

Table D4.4 Representative Link Budget/ASI analysis for QPSK 24M0G7W R2/3 (NF HP XPDR @ 89.0°W)

| | | CLEAR-SKY | | DEGRADED | | |
|-----------------------------|---|------------|---------|----------|---------|---------|
| Carrier | Carrier Type | | 24MG7W | 24MG7W | 24MG7W | 24MG7W |
| | Modulation | | QPSK | QPSK | QPSK | QPSK |
| | Info Rate | Mbit/s | 26.65 | 26.65 | 26.65 | 26.65 |
| | FEC: | | 0.67 | 0.67 | 0.67 | 0.67 |
| | Noise BW: | MHz | 19.988 | 19.988 | 19.988 | 19.988 |
| | Eb/No required: | dB | 2.9 | 2.9 | 2.9 | 2.9 |
| | C/N required | dB | 4.1 | 4.1 | 4.1 | 4.1 |
| | ASI+Terrestrial losses | dB | 1.5 | 1.5 | 1.5 | 1.5 |
| | Adjusted required C/N | dB | 5.6 | 5.6 | 5.649 | 5.6 |
| S/C Loc | Longitude | deg | -89.00 | -89.00 | -89.00 | -89.00 |
| Beam Polarization Frequency | Uplink Beam Name | | NRF | NRF | NRF | NRF |
| | Polarisation (H, V or, C) | | C | C | C | C |
| | Uplink Frequency | MHz | 24750.0 | 24750.0 | 24750.0 | 24750.0 |
| | Downlink Beam Name | | NTF | NTF | NTF | NTF |
| Rain Analysis | Polarisation (H, V or, C) | | C | C | C | C |
| | Downlink Frequency | MHz | 17300.0 | 17300.0 | 17300.0 | 17300.0 |
| Tx E/S | Rain Model (ITU/Crane) | | | | ITU | ITU |
| | % time uplink rain attenuation exceeded | | | | 0.03 | 0.03 |
| | % time downlink rain attenuation exceeded | | | | 0.27 | 0.37 |
| | Total Link Availability | | | | 99.70 | 99.60 |
| Rx E/S | ES Longitude | deg | Denver | Denver | Denver | Denver |
| | ES Latitude | deg | -105.0 | -105.0 | -105.0 | -105.0 |
| | Temperature ground | deg C | 39.5 | 39.5 | 39.5 | 39.5 |
| | Humidity | % | 25.0 | 25.0 | 25.0 | 25.0 |
| | Rain Zone (as per rain model) | | 50.0 | 50.0 | 50.0 | 50.0 |
| | Uplink Power Control range | dB | E | E | E | E |
| | E/S Elevation angle | deg | 20.0 | 20.0 | 20.0 | 20.0 |
| | E/S size | m | 41.4 | 41.4 | 41.4 | 41.4 |
| | Transmit E/S peak gain (Eff=0.6) | dB | 9.00 | 9.00 | 9.00 | 9.00 |
| | | | dB | 65.1 | 65.1 | 65.1 |
| Uplink Thermal | ES Longitude | deg | Reno | Miami | Reno | Miami |
| | ES Latitude | deg | -119.8 | -80.2 | -119.8 | -80.2 |
| | Temperature ground | deg C | 39.5 | 25.5 | 39.5 | 25.5 |
| | Humidity | % | 25.0 | 25.0 | 25.0 | 25.0 |
| | Rain Zone (as per rain model) | | 30.0 | 70.0 | 30.0 | 70.0 |
| | E/S Elevation angle | deg | D | N | D | N |
| | E/S size | m | 34.4 | 58.7 | 34.4 | 58.7 |
| | Receive E/S peak gain (Eff=0.6) | dB | 0.45 | 0.45 | 0.45 | 0.90 |
| | System (LNA + Sky) Noise Temp. | km | 36.0 | 36.0 | 36.0 | 42.0 |
| | Temperature due to rain fade and gases | K | 200.0 | 200.0 | 200.0 | 200.0 |
| Receive E/S G/T | dB/K | 6.4 | 4.3 | 106.2 | 232.9 | |
| | | dB/K | 12.9 | 12.9 | 11.1 | 15.7 |
| Downlink Thermal | U/L eirp | dBW | 76.7 | 75.5 | 77.1 | 75.5 |
| | Uplink PSD | dBW/Hz | -61.4 | -62.6 | -61.0 | -62.6 |
| | Transponder BP SFD | dBW/m2 | -84.0 | -84.0 | -83.6 | -84.0 |
| | Input Backoff | dB | -3.2 | -4.4 | -3.2 | -4.4 |
| | Uplink Path Loss, clear sky | dB | 212.2 | 212.2 | 212.2 | 212.2 |
| | Uplink gaseous attenuation | dB | 0.1 | 0.1 | 1.0 | 1.0 |
