



AGENCE JAPONAISE DE COOPERATION INTERNATIONALE

ROYAUME DU MAROC
DIRECTION GENERALE DE L'HYDRAULIQUE
MINISTERE DE L'AMENAGEMENT DU TERRITOIRE,
DE L'EAU ET DE L'ENVIRONNEMENT

ETUDE DU PLAN DIRECTEUR SUR LE SYSTEME DE PREVISION ET D'ALERTE AUX CRUES POUR LA REGION DE L'ATLAS AU ROYAUME DU MAROC

RAPPORT DEFINITIF

VOLUME 4 MANUEL DE DONNEES



JANVIER 2004



CTI ENGINEERING INTERNATIONAL CO., LTD.
YACHIYO ENGINEERING CO., LTD.

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Dans la présente Etude, les estimations des coûts sont basées sur les prix ci-dessous indiqués et exprimés en Dirhams marocains selon les taux de change suivants:

1.00 DUS = 9.8638 MDH = 120.590 YJP

Pratiqués en date du 1 août 2003

COMPOSITION DU RAPPORT DEFINITIF

Volume 1 RESUME

Volume 2 RAPPORT PRINCIPAL

Volume 3 RAPPORTS ANNEXES

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ANNEXE	B	GEOMORPHOLOGIE
ANNEXE	C	ANALYSE HYDROLOGIQUE ET HYDRAULIQUE
ANNEXE	D	SIMULATION HYDRAULIQUE
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Volume 4 MANUEL DE DONNEES

**ETUDE DU PLAN DIRECTEUR
SUR LE SYSTEME DE PREVISION ET D'ALERTE AUX CRUES
POUR LA REGION DE L'ATLAS AU ROYAUME DU MAROC**

MANUEL DE DONNES

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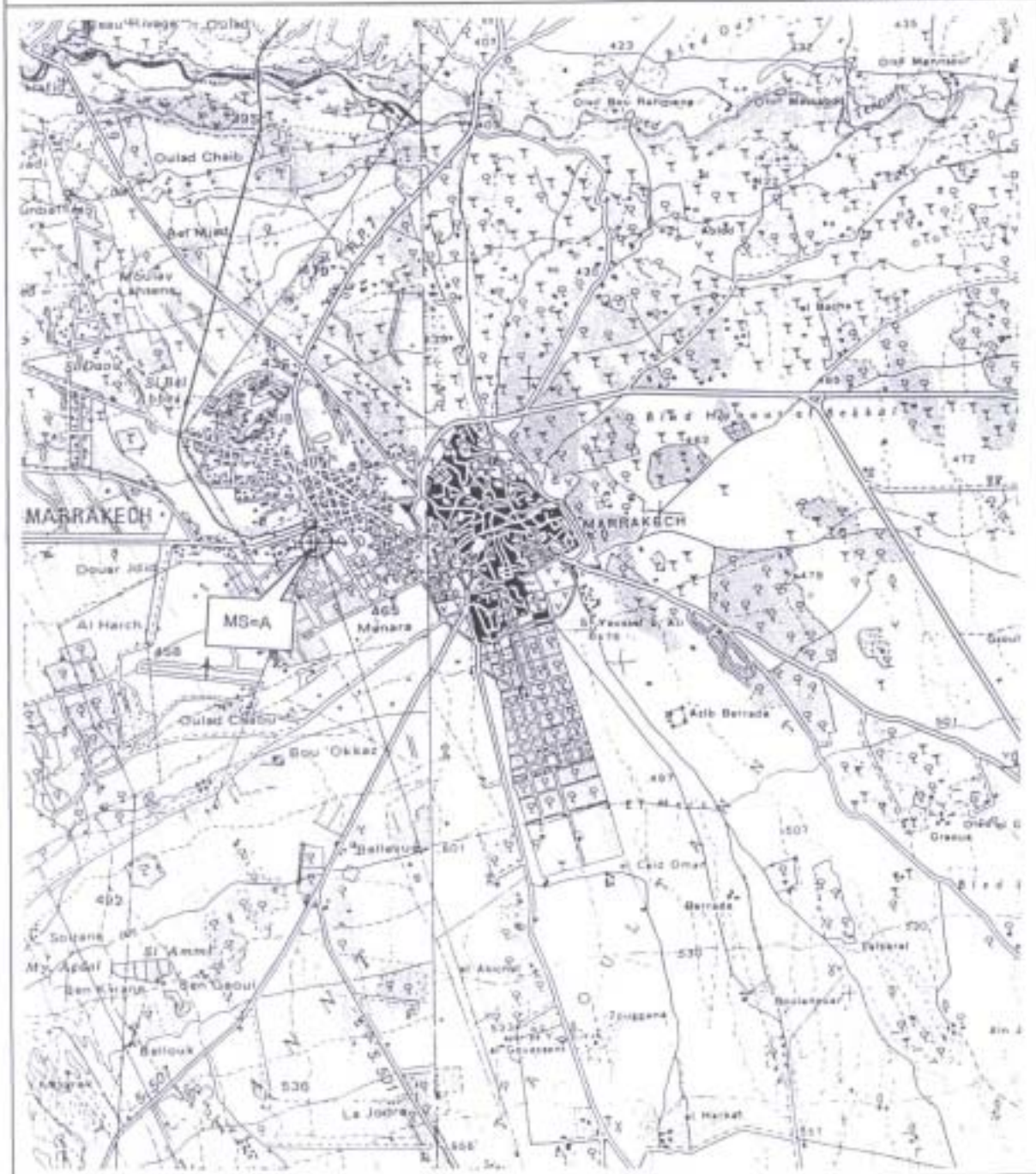
I. TEST DE PROPAGATION RADIO

LOCATION MAP

Station Code :	LOCATION
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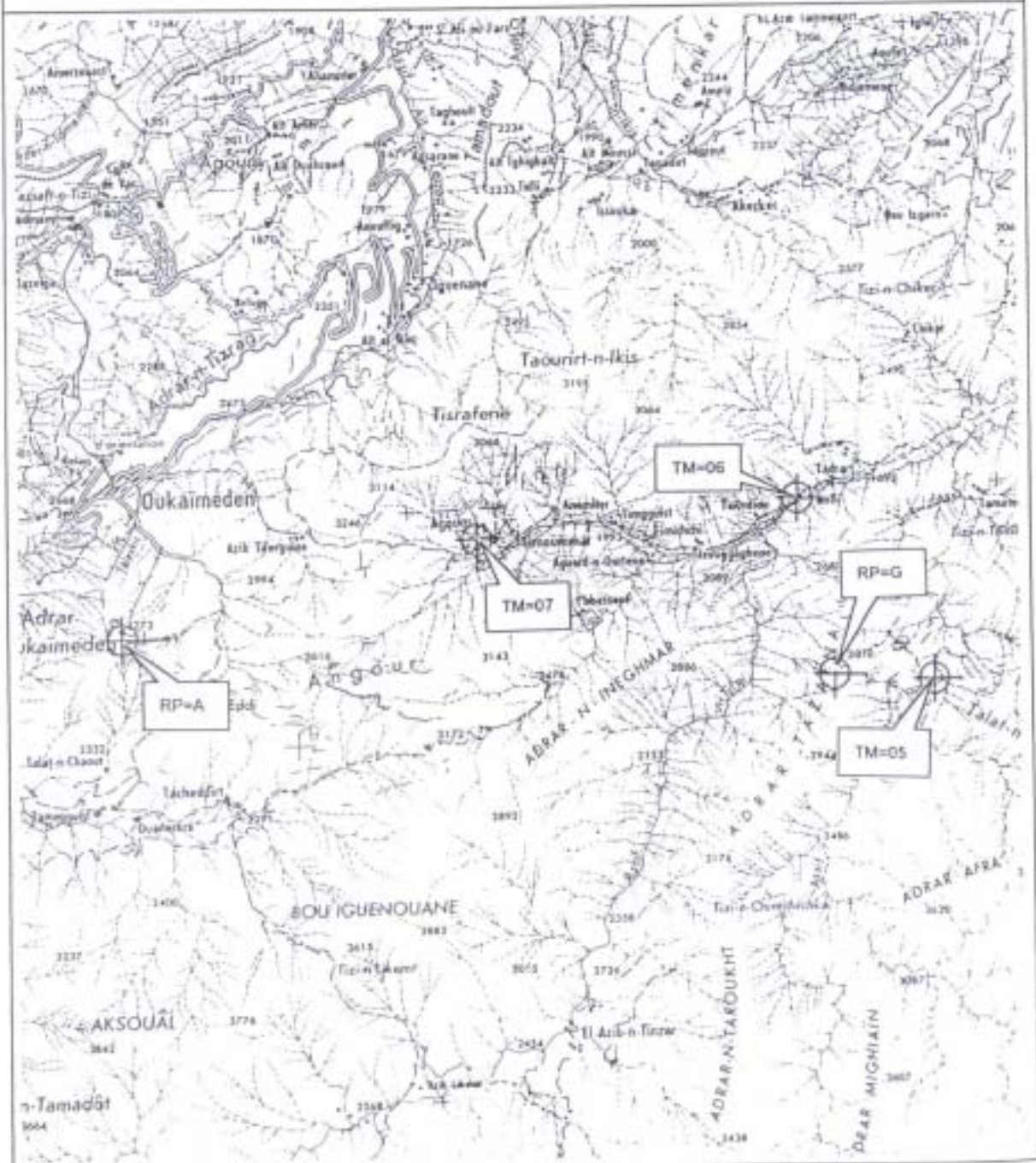
Map Scale : 1/100,000



