Table D4.1

**IA-5-77W Link Budget**

Ku-band Digital

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Wanted System Orbital Location | -77 deg | | | | Equivalent | Uplink | I, psd | -48.7 | dBw/hz | Tx F | 14.000 | GHz | |
| Interfering System Orbital Location | -79 deg | | | | and 74W (FCC allocation) | Dnlink | I, eirpd | -21.7 | dBw/hz | Rx F | 11.700 | GHz | |
| Minimum Orbital Separation (Geo-centric) | 1.90 deg ; Note: the calculations take topocentric advantage into account | | | | | | | | | | | | |

| Carrier Type | 64K, 8PSK, R2/3 RS | | | | | | 64K, QPSK, R1/2 RS | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Transmit ES Location | CONUS | CONUS | Mexico | Mexico | Conus | Conus | CONUS | CONUS | Mexico | Mexico | Conus | Conus |
| Receive ES Location | CONUS | CONUS | Conus | Conus | Mexico | Mexico | CONUS | CONUS | Conus | Conus | Mexico | Mexico |
| Tx ES Size at SA | 2.4 | 2.4 | 2.4 | 2.4 | 2.4 | 2.4 | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 | 1.8 |
| Transmit ES Peak gain | 48.7 | 48.7 | 48.7 | 48.7 | 48.7 | 48.7 | 46.2 | 46.2 | 46.2 | 46.2 | 46.2 | 46.2 |
| RX ES Size | 2.4 | 12.0 | 2.4 | 12.0 | 2.4 | 12.0 | 1.2 | 12.0 | 1.2 | 12.0 | 1.2 | 12.0 |
| Receive ES Gain | 47.2 | 61.1 | 47.2 | 61.1 | 47.2 | 61.1 | 41.1 | 61.1 | 41.1 | 61.1 | 41.1 | 61.1 |
| Receive ES G/T (Temp=105K) | 26.9 | 40.9 | 26.9 | 40.9 | 26.9 | 40.9 | 20.9 | 40.9 | 20.9 | 40.9 | 20.9 | 40.9 |
| Carrier Type | 64KR2/3 | 64KR2/3 | 64KR2/3 | 64KR2/3 | 64KR2/3 | 64KR2/3 | 64KR1/2 | 64KR1/2 | 64KR1/2 | 64KR1/2 | 64KR1/2 | 64KR1/2 |
| Occupied bandwidth per carrier (kHz) | 34.9 | 34.9 | 34.9 | 34.9 | 34.9 | 34.9 | 69.7 | 69.7 | 69.7 | 69.7 | 69.7 | 69.7 |
| Allocated bandwidth per carrier (kHz) | 47.1 | 47.1 | 47.1 | 47.1 | 47.1 | 47.1 | 94.1 | 94.1 | 94.1 | 94.1 | 94.1 | 94.1 |
| C/N Threshold | 10.54 | 10.54 | 10.54 | 10.54 | 10.54 | 10.54 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| System Margin | 5.0 | 5.0 | 4.1 | 4.9 | 3.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 2.3 | 5.0 |
| Other losses(terrestrial, OBE, etc.,) | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| Clear Sky C/N | 16.5 | 16.5 | 15.6 | 16.4 | 14.5 | 16.5 | 10.5 | 10.5 | 10.5 | 10.5 | 7.8 | 10.5 |
| Nominal e/s e.i.r.p. per carrier @ES(dBW) | 42.9 | 41.8 | 44.1 | 44.1 | 44.1 | 42.0 | 40.3 | 38.5 | 42.8 | 40.9 | 41.1 | 38.5 |
| TX ES PSD | -51.2 | -52.3 | -50.0 | -50.0 | -50.0 | -52.1 | -54.3 | -56.1 | -51.8 | -53.7 | -53.5 | -56.1 |
| ES eirp @ bp-- minimum (dBW) | 41.1 | 40.0 | 39.5 | 39.5 | 42.3 | 40.2 | 38.5 | 36.7 | 38.2 | 36.3 | 39.3 | 36.7 |
| Sat G/T at bp | 2.7 | 2.7 | 2.7 | 2.7 | 2.7 | 2.7 | 2.7 | 2.7 | 2.7 | 2.7 | 2.7 | 2.7 |
| Sat G/T at e/s | 0.9 | 0.9 | -1.9 | -1.9 | 0.9 | 0.9 | 0.9 | 0.9 | -1.9 | -1.9 | 0.9 | 0.9 |
| Free space path loss (dB) | 207.0 | 207.0 | 206.7 | 206.7 | 207.0 | 207.0 | 207.0 | 207.0 | 206.7 | 206.7 | 207.0 | 207.0 |
| Input back off, dB | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| Output back off dB | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |
| C/N uplink (dB) | 20.1 | 19.0 | 18.7 | 18.7 | 21.3 | 19.2 | 14.5 | 12.7 | 14.4 | 12.5 | 15.3 | 12.7 |
| X-pol interf:C/I -uplink (dB)-wanted system | 30.0 | 30.0 | 30.0 | 30.0 | 30.0 | 30.0 | 30.0 | 30.0 | 30.0 | 30.0 | 30.0 | 30.0 |
| X-pol interf:C/I -uplink (dB)-interfering ES | 29.6 | 28.5 | 30.8 | 30.8 | 30.8 | 28.7 | 24.0 | 22.2 | 26.5 | 24.6 | 24.8 | 22.2 |
| C/I - copol asi uplink (dB) | 23.4 | 22.3 | 21.8 | 21.8 | 24.6 | 22.5 | 17.8 | 16.0 | 17.5 | 15.6 | 18.6 | 16.0 |
| HPA IM at 10 deg el angle(limit: 21,c;10,Ku) | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 |
| Satellite TWTA IM per carrier @ bp | -21.0 | -21.0 | -21.0 | -21.0 | -21.0 | -21.0 | -21.0 | -21.0 | -21.0 | -21.0 | -21.0 | -21.0 |
| C/N+I+others, uplink | 17.7 | 16.6 | 16.5 | 16.5 | 18.8 | 16.8 | 12.4 | 10.6 | 12.4 | 10.5 | 13.1 | 10.6 |
| Downlink e.i.r.p. -bp (dBW) | 50.8 | 50.8 | 50.8 | 50.8 | 50.8 | 50.8 | 50.8 | 50.8 | 50.8 | 50.8 | 50.8 | 50.8 |
| Downlink BP-BE difference | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 | 7.1 |
| DL ES Pattern Advantage | 4.6 | 4.6 | 4.6 | 4.6 | 0 | 0 | 4.6 | 4.6 | 4.6 | 4.6 | 0 | 0 |
| Satellite e.i.r.p.d. per carrier (dBW)-tow es | -25.5 | -27.7 | -25.5 | -27.7 | -30.1 | -32.3 | -25.5 | -27.7 | -25.5 | -27.7 | -30.1 | -32.3 |
| Satellite e.i.r.p.d. per carrier (dBW)-bp | -23.0 | -25.2 | -23.0 | -25.2 | -23.0 | -25.2 | -23.0 | -25.2 | -23.0 | -25.2 | -23.0 | -25.2 |
| Satellite e.i.r.p. per carrier (dBW)-bp | 22.4 | 20.2 | 22.4 | 20.2 | 22.4 | 20.2 | 25.4 | 23.2 | 25.4 | 23.2 | 25.4 | 23.2 |
| Satellite e.i.r.p. per carrier (dBW)-ES | 19.9 | 17.7 | 19.9 | 17.7 | 15.3 | 13.1 | 22.9 | 20.7 | 22.9 | 20.7 | 18.3 | 16.1 |
| Free space path loss (dB) | 205.4 | 205.4 | 205.1 | 205.1 | 205.4 | 205.4 | 205.4 | 205.4 | 205.1 | 205.1 | 205.4 | 205.4 |
| Earth station pointing loss (dB) | 0.30 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.30 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 |
| C/N downlink towards BP (dB) | 31.4 | 43.2 | 31.7 | 43.5 | 26.8 | 38.6 | 25.4 | 43.2 | 25.7 | 43.5 | 20.8 | 38.6 |
| C/N downlink towards ES (dB) | 28.9 | 40.7 | 29.2 | 41.0 | 19.7 | 31.5 | 22.9 | 40.7 | 23.2 | 41.0 | 13.7 | 31.5 |
| C/N-thermal-total | 19.5 | 18.9 | 18.3 | 18.7 | 17.4 | 18.9 | 13.9 | 12.6 | 13.9 | 12.5 | 11.4 | 12.6 |
| Interference & Margins: | | | | | | | | | | | | |
| C/I Co-polar downlink interference d/I(dB) | 28.5 | 40.8 | 28.5 | 40.8 | 23.9 | 36.2 | 21.8 | 40.8 | 21.8 | 40.8 | 17.2 | 36.2 |
| C/I X-polar external interference d/I (dB) | 25.9 | 38.1 | 25.9 | 38.1 | 21.3 | 33.5 | 17.2 | 38.1 | 17.2 | 38.1 | 12.6 | 33.5 |
| Downlink C/(Nth +I+others) composite with ASI dn | 22.8 | 34.9 | 22.9 | 35.0 | 16.6 | 28.6 | 15.1 | 34.9 | 15.2 | 35.0 | 9.4 | 28.6 |
| Total C/(Nth +I) composite with ASI tot | 16.5 | 16.6 | 15.6 | 16.4 | 14.5 | 16.5 | 10.5 | 10.6 | 10.6 | 10.5 | 7.8 | 10.5 |
| Total C/(Nth +others) w/o ASI | 19.0 | 18.4 | 18.0 | 18.2 | 17.1 | 18.4 | 13.7 | 12.5 | 13.7 | 12.4 | 11.3 | 12.5 |
| C/N Margin | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |