 ITECHCOM <small>Instrumentation, Control and Data Systems</small>	<b>CLIENTE:</b> CDM SMITH - INGESAM		<b>CONTRATO No.:</b>
	<b>DOCUMENTO NO.:</b> INF-PTAR-003	<b>ELABORO:</b> P.VIVEROS	<b>FECHA:</b> 19/09/2013

**ESTUDIOS DE PROPAGACION  
ALTERNATIVA # 1  
SITIO DE REPETICION SIERRA MORENA**



**CLIENTE:**  
CDM SMITH - INGESAM

**CONTRATO No.:**

**DOCUMENTO NO.:**  
INF-PTAR-003

**ELABORO:**  
P.VIVEROS

**FECHA:**  
19/09/2013

cansm7.p13	PTAR CANOAS	SIERRA MORENA
Elevation (m)	2558.00	2783.00
Latitude	004 34 23 N	004 34 29 N
Longitude	074 15 38 W	074 10 13 W
Azimuth	88.92	268.92
Antenna Type	0.6 M - 7.5 GHz	0.6 M - 7.5 GHz
Antenna Height (m)	10.00	10.00
Antenna Gain (dBi)	30.80	30.80
TX Line Type	Antena Integrada	Antena Integrada
TX Line Unit Loss (dB/100 m)	0.00	0.00
Connector Loss (dB)	0.20	0.20
TX Filter Loss (dB)	1.90	1.90
RX Filter Loss (dB)	1.90	1.90
Frequency (MHz)	7000.00	
Polarization	Vertical	
Path Length (km)	10.01	
Free Space Loss (dB)	129.38	
Field Margin (dB)	2.00	
Diffraction Loss (dB)	0.00	
Atmospheric Absorption Loss (dB)	0.09	
Net Path Loss (dB)	74.07	74.07
Radio Type Model	RADIO TIPO	RADIO TIPO
Emission Designator	27M5D7W	27M5D7W
TX Frequency Assignment (MHz)	7000	7000
TX Power (watts)	0.13	0.13
TX Power (dBm)	21.00	21.00
Effective Radiated Power (dBm)	49.70	49.70
RX Threshold Criteria	10E-6	10E-6
RX Threshold Level (dBm)	-77.50	-77.50
Maximum Receive Signal (dBm)	-25.00	-25.00
RX Signal (dBm)	-53.07	-53.07
Thermal Fade Margin (dB)	24.43	24.43
Dispersive Fade Margin (dB)	45.00	45.00
Dispersive Fade Occurrence Factor	1.00	
Effective Fade Margin (dB)	24.39	24.39
Climatic Factor	1.00	
Terrain Roughness (m)	32.85	
C Factor	0.37	
Average Annual Temperature (deg C)	18.00	
Diversity Type	Non Diversity	
Worst Month Multipath 1 way (sec)	14.90	14.90
Worst Month Multipath 1 way (%)	99.999433	99.999433
Annual Multipath 1 way (sec)	57.59	57.59
Annual Multipath 1 way (%)	99.999817	99.999817
Annual Multipath 2 way (%-sec)	99.999635 - 115.17	



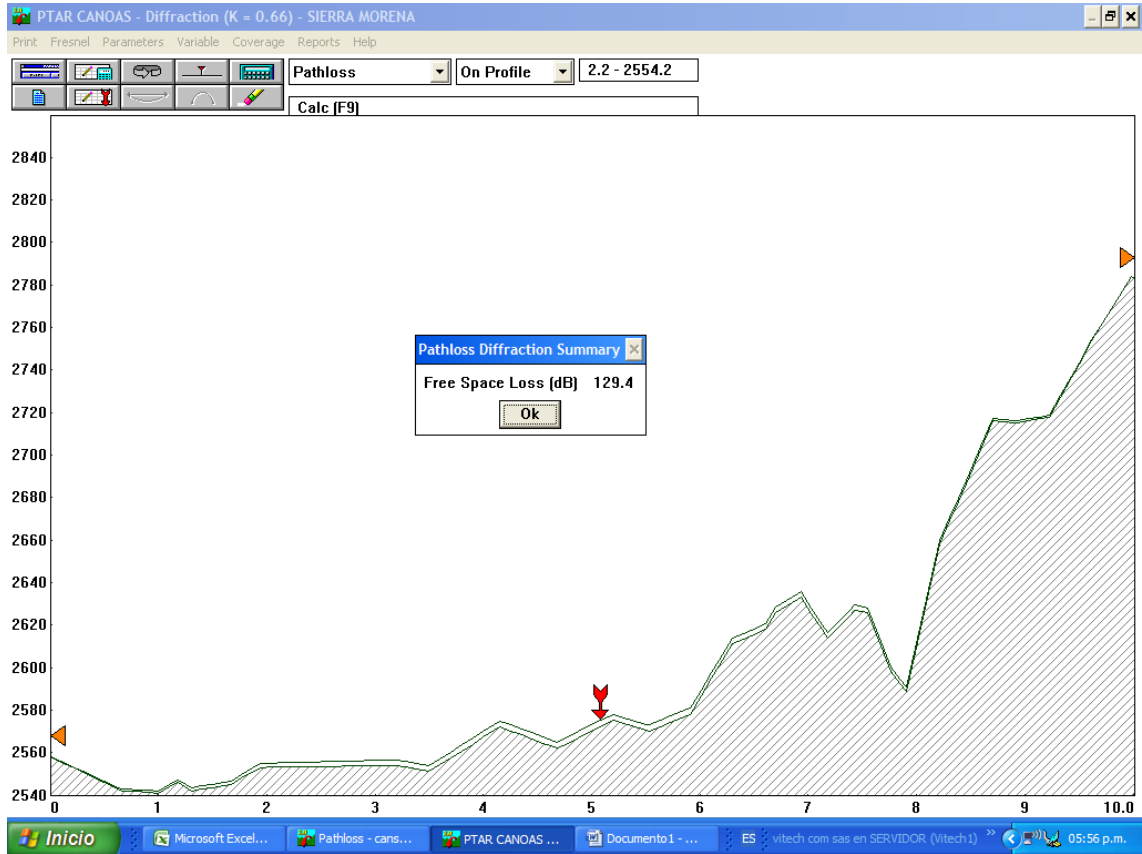
CLIENTE:  
CDM SMITH - INGESAM


CONTRATO No.:

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INF-PTAR-003

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19/09/2013



	<b>CLIENTE:</b> CDM SMITH - INGESAM		<b>CONTRATO No.:</b>	
	<b>DOCUMENTO NO.:</b> INF-PTAR-003	<b>ELABORO:</b> P.VIVEROS	<b>FECHA:</b> 19/09/2013	


Variable Parameter : Earth Radius Factor (K)

Reflective plane defined between 0.00 and 5.91 km (Least Squares)

PTAR CANOAS Antenna 3 dB Beamwidth (deg)	2.00
SIERRA MORENA Antenna 3 dB Beamwidth (deg)	2.00
Terrain Roughness (m)	5.09
Clearance - Ground Cover Loss (dB)	2.00
Divergence	Included

PTAR CANOAS Antenna Height (m)	10.00
SIERRA MORENA Antenna Height (m)	10.00
Frequency (MHz)	7000.00
Polarization	Vertical

K	Location km	Reflection Loss %    dB	Reflection Delay rad    ns	Gain dB
0.70	1.23	95.70    27.32	151.0    3.4	0.36
0.71	1.23	95.70    27.32	151.1    3.4	0.35
0.72	1.23	95.70    27.33	151.2    3.4	0.34
0.74	1.23	95.70    27.33	151.4    3.4	0.30
0.76	1.23	95.70    27.33	151.6    3.4	0.26
0.78	1.23	95.70    27.34	151.8    3.5	0.21
0.80	1.23	95.70    27.34	151.9    3.5	0.17
0.82	1.23	95.71    27.34	152.1    3.5	0.11
0.84	1.23	95.71    27.34	152.3    3.5	0.05
0.87	1.22	95.71    27.35	152.5    3.5	-0.02
0.89	1.22	95.71    27.35	152.6    3.5	-0.09
0.92	1.22	95.71    27.36	152.8    3.5	-0.15
0.95	1.22	95.71    27.36	153.0    3.5	-0.21
0.97	1.22	95.72    27.36	153.1    3.5	-0.26
1.00	1.22	95.72    27.37	153.3    3.5	-0.30
1.04	1.22	95.72    27.37	153.5    3.5	-0.34
1.08	1.22	95.72    27.37	153.7    3.5	-0.37
1.12	1.22	95.72    27.38	153.9    3.5	-0.38
1.13	1.22	95.72    27.38	153.9    3.5	-0.38
1.13	1.22	95.72    27.38	153.9    3.5	-0.38
1.14	1.22	95.72    27.38	153.9    3.5	-0.38
1.15	1.22	95.72    27.38	154.0    3.5	-0.38
1.16	1.22	95.73    27.38	154.0    3.5	-0.38
1.20	1.22	95.73    27.39	154.2    3.5	-0.37
1.25	1.21	95.73    27.39	154.4    3.5	-0.34
1.30	1.21	95.73    27.39	154.5    3.5	-0.31
1.36	1.21	95.73    27.40	154.7    3.5	-0.26
1.43	1.21	95.74    27.40	154.9    3.5	-0.21

	<b>CLIENTE:</b> CDM SMITH - INGESAM		<b>CONTRATO No.:</b>
	<b>DOCUMENTO NO.:</b> INF-PTAR-003	<b>ELABORO:</b> P.VIVEROS	<b>FECHA:</b> 19/09/2013

	PTAR CANOAS	SIERRA MORENA
Latitude	004 34 23 N	004 34 29 N
Longitude	074 15 38 W	074 10 13 W
Azimuth	88.92	268.92
Distance (km)		10.01
Elevation (m)	2558.0	2783.0
Antenna Height (m)	10.0	10.0
Frequency (MHz)		7000.00
Polarization		Vertical
Antenna 3 dB Beamwidth (deg)	2.00	2.00
Constant Gradient K		1.33

#1 Direct Path

Number of Rays	20
Lower Limit (m)	1.67
Upper Limit (m)	40.00



**CLIENTE:**  
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**ELABORO:**  
P.VIVEROS

**FECHA:**  
19/09/2013

cansm.pl3	PTAR CANOAS	SIERRA MORENA
Elevation (m)	2558.00	2783.00
Latitude	004 34 23 N	004 34 29 N
Longitude	074 15 38 W	074 10 13 W
Azimuth	88.92	268.92
Antenna Type	1.0 M - 13 GHz	1.0 M - 13 GHz
Antenna Height (m)	10.00	10.00
Antenna Gain (dBi)	40.00	40.00
TX Line Type	Antena Integrada	Antena Integrada
TX Line Unit Loss (dB/100 m)	0.00	0.00
Connector Loss (dB)	0.20	0.20
TX Filter Loss (dB)	1.90	1.90
RX Filter Loss (dB)	1.90	1.90
Frequency (MHz)	13000.00	
Polarization	Vertical	
Path Length (km)	10.01	
Free Space Loss (dB)	134.75	
Field Margin (dB)	1.00	
Diffraction Loss (dB)	0.00	
Atmospheric Absorption Loss (dB)	0.20	
Net Path Loss (dB)	60.16	60.16
Radio Type Model	RADIO TIPO	RADIO TIPO
Emission Designator	27M5D7W	27M5D7W
TX Frequency Assignment (MHz)	13000	13000
TX Power (watts)	0.12	0.12
TX Power (dBm)	20.80	20.80
Effective Radiated Power (dBm)	58.70	58.70
RX Threshold Criteria	10E-6	10E-6
RX Threshold Level (dBm)	-78.50	-78.50
Maximum Receive Signal (dBm)	-25.00	-25.00
RX Signal (dBm)	-39.36	-39.36
Thermal Fade Margin (dB)	39.14	39.14
Dispersive Fade Margin (dB)	45.00	45.00
Dispersive Fade Occurrence Factor	1.00	
Effective Fade Margin (dB)	38.14	38.14
Climatic Factor	1.00	
Terrain Roughness (m)	32.85	
C Factor	0.37	
Average Annual Temperature (deg C)	20.00	
Diversity Type	Non Diversity	
Worst Month Multipath 1 way (sec)	1.16	1.16
Worst Month Multipath 1 way (%)	99.999956	99.999956
Annual Multipath 1 way (sec)	4.74	4.74
Annual Multipath 1 way (%)	99.999985	99.999985
Annual Multipath 2 way (%-sec)	99.999970 - 9.48	
Rain Region	G Tropical Moderate	
Rain Rate (mm/hr)	147.06	
Rain Attenuation (dB)	39.15	
Annual Rain 2 way (%-sec)	99.999465 - 168.62	
Annual Multipath + Rain (%-sec)	99.999435 - 178.11	



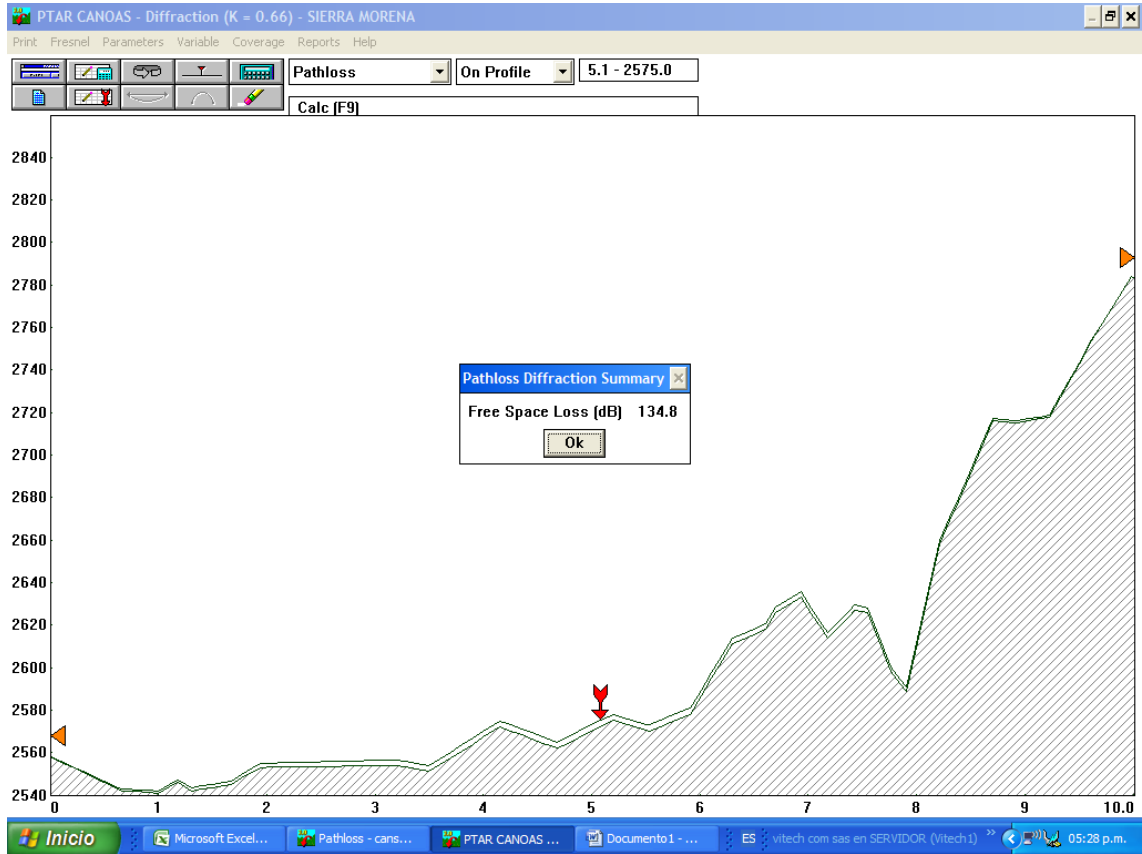
CLIENTE:  
CDM SMITH - INGESAM


CONTRATO No.:

DOCUMENTO NO.:  
INF-PTAR-003

ELABORO:  
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19/09/2013



	<b>CLIENTE:</b> CDM SMITH - INGESAM		<b>CONTRATO No.:</b>	
	<b>DOCUMENTO NO.:</b> INF-PTAR-003	<b>ELABORO:</b> P.VIVEROS	<b>FECHA:</b> 19/09/2013	

Variable Parameter : Earth Radius Factor (K)


Reflective plane defined between 0.00 and 3.60 km (Least Squares)

PTAR CANOAS Antenna 3 dB Beamwidth (deg)	2.00
SIERRA MORENA Antenna 3 dB Beamwidth (deg)	2.00
Terrain Roughness (m)	4.30
Clearance - Ground Cover Loss (dB)	2.00
Divergence	Included

PTAR CANOAS Antenna Height (m)	10.00
SIERRA MORENA Antenna Height (m)	10.00
Frequency (MHz)	13000.00
Polarization	Vertical

K	Location km	Reflection Loss %    dB	Reflection Delay rad    ns	Gain dB
0.70	0.94	98.77    38.22	265.6    3.3	-0.01
0.71	0.94	98.77    38.23	265.7    3.3	-0.03
0.72	0.94	98.77    38.23	265.9    3.3	-0.04
0.73	0.94	98.78    38.24	266.0    3.3	-0.06
0.74	0.94	98.78    38.25	266.2    3.3	-0.07
0.75	0.94	98.78    38.26	266.5    3.3	-0.09
0.76	0.93	98.78    38.27	266.6    3.3	-0.10
0.77	0.93	98.78    38.28	266.8    3.3	-0.10
0.78	0.93	98.78    38.28	266.9    3.3	-0.11
0.79	0.93	98.78    38.29	267.0    3.3	-0.11
0.79	0.93	98.78    38.29	267.0    3.3	-0.11
0.79	0.93	98.78    38.29	267.1    3.3	-0.11
0.80	0.93	98.78    38.29	267.1    3.3	-0.11
0.80	0.93	98.78    38.29	267.1    3.3	-0.11
0.81	0.93	98.78    38.30	267.3    3.3	-0.10
0.83	0.93	98.79    38.31	267.5    3.3	-0.10
0.84	0.93	98.79    38.32	267.6    3.3	-0.09
0.85	0.93	98.79    38.33	267.8    3.3	-0.07
0.87	0.93	98.79    38.34	268.0    3.3	-0.06
0.88	0.93	98.79    38.34	268.2    3.3	-0.04
0.90	0.93	98.79    38.35	268.3    3.3	-0.03
0.92	0.93	98.79    38.36	268.5    3.3	-0.01
0.93	0.93	98.79    38.37	268.7    3.3	0.01
0.95	0.93	98.79    38.38	268.9    3.3	0.03
0.97	0.93	98.80    38.39	269.0    3.3	0.04
0.99	0.93	98.80    38.40	269.2    3.3	0.06
1.01	0.93	98.80    38.41	269.4    3.3	0.07
1.03	0.93	98.80    38.41	269.6    3.3	0.08



	<b>CLIENTE:</b> CDM SMITH - INGESAM		<b>CONTRATO No.:</b>
	<b>DOCUMENTO NO.:</b> INF-PTAR-003	<b>ELABORO:</b> P.VIVEROS	<b>FECHA:</b> 19/09/2013

	PTAR CANOAS	SIERRA MORENA
Latitude	004 34 23 N	004 34 29 N
Longitude	074 15 38 W	074 10 13 W
Azimuth	88.92	268.92
Distance (km)		10.01
Elevation (m)	2558.0	2783.0
Antenna Height (m)	10.0	10.0
Frequency (MHz)		13000.00
Polarization		Vertical
Antenna 3 dB Beamwidth (deg)	2.00	2.00
Constant Gradient K		1.33

#1 Direct Path

Number of Rays	20
Lower Limit (m)	1.67
Upper Limit (m)	40.00



**CLIENTE:**  
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INF-PTAR-003

**ELABORO:**  
P.VIVEROS

**FECHA:**  
19/09/2013

ccmsm7.p13	CONTROL MODELIA	SIERRA MORENA
Elevation (m)	2546.00	2761.00
Latitude	004 39 39 N	004 34 29 N
Longitude	074 07 38 W	074 10 13 W
Azimuth	206.63	26.62
Antenna Type	0.6 M - 7.5 GHz	0.6 M - 7.5 GHz
Antenna Height (m)	32.70	10.00
Antenna Gain (dBi)	30.80	30.80
TX Line Type	Antena Integrada	Antena Integrada
TX Line Unit Loss (dB/100 m)	0.00	0.00
TX Filter Loss (dB)	1.90	1.90
RX Filter Loss (dB)	1.90	1.90
Frequency (MHz)	7000.00	
Polarization	Vertical	
Path Length (km)	10.66	
Free Space Loss (dB)	129.92	
Field Margin (dB)	1.00	
Diffraction Loss (dB)	0.00	
Atmospheric Absorption Loss (dB)	0.10	
Net Path Loss (dB)	73.22	73.22
Radio Type Model	RADIO TIPO	RADIO TIPO
Emission Designator	27M5D7W	27M5D7W
TX Power (watts)	0.13	0.13
TX Power (dBm)	21.00	21.00
Effective Radiated Power (dBm)	49.90	49.90
RX Threshold Criteria	10E-6	10E-6
RX Threshold Level (dBm)	-77.50	-77.50
Maximum Receive Signal (dBm)	-25.00	-25.00
RX Signal (dBm)	-52.22	-52.22
Thermal Fade Margin (dB)	25.28	25.28
Dispersive Fade Margin (dB)	45.00	45.00
Dispersive Fade Occurrence Factor	1.00	
Effective Fade Margin (dB)	25.23	25.23
Climatic Factor	1.00	
Terrain Roughness (m)	30.98	
C Factor	0.40	
Average Annual Temperature (deg C)	18.00	
Diversity Type	Non Diversity	
Worst Month Multipath 1 way (sec)	15.94	15.94
Worst Month Multipath 1 way (%)	99.999393	99.999393
Annual Multipath 1 way (sec)	61.61	61.61
Annual Multipath 1 way (%)	99.999805	99.999805
Annual Multipath 2 way (%-sec)	99.999609 - 123.21	



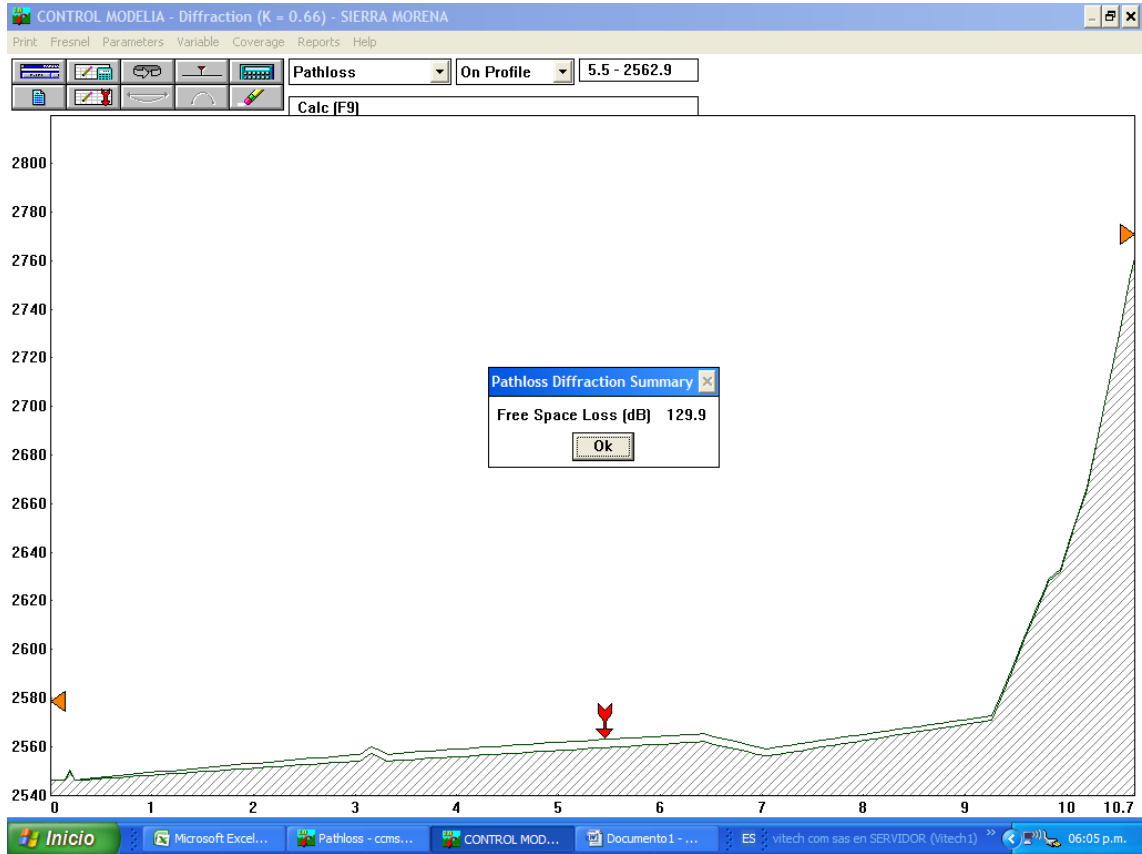
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	<b>CLIENTE:</b> CDM SMITH - INGESAM		<b>CONTRATO No.:</b>	
	<b>DOCUMENTO NO.:</b> INF-PTAR-003	<b>ELABORO:</b> P.VIVEROS	<b>FECHA:</b> 19/09/2013	


Variable Parameter : Earth Radius Factor (K)

Reflective plane defined between 0.00 and 9.26 km (Least Squares)

CONTROL MODELIA Antenna 3 dB Beamwidth (deg)	2.00
SIERRA MORENA Antenna 3 dB Beamwidth (deg)	2.00
Terrain Roughness (m)	1.90
Clearance - Ground Cover Loss (dB)	2.00
Divergence	Included

CONTROL MODELIA Antenna Height (m)	32.70
SIERRA MORENA Antenna Height (m)	10.00
Frequency (MHz)	7000.00
Polarization	Vertical

K	Location km	Reflection Loss %	Reflection Loss dB	Reflection Delay rad	Reflection Delay ns	Gain dB
0.70	1.51	88.04	18.44	170.7	3.9	0.51
0.70	1.51	88.03	18.44	170.8	3.9	0.47
0.72	1.51	88.03	18.44	171.0	3.9	0.32
0.73	1.51	88.02	18.43	171.1	3.9	0.16
0.74	1.51	88.01	18.42	171.3	3.9	-0.02
0.76	1.51	88.00	18.42	171.5	3.9	-0.20
0.77	1.51	88.00	18.41	171.7	3.9	-0.39
0.79	1.51	87.99	18.41	171.8	3.9	-0.57
0.81	1.51	87.98	18.40	172.0	3.9	-0.73
0.82	1.50	87.97	18.40	172.2	3.9	-0.87
0.84	1.50	87.97	18.39	172.3	3.9	-0.98
0.86	1.50	87.96	18.39	172.5	3.9	-1.07
0.88	1.50	87.95	18.38	172.7	3.9	-1.11
0.89	1.50	87.95	18.38	172.7	3.9	-1.11
0.89	1.50	87.95	18.38	172.8	3.9	-1.12
0.89	1.50	87.95	18.38	172.8	3.9	-1.12
0.90	1.50	87.95	18.38	172.8	3.9	-1.11
0.90	1.50	87.95	18.38	172.9	3.9	-1.11
0.92	1.50	87.94	18.37	173.0	3.9	-1.07
0.95	1.50	87.93	18.37	173.2	3.9	-0.99
0.97	1.50	87.92	18.36	173.4	3.9	-0.88
0.99	1.50	87.92	18.36	173.6	3.9	-0.74
1.02	1.50	87.91	18.35	173.7	4.0	-0.58
1.05	1.49	87.90	18.35	173.9	4.0	-0.40
1.08	1.49	87.90	18.34	174.1	4.0	-0.22
1.11	1.49	87.89	18.34	174.3	4.0	-0.03
1.14	1.49	87.88	18.33	174.4	4.0	0.15
1.18	1.49	87.88	18.33	174.6	4.0	0.32

	<b>CLIENTE:</b> CDM SMITH - INGESAM		<b>CONTRATO No.:</b>
	<b>DOCUMENTO NO.:</b> INF-PTAR-003	<b>ELABORO:</b> P.VIVEROS	<b>FECHA:</b> 19/09/2013

	CONTROL MODELIA	SIERRA MORENA
Latitude	004 39 39 N	004 34 29 N
Longitude	074 07 38 W	074 10 13 W
Azimuth	206.63	26.62
Distance (km)		10.66
Elevation (m)	2546.0	2761.0
Antenna Height (m)	32.7	10.0
Frequency (MHz)		7000.00
Polarization		Vertical
Antenna 3 dB Beamwidth (deg)	2.00	2.00
Constant Gradient K		1.33

