

Table D4.1 Representative Link Budget/ASI analysis for QPSK 24M0G7W R2/3 (NF HP XPDR @ 67.5°W)

		CLEAR-SKY		DEGRADED		
Carrier	Carrier Type		24MG7W	24MG7W	24MG7W	24MG7W
	Modulation		QPSK	QPSK	QPSK	QPSK
	Info Rate	Mbit/s	26.65	26.65	26.65	26.65
	FEC:		0.67	0.67	0.67	0.67
	Noise BW:	MHz	19.988	19.988	19.988	19.988
	Eb/No required:	dB	2.9	2.9	2.9	2.9
	C/N required	dB	4.1	4.1	4.1	4.1
Carrier	ASI+Terrestrial losses	dB	1.5	1.5	1.5	1.5
	Adjusted required C/N	dB	5.6	5.6	5.649	5.6
S/C Loc	Longitude	deg	-87.50	-87.50	-87.50	-87.50
Beam Polarization Frequency	Uplink Beam Name		NRF	NRF	NRF	NRF
	Polarisation (H, V or, C)		C	C	C	C
	Uplink Frequency	MHz	24750.0	24750.0	24750.0	24750.0
	Downlink Beam Name		NTF	NTF	NTF	NTF
Beam Polarization Frequency	Polarisation (H, V or, C)		C	C	C	C
	Downlink Frequency	MHz	17300.0	17300.0	17300.0	17300.0
	Downlink Frequency	MHz	17300.0	17300.0	17300.0	17300.0
Rain Analysis	Rain Model (ITU/Crane)				ITU	ITU
	% time uplink rain attenuation exceeded				0.03	0.03
	% time downlink rain attenuation exceeded				0.27	0.37
	Total Link Availability				99.70	99.60
Tx E/S	ES Longitude	deg	Denver	Denver	Denver	Denver
	ES Latitude	deg	-105.0	-105.0	-105.0	-105.0
	Temperature ground	deg C	39.5	39.5	39.5	39.5
	Humidity	%	25.0	25.0	25.0	25.0
	Rain Zone (as per rain model)		50.0	50.0	50.0	50.0
	Uplink Power Control range	dB	E	E	E	E
	E/S Elevation angle	deg	20.0	20.0	20.0	20.0
	E/S size	m	30.3	30.3	30.3	30.3
	E/S size	m	9.00	9.00	9.00	9.00
	Transmit E/S peak gain (Eff=0.6)	dB	65.1	65.1	65.1	65.1
Rx E/S	ES Longitude	deg	Reno	Miami	Reno	Miami
	ES Latitude	deg	-119.8	-80.2	-119.8	-80.2
	Temperature ground	deg C	39.5	25.5	39.5	25.5
	Humidity	%	25.0	25.0	25.0	25.0
	Rain Zone (as per rain model)		30.0	70.0	30.0	70.0
	E/S Elevation angle	deg	D	N	D	N
	E/S size	m	20.0	57.1	20.0	57.1
	E/S size	m	0.45	0.65	0.45	0.65
	Receive E/S peak gain (Eff=0.6)	dB	36.0	39.2	36.0	39.2
	System (LNA + Sky) Noise Temp.	km	200.0	200.0	200.0	200.0
Temperature due to rain fade and gases	K	10.5	4.3	140.9	233.0	
Receive E/S G/T	dB/K	12.8	16.1	10.7	12.8	
Uplink Thermal	U/L eirp	dBW	77.8	79.4	78.2	79.4
	Uplink PSD	dBW/Hz	-80.4	-58.7	-60.0	-58.7
	Transponder BP SFD	dBW/m2	-84.0	-84.0	-83.6	-84.0
	Input Backoff	dB	-3.8	-2.2	-3.8	-2.2
	Uplink Path Loss, clear sky	dB	212.5	212.5	212.5	212.5
