

Digital Ku-band link budgets

| S13.c. | K1 | K2 | K3 | K4 | K5 | K6 | K7 |
|---------------------------------------|--|--|---------------------------------|---------------------------------|----------------------|-------------------------|--|
| Parameter | Digital TV MCPC 40 Mbps QPSK ¾ RS | Digital TV MCPC 32 Mbps QPSK ¾ RS | Digital TV SCPC QPSK ¾ RS | Digital TV SCPC QPSK ¾ RS | 56 Kbps QPSK ¾ RS | 1.544 Mbps QPSK ¾ RS | Digital TV MCPC 50 Mbps 8PSK ¾ RS |
| Carrier designation | 36M0G7W | 27M0G7W | 6M95G1W | 5M00G1W | 100KG1W | 1M60G1W | 36M0G7W |
| Noise bandwidth (MHz) | 36 | 27 | 7 | 5 | 0.100 | 1.600 | 36 |
| Uplinks: | | | | | | | |
| Transmit Power (dBW) | 20 | 20 | 8.9 | 8.9 | -2 | 8 | 20 |
| Transmit Loss (dB) | -2.5 | -2.5 | -2.5 | -2.5 | -2.5 | -2.5 | -2.5 |
| TX earth station antenna diameter (m) | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| TX earth station antenna gain (dBi) | 57.2 | 57.2 | 57.2 | 57.2 | 57.2 | 57.2 | 57.2 |
| TX earth station antenna EIRP (dBW) | 74.7 | 74.7 | 63.6 | 63.6 | 52.7 | 62.7 | 74.7 |
| Uplink Rain Loss (dB) | -2 | -2 | -2 | -2 | -2 | -2 | -2 |
| Free Space Loss (dB) | -207 | -207 | -207 | -207 | -207 | -207 | -207 |
| Satellite G/T (dB/K) | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| Boltzmann's Constant (dBW/K-Hz) | -228.6 | -228.6 | -228.6 | -228.6 | -228.6 | -228.6 | -228.6 |
| C/N uplink (dB) | 21.7 | 23.0 | 17.7 | 19.2 | 25.3 | 23.2 | 21.7 |
| C/I uplink (dB) | 27.6 | 28.9 | 23.6 | 25.1 | 31.2 | 29.1 | 27.6 |
| C/N+I uplink (dB) | 20.7 | 22.0 | 16.7 | 18.2 | 24.3 | 22.2 | 20.7 |
| Downlinks: | | | | | | | |
| Satellite Carrier EIRP (dBW) | 49.5 | 48.3 | 38.4 | 36.9 | 19.9 | 32.0 | 45.5 |
| Interference bandwidth (MHz) | 36.0 | 27.0 | 7.0 | 5.0 | 0.1 | 1.6 | 36.0 |
| Satellite EIRP density (dBW/4KHz) | 9.96 | 9.96 | 5.96 | 5.96 | 5.96 | 5.96 | 5.96 |
| Downlink Rain Loss (dB) | -3 | -3 | -3 | -3 | -3 | -3 | -3 |
| Free Space Loss (dB) | -205.4 | -205.4 | -205.4 | -205.4 | -205.4 | -205.4 | -205.4 |
| RX earth station antenna diameter (m) | 1.2 | 1.2 | 1.2 | 1.8 | 1.8 | 1.8 | 1.2 |
| RX earth station antenna G/T (dB/K) | 21.7 | 21.7 | 21.7 | 25.2 | 25.2 | 25.2 | 21.7 |
| C/N downlink (dB) | 15.8 | 15.8 | 11.8 | 15.4 | 15.4 | 15.4 | 11.8 |
| C/I downlink (dB) | 17.6 | 17.6 | 13.6 | 17.2 | 17.2 | 17.2 | 13.6 |
| C/N+I downlink (dB) | 13.6 | 13.6 | 9.6 | 13.2 | 13.2 | 13.2 | 9.6 |
| C/N system (dB) | 14.8 | 15.1 | 10.8 | 13.9 | 14.9 | 14.7 | 11.4 |
| C/I system (dB) | 17.2 | 17.3 | 13.2 | 16.5 | 17.0 | 16.9 | 13.5 |
| C/N+I system (dB) | 12.9 | 13.0 | 8.9 | 12.0 | 12.8 | 12.7 | 9.3 |

Digital C-band link budgets

| S13.c. | C1 | C2 | C3 | C4 | C5 | C6 | C7 |
|---------------------------------------|--|--|---------------------------------|---------------------------------|----------------------|-------------------------|--|
| | Digital TV MCPC 40 Mbps QPSK ¾ RS | Digital TV MCPC 32 Mbps QPSK ¾ RS | Digital TV SCPC QPSK ¾ RS | Digital TV SCPC QPSK ¾ RS | 56 Kbps QPSK ¾ RS | 1.544 Mbps QPSK ¾ RS | Digital TV MCPC 50 Mbps 8PSK ¾ RS |
| Carrier designation | 36M0G7W | 27M0G7W | 6M95G1W | 5M00G1W | 100KG1W | 1M60G1W | 36M0G7W |
| Noise bandwidth (MHz) | 36 | 27 | 7 | 5 | 0.100 | 1.600 | 36 |
| Uplinks: | | | | | | | |
| Transmit Power (dBW) | 25.1 | 20 | 9.6 | 12 | -3.4 | 11.8 | 25.1 |
| Transmit Loss (dB) | -2.5 | -2.5 | -2.5 | -2.5 | -2.5 | -2.5 | -2.5 |
| TX earth station antenna diameter (m) | 9 | 9 | 9 | 9 | 4.5 | 4.5 | 9 |
| TX earth station antenna gain (dBi) | 53.2 | 53.2 | 53.2 | 53.2 | 47.2 | 47.2 | 53.2 |
| TX earth station antenna EIRP (dBW) | 75.8 | 70.7 | 60.3 | 62.7 | 41.3 | 56.5 | 75.8 |
| Uplink Rain Loss (dB) | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Free Space Loss (dB) | -199.7 | -199.7 | -199.7 | -199.7 | -199.7 | -199.7 | -199.7 |
| Satellite G/T (dB/K) | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| Boltzmann's Constant (dBW/K-Hz) | -228.6 | -228.6 | -228.6 | -228.6 | -228.6 | -228.6 | -228.6 |
| C/N uplink (dB) | 32.1 | 28.3 | 23.7 | 27.6 | 23.2 | 26.3 | 32.1 |
| C/I uplink (dB) | 20.7 | 16.9 | 12.3 | 16.2 | 11.8 | 14.9 | 20.7 |
| C/N+I uplink (dB) | 20.4 | 16.6 | 12.0 | 15.9 | 11.5 | 14.6 | 20.4 |
| Downlinks: | | | | | | | |
| Satellite Carrier EIRP (dBW) | 39 | 37.8 | 31.9 | 30.4 | 13.4 | 25.5 | 39.0 |
| Interference bandwidth (MHz) | 36 | 27 | 7 | 5 | 0.100 | 1.600 | 36 |
| Satellite EIRP density (dBW/4KHz) | -0.54 | -0.54 | -0.54 | -0.54 | -0.54 | -0.54 | -0.54 |
| Downlink Rain Loss (dB) | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Free Space Loss (dB) | -195.8 | -195.8 | -195.8 | -195.8 | -195.8 | -195.8 | -195.8 |
| RX earth station antenna diameter (m) | 3.8 | 3.8 | 3.8 | 3.8 | 3.8 | 3.8 | 3.8 |
| RX earth station antenna G/T (dB/K) | 22.2 | 22.2 | 22.2 | 22.2 | 22.2 | 22.2 | 22.2 |
| C/N downlink (dB) | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 | 18.4 |
| C/I downlink (dB) | 18.2 | 18.2 | 18.2 | 18.2 | 18.2 | 18.2 | 18.2 |
| C/N+I downlink (dB) | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 | 15.3 |
| C/N system (dB) | 18.2 | 18.0 | 17.3 | 17.9 | 17.2 | 17.8 | 18.2 |
| C/I system (dB) | 16.2 | 14.5 | 11.3 | 14.1 | 10.9 | 13.2 | 16.2 |
| C/N+I system (dB) | 14.1 | 12.9 | 10.3 | 12.6 | 10.0 | 11.9 | 14.1 |

TV-FM C and Ku link budget

| S13.d. Parameter | K8 | C8 |
|---------------------------------------|----------------------------------|---------------------------------|
| | Ku-band Typical TV/FM link | C-band Typical TV/FM link |
| Carrier designation | 36M0F3F | 36M0F3F |
| Uplinks: | | |
| Transmit Power (dBW) | 22 | 25 |
| Transmit Loss (dB) | -1 | -0.5 |
| TX earth station antenna diameter (m) | 6.1 | 9 |
| TX earth station antenna gain (dBi) | 57.3 | 53.5 |
| TX earth station antenna EIRP (dBW) | 78.3 | 78.0 |
| Uplink Rain Loss (dB) | -2 | -1 |
| Free Space Loss (dB) | -207 | -199.7 |
| Satellite G/T (dB/K) | 3 | 1.3 |
| Bandwidth (dB-Hz) | 75.6 | 75.6 |
| Boltzmann's Constant (dBW/K-Hz) | -228.6 | -228.6 |
| C/N, uplink (dB) | 25.4 | 31.7 |
| Downlinks: | | |
| Satellite Carrier EIRP (dBW) | 48.2 | 42 |
| Downlink Rain Loss (dB) | -3 | -0.5 |
| Free Space Loss (dB) | -205.4 | -195.8 |
| RX earth station antenna diameter (m) | 1.2 | 3.8 |
| RX earth station antenna G/T (dB/K) | 21.7 | 22.1 |
| C/N downlink (dB) | 14.5 | 20.8 |
| C/I ASI (dB) | 17.3 | 17.6 |
| C/N Total (dB) | 12.7 | 15.9 |
| Required (dB) | 11 | 11 |
| Margin (dB) | 1.7 | 4.9 |

Ka-band link budget

| S13.c. | KA1 | KA2 |
|--|------------|------------|
| Carrier designation | 1M20G1W | 5M50G1W |
| Required bandwidth (MHz) | 1.2 | 5.5 |
| C/N required (dB) | 4.7 | 1.3 |
| Faded system margin (dB) | 0.5 | 0.5 |
| Uplink | | |
| Transmit Power (dBW) | 4 | 10.5 |
| TX earth station antenna diameter (m) | 9 | 9 |
| TX earth station antenna gain (dBi) | 65.6 | 65.6 |
| TX earth station input power density (dBW/MHz) | 3.2 | 3.1 |
| TX earth station antenna EIRP (dBW) | 69.6 | 76.1 |
| Uplink Rain Loss (dB) | 0 | 0 |
| Uplink Path Loss (dB) | -212.2 | -212.2 |
| Boltzmann's Constant (dBW/K-Hz) | -228.6 | -228.6 |
| Satellite G/T (dB/K) | -8 | -8 |
| C/N uplink (dB) | 17.2 | 17.1 |
| C/I X-pol uplink (dB) | 30 | 30 |
| Downlink | | |
| Satellite Carrier EIRP (dBW) | 29.6 | 31.6 |
| RX earth station antenna diameter (m) | 0.95 | 1.5 |
| RX earth station antenna G/T (dB/K) | 22.9 | 26.9 |
| Downlink path loss (dB) | -209.1 | -209.1 |
| C/N downlink clear-sky (dB) | 11.3 | 10.6 |
| Min C/N down (dB) | 6.2 | 2.6 |
| C/I ASI (dB) | 12.2 | 9.5 |
| C/I Total (dB) | 12.0 | 9.5 |
| Rain margin to min C/N down (dB) | 5.0 | 8.0 |

Command link budget

| CMD S13.d | KTC | CTC |
|---|---------|--------|
| | Ku-band | C-band |
| TX earth station antenna diameter (m) | 8.4 | 13 |
| TX earth station antenna gain (dBi) | 60.2 | 57.0 |
| TX earth station input power (dBW) | 10 | 10 |
| TX earth station EIRP (dBW) | 70.2 | 67.0 |
| Link loss (dB) | 207.5 | 200.1 |
| Satellite G/T (dB/K) | 6 | 2 |
| Command carrier bandwidth (MHz) | 1 | 1 |
| TX earth station input power density (dBW/Hz) | -50 | -50 |
| C/N (dB) | 37.3 | 37.5 |
| C/N Required (dB) | 10 | 10 |
| Margin | 27.3 | 27.5 |

Telemetry link budget

| TLM S13.d | KTM | CTM |
|---------------------------------------|---------|--------|
| | Ku-band | C-band |
| EIRP (dBW) | 19 | 16 |
| Carrier bandwidth (MHz) | 0.5 | 0.5 |
| EIRP density (dBW/4 kHz) | -1.97 | -4.97 |
| RX earth station antenna diameter (m) | 5.7 | 4.5 |
| RX earth station antenna gain (dBi) | 55.0 | 43.0 |
| RX earth station antenna G/T (dB/K) | 34.6 | 22.5 |
| Rain fade (dB) | 8 | 1 |
| C/N (dB) | 10.21 | 9.16 |
| C/N Required (dB) | 9 | 9 |
| Margin | 1.2 | 0.2 |