#1 Direct Path

Number of Rays	21
Lower Limit (m)	0.00
Upper Limit (m)	40.00



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INF-PTAR-003

**ELABORO:**  
P.VIVEROS

**FECHA:**  
19/09/2013

ccmsm.p13	CONTROL MODELIA	SIERRA MORENA
Elevation (m)	2546.00	2761.00
Latitude	004 39 39 N	004 34 29 N
Longitude	074 07 38 W	074 10 13 W
Azimuth	206.63	26.62
Antenna Type	1.0 M - 13 GHz	1.0 M - 13 GHz
Antenna Height (m)	32.19	10.00
Antenna Gain (dBi)	40.00	40.00
TX Line Type	Antena Integrada	Antena Integrada
TX Line Unit Loss (dB/100 m)	0.00	0.00
TX Filter Loss (dB)	1.90	1.90
RX Filter Loss (dB)	1.90	1.90
Frequency (MHz)	13000.00	
Polarization	Vertical	
Path Length (km)	10.66	
Free Space Loss (dB)	135.30	
Field Margin (dB)	1.00	
Diffraction Loss (dB)	0.00	
Atmospheric Absorption Loss (dB)	0.22	
Net Path Loss (dB)	60.32	60.32
Radio Type Model	RADIO TIPO	RADIO TIPO
Emission Designator	27M5D7W	27M5D7W
TX Frequency Assignment (MHz)	13000	13000
TX Power (watts)	0.12	0.12
TX Power (dBm)	20.80	20.80
Effective Radiated Power (dBm)	58.90	58.90
RX Threshold Criteria	10E-6	10E-6
RX Threshold Level (dBm)	-78.50	-78.50
Maximum Receive Signal (dBm)	-25.00	-25.00
RX Signal (dBm)	-39.52	-39.52
Thermal Fade Margin (dB)	38.98	38.98
Dispersive Fade Margin (dB)	45.00	45.00
Dispersive Fade Occurrence Factor	1.00	
Effective Fade Margin (dB)	38.01	38.01
Climatic Factor	1.00	
Terrain Roughness (m)	32.29	
C Factor	0.38	
Average Annual Temperature (deg C)	20.00	
Diversity Type	Non Diversity	
Worst Month Multipath 1 way (sec)	1.48	1.48
Worst Month Multipath 1 way (%)	99.999944	99.999944
Annual Multipath 1 way (sec)	6.03	6.03
Annual Multipath 1 way (%)	99.999981	99.999981
Annual Multipath 2 way (%-sec)	99.999962 - 12.06	
Rain Region	G Tropical Moderate	
Rain Rate (mm/hr)	141.87	
Rain Attenuation (dB)	39.02	
Annual Rain 2 way (%-sec)	99.999360 - 201.88	
Annual Multipath + Rain (%-sec)	99.999322 - 213.94	



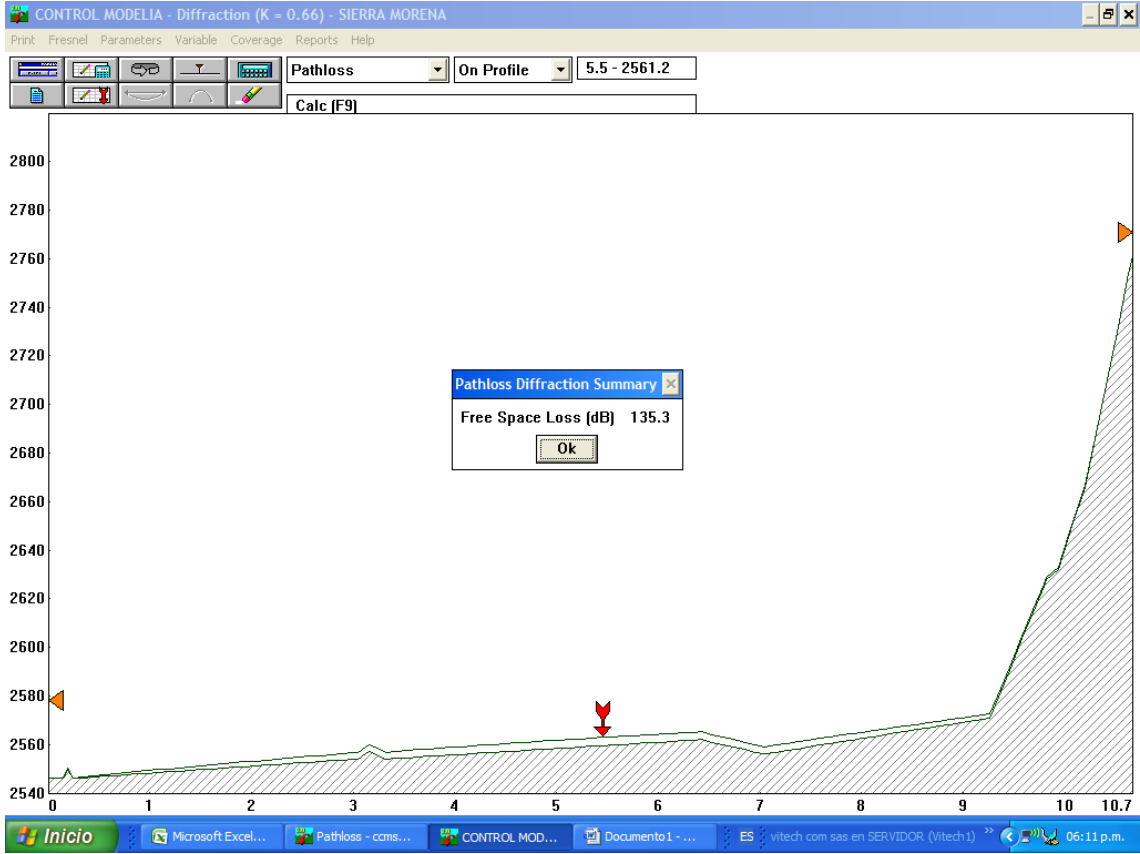
CLIENTE:  
CDM SMITH - INGESAM


CONTRATO No.:

DOCUMENTO NO.:  
INF-PTAR-003

ELABORO:  
P.VIVEROS

FECHA:  
19/09/2013



	<b>CLIENTE:</b> CDM SMITH - INGESAM		<b>CONTRATO No.:</b>	
	<b>DOCUMENTO NO.:</b> INF-PTAR-003	<b>ELABORO:</b> P.VIVEROS	<b>FECHA:</b> 19/09/2013	

Variable Parameter : Earth Radius Factor (K)


Reflective plane defined between 0.00 and 9.26 km (Least Squares)

CONTROL MODELIA Antenna 3 dB Beamwidth (deg)	2.00
SIERRA MORENA Antenna 3 dB Beamwidth (deg)	2.00
Terrain Roughness (m)	1.90
Clearance - Ground Cover Loss (dB)	2.00
Divergence	Included

CONTROL MODELIA Antenna Height (m)	32.19
SIERRA MORENA Antenna Height (m)	10.00
Frequency (MHz)	13000.00
Polarization	Vertical

K	Location km	Reflection Loss %    dB	Reflection Delay rad    ns	Gain dB
0.70	1.49	92.55    22.55	309.4    3.8	0.06
0.71	1.49	92.55    22.55	309.5    3.8	-0.03
0.71	1.49	92.55    22.55	309.7    3.8	-0.13
0.72	1.49	92.54    22.55	309.8    3.8	-0.24
0.73	1.49	92.54    22.55	310.1    3.8	-0.36
0.74	1.49	92.54    22.55	310.3    3.8	-0.47
0.74	1.49	92.54    22.55	310.4    3.8	-0.55
0.75	1.49	92.54    22.55	310.6    3.8	-0.60
0.76	1.49	92.54    22.54	310.7    3.8	-0.64
0.77	1.49	92.54    22.54	310.9    3.8	-0.67
0.77	1.49	92.54    22.54	311.0    3.8	-0.67
0.77	1.49	92.54    22.54	311.0    3.8	-0.67
0.77	1.49	92.54    22.54	311.0    3.8	-0.67
0.77	1.49	92.54    22.54	311.1    3.8	-0.67
0.78	1.49	92.54    22.54	311.1    3.8	-0.67
0.78	1.49	92.54    22.54	311.3    3.8	-0.65
0.79	1.49	92.54    22.54	311.5    3.8	-0.60
0.80	1.49	92.53    22.54	311.6    3.8	-0.54
0.81	1.48	92.53    22.54	311.8    3.8	-0.46
0.82	1.48	92.53    22.54	312.0    3.8	-0.36
0.83	1.48	92.53    22.54	312.2    3.8	-0.26
0.84	1.48	92.53    22.53	312.3    3.8	-0.15
0.85	1.48	92.53    22.53	312.5    3.8	-0.03
0.86	1.48	92.53    22.53	312.7    3.8	0.08
0.87	1.48	92.53    22.53	312.8    3.8	0.19
0.88	1.48	92.53    22.53	313.0    3.8	0.29
0.89	1.48	92.53    22.53	313.2    3.8	0.38
0.91	1.48	92.53    22.53	313.4    3.8	0.46



	<b>CLIENTE:</b> CDM SMITH - INGESAM		<b>CONTRATO No.:</b>	
	<b>DOCUMENTO NO.:</b> INF-PTAR-003	<b>ELABORO:</b> P.VIVEROS	<b>FECHA:</b> 19/09/2013	

	CONTROL MODELIA	SIERRA MORENA
Latitude	004 39 39 N	004 34 29 N
Longitude	074 07 38 W	074 10 13 W
Azimuth	206.63	26.62
Distance (km)		10.66
Elevation (m)	2546.0	2761.0
Antenna Height (m)	32.2	10.0
Frequency (MHz)		13000.00
Polarization		Vertical
Antenna 3 dB Beamwidth (deg)	2.00	2.00
Constant Gradient K		1.33

#1 Direct Path

Number of Rays	21
Lower Limit (m)	0.00
Upper Limit (m)	40.00



**CLIENTE:**  
CDM SMITH - INGESAM

**CONTRATO No.:**

**DOCUMENTO NO.:**  
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**ELABORO:**  
P.VIVEROS

**FECHA:**  
19/09/2013

cnrsm7.pl3	CENTRO NARIÑO	SIERRA MORENA
Elevation (m)	2561.00	2783.00
Latitude	004 37 42 N	004 34 29 N
Longitude	074 05 30 W	074 10 13 W
Azimuth	235.75	55.74
Antenna Type	0.6 M - 7.5 GHz	0.6 M - 7.5 GHz
Antenna Height (m)	11.14	10.00
Antenna Gain (dBi)	30.80	30.80
TX Line Type	Antena Integrada	Antena Integrada
TX Line Unit Loss (dB/100 m)	0.00	0.00
TX Filter Loss (dB)	1.90	1.90
RX Filter Loss (dB)	1.90	1.90
Frequency (MHz)	7000.00	
Polarization	Vertical	
Path Length (km)	10.54	
Free Space Loss (dB)	129.83	
Field Margin (dB)	1.00	
Diffraction Loss (dB)	0.00	
Atmospheric Absorption Loss (dB)	0.10	
Net Path Loss (dB)	73.13	73.13
Radio Type Model	RADIO TIPO	RADIO TIPO
Emission Designator	27M5D7W	27M5D7W
TX Frequency Assignment (MHz)	7000	7000
TX Power (watts)	0.13	0.13
TX Power (dBm)	21.00	21.00
Effective Radiated Power (dBm)	49.90	49.90
RX Threshold Criteria	10E-6	10E-6
RX Threshold Level (dBm)	-77.50	-77.50
Maximum Receive Signal (dBm)	-25.00	-25.00
RX Signal (dBm)	-52.13	-52.13
Thermal Fade Margin (dB)	25.37	25.37
Dispersive Fade Margin (dB)	45.00	45.00
Dispersive Fade Occurrence Factor	1.00	
Effective Fade Margin (dB)	25.33	25.33
Climatic Factor	1.00	
Terrain Roughness (m)	36.21	
C Factor	0.32	
Average Annual Temperature (deg C)	20.00	
Diversity Type	Non Diversity	
Worst Month Multipath 1 way (sec)	12.13	12.13
Worst Month Multipath 1 way (%)	99.999539	99.999539
Annual Multipath 1 way (sec)	49.47	49.47
Annual Multipath 1 way (%)	99.999843	99.999843
Annual Multipath 2 way (%-sec)	99.999686 - 98.94	



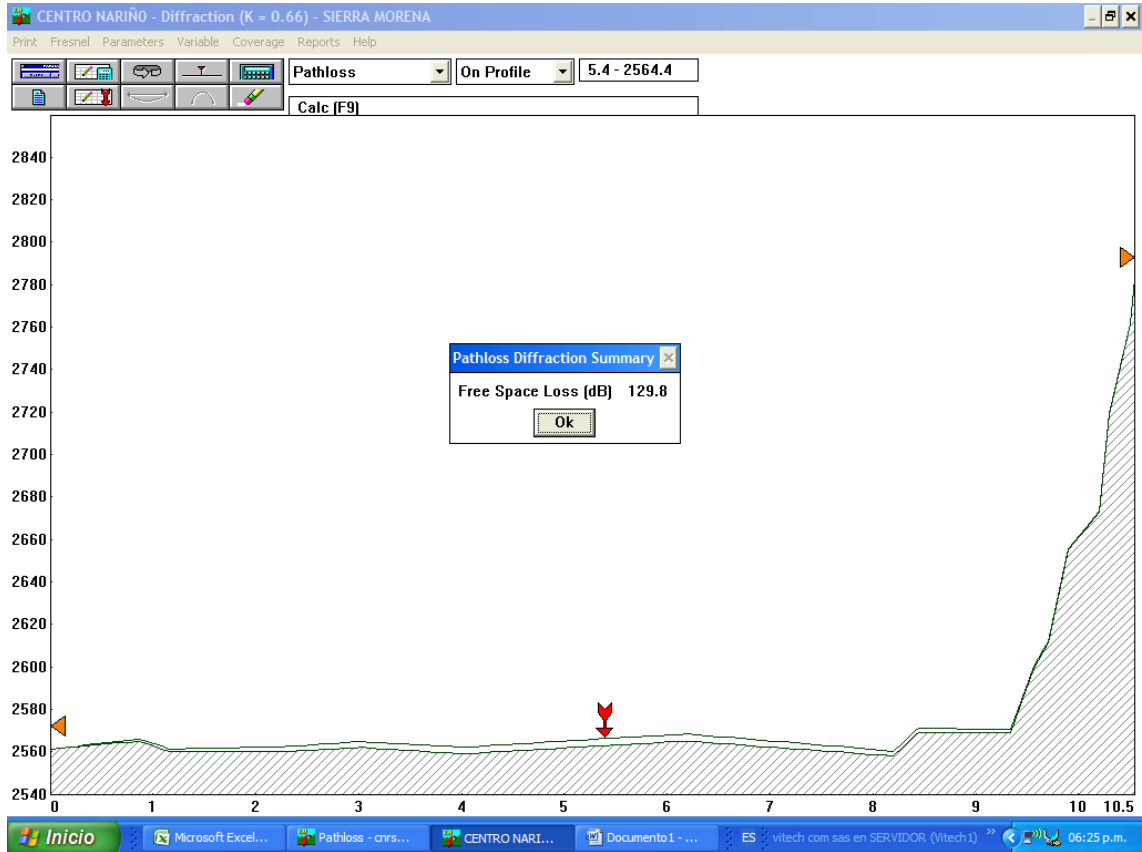
CLIENTE:  
CDM SMITH - INGESAM


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INF-PTAR-003

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19/09/2013



	<b>CLIENTE:</b> CDM SMITH - INGESAM		<b>CONTRATO No.:</b>	
	<b>DOCUMENTO NO.:</b> INF-PTAR-003	<b>ELABORO:</b> P.VIVEROS	<b>FECHA:</b> 19/09/2013	


