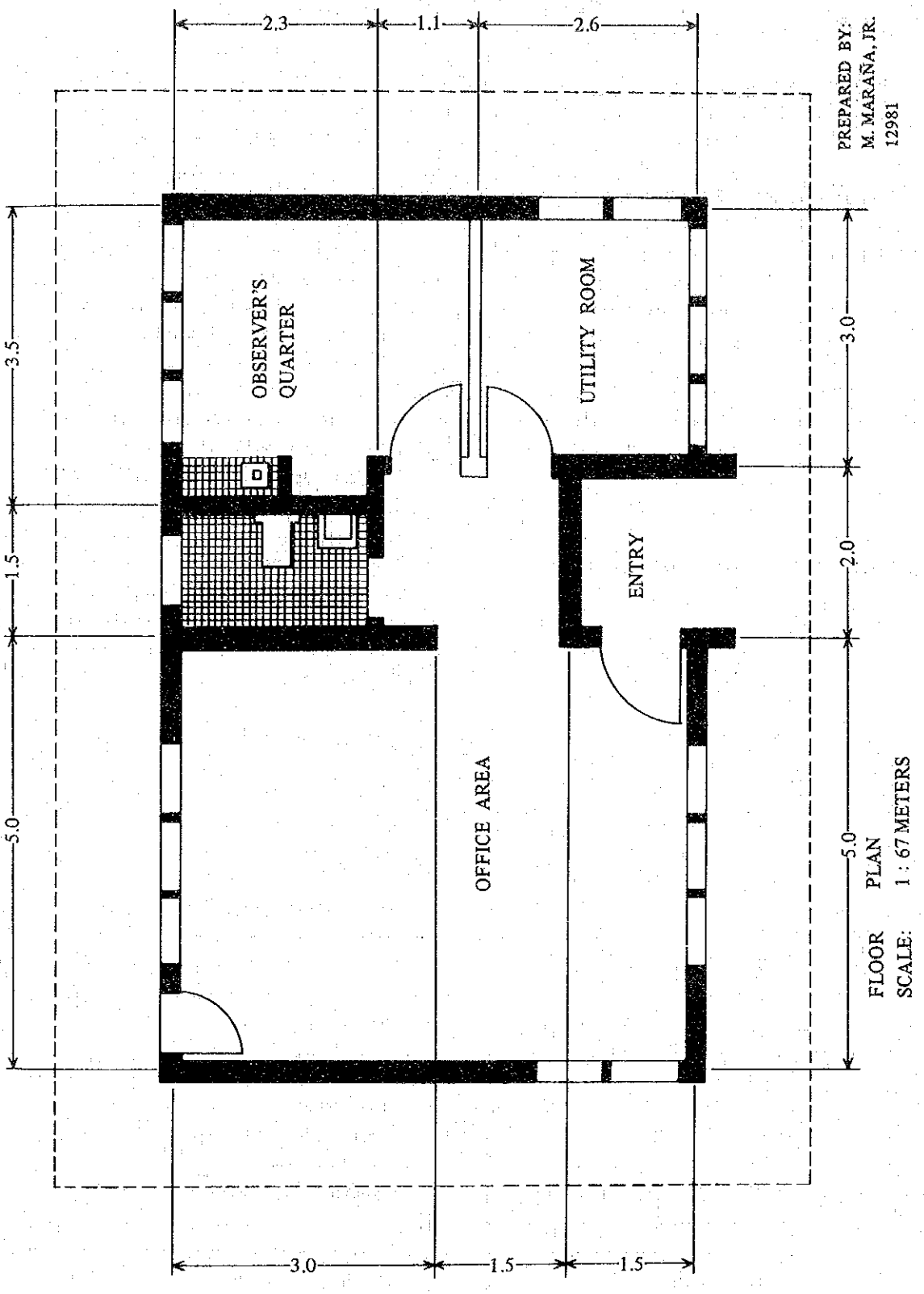

2.3
1.1
2.6
OBSERVER'S QUARTER
UTILITY ROOM
ENTRY
OFFICE AREA
3.5
1.5
5.0
3.0
2.0
5.0
3.0
1.5
1.5
PREPARED BY:
M. MARAÑA, JR.
12981
FLOOR PLAN
SCALE: 1 : 67 METERS

Table of Survey Items for Radio Station (Field Survey) 13.

Station: CEBU Surveyors: Date 2 December 81

Item			Judge-ment	Remarks
1. Picture of Route	1-1	Span Distance and Above the Sea Level		24.8M
	1-2	Relative Figure of Established Ratio Circuit		The new Communication-sub-center for VISAYAS will be established near future (HF SSB, radar, radiosonde, rawinsonde are existing)
	1-3	Outline of Direction Angle		None direction HF system will be adopted for the sub-center for VISAYAS 350° for DILIMAN & 170° for DAVAO (OH link)
2. Place of Candidacy	2-1	Established Station or New		The new station for communication sub-center for VISAYAS and for UHF link for DILIMAN & DAVAO will be established in the near future
	2-2	Geology		Rolling terrain rocky
	2-3	Latitude and Longitude		10° 20' N 123° 43' E
	2-4	Above the Sea Level		24.8 M
	2-5	Direction Angle		350° for DILIMAN, 170° for DAVAO
	2-6	Area of Site (Estimate)		approximately 2.7 HA
	2-7	Owner (Private, Government-owned or public)		government owned
	2-8	Topography and Geology etc (Outline)		plane terrain rocky & hilly in the site
	2-9	Take-able Point of Water for Construction		available
	2-10	Others		

Item			Judge-ment	Remarks
3. Road	3-1	Present of Road (Path and Driveway)		good
	3-2	Length of the New Road Needed (km)		none
	3-3	Length of Road to be repaired (km)		none
	3-4	Figure of Outline (include Established Road)		see the FIG attached
4. Tower	4-1	Established or New Establish		Three 35mH towers will be needed for the new HF link for the Communication-Center for VISAYAS and for DILIMAN & DAVAO
	4-2	Antenna Height from the Ground, or the roof		more than 35mH will be needed
	4-3	Need of Radome		none
	4-4	Propriety of Antenna-Load		will be designed as the occasion demands
5. Power Supply, Electric Power Line	5-1	Length of Exclusive New Power Line (km)		none
	5-2	Obstructive Condition of Commercial Power		cut off 2 or 3 hours a month 4 hours a time on an average.
	5-3	Present State of Used Power in the Established Station		220V, 3ϕ (existing E.G. has been out of order)
6. Station House	6-1	Necessity of New, Extension and Established etc.		The new station house will be needed including E.G.
	6-2	Figure of Present Outline of Established House		see the FIG attached
7. Propa-gation Path of Relations	7-1	Profile		none
	7-2	Testing of Line of Sight		none
	7-3	Outline of Topography around Reflection Points		

Item			Judge-ment	Remarks
	7-4	Outline of Topography near the Station		plain terrain, rocky & hilly in the site
	7-5	Kinds of Propagation Path Models		ionospheric reflected propagation path, tropo-spheric scattering propagation path
8. Vehicles	8-1	Necessity of Particular Cars		none
	8-2	Necessity of Car Sheds		none
9. Mainte-nance	9-1	Minimum time for Mainte-nance		none
10. Informa-tion Figure of Road to the Sta-tion	10-1	Map around Place of Candidacy		see the FIG attached
	10-2	Map of Road to the Station		ditto
	10-3	Direction of Neighbouring Stations Established		
11. Others	11-1	Amount of Rainfall in a Year		1677.1 mm
	11-2	Means of Wind-Speed and Main Wind Direction		NE/5 KNOTS
	11-3	Poisonous Gas		none
	11-4	Harmful Establishments		none
	11-5	Kinds of Near Radio Station Systems		microwave radio stations (PLDT, BAT, PAR, PAL)
	11-6	Communication Traffic of Relative Area		
	11-7	Condition of Traffic		smooth
	11-8	Present Public Order		peaceful
	11-9	Others		The site is situated at 1KM distance to the south of CEBU airport.