LOCATION MAP

Station Code :		LOCATION	
RP=A	Oukaimeden	W 7° 51' 46"	N 31° 11' 6"
RP=G	Adrar Tazaina	W 7° 43' 55"	N 31° 10' 29"
TM=05	Amenzal	W 7° 43' 13"	N 31° 10' 23"
TM=06	Tioundou	W 7° 44' 40"	N 31° 12' 12"
TM=07	Agouns	W 7° 48' 3"	N 31° 11' 49"

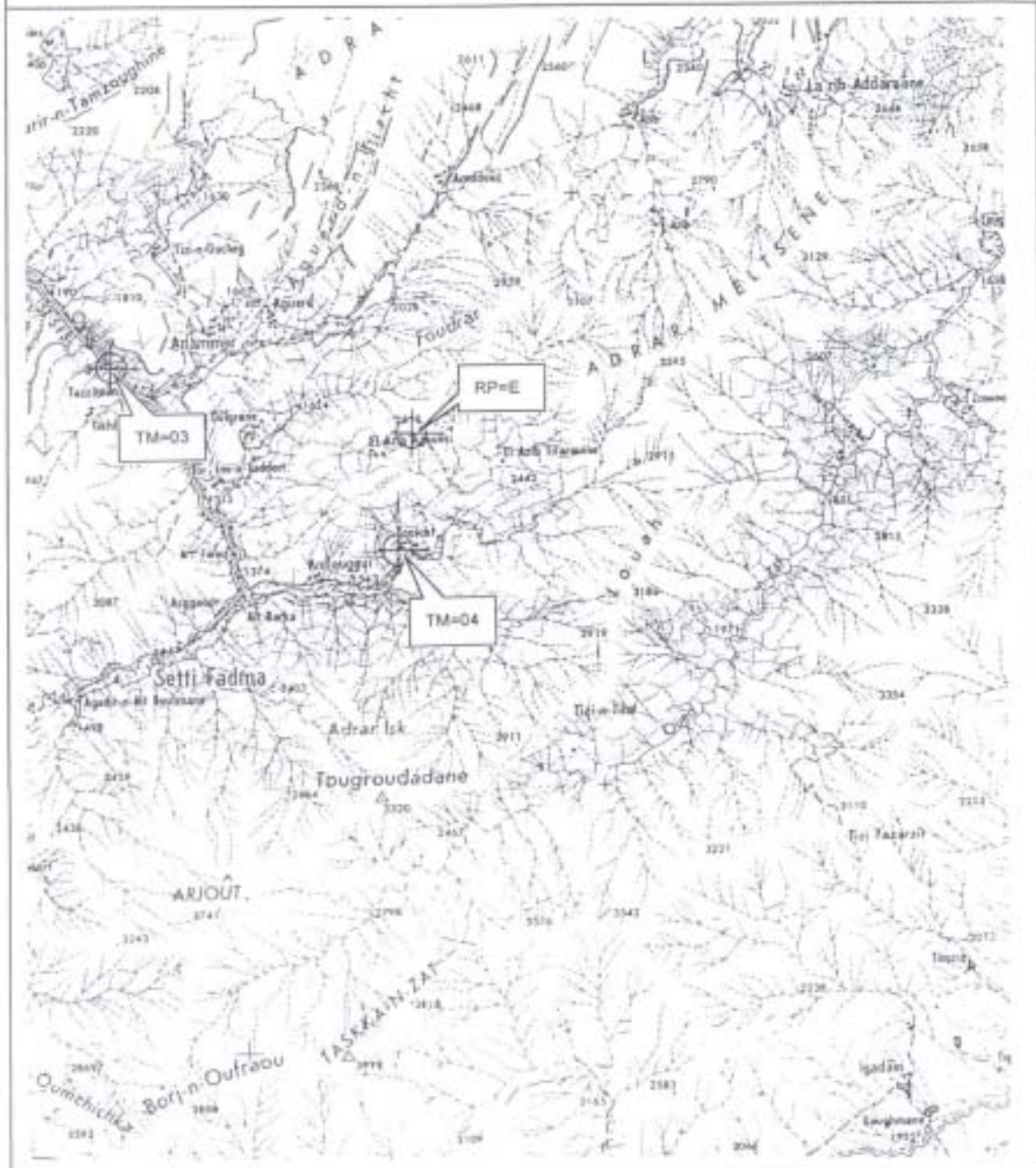
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LOCATION MAP

