

Alpha CubeSat		NOTE:	Alpha CubeSat	Date Data Last Modified:
Uplink Command Budget:			Version: 2.5.3	2016 February 05
Parameter:	Value:	Units:	Comments:	
Ground Station:				
Ground Station Transmitter Power Output:	50.0	watts	This value is transferred from "Transmitters" W/S, Cell [E15].	
In dBW:	17.0	dBW	Transmitter power expressed in dB above one watt	
In dBm:	47.0	dBm	Transmitter power expressed in dB above one milliwatt	
Ground Stn. Total Transmission Line Losses:	3.6	dB	This value is transferred from "Transmitters" W/S, Cell [I33]	
Antenna Gain:	94.7	dBi	This value is selected at "Antenna Gain" W/S, Cell [E11]	
Ground Station EIRP:	108.1	dBW	Ground Station Effective Isotropic Radiated Power (EIRP) [EIRP=Pt x Ltl x Ga]	
Uplink Path:				
Ground Station Antenna Pointing Loss:	0.0	dB	This value is calculated in the "Antenna Pointing Losses" W/S, and transferred from Cell [K43]	
Gnd-to-S/C Antenna Polarization Losses:	0.0	dB	This value is calculated in the "Polarization Loss" W/S and is transferred from Cell [F40].	
Path Loss:	241.6	dB	Lp = 22 + 20LOG(D/λ); Transferred from "Frequency" W/S	
Atmospheric Losses:	2.1	dB	This value is transferred from "Atmos. & Ionos. Losses" W/S, Cell [D23]	
Ionospheric Losses:	0.0	dB	This value is transferred from "Atmos. & Ionos. Losses" W/S, Cell [D47:D50]	
Rain Losses:	0.0	dB	This value should be estimated by the link model operator and place into Cell [B18]	
Isotropic Signal Level at Spacecraft:	-135.6	dBW	This is the signal level received in space in the vicinity of the spacecraft using an omnidirectional antenna.	
Spacecraft (Eb/No Method):				
----- Eb/No Method -----				
Spacecraft Antenna Pointing Loss:	0.0	dB	This value is transferred from "Antenna Pointing Losses" W/S, Cell [K63]	
Spacecraft Antenna Gain:	8.0	dBi	This value is selected at "Antenna Gain" W/S, Cell [E24]	
Spacecraft Total Transmission Line Losses:	0.1	dB	This value is transferred from the "Receivers" W/S, Cell [J52]	
Spacecraft Effective Noise Temperature:	282	K	This value is calculated in the "Receivers" W/S and Transferred from Cell [J67]	
Spacecraft Figure of Merit (G/T):	-16.6	dB/K	G/T = Ga-Ltl-10log(Ts). This is the upmtate measure of the receiver's performance.	
S/C Signal-to-Noise Power Density (S/No):	76.3	dBHz	Boltzman's Constant: -228.6 dBW/K/Hz	
System Desired Data Rate:	9600	bps	Operator selects this value. Be Carefull! This is the data rate, not the symbol rate.	
In dBHz:	39.8	dBHz	This is simply = 10log(R); R= data rate	
Command System Eb/No:	36.5	dB		
Demodulation Method Seleted:	QPSKw.FEC		Values selected in "Modulation-Demodulation W/S, Cell [E3]	
Forward Error Correction Coding Used:	Reed Solomon FEC		Value selected in "Modulation-Demodulation" W/S, also Cell [E3]	
System Allowed or Specified Bit-Error-Rate:	1.0E-06		The selected value is transferred from the "Modulation-Demodulation W/S, Cells [E6:E23]	
Demodulator Implementation Loss:	1.0	dB	This value is transferred from the "Modulation-Demodulation W/S, Cell[E25]	
Telemetry System Required Eb/No:	9.6	dB	The selected value is transferred from the "Modulation-Demodulation W/S, Cells [F6:F23]	
Eb/No Threshold:	10.6	dB	This is the result of the "Modulation-Demodulation" W/S and is transferred from Cell [H32]	
System Link Margin:	25.9	dB		
Spacecraft Alternative Signal Analysis Method (SNR Computation):			NOTE:	

----- SNR Method -----

Spacecraft Antenna Pointing Loss: 0.0 dB
Spacecraft Antenna Gain: 8.0 dBi
Spacecraft Total Transmission Line Losses: 0.1 dB
Spacecraft Effective Noise Temperature: 282 K
Spacecraft Figure of Merit (G/T): -16.6 dB/K

This value is transferred from "Antenna Pointing Losses" W/S, Cell [K63]
This value is selected at "Antenna Gain" W/S, Cell [E24]
This value is transferred from the "Receivers" W/S, Cell [J52]
This value is calculated in the "Receivers" W/S and Transferred from Cell [J67]
 $G/T = G_a - L_{tl} - 10\log(T_s)$. This is the ultimate measure of the receiver's performance.

Signal Power at Spacecraft LNA Input: -127.8 dBW

$P_s = P_{iso} + G_a - L_{pl} - L_{tl}$; This is the signal power that has arrived at the ground station receiver.

Spacecraft Receiver Bandwidth: 15,000 Hz

Signal Spectrum Must Pass Through This Data Filter.

NOTE:

Spacecraft Receiver Noise Power ($P_n = kTB$): -162.3 dBW

$P_n = K + 10\log(T_s) + 10\log(B)$. This is the total noise power arriving at the ground station receiver.

Signal-to-Noise Power Ratio at G.S. Rcvr: 34.6 dB

$P_s/P_n = P_s(\text{in dBW}) - P_n(\text{in dBW})$

Analog or Digital System Required S/N: 9.6 dB

If system is digital, use values from "Modulation-Demodulation" W/S. If analog, use appropriate value from text book.

System Link Margin: 25.0 dB