| | Uplink rain attenuation | dB | 0.0 | 0.0 | 9.4 | 9.4 |
| | Uplink power control correction (dB) | dB | 0.0 | 0.0 | 9.4 | 9.4 |
| | + Satellite G/T | dB/K | 5.7 | 5.7 | 5.7 | 5.7 |
| | Antenna pattern towards E/S | dB | -1.0 | -1.0 | -1.0 | -1.0 |
| C/N thermal uplink | dB | 24.6 | 23.4 | 24.2 | 22.6 | |
| Other | S/C saturated EIRP (Beam Peak) | dBW | 54.5 | 54.5 | 54.5 | 54.5 |
| | Carrier Output backoff | dB | -1.3 | -2.5 | -1.3 | -2.5 |
| | Antenna pattern towards E/S | dB | -2.8 | -1.5 | -2.8 | -1.5 |
| | Downlink EIRP towards E/S | dBW | 50.4 | 50.5 | 50.4 | 50.5 |
| | Downlink Path Loss, clear sky | dB | 209.1 | 208.6 | 209.1 | 208.6 |
| | Downlink gaseous attenuation | dB | 0.1 | 0.1 | 0.2 | 0.3 |
| | Downlink rain attenuation | dB | 0.0 | 0.0 | 1.7 | 6.7 |
| | - Antenna Pointing error | dB | -0.3 | -0.3 | -0.3 | -0.3 |
| | + Earth Station G/T, clear sky | dB/K | 12.9 | 12.9 | 11.1 | 15.7 |
| | C/N thermal downlink | dB | 9.4 | 10.0 | 5.8 | 5.8 |
| Total | C/I (Other link degradation) | dB | 25.0 | 25.0 | 25.0 | 25.0 |
| | Available C/N | dB | 0.2 | 0.7 | 5.7 | 5.6 |
| ASI | PF | dBW/m2/MHz | -122.7 | -123.4 | -122.7 | -123.4 |
| | Margin | dB | 3.5 | 4.0 | 0.1 | 0.0 |
| ASI | Geocentric Separation | deg | 4.0 | 4.0 | 4.0 | 4.0 |
| | Topocentric Separation w/o pointing error | deg | 4.4 | 4.4 | 4.4 | 4.4 |
| | Orbital Separation w/pointing error | deg | 4.0 | 4.0 | 4.0 | 4.2 |
| | Interfering Uplink power density | dBW/Hz | -66.5 | -66.5 | -66.5 | -66.5 |
| | Interfering D/L eirp density | dBW/Hz | -12.1 | -12.6 | -12.1 | -12.6 |
| | D/Lambda | | 26.0 | 26.0 | 26.0 | 61.9 |
| | Gain at offset angle | dB | 14.0 | 14.0 | 14.0 | 13.4 |
| | C/I ASI uplink | dB | 47.3 | 46.1 | 47.7 | 46.1 |
| | C/I ASI downlink | dB | 11.3 | 11.8 | 11.3 | 18.4 |
| | C/I (ASI total) | dB | 11.3 | 11.8 | 11.3 | 18.4 |
| ASI uplink | % | 0% | 0% | 0% | 0% | |
| ASI downlink | % | 22% | 20% | 22% | 5% | |
| ASI total | % | 22% | 20% | 22% | 5% | |
| ASI degradation | dB | 1.1 | 0.9 | 1.1 | 0.2 | |

Table D4.5 Representative Link Budget/ASI analysis for QPSK 24M0G7W R2/3 (NF SHP XPDR @ 89.0°W)

| | | CLEAR-SKY | | DEGRADED | | |
|--------------------|---|------------|---------|----------|---------|---------|
| Carrier | Carrier Type | | 24M0G7W | 24M0G7W | 24M0G7W | 24M0G7W |
| | | Modulation | | QPSK | QPSK | QPSK |
| | Info Rate | Mbit/s | 26.65 | 26.65 | 26.65 | 26.65 |
| | FEC: | | 0.67 | 0.67 | 0.67 | 0.67 |
| | Noise BW: | MHz | 19.988 | 19.988 | 19.988 | 19.988 |
| | Eb/No required: | dB | 2.9 | 2.9 | 2.9 | 2.9 |
| | C/N required | dB | 4.1 | 4.1 | 4.1 | 4.1 |
| | ASI+Terrestrial losses | dB | 1.5 | 1.5 | 1.5 | 1.5 |
| | Adjusted required C/N | dB | 5.6 | 5.6 | 5.649 | 5.6 |
| S/C Loc | Longitude | deg | -89.00 | -89.00 | -89.00 | -89.00 |
| Beam Polarization | Uplink Beam Name | | NRF | NRF | NRF | NRF |
| | Polarisation (H, V or, C) | | C | C | C | C |
| | Uplink Frequency | MHz | 25150.0 | 25150.0 | 25150.0 | 25150.0 |
| Frequency | Downlink Beam Name | | NTF | NTF | NTF | NTF |