Variable Parameter : Earth Radius Factor (K)

Reflective plane defined between 0.00 and 9.34 km (Least Squares)

CENTRO NARIÑO Antenna 3 dB Beamwidth (deg)	2.00
SIERRA MORENA Antenna 3 dB Beamwidth (deg)	2.00
Terrain Roughness (m)	3.60
Clearance - Ground Cover Loss (dB)	2.00
Divergence	Included

CENTRO NARIÑO Antenna Height (m)	11.14
SIERRA MORENA Antenna Height (m)	10.00
Frequency (MHz)	7000.00
Polarization	Vertical

K	Location km	Reflection Loss %    dB	Reflection Delay rad    ns	Gain dB
0.70	0.56	93.59    23.86	75.9    1.7	0.49
0.71	0.55	93.59    23.87	76.0    1.7	0.47
0.76	0.55	93.60    23.88	76.2    1.7	0.39
0.81	0.55	93.62    23.90	76.4    1.7	0.31
0.85	0.55	93.63    23.91	76.6    1.7	0.23
0.88	0.55	93.63    23.92	76.7    1.7	0.17
0.92	0.55	93.64    23.93	76.8    1.7	0.09
0.98	0.55	93.65    23.95	77.0    1.8	-0.01
1.06	0.55	93.67    23.97	77.2    1.8	-0.12
1.15	0.55	93.68    23.98	77.4    1.8	-0.23
1.24	0.54	93.69    24.00	77.6    1.8	-0.32
1.33	0.54	93.70    24.01	77.7    1.8	-0.38
1.43	0.54	93.71    24.02	77.9    1.8	-0.44
1.57	0.54	93.72    24.04	78.1    1.8	-0.50
1.77	0.54	93.73    24.06	78.3    1.8	-0.54
2.02	0.54	93.75    24.08	78.5    1.8	-0.56
2.06	0.54	93.75    24.08	78.5    1.8	-0.56
2.11	0.54	93.75    24.08	78.5    1.8	-0.56
2.17	0.54	93.75    24.08	78.6    1.8	-0.56
2.23	0.54	93.75    24.09	78.6    1.8	-0.56
2.29	0.54	93.76    24.09	78.6    1.8	-0.56
2.67	0.54	93.77    24.11	78.8    1.8	-0.54
3.19	0.54	93.78    24.12	79.0    1.8	-0.50
3.96	0.54	93.79    24.14	79.1    1.8	-0.45
5.32	0.53	93.80    24.16	79.3    1.8	-0.38
8.17	0.53	93.82    24.18	79.5    1.8	-0.30
17.32	0.53	93.83    24.19	79.7    1.8	-0.21
100.00	0.53	93.84    24.21	79.8    1.8	-0.14

	<b>CLIENTE:</b> CDM SMITH - INGESAM		<b>CONTRATO No.:</b>
	<b>DOCUMENTO NO.:</b> INF-PTAR-003	<b>ELABORO:</b> P.VIVEROS	<b>FECHA:</b> 19/09/2013

	CENTRO NARIÑO	SIERRA MORENA
Latitude	004 37 42 N	004 34 29 N
Longitude	074 05 30 W	074 10 13 W
Azimuth	235.75	55.74
Distance (km)		10.54
Elevation (m)	2561.0	2783.0
Antenna Height (m)	11.1	10.0
Frequency (MHz)		7000.00
Polarization		Vertical
Antenna 3 dB Beamwidth (deg)	2.00	2.00
Constant Gradient K		1.33

#1 Direct Path

Number of Rays	21
Lower Limit (m)	0.00
Upper Limit (m)	40.00



**CLIENTE:**  
CDM SMITH - INGESAM

**CONTRATO No.:**

**DOCUMENTO NO.:**  
INF-PTAR-003

**ELABORO:**  
P.VIVEROS

**FECHA:**  
19/09/2013

cnrsm.pl3	CENTRO NARIÑO	SIERRA MORENA
Elevation (m)	2561.00	2783.00
Latitude	004 37 42 N	004 34 29 N
Longitude	074 05 30 W	074 10 13 W
Azimuth	235.75	55.74
Antenna Type	1.0 M - 13 GHz	1.0 M - 13 GHz
Antenna Height (m)	10.63	10.00
Antenna Gain (dBi)	40.00	40.00
TX Line Type	Antena Integrada	Antena Integrada
TX Line Unit Loss (dB/100 m)	0.00	0.00
TX Filter Loss (dB)	1.90	1.90
RX Filter Loss (dB)	1.90	1.90
Frequency (MHz)	13000.00	
Polarization	Vertical	
Path Length (km)	10.54	
Free Space Loss (dB)	135.20	
Field Margin (dB)	1.00	
Diffraction Loss (dB)	0.00	
Atmospheric Absorption Loss (dB)	0.21	
Net Path Loss (dB)	60.22	60.22
Radio Type Model	RADIO TIPO	RADIO TIPO
Emission Designator	27M5D7W	27M5D7W
TX Power (watts)	0.12	0.12
TX Power (dBm)	20.80	20.80
Effective Radiated Power (dBm)	58.90	58.90
RX Threshold Criteria	10E-6	10E-6
RX Threshold Level (dBm)	-78.50	-78.50
Maximum Receive Signal (dBm)	-25.00	-25.00
RX Signal (dBm)	-39.42	-39.42
Thermal Fade Margin (dB)	39.08	39.08
Dispersive Fade Margin (dB)	45.00	45.00
Dispersive Fade Occurrence Factor	1.00	
Effective Fade Margin (dB)	38.09	38.09
Climatic Factor	1.00	
Terrain Roughness (m)	36.21	
C Factor	0.32	
Average Annual Temperature (deg C)	20.00	
Diversity Type	Non Diversity	
Worst Month Multipath 1 way (sec)	1.19	1.19
Worst Month Multipath 1 way (%)	99.999955	99.999955
Annual Multipath 1 way (sec)	4.86	4.86
Annual Multipath 1 way (%)	99.999985	99.999985
Annual Multipath 2 way (%-sec)	99.999969 - 9.72	
Rain Region	G Tropical Moderate	
Rain Rate (mm/hr)	142.80	
Rain Attenuation (dB)	39.05	
Annual Rain 2 way (%-sec)	99.999380 - 195.51	
Annual Multipath + Rain (%-sec)	99.999349 - 205.23	



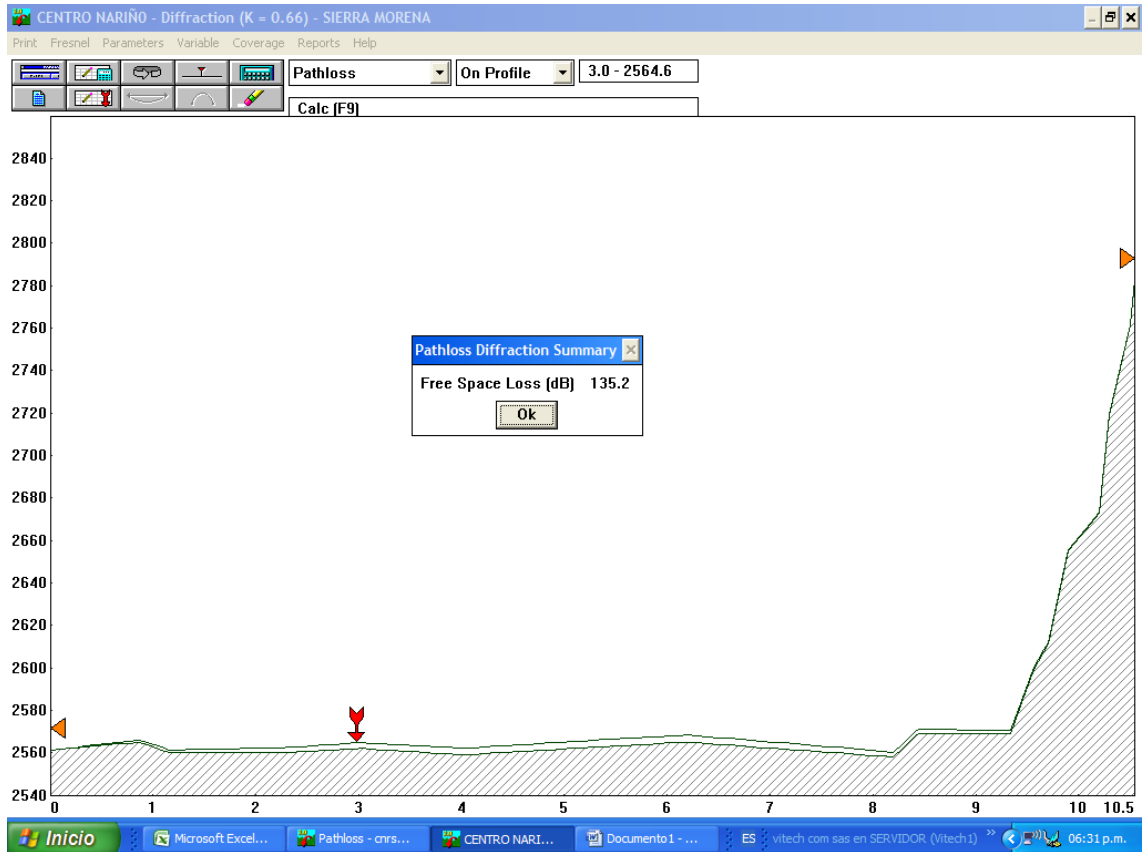
CLIENTE:  
CDM SMITH - INGESAM


CONTRATO No.:

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INF-PTAR-003

ELABORO:  
P.VIVEROS

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19/09/2013



	<b>CLIENTE:</b> CDM SMITH - INGESAM		<b>CONTRATO No.:</b>	
	<b>DOCUMENTO NO.:</b> INF-PTAR-003	<b>ELABORO:</b> P.VIVEROS	<b>FECHA:</b> 19/09/2013	

Variable Parameter : Earth Radius Factor (K)


Reflective plane defined between 0.00 and 9.34 km (Least Squares)

CENTRO NARIÑO Antenna 3 dB Beamwidth (deg)	2.00
SIERRA MORENA Antenna 3 dB Beamwidth (deg)	2.00
Terrain Roughness (m)	2.50
Clearance - Ground Cover Loss (dB)	2.00
Divergence	Included

CENTRO NARIÑO Antenna Height (m)	10.63
SIERRA MORENA Antenna Height (m)	10.00
Frequency (MHz)	13000.00
Polarization	Vertical

K	Location km	Reflection Loss %    dB	Reflection Delay rad    ns	Gain dB
0.70	0.53	95.31    26.57	132.5    1.6	0.34
0.71	0.53	95.31    26.58	132.6    1.6	0.31
0.72	0.53	95.31    26.58	132.7    1.6	0.30
0.74	0.53	95.32    26.60	132.9    1.6	0.24
0.77	0.53	95.33    26.61	133.1    1.6	0.17
0.79	0.53	95.33    26.62	133.3    1.6	0.11
0.81	0.53	95.34    26.63	133.4    1.6	0.05
0.83	0.53	95.34    26.64	133.6    1.6	-0.01
0.85	0.53	95.35    26.65	133.7    1.6	-0.08
0.88	0.53	95.36    26.66	133.9    1.6	-0.16
0.91	0.53	95.36    26.68	134.1    1.6	-0.23
0.94	0.53	95.37    26.69	134.3    1.6	-0.29
0.97	0.53	95.38    26.70	134.5    1.6	-0.33
1.00	0.53	95.38    26.71	134.6    1.6	-0.36
1.04	0.53	95.39    26.72	134.8    1.7	-0.39
1.08	0.52	95.39    26.73	135.0    1.7	-0.41
1.09	0.52	95.40    26.74	135.0    1.7	-0.41
1.10	0.52	95.40    26.74	135.1    1.7	-0.41
1.11	0.52	95.40    26.74	135.1    1.7	-0.41
1.12	0.52	95.40    26.74	135.1    1.7	-0.41
1.12	0.52	95.40    26.75	135.2    1.7	-0.41
1.17	0.52	95.41    26.76	135.3    1.7	-0.39
1.22	0.52	95.41    26.77	135.5    1.7	-0.37
1.28	0.52	95.42    26.78	135.7    1.7	-0.33
1.34	0.52	95.43    26.79	135.9    1.7	-0.28
1.40	0.52	95.43    26.81	136.0    1.7	-0.23
1.48	0.52	95.44    26.82	136.2    1.7	-0.16
1.56	0.52	95.45    26.83	136.4    1.7	-0.10




	<b>CLIENTE:</b> CDM SMITH - INGESAM		<b>CONTRATO No.:</b>
	<b>DOCUMENTO NO.:</b> INF-PTAR-003	<b>ELABORO:</b> P.VIVEROS	<b>FECHA:</b> 19/09/2013

