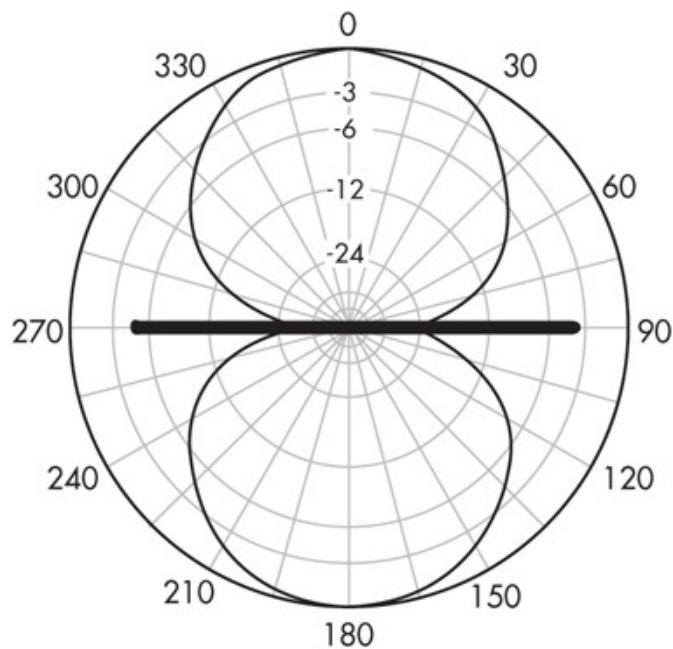


Flight Antenna – Simple Dipole Design



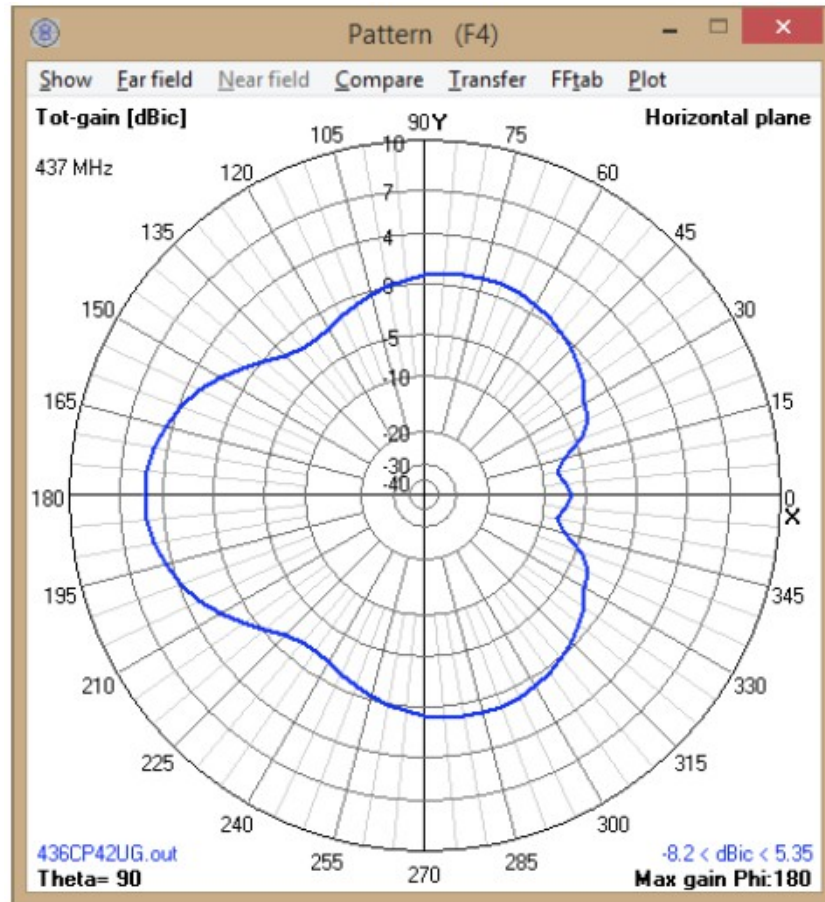
Transmit Power	0. dBW	1 W
Coupling Loss	-0.4 dB	
Antenna Gain	0. dB	Dipole Average
EIRP	-0.4 dBW	0.912011 W
Path Loss	-154.8 dB	437 megahertz 3000 kilometers
Antenna Gain	14.2 dB	
Polarization Loss	-3.0103 dB	RHCP
Coupling Loss	-2.3 dB	
Received Power	-146.31 dBW	2.33876×10^{-15} W
Receiver temperature		150. K
Bit Rate		19 200. b/s
Eb/N0	17.6951	
Threshold	9.4 dB	GMSK Theoretical 10^{-4} BER
Demod loss	-3. dB	Practical
Link Margin	5.29511 dB	

Flight Equipment

Transmitter RFM22B

Note: This flight and ground system shown here have worked with a previous CubeSat see URL: <http://lbysonoma.edu/T-LogoQube> (aka Eagle1 by AirForce). We can operate our RFM22B transceiver at a lower rate ~500 baud if we need extra bandwidth margin.

Ground System



Transmit Power	18.7506 dBW	75 W
Coupling Loss	-3. dB	
Antenna Gain	14.2 dB	RHCP
EIRP	29.9506 dBW	988.693 W
Path Loss	-154.8 dB	437 megahertz 3000 kilometers
Antenna Gain	0. dB	Average
Polarization Loss	-3.0103 dB	Dipole
Coupling Loss	-0.11 dB	
Received Power	-127.97 dBW	1.59605×10^{-13} W
Receiver temperature		1200. K
Bit Rate		9600. b/s
Eb/N0	30.0151	
Threshold	9.4 dB	GMSK Theoretical 10^{-4} BER
Demod loss	-3. dB	Practical
Link Margin	17.6151 dB	

The Spacecraft uses the following receive and transmit frequencies.

Note: Discrete values are expected rather than ranges.

Description	Transmitter 1
Communication System Nominal String	RFM22BP
Carrier Frequency, MHz	437.465 MHz
3 dB Bandwidth, MHz	~0.005 MHz
Necessary Bandwidth per NTIA redbook, MHz	0.0083 MHz
20 dB Bandwidth, MHz	~0.012 MHz
60 dB Bandwidth, MHz	~0.028 MHz
Receiver sensitivity, dBW	-145 dBW
Antenna gain, dBi	2.2dBi
Modulation type and characteristics (total data rate)	GMSK 9600 baud
Receiver Input Damage Threshold*, (line loss included), dBm	Unknown, presumed high with antenna stowed.
Receiver span (MHz)	40 MHz
Intermediate frequency, MHz	937 kHz
Local Oscillator frequency, MHz	436.528 MHz
Transmit Antenna output (EIRP), dBW	1.8 dBW
Receive Antenna Flux Density, dBW/m ² (receiver ON)	Simplex mode: RX off when TX on.
Antenna Description, Polarization	Dipole, linear
Operating on PAD	No
Operating during launch	No
Ground Equipment output power, dBm	20 dBm

*If Spaceflight is not provided Receiver Input Damage Threshold, Spaceflight will assume -40dBm.