LA JUMENT Link Budget Working Example

Legend: Inputs | Calculations | Guess | Changed by LM

Option A: Effective External amplifer gain: 52.5 dB Triad - 10.5 dB attenuator pad before the Triad = 42.5 dB, Triad 1140

Option B: Triad 1120, RF Gain of 28dB only

		GOMSpace AX100 to Yagii				
Item	**Units**	**Downlink from Sat (FCC Inputs)**	**Conservative Downlink**	**Notes for Downlink**	**Uplink from GS**	**Notes for Uplink**
Frequency	Mhz	403.0	403.0		403.0	Frequency of the transmitter from the satellite
Transmitter Power	Watts	1.0	1.0	From AX-100-33 datasheet	0.003	HACKRF is very small power output (5 dBm), needs external amplifier
Transmitter Power Amplifier	dB	0.0	0.0		28.0	Option B
Transmitter Power	dBW	0.0	0.0		3.0	Fixed equation.
Transmitter Line Loss	dB	0.5	0.5	Losses are entered as positive	1.5	From G-over-T Calculator Tab
Transmit Antenna Beamwidth	deg	90.0	90.0		30.0	From 400CP30A datasheet
Peak Transmit Antenna Gain	dBi	0.0	0.0	From AX-100-33 datasheet	16.2	From 400CP30A datasheet
Antenna Gain Loss due to 403 MHz	dB	0.0	0.0		0.0	Set to zero, as 400CP30A operates at 403 MHz
Transmit Antenna Pointing Error	deg	1.0	1.0		5.0	Transmitter antenna pointing loss (estimated usually)
Transmit Antenna Pointing Loss	dB	0.0	0.0		0.3	Losses are entered as positive
Transmit Antenna Gain (net)	dBi	0.0	0.0		15.9	
EIRP	dBW	-0.5	-0.5	Fixed equation	17.3	Fixed equation.
Elevation Angle		10.0	5.0		10.0	This is the elevation angle of the ground antenna that will be used to calculate the free path loss.
Circular Orbit Altitude	km	550.0	550.0		550.0	This is the altitude of the satellite, which drives the free space path loss
Propagation Path Length (Slant Range)	km	1815.6	2205.9		1815.6	*Calculated from the elevation angle and circular orbit altitude*
Space Loss	dB	149.7	151.4	Losses are entered as positive	149.7	Losses are entered as positive
Ionospheric Loss	dB	0.4	0.4	From AX-100-33 datasheet	0.4	From AX-100-33 datasheet
Atmospheric Loss	dB	2.1	2.1	From AX-100-33 datasheet	2.1	From AX-100-33 datasheet
Propagation & Polarization Loss	dB	5.5	5.5	Includes the Iono/Atm losses	5.5	Includes the Iono/Atm losses
Peak Receive Antenna Gain	dBi	16.2	16.2	From 400CP30A datasheet	0.0	
Receive Antenna Beamwidth	deg	30.0	30.0	From 400CP30A datasheet	90.0	Spacecraft Rx antenna beamwidth changed to match the Spacecraft Tx antenna beamwidth.
Receive Antenna Pointing Error	deg	5.0	5.0	Assumed	1.0	This is either estimate, or measured pointing error of the ground antenna to the satellite.
Receive Antenna Pointing Loss	dB	0.3	0.3	Losses are entered as positive	0.0	Calculated
Receive System G/T	dB/K	-9.9	-9.9	From G-over-T Calculator Tab	-23.9	From AX-100-33 datasheet
Received C/No	dB/Hz	62.7	61.0	Added new equation	66.8	Added new equation
Data Rate	bps	19200	19200	Changed for positive margin	19200	Data rate that is being sent up or down.
Received Eb/No	dB	19.8	18.1		24.0	Effective at the receiver
Required Eb/No	dB	7.8	7.8	**Assuming GMSK Rate-1/2 + RS(255.223)**	7.8	**Assuming GMSK Rate-1/2 + RS(255.223)**
Implementation Loss	dB	2.0	2.0	Losses are entered as positive	2.0	
Link Margin	**dB**	**10.0**	**8.3**		**14.2**	

GOM Space Required Eb/No dB 7.8 for BER of 1E-05

Unclear How to Calculate
User Input Value
From Figure in SMAD
Calculated Value

FOR FCC LICENSE
Converted from dbW to Watts
1.995

FOR FCC LICENSE, LM used the -2.15
Convert EIRP to ERP, ERP = EIRP/1.64, or EIRP-2.15????
15.19

Converted from dbW to Watts
33.0

Calculate the Power saturation limit for each Amplifier