	Uplink gaseous attenuation	dB	0.2	0.2	1.3	1.3
	Uplink rain attenuation	dB	0.0	0.0	11.4	11.4
	Up link power control correction (dB)	dB	0.0	0.0	11.4	11.4
	+ Satellite G/T	dB/K	7.9	7.9	7.9	7.9
Antenna pattern towards E/S	dB	-2.4	-2.4	-2.4	-2.4	
C/N thermal uplink	dB	26.2	27.8	25.4	26.6	
Downlink Thermal	S/C saturated EIRP (Beam Peak)	dBW	55.6	55.6	55.6	55.6
	Carrier Output backoff	dB	-1.9	-0.3	-1.9	-0.3
	Antenna pattern towards E/S	dB	-1.5	-2.0	-1.5	-2.0
	Downlink EIRP towards E/S	dBW	52.2	53.3	52.2	53.3
	Downlink Path Loss, clear sky	dB	209.5	208.6	209.5	208.6
	Downlink gaseous attenuation	dB	0.2	0.1	0.4	0.3
	Downlink rain attenuation	dB	0.0	0.0	2.6	6.7
	- Antenna Pointing error	dB	-0.3	-0.3	-0.3	-0.3
	+ Earth Station G/T, clear sky	dB/K	12.8	16.1	10.7	12.8
	C/N thermal downlink	dB	10.6	16.0	5.7	5.7
Other	C/I (Other link degradation)	dB	25.0	25.0	25.0	25.0
Total	Available C/N	dB	10.3	15.2	5.6	5.6
	PF	dBW/m2/MHz	-122.6	-120.1	-122.6	-120.1
	Margin	dB	4.7	9.6	0.0	0.0
ASI	Geocentric Separation	deg	4.0	4.0	4.0	4.0
	Topocentric Separation w/o pointing error	deg	4.4	4.4	4.4	4.4
	Orbital Separation w/pointing error	deg	4.0	4.1	4.0	4.1
	Interfering Uplink power density	dBW/Hz	-66.5	-66.5	-66.5	-66.5
	Interfering D/L eirp density	dBW/Hz	-11.7	-12.6	-11.7	-12.6
	D/Lambda		26.0	37.6	26.0	37.6
	Gain at offset angle	dB	14.0	13.7	14.0	13.7
	C/I ASI uplink	dB	48.4	50.0	48.8	50.0
	C/I ASI downlink	dB	12.6	18.1	12.6	18.1
	C/I (ASI total)	dB	12.6	18.1	12.6	18.1
ASI	ASI uplink	%	0%	0%	0%	0%
	ASI downlink	%	17%	5%	17%	5%
	ASI total	%	17%	5%	17%	5%
	ASI degradation	dB	0.8	0.2	0.8	0.2

Table D4.2 Representative Link Budget/ASI analysis for QPSK 24M0G7W R2/3 (NF SHP XPDR @ 67.5°W)

			CLEAR-SKY		DEGRADED	
Carrier	Carrier Type		24M0G7W	24M0G7W	24M0G7W	24M0G7W
	Modulation		QPSK	QPSK	QPSK	QPSK
	Info Rate	Mbit/s	26.65	26.65	26.65	26.65
	FEC:		0.67	0.67	0.67	0.67
	Noise BW:	MHz	19.988	19.988	19.988	19.988
	Eb/No required:	dB	2.9	2.9	2.9	2.9
	C/N required	dB	4.1	4.1	4.1	4.1
S/C Loc	ASI+Terrestrial losses	dB	1.5	1.5	1.5	1.5
	Adjusted required C/N	dB	5.6	5.6	5.649	5.6
	Longitude	deg	-67.50	-67.50	-67.50	-67.50
	Latitude	deg	-105.0	-105.0	-105.0	-105.0
Beam Polarization	Uplink Beam Name		NRF	NRF	NRF	NRF
	Polarisation (H, V or, C)		C	C	C	C
	Uplink Frequency	MHz	25150.0	25150.0	25150.0	25150.0
	Downlink Beam Name		NTF	NTF	NTF	NTF