| | Polarisation (H, V or, C) | | C | C | C | C |
| | Downlink Frequency | MHz | 17700.0 | 17700.0 | 17700.0 | 17700.0 |
| Rain Analysis | Rain Model (ITU/Crane) | | | | ITU | ITU |
| | % time uplink rain attenuation exceeded | | | | 0.03 | 0.03 |
| | % time downlink rain attenuation exceeded | | | | 0.27 | 0.37 |
| | Total Link Availability | | | | 99.70 | 99.60 |
| Tx E/S | ES Longitude | deg | Denver | Denver | Denver | Denver |
| | ES Latitude | deg | -105.0 | -105.0 | -105.0 | -105.0 |
| | Temperature ground | deg C | 39.5 | 39.5 | 39.5 | 39.5 |
| | Humidity | % | 25.0 | 25.0 | 25.0 | 25.0 |
| | Rain Zone (as per rain model) | | 50.0 | 50.0 | 50.0 | 50.0 |
| | Uplink Power Control range | dB | E | E | E | E |
| | E/S Elevation angle | deg | 20.0 | 20.0 | 20.0 | 20.0 |
| | E/S size | m | 41.4 | 41.4 | 41.4 | 41.4 |
| | Transmit E/S peak gain (Eff=0.6) | dB | 9.00 | 9.00 | 9.00 | 9.00 |
| | | | dB | 65.3 | 65.3 | 65.3 |
| Rx E/S | ES Longitude | deg | Reno | Miami | Reno | Miami |
| | ES Latitude | deg | -119.8 | -80.2 | -119.8 | -80.2 |
| | Temperature ground | deg C | 39.5 | 25.5 | 39.5 | 25.5 |
| | Humidity | % | 25.0 | 25.0 | 25.0 | 25.0 |
| | Rain Zone (as per rain model) | | 30.0 | 70.0 | 30.0 | 70.0 |
| | E/S Elevation angle | deg | D | N | D | N |
| | E/S size | m | 34.4 | 58.7 | 34.4 | 58.7 |
| | Receive E/S peak gain (Eff=0.6) | dB | 0.45 | 0.65 | 0.45 | 0.65 |
| | System (LNA + Sky) Noise Temp. | km | 38.2 | 39.4 | 38.2 | 39.4 |
| | Temperature due to rain fade and gases | K | 200.0 | 200.0 | 200.0 | 200.0 |
| Receive E/S G/T | dB/K | 6.5 | 4.3 | 110.4 | 236.5 | |
| | | dB/K | 13.1 | 16.3 | 11.3 | 13.0 |
| Uplink Thermal | U/L eirp | dBW | 74.3 | 76.1 | 74.7 | 76.1 |
| | Uplink PSD | dBW/Hz | -84.0 | -82.2 | -83.6 | -82.2 |
| | Transponder BP SFD | dBW/m2 | -84.0 | -84.0 | -83.6 | -84.0 |
| | Input Backoff | dB | -5.6 | -3.8 | -5.6 | -3.8 |
| | Uplink Path Loss, clear sky | dB | 212.4 | 212.4 | 212.4 | 212.4 |
| | Uplink gaseous attenuation | dB | 0.1 | 0.1 | 0.9 | 0.9 |
| | Uplink rain attenuation | dB | 0.0 | 0.0 | 9.6 | 9.6 |
| | Up link power control correction (dB) | | 0.0 | 0.0 | 9.6 | 9.6 |
| | + Satellite G/T | dB/K | 5.7 | 5.7 | 5.7 | 5.7 |
| | Antenna pattern towards E/S | dB | -1.0 | -1.0 | -1.0 | -1.0 |
| C/N thermal uplink | dB | 22.0 | 23.8 | 21.7 | 23.0 | |
| Downlink Thermal | S/C saturated EIRP (Beam Peak) | dBW | 57.1 | 57.1 | 57.1 | 57.1 |
| | Carrier Output backoff | dB | -3.7 | -1.9 | -3.7 | -1.9 |
| | Antenna pattern towards E/S | dB | -2.8 | -1.5 | -2.8 | -1.5 |
| | Downlink EIRP towards E/S | dBW | 50.6 | 53.7 | 50.6 | 53.7 |
| | Downlink Path Loss, clear sky | dB | 209.3 | 208.8 | 209.3 | 208.8 |
| | Downlink gaseous attenuation | dB | 0.1 | 0.1 | 0.3 | 0.4 |
| | Downlink rain attenuation | dB | 0.0 | 0.0 | 1.8 | 7.0 |
| | - Antenna Pointing error | dB | -0.3 | -0.3 | -0.3 | -0.3 |
| | + Earth Station G/T, clear sky | dB/K | 13.1 | 16.3 | 11.3 | 13.0 |
| | C/N thermal downlink | dB | 9.6 | 16.3 | 5.8 | 5.8 |
| Other | C/I (Other link degradation) | dB | 25.0 | 25.0 | 25.0 | 25.0 |