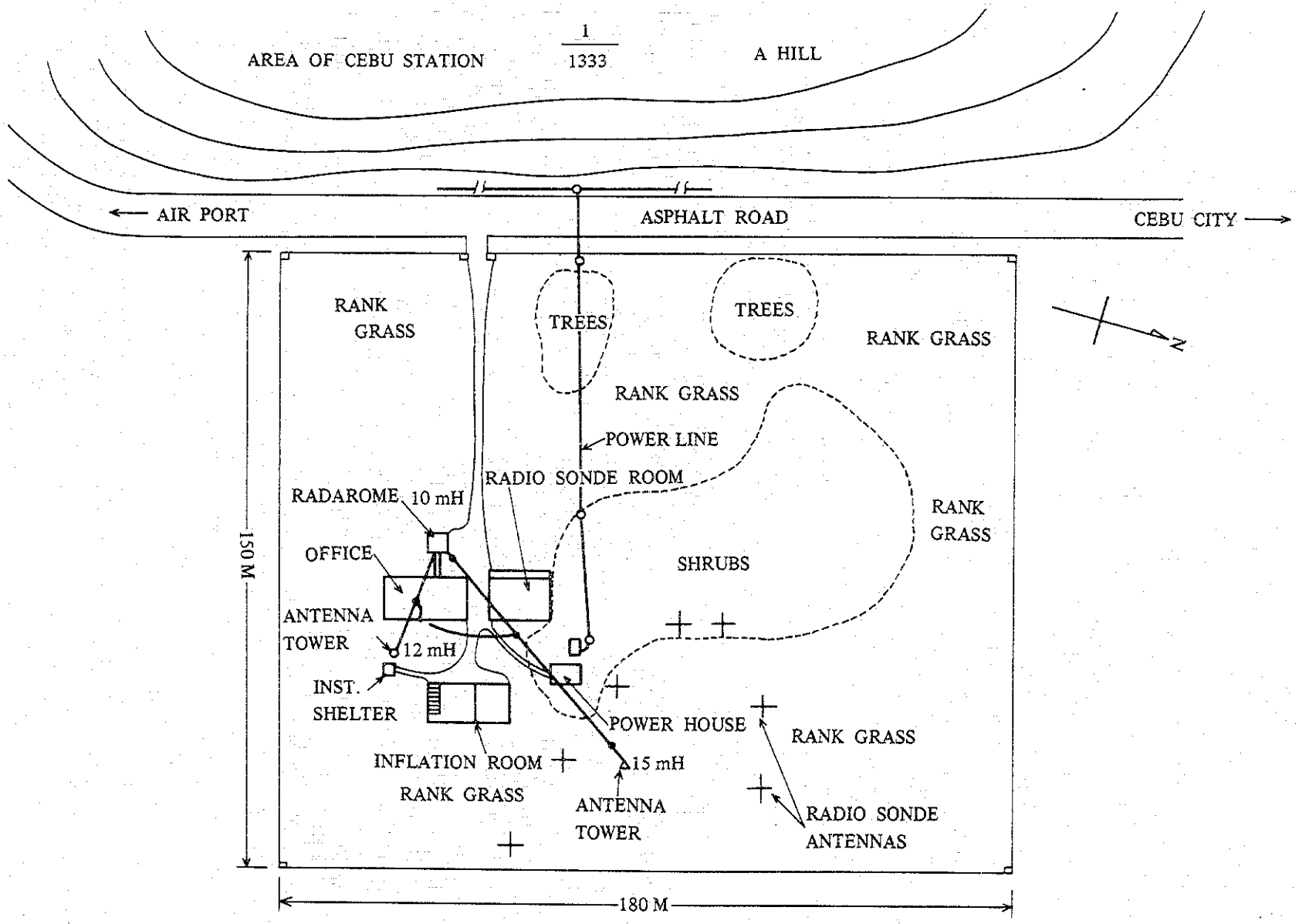

AREA OF CEBU STATION
1/1333
A HILL
AIR PORT
ASPHALT ROAD
CEBU CITY
RANK GRASS
TREES
TREES
RANK GRASS
RANK GRASS
POWER LINE
RADIO SONDE ROOM
RADAROME 10 mH
OFFICE
ANTENNA TOWER
12 mH
INST. SHELTER
SHRUBS
RANK GRASS
POWER HOUSE
RANK GRASS
INFLATION ROOM
RANK GRASS
15 mH
ANTENNA TOWER
RADIO SONDE ANTENNAS
150 M
180 M
N

Table of Survey Items for Radio Station (Field Survey) 14.

Station: DAVAO Surveyors: Date 4 December 81

Item			Judgement	Remarks
1. Picture of Route	1-1	Span Distance and Above the Sea Level		17.89 M
	1-2	Relative Figure of Established Radio Circuit		The new communication subcenter for Mindanao will be established in the near future. (existing bad communication facilities, 260 m south, 1150 m north).
	1-3	Outline of Direction Angle		None direction system will be adopted for the Sub Center. for Mindanao by HF. 350° for CEBU(UHF link)
2. Place of Candidacy	2-1	Established Station or New		The new H F station for Communication-Sub-Center for Mindanao and for UHF link for CEBU will be established in the near future.
	2-2	Geology		Corals
	2-3	Latitude and Longitude		07° 12′ N 125° 05′ E
	2-4	Above the Sea Level		17.89 m
	2-5	Direction Angle		350° for CEBU
	2-6	Area of Site (Estimate)		0.5HA
	2-7	Owner (Private, Government-owned or public)		Government owned
	2-8	Topography and Geology etc (Outline)		Lane terrains, corals
	2-9	Take-able Point of Water for Construction		Always available
	2-10	Others		very near to the DAVAO INTERNATIONAL AIR PORT

Item			Judge-ment	Remarks
3. Road	3-1	Present of Road (Path and Driveway)		accessible
	3-2	Length of the New Road Needed (km)		none
	3-3	Length of Road to be repaired		none
	3-4	Figure of Outline (include Established Road)		see the FIG attached
4. Tower	4-1	Established or New Establish		Three 35 mH towers will be needed for the new HF links for the communication-center for MINDANAO, and for UHF link for CEBU.
	4-2	Antenna Height from the Ground, or the roof		more than 35 mH will be needed.
	4-3	Need of Radome		none
	4-4	Propriety of Antenna-Load		will be designed as the occasion demands
5. Power Supply, Electric Power Line	5-1	Length of Exclusive New Power Line (km)		none
	5-2	Obstructive Condition of Commercial Power		stable
	5-3	Present State of Used Power in the Established Station		220V 1Ø 60HZ stable
6. Station House	6-1	Necessity of New, Extension and Established etc.		The new station house will be needed including E.G.
	6-2	Figure of Present Outline of Established House		see the FIG attached
7. Propa-gation Path of Relations	7-1	Profile		none
	7-2	Testing of Line of Sight		none
	7-3	Outline of Topography around Reflection Points		

Item			Judge-ment	Remarks
	7-4	Outline of Topography near the Station		plane terrain corals
	7-5	Kinds of Propagation Path Models		Ionospheric reflected propagation path and tropospheric scattering propagation path
8. Vehicles	8-1	Necessity of Particular Cars		none
	8-2	Necessity of Car Sheds		none
9. Maintenance	9-1	Minimum time for Maintenance		none
10. Information Figure of Road to the Station	10-1	Map around Place of Candidacy		see the FIG attached
	10-2	Map of Road to the Station		see the FIG attached
	10-3	Direction of Neighbouring Stations Established		
11. Others	11-1	Amount of Rainfall in a Year		1820.4 mm
	11-2	Means of Wind-Speed and Main Wind Direction		N/4 KNOTS
	11-3	Poisonous Gas		none
	11-4	Harmful Establishments		none
	11-5	Kinds of Near Radio Station Systems		Microwave, HF, VHF (BAT & PAL)
	11-6	Communication Traffic of Relative Area		
	11-7	Condition of Traffic		smooth
	11-8	Present Publice Order		peaceful
	11-9	Others		