Frequency	Polarisation (H, V or, C)		C	C	C	C
	Downlink Frequency	MHz	17700.0	17700.0	17700.0	17700.0
	Rain Model (ITU/Crane)				ITU	ITU
	% time uplink rain attenuation exceeded				0.03	0.03
Rain Analysis	% time downlink rain attenuation exceeded				0.27	0.37
	Total Link Availability				99.70	99.60
Tx E/S	ES Longitude	deg	Denver	Denver	Denver	Denver
	ES Latitude	deg	-105.0	-105.0	-105.0	-105.0
	Temperature ground	deg C	39.5	39.5	39.5	39.5
	Humidity	%	25.0	25.0	25.0	25.0
	Rain Zone (as per rain model)		50.0	50.0	50.0	50.0
	Uplink Power Control range	dB	E	E	E	E
	E/S Elevation angle	deg	20.0	20.0	20.0	20.0
	E/S size	m	30.3	30.3	30.3	30.3
	Transmit E/S peak gain (Eff=0.6)	dB	9.00	9.00	9.00	9.00
		dB	65.3	65.3	65.3	65.3
Rx E/S	ES Longitude	deg	Denver	Miami	Reno	Miami
	ES Latitude	deg	-119.8	-80.2	-119.8	-80.2
	Temperature ground	deg C	39.5	25.5	39.5	25.5
	Humidity	%	25.0	25.0	25.0	25.0
	Rain Zone (as per rain model)		30.0	70.0	30.0	70.0
	E/S Elevation angle	deg	D	N	D	N
	E/S size	m	20.0	57.1	20.0	57.1
	Receive E/S peak gain (Eff=0.6)	dB	0.45	0.65	0.45	0.65
	System (LNA + Sky) Noise Temp.	dB	36.2	39.4	36.2	39.4
	Temperature due to rain fade and gases	km	200.0	200.0	200.0	200.0
Uplink Thermal	U/L eirp	K	10.7	4.4	146.0	236.6
	Uplink PSD	dB/K	13.0	16.3	10.8	13.0
	Transponder BP SFD	dB/K	75.5	77.2	75.9	77.2
	Input Backoff	dB	-82.8	-81.1	-82.4	-81.1
	Uplink Path Loss, clear sky	dB	-84.0	-84.0	-83.6	-84.0
	Uplink gaseous attenuation	dB	-8.2	-4.5	-6.2	-4.5
	Uplink rain attenuation	dB	212.7	212.7	212.7	212.7
	Uplink power control correction (dB)	dB	0.2	0.2	1.2	1.2
	+ Satellite G/T	dB	0.0	0.0	11.7	11.7
	Antenna pattern towards E/S	dB/K	0.0	0.0	11.7	11.7
Downlink Thermal	C/N thermal uplink	dB/K	7.9	7.9	7.9	7.9
	S/C saturated EIRP (Beam Peak)	dB	-2.4	-2.4	-2.4	-2.4
	Carrier Output backoff	dB	23.7	25.4	23.1	24.4
	Antenna pattern towards E/S	dB	58.2	58.2	58.2	58.2
	Downlink EIRP towards E/S	dB	-4.3	-2.6	-4.3	-2.6
	Downlink Path Loss, clear sky	dB	-1.5	-2.0	-1.5	-2.0
	Downlink gaseous attenuation	dB	52.4	53.7	52.4	53.7
	Downlink rain attenuation	dB	209.7	208.9	209.7	208.9
	- Antenna Pointing error	dB	0.2	0.1	0.4	0.4
	+ Earth Station G/T, clear sky	dB	0.0	0.0	2.6	7.0
ASI	C/N thermal downlink	dB/K	-0.3	-0.3	-0.3	-0.3
	C/I (Other link degradation)	dB	13.0	16.3	10.8	13.0
	Available C/N	dB	10.8	16.3	5.8	5.8
