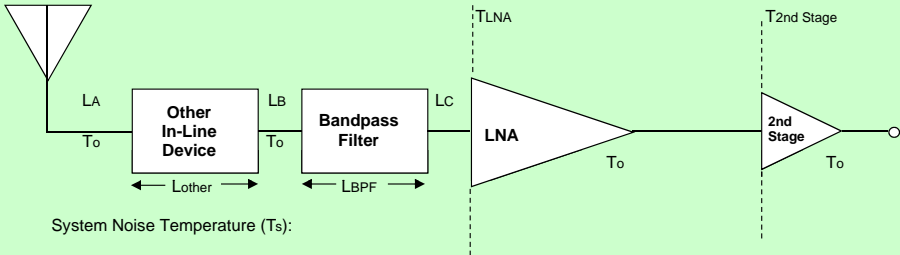


Uplink Receiver System (At Spacecraft):

NOTE:

Block Diagram:



$T_s = (\alpha)T_a + (1-\alpha)T_o + T_{LNA} + T_{2ndStage}/GLNA$

Where:

- $T_a$  = Antenna Temperature or Sky Temperature (°K)
  - $T_o$  = System Line Temperature (Physical Temperature) (°K) = System Reference Temperature
  - $T_{LNA}$  = Noise Temperature of the Low Noise Amplifier (°K)
  - $T_{2nd\ Stage}$  = Noise Temperature of Next Stage Amplifier or Mixer (°K)
  - $GLNA$  = The gain of the LNA in linear (non-dB) units
  - $\alpha$  = Feed Line Coefficient =  $10^{-(LA/10)-(LB/10)-(LC/10)-(LBPF/10)-(Lothier/10)}$
- Where:

- $LA, LB, LC$  = All Cable or Waveguide Losses (expressed in dB)
- $LBPF$  = Insertion Loss of any bandpass filter used in front of LNA (expressed in dB)
- $Lothier$  = Insertion Loss of any other In-Line device in front of LNA (expressed in dB)

Cable or Waveguide "Line" Losses:

Line A Length:	0.3	meters
Line B Length:	0	meters
Line C Length:	0	meters
Cable/Guide Type:	MicroCoax MCJ185A	cable
Cable/Guide Loss/meter:	0.1	dB at frequency 7145.0 MHz
Line A Loss:	LA =	0.03 dB
Line B Loss:	LB =	0 dB
Line C Loss:	LC =	0 dB
Bandpass Filter Insertion Loss:	LBPF =	0.0 dB
Insertion Loss of Other In-Line Devices:	Lothier =	0 dB
No. of In-Line Connectors:	2 X .05 dB/Con.=	0.1 dB
Other In-Line Device Type:	none	
Total In-Line Losses from Antenna to LNA:	0.13	dB
Transmission Line Coefficient:	$\alpha$ =	0.9705
Antenna or "Sky" Temperature:	NOTE:	$T_a$ = 290 K
Spacecraft Temperature:	$T_o$ =	3.9 K
LNA Temperature:	$T_{LNA}$ =	0.8 K
LNA Gain:	40.0	dB
	$GLNA$ =	10000.0

Noise Temperature/Noise Figure Calculator (Tool):

NOTE:

$NF_{dB} = 10 \log_{10}[1+(T/T_o)]$   
or  
 $T = T_o[10^{(NF_{dB}/10)}-1]$

$T_o$  = 3.9 K

$NF_{dB}$  = 0.8 dB       $T$  = 0.8 K

OR

$T$  = 200.0 K       $NF_{dB}$  = 17.18 dB

2nd Stage Temperature:

T<sub>2ndStage</sub> = 0 K

System Noise Temperature:

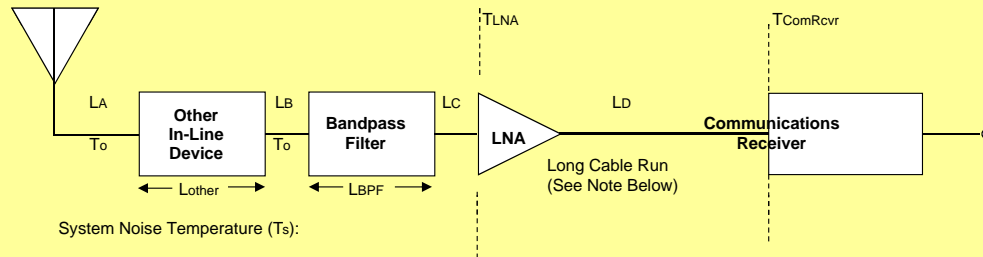
T<sub>s</sub> = 282.4 K

Enter Data Here:

Result is Here

### Downlink Receiver System (At Ground Station):

#### Block Diagram:



System Noise Temperature (T<sub>s</sub>):

$$T_s = (\alpha)T_a + (1-\alpha)T_o + T_{LNA} + T_{ComRcvr}/(GLNA/LD)$$

Where:

T<sub>a</sub> = Antenna Temperature or Sky Temperature (°K)

T<sub>o</sub> = System Line Temperature (Physical Temperature) (°K)

T<sub>LNA</sub> = Noise Temperature of the Low Noise Amplifier (°K)

T<sub>ComRcvr</sub> = Noise Temperature of Communications Receiver Front End (°K)

GLNA = The gain of the LNA in linear (non-dB) units

$\alpha$  = Feed Line Coefficient =  $10^{-((LA/10)+(LB/10)+(LC/10)+(LBPF/10)+(Lothcr/10))}$

Where:

LA, LB, LC = All Cable or Waveguide Losses (expressed in dB)

LBPF = Insertion Loss of any bandpass filter used in front of LNA (expressed in dB)

Lothcr = Insertion Loss of any other In-Line device in front of LNA (expressed in dB)

Cable or Waveguide "Line" Losses:

NOTE:

Line A Length: 2.5 meters

Line B Length: 0.3 meters

Line C Length: 0.3 meters

Cable/Guide Type: Belden 9913 cable

Cable/Guide Loss/meter: 0.092 dB (at freq.) 32000.0 MHz

Line A Loss: LA = 0.23 dB

Line B Loss: LB = 0.0276 dB

Line C Loss: LC = 0.0276 dB

Bandpass Filter Insertion Loss: LBPF = 0.0 dB

Insertion Loss of Other In-Line Devices: Lothcr = 0.0 dB

No. of In-Line Connectors: 4 X 0.05 dB/con. = 0.2 dB

Other In-Line Device Type: none

Total In-Line Losses from Antenna to LNA: 0.49 dB

Transmission Line Coefficient:  $\alpha$  = 0.8943

#### Ground Station, Antenna or Sky Noise Temperature Calculation Tool:

Galactic Noise Component:

Receiver Frequency: 32000 MHz

Coldest Galactic Noise Temp.: 3 K

Antenna or "Sky" Temperature: **NOTE:**  $T_a =$   K ←

Ground Station Feedline Temperature:  $T_o =$   K

LNA Temperature:  $T_{LNA} =$   K

LNA Gain:  dB  $G_{LNA} =$  1000000.0

Cable/Waveguide D Length: **NOTE:**  meters

Cable/Waveguide D Type:

Cable/Waveguide D Loss/meter:  dB/m

Cable/Waveguide D Loss: 2.3 dB

Communications Receiver Front End Temperature  $T_{ComRcvr} =$   K

System Noise Temperature:  $T_s =$   K

Warmest Galactic Noise Temp:  K

Terrestrial Noise Component:

Receiver Bandwidth:  KHz

**NOTE:** Estimated or Measured Noise Level:  dBm

Noise Source Effective Temperature:  K

Minimum Sky Noise Temp:  K

Maximum Sky Noise Temp:  K