Stealth Antenna Farm - 2024

Preliminary Considerations

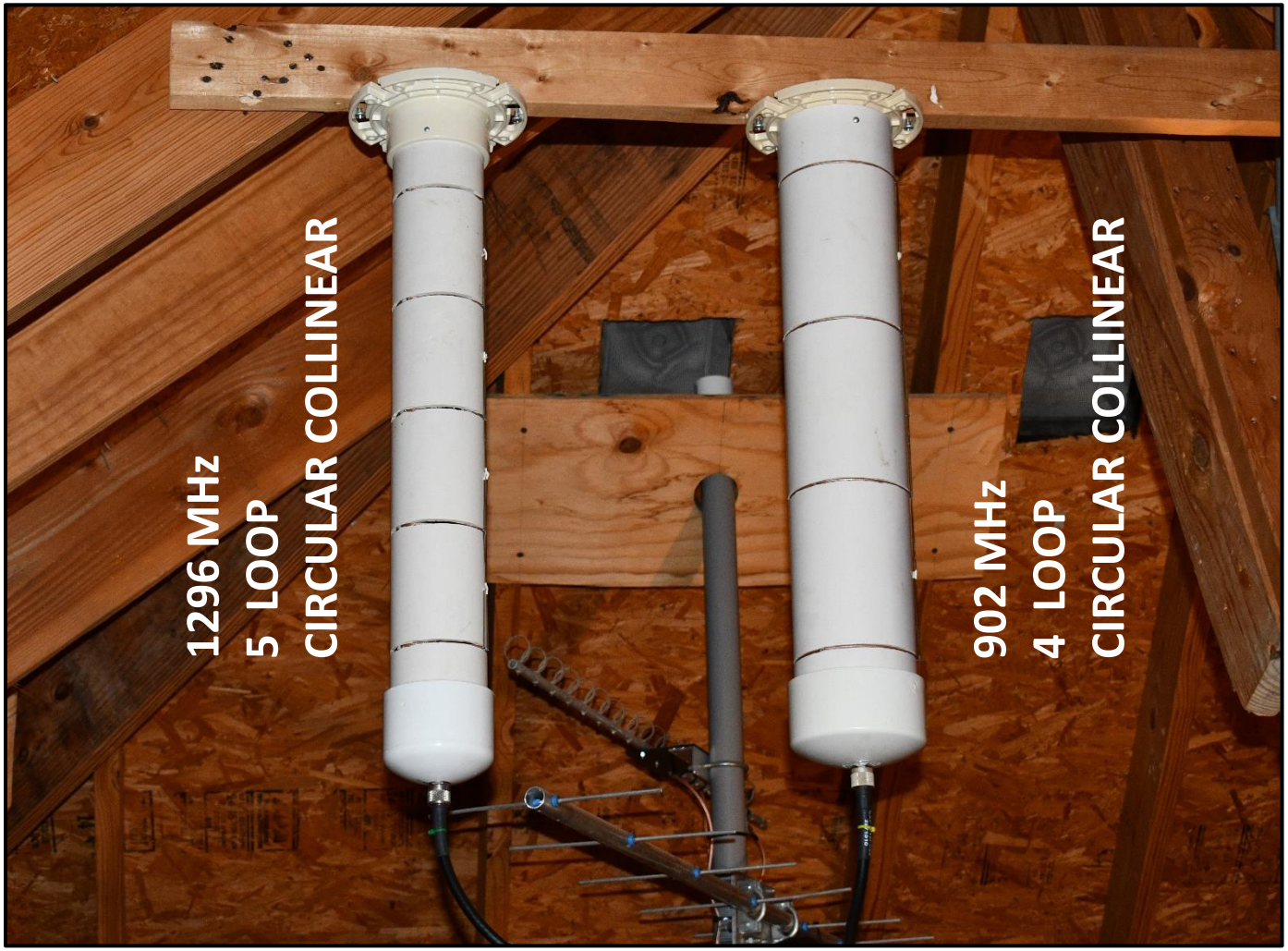
- Why stealth ? Restrictive neighborhood covenants !
- Attic performance factors
  - Location /ground elevation
  - Attic size and height
  - Reflective clutter: furnace/AC/ducting
  - Roof insulation (reflective or not)
  - Feedline routing plan
- Improvements
  - Plywood flooring
  - 120 V AC power
  - Overhead lights
  - CAT-5

