

Digital Link Budget			
Produced using Salmaster Pro			
Sunday, March 18, 2012			
Service Name	(1) 64kbps SeaTel 18-Mar 2012		
Coverage	NORTH AMERICA		
Uplink earth station	SeaTel 6009 Antenna (Port Canaveral)		
Downlink earth station	Normal Patriot Antenna (CCAFS)		
Satellite name	INTELSAT G-25		
Link Input Parameters	Up	Down	Units
Site latitude	28.28N	28.46N	degrees
Site longitude	80.18W	80.56W	degrees
Site altitude	0	0	km
Frequency	14.25	11.95	GHz
Polarization	Vertical	Horizontal	
Rain model	ITU (95.1)	ITU (93.2)	(mm/h or zone)
Availability (average year)	99.8	99.8	%
Antenna aperture	1.5	2.4	metres
Antenna efficiency / gain	45.1	46	% (+ prefix dBi)
Coupling loss	0.3	0.3	dB
Antenna tracking / mispoint error	0.5	0.5	dB
LNB noise figure / temp		1	dB (+ prefix K)
Antenna noise		62	K
Adjacent carrier interference	27	27	dB
Adjacent satellite interference	24	24	dB
Cross polarization interference	27	27	dB
Uplink station HPA output back-off	0		dB
Number of carriers / HPA	1		
HPA C/IM (up)	30		dB
Uplink power control	0		dB
Uplink filter truncation loss	0		dB
Required HPA power capability	MIN		W
Satellite Input Parameters	Value		Units
Satellite longitude	97W		degrees
Transponder type	TWTA		
Receive G/T	42		dB/K
Saturation flux density	-91		dBW/m2
Satellite attenuator pad	0		dB
Satellite ALC	0		dB
EIRP (saturation)	55.1		dBW
Transponder bandwidth	36		MHz
Input back off total	8		dB
Output back off total	AUTO		dB
Intermodulation interference	AUTO		dB
Number of transponder carriers	AUTO		
Carrier/Link Input Parameters	Value		Units
Modulation	4-PSK		
Required bit error rate performance	10 ⁻⁷		
Required Eb/No without FEC coding	11.31		dB
Required Eb/No with FEC coding	8		dB
Information rate	0.064		Mbps
Overhead	1		%
FEC code rate	0.75		
Spreading gain	1		dB
Reed Solomon code	1		
(1 + Roll off factor)	1.2		
Carrier spacing factor	1.4		
Bandwidth allocation step size	0.01		MHz
System margin	1		dB

Calculations at Saturation	Value		Units
Gain 1m ²	44.53		dB/m ²
Uplink C/No	135.07		dB.Hz
Downlink C/No	101.34		dB.Hz
Total C/No	101.34		dB.Hz
Uplink EIRP for saturation	72.3		dBW
General Calculations	Up	Down	Units
Elevation	52.13	52.16	degrees
True azimuth	212.54	211.77	degrees
Compass bearing	219.02	218.03	degrees
Path distance to satellite	36945.26	36943.51	km
Propagation time delay	0.123236	0.12323	seconds
Antenna efficiency	64.5	44.07	%
Antenna gain	45.1	46	dBi
Availability (average year)	99.8	99.8	%
Link downtime (average year)	17.532	17.532	hours
Availability (worst month)	99.297	99.297	%
Link downtime (worst month)	5.134	5.134	hours
Spectral power density	-51.8	-25.46	dBW/Hz
Uplink Calculation	Clear	Rain	Units
Uplink transmit EIRP	40.64	40.64	dBW
Transponder input back-off (total)	8	8	dB
Input back-off per carrier	31.66	36.15	dB
Mispoint loss	0.5	0.5	dB
Free space loss	206.88	206.88	dB
Atmospheric absorption	0.14	0.14	dB
Tropospheric scintillation fading	0.33	0.33	dB
Atmospheric losses total	0.46	0.46	dB
Total path loss (excluding rain)	207.34	207.34	dB
Rain attenuation	0	4.49	dB
Uplink power control	0	0	dB
Uncompensated rain fade	0	4.49	dB
C/No (thermal)	103.41	98.91	dB.Hz
C/N (thermal)	55.27	50.78	dB
C/ACI	27	22.51	dB
C/ASI	24	19.51	dB
C/XPI	27	22.51	dB
C/IM	30	30	dB
Eb/(No+Io)	20.5	16.33	dB
Downlink Calculation	Clear	Rain	Units
Satellite EIRP total	55.1	55.1	dBW
Transponder output back-off (total)	5.06	5.06	dB
Output back-off per carrier	28.72	33.22	dB
Satellite EIRP per carrier	26.38	21.88	dBW
Mispoint loss	0.5	0.5	dB
Free space loss	205.35	205.35	dB
Atmospheric absorption	0.1	0.1	dB
Tropospheric scintillation fading	0.28	0.28	dB
Atmospheric losses total	0.38	0.38	dB
Total path loss (excluding rain)	205.73	205.73	dB
Rain attenuation	0	2.95	dB
Noise increase due to precipitation	0	2.67	dB
Downlink degradation (DND)	0	5.62	dB
Total system noise	152.31	281.44	K
Figure of merit (G/T)	23.37	20.71	dB/K
C/No (thermal)	72.62	62.51	dB.Hz
C/N (thermal)	24.49	14.38	dB
C/ACI	27	22.51	dB
C/ASI	24	19.51	dB
C/XPI	27	22.51	dB
C/IM	18.02	13.53	dB
Eb/(No+Io)	15.67	9.89	dB

