

# EchoStar 17/24 GHz Link Budget

| Link Parameters                           |           | Clear Sky<br>(New York) | Faded D/L<br>(New York) | Clear Sky<br>(Miami) | Faded D/L<br>(Miami) |
|---|-----------|-------------------------|-------------------------|----------------------|----------------------|
| <b>Link Geometry:</b>                     |           |                         |                         |                      |                      |
| Tx E/S Range to Satellite (Cheyenne)      | (km)      | 38,110                  | 38,110                  | 38,110               | 38,110               |
| Rx E/S Range to Satellite                 | (km)      | 37,577                  | 37,577                  | 36,528               | 36,528               |
| <b>Uplink:</b>                            |           |                         |                         |                      |                      |
| Carrier Frequency                         | (MHz)     | 25,000                  | 25,000                  | 25,000               | 25,000               |
| Tx E/S Antenna Diameter                   | (m)       | 12.0                    | 12.0                    | 12.0                 | 12.0                 |
| Max. Tx E/S Power to Antenna              | (W)       | 5.0                     | 5.0                     | 5.0                  | 5.0                  |
| Max. Tx E/S Power Density to Antenna      | (dBW/MHz) | -6.6                    | -6.6                    | -6.6                 | -6.6                 |
| Tx E/S Antenna Gain                       | (dB)      | 68.2                    | 68.2                    | 68.2                 | 68.2                 |
| Tx E/S EIRP per Carrier                   | (dBW)     | 75.2                    | 75.2                    | 75.2                 | 75.2                 |
| Atmospheric and Other Losses              | (dB)      | 0.7                     | 0.7                     | 0.7                  | 0.7                  |
| Free Space Loss                           | (dB)      | 212.0                   | 212.0                   | 212.0                | 212.0                |
| <b>Satellite:</b>                         |           |                         |                         |                      |                      |
| G/T towards Tx E/S                        | (dB/K)    | 17.3                    | 17.3                    | 17.3                 | 17.3                 |
| EIRP per Carrier towards Rx E/S           | (dBW)     | 54.6                    | 54.6                    | 58.9                 | 58.9                 |
| <b>Downlink:</b>                          |           |                         |                         |                      |                      |
| Carrier Frequency                         | (MHz)     | 17,500                  | 17,500                  | 17,500               | 17,500               |
| Atmospheric and Other Losses              | (dB)      | 0.2                     | 3.1                     | 0.2                  | 6.8                  |
| Free Space Loss                           | (dB)      | 208.8                   | 208.8                   | 208.6                | 208.6                |
| Rx E/S Antenna Diameter                   | (m)       | 0.45                    | 0.45                    | 0.45                 | 0.45                 |
| Rx E/S Antenna Gain                       | (dB)      | 36.1                    | 36.1                    | 36.1                 | 36.1                 |
| Pointing Error                            | (dB)      | 0.5                     | 0.5                     | 0.5                  | 0.5                  |
| Rx E/S G/T                                | (dB/K)    | 13.1                    | 10.9                    | 13.1                 | 9.9                  |
| System (LNA+Sky) Noise Temperature        | (K)       | 200                     | 335                     | 200                  | 416                  |
| <b>Total Link:</b>                        |           |                         |                         |                      |                      |
| Bandwidth                                 | (dB-Hz)   | 73.6                    | 73.6                    | 73.6                 | 73.6                 |
| C/N - Thermal Uplink                      | (dB)      | 34.7                    | 34.7                    | 34.7                 | 34.7                 |
| C/N - Thermal Downlink                    | (dB)      | 13.2                    | 8.1                     | 17.7                 | 8.0                  |
| C/I - Aggregate uplink ASI                | (dB)      | 37.5                    | 37.5                    | 37.5                 | 37.5                 |
| C/I - Aggregate downlink ASI              | (dB)      | 18.3                    | 18.3                    | 19.9                 | 19.9                 |
| C/I - Other Link Degradations             | (dB)      | 22.0                    | 22.0                    | 22.0                 | 22.0                 |
| C/(N+I) - Total, Actual                   | (dB)      | 11.6                    | 7.5                     | 14.7                 | 7.6                  |
| C/(N+I) - Total, Required                 | (dB)      | 7.5                     | 7.5                     | 7.5                  | 7.5                  |
| Excess Margin                             | (dB)      | 4.1                     | 0.0                     | 7.2                  | 0.1                  |
| Availability                              | (%)       | N/A                     | 99.70                   | N/A                  | 99.74                |
| <b>Aggregate Interference Assessment:</b> |           |                         |                         |                      |                      |
| (C/N) - no ASI                            | (dB)      | 12.6                    | 7.9                     | 16.3                 | 7.8                  |
| Degradation due to aggregate ASI          | (dB)      | 1.0                     | 0.4                     | 1.6                  | 0.3                  |