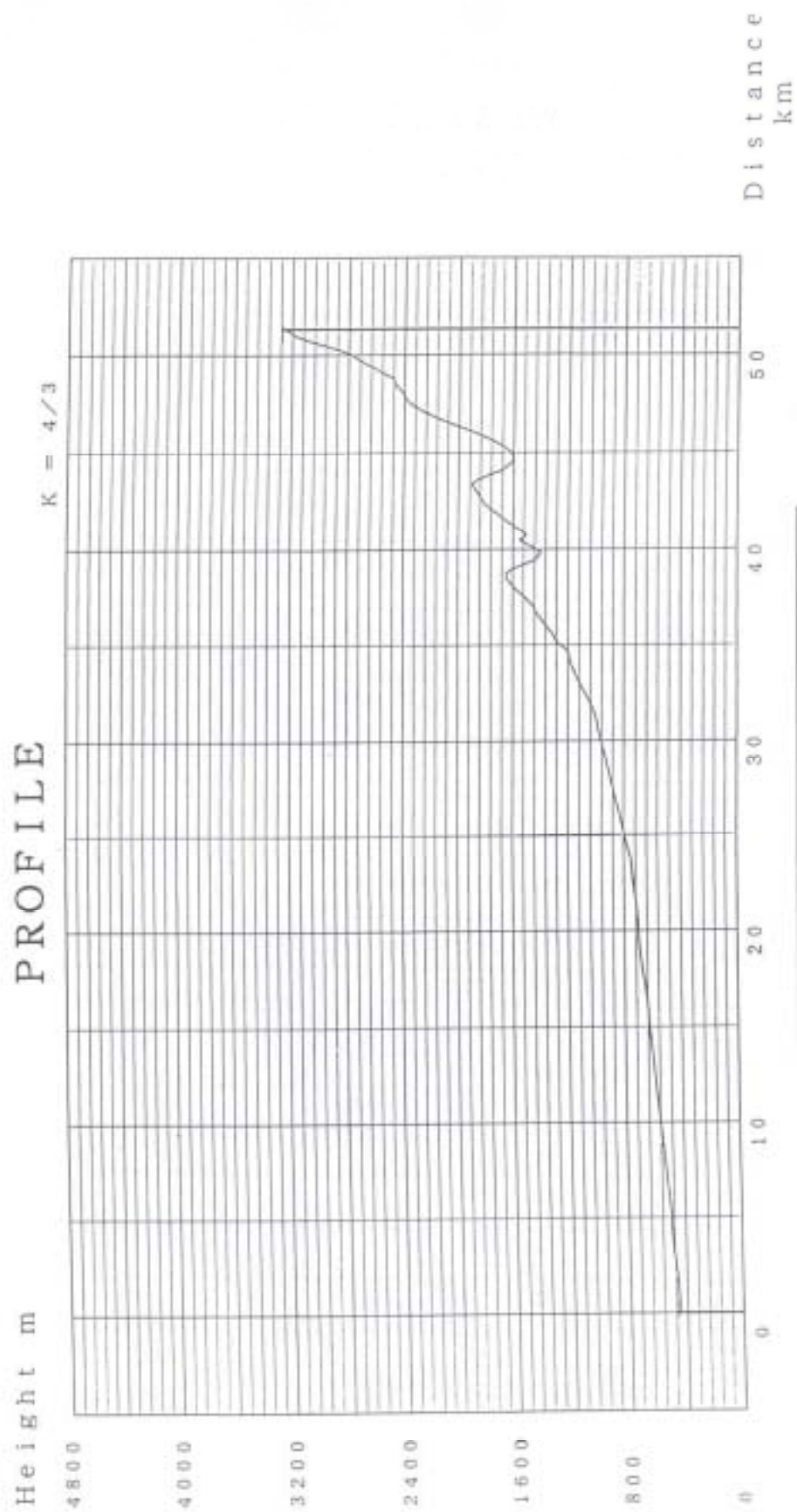
Station Code :		LOCATION	
RP=E	Setti Fadma	W 7°, 37', 34"	N 31°, 15', 36"
TM=03	Tazzount	W 7°, 41', 21"	N 31°, 16', 46"
TM=04	Touche	W 7°, 37', 49"	N 31°, 14', 30"

Map Scale : 1/100,000



88MHz Radio Path

Span				Desk Plan			
Item				MS=A - RP=A (51.3Km)			
Transmit power $10\log P(W)+30$		Pt	dBm	40	10W		
Free space Loss $30\log (fxD)+32.4$		Lpf	dB	-105.5			
Shadow Loss	Knife Edge	Lps	dB	0			
	Plane earth Loss	LAL	dB	0			
	Topography C	tf	dB	0			
Adjustment		Z	dB				
Antenna Loss	Feeder Loss T	Lft	dB	-1.4	10D-2V 30m		
	Feeder Loss R	Lfr	dB	-1.4	10D-2V 30m		
	Coaxial Arrester	Lfa	dB	0			
	Ant. Angle Loss		dB	0	T-0, R-0		
	Duplexer Loss	Lfp	dB	0			
Antenna Gain (T)		Gat	dB	2	Sleeve		
Antenna Gain (R)		Gar	dB	2	Sleeve		
Receiving Voltage			dB/ μv	48.7			
Receiving Power		Pr	dBm	-64.3			
Internal Noise P $10\log B+NF-144$		Prni	dBm	-125.2	B=12KHz NF=8dB		
External Noise P. $dBf \hat{E}v-113$		Prne	dBm	-121.9	Noise defect 5dB		
Receive Noise P. $1/Prni+1/Prne$		Prn	dBm	-120.2			
Radio frequency S/N		C/N	dB	55.9			
S/N Improvement $10\log 3fd \sim 2xB/2fm \sim 3$		I	dB	9.1	fd=3.5KHz fm=3KHz		
Standard S/N		S/N	dB	65			
Fading Loss		fd	dB	8.1	0.1dB/Km +3dB		
Fading S/N		SNfd	dB	56.9			
Threhold Level $Prn+(S/NL-I)$		PL	dBm	-99.3			
Margin to Threshold Level PL-Pr		ML	dB	35			
Fading Margin to Threshold Level		Mf	dB	26.9			
Overall S/N			dB				
Remarks Transmission Antenna Height = 470m Receiving Antenna Height = 3270m P. = Power							

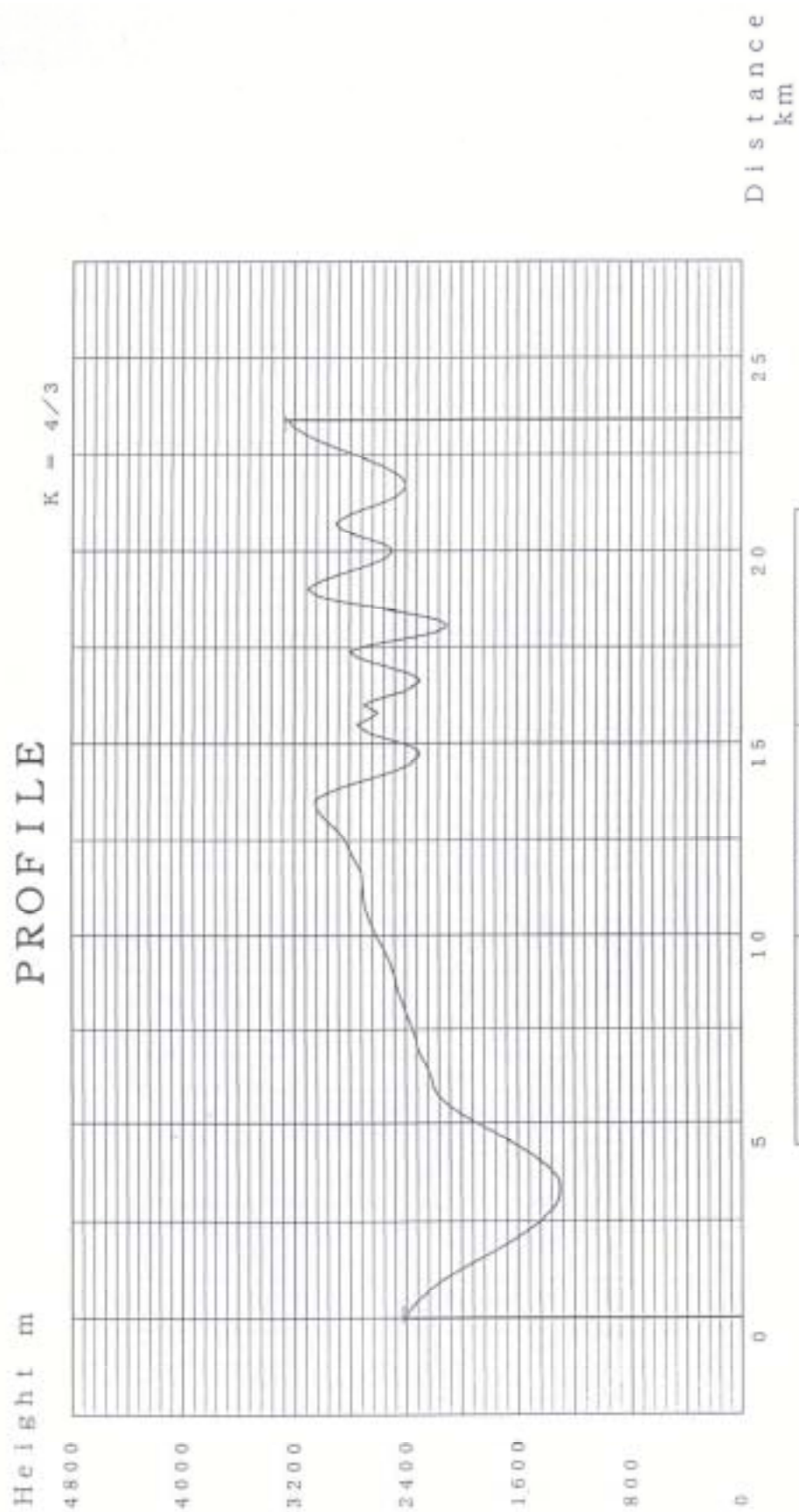


Station	MS=A	RP=A
Height/GL	470m/20m	3270m/20m
Direction		
Distance	51.3 km	

Scale = 60 km / 4800m

88MHz Radio Path

Span			Desk Plan			
Item			RP=E - RP=A (23.4Km)			
Transmit power 10log P(W)+30	Pt	dBm	40	10W		
Free space Loss 30Log (fxD)+32.4	Lpf	dB	-98.7			
Shadow Loss	Knife Edge	Lps	dB	-17		
	Plane earth Loss	LAL	dB	0		
	Topography C	tf	dB	-10		
Adjustment		Z	dB			
Antenna Loss	Feeder Loss T	Lft	dB	-1.4	10D-2V 30m	
	Feeder Loss R	Lfr	dB	-1.4	10D-2V 30m	
	Coaxial Arrester	Lfa	dB	0		
	Ant. Angle Loss		dB	0	T-0, R-0	
	Duplexer Loss	Lfp	dB	0		
Antenna Gain (T)	Gat	dB	2	Sleeve		
Antenna Gain (R)	Gar	dB	2	Sleeve		
Receiving Voltage		dB/ μv	28.5			
Receiving Power	Pr	dBm	-84.5			
Internal Noise P 10LogB+NF-144	Prni	dBm	-125.2	B=12KHz NF=8dB		
External Noise P. dBfÊv-113	Prne	dBm	-121.9	Noise defect 5dB		
Receive Noise P. 1/Prni+1/Prne	Prn	dBm	-120.2			
Radio frequency S/N	C/N	dB	35.7			
S/N Improvement 10Log3fd~2xB/2fm~3	I	dB	9.1	fd=3.5KHz fm=3KHz		
Standard S/N	S/N	dB	44.8			
Fading Loss	fd	dB	5.3	0.1dB/Km +3dB		
Fading S/N	SNfd	dB	39.5			
Threhold Level Prn+(S/NL-I)	PL	dBm	-99.3			
Margin to Threshold Level PL-Pr	ML	dB	14.8			
Fading Margin to Threshold Level	Mf	dB	9.5			
Overall S/N		dB				
Remarks Transmission Antenna Height = 2420m Receiving Antenna Height = 3270m P. = Power						

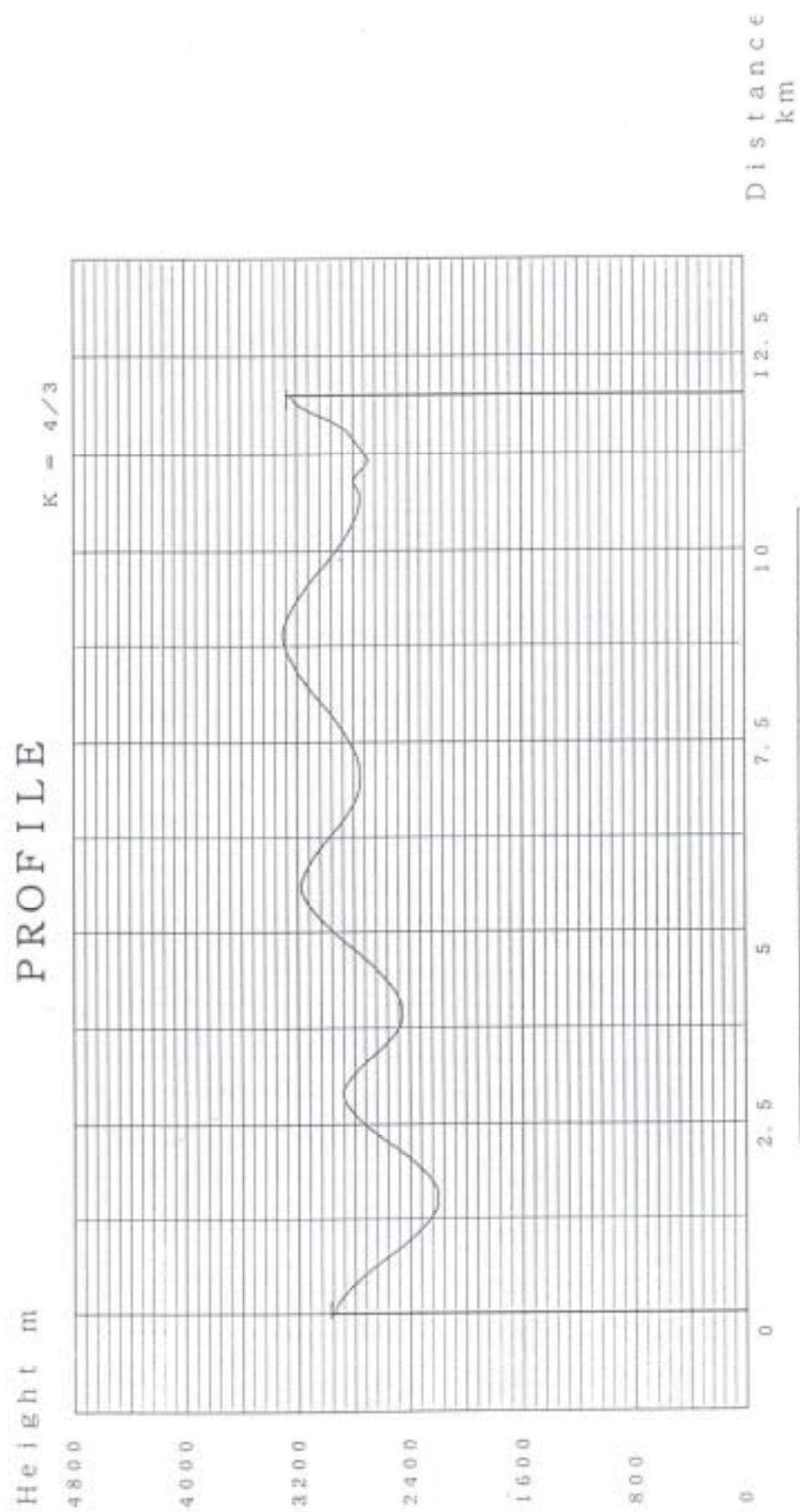