Totals per Carrier (End-to-End)	Clear	Rain	Units
C/No (thermal)	72.62	62.51	dB.Hz
C/N (thermal)	24.48	14.37	dB
C/ACI	23.99	19.5	dB
C/ASI	20.99	16.5	dB
C/XPI	23.99	19.5	dB
C/IM	17.75	13.43	dB
C/(No+Io)	62.54	57.1	dB.Hz
C/(N+I)	14.4	8.97	dB
Eb/(No+Io)	14.43	9	dB
System margin	1	1	dB
Net Eb/(No+Io)	13.43	8	dB
Required Eb/(No+Io)	8	8	dB
Excess margin	5.43	0	dB
Earth Station Power Requirements	Value		Units
EIRP per carrier	40.64		dBW
Antenna gain	45.1		dBi
Antenna feed flange power per carrier	-4.46		dBW
Uplink power control	0		dB
HPA output back off	0		dB
Waveguide loss	0.3		dB
Filter truncation loss	0		dB
Number of HPA carriers	1		
Total HPA power required	-4.1559		dBW
Required HPA power capability	0.3841		W
Spectral power density	-51.8		dBW/Hz
Space Segment Utilization	Value		Units
Overall link availability	99.6		%
Information rate (inc overhead)	0.0646		Mbps
Transmit rate	0.0862		Mbps
Symbol rate	0.0543		Mbaud
Occupied bandwidth	0.0651		MHz
Noise bandwidth	48.14		dB.Hz
Minimum allocated bandwidth required	0.076		MHz
Allocated transponder bandwidth	0.08		MHz
Percentage transponder bandwidth use	0.22		%
Used transponder power	26.38		dBW
Percentage transponder power used	0.43		%
Max carriers by transponder bandwidth	450		
Max carriers by transponder power	232.29		
Max transponder carriers limited by-	Power		[232.29]
Power equivalent bandwidth usage	0.15		MHz

Digital Link Budget			
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Service Name	(1) 2048 kbps SeaTel 18-Mar 2012		
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Downlink earth station	Normal Patriot Antenna (CCAFS)		
Satellite name	INTELSAT G-25		
Link Input Parameters	Up	Down	Units
Site latitude	28.28N	28.46N	degrees
Site longitude	80.18W	80.56W	degrees
Site altitude	0	0	km
Frequency	14.25	11.95	GHz
Polarization	Vertical	Horizontal	
Rain model	ITU (95.1)	ITU (93.2)	(mm/h or zone)
Availability (average year)	99.8	99.8	%
Antenna aperture	1.5	2.4	metres
Antenna efficiency / gain	45.1	46	% (+ prefix dBi)
Coupling loss	0.3	0.3	dB
Antenna tracking / mispoint error	0.5	0.5	dB
LNB noise figure / temp		1	dB (+ prefix K)
Antenna noise		62	K
Adjacent carrier interference	27	27	dB
Adjacent satellite interference	24	24	dB
Cross polarization interference	27	27	dB
Uplink station HPA output back-off	0		dB
Number of carriers / HPA	1		
HPA C/I _M (up)	30		dB
Uplink power control	0		dB
Uplink filter truncation loss	0		dB
Required HPA power capability	MIN		W
Satellite Input Parameters	Value		Units
Satellite longitude	97W		degrees
Transponder type	TWTA		
Receive G/T	42		dB/K
Saturation flux density	-91		dBW/m ²
Satellite attenuator pad	0		dB
Satellite ALC	0		dB
EIRP (saturation)	55.1		dBW
Transponder bandwidth	36		MHz
Input back off total	8		dB
Output back off total	AUTO		dB
Intermodulation interference	AUTO		dB
Number of transponder carriers	AUTO		
Carrier/Link Input Parameters	Value		Units
Modulation	4-PSK		
Required bit error rate performance	10 ⁻⁷		
Required Eb/No without FEC coding	11.31		dB
Required Eb/No with FEC coding	8		dB
Information rate	2.048		Mbps
Overhead	1		%
FEC code rate	0.75		
Spreading gain	1		dB
Reed Solomon code	1		
(1 + Roll off factor)	1.2		
Carrier spacing factor	1.4		
Bandwidth allocation step size	0.01		MHz
System margin	1		dB

