

ECHOSTAR-6 Link Budgets				
		Medium Power Mode		
Link Parameters		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	to	to
		45 cm Receive-Only	45 cm Receive-Only	45 cm Receive-Only
<b>Modulation Parameters:</b>				
Information Bit Rate per Carrier (kbps)	41,200	41,200	41,200	
FEC Rate	2/3	2/3	2/3	
Overall Coding Overhead (%)	56.5%	56.5%	56.5%	
Modulation Type (BPSK/QPSK/8PSK/16QAM)	8PSK	8PSK	8PSK	
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 (Km)	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 (%)	99.1	99.8	99.6	
Rain attenuation (dB)	1.30	1.80	0.85	
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)	67	88	43	
<b>Total Link:</b>				
Carrier Noise Bandwidth (kHz)	25,794	25,794	25,794	
(C/N) - Thermal Uplink (dB)	30.2	30.2	30.2	
(C/N) - Thermal Downlink - CLEAR SKY (dB)	11.1	12.2	10.0	
(C/N) - Thermal Downlink - RAIN DOWN (dB)	7.9	8.0	7.8	
(C/I) - Other Link Degradations (dB)	20.0	20.0	20.0	
(C/N) - Total Actual - CLEAR SKY (dB)	10.5	11.5	9.5	
(C/N) - Total Actual - RAIN DOWN (dB)	7.6	7.7	7.5	
(C/N) - Total Required (dB)	7.5	7.5	7.5	
Excess Margin - CLEAR SKY (dB)	3.0	4.0	2.0	
Excess Margin - RAIN DOWN (dB)	0.1	0.2	0.0	