

ECHOSTAR-6 Link Budgets			
Link Parameters	Medium Power Mode		
	1	2	3
	13 meter Feeder Link E/S Nominal Feeder Link Site	13 meter Feeder Link E/S Nominal Feeder Link Site	13 meter Feeder Link E/S Nominal Feeder Link Site
	to 45 cm Receive-Only	to 45 cm Receive-Only	to 45 cm Receive-Only
<b>Modulation Parameters:</b>			
Information Bit Rate per Carrier (kbps)	30,719	30,719	30,719
FEC Rate	5/6	5/6	5/6
Reed-Solomon Ratio (188/204, None)	188/204	188/204	188/204
Overall Coding Overhead (%)	30.2%	30.2%	30.2%
Modulation Type (BPSK/QPSK/8PSK/16QAM)	QPSK	QPSK	QPSK
Filter Roll-off Factor ("alpha") (%)	20	20	20
<b>Link Geometry:</b>			
Tx E/S City Location (name)	Cheyenne	Cheyenne	Cheyenne
Tx E/S Longitude ("East")	-104.7	-104.7	-104.7
Tx E/S Latitude ("North")	41.1	41.1	41.1
Tx E/S Range to Satellite (Krn)	39,021	39,021	39,021
Tx E/S Elevation to Satellite (")	25.5	25.5	25.5
Tx E/S Altitude (m)	1876.0	1876.0	1876.0
Rx E/S City Location (name)	Miami	New York	Chicago
Rx E/S Longitude ("East")	-80.3	-74.0	-87.8
Rx E/S Latitude ("North")	25.9	40.8	41.8
Rx E/S Range to Satellite (km)	36,876	37,689	38,192
Rx E/S Elevation to Satellite (")	53.3	41.2	34.9
Rx E/S Altitude (m)	1.0	15.0	182.0
<b>Uplink (per carrier):</b>			
Carrier Frequency (MHz)	17,550	17,550	17,550
HPA Power Level (to give required PFD at satellite) (W)	67.1	67.1	67.1
HPA Power in dBW (dBW)	18.3	18.3	18.3
Post-HPA Losses (dB)	2.0	2.0	2.0
Tx E/S Power to Antenna in dBW (dBW)	16.3	16.3	16.3
Tx E/S Antenna Diameter (m)	13.0	13.0	13.0
Antenna Efficiency (%)	65	65	65
Tx E/S Antenna Gain (dB)	65.7	65.7	65.7
Tx E/S EIRP (dBW)	82.0	82.0	82.0
E/S Pointing Loss (dB)	0.1	0.1	0.1
Atmospheric Loss (dB)	0.44	0.44	0.44
Availability up (%)	99.9	99.9	99.9
Rain attenuation (dB)	3.9	3.9	3.9
Free Space Loss (dB)	209.2	209.2	209.2
<b>Satellite:</b>			
Resulting PFD at Satellite (dBW/m <sup>2</sup> )	-85.3	-85.3	-85.3
Transponder Gain Setting (dB)	10	10	10
G/T towards Tx E/S (dB/K)	3.5	3.5	3.5
EIRP towards Rx E/S (dBW)	49.7	51.0	48.9
<b>Downlink:</b>			
Carrier Frequency (MHz)	12,450	12,450	12,450
Atmospheric Loss (dB)	0.09	0.11	0.13
Availability down (%)	99.5	99.9	99.6
Rain attenuation (dB)	2.00	2.60	1.30
E/S Pointing Loss (dB)	0.5	0.5	0.5
Free Space Loss (dB)	205.7	205.9	206.0
Rx E/S Antenna Diameter (m)	0.45	0.45	0.45
Rx E/S Antenna Gain (dB)	34.0	34.0	34.0
Rx E/S G/T (dB/K)	13.2	13.2	13.2
System (LNA+Sky) Noise Temp. (K)	120	120	120
Increase in Noise Temp due to rain (K)	98	120	65
<b>Total Link:</b>			
Carrier Noise Bandwidth (kHz)	24,000	24,000	24,000
(C/N) - Thermal Uplink (dB)	30.6	30.6	30.6
(C/N) - Thermal Downlink - CLEAR SKY (dB)	11.4	12.5	10.3
(C/N) - Thermal Downlink - RAIN DOWN (dB)	6.8	6.9	7.1
(C/I) - Other Link Degradations (dB)	20.0	20.0	20.0
(C/N) - Total Actual - CLEAR SKY (dB)	10.8	11.8	9.8
(C/N) - Total Actual - RAIN DOWN (dB)	6.6	6.7	6.9
(C/N) - Total Required (dB)	6.6	6.6	6.6
Excess Margin - CLEAR SKY (dB)	4.2	5.2	3.2
Excess Margin - RAIN DOWN (dB)	0.0	0.1	0.3