Station	RP=E	RP=A
Height/GL	2420m/20m	3270m/20m
Direction		
Distance	23.4 km	

Scale=30 km/4800m

88MHz Radio Path

Span				Desk Plan			
Item				RP=G - RP=A (12Km)			
Transmit power $10\log P(W)+30$		Pt	dBm	40	10W		
Free space Loss $30\log (fxD)+32.4$		Lpf	dB	-92.9			
Shadow Loss	Knife Edge	Lps	dB	-23.6			
	Plane earth Loss	LAL	dB	0			
	Topography C	tf	dB	-10			
Adjustment		Z	dB				
Antenna Loss	Feeder Loss T	Lft	dB	-1.4	10D-2V 30m		
	Feeder Loss R	Lfr	dB	-1.4	10D-2V 30m		
	Coaxial Arrester	Lfa	dB	0			
	Ant. Angle Loss		dB	0	T-0, R-0		
	Duplexer Loss	Lfp	dB	0			
Antenna Gain (T)		Gat	dB	2	Sleeve		
Antenna Gain (R)		Gar	dB	2	Sleeve		
Receiving Voltage			dB/ μv	27.7			
Receiving Power		Pr	dBm	-85.3			
Internal Noise P $10\log B+NF-144$		Prni	dBm	-125.2	B=12KHz NF=8dB		
External Noise P. $dBf\hat{E}v-113$		Prne	dBm	-121.9	Noise defect 5dB		
Receive Noise P. $1/Prni+1/Prne$		Prn	dBm	-120.2			
Radio frequency S/N		C/N	dB	34.9			
S/N Improvement $10\log 3fd\sim 2xB/2fm\sim 3$		I	dB	9.1	fd=3.5KHz fm=3KHz		
Standard S/N		S/N	dB	44			
Fading Loss		fd	dB	4.2	0.1dB/Km +3dB		
Fading S/N		SNfd	dB	39.8			
Threhold Level $Prn+(S/NL-I)$		PL	dBm	-99.3			
Margin to Threshold Level PL-Pr		ML	dB	14			
Fading Margin to Threshold Level		Mf	dB	9.8			
Overall S/N			dB				
Remarks							
Transmission Antenna Height				=	2970m		
Receiving Antenna Height				=	3270m		
P.				=	Power		