| Total | Available C/N | dB | 9.2 | 15.2 | 5.6 | 5.6 |
| Margin | PFM | dBW/m2/MHz | -122.5 | -120.3 | -122.5 | -120.3 |
| | Margin | dB | 3.6 | 9.5 | 0.0 | 0.0 |
| ASI | Geocentric Separation | deg | 4.0 | 4.0 | 4.0 | 4.0 |
| | Topocentric Separation | deg | 4.4 | 4.4 | 4.4 | 4.4 |
| | Orbital Separation w/pointing error | deg | 4.0 | 4.1 | 4.0 | 4.1 |
| | Interfering Uplink power density | dBW/Hz | -56.5 | -56.5 | -56.5 | -56.5 |
| | Interfering D/L eirp density | dBW/Hz | -12.1 | -12.6 | -12.1 | -12.6 |
| | D/Lambda | | 28.6 | 38.4 | 28.6 | 38.4 |
| | Gain at offset angle | dB | 14.0 | 13.6 | 14.0 | 13.6 |
| | C/I ASI uplink | dB | 44.8 | 46.6 | 45.3 | 46.6 |
| | C/I ASI downlink | dB | 11.6 | 18.7 | 11.6 | 18.7 |
| | C/I (ASI total) | dB | 11.6 | 18.7 | 11.6 | 18.7 |
| ASI uplink | % | 0% | 0% | 0% | 0% | |
| ASI downlink | % | 20% | 5% | 20% | 5% | |
| ASI total | % | 20% | 5% | 20% | 5% | |
| ASI degradation | dB | 1.0 | 0.2 | 1.0 | 0.2 | |

Table D4.6 Representative Link Budget/ASI analysis for QPSK 24M0G7W R2/3 (SF SHP XPDR @ 89.0°W)

| | | CLEAR-SKY | | DEGRADED | |
|--------------------|---|------------|----------|----------|----------|
| | | 24M0G7W | 24M0G7W | 24M0G7W | 24M0G7W |
| Carrier | Carrier Type | | 24M0G7W | 24M0G7W | 24M0G7W |
| | Modulation | | QPSK | QPSK | QPSK |
| | Info Rate | Mbit/s | 26.65 | 26.65 | 26.65 |
| | FEC: | | 0.67 | 0.67 | 0.67 |
| | Noise BW: | MHz | 19.988 | 19.988 | 19.988 |
| | Eb/No required: | dB | 2.9 | 2.9 | 2.9 |
| | C/N required | dB | 4.1 | 4.1 | 4.1 |
| S/C Loc | ASI+Terrestrial losses | dB | 1.5 | 1.5 | 1.5 |
| | Adjusted required C/N | dB | 5.6 | 5.6 | 5.649 |
| | Longitude | deg | -89.00 | -89.00 | -89.00 |
| | Latitude | deg | -89.00 | -89.00 | -89.00 |
| Beam Polarization | Uplink Beam Name | | SRF | SRF | SRF |
| | Polarisation (H, V or, C) | | C | C | C |
| | Uplink Frequency | MHz | 25150.0 | 25150.0 | 25150.0 |
| | Downlink Beam Name | | STF | STF | STF |
| Frequency | Polarisation (H, V or, C) | | C | C | C |
| | Downlink Frequency | MHz | 17700.0 | 17700.0 | 17700.0 |
| | Frequency | MHz | 17700.0 | 17700.0 | 17700.0 |
| Rain Analysis | Rain Model (ITU/Crane) | | | ITU | ITU |
| | % time uplink rain attenuation exceeded | | | 0.03 | 0.03 |
| | % time downlink rain attenuation exceeded | | | 0.27 | 0.47 |
| | Total Link Availability | | | 99.70 | 99.50 |
| Tx E/S | ES Longitude | deg | Santiago | Santiago | Santiago |
| | ES Latitude | deg | -70.4 | -70.4 | -70.4 |
| | Temperature ground | deg C | -33.3 | -33.3 | -33.3 |
| | Humidity | % | 25.0 | 25.0 | 25.0 |
| | Rain Zone (as per rain model) | | 50.0 | 50.0 | 50.0 |
| | Uplink Power Control range | dB | E | E | E |
| | E/S Elevation angle | deg | 20.0 | 20.0 | 20.0 |
| | E/S size | m | 46.4 | 46.4 | 46.4 |
| | Transmit E/S peak gain (Eff=0.6) | dB | 9.0 | 9.0 | 9.0 |
| | | dB | 65.3 | 65.3 | 65.3 |
| Rx E/S | ES Longitude | deg | Santiago | Rio | Santiago |
| | ES Latitude | deg | -70.4 | -43.2 | -70.4 |
| | Temperature ground | deg C | -33.3 | -22.5 | -33.3 |
