CuPID Operating Frequency

FCC Application Number: 0595-EX-CN-2018

Correspondence Reference Number: 44145

The desired operating frequency of the CuPID Satellite Network is 400.5 MHz.

The desired operating band is 400 to 405 MHz.

The link budgets below provide further details.

		5 Watt TX - Ground Station Uplink			
		Earth Station Elevation Above Local Horizon			
Parameters	Units	90°	40°	10°	5°
Frequency	MHz	400.5			
Wavelength	m	0.75			
Data Rate	kbps	9.6	9.6	9.6	9.6
Earth Radius	km	6378.14	6378.14	6378.14	6378.14
Symbol Rate	ksps	9.6	9.6	9.6	9.6
Elevation Angle	degrees	90	40	10	5
Spacecraft Orbital Altitude	km	500	500	500	500
Angular Radius of Earth	degrees	68.02	68.02	68.02	68.02
Nadir Angle	degrees	0.00	45.26	65.95	67.48
Earth Central Angle	degrees	0.00	4.74	14.05	17.52
Range	km	500.00	741.33	1695.09	2077.96
Transmit Parameters					
Transmitter Power	dBm	36.99	36.99	36.99	36.99
Transmitter Network Loss	dB	-1.50	-1.50	-1.50	-1.50
Earth Station Antenna Cross Pol Loss	dB	-3.00	-3.00	-3.00	-3.00
Earth Station Antenna Gain	dBi	14.35	14.35	14.35	14.35
EIRP	dBm	46.84	46.84	46.84	46.84
Channel Parameters					
Space Path Loss	dB	-138.48	-141.90	-149.08	-150.85
Atmospheric and Scintillation Loss	dB	0.00	-0.21	-0.41	-0.41
Rain Loss	dB	0.00	-0.09	-0.18	-0.18
Polarization Loss	dB	-0.25	-0.25	-0.25	-0.25
Receiver Parameters					
Spacecraft Receiver G/T	dB/K	-27.00	-28.80	-32.20	-32.70
Power Summary					
Received Power at Antenna input	dBm	-91.89	-95.61	-103.08	-104.85
Boltzmann's Constant	dB	-228.60	-228.60	-228.60	-228.60
C/No at spacecraft	dB-Hz	79.71	74.19	63.32	61.05
BER 1e-05					
C/No	dB-Hz	79.71	74.19	63.32	61.05
Bit Rate	bps	9600	9600	9600	9600
Occupied Bandwidth	dB-Hz	39.82	39.82	39.82	39.82
Received Eb/No	dB	39.89	34.37	23.49	21.23
Demod Implementation Loss	dB	-1.40	-1.40	-1.40	-1.40
FEC Coding Gain	dB	0.00	0.00	0.00	0.00
Resulting Eb/No	dB	38.49	32.97	22.09	19.83
Theoretical Eb/No (Measured)	dB	10.10	10.10	10.10	10.10
BER margin	**dB**	**28.39**	**22.87**	**11.99**	**9.73**

		1 Watt TX - Downlink to Ground Station			
		Earth Station Elevation Above Horizon			
Parameters	**Units**	**90°**	**40°**	**10°**	**5°**
Frequency	MHz	400.5			
Wavelength	m	0.75			
Data Rate	kbps	38.4	38.4	38.4	38.4
Earth Radius	km	6378.14	6378.14	6378.14	6378.14
Symbol Rate	ksps	38.4	38.4	38.4	38.4
Elevation Angle	degrees	90	40	10	5
Spacecraft Orbital Altitude	km	500	500	500	500
Angular Radius of Earth	degrees	68.02	68.02	68.02	68.02
Nadir Angle	degrees	0.00	45.26	65.95	67.48
Earth Central Angle	degrees	0.00	4.74	14.05	17.52
Range	km	500.00	741.33	1695.09	2077.96
Transmit Parameters					
Transmitter Power	dBm	30.00	30.00	30.00	30.00
Transmitter Network Loss	dB	-3.30	-3.30	-3.30	-3.30
Spacecraft Antenna Gain	dBi	2.15	2.15	2.15	2.15
EIRP	dBm	28.85	28.85	28.85	28.85
Channel Parameters					
Space Path Loss	dB	-138.48	-141.90	-149.08	-150.85
Atmospheric and Scintillation Loss	dB	0.00	-0.21	-0.41	-0.41
Rain Loss	dB	0.00	-0.09	-0.18	-0.18
Earth Station Antenna Cross Pol Loss	dB	-3.00	-3.00	-3.00	-3.00
Polarization Loss	dB	-0.25	-0.25	-0.25	-0.25
Receiver Parameters					
Ground Station Receiver G/T	dB/K	-8.46	-8.58	-8.87	-9.25
Power Summary					
Received Power at Ground Station input	dBm	-112.88	-116.60	-124.07	-125.84
Boltzmann's Constant	dB	-228.60	-228.60	-228.60	-228.60
C/No at Ground Station	dB-Hz	77.26	73.42	65.65	63.51
BER 1e-05					
C/No	dB-Hz	77.26	73.42	65.65	63.51
Bit Rate	bps	38400	38400	38400	38400
Occupied Bandwidth	dB-Hz	45.84	45.84	45.84	45.84
Received Eb/No	dB	31.42	27.58	19.81	17.67
Demod Implementation Loss	dB	-1.40	-1.40	-1.40	-1.40
FEC Coding Gain	dB	5.00	5.00	5.00	5.00
Resulting Eb/No	dB	35.02	31.18	23.41	21.27
Theoretical Eb/No	dB	10.10	10.10	10.10	10.10
BER margin	**dB**	**24.92**	**21.08**	**13.31**	**11.17**