AREA OF DAVAO STATION $\frac{1}{625}$

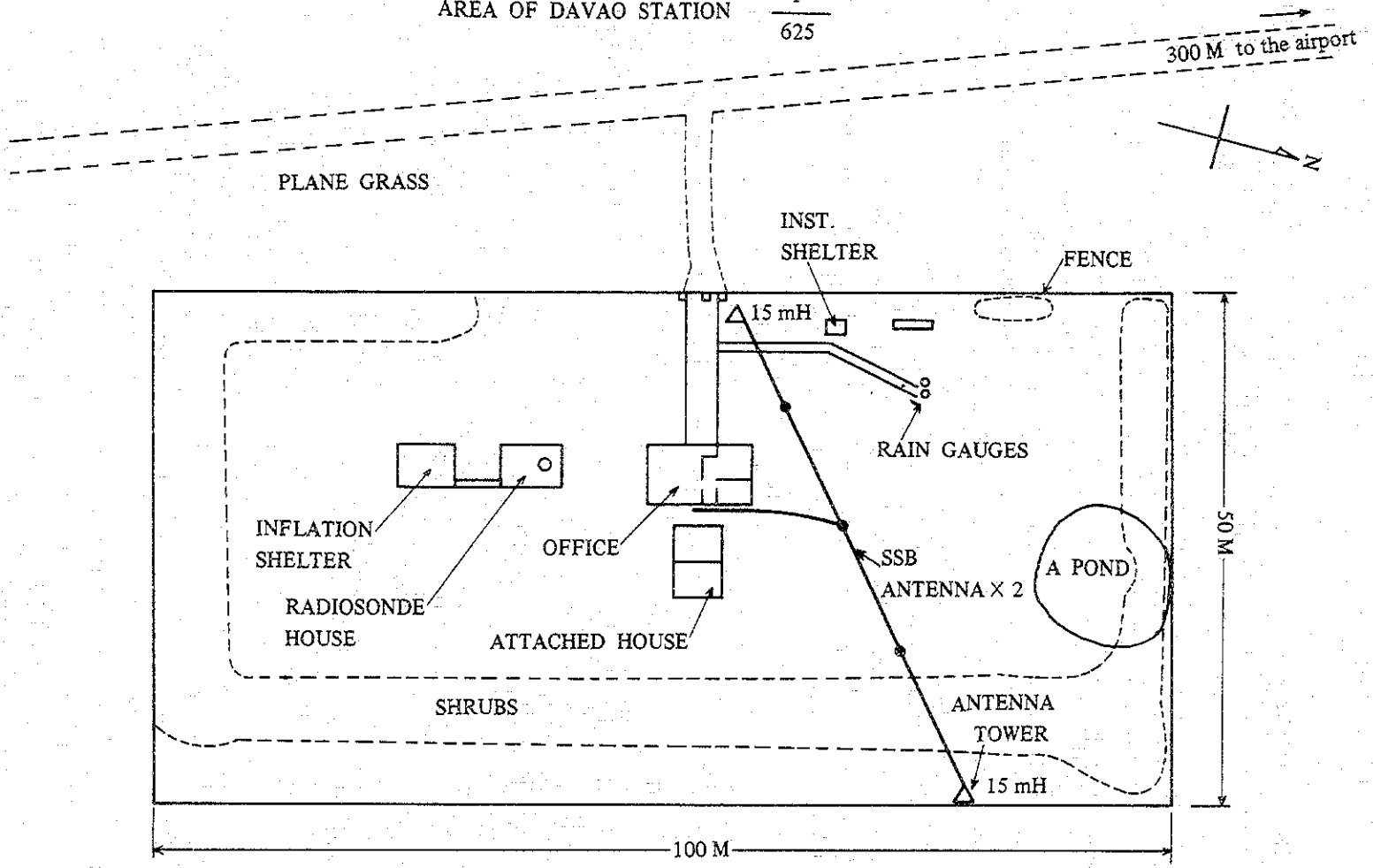


Table of Survey Items for Radio Station (Field Survey) 15.

Station: ZAMBOANGA Surveyors: Date 5 December 81

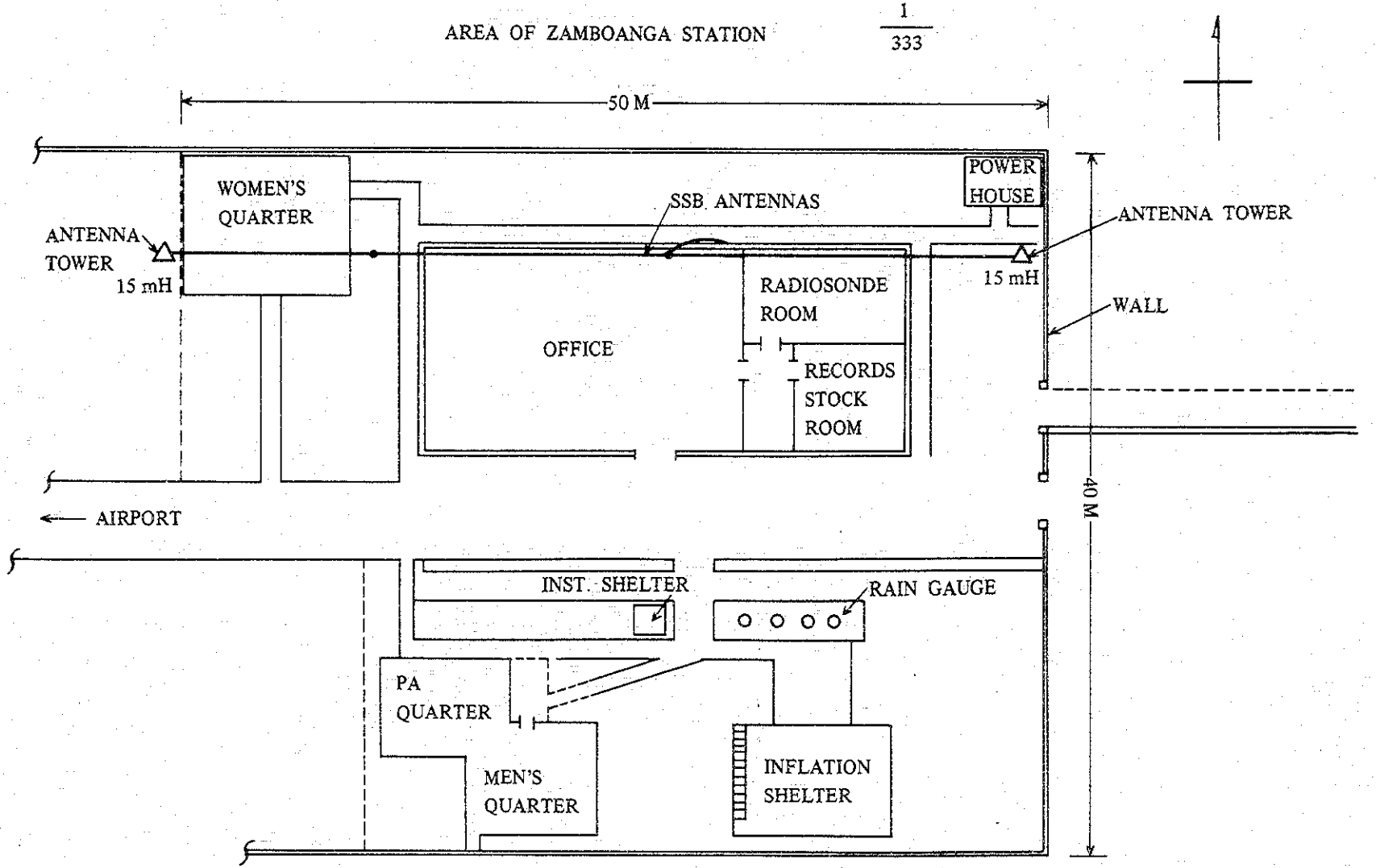
Item			Judge-ment	Remarks
1. Picture of Route	1-1	Span Distance and Above the Sea Level		6 M
	1-2	Relative Figure of Established Radio Circuit		The new HF link for the sub-center at DABO will be established near future. (HF SSB link is existing)
	1-3	Outline of Direction Angle		
2. Place of Candidacy	2-1	Established Station or New		The new HF station
	2-2	Geology		plane terrain ordinary soil
	2-3	Latitude and Longitude		06° 54′ N 122° 04′ E
	2-4	Above the Sea Level		6 M
	2-5	Direction Angle		
	2-6	Area of Site (Estimate)		approximately 1200 m^2
	2-7	Owner (Private, Government-owned or public)		government owned
	2-8	Topography and Geology etc (Outline)		plane terrain ordinary soil
	2-9	Take-able Point of Water for		always available
	2-10	Others		very near to the ZAMBOANGA AIR PORT
3. Road	3-1	Present of Road (Path and Driveway)		good
	3-2	Length of the New Road Needed (km)		none

Item			Judge-ment	Remarks
	3-3	Length of Road to be repaired (km)		none
	3-4	Figure of Outline (include Established Road)		
4. Tower	4-1	Established or New Establish		two 20 mH towers will be needed
	4-2	Antenna Height from the Ground, or the roof		more than 15 mH will be needed
	4-3	Need of Radome		none
	4-4	Propriety of Antenna-Load		will be designed as the occasion demands
5. Power Supply, Electric Power Line	5-1	Length of Exclusive New Power Line (km)		none
	5-2	Obstructive Condition of Commercial Power		stable
	5-3	Present State of Used Power in the Established Station		220V 1Ø 60Hz stable 3 KVA E.G. will be needed (1.5 KVA E.G. has been out of order since November 20 81)
6. Station House	6-1	Necessity of New, Extension and Established etc.		a new power house will be needed
	6-2	Figure of Present Outline of Established House		see the FIG attached
7. Propa-gation Path of Relations	7-1	Profile		none (propagation path by H.F.)
	7-2	Testing of Line of Sight		none
	7-3	Outline of Topography around Reflection Points		
	7-4	Outline of Topography near the Station		plane terrain ordinary soil
	7-5	Kinds of Propagation Path Models		ionospheric reflected propagation path

Item			Judgement	Remarks
8. Vehicles	8-1	Necessity of Particular Cars		none
	8-2	Necessity of Car Sheds		none
9. Maintenance	9-1	Minimum time for Maintenance		1 hour from DAVAO by air liner
10. Information Figure of Road to the Station	10-1	Map around Place of Candidacy		see the FIG attached
	10-2	Map of Road to the Station		ditto
	10-3	Direction of Neighbouring Stations Established		
11. Others	11-1	Amount of Rainfall in a Year		1198.8 mm
	11-2	Means of Wind-Speed and Main Wind Direction		W/4 KNOTS
	11-3	Poisonous Gas		none
	11-4	Harmful Establishments		none
	11-5	Kinds of Near Radio Station		microwave, HF, UHF (BAT, PAL, PAF)
	11-6	Communication Traffic of Relative Area		some interference experienced on existing SSB link especially at night.
	11-7	Condition of Traffic		smooth
	11-8	Present Public Order		peaceful
	11-9	Others		The site is situated at 700M distance to the south of the run way of Zamboanga airport.

