

# EchoStar 17/24 GHz Link Budget

Link Parameters		Clear Sky (L.A.)	Faded D/L (L.A.)	Clear Sky (New York)	Faded D/L (New York)	Clear Sky (Miami)	Faded D/L (Miami)	Clear Sky (Puerto Rico)	Faded D/L (Puerto Rico)
<b>Link Geometry:</b>									
Tx E/S Range to Satellite	(km)	39,080	39,080	37,910	37,910	37,948	37,948	39,080	39,080
Rx E/S Range to Satellite	(km)	39,610	39,610	37,670	37,670	36,853	36,853	36,172	36,172
<b>Uplink:</b>									
Carrier Frequency	(MHz)	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000
Tx E/S Antenna Diameter	(m)	12.0	12.0	12.0	12.0	12.0	12.0	12.0	12.0
Max. Tx E/S Power to Antenna	(W)	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Max. Tx E/S Power Density to Antenna	(dBW/MHz)	-7.1	-7.1	-7.1	-7.1	-7.1	-7.1	-7.1	-7.1
Tx E/S Antenna Gain	(dB)	68.2	68.2	68.2	68.2	68.2	68.2	68.2	68.2
Tx E/S EIRP per Carrier	(dBW)	79.9	79.9	79.9	79.9	79.9	79.9	79.9	79.9
Atmospheric and Other Losses	(dB)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Free Space Loss	(dB)	212.2	212.2	212.0	212.0	212.0	212.0	212.2	212.2
<b>Satellite:</b>									
G/T towards Tx E/S	(dB/K)	18.5	18.5	15.8	15.8	18.2	18.2	18.5	18.5
EIRP per Carrier towards Rx E/S	(dBW)	59.2	59.2	61.4	61.4	65.0	65.0	65.4	65.4
<b>Downlink:</b>									
Carrier Frequency	(MHz)	17,500	17,500	17,500	17,500	17,500	17,500	17,500	17,500
Atmospheric and Other Losses	(dB)	0.4	3.3	0.2	5.4	0.2	8.8	0.2	9.7
Free Space Loss	(dB)	209.3	209.3	208.8	208.8	208.6	208.6	208.5	208.5
Rx E/S Antenna Diameter	(m)	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45
Rx E/S Antenna Gain	(dB)	36.1	36.1	36.1	36.1	36.1	36.1	36.1	36.1
Pointing Error	(dB)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Rx E/S G/T	(dB/K)	13.1	10.9	13.1	10.2	13.1	9.7	13.1	9.6
System (LNA+Sky) Noise Temperature	(K)	200	333	200	393	200	439	200	446
<b>Total Link:</b>									
Bandwidth	(dB-Hz)	78.9	78.9	78.9	78.9	78.9	78.9	78.9	78.9
C/N - Thermal Uplink	(dB)	35.4	35.4	33.0	33.0	35.3	35.3	35.4	35.4
C/N - Thermal Downlink	(dB)	11.8	6.8	14.7	6.6	18.5	6.5	19.0	6.0
C/I - Aggregate uplink ASI	(dB)	36.9	36.9	37.2	37.2	37.2	37.2	36.9	36.9
C/I - Aggregate downlink ASI	(dB)	20.2	20.2	19.8	19.8	20.6	20.6	21.2	21.2
C/I - Other Link Degradations	(dB)	14.0	14.0	16.6	16.6	17.0	17.0	21.6	21.6
C/(N+I) - Total, Actual	(dB)	9.4	5.8	11.7	6.0	13.6	6.0	15.6	5.8
C/(N+I) - Total, Required	(dB)	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8
Excess Margin	(dB)	3.6	0.0	5.9	0.2	7.8	0.2	9.8	0.0
Availability	(%)	N/A	99.75	N/A	99.89	N/A	99.84	N/A	99.83
<b>Aggregate Interference Assessment:</b>									
(C/N) - no ASI	(dB)	9.8	6.0	12.5	6.2	14.6	6.1	17.1	5.9
Degradation due to aggregate ASI	(dB)	0.4	0.2	0.7	0.2	1.0	0.2	1.5	0.1