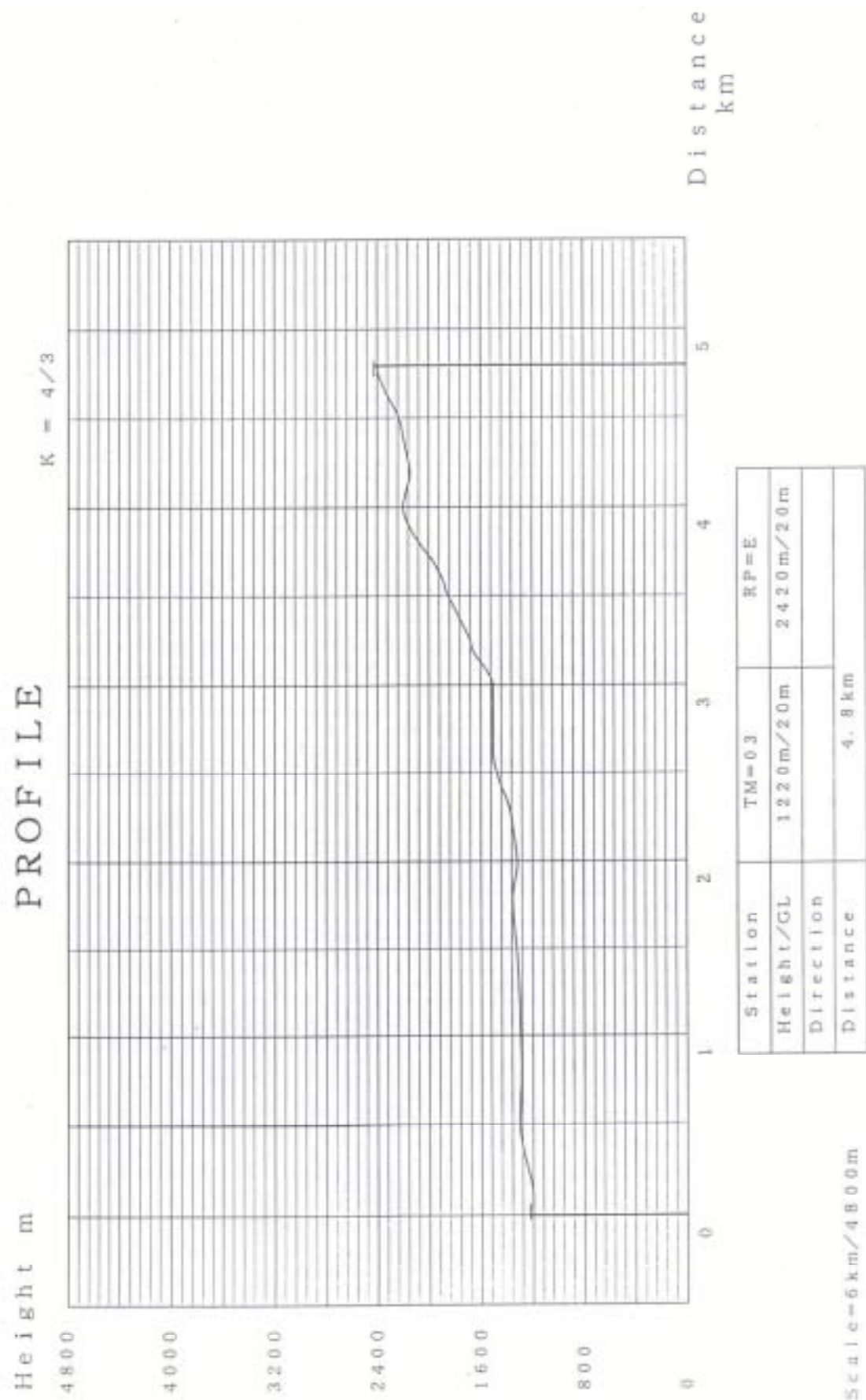


Station	RP=G	RP=A
Height/GL	2970m/20m	3270m/20m
Direction		
Distance	12km	

Scale=15km/4800m

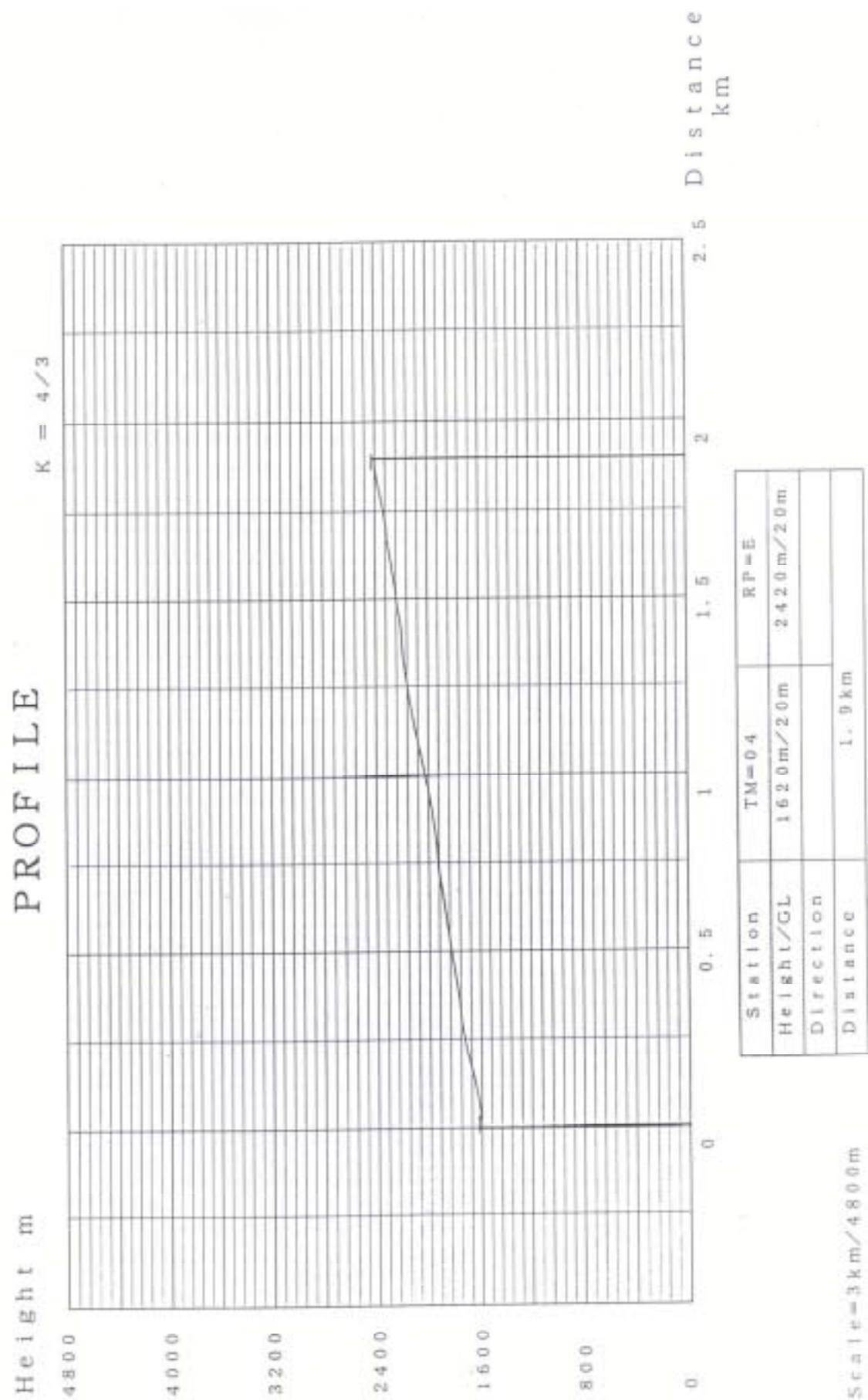
88MHz Radio Path

Span Item			Desk Plan			
			TM=03 - RP=E (4.8Km)			
Transmit power 10log $P(W)+30$	Pt	dBm	40	10W		
Free space Loss 30Log $(fxD)+32.4$	Lpf	dB	-84.9			
Shadow Loss	Knife Edge	Lps	dB	-1.7		
	Plane earth Loss	LAL	dB	0		
	Topography C	tf	dB	-10		
Adjustment		Z	dB			
Antenna Loss	Feeder Loss T	Lft	dB	-1.4	10D-2V 30m	
	Feeder Loss R	Lfr	dB	-1.4	10D-2V 30m	
	Coaxial Arrester	Lfa	dB	0		
	Ant. Angle Loss		dB	0	T-0, R-0	
	Duplexer Loss	Lfp	dB	0		
Antenna Gain (T)	Gat	dB	8	3EL Yagi		
Antenna Gain (R)	Gar	dB	2	Sleeve		
Receiving Voltage		dB/ μv	63.6			
Receiving Power	Pr	dBm	-49.4			
Internal Noise P $10\log B+NF-144$	Prni	dBm	-125.2	B=12KHz NF=8dB		
External Noise P. $dBf \hat{E}v-113$	Prne	dBm	-121.9	Noise defect 5dB		
Receive Noise P. $1/Prni+1/Prne$	Prn	dBm	-120.2			
Radio frequency S/N	C/N	dB	70.8			
S/N Improvement $10\log 3fd \sim 2xB/2fm \sim 3$	I	dB	9.1	fd=3.5KHz fm=3KHz		
Standard S/N	S/N	dB	79.9			
Fading Loss	fd	dB	3.5	0.1dB/Km +3dB		
Fading S/N	SNfd	dB	76.4			
Threhold Level $Prn+(S/NL-I)$	PL	dBm	-99.3			
Margin to Threshold Level PL-Pr	ML	dB	49.9			
Fading Margin to Threshold Level	Mf	dB	46.4			
Overall S/N		dB				
Remarks Transmission Antenna Height = 1220m Receiving Antenna Height = 2420m P. = Power						