| | Humidity | % | 25.0 | 25.0 | 25.0 |
| | Rain Zone (as per rain model) | | 50.0 | 75.0 | 50.0 |
| | E/S Elevation angle | deg | E | N | E |
| | E/S size | m | 46.4 | 32.8 | 46.4 |
| | Receive E/S peak gain (Eff=0.6) | dB | 46.4 | 32.8 | 46.4 |
| | System (LNA + Sky) Noise Temp. | km | 0.45 | 0.90 | 0.45 |
| | Temperature due to rain fade and gases | K | 36.2 | 42.2 | 36.2 |
| Receive E/S G/T | dB/K | 200.0 | 200.0 | 200.0 | |
| | dB/K | 5.1 | 6.8 | 117.5 | |
| | dB/K | 13.1 | 19.1 | 11.2 | |
| Uplink Thermal | U/L eirp | dBW | 77.4 | 78.5 | 77.4 |
| | Uplink PSD | dBW/Hz | -80.9 | -59.8 | -80.9 |
| | Transponder BP SFD | dBW/m2 | -86.0 | -86.0 | -86.0 |
| | Input Backoff | dB | -5.4 | -4.3 | -5.4 |
| | Uplink Path Loss, clear sky | dB | 212.2 | 212.2 | 212.2 |
| | Uplink gaseous attenuation | dB | 0.1 | 0.1 | 0.8 |
| | Uplink rain attenuation | dB | 0.0 | 0.0 | 9.9 |
| | Uplink power control correction (dB) | dB | 0.0 | 0.0 | 9.9 |
| | + Satellite G/T | dB/K | 6.3 | 6.3 | 6.3 |
| | Antenna pattern towards E/S | dB | -6.0 | -6.0 | -6.0 |
| C/N thermal uplink | dB | 20.2 | 22.1 | 20.2 | |
| | dB | 21.3 | | | |
| Downlink Thermal | S/C saturated EIRP (Beam Peak) | dBW | 55.2 | 55.2 | 55.2 |
| | Carrier Output backoff | dB | -3.5 | -2.4 | -3.5 |
| | Antenna pattern towards E/S | dB | -1.0 | -1.0 | -1.0 |
| | Downlink EIRP towards E/S | dBW | 50.7 | 51.8 | 50.7 |
| | Downlink Path Loss, clear sky | dB | 209.0 | 209.3 | 209.0 |
| | Downlink gaseous attenuation | dB | 0.1 | 0.1 | 0.3 |
| | Downlink rain attenuation | dB | 0.0 | 0.0 | 1.9 |
| | - Antenna Pointing error | dB | 0.0 | 0.0 | 7.1 |
| | + Earth Station G/T, clear sky | dB/K | -0.3 | -0.3 | -0.3 |
| | C/N thermal downlink | dB/K | 13.1 | 19.1 | 11.2 |
| | dB | 9.9 | 16.7 | 5.9 | |
| | dB | 5.8 | | | |
| Other | C/I (Other link degradation) | dB | 25.0 | 25.0 | 25.0 |
| Total | Available C/N | dB | 9.5 | 15.1 | 5.6 |
| | Margin | dB | 5.6 | 5.6 | 5.6 |
| ASI | PFD | dBW/m2/MHz | -124.0 | -123.2 | -124.0 |
| | Margin | dB | 3.8 | 9.5 | 0.0 |
| | Geocentric Separation | deg | 4.0 | 4.0 | 4.0 |
| | Topocentric Separation | deg | 4.4 | 4.4 | 4.4 |
| | Orbital Separation w/pointing error | deg | 4.0 | 4.2 | 4.0 |
| | Interfering Uplink power density | dBW/Hz | 4.0 | 4.0 | 4.0 |
| | Interfering D/L eirp density | dBW/Hz | -66.5 | -66.5 | -66.5 |
| | D/Lambda | dBW/Hz | -12.4 | -12.1 | -12.4 |
| | Gain at offset angle | dB | 28.6 | 53.1 | 28.6 |
| | C/I ASI uplink | dB | 14.0 | 13.4 | 14.0 |
| C/I ASI downlink | dB | 48.0 | 49.1 | 48.0 | |
| C/I (ASI total) | dB | 12.0 | 19.3 | 12.0 | |
| | dB | 12.0 | 19.3 | 12.0 | |
| ASI uplink | % | 0% | 0% | 0% | |
| ASI downlink | % | 19% | 4% | 19% | |
| ASI total | % | 19% | 4% | 19% | |
| ASI degradation | dB | 0.9 | 0.2 | 0.9 | |

Table D4.13 Representative Link Budget/ASI analysis for 8PSK 48M0G7W R5/6 & R2/3 (Local DBS XPDR)

| | | CLEAR-SKY | | DEGRADED | | |
|----------------------|---|------------|-----------|-----------|-----------|-----------|
| Carrier | Carrier Type | | 48M0G7W | 48M0G7W | 48M0G7W | 48M0G7W |
| | Modulation | | 8PSK | 8PSK | 8PSK | 8PSK |
| | Bits/Symbol | | 3 | 3 | 3 | 3 |
| | Info Rate | Mbit/s | 100 | 100 | 80 | 80 |
| | FEC: | | 0.83 | 0.83 | 0.67 | 0.67 |
| | Noise BW: | MHz | 40.000 | 40.000 | 40.000 | 40.000 |
| | Eb/No required: | dB | 4.9 | 4.9 | 6.6 | 6.6 |
| | C/N required | dB | 8.9 | 8.9 | 9.6 | 9.6 |
| | ASI+Terrestrial losses | dB | 1.5 | 1.5 | 1.5 | 1.5 |
| | Adjusted required C/N | dB | 10.4 | 10.4 | 11.1 | 11.1 |
| Beam Polarization | Uplink Beam Name | | GR | GR | GR | GR |
| | Polarisation (H, V or, C) | | C | C | C | C |
| Frequency | Uplink Frequency | MHz | 24750.0 | 24750.0 | 24750.0 | 24750.0 |
| | Downlink Beam Name | | UT | UT | UT | UT |
| | Polarisation (H, V or, C) | | C | C | C | C |
| | Downlink Frequency | MHz | 17300.0 | 17300.0 | 17300.0 | 17300.0 |
| Rain Analysis | Rain Model (ITU/Crane) | | | | ITU | ITU |
| | % time uplink rain attenuation exceeded | | | | 0.100 | 0.100 |
| | % time downlink rain attenuation exceeded | | | | 4.900 | 4.900 |
| | Total Link Availability | | | | 95.0 | 95.0 |
| Tx E/S | ES Longitude | deg | Hagerstwn | Hagerstwn | Hagerstwn | Hagerstwn |
| | ES Latitude | deg | -77.4 | -77.4 | -77.4 | -77.4 |
| | Temperature ground | deg C | 39.3 | 39.3 | 39.3 | 39.3 |
| | Humidity | % | 25.0 | 25.0 | 25.0 | 25.0 |
| | Rain Zone (as per rain model) | | 50.0 | 50.0 | 50.0 | 50.0 |
| | Uplink Power Control range | dB | K | K | K | K |
| | E/S Elevation angle | deg | 20.0 | 20.0 | 20.0 | 20.0 |
| | E/S size | m | 39.2 | 39.2 | 39.2 | 39.2 |
| | Transmit E/S peak gain (Eff=0.6) | dB | 9.0 | 9.0 | 9.0 | 9.0 |
| | | dB | 65.1 | 65.1 | 65.1 | 65.1 |
| Rx E/S | ES Longitude | deg | Riverside | Miami | Riverside | Miami |
| | ES Latitude | deg | -117.2 | -80.2 | -117.2 | -80.2 |
| | Temperature ground | deg C | 33.6 | 25.5 | 33.6 | 25.5 |
| | Humidity | % | 25.0 | 25.0 | 25.0 | 25.0 |
| | Rain Zone (as per rain model) | | 50.0 | 75.0 | 50.0 | 75.0 |
| | E/S Elevation angle | deg | E | N | E | N |
| | E/S size | m | 14.9 | 49.5 | 14.9 | 49.5 |
| | Receive E/S peak gain (Eff=0.6) | dB | 0.45 | 0.45 | 0.45 | 0.45 |
| | System (LNA + Sky) Clearsky Temp. | K | 36.0 | 36.0 | 36.0 | 36.0 |
| | Temperature due to rain fade and gases | K | 200.0 | 200.0 | 200.0 | 200.0 |
| Receive E/S G/T | dB/K | 14.0 | 4.8 | 86.8 | 107.3 | |
| | | dB/K | 12.7 | 12.9 | 11.4 | 11.1 |
| Uplink Thermal | U/L eirp | dBW | 76.9 | 76.7 | 76.9 | 76.7 |
| | Uplink PSD | dBW/Hz | -84.3 | -84.5 | -84.3 | -84.5 |
| | Transponder BP SFD | dBW/m2 | -88.0 | -88.0 | -88.0 | -88.0 |
| | Input Backoff | dB | -3.1 | -3.3 | -3.1 | -3.3 |
| | Uplink Path Loss, clear sky | dB | 212.3 | 212.3 | 212.3 | 212.3 |
| | Uplink gaseous attenuation | dB | 0.1 | 0.1 | 1.1 | 1.1 |
| | Uplink rain attenuation | dB | 0.0 | 0.0 | 10.6 | 10.6 |
| | Up link power control correction (dB) | | 0.0 | 0.0 | 10.6 | 10.6 |
| | + Satellite G/T | dB/K | 16.7 | 16.7 | 16.7 | 16.7 |
| | Antenna pattern towards E/S | dB | -5.0 | -5.0 | -5.0 | -5.0 |
| C/N thermal uplink | dB | 26.8 | 26.5 | 27.8 | 27.6 | |