Calculations at Saturation	Value		Units
Gain 1m ²	44.53		dB/m ²
Uplink C/No	135.07		dB.Hz
Downlink C/No	101.34		dB.Hz
Total C/No	101.34		dB.Hz
Uplink EIRP for saturation	72.3		dBW
General Calculations	Up	Down	Units
Elevation	52.13	52.16	degrees
True azimuth	212.54	211.77	degrees
Compass bearing	219.02	218.03	degrees
Path distance to satellite	36945.26	36943.51	km
Propagation time delay	0.123236	0.12323	seconds
Antenna efficiency	64.5	44.07	%
Antenna gain	45.1	46	dBi
Availability (average year)	99.8	99.8	%
Link downtime (average year)	17.532	17.532	hours
Avaiability (worst month)	99.297	99.297	%
Link downtime (worst month)	5.134	5.134	hours
Spectral power density	-51.8	-25.46	dBW/Hz
Uplink Calculation	Clear	Rain	Units
Uplink transmit EIRP	55.7	55.7	dBW
Transponder input back-off (total)	8	8	dB
Input back-off per carrier	16.61	21.1	dB
Mispoint loss	0.5	0.5	dB
Free space loss	206.88	206.88	dB
Atmospheric absorption	0.14	0.14	dB
Tropospheric scintillation fading	0.33	0.33	dB
Atmospheric losses total	0.46	0.46	dB
Total path loss (excluding rain)	207.34	207.34	dB
Rain attenuation	0	4.49	dB
Uplink power control	0	0	dB
Uncompensated rain fade	0	4.49	dB
C/No (thermal)	118.46	113.96	dB.Hz
C/N (thermal)	55.27	50.78	dB
C/ACI	27	22.51	dB
C/ASI	24	19.51	dB
C/XPI	27	22.51	dB
C/IM	30	30	dB
Eb/(No+Io)	20.5	16.33	dB
Downlink Calculation	Clear	Rain	Units
Satellite EIRP total	55.1	55.1	dBW
Transponder output back-off (total)	5.06	5.06	dB
Output back-off per carrier	13.67	18.16	dB
Satellite EIRP per carrier	41.43	36.94	dBW
Mispoint loss	0.5	0.5	dB
Free space loss	205.35	205.35	dB
Atmospheric absorption	0.1	0.1	dB
Tropospheric scintillation fading	0.28	0.28	dB
Atmospheric losses total	0.38	0.38	dB
Total path loss (excluding rain)	205.73	205.73	dB
Rain attenuation	0	2.95	dB
Noise increase due to precipitation	0	2.67	dB
Downlink degradation (DND)	0	5.62	dB
Total system noise	152.31	281.44	K
Figure of merit (G/T)	23.37	20.71	dB/K
C/No (thermal)	87.68	77.56	dB.Hz
C/N (thermal)	24.49	14.38	dB
C/ACI	27	22.51	dB
C/ASI	24	19.51	dB
C/XPI	27	22.51	dB
C/IM	18.02	13.53	dB
Eb/(No+Io)	15.67	9.89	dB

Totals per Carrier (End-to-End)	Clear	Rain	Units
C/No (thermal)	87.67	77.56	dB.Hz
C/N (thermal)	24.48	14.37	dB
C/ACI	23.99	19.5	dB
C/ASI	20.99	16.5	dB
C/XPI	23.99	19.5	dB
C/IM	17.75	13.43	dB
C/(No+Io)	77.59	72.16	dB.Hz
C/(N+I)	14.4	8.97	dB
Eb/(No+Io)	14.43	9	dB
System margin	1	1	dB
Net Eb/(No+Io)	13.43	8	dB
Required Eb/(No+Io)	8	8	dB
Excess margin	5.43	0	dB
Earth Station Power Requirements	Value		Units
EIRP per carrier	55.7		dBW
Antenna gain	45.1		dB
Antenna feed flange power per carrier	10.6		dBW
Uplink power control	0		dB
HPA output back off	0		dB
Waveguide loss	0.3		dB
Filter truncation loss	0		dB
Number of HPA carriers	1		
Total HPA power required	10.8958		dBW
Required HPA power capability	12.2908		W
Spectral power density	-51.8		dBW/Hz
Space Segment Utilization	Value		Units
Overall link availability	99.6		%
Information rate (inc overhead)	2.0685		Mbps
Transmit rate	2.758		Mbps
Symbol rate	1.736		Mbaud
Occupied bandwidth	2.0832		MHz
Noise bandwidth	63.19		dB.Hz
Minimum allocated bandwidth required	2.4305		MHz
Allocated transponder bandwidth	2.44		MHz
Percentage transponder bandwidth used	6.78		%
Used transponder power	41.43		dBW
Percentage transponder power used	13.78		%
Max carriers by transponder bandwidth	14.75		
Max carriers by transponder power	7.26		
Max transponder carriers limited by:-	Power		(7.26)
Power equivalent bandwidth usage	4.96		MHz