Keys to Performance

- **HF**
  - Balanced antennas: large loops or dipoles – eliminates problems with grounding/counterpoise
  - Lots of copper for efficiency – I use copper tubing for my HF loop
  - A good balun with plenty of reserve power rating – I use a 10KW, 4:1
- **VHF-UHF-μWave**
  - Stacked Yagi antennas – closely spaced
  - Line loss management is key to performance at higher frequency bands
    - Remote LNA establishes system NF at antenna –
    - LNA preselector filter is a MUST below 440 MHz
    - Remote PA provides *'free'* boost to transmit power
- **Omni antennas are useful for local QSO's**
- **LAN IP control of remote power supplies for:**
  - LNA/PA
  - 13cm and 3cm transverters
  - Remote power telemetry
  - 6m antenna switching
  - 10 GHz dish control
  - Attic camera
- **Filters are needed with co-located transmitters / repeaters**
  - Receiver desense
  - Reverse IMD
- **Crossband couplers reduce the number feedlines**

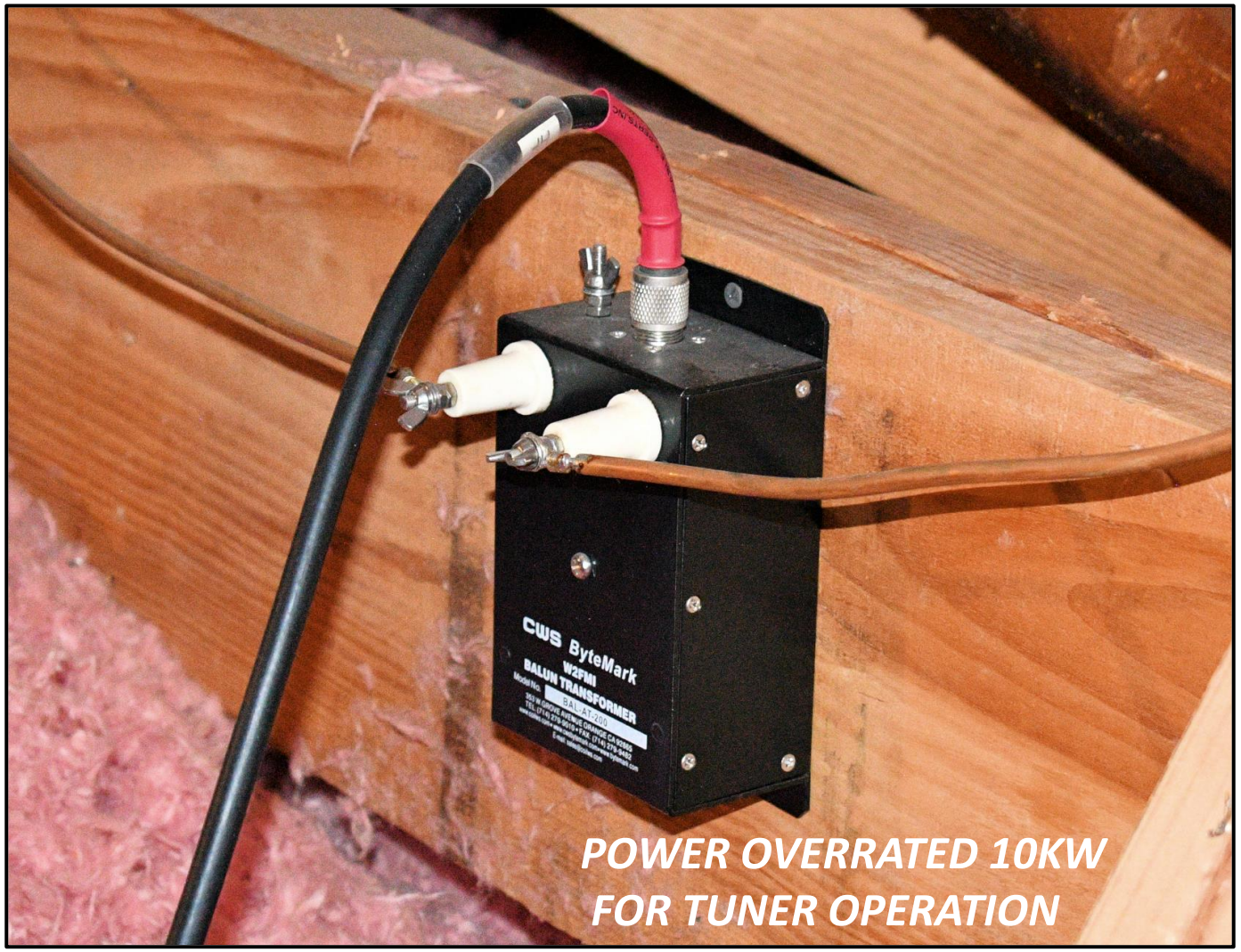
Yagi Antennas

Omni H-Polarized Antennas

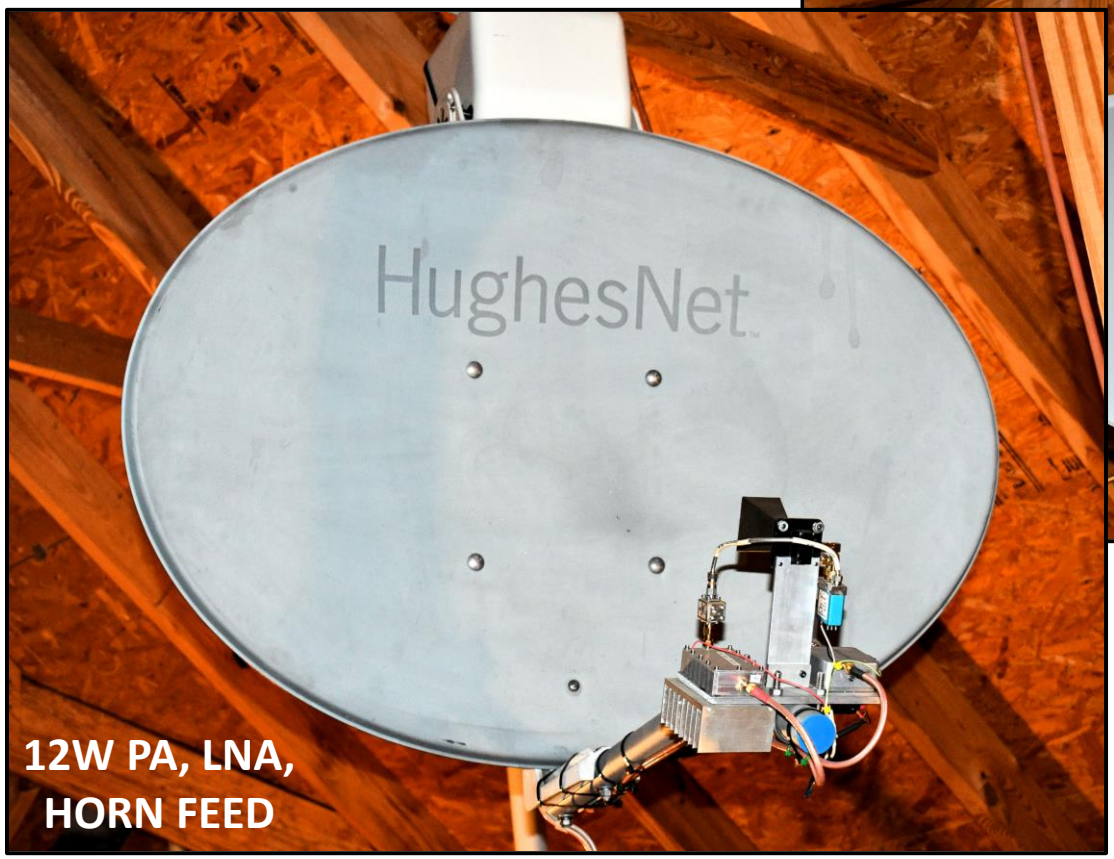


