

University of Michigan Uplink Command Budget

Date Data Last Modified:

Version: 1.0

06/20/11

(Satellite Side)

Parameter:	Value:	Units:	Source:	Comments:	Complete?
<i>Ground Station:</i>					
Transmitter Power Output:	75.0	watts	Spec	Power Output	X
In dBW:	18.8	dBW			
In dBm:	48.8	dBm			
Transmission Line Losses:	-2.0	dB	TEST		X
Connector, Filter or In-Line Switch Losses:	-2.1	dB	EST	Preamp bypass loss and connectors	X
Antenna Gain:	16.8	dBiC	Spec	HyGain Manf Spec	X
Ground Station EIRP:	31.5	dBW			
<i>Uplink Path:</i>					
Ground Station Antenna Beamwidth	21.0	deg	Spec	M2 Spec	X
Ground Station Pointing Error	5.0	deg	EST	Estimated alignment error	X
Ground Station Antenna Pointing Loss:	-0.7	dB	SMAD	SMAD calculation	X
Antenna Polarization Losses:	-3.0	dB	Spec	Linear to circular	X
Path Loss:	-141.0	dB			
Atmospheric Losses:	0.0	dB	SMAD	Loss at UHF Negligible	X
Ionospheric Losses:	0.0	dB	SMAD	Loss at UHF Negligible	X
Rain Losses:	0.0	dB	SMAD	Loss at UHF Negligible	X
Isotropic Signal Level at Ground Station:	-113.3	dBW			
<i>Spacecraft:</i>					
<i>----- Eb/No Method -----</i>					
Antenna Polarization Loss:	-3.0	dB	TEST	Anechoic result ???	?
Spacecraft Antenna Pointing Loss:	-5.5	dB	TEST	Worst-case anechoic result, still need to	?
Spacecraft Antenna Gain:	0.00	dBiC	TEST	Anechoic result still need to be measured	?
Spacecraft Transmission Line Losses:	-0.20	dB	EST	Needs to be measured	?
Spacecraft LNA Noise Temperature:	0.0	K	N/A	No LNA	X
Spacecraft Transmission Line Temp.:	35.0	K	SMAD	Estimate from 13-10	X
Spacecraft Sky Temperature:	600.0	K	SMAD	Max Possible	X
S/C Transmission Line Coefficient:	0.955				
Spacecraft Effective Noise Temperature:	574.6	K			
Spacecraft Figure of Merit (G/T):	-27.8	dB/K			
S/C Signal-to-Noise Power Density (S/No):	82.0	dBHz			
System Desired Data Rate:	9600	bps	Spec	TNC-X Spec	X
In dBHz:	39.823	dBHz			
Telemetry System Eb/No:	42.2	dB			
Telemetry System Required Bit Error Rate:	1E-06		SMAD	Req BER	X
Telemetry System Required Eb/No:	13.0	dB	SMAD	This Eb/No Required to meet B.E.R.	X
System Link Margin:	29.2	dB			X

University of Michigan Downlink Telemetry Budget

Version: 1.0

Date Data Last Modified
06/20/11

(Ground Station Side)

Parameter:	Value:	Units:	Source:	Comments:	Complete?
<i>Spacecraft:</i>					
Spacecraft Transmitter Power Output:	1.00	watts	Spec	Variable	?
In dBW:	0.0	dBW			
In dBm:	30.0	dBm			
Spacecraft Transmission Line Losses:	-0.20	dB	EST	Still Need to be measured	?
S/C Connector, Filter or In-Line Switch Losses:	-1.90	dB	EST	AstroDev Board 2 Config	?
Spacecraft Antenna Gain:	0.00	dBiC	EST	Average for Monopole	?
Spacecraft EIRP:	-2.1	dBW			
<i>Downlink Path:</i>					
Spacecraft Antenna Pointing Loss:	-3.0	dB	TEST	Worst-case anechoic result, still ne	?
Antenna Polarization Loss:	-3.0	dB	TEST	Linear to circular loss	?
Path Loss:	-150.7	dB			
Atmospheric Loss:	0.0	dB	SMAD	Loss at UHF negligible	X
Ionospheric Loss:	0.0	dB	SMAD	Loss at UHF negligible	X
Rain Loss:	0.0	dB	SMAD	Loss at UHF negligible	X
Isotropic Signal Level at Ground Station:	-158.8	dBW			
<i>Ground Station:</i>					
<i>----- Eb/No Method -----</i>					
Ground Station Antenna Beamwidth	21.0	deg	Spec	M2 Spec	X
Ground Station Pointing Error	5.0	deg	EST	Estimated alignment error	X
Ground Station Antenna Pointing Loss:	-0.7	dB	EST	SMAD-based calculation	X
Antenna Polarization Loss	-3.0	dB	Spec	Typical 436CP42UG axial loss	X
Ground Station Antenna Gain:	16.8	dBiC	Spec	436CP42UG	X
Ground Station Transmission Line Losses:	-2.8	dB	EST	Line and connectors in SRB	X
Ground Station LNA Noise Temperature:	36.2	K	Web	Duffy, Owen: Typical pre-amp conf	X
Ground Station Transmission Line Temp.:	35.0	K	SMAD	Estimate from 13-10	X
Ground Station Sky Temperature:	290.0	K	Dr, SETI	Worst sky noise: http://www.setileague.org/askdr/skynoise.htm	X
G.S. Transmission Line Coefficient:	0.5				
Ground Station Effective Noise Temperature:	205.0	K			
Ground Station Figure of Merit (G/T):	-12.1	dB/K			
G.S. Signal-to-Noise Power Density (S/No):	57.0	dBHz			
System Desired Data Rate:	1200	bps	Spec	TNC baud rate	X
In dBHz:	30.8	dBHz			
Telemetry System Eb/No:	26.2	dB			
Telemetry System Required Bit Error Rate:	1E-06		SMAD	Req BER	X
Telemetry System Required Eb/No:	13.0	dB	Aero Corp	http://www.aero.org/publications/rosslink/winter2002/03.html	X
System Link Margin:	13.2	dB			X