

Alpha CubeSat		NOTE:	Alpha CubeSat	Date Data Last Modified:
Downlink Telemetry Budget:			Version: 2.5.3	2016 February 05
Parameter:	Value:	Units:	Comments:	
Spacecraft:				
Spacecraft Transmitter Power Output:	3.0 watts		This value is transferred from "Transmitters" W/S, Cell [E50]	
In dBW:	4.8	dBW	Transmitter power expressed in dB above one watt	
In dBm:	34.8	dBm	Transmitter power expressed in dB above one milliwatt	
Spacecraft Total Transmission Line Losses:	0.5 dB		This value is transferred from "Transmitters" W/S, Cell [I68]	
Spacecraft Antenna Gain:	32.0 dBi		This value is selected at "Antenna Gain" W/S, Cell [E41]	
Spacecraft EIRP:	36.3	dBW	Spacecraft Effective Isotropic Radiated Power (EIRP) [EIRP=Pt x Ltl x Ga]	
Downlink Path:				
Spacecraft Antenna Pointing Loss:	0.0 dB		This value is calculated in the "Antenna Pointing Losses" W/S, and trasferred from Cell [K85]	
S/C-to-Ground Antenna Polarization Loss:	0.0 dB		This value is calculated in the "Polarization Loss" W/S and is transferred from Cell [F60].	
Path Loss:	254.6 dB		Lp = 22 + 20LOG(D/λ); Transferred from "Frequency" W/S	
Atmospheric Loss:	2.1 dB		This value is transferred from "Atmos. & Ionos. Losses" W/S, Cell [D23]	
Ionospheric Loss:	0.0 dB		This value is transferred from "Atmos. & Ionos. Losses" W/S, Cell [D47:D50]	
Rain Loss:	0.0 dB		This value should be estimated by the link model operator and place into Cell [B18]	
Isotropic Signal Level at Ground Station:	-220.4	dBW	This is the signal level received at the Earth in the vacinity of the ground station using an omnidirectional antenna.	
Ground Station (EbNo Method):				
----- Eb/No Method -----				
Ground Station Antenna Pointing Loss:	0.1 dB		This value is transferred from "Antenna Pointing Losses" W/S, Cell [K102]	
Ground Station Antenna Gain:	79.0 dBi		This value is selected at "Antenna Gain" W/S, Cell [E58]	
Ground Station Total Transmission Line Losses:	0.5 dB		This value is transferred from the "Receivers" W/S, Cell [J123]	
Ground Station Effective Noise Temperature:	174 K		This value is calculated in the "Receivers" W/S and Transferred from Cell [J138]	
Ground Station Figure of Merrit (G/T):	56.1 dB/K		G/T = Ga-Lti-10log(Ts). This is the upmtate measure of the receiver's performance.	
G.S. Signal-to-Noise Power Density (S/No):	64.2	dBHz	Boltzman's Constant: -228.6 dBW/K/Hz	
System Desired Data Rate:	256000	bps	Operator selects this value. Be Careful! This is the data rate, not the symbol rate.	
In dBHz:	54.1	dBHz	This is simply = 10log(R); R= data rate	
Telemetry System Eb/No for the Downlink:	10.1	dB		
Demodulation Method Seleted:	16QAM		Values selected in "Modulation-Demodulation W/S, Cell [E30]	
Forward Error Correction Coding Used:	Reed Solomon FEC		Value selected in "Modulation-Demodulation" W/S, also Cell [E30]	
System Allowed or Specified Bit-Error-Rate:	1.0E-07		The selected value is transferred from the "Modulation-Demodulation W/S, Cells [E33:E50]	
Demodulator Implementation Loss:	0	dB	This value is transferred from the "Modulation-Demodulation W/S, Cell[E52]	
Telemetry System Required Eb/No:	0.9	dB	The selected value is transferred from the "Modulation-Demodulation W/S, Cells [F33:F50]	
Eb/No Threshold:	0.9	dB	This is the result of the "Modulation-Demodulation" W/S and is transferred from Cell [H32]	
System Link Margin:	9.2	dB		
Ground Station Alternative Signal Analysis Method (SNR Computation):				
----- SNR Method -----				
Ground Station Antenna Pointing Loss:	0.1 dB		This value is transferred from "Antenna Pointing Losses" W/S, Cell [K102]	
Ground Station Antenna Gain:	79.0 dBi		This value is selected at "Antenna Gain" W/S, Cell [E58]	

Ground Station Total Transmission Line Losses:	0.5 dB	This value is transferred from the "Receivers" W/S, Cell [J123]
Ground Station Effective Noise Temperature:	174 K	This value is calculated in the "Receivers" W/S and Transferred from Cell [J138]
Ground Station Figure of Merit (G/T):	56.1 dB/K	$G/T = G_a - L_{ti} - 10\log(T_s)$. This is the ultimate measure of the receiver's performance.
Signal Power at Ground Station LNA Input:	-142.0 dBW	$P_s = P_{iso} + G_a - L_{pl} - L_{ti}$; This is the signal power that has arrived at the ground station receiver.
Ground Station Receiver Bandwidth (B):	22,000 Hz	Signal Spectrum Must Pass Through This Data Filter NOTE:
G.S. Receiver Noise Power ($P_n = kTB$)	-162.8 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:	20.8 dB	$P_s/P_n = P_s(\text{in dBW}) - P_n(\text{in dBW})$
Analog or Digital System Required S/N:	0.9 dB	If system is digital, use values from "Modulation-Demodulation" W/S. If analog, use appropriate value from text book.
System Link Margin	19.9 dB	