6m Phase Steerable Array

Balun Feed for HF Loop

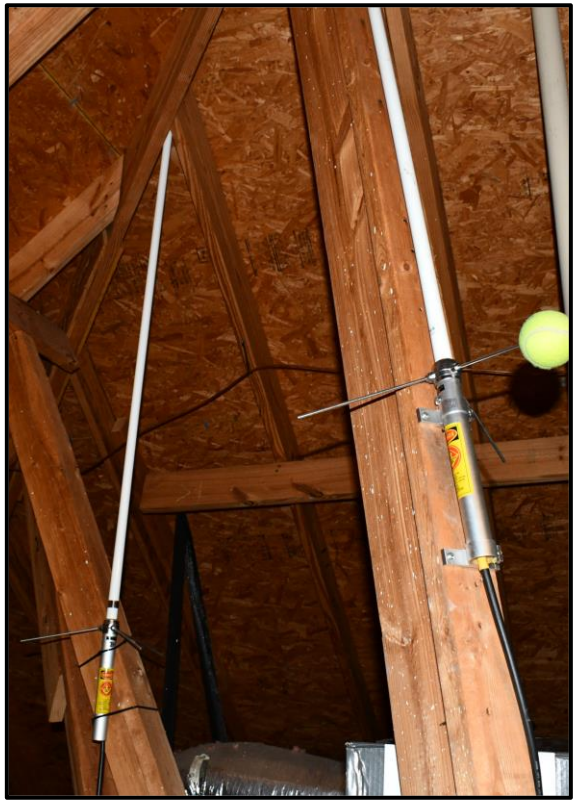


10 GHz Dish



Vertical Omni Antennas





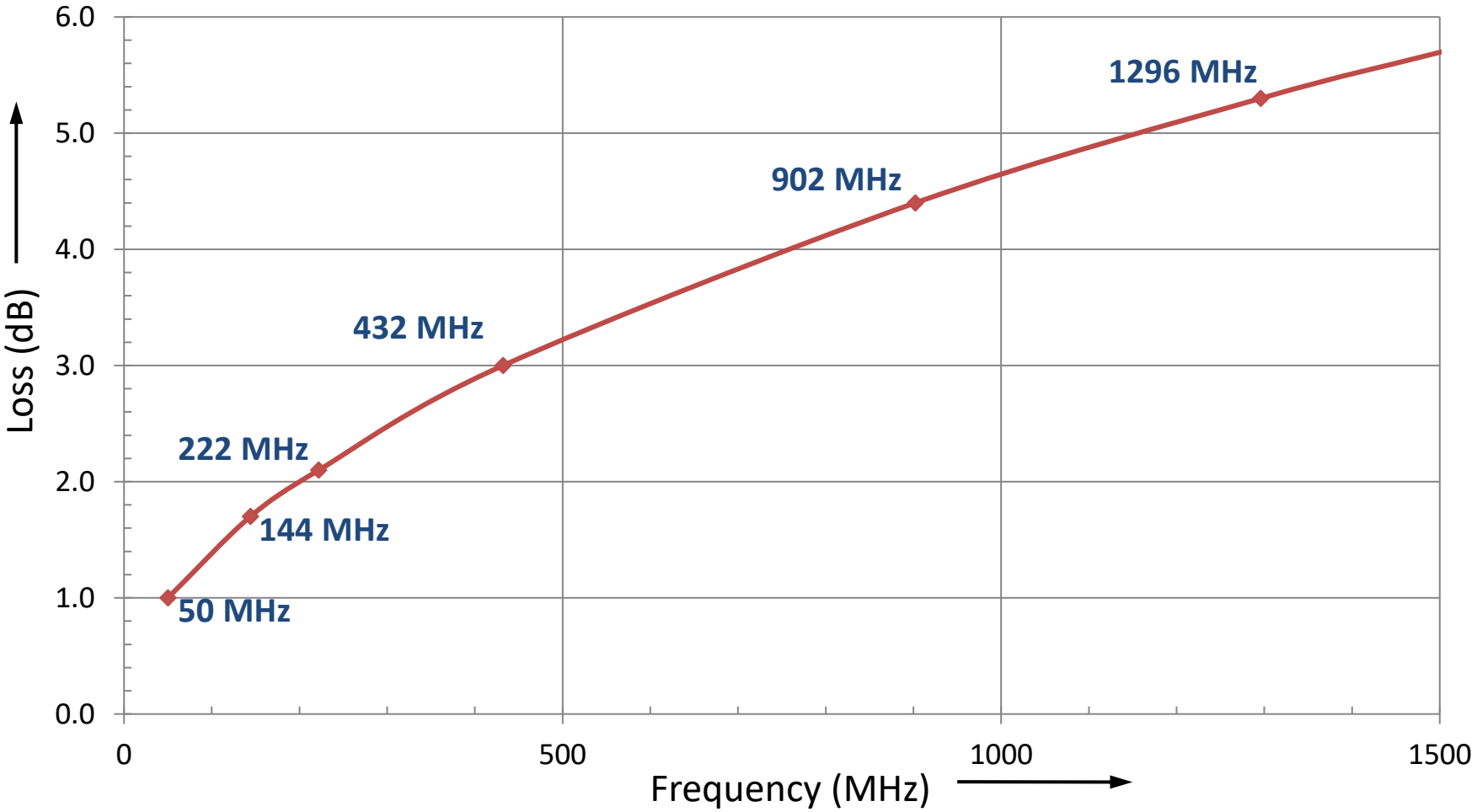

Repeater and Link Vertical Omni's

• 900 MHz FM repeater	SCALA OGB 6-900
• 900 MHz P25 repeater	DB PRODUCTS DB-589
• 900 MHz transceiver	DIAMOND BC-920
• UHF FM/P25/DMR repeater	STATIONMASTER-II
• Link for 900 MHz repeaters	DIAMOND X50
• Auxiliary node	DIAMOND X50
• VHF remote base	DIAMOND X50
• VHF-UHF transceiver	DIAMOND X50

More Than Just Antennas !

