

## TTC Downlink

## Preliminary Link Budget for TT&amp;C Downlink

Parameters	Value	Unit
Carrier Frequency	145980000	[Hz]
Speed of light	3,00E+008	[m/s]
Carrier Wavelength	2,06	[m]
Earth Radius	6378000	[m]
Orbit Altitude	750000	[m]
Pi	3,14	
Boltzmann's constant	1,38E-023	[J/K]
Boltzmann's constant	-228,6	[dBW/K/Hz]
Transmitter: Satellite		
Ouput RF Power (EIRP)	2	[W]
Output RF Power (EIRP)	3,01	[dBW]
Downlink Path		
Maximum Distance Trasmmitter-Receiver (to horizon)	3182687,54	[m]
Free Space Loss	145,78	[dB]
Polarization Loss	1	[dB]
Receiver: Ground		
Received Power Pr	-143,77	[dBW]
Antenna Gain	10	[dB]
Received EIRP	-133,77	[dBW]
Received EIRP	-103,77	[dBm]
System Noise Temperature	23,01	[dBK]
Noise Bandwidth	39,82	[dBHz]
Noise Power (referred to receiver input)	-165,77	[dBW]
Cable and connector losses	2	[dB]
Link Performance		
Received C/N	30	[dB]
System Margin	6	[dB]
Minimum receiver C/N	10	[dB]
Downlink Fading Margin	14	[dB]

Payload Downlink

Preliminary Link Budget for Payload Downlink

Parameters	Value	Unit
Carrier Frequency	437307000	Hz
Speed of light	3,00E+008	[m/s]
Carrier Wavelength	0,69	[m]
Earth Radius	6378000	[m]
Orbit Altitude	750000	[m]
Pi	3,14	
Boltzmann's constant	1,38E-023	[J/K]
Boltzmann's constant	-228,6	[dBW/K/Hz]
Transmitter: Satellite		
Output RF Power (EIRP)	2	[W]
Output RF Power (EIRP)	3,01	[dBW]
Downlink Path		
Maximum Distance Trasmmitter-Receiver (to horizon)	3182687,54	[m]
Free Space Loss	155,31	[dB]
Atmospheric Losses	1	[dB]
Receiver: Ground		
Received Power Pr	-153,3	[dBW]
Antenna Gain	10	[dB]
Received EIRP	-143,3	[dBW]
Received EIRP	-113,3	[dBm]
System Noise Temperature	23,01	[dBK]
Noise Bandwidth	39,82	[Hz]
Noise Power (referred to receiver input)	-165,77	[dBW]
Cable and connector losses	2	[dB]
Link Performance		
Received C/N	20,47	[dB]
System Margin	6	[dB]
Minimum Receiver C/N	10	[dB]
Downlink Fading Margin	4,47	[dB]

Preliminary Link Budget for TT&C Uplink
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Constants	Value	Unit
Carrier Frequency	145980000	Hz
Speed of light	3,00E+008	[m/s]
Carrier Wavelength	2,06	[m]
Earth Radius	6378000	[m]
Orbit Height	800000	[m]
Pi	3,14	
Boltzmann's constant	1,38E-023	[J/K]
Boltzmann's constant	-228,6	[dBW/K/Hz]
Transmitter: Ground		
Output RF Power (EIRP)	20	[W]
Output RF Power (EIRP)	13,01	[dBW]
Uplink Path		
Maximum Distance Trasmmitter-Receiver (to horizon)	3293144,39	[m]
Free Space Loss	146,08	[dB]
Atmospheric Losses	1	[dB]
Receiver: Satellite		
Received Power Pr	-134,07	[dBW]
Antenna Gain	2	[dB]
Received EIRP	-132,07	[dBW]
Received EIRP	-102,07	[dBm]
System Noise Temperature	24,77	[dBK]
Noise Bandwidth	39,82	[Hz]
Noise Power (referred to receiver input)	-164,01	[dBW]
Cable and connector losses	2	[dB]
Link Performance		
Received C/N	29,94	[dB]
System Margin	6	[dB]
Minimum Receiver C/N	10	[dB]
Uplink Fading Margin	13,94	[dB]

Backup Uplink

Preliminary Link Budget for Backup Uplink

Constants	Value	Unit
Carrier Frequency	437305000	Hz
Speed of light	3,00E+008	[m/s]
Carrier Wavelength	0,69	[m]
Earth Radius	6378000	[m]
Orbit Height	800000	[m]
Pi	3,14	
Boltzmann's constant	1,38E-023	[J/K]
Boltzmann's constant	-228,6	[dBW/K/Hz]
Transmitter: Ground		
Output RF Power (EIRP)	20	[W]
Output RF Power (EIRP)	13,01	[dBW]
Uplink Path		
Maximum Distance Trasmmitter-Receiver (to horizon)	3293144,39	[m]
Free Space Loss	155,61	[dB]
Atmospheric Losses	1	[dB]
Receiver: Satellite		
Received Power Pr	-143,6	[dBW]
Antenna Gain	2	[dB]
Received EIRP	-141,6	[dBW]
Received EIRP	-111,6	[dBm]
System Noise Temperature	24,77	[dBK]
Noise Bandwidth	39,82	[Hz]
Noise Power (referred to receiver input)	-164,01	[dBW]
Cable and connector losses	2	[dB]
Link Performance		
Received C/N	20,41	[dB]
System Margin	6	[dB]
Minimum Receiver C/N	10	[dB]
Uplink Fading Margin	4,41	[dB]