	PFD	dB	25.0	25.0	25.0	25.0
	Margin	dB	10.4	15.3	5.6	5.6
	Geocentric Separation	dB/m2/MHz	-122.4	-119.8	-122.4	-119.8
	Topocentric Separation	dB	4.8	9.7	0.0	0.0
	Orbital Separation w/pointing error	dB	4.0	4.0	4.0	4.0
	Interfering Uplink power density	deg	4.4	4.4	4.4	4.4
	Interfering D/L eirp density	deg	4.0	4.1	4.0	4.1
ASI	D/Lambda	dB/Hz	-56.5	-56.5	-56.5	-56.5
	Gain at offset angle	dB/Hz	-11.7	-12.6	-11.7	-12.6
	C/I ASI uplink	dB	26.6	38.4	26.6	38.4
	C/I ASI downlink	dB	14.0	13.6	14.0	13.6
	C/I (ASI total)	dB	46.0	47.8	46.4	47.8
	ASI uplink	dB	13.0	18.7	13.0	18.7
	ASI downlink	dB	13.0	18.7	13.0	18.7
	ASI total	dB	13.0	18.7	13.0	18.7
	ASI degradation	%	0%	0%	0%	0%
		%	15%	5%	15%	5%

Table D4.3 Representative Link Budget/ASI analysis for QPSK 24M0G7W R2/3 (SF SHP XPDR @ 67.5°W)

		CLEAR-SKY		DEGRADED		
Carrier	Carrier Type		24MG7W	24MG7W	24MG7W	24MG7W
	Modulation		QPSK	QPSK	QPSK	QPSK
	Info Rate	Mbit/s	26.65	26.65	26.65	26.65
	FEC:		0.67	0.67	0.67	0.67
	Noise BW:	MHz	19.988	19.988	19.988	19.988
	Eb/No required:	dB	2.9	2.9	2.9	2.9
	C/N required	dB	4.1	4.1	4.1	4.1
S/C Loc	ASI+Terrestrial losses	dB	1.5	1.5	1.5	1.5
	Adjusted required C/N	dB	5.6	5.6	5.649	5.6
	Longitude	deg	-67.50	-67.50	-67.50	-67.50
Beam Polarization Frequency	Uplink Beam Name		SRF	SRF	SRF	SRF
	Polarisation (H, V or, C)		C	C	C	C
	Uplink Frequency	MHz	25150.0	25150.0	25150.0	25150.0
	Downlink Beam Name		STF	STF	STF	STF
Rain Analysis	Polarisation (H, V or, C)		C	C	C	C
	Downlink Frequency	MHz	17700.0	17700.0	17700.0	17700.0
	Rain Model (ITU/Crane)				ITU	ITU
	% time uplink rain attenuation exceeded				0.03	0.03
Tx E/S	% time downlink rain attenuation exceeded				0.27	0.47
	Total Link Availability				99.70	99.50
	ES Longitude	deg	Santiago	Santiago	Santiago	Santiago
	ES Latitude	deg	-70.4	-70.4	-70.4	-70.4
	Temperature ground	deg C	-33.3	-33.3	-33.3	-33.3
	Humidity	%	25.0	25.0	25.0	25.0
	Rain Zone (as per rain model)		50.0	50.0	50.0	50.0
	Uplink Power Control range	dB	E	E	E	E
	E/S Elevation angle	deg	20.0	20.0	20.0	20.0
	E/S size	m	51.2	51.2	51.2	51.2
Rx E/S	Transmit E/S peak gain (Eff=0.6)	dB	9.0	9.0	9.0	9.0
	ES Longitude	deg	65.3	65.3	65.3	65.3
	ES Latitude	deg	Santiago	Rio	Santiago	Rio
	Temperature ground	deg C	-70.4	-43.2	-70.4	-43.2
	Humidity	%	-33.3	-22.5	-33.3	-22.5
	Rain Zone (as per rain model)		25.0	25.0	25.0	25.0