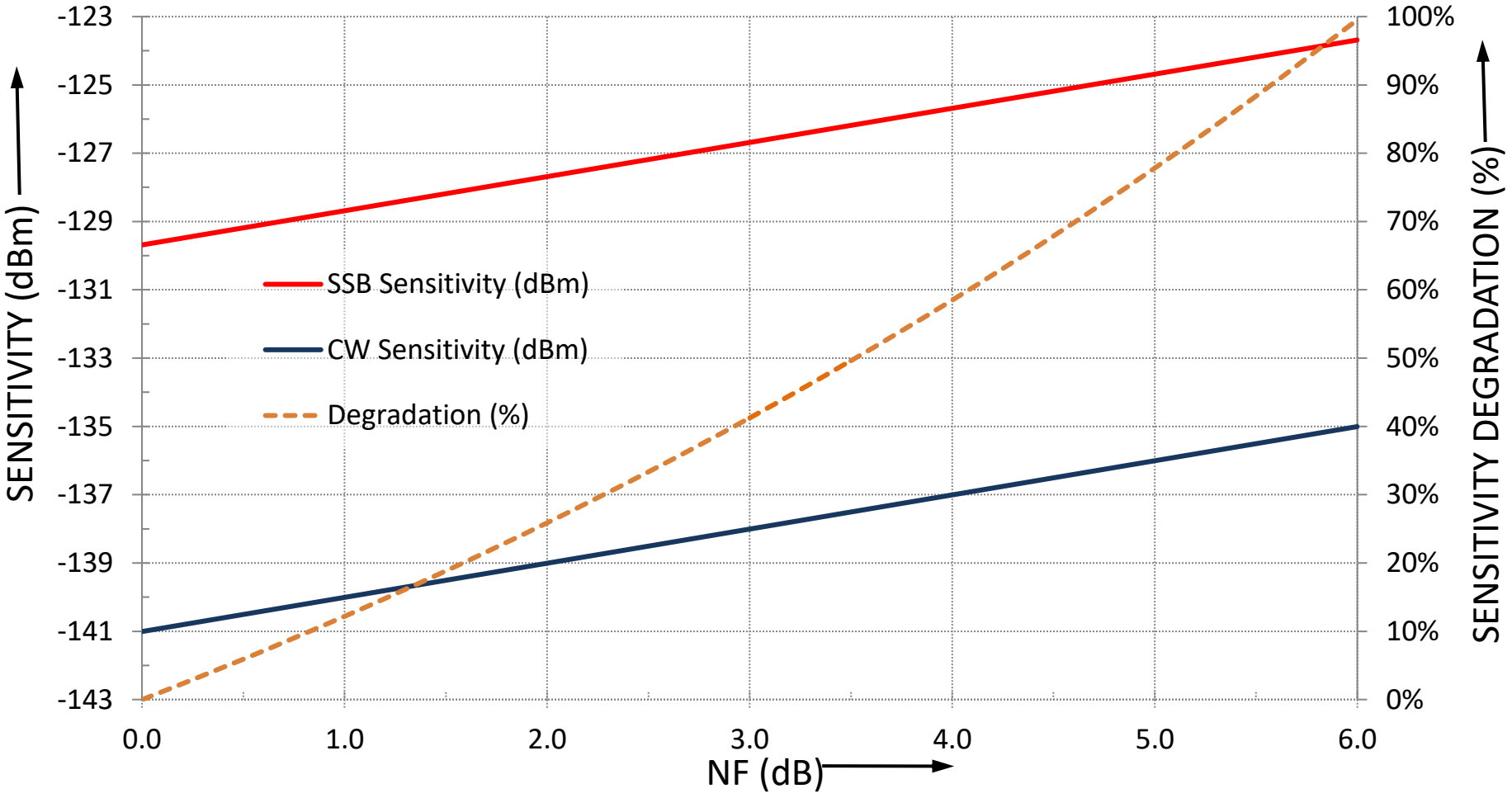
Loss of LMR-400

(100 ft, with connectors)



Sensitivity vs NF