	CENTRO NARIÑO	SIERRA MORENA
Latitude	004 37 42 N	004 34 29 N
Longitude	074 05 30 W	074 10 13 W
Azimuth	235.75	55.74
Distance (km)		10.54
Elevation (m)	2561.0	2783.0
Antenna Height (m)	10.6	10.0
Frequency (MHz)		13000.00
Polarization		Vertical
Antenna 3 dB Beamwidth (deg)	2.00	2.00
Constant Gradient K		1.33

#1 Direct Path

Number of Rays	21
Lower Limit (m)	0.00
Upper Limit (m)	40.00

 VITECHCOM <small>Specialized in the Design and Construction of</small>	<b>CLIENTE:</b> CDM SMITH - INGESAM		<b>CONTRATO No.:</b>	
	<b>DOCUMENTO NO.:</b> INF-PTAR-003	<b>ELABORO:</b> P.VIVEROS	<b>FECHA:</b> 19/09/2013	

**ESTUDIOS DE PROPAGACION**  
**ALTERNATIVA # 2**  
**SITIO DE REPETICION CERRO SUBA**



**CLIENTE:**  
CDM SMITH - INGESAM

**CONTRATO No.:**

**DOCUMENTO NO.:**  
INF-PTAR-003

**ELABORO:**  
P.VIVEROS

**FECHA:**  
19/09/2013

cansub7.p13	PTAR CANOAS	CERRO SUBA
Elevation (m)	2558.00	2704.00
Latitude	004 34 23 N	004 43 39 N
Longitude	074 15 38 W	074 04 52 W
Azimuth	49.37	229.39
Antenna Type	1.8 M - 7.5 GHz	1.8 M - 7.5 GHz
Antenna Height (m)	39.59	30.00
Antenna Gain (dBi)	40.70	40.70
TX Line Type	Antena Integrada	Antena Integrada
TX Line Unit Loss (dB/100 m)	0.00	0.00
TX Filter Loss (dB)	1.90	1.90
RX Filter Loss (dB)	1.90	1.90
Frequency (MHz)	7000.00	
Polarization	Vertical	
Path Length (km)	26.22	
Free Space Loss (dB)	137.74	
Field Margin (dB)	1.00	
Diffraction Loss (dB)	0.00	
Atmospheric Absorption Loss (dB)	0.25	
Net Path Loss (dB)	61.39	61.39
Radio Type Model	RADIO TIPO	RADIO TIPO
Emission Designator	27M5D7W	27M5D7W
TX Frequency Assignment (MHz)	7000	7000
TX Power (watts)	0.13	0.13
TX Power (dBm)	21.00	21.00
Effective Radiated Power (dBm)	59.80	59.80
RX Threshold Criteria	10E-6	10E-6
RX Threshold Level (dBm)	-77.50	-77.50
Maximum Receive Signal (dBm)	-25.00	-25.00
RX Signal (dBm)	-40.39	-40.39
Thermal Fade Margin (dB)	37.11	37.11
Dispersive Fade Margin (dB)	45.00	45.00
Dispersive Fade Occurrence Factor	1.00	
Effective Fade Margin (dB)	36.46	36.46
Climatic Factor	1.00	
Terrain Roughness (m)	21.48	
C Factor	0.64	
Average Annual Temperature (deg C)	20.00	
Diversity Type	Non Diversity	
Worst Month Multipath 1 way (sec)	28.79	28.79
Worst Month Multipath 1 way (%)	99.998905	99.998905
Annual Multipath 1 way (sec)	117.45	117.45
Annual Multipath 1 way (%)	99.999628	99.999628
Annual Multipath 2 way (%-sec)	99.999255 - 234.90	



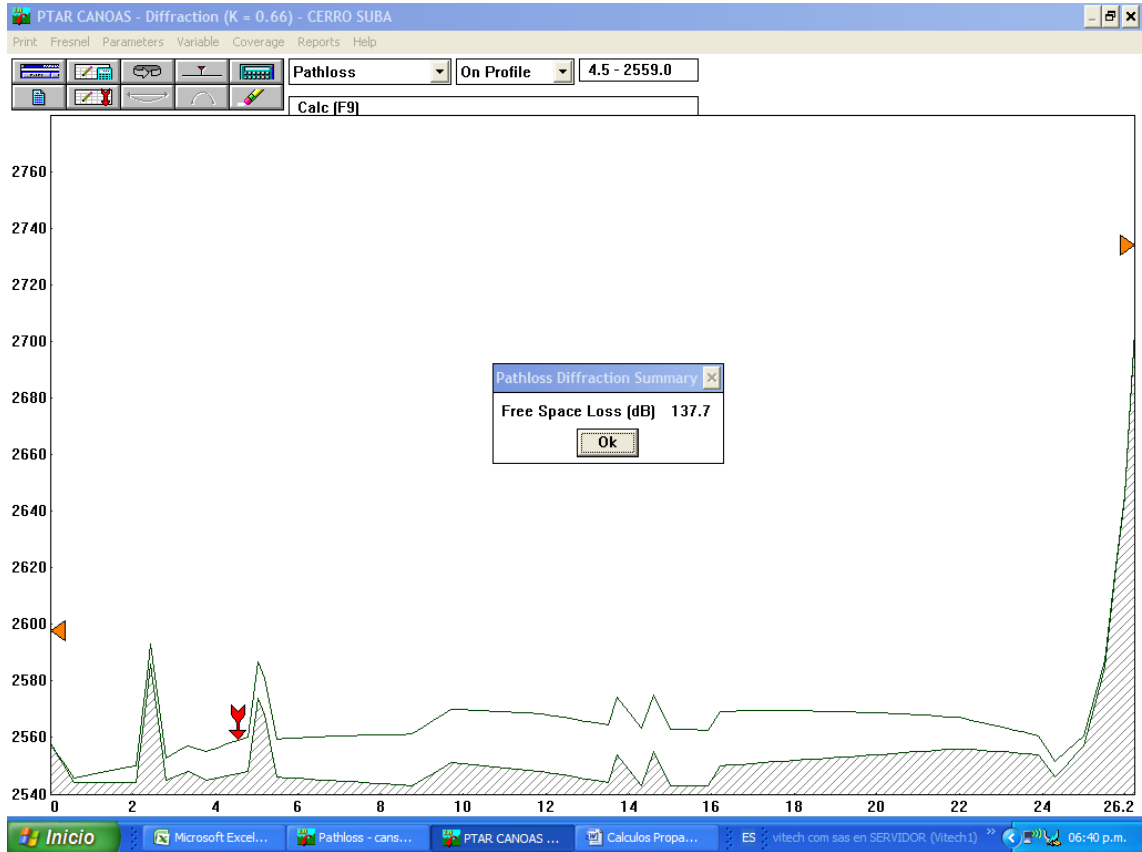
**CLIENTE:**  
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	<b>CLIENTE:</b> CDM SMITH - INGESAM		<b>CONTRATO No.:</b>	
	<b>DOCUMENTO NO.:</b> INF-PTAR-003	<b>ELABORO:</b> P.VIVEROS	<b>FECHA:</b> 19/09/2013	


Variable Parameter : Earth Radius Factor (K)

Reflective plane defined between 0.00 and 24.30 km (Least Squares)

PTAR CANOAS Antenna 3 dB Beamwidth (deg)	2.00
CERRO SUBA Antenna 3 dB Beamwidth (deg)	2.00
Terrain Roughness (m)	6.40
Clearance - Ground Cover Loss (dB)	2.00
Divergence	Included

PTAR CANOAS Antenna Height (m)	39.59
CERRO SUBA Antenna Height (m)	30.00
Frequency (MHz)	7000.00
Polarization	Vertical

K	Location	Reflection Loss	Reflection Delay	Gain
	km	%    dB	rad    ns	dB
0.70	6.46	72.20    11.12	72.9    1.7	-1.92
0.70	6.46	72.18    11.11	73.0    1.7	-1.65
0.71	6.45	72.17    11.11	73.2    1.7	-1.37
0.71	6.45	72.14    11.10	73.3    1.7	-0.92
0.72	6.44	72.11    11.09	73.6    1.7	-0.31
0.72	6.44	72.08    11.08	73.8    1.7	0.26
0.73	6.43	72.06    11.07	74.0    1.7	0.65
0.73	6.43	72.04    11.07	74.1    1.7	0.88
0.73	6.43	72.03    11.07	74.2    1.7	1.08
0.74	6.42	72.01    11.06	74.4    1.7	1.37
0.74	6.42	71.98    11.05	74.6    1.7	1.68
0.75	6.41	71.95    11.04	74.8    1.7	1.92
0.75	6.40	71.92    11.03	75.0    1.7	2.04
0.76	6.40	71.91    11.03	75.1    1.7	2.10
0.76	6.40	71.90    11.02	75.3    1.7	2.14
0.77	6.39	71.87    11.02	75.5    1.7	2.15
0.77	6.39	71.84    11.01	75.7    1.7	2.08
0.78	6.38	71.82    11.00	75.9    1.7	1.98
0.78	6.38	71.80    11.00	76.0    1.7	1.88
0.78	6.37	71.79    10.99	76.1    1.7	1.76
0.79	6.37	71.77    10.99	76.3    1.7	1.55
0.80	6.36	71.74    10.98	76.5    1.7	1.20
0.80	6.36	71.72    10.97	76.8    1.7	0.78
0.81	6.35	71.70    10.96	76.9    1.7	0.41
0.81	6.35	71.68    10.96	77.1    1.8	0.13
0.82	6.35	71.67    10.95	77.2    1.8	-0.16
0.82	6.34	71.65    10.95	77.4    1.8	-0.61
0.83	6.34	71.62    10.94	77.6    1.8	-1.22

	<b>CLIENTE:</b> CDM SMITH - INGESAM		<b>CONTRATO No.:</b>
	<b>DOCUMENTO NO.:</b> INF-PTAR-003	<b>ELABORO:</b> P.VIVEROS	<b>FECHA:</b> 19/09/2013

	PTAR CANOAS	CERRO SUBA
Latitude	004 34 23 N	004 43 39 N
Longitude	074 15 38 W	074 04 52 W
Azimuth	49.37	229.39
Distance (km)		26.22
Elevation (m)	2558.0	2704.0
Antenna Height (m)	39.6	30.0
Frequency (MHz)		7000.00
Polarization		Vertical
Antenna 3 dB Beamwidth (deg)	2.00	2.00
Constant Gradient K		1.33

#1 Direct Path

Number of Rays	21
Lower Limit (m)	0.00
Upper Limit (m)	40.00



**CLIENTE:**  
CDM SMITH - INGESAM

**CONTRATO No.:**

**DOCUMENTO NO.:**  
INF-PTAR-003

**ELABORO:**  
P.VIVEROS

**FECHA:**  
19/09/2013

cansub.p13	PTAR CANOAS	CERRO SUBA
Elevation (m)	2558.00	2704.00
Latitude	004 34 23 N	004 43 39 N
Longitude	074 15 38 W	074 04 52 W
Azimuth	49.37	229.39
Antenna Type	1.8 M - 13 GHz	1.8 M - 13 GHz
Antenna Height (m)	39.93	10.00
Antenna Gain (dBi)	45.20	45.20
TX Line Type	Antena Integrada	Antena Integrada
TX Line Unit Loss (dB/100 m)	0.00	0.00
TX Filter Loss (dB)	1.90	1.90
RX Filter Loss (dB)	1.90	1.90
Frequency (MHz)	13000.00	
Polarization	Vertical	
Path Length (km)	26.22	
Free Space Loss (dB)	143.12	
Field Margin (dB)	1.00	
Diffraction Loss (dB)	0.00	
Atmospheric Absorption Loss (dB)	0.53	
Net Path Loss (dB)	58.05	58.05
Radio Type Model	RADIO TIPO	RADIO TIPO
Emission Designator	27M5D7W	27M5D7W
TX Frequency Assignment (MHz)	13000	13000
TX Power (watts)	0.12	0.12
TX Power (dBm)	20.80	20.80
Effective Radiated Power (dBm)	64.10	64.10
RX Threshold Criteria	10E-6	10E-6
RX Threshold Level (dBm)	-78.50	-78.50
Maximum Receive Signal (dBm)	-25.00	-25.00
RX Signal (dBm)	-37.25	-37.25
Thermal Fade Margin (dB)	41.25	41.25
Dispersive Fade Margin (dB)	45.00	45.00
Dispersive Fade Occurrence Factor	1.00	
Effective Fade Margin (dB)	39.72	39.72
Climatic Factor	1.00	
Terrain Roughness (m)	21.48	
C Factor	0.64	
Average Annual Temperature (deg C)	18.00	
Diversity Type	Non Diversity	
Worst Month Multipath 1 way (sec)	25.21	25.21
Worst Month Multipath 1 way (%)	99.999041	99.999041
Annual Multipath 1 way (sec)	97.41	97.41
Annual Multipath 1 way (%)	99.999691	99.999691
Annual Multipath 2 way (%-sec)	99.999382 - 194.83	
Rain Region	G Tropical Moderate	
Rain Rate (mm/hr)	112.68	
Rain Attenuation (dB)	41.20	
Annual Rain 2 way (%-sec)	99.998239 - 555.20	
Annual Multipath + Rain (%-sec)	99.997622 - 750.03	