	E/S Elevation angle	deg	50.0	75.0	50.0	75.0
	E/S size	m	E	N	E	N
	Receive E/S peak gain (Eff=0.6)	dB	51.2	52.0	51.2	52.0
	System (LNA + Sky) Noise Temp.	K	0.45	0.65	0.45	0.65
Uplink Thermal	Temperature due to rain fade and gases	dB	36.2	39.4	36.2	39.5
	Receive E/S G/T	dB/K	200.0	200.0	200.0	200.0
	U/L eirp	dBW	4.8	4.7	112.7	229.6
	Uplink PSD	dBW/Hz	13.1	16.3	11.3	13.1
	Transponder BP SFD	dBW/m2	76.6	79.3	76.6	79.3
	Input Backoff	dB	-61.7	-59.0	-61.7	-59.0
	Uplink Path Loss, clear sky	dB	-86.0	-86.0	-86.0	-86.0
	Uplink gaseous attenuation	dB	-5.1	-2.4	-5.1	-2.4
	Uplink rain attenuation	dB	212.2	212.2	212.2	212.2
	Up link power control correction (dB)	dB	0.1	0.1	0.8	0.8
Downlink Thermal	+ Satellite G/T	dB/K	0.0	0.0	9.4	9.4
	Antenna pattern towards E/S	dB	0.0	0.0	9.4	9.4
	C/N thermal uplink	dB	5.1	5.1	5.1	5.1
	S/C saturated EIRP (Beam Peak)	dBW	-5.0	-5.0	-5.0	-5.0
	Carrier Output backoff	dB	20.1	22.8	19.4	22.1
	Antenna pattern towards E/S	dB	54.6	54.6	54.6	54.6
	Downlink EIRP towards E/S	dBW	-3.2	-0.5	-3.2	-0.5
	Downlink Path Loss, clear sky	dB	-1.0	-1.0	-1.0	-1.0
	Downlink gaseous attenuation	dB	50.4	53.1	50.4	53.1
	Downlink rain attenuation	dB	208.9	208.9	208.9	208.9
Other	- Antenna Pointing error	dB	0.1	0.1	0.3	0.4
	+ Earth Station G/T, clear sky	dB	0.0	0.0	1.8	6.4
	C/N thermal downlink	dB	0.0	0.0	9.4	9.4
	C/I (Other link degradation)	dB	-0.3	-0.3	-0.3	-0.3
	Total	dB	13.1	16.3	11.3	13.1
	Available C/N	dB	9.8	15.7	5.9	5.8
	PF	dBW/m2/MHz	25.0	25.0	25.0	25.0
	Margin	dB	9.3	14.5	5.6	5.6
	Geocentric Separation	deg	3.6	8.9	0.0	0.0
	Topocentric Separation	deg	4.0	4.0	4.0	4.0
ASI	Orbital Separation w/pointing error	deg	4.4	4.4	4.4	4.4
	Interfering Uplink power density	dBW/Hz	4.0	4.1	4.0	4.1
	Interfering D/L eirp density	dBW/Hz	-66.5	-66.5	-66.5	-66.5
	D/Lambda	dB	-12.5	-12.5	-12.5	-12.5
	Gain at offset angle	dB	26.6	38.4	26.6	38.6
	C/I ASI uplink	dB	14.0	13.6	14.0	13.6
	C/I ASI downlink	dB	47.2	49.9	47.2	49.9
	C/I (ASI total)	dB	11.8	18.1	11.8	18.1
	ASI uplink	%	11.8	18.0	11.8	18.1
	ASI downlink	%	0%	0%	0%	0%
ASI	ASI total	%	20%	5%	20%	5%
	ASI degradation	dB	20%	5%	20%	5%
	ASI degradation	dB	0.9	0.2	0.9	0.2

Table D4.13 Representative Link Budget/ASI analysis for 8PSK 48M0G7W R5/6 & R2/3 (Local DBS XPDR)

		CLEAR-SKY		DEGRADED		
Carrier	Carrier Type		48M0G7W	48M0G7W	48M0G7W	48M0G7W