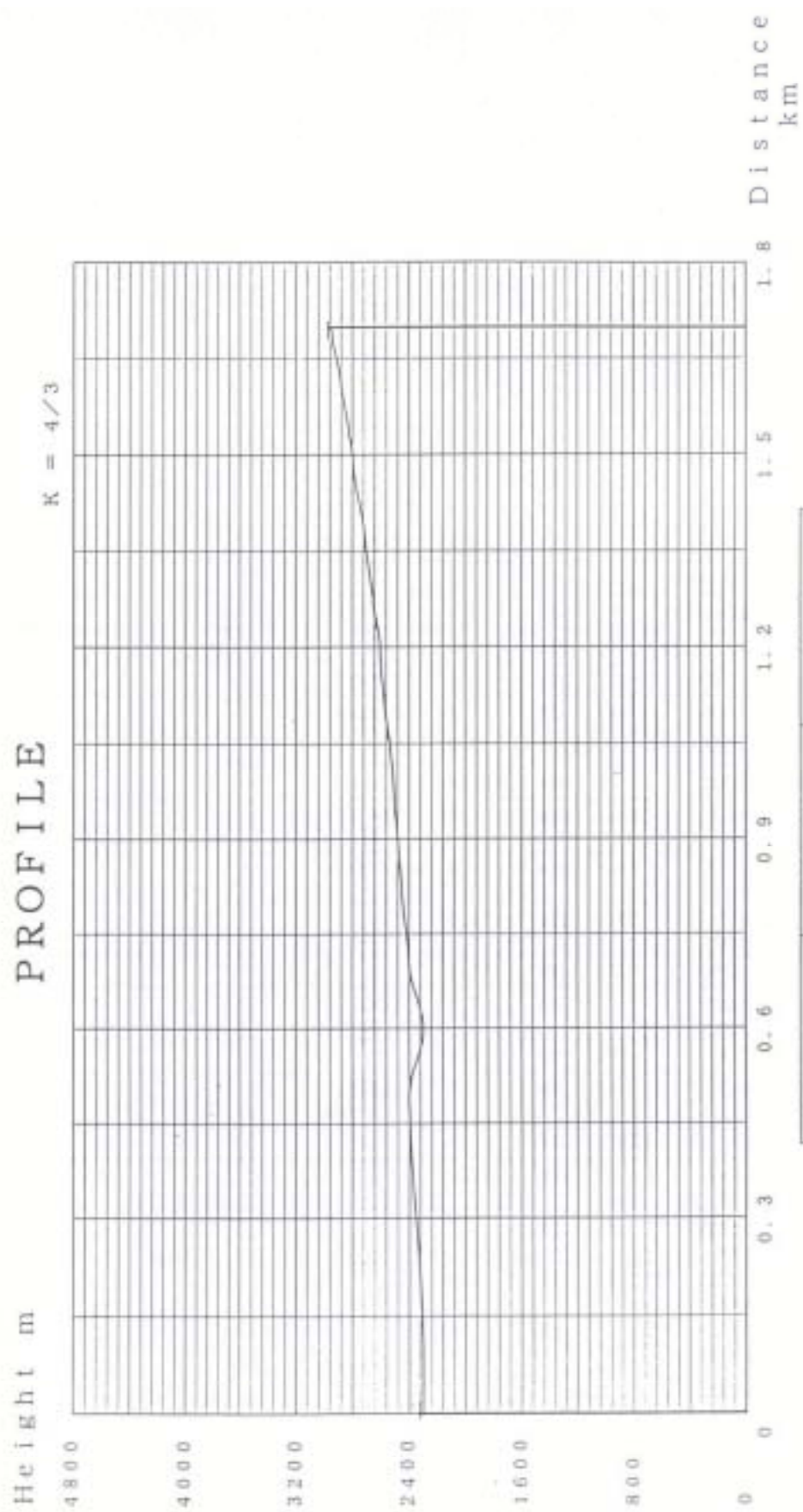
88MHz Radio Path

Span Item				Desk Plan			
				TM=04 - RP=E (1.9Km)			
Transmit power 10log P(W)+30		Pt	dBm	40	10W		
Free space Loss 30Log (fxD)+32.4		Lpf	dB	-76.9			
Shadow Loss	Knife Edge	Lps	dB	0			
	Plane earth Loss	LAL	dB	0			
	Topography C	tf	dB	-10			
Adjustment		Z	dB				
Antenna Loss	Feeder Loss T	Lft	dB	-1.4	10D-2V 30m		
	Feeder Loss R	Lfr	dB	-1.4	10D-2V 30m		
	Coaxial Arrester	Lfa	dB	0			
	Ant. Angle Loss		dB	0	T-0, R-0		
	Duplexer Loss	Lfp	dB	0			
Antenna Gain (T)		Gat	dB	8	3EL Yagi		
Antenna Gain (R)		Gar	dB	2	Sleeve		
Receiving Voltage			dB/ μ	73.3			
Receiving Power		Pr	dBm	-39.7			
Internal Noise P 10LogB+NF-144		Prni	dBm	-125.2	B=12KHz NF=8dB		
External Noise P. dBf $\hat{E}_v$ -113		Prne	dBm	-121.9	Noise defect 5dB		
Receive Noise P. 1/Prni+1/Prne		Prn	dBm	-120.2			
Radio frequency S/N		C/N	dB	80.5			
S/N Improvement 10Log3fd~2xB/2fm~3		I	dB	9.1	fd=3.5KHz fm=3KHz		
Standard S/N		S/N	dB	89.6			
Fading Loss		fd	dB	3.2	0.1dB/Km +3dB		
Fading S/N		SNfd	dB	86.4			
Threhold Level Prn+(S/NL-I)		PL	dBm	-99.3			
Margin to Threshold Level PL-Pr		ML	dB	59.6			
Fading Margin to Threshold Level		Mf	dB	56.4			
Overall S/N			dB				
Remarks Transmission Antenna Height = 1620m Receiving Antenna Height = 2420m P. = Power							



88MHz Radio Path

Span				Desk Plan			
Item				TM=06 - RP=G (1.7Km)			
Transmit power 10log P(W)+30		Pt	dBm	40	10W		
Free space Loss 30Log (fxD)+32.4		Lpf	dB	-75.9			
Shadow Loss	Knife Edge	Lps	dB	-0			
	Plane earth Loss	LAL	dB	0			
	Topography C	tf	dB	-10			
Adjustment		Z	dB				
Antenna Loss	Feeder Loss T	Lft	dB	-1.4	10D-2V 30m		
	Feeder Loss R	Lfr	dB	-1.4	10D-2V 30m		
	Coaxial Arrester	Lfa	dB	0			
	Ant. Angle Loss		dB	0	T-0, R-0		
	Duplexer Loss	Lfp	dB	0			
Antenna Gain (T)		Gat	dB	8	3EL Yagi		
Antenna Gain (R)		Gar	dB	2	Sleeve		
Receiving Voltage			dB/ μ v	74.3			
Receiving Power		Pr	dBm	-38.7			
Internal Noise P 10LogB+NF-144		Prni	dBm	-125.2	B=12KHz NF=8dB		
External Noise P. dBfÊv-113		Prne	dBm	-121.9	Noise defect 5dB		
Receive Noise P. 1/Prni+1/Prne		Prn	dBm	-120.2			
Radio frequency S/N		C/N	dB	81.5			
S/N Improvement 10Log3fd~2xB/2fm~3		I	dB	9.1	fd=3.5KHz fm=3KHz		
Standard S/N		S/N	dB	90.6			
Fading Loss		fd	dB	3.2	0.1dB/Km +3dB		
Fading S/N		SNfd	dB	87.4			
Threhold Level Prn+(S/NL-I)		PL	dBm	-99.3			
Margin to Threshold Level PL-Pr		ML	dB	60.6			
Fading Margin to Threshold Level		Mf	dB	57.4			
Overall S/N			dB				
Remarks							
Transmission Antenna Height				=	2320m		
Receiving Antenna Height				=	2970m		
P.				=	Power		



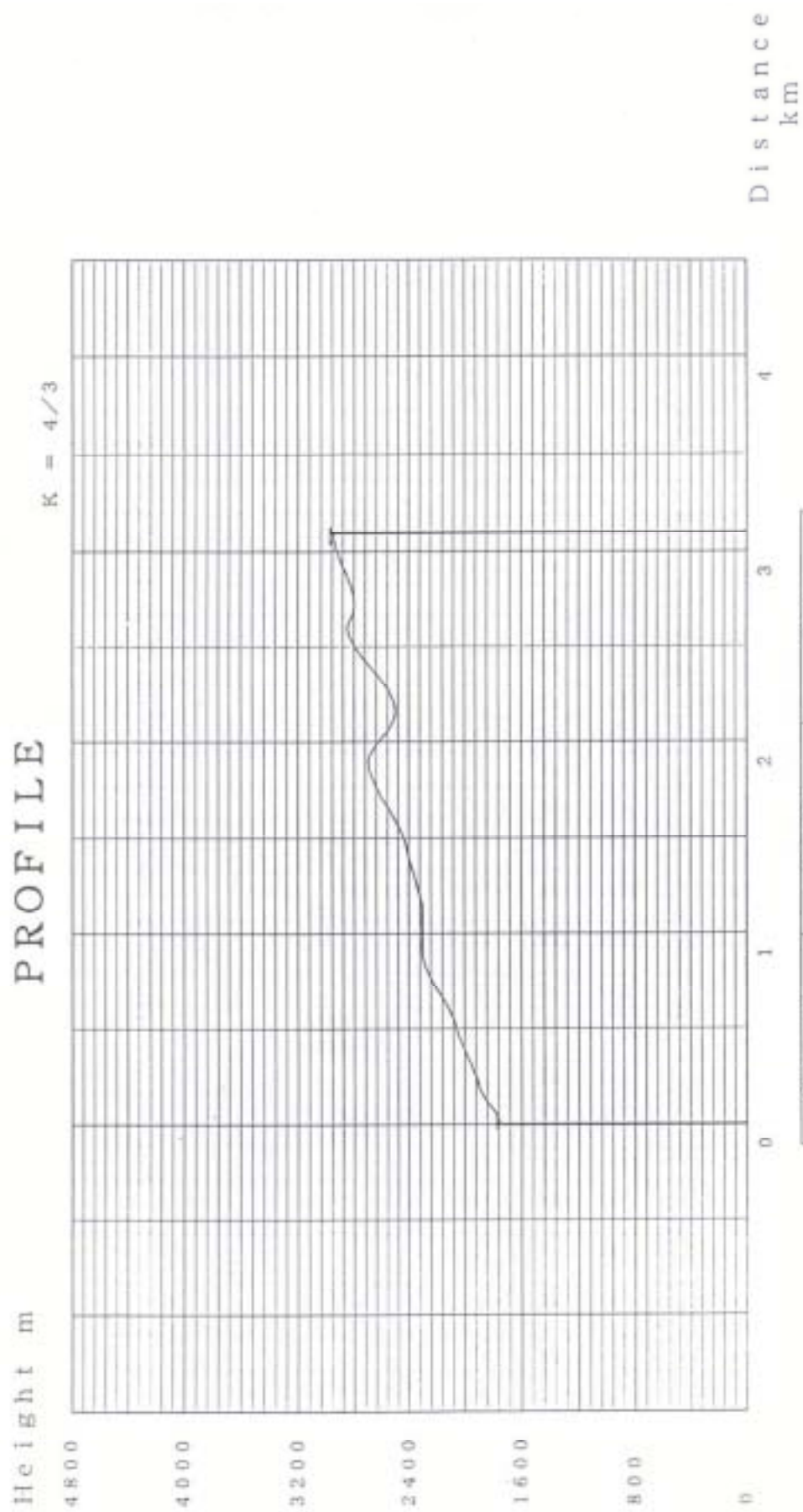
Station	TM=05	RP=G
Height/GL	2320m/20m	2970m/20m
Direction		
Distance	1.7 km	