AREA OF ZAMBOANGA STATION

1/333



APPENDIX V

AN EXPLANATION ON RADIO WAVE PROPAGATION AND LINK BUDGET OF THE VHF BAND

USED FOR THE LECTURE FOR THE COUNTERPARTS

CONTENTS

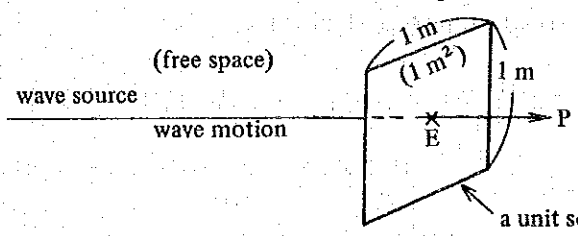
Page

1. Radiation power and field strength of electro-magnetic wave in the free space

1-1 Pointing power and field strength (by Maxwell's fundamental electro-magnetic equation)

$$P = \frac{E^2}{Z_0} = \frac{E^2}{\sqrt{\frac{\omega_0}{\epsilon_0}}} = \frac{E^2\ [v^2/m^2]}{120\pi\ [\Omega]} = \frac{E^2}{120\pi}\ [W/m^2] \qquad (1)$$

Z_0 : intrinsic impedance in the free space
P : pointing power $[W/m^2]$
E : field strength on the surface of a unit square [V/m]

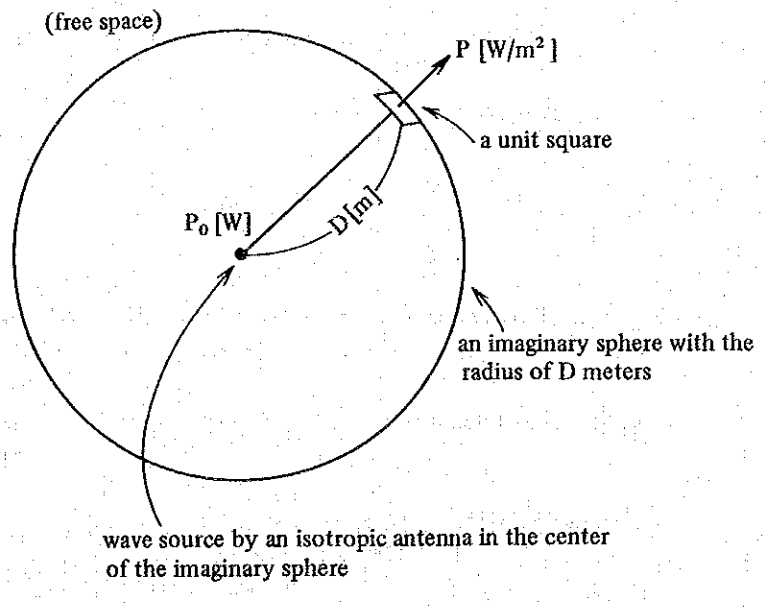


a unit square in the radiated electro-magnetic field

1-2 Radiation power and field strength — surface area of a sphere

$$P_0 = P \times 4\pi D^2 = \frac{E^2}{120\pi} \times 4\pi D^2 = \frac{E^2 \cdot D^2}{30}\ [W] \qquad (2)$$

P_0 : radiation power [W]
P : pointing power $[W/m^2]$
D : value of a radius [m]
E : field strength in a unit square [v/m]
$4\pi D^2$: surface area of the sphere $[m^2]$



1-3 Field strength and transmitting power by an antenna of gain Gt and of feeder loss Lft

$$P_0 = Pt \cdot Gt \cdot \frac{1}{Lft} = \frac{E^2 \cdot D^2}{30} \quad \left(= \frac{E^2}{120\pi} \cdot 4\pi D^2\right) \quad [W] \qquad (2)'$$

$$\therefore \quad E^2 = \frac{30 \cdot Pt \cdot Gt \cdot \frac{1}{Lft}}{D^2} \qquad (3)$$

or

$$\therefore \quad E = \frac{\sqrt{30 \cdot Pt \cdot Gt \cdot \frac{1}{Lft}}}{D} \quad [v/m] \qquad (4)$$

P_0:	radiated power (effective radiated power)	[W]
Pt:	transmitting power (out put power of a transmitter)	[W]
Gt:	value of a gain of a transmitting antenna (absolute gain)	
Lft:	value of a loss of a transmitting feeder	
D:	value of a distance from a transmitting point	[m]
E:	field strength at the point which is D meters away from the source	[V/m]

The equation (3) is converted into the next in which the dimensions are Pt [W], E [μV/m] and D [m] or D [Km].

$$20 \log E[\mu V/m] + 20 \log 10^{-6} = 10 \log 30 + 10 \log Pt[W] + 10 \log Gt - 20 \log D[m] - 10 \log Lft$$

$$20 \log E[\mu V/m] = 10 \log Pt[W] + 10 \log Gt - 10 \log Lft - 20 \log D[m] + 120 + 14.77$$

$$\therefore \quad E[dB/\mu] = Pt[dB/W] + Gt[dB] - Lft[dB] - 20 \log D[m] + 134.77 \quad (D : [m]) \qquad (5)$$

$$\therefore \quad E[dB/\mu] = Pt[dB/W] + Gt[dB] - Lft[dB] - 20 \log D[Km] + 74.77 \quad (D : [Km]) \qquad (6)$$

Field strength in the free space

table (1)

As the equation (6) is $E[dB/\mu] = Pt[dB/W] + Gt[dB] - Lft[dB] - 20 \log D[Km] + 74.77$

using $Pt = 1[W] = 0[dB]$, $Gt = 1 = 0[dB]$. $Lft = 1 = 0[dB]$, then following table is to be made.

(isotropic antenna)

* Add 10 log Pt[W] if Pt ≠ 1[W]

D[Km]	E[dB/μ]	D[Km]	E[dB/μ]	D[Km]	E[dB/μ]	D[Km]	E[dB/μ]	D[Km]	E[dB/μ]	D[Km]	E[dB/μ]	D[Km]	E[dB/μ]
1	74.8	26	46.5	51	40.6	76	37.2	101	34.7	126	32.8	151	31.2
2	68.7	27	46.1	52	40.4	77	37.0	102	34.6	127	32.7	152	31.1
3	65.2	28	45.8	53	40.3	78	36.9	103	34.5	128	32.6	153	31.1
4	62.7	29	45.5	54	40.1	79	36.8	104	34.4	129	32.6	154	31.0
5	60.8	30	45.2	55	40.0	80	36.7	105	34.3	130	32.5	155	31.0
6	59.2	31	44.9	56	39.8	81	36.6	106	34.3	131	32.4	156	30.9
7	57.9	32	44.7	57	39.7	82	36.5	107	34.2	132	32.4	157	30.9
8	56.7	33	44.4	58	39.5	83	36.4	108	34.1	133	32.3	158	30.8
9	55.7	34	44.1	59	39.4	84	36.3	109	34.0	134	32.2	159	30.7
10	54.8	35	43.8	60	39.2	85	36.2	110	33.9	135	32.2	160	30.7
11	53.9	36	43.6	61	39.1	86	36.1	111	33.9	136	32.1	161	30.6
12	53.2	37	43.4	62	38.9	87	36.0	112	33.8	137	32.0	162	30.6
13	52.5	38	43.2	63	38.8	88	35.9	113	33.7	138	32.0	163	30.5
14	51.8	39	42.9	64	38.6	89	35.8	114	33.6	139	32.0	164	30.5
15	51.2	40	42.7	65	38.5	90	35.7	115	33.6	140	31.8	165	30.4
16	50.7	41	42.5	66	38.4	91	35.6	116	33.5	141	31.8	166	30.4
17	50.2	42	42.3	67	38.2	92	35.5	117	33.4	142	31.7	167	30.3
18	49.7	43	42.1	68	38.1	93	35.4	118	33.3	143	31.7	168	30.3
19	49.2	44	41.9	69	38.0	94	35.3	119	33.3	144	31.6	169	30.2
20	48.7	45	41.7	70	37.9	95	35.2	120	33.2	145	31.5	170	30.2
21	48.3	46	41.5	71	37.7	96	35.1	121	33.1	146	31.5	171	30.0
22	47.9	47	41.3	72	37.6	97	35.0	122	33.0	147	31.4	172	30.0
23	47.5	48	41.1	73	37.5	98	34.9	123	33.0	148	31.4	172	30.0
24	47.2	49	41.0	74	37.4	99	34.9	124	32.9	149	31.3	174	30.0
25	46.8	50	40.8	75	37.3	100	34.8	125	32.8	150	31.2	175	29.9

