Antenna Calibration
for BicoLOG 5070 Biconical Antenna

Prepared by Jose Chavez
2013 Apr 07
LoCo Research Group
Tentative Setup

Comb generator → LPF → Amp → bicoLOG

$R_{\text{farfield}}$
Farfield radial distance

\[ R_{ff} = \frac{2D^2}{\lambda} \]

- \( D \): maximum dimension of transmitting antenna
- \( \lambda \): operating wavelength of transmitting antenna

\[ R_{ff} = 2\lambda \]

- (top) general equation
- (bottom) equation for electrically small antennas, like short dipole and small loops.
**R\_ff** for bicoLOG antenna

\[
R_{ff} = 2\lambda = 2 \left( \frac{c}{f_{\text{min}}} \right) = 2 \cdot \left( \frac{3 \times 10^8 \text{ m}}{50 \text{ MHz}} \right) = 2 \cdot (6 \text{ m}) = 12 \text{ m}
\]

*Distance is too large for the lab.*

*Might be able to use larger frequency (80 MHz), smaller wavelength.*

*Lab setup was 25’’ (7.62 m)*
Radio Link (Friis)

\[ P_r = \left( \frac{\lambda}{4\pi R} \right)^2 G_t G_r P_t \]

- \( P_t \): radiated power by transmitting antenna
- \( P_r \): received power by antenna
- \( G_t \): gain of transmitting antenna
- \( G_r \): gain of receiving antenna
- \( \lambda \): transmitting antenna operating wavelength
- \( R \): radial distance from transmitting antenna
If we want receiving antenna to get a -30dBm signal, solve for $P_t$ and set $P_r$ to be 0.001 mW. (Used linear gain, 80MHz)

\[ P_t = \frac{(4\pi R)^2}{G_t G_r \lambda} P_r \]

\[ P_t = \frac{(4\pi (12 \text{ m}))^2}{(0.0076) (1.5849) (3.75 \text{ m})} (0.001 \text{ mW}) = 133.6 \text{ mW} = 21.26 \text{ dBm} \]

We need approximately a 50 db amplification.
Setup

Comb generator (200 mW) > LPF (SLP-200+) > Amps (ZX60-601E-S+, 16 dB each) > bicoLOG 5070

LPF (6LC-190-S) > Amp > Spectrum Analyzer

R&S HK033
Setup (Transmitting)
Setup (Receiving)
Sweeps

Upright (on)

Power (dBm) vs Frequency (MHz) for the Upright (on) mode.