| Downlink Thermal | S/C saturated EIRP (Beam Peak) | dBW | 64.7 | 64.7 | 64.7 | 64.7 |
| | Carrier Output backoff | dB | -1.2 | -1.4 | -1.2 | -1.4 |
| | Antenna pattern towards E/S | dB | -4.1 | -4.1 | -4.1 | -4.1 |
| | Downlink EIRP towards E/S | dBW | 59.4 | 59.2 | 59.4 | 59.2 |
| | Downlink Path Loss, clear sky | dB | 209.8 | 208.8 | 209.8 | 208.8 |
| | Downlink gaseous attenuation | dB | 0.2 | 0.1 | 0.8 | 0.4 |
| | Downlink rain attenuation | dB | 0.0 | 0.0 | 0.8 | 1.6 |
| | - Antenna Pointing error | dB | -0.3 | -0.3 | -0.3 | -0.3 |
| | + Earth Station G/T, clear sky | dB/K | 12.7 | 12.9 | 11.4 | 11.1 |
| C/N thermal downlink | dB | 14.4 | 15.5 | 11.8 | 11.8 | |
| Other | C/I (Other link degradation) | dB | 20.0 | 20.0 | 20.0 | 20.0 |
| Total | Available C/N | dB | 13.24 | 14.04 | 11.11 | 11.11 |
| | PFDF Margin | dBW/m2/MHz | -116.1 | -115.3 | -116.1 | -115.3 |
| | | dB | 2.9 | 3.7 | 0.0 | 0.0 |
| ASI | Geocentric Separation | deg | 4.0 | 4.0 | 4.0 | 4.0 |
| | Topocentric Separation | deg | 4.4 | 4.4 | 4.4 | 4.4 |
| | Orbital Separation w/pointing error | deg | 4.0 | 4.0 | 4.0 | 4.0 |
| | Interfering Uplink power density | dBW/Hz | -56.5 | -56.5 | -56.5 | -56.5 |
| | Interfering D/L eirp density | dBW/Hz | -11.4 | -12.4 | -11.4 | -12.4 |
| | D/Lambda | | 26.0 | 26.0 | 26.0 | 26.0 |
| | Gain at offset angle | dB | 14.0 | 14.0 | 14.0 | 14.0 |
| | C/I ASI uplink | dB | 44.5 | 44.2 | 44.5 | 44.2 |
| | C/I ASI downlink | dB | 16.8 | 17.6 | 16.8 | 17.6 |
| | C/I (ASI total) | dB | 16.8 | 17.6 | 16.8 | 17.6 |
| ASI uplink | % | 0% | 0% | 0% | 0% | |
| ASI downlink | % | 18% | 16% | 21% | 18% | |
| ASI total | % | 18% | 16% | 21% | 18% | |
| | ASI degradation | dB | 0.9 | 0.8 | 1.0 | 0.9 |

Table D4.14 Representative Link Budget/ASI analysis for 8PSK 24M0G7W R5/6 & R2/3 (Local DBS XPDR)

| | | CLEAR-SKY | | DEGRADED | |
|--------------------------------|---|--------------------------------|-----------|-----------|-----------|
| | | 24M0G7W | 24M0G7W | 24M0G7W | 24M0G7W |
| Carrier | Carrier Type | | 8PSK | 8PSK | 8PSK |
| | Modulation | | 3 | 3 | 3 |
| | Bits/Symbol | | 50 | 50 | 40 |
| | Info Rate | Mbit/s | 0.83 | 0.83 | 0.67 |
| | FEC: | | 20.000 | 20.000 | 20.000 |
| | Noise BW: | MHz | 4.9 | 4.9 | 6.6 |
| | Eb/No required: | dB | 8.9 | 8.9 | 9.6 |
| | C/N required | dB | 1.5 | 1.5 | 1.5 |
| ASI+Terrestrial losses | dB | 10.4 | 10.4 | 11.1 | |
| Adjusted required C/N | dB | | | | |
| Beam Polarization | Uplink Beam Name | | GR | GR | GR |
| | Polarisation (H, V or, C) | | C | C | C |
| | Uplink Frequency | MHz | 24750.0 | 24750.0 | 24750.0 |
| | Downlink Beam Name | | UT | UT | UT |
| Frequency | Polarisation (H, V or, C) | | C | C | C |
| | Downlink Frequency | MHz | 17300.0 | 17300.0 | 17300.0 |
| | Downlink Frequency | | | | |
| Rain Analysis | Rain Model (ITU/Crane) | | | ITU | ITU |
| | % time uplink rain attenuation exceeded | | | 0.100 | 0.100 |
| | % time downlink rain attenuation exceeded | | | 4.900 | 4.900 |
| | Total Link Availability | | | 95.0 | 95.0 |