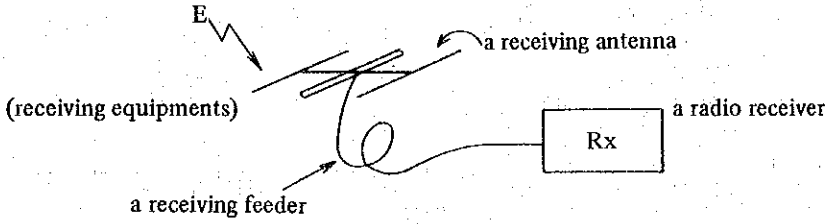
2. Receiving power and field strength of electro-magnetic wave in the free space

2-1 Effective length of an antenna

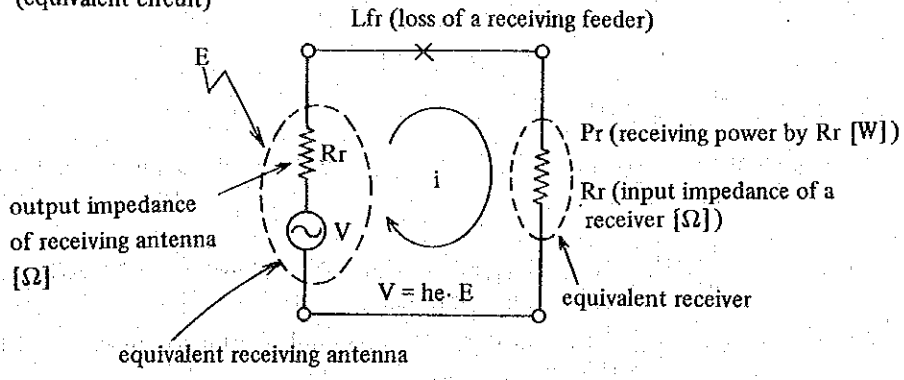
$$he = \frac{\lambda}{\pi}\sqrt{G}\sqrt{\frac{R}{120}} \quad [m] \qquad (7)$$

he: effective length of a sending or a receiving antenna [m]
λ: radio wave-length [m]
π: 3.14
G: transmitting / receiving antenna gain
R: radiation resistance (or input/output impedance) of a transmitting / receiving antenna [Ω]

2-2 Receiving power of a receiving circuit (Available power of antenna)



(equivalent circuit)



V: electromotive voltage by a receiving antenna in a field strength of E [V/m] [V]
he: effective length of a receiving antenna [m]
i: current in the equivalent circuit

2-2-1 The receiving equipments sketched above is able to be written into the equivalent circuit as shown below in the figure.

2-2-2 According to the equivalent circuit:

$$Pr = i^2 \cdot Rr \cdot \frac{1}{Lfr} = \left(\frac{V}{2Rr}\right)^2 \cdot Rr \cdot \frac{1}{Lfr} = \left(\frac{E \cdot he}{2Rr}\right)^2 \cdot Rr \cdot \frac{1}{Lfr} = \frac{E^2 \cdot he^2}{4Rr} \cdot \frac{1}{Lfr} \quad [W] \qquad (8)$$

2-2-3 If the equation (7) is substituted into the equation (8)

$$Pr = \frac{E^2 \cdot he^2}{4Rr} \cdot \frac{1}{Lfr} = \frac{E^2}{4Rr} \cdot \frac{1}{Lfr} \cdot \left(\frac{\lambda}{\pi}\sqrt{Gr} \cdot \sqrt{\frac{Rr}{120}}\right)^2$$

$$= \frac{E^2}{4Rr} \cdot \frac{1}{Lfr} \cdot \frac{\lambda^2}{\pi^2} \cdot Gr \cdot \frac{Rr}{120}$$

$$= \frac{E^2}{120\,\pi} \cdot \frac{\lambda^2}{4\pi} \cdot Gr \cdot \frac{1}{Lfr}$$

$$= \frac{E^2 \cdot \lambda^2}{480\,\pi^2} \cdot Gr \cdot \frac{1}{Lfr}$$

$$\therefore \quad Pr = \frac{E^2}{120\,\pi} \cdot \frac{\lambda^2}{4\pi} \cdot Gr \cdot \frac{1}{Lfr} \quad [W] \qquad (9)$$

or

$$\therefore \quad Pr = \frac{E^2 \cdot \lambda^2}{480\,\pi^2} \cdot Gr \cdot \frac{1}{Lfr} \quad [W] \qquad (10)$$

E: field strength at a receiving point [V/m]
λ: radio wave-length [m]
Gr: receiving antenna gain
Lfr: receiving feeder loss
Pr: receiving power [W]

is given

2-2-4 If the dimensions of Pr[W], E[μV/m], λ[m] are used, the equation (10) is given as the following equation.

$$10 \log Pr[W] = 20 \log E[\mu V/m] + 20 \log 10^{-6} + 20 \log \lambda[m] + 10 \log Gr[\text{times}] - 10 \log 480 - 20 \log \pi - 10 \log Lfr[\text{times}]$$

$$= 20 \log E[\mu V/m] + 20 \log \lambda[m] + 10 \log Gr[\text{times}] - 10 \log Lfr[\text{times}] - 120 - 26.81 - 9.94$$

$$= 20 \log E[\mu V/m] + 20 \log \lambda[m] + 10 \log Gr[\text{times}] - 10 \log Lfr[\text{times}] - 156.75$$

$$\therefore \quad Pr[dB/W] = E[dB/\mu] + Gr[dB] - Lft[dB] + \lambda[dB/m] - 156.75 \qquad (11)$$

This is the equation between the receiving power Pr[dB/W] and the field strength E[dB/μ].

2-3 Effective area of antenna

2-3-1 According to the equation (9):

$$Pr = \underbrace{\frac{E^2}{120\pi}}_{\text{pointing power in the field strength of E[V/m] shown by the equation (1)}} \cdot \underbrace{\frac{\lambda^2}{4\pi} \cdot Gr}_{\text{Ae: effective area by the antenna of gain Gr}} \cdot \frac{1}{Lfr} \quad [W]$$

$$\therefore \quad Pr = P \cdot Ae \cdot \frac{1}{Lfr} \quad [W] \qquad \text{——————— (12)}$$

$$\therefore \quad Ae = \frac{\lambda^2}{4\pi} Gr \cdot \quad [m^2] \qquad \text{——————— (13)}$$

are given.

Field strength and Receiving power, Receiving voltage in case of 150 [MHZ]

table (2)

The threshold levels
Pth = -144.7 [dB/W]
Vr_0th = - 1.7 [dB/μ]
Vrth = - 7.7 [dB/μ]
See the equations (52),(53) and (54).

From the equation (11), the receiving power is

$$Pr[dB/W] = E[dB/\mu] + Gr[dB] - Lfr[dB] + \lambda[dB/m] - 156.75$$

From the equation (21) and (22), the stational receiving voltage and the open receiving voltage are

$$Vr[dB/\mu] = Pr[dB/W] + 10\log Rr[\Omega] + 120 \quad \text{(stational)}$$

$$Vr_0[dB/\mu] = Pr[dB/W] + 10\log Rr[\Omega] + 126 \quad \text{(open)}$$

Using Gr[dB] = 11[dB] (8 elements Yagi type), Lfr[dB] = 2.5[dB] (8D-2V 25m, etc.), λ[dB] = 20 log 2[m] = 6[dB] (f = 150MHZ), and 10 log Rr[Ω] = 10 log 50[Ω] = 17[dB], the following table is to be made.