	Modulation		8PSK	8PSK	8PSK	8PSK
	Bits/Symbol		3	3	3	3
	Info Rate	Mbit/s	100	100	80	80
	FEC:		0.83	0.83	0.67	0.67
	Noise BW:	MHz	40.000	40.000	40.000	40.000
	Eb/No required:	dB	4.9	4.9	6.6	6.6
	C/N required	dB	8.9	8.9	9.6	9.6
Beam Polarization Frequency	ASI+Terrestrial losses	dB	1.5	1.5	1.5	1.5
	Adjusted required C/N	dB	10.4	10.4	11.1	11.1
	Uplink Beam Name		GR	GR	GR	GR
	Polarisation (H, V or, C)		C	C	C	C
	Uplink Frequency	MHz	24750.0	24750.0	24750.0	24750.0
	Downlink Beam Name		UT	UT	UT	UT
	Polarisation (H, V or, C)		C	C	C	C
	Downlink Frequency	MHz	17300.0	17300.0	17300.0	17300.0
Rain Analysis	Rain Model (ITU/Crane)				ITU	ITU
	% time uplink rain attenuation exceeded				0.100	0.100
	% time downlink rain attenuation exceeded				4.900	4.900
	Total Link Availability				95.0	95.0
Tx E/S	ES Longitude	deg	Hagerstwn	Hagerstwn	Hagerstwn	Hagerstwn
	ES Latitude	deg	-77.4	-77.4	-77.4	-77.4
	Temperature ground	deg C	39.3	39.3	39.3	39.3
	Humidity	%	25.0	25.0	25.0	25.0
	Rain Zone (as per rain model)		50.0	50.0	50.0	50.0
	Uplink Power Control range	K	K	K	K	K
	E/S Elevation angle	deg	20.0	20.0	20.0	20.0
	E/S size	m	39.2	39.2	39.2	39.2
	Transmit E/S peak gain (Eff=0.6)	dB	9.0	9.0	9.0	9.0
		dB	65.1	65.1	65.1	65.1
Rx E/S	ES Longitude	deg	Riverside	Miami	Riverside	Miami
	ES Latitude	deg	-117.2	-80.2	-117.2	-80.2
	Temperature ground	deg C	33.6	25.5	33.6	25.5
	Humidity	%	25.0	25.0	25.0	25.0
	Rain Zone (as per rain model)		50.0	75.0	50.0	75.0
	E/S Elevation angle	deg	E	N	E	N
	E/S size	m	14.9	49.5	14.9	49.5
	Receive E/S peak gain (Eff=0.6)	dB	0.45	0.45	0.45	0.45
	System (LNA + Sky) Clearsky Temp.	K	36.0	36.0	36.0	36.0
	Temperature due to rain fade and gases	K	200.0	200.0	200.0	200.0
Receive E/S G/T	dB/K	14.0	4.8	86.8	107.3	
Uplink Thermal	U/L eirp	dBW	76.9	76.7	76.9	76.7
	Uplink PSD	dBW/Hz	-84.3	-84.5	-84.3	-84.5
	Transponder BP SFD	dBW/m2	-88.0	-88.0	-88.0	-88.0
	Input Backoff	dB	-3.1	-3.3	-3.1	-3.3
	Uplink Path Loss, clear sky	dB	212.3	212.3	212.3	212.3
	Uplink gaseous attenuation	dB	0.1	0.1	1.1	1.1
	Uplink rain attenuation	dB	0.0	0.0	10.6	10.6
	Up link power control correction (dB)	dB	0.0	0.0	10.6	10.6
	+ Satellite G/T	dB/K	16.7	16.7	16.7	16.7
	Antenna pattern towards E/S	dB	-5.0	-5.0	-5.0	-5.0
C/N thermal uplink	dB	28.8	28.5	27.8	27.6	
Downlink Thermal	S/C saturated EIRP (Beam Peak)	dBW	64.7	64.7	64.7	64.7
