

# EchoStar-15 Link Budgets

## (8PSK Normal Mode)

Link Parameters		Rio de Janeiro	Manaus	Recife
<b>Link Geometry:</b>				
Tx E/S Range to Satellite	(km)	40,522	40,522	40,522
Rx E/S Range to Satellite	(km)	36,371	36,055	35,848
<b>Uplink (per carrier):</b>				
Carrier Frequency	(MHz)	17,500	17,500	17,500
Tx E/S Antenna Diameter	(m)	13.2	13.2	13.2
Tx E/S Power to Antenna	(dBW)	11.2	11.2	11.2
Tx E/S Antenna Gain	(dB)	65.8	65.8	65.8
Tx E/S EIRP per Carrier	(dBW)	77.0	77.0	77.0
Atmospheric Losses	(dB)	0.5	0.5	0.5
Free Space Loss	(dB)	209.5	209.5	209.5
<b>Satellite:</b>				
G/T towards Tx E/S	(dB/K)	9.7	9.7	9.7
Peak EIRP	(dBW)	56.5	56.5	56.5
EIRP towards Rx E/S	(dBW)	54.7	53.0	53.5
<b>Downlink (per carrier):</b>				
Carrier Frequency	(MHz)	12,500	12,500	12,500
Atmospheric Losses	(dB)	0.1	0.1	0.1
Free Space Loss	(dB)	205.6	205.5	205.5
Rain Attenuation	(dB)	6.3	5.7	6.2
Rx E/S Antenna Diameter	(m)	0.60	0.60	0.60
Antenna Mis-pointing Error	(dB)	0.40	0.40	0.40
Rx E/S Antenna Gain	(dB)	36.5	36.5	36.5
Rx E/S G/T	(dB/K)	15.7	15.7	15.7
Noise Temperature - Clear Sky	(K)	120	120	120
Noise Temperature - Rain	(K)	331	322	330
<b>Total Link:</b>				
Noise Bandwidth	(dB-Hz)	73.6	73.6	73.6
(C/N) - Thermal Uplink	(dB)	31.7	31.7	31.7
(C/N) - Thermal Downlink - Clear Sky	(dB)	19.3	17.7	18.2
(C/N) - Thermal Downlink - Rain Down	(dB)	8.6	7.6	7.6
(C/I) - Adjacent Satellite Interference	(dB)	31.1	29.5	30.0
(C/N+I) - Clear Sky	(dB)	18.5	17.0	17.5
(C/N+I) - Rain Down	(dB)	8.5	7.6	7.5
(C/N+I) - Total Required	(dB)	7.5	7.5	7.5
Downlink Margin - Clear Sky	(dB)	11.0	9.5	10.0
Downlink Margin - Rain Down	(dB)	1.0	0.1	0.0
Downlink Availability	(%)	99.97	99.81	99.92