(The value of 0.4[dB] above the threshold level are under lined)

E [dB/μ]	Pr [dB/W]	Vr_0 [dB/μ]	Vr [dB/μ]	E [dB/μ]	Pr [dB/W]	Vr_0 [dB/μ]	Vr [dB/μ]	E [dB/μ]	Pr [dB/W]	Vr_0 [dB/μ]	Vr [dB/μ]
- 5	-147.3	-4.3	-10.3	13	-129.3	13.7	7.7	31	-111.3	31.7	25.7
- 4	-146.3	-3.3	- 9.3	14	-128.3	14.7	-8.7	32	-110.3	32.7	16.7
- 3	-145.3	-2.3	- 8.3	15	-127.3	15.7	9.7	33	-109.3	33.7	27.7
- 2	-144.3	-1.3	- 7.3	16	-126.3	16.7	10.7	34	-108.3	34.7	28.7
- 1	-143.3	-0.3	- 6.3	17	-125.3	17.7	11.7	35	-107.3	35.7	29.7
0	-142.3	0.7	- 5.3	18	-124.3	18.7	12.7	36	-106.3	36.7	30.7
1	-141.3	1.7	- 4.3	19	-123.3	19.7	13.7	37	-105.3	37.7	31.7
2	-140.3	2.7	- 3.3	20	-122.3	20.7	14.7	38	-104.3	38.7	32.7
3	-139.3	3.7	- 2.3	21	-121.3	21.7	15.7	39	-103.3	39.7	33.7
4	-138.3	4.7	- 1.3	22	-120.3	22.7	16.7	40	-102.3	40.7	34.7
5	-137.3	5.7	- 0.3	23	-119.3	23.7	17.7	41	-101.3	41.7	35.7
6	-136.3	6.7	0.7	24	-118.3	24.7	18.7	42	-100.3	42.7	36.7
7	-135.3	7.7	1.7	25	-117.3	25.7	19.7	43	- 99.3	43.7	37.7
8	-134.3	8.7	2.7	26	-116.3	26.7	20.7	44	- 98.3	44.7	38.7
9	-133.3	9.7	3.7	27	-115.3	27.7	21.7	45	- 97.3	45.7	39.7
10	-132.3	10.7	4.7	28	-114.3	28.7	22.7	46	- 96.3	46.7	40.7
11	-131.3	11.7	5.7	29	-113.3	29.7	23.7	47	- 95.3	47.7	41.7
12	-130.3	12.7	6.7	30	-112.3	30.7	24.7				

3. Receiving power and transmitting power in the free space

3-1 Transmitting power and field strength

According to the equation (2)',

$$Pt \cdot Gt \cdot \frac{1}{Lft} = \frac{E^2}{120\pi} \cdot 4\pi D^2$$

$$\therefore \quad \frac{E^2}{120\pi} = \frac{1}{4\pi D^2} \cdot Pt \cdot Gt \cdot \frac{1}{Lft} \quad [W/m^2] \qquad (14)$$

is given

3-2 Receiving power and field strength

According to the equation (9)

$$\therefore \quad Pr = \frac{E^2}{120\pi} \cdot \frac{\lambda^2}{4\pi} \cdot Gr \cdot \frac{1}{Lfr} \quad [W] \qquad (9)$$

(reappeared)

is given.

3-3 Receiving power and transmitting power

3-3-1 If the equation (14) is substituted into the equation (9):

$$Pr = \underbrace{\frac{1}{4\pi D^2} \cdot Pt \cdot Gt \cdot \frac{1}{Lft}} \cdot \frac{\lambda^2}{4\pi} \cdot Gr \cdot \frac{1}{Lfr}$$

$\frac{E^2}{120\pi}$ by the equation (14)

$$= \left(\frac{\lambda}{4\pi D}\right)^2 Pt \cdot Gt \cdot \frac{1}{Lft} \cdot Gr \cdot \frac{1}{Lfr}$$

$$\therefore \quad Pr = \left(\frac{\lambda}{4\pi D}\right)^2 \cdot Pt \cdot Gt \cdot Gr \cdot \frac{1}{Lft} \cdot \frac{1}{Lfr} \quad [W] \qquad (15)$$

This is the relative equation of the receiving power Pr[W] and sending power Pt[W].

3-3-2 In the equation (15), the part $(\lambda/4\pi D)^2$ can be called as the propagation gain. However, there is no propagation gain in fact but propagation loss in the free space. Therefore, changing a formula of the part as below;

$$\left(\frac{\lambda}{4\pi D}\right)^2 = \frac{1}{\left(\frac{4\pi D}{\lambda}\right)^2} = \frac{1}{\Gamma}$$

Γ is called Free space propagation loss.

$$\Gamma = \left(\frac{4\pi D}{\lambda}\right)^2 \qquad \text{——(16)}$$

3-3-3 If the equation (16) is substituted in to the equation (15),

$$Pr = Pt \cdot Gt \cdot Gr \cdot \frac{1}{Lft} \cdot \frac{1}{Lfr} \cdot \frac{1}{\Gamma} \quad [W] \qquad \text{——(17)}$$

is given. This is the relative equation of the receiving power Pr[W] and the transmitting power Pt[W], and is also called the Basic equation of propagation in the free space.

Pr:	receiving power [W]
Pt:	transmitting power [W]
	(output power of a transmitter)
Gt:	transmitting antenna gain
Gr:	receiving antenna gain
Lft:	transmitting feeder loss
Lfr:	receiving feeder loss
Γ:	free space propagation loss

3-3-4 If the dimensions of D[Km] and λ[m] are used, the equation (16) and (17) are given as the following equations.

$$10 \log \Gamma = 20 \log 4\pi + 20 \log D[Km] + 20 \log 10^3 - 20 \log \lambda[m]$$
$$= 21.98 + 20 \log D[Km] + 60 - 20 \log \lambda[m]$$

$$\therefore \quad \Gamma\,[dB] = 81.98 + D[dB/Km] - \lambda[dB/m] \qquad \text{——(18)}$$

or

$$\therefore \quad \Gamma\,[dB] = 21.98 + D[dB/m] - \lambda[dB/m] \qquad \text{——(19)}$$

and

$$\therefore \quad Pr[dB/W] = Pt[dB/W] + Gr[dB] + Gr[dB] - Lft[dB] - Lfr[dB] - \Gamma[dB] \qquad \text{——(20)}$$

Free space propagation loss in case of 150MHZ

table (3)

from the equation (18) $\Gamma[dB] = 81.98 + D[dB/Km] - \lambda[dB/m]$

where $\lambda[dB/m] = 20 \log 2[m] = 6[dB]$ ($f = 150MHZ, \lambda = 300/150 = 2[m]$)

$D[dB/Km] = 20 \log D[Km]$

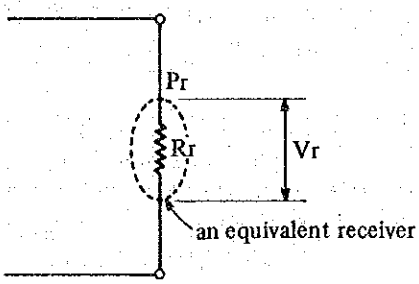
* subtract 60[dB] from Γ if the dimension of D is [m].

D[Km]	Γ[dB]	D[Km]	Γ[dB]	D[Km]	Γ[dB]	D[Km]	Γ[dB]	D[Km]	Γ[dB]	D[Km]	Γ[dB]	D[Km]	Γ[dB]
1	76.0	26	104.3	51	110.1	76	113.6	101	116.1	126	118.0	151	119.6
2	82.0	27	104.6	52	110.3	77	113.7	102	116.2	127	118.1	152	119.6
3	85.5	28	104.9	53	110.5	78	113.8	103	116.2	128	118.1	153	119.7
4	88.0	29	105.2	54	110.6	79	113.9	104	116.3	129	118.2	154	119.7
5	90.0	30	105.5	55	110.8	80	114.0	105	116.4	130	118.3	155	119.8
6	91.5	31	105.8	56	110.9	81	114.1	106	116.5	131	118.3	156	119.8
7	92.9	32	106.1	57	111.1	82	114.3	107	116.6	132	118.4	157	119.9
8	94.0	33	106.4	58	111.2	83	114.4	108	116.6	133	118.5	158	120.0
9	95.1	34	106.6	59	111.4	84	114.5	109	116.7	134	118.5	159	120.0
10	96.0	35	106.9	60	111.5	85	114.6	110	116.8	135	118.6	160	120.1
11	96.8	36	107.1	61	111.7	86	114.7	111	116.9	136	118.7	161	120.1
12	97.6	37	107.3	62	111.8	87	114.8	112	117.0	137	118.7	162	120.2
13	98.3	38	107.6	63	112.0	88	114.9	113	117.0	138	118.8	163	120.2
14	98.9	39	107.8	64	112.1	89	115.0	114	117.1	139	118.8	164	120.3
15	99.5	40	108.0	65	112.2	90	115.1	115	117.2	140	118.9	165	120.3
16	100.1	41	108.2	66	112.3	91	115.2	116	117.3	141	119.0	166	120.4
17	100.6	42	108.4	67	112.5	92	115.3	117	117.3	142	119.0	167	120.4
18	101.1	43	108.6	68	112.6	93	115.3	118	117.4	143	119.1	168	120.5
19	101.6	44	108.8	69	112.8	94	115.4	119	117.5	144	119.1	169	120.5
20	102.0	45	109.0	70	112.9	95	115.5	120	117.6	145	119.2	170	120.6
21	102.4	46	109.2	71	113.0	96	115.6	121	117.6	146	119.3	171	120.6
22	102.8	47	109.4	72	113.1	97	115.7	122	117.7	147	119.3	172	120.7
23	103.2	48	109.6	73	113.2	98	115.8	123	117.8	148	119.4	173	120.7
24	103.6	49	109.8	74	113.3	99	115.9	124	117.8	149	119.4	174	120.8
25	103.9	50	110.0	75	113.5	100	116.0	125	117.9	150	119.5	175	120.8

4. Receiving power and receiving voltage of a radio receiver

4-1 According to the picture drawn below

$$Pr = \frac{Vr^2}{Rr} \quad [W] \qquad \therefore \quad Vr^2 = Pr \cdot Rr \quad [V^2]$$