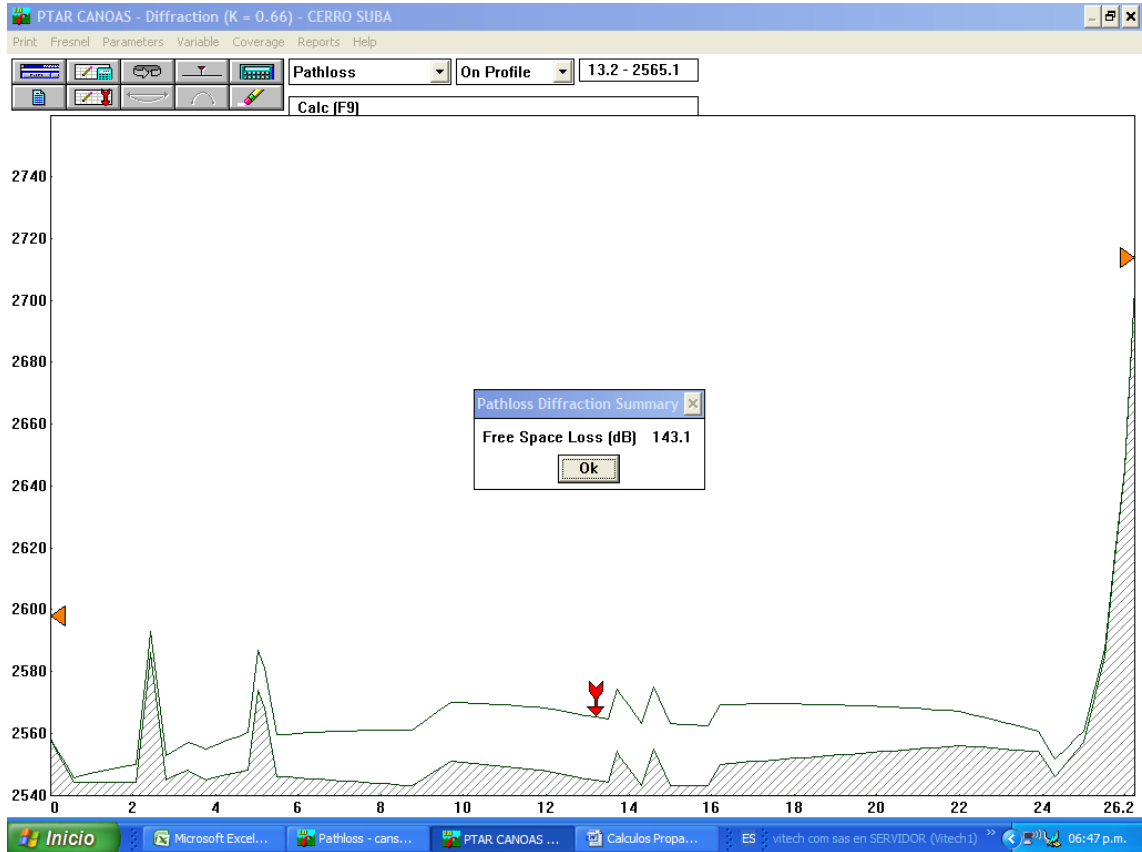
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CONTRATO No.:


DOCUMENTO NO.:  
INF-PTAR-003

ELABORO:  
P.VIVEROS

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19/09/2013





	<b>CLIENTE:</b> CDM SMITH - INGESAM		<b>CONTRATO No.:</b>	
	<b>DOCUMENTO NO.:</b> INF-PTAR-003	<b>ELABORO:</b> P.VIVEROS	<b>FECHA:</b> 19/09/2013	


Variable Parameter : Earth Radius Factor (K)

Reflective plane defined between 0.00 and 24.56 km (Least Squares)

PTAR CANOAS Antenna 3 dB Beamwidth (deg)	2.00
CERRO SUBA Antenna 3 dB Beamwidth (deg)	2.00
Terrain Roughness (m)	6.40
Clearance - Ground Cover Loss (dB)	2.00
Divergence	Included

PTAR CANOAS Antenna Height (m)	39.93
CERRO SUBA Antenna Height (m)	10.00
Frequency (MHz)	13000.00
Polarization	Vertical

K	Location km	Reflection Loss %    dB	Reflection Delay rad    ns	Gain dB
0.70	7.07	81.31    14.57	114.7    1.4	0.15
0.70	7.07	81.31    14.57	114.8    1.4	0.01
0.70	7.07	81.31    14.57	114.8    1.4	-0.13
0.71	7.07	81.31    14.57	115.1    1.4	-0.57
0.71	7.06	81.31    14.57	115.4    1.4	-0.99
0.71	7.06	81.30    14.57	115.5    1.4	-1.25
0.71	7.06	81.30    14.56	115.6    1.4	-1.37
0.71	7.06	81.30    14.56	115.7    1.4	-1.48
0.72	7.05	81.30    14.56	115.9    1.4	-1.65
0.72	7.05	81.30    14.56	116.2    1.4	-1.79
0.72	7.05	81.30    14.56	116.2    1.4	-1.80
0.72	7.05	81.30    14.56	116.2    1.4	-1.80
0.72	7.05	81.30    14.56	116.3    1.4	-1.80
0.72	7.05	81.30    14.56	116.3    1.4	-1.80
0.72	7.05	81.30    14.56	116.3    1.4	-1.79
0.73	7.04	81.29    14.56	116.5    1.4	-1.72
0.73	7.04	81.29    14.56	116.7    1.4	-1.57
0.73	7.04	81.29    14.56	116.8    1.4	-1.38
0.73	7.04	81.29    14.56	117.0    1.4	-1.13
0.74	7.03	81.29    14.56	117.2    1.4	-0.86
0.74	7.03	81.29    14.56	117.4    1.4	-0.57
0.74	7.03	81.28    14.56	117.5    1.4	-0.28
0.74	7.03	81.28    14.56	117.7    1.4	0.01
0.75	7.02	81.28    14.55	117.9    1.4	0.28
0.75	7.02	81.28    14.55	118.1    1.4	0.54
0.75	7.02	81.28    14.55	118.2    1.4	0.77
0.75	7.02	81.28    14.55	118.4    1.4	0.97
0.76	7.01	81.28    14.55	118.6    1.5	1.14

	<b>CLIENTE:</b> CDM SMITH - INGESAM		<b>CONTRATO No.:</b>
	<b>DOCUMENTO NO.:</b> INF-PTAR-003	<b>ELABORO:</b> P.VIVEROS	<b>FECHA:</b> 19/09/2013

	PTAR CANOAS	CERRO SUBA
Latitude	004 34 23 N	004 43 39 N
Longitude	074 15 38 W	074 04 52 W
Azimuth	49.37	229.39
Distance (km)		26.22
Elevation (m)	2558.0	2704.0
Antenna Height (m)	39.9	10.0
Frequency (MHz)		13000.00
Polarization		Vertical
Antenna 3 dB Beamwidth (deg)	2.00	2.00
Constant Gradient K		1.33

#1 Direct Path

Number of Rays	21
Lower Limit (m)	0.00
Upper Limit (m)	40.00



**CLIENTE:**  
CDM SMITH - INGESAM

**CONTRATO No.:**

**DOCUMENTO NO.:**  
INF-PTAR-003

**ELABORO:**  
P.VIVEROS

**FECHA:**  
19/09/2013

ccmsub7.pl3	CONTROL MODELIA	CERRO SUBA
Elevation (m)	2544.00	2704.00
Latitude	004 39 39 N	004 43 39 N
Longitude	074 07 38 W	074 04 52 W
Azimuth	34.79	214.79
Antenna Type	0.6 M - 7.5 GHz	0.6 M - 7.5 GHz
Antenna Height (m)	14.68	10.00
Antenna Gain (dBi)	30.80	30.80
TX Line Type	Antena Integrada	Antena Integrada
TX Line Unit Loss (dB/100 m)	0.00	0.00
TX Filter Loss (dB)	1.90	1.90
RX Filter Loss (dB)	1.90	1.90
Frequency (MHz)	7000.00	
Polarization	Vertical	
Path Length (km)	8.96	
Free Space Loss (dB)	128.42	
Field Margin (dB)	1.00	
Diffraction Loss (dB)	0.00	
Atmospheric Absorption Loss (dB)	0.08	
Net Path Loss (dB)	71.70	71.70
Radio Type Model	RADIO TIPO	RADIO TIPO
Emission Designator	27M5D7W	27M5D7W
TX Frequency Assignment (MHz)	7000	7000
TX Power (watts)	0.13	0.13
TX Power (dBm)	21.00	21.00
Effective Radiated Power (dBm)	49.90	49.90
RX Threshold Criteria	10E-6	10E-6
RX Threshold Level (dBm)	-77.50	-77.50
Maximum Receive Signal (dBm)	-25.00	-25.00
RX Signal (dBm)	-50.70	-50.70
Thermal Fade Margin (dB)	26.80	26.80
Dispersive Fade Margin (dB)	45.00	45.00
Dispersive Fade Occurrence Factor	1.00	
Effective Fade Margin (dB)	26.73	26.73
Climatic Factor	1.00	
Terrain Roughness (m)	25.82	
C Factor	0.50	
Average Annual Temperature (deg C)	18.00	
Diversity Type	Non Diversity	
Worst Month Multipath 1 way (sec)	8.42	8.42
Worst Month Multipath 1 way (%)	99.999680	99.999680
Annual Multipath 1 way (sec)	32.52	32.52
Annual Multipath 1 way (%)	99.999897	99.999897
Annual Multipath 2 way (%-sec)	99.999794 - 65.05	



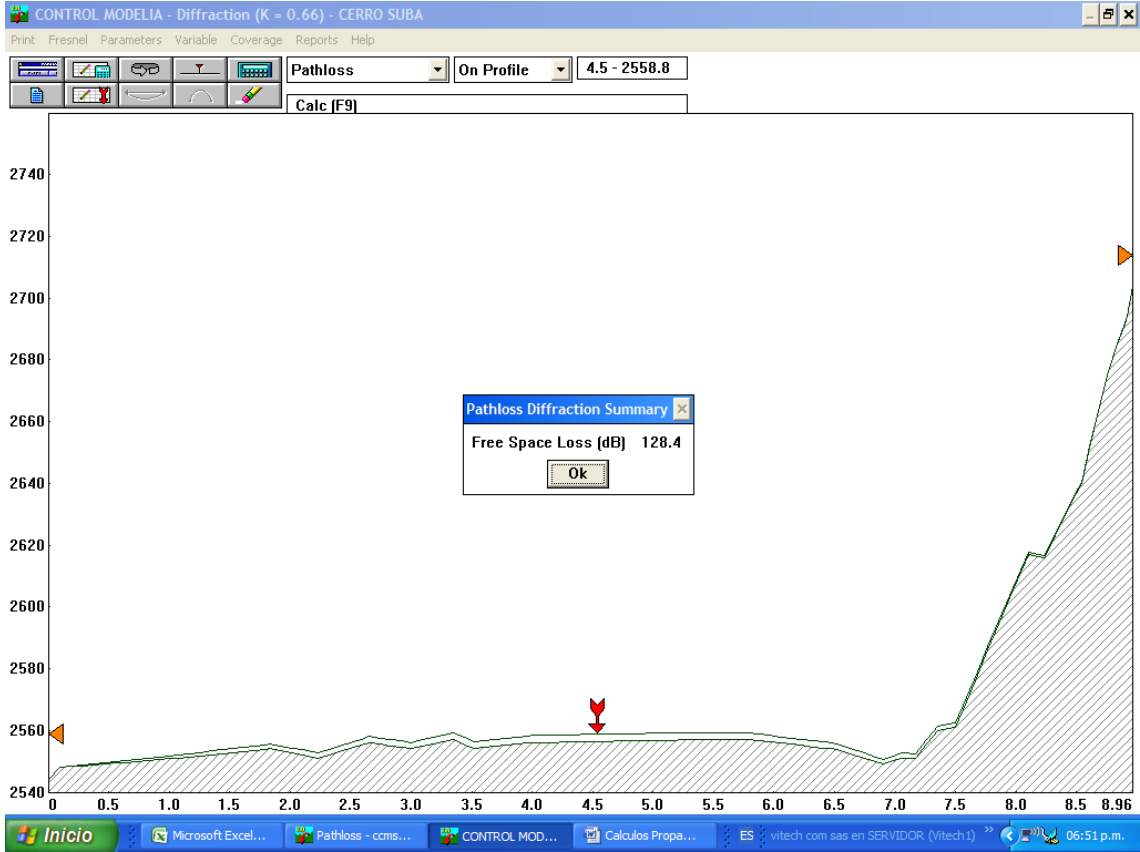
CLIENTE:  
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CONTRATO No.:

DOCUMENTO NO.:  
INF-PTAR-003

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FECHA:  
19/09/2013



	<b>CLIENTE:</b> CDM SMITH - INGESAM		<b>CONTRATO No.:</b>	
	<b>DOCUMENTO NO.:</b> INF-PTAR-003	<b>ELABORO:</b> P.VIVEROS	<b>FECHA:</b> 19/09/2013	


Variable Parameter : Earth Radius Factor (K)

Reflective plane defined between 0.00 and 7.17 km (Least Squares)

CONTROL MODELIA Antenna 3 dB Beamwidth (deg)	2.00
CERRO SUBA Antenna 3 dB Beamwidth (deg)	2.00
Terrain Roughness (m)	2.50
Clearance - Ground Cover Loss (dB)	2.00
Divergence	Included

CONTROL MODELIA Antenna Height (m)	14.68
CERRO SUBA Antenna Height (m)	10.00
Frequency (MHz)	7000.00
Polarization	Vertical

K	Location km	Reflection Loss %    dB	Reflection Delay rad    ns	Gain dB
0.70	0.44	86.56    17.43	40.5    0.9	-1.16
0.71	0.44	86.57    17.44	40.5    0.9	-1.18
0.79	0.44	86.59    17.45	40.7    0.9	-1.24
0.81	0.44	86.60    17.46	40.8    0.9	-1.25
0.83	0.44	86.60    17.46	40.8    0.9	-1.25
0.84	0.44	86.60    17.46	40.9    0.9	-1.25
0.86	0.44	86.61    17.46	40.9    0.9	-1.25
0.88	0.44	86.61    17.47	40.9    0.9	-1.24
0.97	0.44	86.63    17.48	41.1    0.9	-1.20
1.08	0.43	86.65    17.49	41.3    0.9	-1.12
1.23	0.43	86.67    17.50	41.4    0.9	-1.00
1.43	0.43	86.69    17.52	41.6    0.9	-0.84
1.74	0.43	86.72    17.54	41.8    0.9	-0.65
2.22	0.43	86.74    17.55	42.0    1.0	-0.44
3.00	0.43	86.77    17.57	42.1    1.0	-0.23
4.52	0.42	86.80    17.59	42.3    1.0	-0.04
9.30	0.42	86.82    17.60	42.5    1.0	0.16
100.00	0.42	86.84    17.62	42.6    1.0	0.32

	<b>CLIENTE:</b> CDM SMITH - INGESAM		<b>CONTRATO No.:</b>
	<b>DOCUMENTO NO.:</b> INF-PTAR-003	<b>ELABORO:</b> P.VIVEROS	<b>FECHA:</b> 19/09/2013

	CONTROL MODELIA		CERRO SUBA
Latitude	004 39 39 N		004 43 39 N
Longitude	074 07 38 W		074 04 52 W
Azimuth	34.79		214.79
Distance (km)		8.96	
Elevation (m)	2544.0		2704.0
Antenna Height (m)	14.7		10.0
Frequency (MHz)		7000.00	
Polarization		Vertical	
Antenna 3 dB Beamwidth (deg)	2.00		2.00
Constant Gradient K		1.33	