	Carrier Output backoff	dB	-1.2	-1.4	-1.2	-1.4
	Antenna pattern towards E/S	dB	-4.1	-4.1	-4.1	-4.1
	Downlink EIRP towards E/S	dBW	59.4	59.2	59.4	59.2
	Downlink Path Loss, clear sky	dB	209.8	208.8	209.8	208.8
	Downlink gaseous attenuation	dB	0.2	0.1	0.8	0.4
	Downlink rain attenuation	dB	0.0	0.0	0.8	1.6
	- Antenna Pointing error	dB	-0.3	-0.3	-0.3	-0.3
	+ Earth Station G/T, clear sky	dB/K	12.7	12.9	11.4	11.1
	C/N thermal downlink	dB	14.4	15.5	11.8	11.8
Other	C/I (Other link degradation)	dB	20.0	20.0	20.0	20.0
Total	Available C/N	dB	13.24	14.04	11.11	11.11
	PF	dBW/m2/MHz	-116.1	-115.3	-116.1	-115.3
	Margin	dB	2.9	3.7	0.0	0.0
ASI	Geocentric Separation	deg	4.0	4.0	4.0	4.0
	Topocentric Separation	deg	4.4	4.4	4.4	4.4
	Orbital Separation w/pointing error	deg	4.0	4.0	4.0	4.0
	Interfering Uplink power density	dBW/Hz	-56.5	-56.5	-56.5	-56.5
	Interfering D/L eirp density	dBW/Hz	-11.4	-12.4	-11.4	-12.4
	D/Lambda	dB	26.0	26.0	26.0	26.0
	Gain at offset angle	dB	14.0	14.0	14.0	14.0
	C/I ASI uplink	dB	44.5	44.2	44.5	44.2
	C/I ASI downlink	dB	16.8	17.6	16.8	17.6
	C/I (ASI total)	dB	16.8	17.6	16.8	17.6
	ASI uplink	%	0%	0%	0%	0%
	ASI downlink	%	18%	16%	21%	18%
	ASI total	%	18%	16%	21%	18%
	ASI degradation	dB	0.9	0.8	1.0	0.9

Table D4.14 Representative Link Budget/ASI analysis for 8PSK 24M0G7W R5/6 & R2/3 (Local DBS XPDR)

		CLEAR-SKY		DEGRADED	
Carrier	Carrier Type		24M0G7W	24M0G7W	24M0G7W
	Modulation		8PSK	8PSK	8PSK
	Bits/Symbol		3	3	3
	Info Rate	Mbit/s	50	50	40
	FEC:		0.83	0.83	0.67
	Noise BW:	MHz	20.000	20.000	20.000
	Eb/No required:	dB	4.9	4.9	6.6
	C/N required	dB	8.9	8.9	9.6
Beam Polarization	ASI+Terrestrial losses	dB	1.5	1.5	1.5
	Adjusted required C/N	dB	10.4	10.4	11.1
	Uplink Beam Name		GR	GR	GR
	Polarisation (H, V or, C)		C	C	C
Frequency	Uplink Frequency	MHz	24750.0	24750.0	24750.0
	Downlink Beam Name		UT	UT	UT
	Polarisation (H, V or, C)		C	C	C
	Downlink Frequency	MHz	17300.0	17300.0	17300.0
Rain Analysis	Rain Model (ITU/Crane)				ITU
	% time uplink rain attenuation exceeded				0.100
	% time downlink rain attenuation exceeded				4.900
	Total Link Availability				95.0
Tx E/S	ES Longitude	deg	Hagerstwn	Hagerstwn	Hagerstwn
	ES Latitude	deg	-77.4	-77.4	-77.4
	Temperature ground	deg C	39.3	39.3	39.3
	Humidity	%	25.0	25.0	25.0
	Rain Zone (as per rain model)		50.0	50.0	50.0