Vr: stational receiving voltage [V]
Pr: receiving power [W]
Rr: input impedance of a receiver [Ω]

4-2 The above equation is converted into the next equations in which dimensions are Pr[W], Vr[μV] and Rr[Ω].

$$20 \log Vr[\mu V] + 20 \log 10^{-6} = 10 \log Pr[W] + 10 \log Rr[\Omega]$$

$$20 \log Vr[\mu V] = 10 \log Pr[W] + 10 \log Rr[\Omega] + 120$$

$$\therefore \quad Vr[dB/\mu] = Pr[dB/W] + 10 \log Rr[\Omega] + 120 \quad \text{(stational)} \qquad \text{——— (21)}$$

or

$$\therefore \quad Vr_0\,[dB/\mu] = Pr[dB/W] + 10 \log Rr[\Omega] + 126 \quad \text{(open)} \qquad \text{——— (22)}$$

5. Field strength and receiving voltage of a radio receiver

5-1 According to the equation (10) on the page No. 10

$$Pr = \frac{E^2 \cdot \lambda^2}{480\,\pi^2} \cdot Gr \cdot \frac{1}{Lfr} \quad [W] \qquad \text{——— (10)}$$

(reappeared)

5-2 If, $Pr = \frac{Vr^2}{Rr}$ is substituted in to the equation above:

$$\frac{Vr^2}{Rr} = \frac{E^2 \cdot \lambda^2}{480\,\pi^2} \cdot Gr \cdot \frac{1}{Lfr} \quad [W]$$

$$\therefore \quad Vr^2 = \frac{E^2 \cdot \lambda^2}{480\pi^2} \cdot Gr \cdot \frac{1}{Lfr} \cdot Rr \quad [V^2] \qquad \text{---------- (23)}$$

is given.

5-3 The above equation is converted into the next equation inwhich the dimensions are $Vr[\mu V]$, $E[\mu V/m]$ and $\lambda[m]$.

$$\begin{aligned} 20 \log Vr[\mu V] &= 20 \log E[\mu V/m] + 20 \log \lambda[m] + 10 \log Gr \\ &\quad + 10 \log Rr[\Omega] - 10 \log 480 - 20 \log \pi - 10 \log Lfr \\ &= 20 \log E[\mu V/m] + 20 \log \lambda[m] + 10 \log Gr \\ &\quad + 10 \log Rr[\Omega] - 26.80 - 9.93 - 10 \log Lfr \end{aligned}$$

$$\therefore \quad Vr[dB/\omega] = E[dB/\omega] + \lambda[dB/m] + Gr[dB] + 10 \log Rr[\Omega] - Lfr[dB] - 36.73 \qquad \text{---------- (24)}$$
(stational)

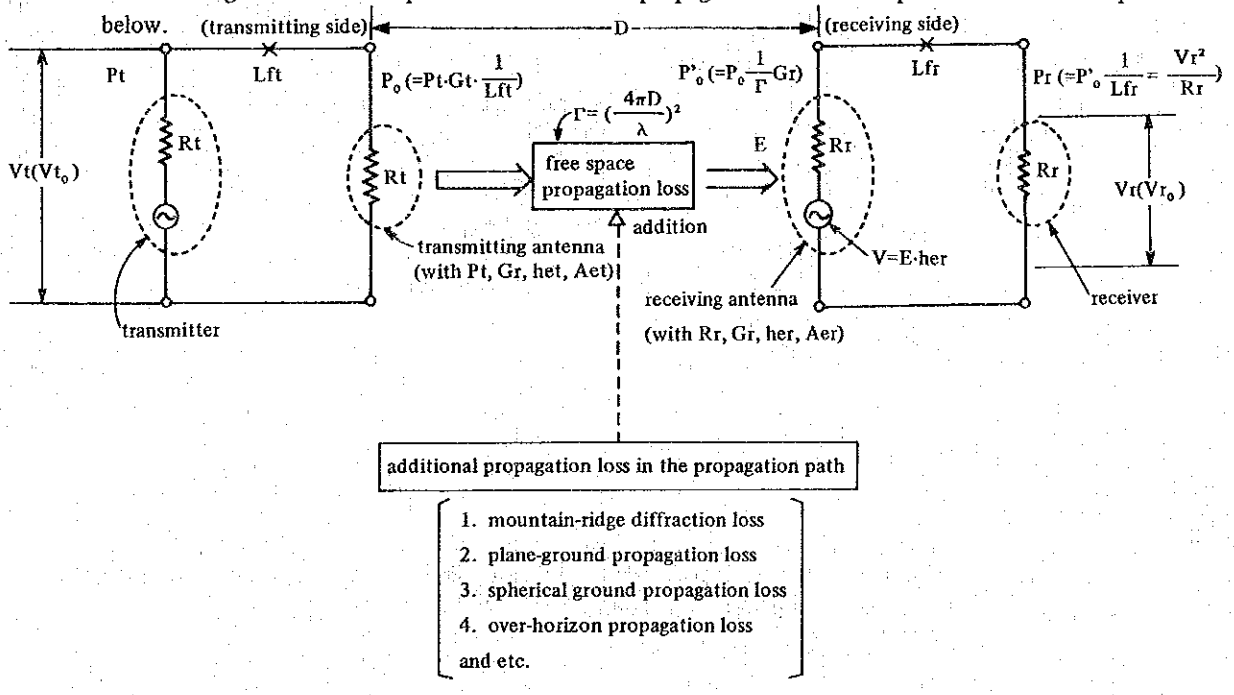
or

$$\therefore \quad Vr_0[dB/\omega] = E[dB/\omega] + \lambda[dB/m] + Gr[dB] + 10 \log Rr[\Omega] - Lfr[dB] - 30.73 \qquad \text{---------- (25)}$$
(open)

6. Meaning about the basic equation of radio wave propagation in the free space

$$\left(Pr = Pt \cdot Gt \cdot \frac{1}{Lft} \cdot \frac{1}{\Gamma} \cdot Gr \cdot \frac{1}{Lfr} \quad \text{----- according to the equation (17) }\right)$$

The meaning of the basic equation of radio wave propagation in the free space is shown as the picture below.



additional propagation loss in the propagation path

1. mountain-ridge diffraction loss
2. plane-ground propagation loss
3. spherical ground propagation loss
4. over-horizon propagation loss

and etc.

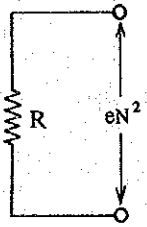
The picture above also shows the mechanism of the radio wave propagation in case of VHF propagation path.

7. Mechanism of reception

7-1 Thermal agitation noise (thermal noise) and effective noise power

7-1-1- Every conductor with resistance emits electromotive voltage of thermal noise which is caused by thermal agitations of its internal free electoron.
According to the Niquist's equation, this thermal agitation noise voltage is shown as below.

$$eN^2 = 4 \cdot KTBR \quad [V^2] \qquad (26)$$



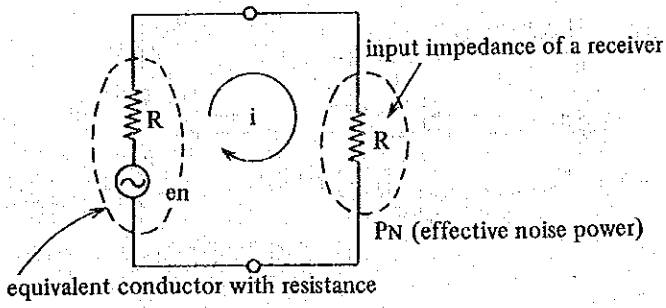
eN: effective thermal agitation noise voltage [V]
K: Boltzman's constant (1.372×10^{-23} [J/°K])
T: temperature of the conductor [°K]
B: band width of a receiver or an amplifier [HZ]
R: resistance value of the conductor [Ω]

7-1-2 According to the equivalent circuit, the effective thermal noise power PN is given as the equation below.

$$PN = i^2 \cdot R = \left(\frac{eN}{2R}\right)^2 \cdot R = \frac{eN^2}{4R} = \frac{4 \cdot KTBR}{4R}$$

$$= K \cdot T \cdot B$$

$$\therefore \quad PN = K \cdot T \cdot B \qquad (27)$$



7-1-3 As shown by the equation (27), the effective thermal noise power has no relation with the resistance value of the conductor.

7-2 Noise figure of a receiver and Carrier-to-noise ratio

7-2-1 If the receiving power was Pr at the input of the receiver of which gain is G and no internal noise, there was only a thermal noise power PN (= KTB) to be caused by its antenna system.

The carrier to noise ratio at input and output under the conditions above are shown as below:

$$\left.\begin{array}{ll} \text{C/N at input} & (C/N)i = \dfrac{Pr}{KTB} \\ \text{C/N at output} & (C/N)o = \dfrac{G \cdot Pr}{G \cdot KTB} \end{array}\right\} \quad \text{(28)}$$

In this case there is no decrease of C/N because (C/N)i equals (C/N)o.