#1 Direct Path

Number of Rays	21
Lower Limit (m)	0.00
Upper Limit (m)	40.00



**CLIENTE:**  
CDM SMITH - INGESAM

**CONTRATO No.:**

**DOCUMENTO NO.:**  
INF-PTAR-003

**ELABORO:**  
P.VIVEROS

**FECHA:**  
19/09/2013

ccmsub.pl3	CONTROL MODELIA	CERRO SUBA
Elevation (m)	2544.00	2704.00
Latitude	004 39 39 N	004 43 39 N
Longitude	074 07 38 W	074 04 52 W
Azimuth	34.79	214.79
Antenna Type	1.0 M - 13 GHz	1.0 M - 13 GHz
Antenna Height (m)	14.20	10.00
Antenna Gain (dBi)	40.00	40.00
TX Line Type	Antena Integrada	Antena Integrada
TX Line Unit Loss (dB/100 m)	0.00	0.00
TX Filter Loss (dB)	1.90	1.90
RX Filter Loss (dB)	1.90	1.90
Frequency (MHz)	13000.00	
Polarization	Vertical	
Path Length (km)	8.96	
Free Space Loss (dB)	133.79	
Field Margin (dB)	1.00	
Diffraction Loss (dB)	0.00	
Atmospheric Absorption Loss (dB)	0.18	
Net Path Loss (dB)	58.77	58.77
Radio Type Model	RADIO TIPO	RADIO TIPO
Emission Designator	27M5D7W	27M5D7W
TX Frequency Assignment (MHz)	13000	13000
TX Power (watts)	0.12	0.12
TX Power (dBm)	20.80	20.80
Effective Radiated Power (dBm)	58.90	58.90
RX Threshold Criteria	10E-6	10E-6
RX Threshold Level (dBm)	-78.50	-78.50
Maximum Receive Signal (dBm)	-25.00	-25.00
RX Signal (dBm)	-37.97	-37.97
Thermal Fade Margin (dB)	40.53	40.53
Dispersive Fade Margin (dB)	45.00	45.00
Dispersive Fade Occurrence Factor	1.00	
Effective Fade Margin (dB)	39.20	39.20
Climatic Factor	1.00	
Terrain Roughness (m)	25.82	
C Factor	0.50	
Average Annual Temperature (deg C)	18.00	
Diversity Type	Non Diversity	
Worst Month Multipath 1 way (sec)	0.89	0.89
Worst Month Multipath 1 way (%)	99.999966	99.999966
Annual Multipath 1 way (sec)	3.45	3.45
Annual Multipath 1 way (%)	99.999989	99.999989
Annual Multipath 2 way (%-sec)	99.999978 - 6.90	
Rain Region	G Tropical Moderate	
Rain Rate (mm/hr)	162.57	
Rain Attenuation (dB)	40.56	
Annual Rain 2 way (%-sec)	99.999688 - 98.54	
Annual Multipath + Rain (%-sec)	99.999666 - 105.44	



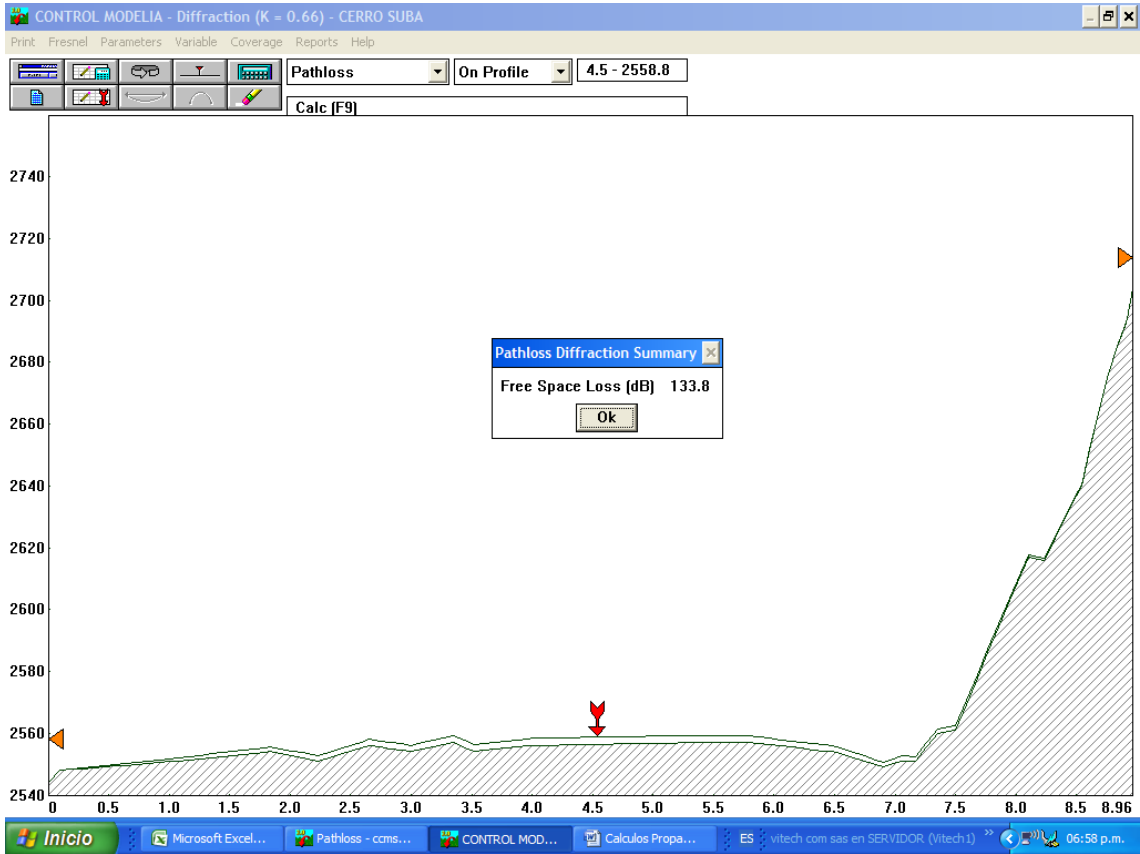
CLIENTE:  
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CONTRATO No.:


DOCUMENTO NO.:  
INF-PTAR-003

ELABORO:  
P.VIVEROS

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19/09/2013





	<b>CLIENTE:</b> CDM SMITH - INGESAM		<b>CONTRATO No.:</b>	
	<b>DOCUMENTO NO.:</b> INF-PTAR-003	<b>ELABORO:</b> P.VIVEROS	<b>FECHA:</b> 19/09/2013	


Variable Parameter : Earth Radius Factor (K)

Reflective plane defined between 0.00 and 7.17 km (Least Squares)

CONTROL MODELIA Antenna 3 dB Beamwidth (deg)	2.00
CERRO SUBA Antenna 3 dB Beamwidth (deg)	2.00
Terrain Roughness (m)	2.46
Clearance - Ground Cover Loss (dB)	2.00
Divergence	Included

CONTROL MODELIA Antenna Height (m)	14.20
CERRO SUBA Antenna Height (m)	10.00
Frequency (MHz)	13000.00
Polarization	Vertical

K	Location km	Reflection Loss %	Reflection Loss dB	Reflection Delay rad	Reflection Delay ns	Gain dB
0.70	0.42	91.86	21.79	68.2	0.8	0.42
0.71	0.42	91.87	21.80	68.3	0.8	0.46
0.77	0.41	91.89	21.82	68.5	0.8	0.57
0.82	0.41	91.91	21.85	68.7	0.8	0.63
0.87	0.41	91.93	21.86	68.9	0.8	0.66
0.90	0.41	91.94	21.88	69.0	0.8	0.67
0.96	0.41	91.96	21.90	69.2	0.8	0.67
1.03	0.41	91.98	21.91	69.4	0.8	0.65
1.10	0.41	91.99	21.93	69.5	0.9	0.62
1.18	0.41	92.01	21.95	69.7	0.9	0.57
1.28	0.41	92.03	21.97	69.9	0.9	0.50
1.40	0.41	92.05	21.99	70.1	0.9	0.41
1.55	0.40	92.07	22.01	70.2	0.9	0.31
1.73	0.40	92.09	22.03	70.4	0.9	0.20
1.95	0.40	92.10	22.05	70.6	0.9	0.09
2.23	0.40	92.12	22.07	70.8	0.9	-0.02
2.61	0.40	92.14	22.09	70.9	0.9	-0.14
3.17	0.40	92.16	22.11	71.1	0.9	-0.26
4.06	0.40	92.18	22.14	71.3	0.9	-0.38
5.58	0.40	92.20	22.16	71.5	0.9	-0.48
8.77	0.40	92.22	22.18	71.6	0.9	-0.56
20.09	0.40	92.24	22.20	71.8	0.9	-0.63
100.00	0.40	92.25	22.21	71.9	0.9	-0.66

	<b>CLIENTE:</b> CDM SMITH - INGESAM		<b>CONTRATO No.:</b>
	<b>DOCUMENTO NO.:</b> INF-PTAR-003	<b>ELABORO:</b> P.VIVEROS	<b>FECHA:</b> 19/09/2013

	CONTROL MODELIA	CERRO SUBA
Latitude	004 39 39 N	004 43 39 N
Longitude	074 07 38 W	074 04 52 W
Azimuth	34.79	214.79
Distance (km)		8.96
Elevation (m)	2544.0	2704.0
Antenna Height (m)	14.2	10.0
Frequency (MHz)		13000.00
Polarization		Vertical
Antenna 3 dB Beamwidth (deg)	2.00	2.00
Constant Gradient K		1.33

#1 Direct Path

Number of Rays	20
Lower Limit (m)	0.00
Upper Limit (m)	38.00



**CLIENTE:**  
CDM SMITH - INGESAM

**CONTRATO No.:**

**DOCUMENTO NO.:**  
INF-PTAR-003

**ELABORO:**  
P.VIVEROS

**FECHA:**  
19/09/2013

cnrsub7.pl3	CENTRO NARIÑO	CERRO SUBA
Elevation (m)	2561.00	2704.00
Latitude	004 37 42 N	004 43 39 N
Longitude	074 05 30 W	074 04 52 W
Azimuth	6.16	186.16
Antenna Type	0.6 M - 7.5 GHz	0.6 M - 7.5 GHz
Antenna Height (m)	21.50	10.51
Antenna Gain (dBi)	30.80	30.80
TX Line Type	Antena Integrada	Antena Integrada
TX Line Unit Loss (dB/100 m)	0.00	0.00
TX Filter Loss (dB)	1.90	1.90
RX Filter Loss (dB)	1.90	1.90
Frequency (MHz)	7000.00	
Polarization	Vertical	
Path Length (km)	11.03	
Free Space Loss (dB)	130.22	
Field Margin (dB)	1.00	
Diffraction Loss (dB)	0.00	
Atmospheric Absorption Loss (dB)	0.10	
Net Path Loss (dB)	73.52	73.52
Radio Type Model	RADIO TIPO	RADIO TIPO
Emission Designator	27M5D7W	27M5D7W
TX Power (watts)	0.13	0.13
TX Power (dBm)	21.00	21.00
Effective Radiated Power (dBm)	49.90	49.90
RX Threshold Criteria	10E-6	10E-6
RX Threshold Level (dBm)	-77.50	-77.50
Maximum Receive Signal (dBm)	-25.00	-25.00
RX Signal (dBm)	-52.52	-52.52
Thermal Fade Margin (dB)	24.98	24.98
Dispersive Fade Margin (dB)	45.00	45.00
Dispersive Fade Occurrence Factor	1.00	
Effective Fade Margin (dB)	24.93	24.93
Climatic Factor	1.00	
Terrain Roughness (m)	30.59	
C Factor	0.40	
Average Annual Temperature (deg C)	20.00	
Diversity Type	Non Diversity	
Worst Month Multipath 1 way (sec)	19.23	19.23
Worst Month Multipath 1 way (%)	99.999268	99.999268
Annual Multipath 1 way (sec)	78.45	78.45
Annual Multipath 1 way (%)	99.999751	99.999751
Annual Multipath 2 way (%-sec)	99.999502 - 156.89	



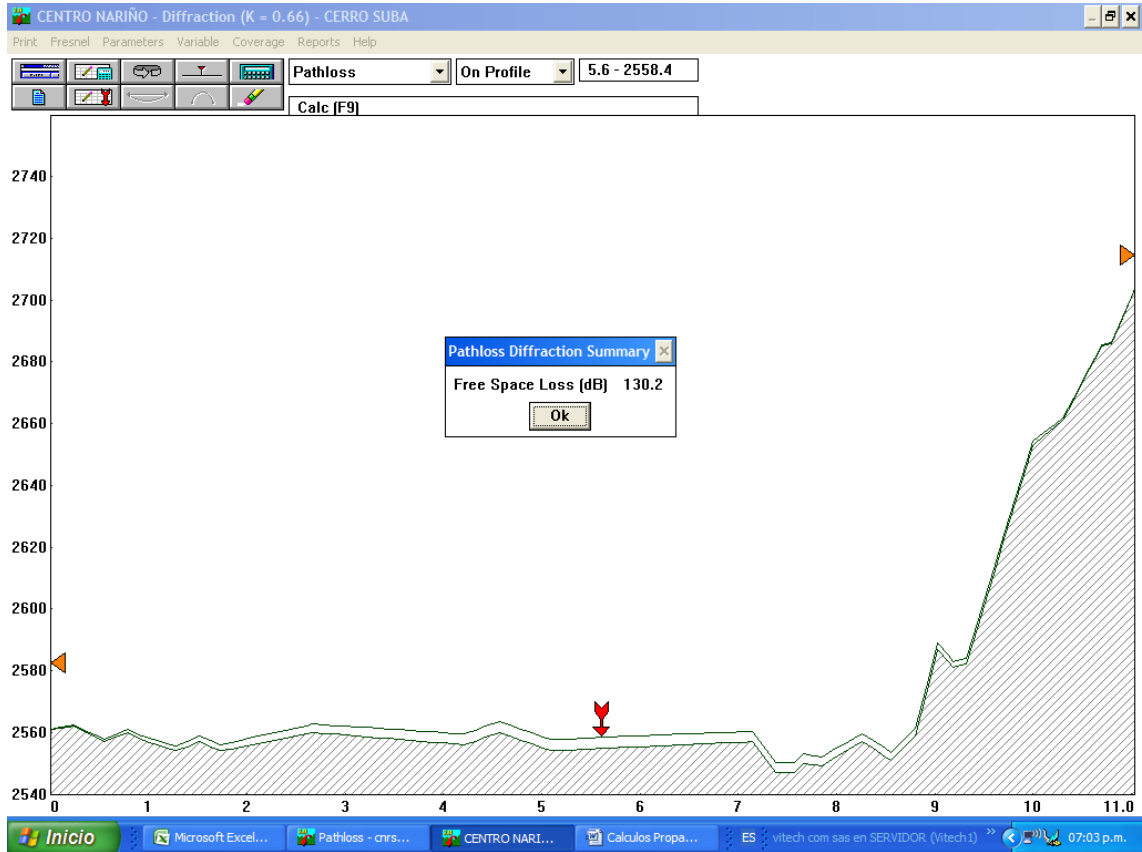
CLIENTE:  
CDM SMITH - INGESAM


CONTRATO No.:

DOCUMENTO NO.:  
INF-PTAR-003

ELABORO:  
P.VIVEROS

FECHA:  
19/09/2013



	<b>CLIENTE:</b> CDM SMITH - INGESAM		<b>CONTRATO No.:</b>	
	<b>DOCUMENTO NO.:</b> INF-PTAR-003	<b>ELABORO:</b> P.VIVEROS	<b>FECHA:</b> 19/09/2013	


Variable Parameter : Earth Radius Factor (K)

Reflective plane defined between 0.00 and 8.71 km (Least Squares)

CENTRO NARIÑO Antenna 3 dB Beamwidth (deg)	2.00
CERRO SUBA Antenna 3 dB Beamwidth (deg)	2.00
Terrain Roughness (m)	2.26
Clearance - Ground Cover Loss (dB)	2.00
Divergence	Included

CENTRO NARIÑO Antenna Height (m)	21.50
CERRO SUBA Antenna Height (m)	10.51
Frequency (MHz)	7000.00
Polarization	Vertical

K	Location	Reflection Loss		Reflection Delay		Gain
	km	%	dB	rad	ns	dB
0.70	1.44	82.82	15.30	96.7	2.2	-1.20
0.70	1.44	82.81	15.30	96.8	2.2	-1.26
0.72	1.44	82.80	15.29	97.0	2.2	-1.44
0.74	1.44	82.79	15.28	97.1	2.2	-1.56
0.76	1.44	82.78	15.28	97.3	2.2	-1.63
0.76	1.44	82.77	15.28	97.3	2.2	-1.64
0.77	1.44	82.77	15.27	97.4	2.2	-1.64
0.77	1.44	82.77	15.27	97.4	2.2	-1.64
0.78	1.44	82.77	15.27	97.4	2.2	-1.64
0.78	1.44	82.76	15.27	97.5	2.2	-1.63
0.80	1.43	82.75	15.27	97.6	2.2	-1.57
0.82	1.43	82.74	15.26	97.8	2.2	-1.45
0.85	1.43	82.73	15.25	98.0	2.2	-1.28
0.87	1.43	82.72	15.25	98.2	2.2	-1.06
0.90	1.43	82.71	15.24	98.3	2.2	-0.81
0.93	1.43	82.70	15.24	98.5	2.2	-0.54
0.96	1.42	82.69	15.23	98.7	2.2	-0.27
0.99	1.42	82.68	15.23	98.9	2.2	-0.01
1.03	1.42	82.67	15.22	99.0	2.3	0.24
1.06	1.42	82.66	15.22	99.2	2.3	0.48
1.10	1.42	82.65	15.21	99.4	2.3	0.70
1.15	1.42	82.64	15.21	99.6	2.3	0.89
1.19	1.41	82.63	15.20	99.7	2.3	1.06
1.24	1.41	82.62	15.20	99.9	2.3	1.18
1.30	1.41	82.61	15.19	100.1	2.3	1.28
1.36	1.41	82.60	15.19	100.3	2.3	1.35
1.43	1.41	82.59	15.19	100.4	2.3	1.39
1.50	1.41	82.58	15.18	100.6	2.3	1.39

	<b>CLIENTE:</b> CDM SMITH - INGESAM		<b>CONTRATO No.:</b>
	<b>DOCUMENTO NO.:</b> INF-PTAR-003	<b>ELABORO:</b> P.VIVEROS	<b>FECHA:</b> 19/09/2013

	CENTRO NARIÑO	CERRO SUBA
Latitude	004 37 42 N	004 43 39 N
Longitude	074 05 30 W	074 04 52 W
Azimuth	6.16	186.16
Distance (km)		11.03
Elevation (m)	2561.0	2704.0
Antenna Height (m)	21.5	10.5
Frequency (MHz)		7000.00
Polarization		Vertical
Antenna 3 dB Beamwidth (deg)	2.00	2.00
Constant Gradient K		1.33

#1 Direct Path

Number of Rays	20
Lower Limit (m)	0.00
Upper Limit (m)	38.00



**CLIENTE:**  
CDM SMITH - INGESAM

**CONTRATO No.:**

**DOCUMENTO NO.:**  
INF-PTAR-003

**ELABORO:**  
P.VIVEROS

**FECHA:**  
19/09/2013

cnrsub.p13	CENTRO NARIÑO	CERRO SUBA
Elevation (m)	2561.00	2704.00
Latitude	004 37 42 N	004 43 39 N
Longitude	074 05 30 W	074 04 52 W
Azimuth	6.16	186.16
Antenna Type	1.0 M - 13 GHz	1.0 M - 13 GHz
Antenna Height (m)	19.86	10.00
Antenna Gain (dBi)	40.00	40.00
TX Line Type	Antena Integrada	Antena Integrada
TX Line Unit Loss (dB/100 m)	0.00	0.00
TX Filter Loss (dB)	1.90	1.90
RX Filter Loss (dB)	1.90	1.90
Frequency (MHz)	13000.00	
Polarization	Vertical	
Path Length (km)	11.03	
Free Space Loss (dB)	135.60	
Field Margin (dB)	1.00	
Diffraction Loss (dB)	0.00	
Atmospheric Absorption Loss (dB)	0.22	
Net Path Loss (dB)	60.62	60.62
Radio Type Model	RADIO TIPO	RADIO TIPO
Emission Designator	27M5D7W	27M5D7W
TX Frequency Assignment (MHz)	13000	13000
TX Power (watts)	0.12	0.12
TX Power (dBm)	20.80	20.80
Effective Radiated Power (dBm)	58.90	58.90
RX Threshold Criteria	10E-6	10E-6
RX Threshold Level (dBm)	-78.50	-78.50
Maximum Receive Signal (dBm)	-25.00	-25.00
RX Signal (dBm)	-39.82	-39.82
Thermal Fade Margin (dB)	38.68	38.68
Dispersive Fade Margin (dB)	45.00	45.00
Dispersive Fade Occurrence Factor	1.00	
Effective Fade Margin (dB)	37.77	37.77
Climatic Factor	1.00	
Terrain Roughness (m)	30.59	
C Factor	0.40	
Average Annual Temperature (deg C)	20.00	
Diversity Type	Non Diversity	
Worst Month Multipath 1 way (sec)	1.84	1.84
Worst Month Multipath 1 way (%)	99.999930	99.999930
Annual Multipath 1 way (sec)	7.50	7.50
Annual Multipath 1 way (%)	99.999976	99.999976
Annual Multipath 2 way (%-sec)	99.999952 - 15.01	
Rain Region	G Tropical Moderate	
Rain Rate (mm/hr)	138.12	
Rain Attenuation (dB)	38.69	
Annual Rain 2 way (%-sec)	99.999271 - 229.90	
Annual Multipath + Rain (%-sec)	99.999223 - 244.91	



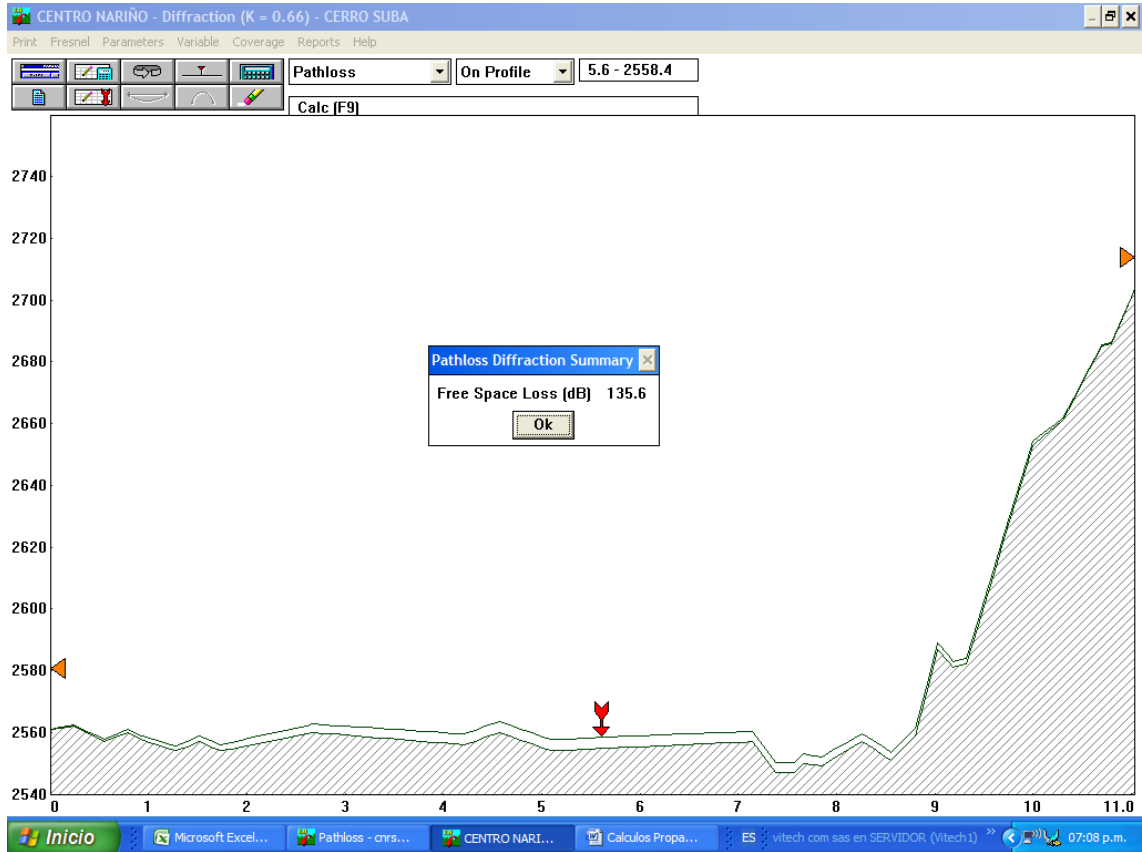
CLIENTE:  
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	<b>CLIENTE:</b> CDM SMITH - INGESAM		<b>CONTRATO No.:</b>	
	<b>DOCUMENTO NO.:</b> INF-PTAR-003	<b>ELABORO:</b> P.VIVEROS	<b>FECHA:</b> 19/09/2013	


Variable Parameter : Earth Radius Factor (K)

Reflective plane defined between 0.00 and 8.60 km (Least Squares)

CENTRO NARIÑO Antenna 3 dB Beamwidth (deg)	2.00
CERRO SUBA Antenna 3 dB Beamwidth (deg)	2.00
Terrain Roughness (m)	2.26
Clearance - Ground Cover Loss (dB)	2.00
Divergence	Included

CENTRO NARIÑO Antenna Height (m)	19.86
CERRO SUBA Antenna Height (m)	10.00
Frequency (MHz)	13000.00
Polarization	Vertical

K	Location	Reflection Loss	Reflection Delay	Gain
	km	%    dB	rad    ns	dB
0.70	1.35	88.65    18.90	163.6    2.0	0.92
0.70	1.35	88.65    18.90	163.6    2.0	0.91
0.71	1.35	88.65    18.90	163.8    2.0	0.86
0.72	1.35	88.65    18.90	164.0    2.0	0.79
0.73	1.35	88.65    18.90	164.1    2.0	0.70
0.74	1.35	88.65    18.90	164.3    2.0	0.58
0.76	1.35	88.65    18.90	164.5    2.0	0.45
0.77	1.34	88.65    18.90	164.7    2.0	0.30
0.78	1.34	88.65    18.90	164.8    2.0	0.14
0.79	1.34	88.65    18.90	165.0    2.0	-0.03
0.80	1.34	88.65    18.90	165.2    2.0	-0.20
0.82	1.34	88.65    18.90	165.4    2.0	-0.37
0.83	1.34	88.65    18.90	165.5    2.0	-0.54
0.84	1.34	88.65    18.90	165.7    2.0	-0.69
0.86	1.34	88.65    18.90	165.9    2.0	-0.82
0.87	1.34	88.65    18.90	166.1    2.0	-0.93
0.89	1.34	88.65    18.90	166.2    2.0	-1.00
0.90	1.34	88.65    18.90	166.4    2.0	-1.04
0.91	1.34	88.65    18.90	166.5    2.0	-1.04
0.91	1.33	88.65    18.90	166.5    2.0	-1.05
0.92	1.33	88.65    18.90	166.5    2.0	-1.05
0.92	1.33	88.65    18.90	166.6    2.0	-1.04
0.92	1.33	88.65    18.90	166.6    2.0	-1.04
0.94	1.33	88.66    18.90	166.8    2.0	-1.00
0.96	1.33	88.66    18.90	166.9    2.0	-0.93
0.97	1.33	88.66    18.91	167.1    2.0	-0.83
0.99	1.33	88.66    18.91	167.3    2.0	-0.70
1.01	1.33	88.66    18.91	167.5    2.1	-0.55

	<b>CLIENTE:</b> CDM SMITH - INGESAM		<b>CONTRATO No.:</b>
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	CENTRO NARIÑO	CERRO SUBA
Latitude	004 37 42 N	004 43 39 N
Longitude	074 05 30 W	074 04 52 W
Azimuth	6.16	186.16
Distance (km)		11.03
Elevation (m)	2561.0	2704.0
Antenna Height (m)	19.9	10.0
Frequency (MHz)		13000.00
Polarization		Vertical
Antenna 3 dB Beamwidth (deg)	2.00	2.00
Constant Gradient K		1.33

#1 Direct Path

Number of Rays	21
Lower Limit (m)	0.00
Upper Limit (m)	40.00