| Tx E/S | ES Longitude | deg | Hagerstwn | Hagerstwn | Hagerstwn |
| | ES Latitude | deg | -77.4 | -77.4 | -77.4 |
| | Temperature ground | deg C | 39.3 | 39.3 | 39.3 |
| | Humidity | % | 25.0 | 25.0 | 25.0 |
| | Rain Zone (as per rain model) | | 50.0 | 50.0 | 50.0 |
| | Uplink Power Control range | dB | K | K | K |
| | E/S Elevation angle | deg | 20.0 | 20.0 | 20.0 |
| | E/S size | m | 39.2 | 39.2 | 39.2 |
| | Transmit E/S peak gain (Eff=0.6) | dB | 9.0 | 9.0 | 9.0 |
| Rx E/S | ES Longitude | deg | 65.1 | 65.1 | 65.1 |
| | ES Latitude | deg | Riverside | Miami | Riverside |
| | Temperature ground | deg C | -117.2 | -80.2 | -117.2 |
| | Humidity | % | 33.6 | 25.5 | 33.6 |
| | Rain Zone (as per rain model) | | 25.0 | 25.0 | 25.0 |
| | E/S Elevation angle | deg | 50.0 | 75.0 | 50.0 |
| | E/S size | m | E | N | E |
| | Receive E/S peak gain (Eff=0.6) | dB | 14.9 | 49.5 | 14.9 |
| | System (LNA + Sky) Clearsky Temp. | K | 0.45 | 0.45 | 0.45 |
| Thermal | U/L eirp | dBW | 74.1 | 73.8 | 74.1 |
| | Uplink PSD | dBW/Hz | -84.1 | -84.3 | -84.1 |
| | Transponder BP SFD | dBW/m2 | -88.0 | -88.0 | -88.0 |
| | Input Backoff | dB | -5.9 | -6.1 | -5.9 |
| | Uplink Path Loss, clear sky | dB | 212.3 | 212.3 | 212.3 |
| | Uplink gaseous attenuation | dB | 0.1 | 0.1 | 1.1 |
| | Uplink rain attenuation | dB | 0.0 | 0.0 | 10.6 |
| | Up link power control correction (dB) | | 0.0 | 0.0 | 10.6 |
| | + Satellite G/T | dB/K | 16.7 | 16.7 | 16.7 |
| | Antenna pattern towards E/S | dB | -5.0 | -5.0 | -5.0 |
| | C/N thermal uplink | dB | 28.9 | 28.7 | 28.0 |
| | Downlink Thermal | S/C saturated EIRP (Beam Peak) | dBW | 64.7 | 64.7 |
| Carrier Output backoff | | dB | -4.0 | -4.2 | -4.0 |
| Antenna pattern towards E/S | | dB | -4.1 | -4.1 | -4.1 |
| Downlink EIRP towards E/S | | dBW | 56.6 | 56.3 | 56.6 |
| Downlink Path Loss, clear sky | | dB | 209.8 | 208.8 | 209.8 |
| Downlink gaseous attenuation | | dB | 0.2 | 0.1 | 0.8 |
| Downlink rain attenuation | | dB | 0.0 | 0.0 | 1.6 |
| - Antenna Pointing error | | dB | -0.3 | -0.3 | -0.3 |
| + Earth Station G/T, clear sky | | dB/K | 12.7 | 12.9 | 11.4 |
| C/N thermal downlink | dB | 14.6 | 15.7 | 12.0 | |
| Other | dB | 19.0 | 19.0 | 19.0 | |
| Total | Available C/N | dB | 13.13 | 13.88 | 11.11 |
| Margin | PFD | dBW/m2/MHz | -115.9 | -115.1 | -115.9 |
| | Margin | dB | 2.8 | 3.5 | 0.0 |
| ASI | Geocentric Separation | deg | 4.0 | 4.0 | 4.0 |
| | Topocentric Separation | deg | 4.4 | 4.4 | 4.4 |
| | Orbital Separation w/pointing error | deg | 4.0 | 4.0 | 4.0 |
| | Interfering Uplink power density | dBW/Hz | -66.5 | -66.5 | -66.5 |
| | Interfering D/L eirp density | dBW/Hz | -11.4 | -12.4 | -11.4 |
| | D/Lambda | | 26.0 | 26.0 | 26.0 |
| | Gain at offset angle | dB | 14.0 | 14.0 | 14.0 |
| | C/I ASI uplink | dB | 44.6 | 44.4 | 44.4 |
| | C/I ASI downlink | dB | 17.0 | 17.8 | 17.0 |
| | C/I (ASI total) | dB | 17.0 | 17.8 | 17.0 |
| ASI uplink | % | 0% | 0% | 0% | |
| ASI downlink | % | 18% | 15% | 20% | |
| ASI total | % | 18% | 15% | 20% | |
| ASI degradation | dB | 0.9 | 0.7 | 1.0 | |