7-2-2 However there are some noises in fact, which are emitted and amplifiered by each of stages in the radio wave receiver, at its output.

If the total noise power including these internal noise was called as Pn, the (C/N)o should be shown as below.

$$\boxed{(C/N)o = \frac{G \cdot Pr}{Pn} \quad (\text{C/N at output, including internal noise})} \quad \text{(29)}$$

7-2-3 The definition of the noise figure F is shown below.

$$F = \frac{(C/N)i}{(C/N)o} = \frac{\dfrac{Pr}{KTB}}{\dfrac{G \cdot Pr}{Pn}} = \frac{Pn}{G} \frac{1}{KTB}$$

$$\boxed{F = \frac{(C/N)i}{(C/N)o} = \frac{Pn}{G} \frac{1}{KTB}} \quad \text{(30)}$$

This noise figure F expresses the value of the internal noise of a receiver.

7-2-4 From the equation (30), the part Pn/G is shown as below.

$$\boxed{\frac{Pn}{G} = F \cdot KTB \quad (\text{output noise power converted into input})} \quad \text{(31)}$$

and

$$\boxed{Pn = G \cdot F \cdot KTB} \quad \text{(32)}$$

7-2-5 If the equation (32) was substituted into (29), the (C/N)o would be shown as below.

$$\boxed{(C/N)o = \frac{G \cdot Pr}{Pn} = \frac{G \cdot Pr}{G \cdot F \cdot KTB} = \frac{Pr}{F \cdot KTB} = \frac{\text{input carrier power (receiving power)}}{\text{output noise power converted into input}}} \quad \text{(33)}$$

or

$$(C/No) = \frac{Pr}{Ni}$$ Ni: output noise power converted into input ——— (34)

and

$$Ni = F \cdot KTB$$ (output noise power converted into input (= equation (31)) ——— (35)

7-2-6 The equation (34) and (35) are be able to rewrite as below in the dimension of [dB].

$$(C/N)o\ [dB] = Pr[dB] - Ni[dB]$$ ——— (36)

$$Ni[dB/W] = 10 \log F + 10 \log K \cdot T + 10 \log B$$ ——— (37)

or

$$Ni[dB/W] = 10 \log F + 10 \log B - 204$$ ——— (38)

T = 293 [°K] (normal temperature, 20°C)
K = 1.372×10^{-23} [J/°K]
K·T ≒ 4×10^{-21} [W]
10 log KT = 10 log 4×10^{-21} = - 204 [dB]
F: noise figure of a receiver
Ni: output noise power converted into input [W]
B: intermediate frequency band width of a receiver [HZ]
Pr: receiving power (effective receiving power) [W]

7-3 Threshold level (Threshold level for improvement of S/N)

7-3-1 In case of the frequency modulation, if the peak value of the carrier voltage was lower than that of the noise voltage, the carrier would not be detected, because it should be covered with the noise.
The maximum input level of the detectable carrier is called Threshold level (Pth).

7-3-2 In this threshold point, the equation below is given, as the Peak Factor of thermal noise wave is 4 and that of carrier wave is $\sqrt{2}$.

$$\sqrt{2}\sqrt{Pth} = 4\sqrt{F \cdot KTB}$$ ——— (39)

FKTB: noise power converted into input using equation (31)

7-3-3 From the equation (39) next two equations are given.

$$Pth = 8 \cdot F \cdot KTB \quad [W]$$
or
$$Pth[dB/W] = 9 + F[dB] + KTB\ [dB/W]$$
} ----- FM ——— (40)

7-3-4 In case of FM communication system, the equation (40) shows that the receiving power (receiving carrier power) should be more than 9 [dB] above the thermal noise power converted in to input which is shown by the equations (31), (35), (37) and (38).
The equation below is also given by introducing Cf which is called the Crest Factor.

$$Pth = Cf \cdot F \cdot KTB \quad [W] \qquad (41)$$

7-4 Signal-to-noise ratio (S/N)

7-4-1 The signal to noise ratio of the modulated carrier above the threshold level Pth is generally better than the carrier to noise ratio which are given as the equation (33) (34) and (36).

7-4-2 S/N to C/N ratio is called Improvement factor GI and shown as below.

$$GI = \frac{\frac{S}{N}}{\frac{C}{N}} \qquad (42)$$

7-4-3 Improvement factor GI is not only the value which is fixed by the kind of the communication system and the performance of the receiver used, but also the value which is meaningless below the threshold level.

GI is also shown as the equation below using the dimension [dB]

$$GI = S/N\ [dB] - C/N\ [dB] \qquad (43)$$

7-4-4 The improvement factor GI for the FM communication system is also given as the equations below.

$$GI = \frac{3 \cdot fd^2 \cdot B}{2 \cdot fm^3} \qquad (44)$$

or

$$GI\ [dB] = 10 \log 3 + 20 \log fd + 10 \log B - 10 \log 2 - 30 \log fm \qquad (45)$$

- fd: frequency deviation [HZ]
- fm: maximum modulation frequency [HZ]
- B: intermediate frequency band width [HZ]
- GI: improvement factor

7-4-5 In the case of the narrow-band FM system where fd = 5 KHZ, fm = 3 KHZ and B = 12 KHZ are used, the improvement factor GI is given as below.

$$GI = \frac{3X(5X10^3)^2X12X10^3}{2X(3X10^3)^3} = \frac{3X25X10^6X12X10^3}{2X27X10^9} = \frac{900X10^9}{54X10^9} = 16.66 \ldots\ldots$$

(For the narrow-band FM system)

$$\therefore \quad G_I\ [dB] = 10 \log G_I = 10 \log 16.66 \fallingdotseq 12.2\ [dB] \qquad (46)$$

7-5 Signal to noise ratio for the threshold level

7-5-1 S/Nth, the signal to noise ratio for the threshold level (just a little above the threshold level) is given as C/Nth · GI, the carrier to noise ratio multiplied by the improvement factor.

7-5-2 C/Nth, the carrier to noise ratio for the threshold level is given as the equations below using the Ni and Pth which are shown as the equations (35) and (41).

$$C/Nth = \frac{Pth}{Ni} = \frac{Pth}{F \cdot KTB} = \frac{Cf \cdot F \cdot KTB}{F \cdot KTB} = Cf$$

$$C/Nth = Cf \qquad (47)$$

and

$$C/Nth\ [dB] = 10 \log Cf = 10 \log 8 = 9\ [dB] \qquad (48)$$

7-5-3 According to the paragraph 7-5-1 above, S/Nth, the signal to noise ratio for the threshold level is given as the equations below.

$$S/Nth = Cf \cdot G_I \qquad (49)$$

and

$$S/Nth\ [dB] = Cf\ [dB] + G_I\ [dB] \qquad (50)$$

7-5-4 According to the equations (46), (47), (48), (49) and (50), the signal to noise ratio S/Nth in the case of narrow-band FM system, is calculated as below.

$$S/Nth\ [dB] = Cf\ [dB] + G_I\ [dB] = 9 + 12.2 = 21.2\ [dB] \qquad (51)$$
(N-FM)

7-5-5 According to the equation (41), the threshold level in the case of narrow-band FM system, is also calculated as below where Cf = 8, T = 293 [°K] (normal temperature), K = 1.372×10^{-23}, B = 12 [KHZ] and F = 9.5 [dB] are used.

$$Pth = Cf \cdot F \cdot KTB$$

$$\begin{aligned} Pth\ [dB/W] &= 10 \log Cf + 10 \log F + 10 \log B + 10 \log KT \\ &= 10 \log 8 + 9.5 + 10 \log (12 \times 10^3) + 10 \log (293 \times 1.372 \times 10^{-23}) \\ &= 9 + 9.5 + 40.8 - 204 = -144.7\ [dB/W] \end{aligned} \qquad (52)$$

7-5-6 According to the equations (21) and (52), the threshold receiving voltage (stational) Vrth is calculated as below where Pr = Pth and Rr = 50 [Ω] are used.

$$\begin{aligned} Vrth\ [dB/\mu] &= Pth\ [dB/W] + 10 \log 50 + 120 \\ &= -144.7 + 17 + 120 \\ &= -7.7\ [dB/\mu] \end{aligned} \quad \text{——————————} \quad (53)$$

7-5-7 In the same way, the threshold receiving voltage (open) is calculated as below.

$$\begin{aligned} Vr_0 th\ [dB/\mu] &= Pth + 10 \log 50 + 126 \\ &= -144.7 + 17 + 126 \\ &= -1.7\ [dB/\mu] \end{aligned} \quad \text{——————————} \quad (54)$$

7-5-8 These value expressed by the equations (51), (52), (53) and (54) are very useful to design the VHF communication circuits in the narrow-band FM system.

7-5-9 The relation between the receiving power Pr and the signal to noise ratio is shown as the picture below in case of the narrow-band FM system.