

Table D 4.1

IA-9 Link Budget

Ku-band Digital

Wanted System Orbital Location -97 deg
 Interfering System Orbital Location -99 deg and 95W (FCC allocation)
 Minimum Orbital Separation (Geo-centric) 1.90 deg ; Note: the calculations take topocentric advantage into account

| | | | | | | |
|--------|----------|-----|--------|------|--------|-----|
| Uplink | I, psd | -47 | dBW/hz | Tx F | 14.000 | GHz |
| Dnlink | I, eirpd | -20 | dBW/hz | Rx F | 11.700 | GHz |

| 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 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| Transmit ES Peak gain | 54.2 | 54.2 | 54.2 | 54.2 | 54.2 | 54.2 | 54.2 | 54.2 | 54.2 | 54.2 | 54.2 | 54.2 |
| RX ES Size | 1.2 | 12.0 | 1.2 | 12.0 | 3.0 | 12.0 | 0.9 | 12.0 | 0.9 | 12.0 | 1.2 | 12.0 |
| Receive ES Gain | 41.1 | 61.1 | 41.1 | 61.1 | 49.1 | 61.1 | 38.6 | 61.1 | 38.6 | 61.1 | 41.1 | 61.1 |
| Receive ES G/T (Temp=105K) | 20.9 | 40.9 | 20.9 | 40.9 | 28.9 | 40.9 | 18.4 | 40.9 | 18.4 | 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 | 2.1 | 5.0 | 1.3 | 5.0 | 4.9 | 5.0 | 2.9 | 5.0 | 2.6 | 5.0 | 2.6 | 5.0 |
| C/N, Threshold + margin | 12.64 | 15.54 | 11.84 | 15.54 | 15.44 | 15.54 | 7.43 | 9.53 | 7.13 | 9.53 | 7.13 | 9.53 |
| Nominal e/s e.i.r.p. per carrier @ES(dBW) | 49.6 | 43.1 | 49.6 | 47.7 | 49.6 | 43.5 | 52.6 | 39.7 | 52.6 | 44.3 | 52.6 | 39.8 |
| TX ES PSD | -50.0 | -56.5 | -50.0 | -51.9 | -50.0 | -56.1 | -50.0 | -62.9 | -50.0 | -58.3 | -50.0 | -62.8 |
| ES eirp @ bp-- minimum (dBW) | 46.2 | 39.7 | 41.2 | 39.3 | 46.2 | 40.1 | 49.2 | 36.3 | 44.2 | 35.9 | 49.2 | 36.4 |
| Sat G/T at bp | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 |
| Sat G/T at e/s | 1.1 | 1.1 | -3.9 | -3.9 | 1.1 | 1.1 | 1.1 | 1.1 | -3.9 | -3.9 | 1.1 | 1.1 |
| Free space path loss (dB) | 206.9 | 206.9 | 206.6 | 206.6 | 206.9 | 206.9 | 206.9 | 206.9 | 206.6 | 206.6 | 206.9 | 206.9 |
| 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) | 27.0 | 20.5 | 22.3 | 20.4 | 27.0 | 20.9 | 27.0 | 14.1 | 22.3 | 14.0 | 27.0 | 14.2 |
| 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 | 34.6 | 28.1 | 34.6 | 32.7 | 34.6 | 28.5 | 34.6 | 21.7 | 34.6 | 26.3 | 34.6 | 21.8 |
| C/I - copol asi uplink (dB) | 26.8 | 20.3 | 21.8 | 19.9 | 26.8 | 20.7 | 26.8 | 13.9 | 21.8 | 13.5 | 26.8 | 14.0 |
| 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+others, uplink | 22.3 | 16.6 | 18.5 | 16.6 | 22.3 | 17.0 | 22.3 | 10.5 | 18.5 | 10.5 | 22.3 | 10.6 |
| Downlink e.i.r.p. -bp (dBW) | 49.5 | 49.5 | 49.5 | 49.5 | 49.5 | 49.5 | 49.5 | 49.5 | 49.5 | 49.5 | 49.5 | 49.5 |
| Downlink BP-BE difference | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| DL ES Pattern Advantage | 5 | 5 | 5 | 5 | 0 | 0 | 5 | 5 | 5 | 5 | 0 | 0 |
| Satellite e.i.r.p.d. per carrier (dBW)-tow es | -25.0 | -28.5 | -25.0 | -28.5 | -30.0 | -33.5 | -25.0 | -28.5 | -25.0 | -28.5 | -30.0 | -33.5 |
| Satellite e.i.r.p.d. per carrier (dBW)-bp | -23.0 | -26.5 | -23.0 | -26.5 | -23.0 | -26.5 | -23.0 | -26.5 | -23.0 | -26.5 | -23.0 | -26.5 |
| Satellite e.i.r.p. per carrier (dBW)-bp | 22.4 | 18.9 | 22.4 | 18.9 | 22.4 | 18.9 | 25.4 | 21.9 | 25.4 | 21.9 | 25.4 | 21.9 |
| Satellite e.i.r.p. per carrier (dBW)-ES | 20.4 | 16.9 | 20.4 | 16.9 | 15.4 | 11.9 | 23.4 | 19.9 | 23.4 | 19.9 | 18.4 | 14.9 |
| Free space path loss (dB) | 205.3 | 205.3 | 205.0 | 205.0 | 205.3 | 205.3 | 205.3 | 205.3 | 205.0 | 205.0 | 205.3 | 205.3 |
| 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) | 25.9 | 42.4 | 26.2 | 42.7 | 28.9 | 37.4 | 23.4 | 42.4 | 23.7 | 42.7 | 20.9 | 37.4 |
| C/N downlink towards ES (dB) | 23.9 | 40.4 | 24.2 | 40.7 | 21.9 | 30.4 | 21.4 | 40.4 | 21.7 | 40.7 | 13.9 | 30.4 |
| C/N-thermal-total | 22.2 | 20.5 | 20.2 | 20.4 | 20.7 | 20.5 | 20.3 | 14.1 | 19.0 | 14.0 | 13.7 | 14.1 |
| Interference & Margins: | | | | | | | | | | | | |
| C/I Co-polar downlink interference d/I(dB) | 20.6 | 38.2 | 20.6 | 38.2 | 24.3 | 33.2 | 11.4 | 38.2 | 11.4 | 38.2 | 15.6 | 33.2 |
| C/I X-polar external interference d/I (dB) | 16.1 | 35.6 | 16.1 | 35.6 | 21.8 | 30.6 | 12.3 | 35.6 | 12.3 | 35.6 | 11.1 | 30.6 |
| Downlink C/(Nth +others) composite with ASI dn | 14.3 | 32.9 | 14.3 | 32.9 | 17.8 | 26.5 | 8.6 | 32.9 | 8.6 | 32.9 | 8.3 | 26.5 |
| Total C/(Nth +) composite with ASI tot | 13.6 | 16.5 | 12.9 | 16.5 | 16.5 | 16.5 | 8.4 | 10.5 | 8.2 | 10.5 | 8.2 | 10.5 |
| Total C/(Nth +others) w/o ASI | 21.3 | 19.6 | 19.6 | 19.6 | 20.1 | 19.6 | 19.7 | 13.9 | 18.5 | 13.8 | 13.6 | 13.9 |
| 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 |
| Available C/N | 12.6 | 15.5 | 11.9 | 15.5 | 15.5 | 15.5 | 7.4 | 9.5 | 7.2 | 9.5 | 7.2 | 9.5 |
| 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 |