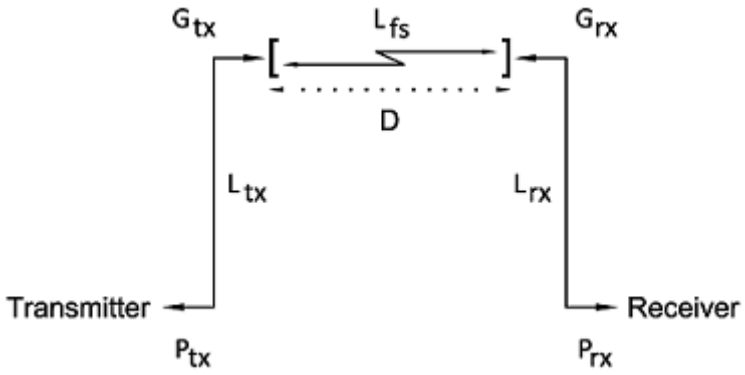
Link Power Budget for Earth Station

PAINANI II

Telecommand Frequency

VHF Up link power budget

Prx (VHF band) = Ptx + Gtx – Ltx – Lfs – Lrx + Grx



Where:

Transmitter Output Power = Ptx, Transmitter Antenna Gain = Gtx, Transmitter Loss = Ltx, Free space loss = Lfs, Receiver Loss = Lrx, Receiver Antenna Gain = Grx

If the orbit height is 600 Km, then the distance at 0° will be 2830.8 km, so the free space loss is: 20Log (4π 2830000/2.06)= 144.7dB, using this value in the Up link power budget calculation we have:

$P_{rx\ 0^\circ}$ (VHF band) = 33dBm + 11.5dBi – 3dB – 144.7dB – 0.3dB + 2dBi = -101.5dBm

Remark 1: In this calculation we consider an output power of 2 Watts (33 dBm) because this is the minimum output power of the ICOM radio in the earth station. UNAM must confirm if the received power in the space station is enough in accordance with the sensitivity of the Astrodev Radio. If not, then the Transmitter output power can be adjusted considering a maximum power of 48 dBm (75 W)

Remark 2: Yagi Antenna gain is 11.5 dBi

Remark 3: The equivalent noise temperature in transmitter antenna is not relevant in the Up link power budget calculation.

Telemetry Frequencies

(UHF down link power budget)

If the orbit height is 600 Km, then the distance at 0° will be 2830.8 km, so the free space loss is: 20Log (4π 2830000/0.686)= 154.2dB, using this in the **down link power budget** we have:

Prx (UHF band) = Ptx + Gtx – Ltx – Lfs – Lrx + Grx

$P_{rx\ 0^\circ}$ (UHF band) = 30dBm + 2dBi – 0.3dB – 154.2dB – 6.5dB + 14.8dBi = -114.2dBm

It is recommended that the output power of the space station transmitter must be at least 30 dBm (1W)