Scale=1:8 km/4800m

88MHz Radio Path

Span Item				Desk Plan			
				TM=06 - RP=G (3.1Km)			
Transmit power $10\log P(W)+30$		Pt	dBm	40	10W		
Free space Loss $30\log (fxD)+32.4$		Lpf	dB	-81.1			
Shadow Loss	Knife Edge	Lps	dB	-50.5			
	Plane earth Loss	LAL	dB	0			
	Topography C	tf	dB	-10			
Adjustment		Z	dB				
Antenna Loss	Feeder Loss T	Lft	dB	-1.4	10D-2V 30m		
	Feeder Loss R	Lfr	dB	-1.4	10D-2V 30m		
	Coaxial Arrester	Lfa	dB	0			
	Ant. Angle Loss		dB	0	T-0, R-0		
	Duplexer Loss	Lfp	dB	0			
Antenna Gain (T)		Gat	dB	8	3EL Yagi		
Antenna Gain (R)		Gar	dB	2	Sleeve		
Receiving Voltage			dB/ μv	18.6			
Receiving Power		Pr	dBm	-94.4			
Internal Noise P $10\log B+NF-144$		Prni	dBm	-125.2	B=12KHz NF=8dB		
External Noise P. $dBf\hat{E}v-113$		Prne	dBm	-121.9	Noise defect 5dB		
Receive Noise P. $1/Prni+1/Prne$		Prn	dBm	-120.2			
Radio frequency S/N		C/N	dB	25.8			
S/N Improvement $10\log 3fd\sim 2xB/2fm\sim 3$		I	dB	9.1	fd=3.5KHz fm=3KHz		
Standard S/N		S/N	dB	34.9			
Fading Loss		fd	dB	3.3	0.1dB/Km +3dB		
Fading S/N		SNfd	dB	31.6			
Threhold Level $Prn+(S/NL-I)$		PL	dBm	-99.3			
Margin to Threshold Level PL-Pr		ML	dB	4.9			
Fading Margin to Threshold Level		Mf	dB	1.6			
Overall S/N			dB				
Remarks Transmission Antenna Height = 1770m Receiving Antenna Height = 2970m P. = Power							

PROFILE



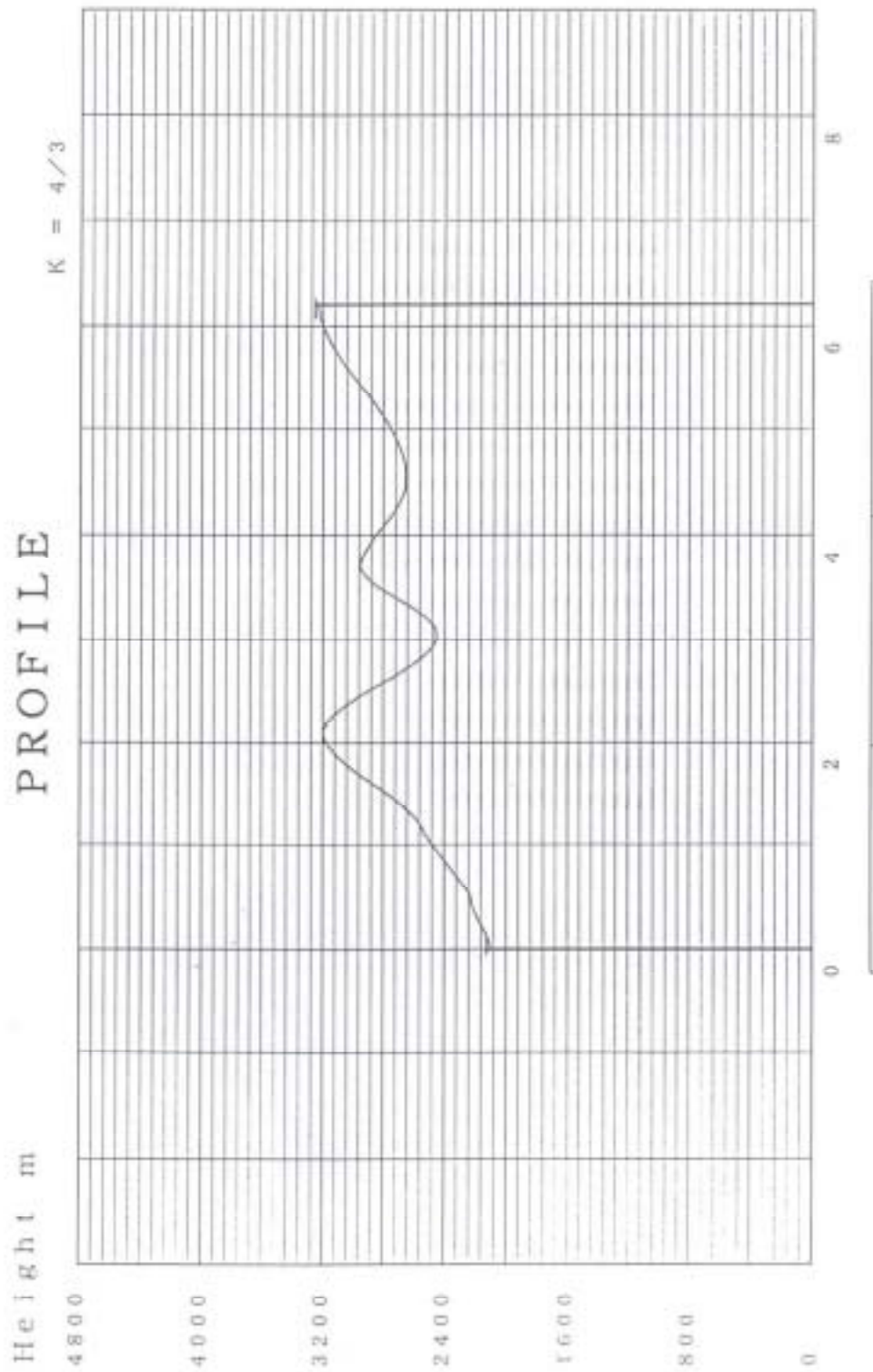
Station	TM=0.6	RP=G
Height/GL	1770m/20m	2970m/20m
Direction		
Distance	3.1 km	

Scale = 6 km / 4800 m

88MHz Radio Path

Span Item			Desk Plan			
			TM=07 - RP=A (6.2Km)			
Transmit power 10log P(W)+30	Pt	dBm	40	10W		
Free space Loss 30Log (fxD)+32.4	Lpf	dB	-87.1			
Shadow Loss	Knife Edge	Lps	dB	-36.1		
	Plane earth Loss	LAL	dB	0		
	Topography C	tf	dB	-10		
Adjustment		Z	dB			
Antenna Loss	Feeder Loss T	Lft	dB	-1.4	10D-2V 30m	
	Feeder Loss R	Lfr	dB	-1.4	10D-2V 30m	
	Coaxial Arrester	Lfa	dB	0		
	Ant. Angle Loss		dB	0	T-0, R-1	
	Duplexer Loss	Lfp	dB	0		
Antenna Gain (T)	Gat	dB	8	3EL Yagi		
Antenna Gain (R)	Gar	dB	2	Sleeve		
Receiving Voltage		dB/ μv	28.5			
Receiving Power	Pr	dBm	-84.5			
Internal Noise P 10LogB+NF-144	Prni	dBm	-125.2	B=12KHz NF=8dB		
External Noise P. dBfÊv-113	Prne	dBm	-121.9	Noise defect 5dB		
Receive Noise P. 1/Prni+1/Prne	Prn	dBm	-120.2			
Radio frequency S/N	C/N	dB	35.7			
S/N Improvement 10Log3fd~2xB/2fm~3	I	dB	9.1	fd=3.5KHz fm=3KHz		
Standard S/N	S/N	dB	44.8			
Fading Loss	fd	dB	3.6	0.1dB/Km +3dB		
Fading S/N	SNfd	dB	41.2			
Threhold Level Prn+(S/NL-I)	PL	dBm	-99.3			
Margin to Threshold Level PL-Pr	ML	dB	14.8			
Fading Margin to Threshold Level	Mf	dB	11.2			
Overall S/N		dB				
Remarks Transmission Antenna Height = 2120m Receiving Antenna Height = 3250m P. = Power						

PROFILE



Station	TM=07	RP=A
Height/GL	2120m/20m	3250m/20m
Direction		
Distance	6.2 km	

Scale=12 km/4800m