	Uplink Power Control range	K	K	K	K
	E/S Elevation angle	deg	20.0	20.0	20.0
	E/S size	m	39.2	39.2	39.2
	Transmit E/S peak gain (Eff=0.6)	dB	9.0	9.0	9.0
		dB	65.1	65.1	65.1
Rx E/S	ES Longitude	deg	Riverside	Miami	Riverside
	ES Latitude	deg	-117.2	-80.2	-117.2
	Temperature ground	deg C	33.6	25.5	33.6
	Humidity	%	25.0	25.0	25.0
	Rain Zone (as per rain model)		50.0	75.0	50.0
	E/S Elevation angle	deg	E	N	E
	E/S size	m	14.9	49.5	14.9
	Receive E/S peak gain (Eff=0.6)	dB	0.45	0.45	0.45
	System (LNA + Sky) Clearsky Temp.	K	36.0	36.0	36.0
	Temperature due to rain fade and gases	K	200.0	200.0	200.0
Thermal	Receive E/S G/T	dB/K	14.0	4.8	86.8
	U/L eirp	dBW	12.7	12.9	11.4
	Uplink PSD	dBW/Hz	74.1	73.8	74.1
	Transponder BP SFD	dBW/Hz	-84.1	-84.3	-84.1
	Input Backoff	dBW/m2	-88.0	-88.0	-88.0
	Uplink Path Loss, clear sky	dB	-5.9	-6.1	-5.9
	Uplink gaseous attenuation	dB	212.3	212.3	212.3
	Uplink rain attenuation	dB	0.1	0.1	1.1
	Up link power control correction (dB)	dB	0.0	0.0	10.6
	+ Satellite G/T	dB/K	0.0	0.0	10.6
Downlink Thermal	Antenna pattern towards E/S	dB	16.7	16.7	16.7
	C/N thermal uplink	dB	-5.0	-5.0	-5.0
	S/C saturated EIRP (Beam Peak)	dBW	28.9	28.7	28.0
	Carrier Output backoff	dB	64.7	64.7	64.7
	Antenna pattern towards E/S	dB	-4.0	-4.2	-4.0
	Downlink EIRP towards E/S	dBW	-4.1	-4.1	-4.1
	Downlink Path Loss, clear sky	dB	56.6	56.3	56.6
	Downlink gaseous attenuation	dB	209.8	208.8	209.8
	Downlink rain attenuation	dB	0.2	0.1	0.8
	- Antenna Pointing error	dB	0.0	0.0	1.6
Other	+ Earth Station G/T, clear sky	dB/K	-0.3	-0.3	-0.3
	C/N thermal downlink	dB/K	12.7	12.9	11.4
	C/I (Other link degradation)	dB	14.6	15.7	12.0
	Total Available C/N	dB	19.0	19.0	19.0
	PFD	dBW/m2/MHz	13.13	13.88	11.11
	Margin	dB	-115.9	-115.1	-115.9
	Geocentric Separation	deg	2.8	3.5	0.0
	Topocentric Separation	deg	4.0	4.0	4.0
	Orbital Separation w/pointing error	deg	4.4	4.4	4.4
	Interfering Uplink power density	dBW/Hz	4.0	4.0	4.0
ASI	Interfering D/L eirp density	dBW/Hz	-56.5	-56.5	-56.5
	D/Lambda	dBW/Hz	-11.4	-12.4	-11.4
	Gain at offset angle	dB	26.0	26.0	26.0
	C/I ASI uplink	dB	14.0	14.0	14.0
	C/I ASI downlink	dB	44.6	44.4	44.6
	C/I (ASI total)	dB	17.0	17.8	17.0
	ASI uplink	dB	17.0	17.8	17.0
	ASI downlink	%	0%	0%	0%
	ASI total	%	18%	15%	18%
	ASI degradation	%	18%	15%	20%
ASI degradation		dB	0.9	0.7	1.0
					0.8