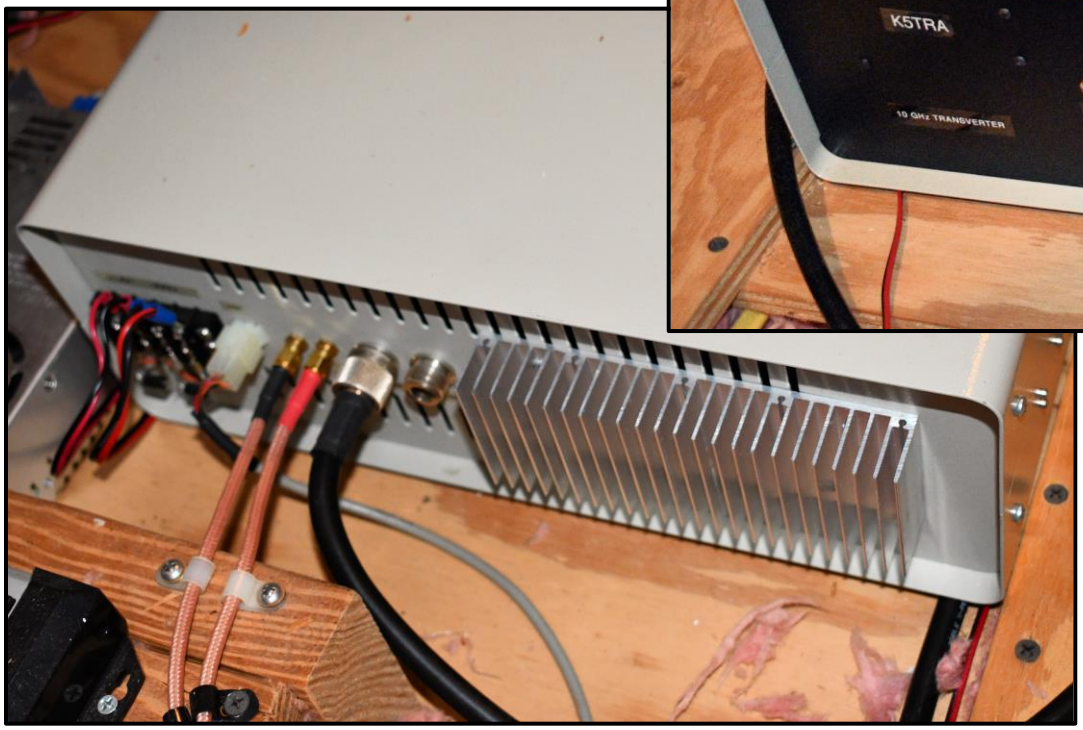
SSB: 2.7 KHz BW, 10 dB S/N, 50 Ω
CW: 500 Hz BW, 6 dB S/N, 50 Ω



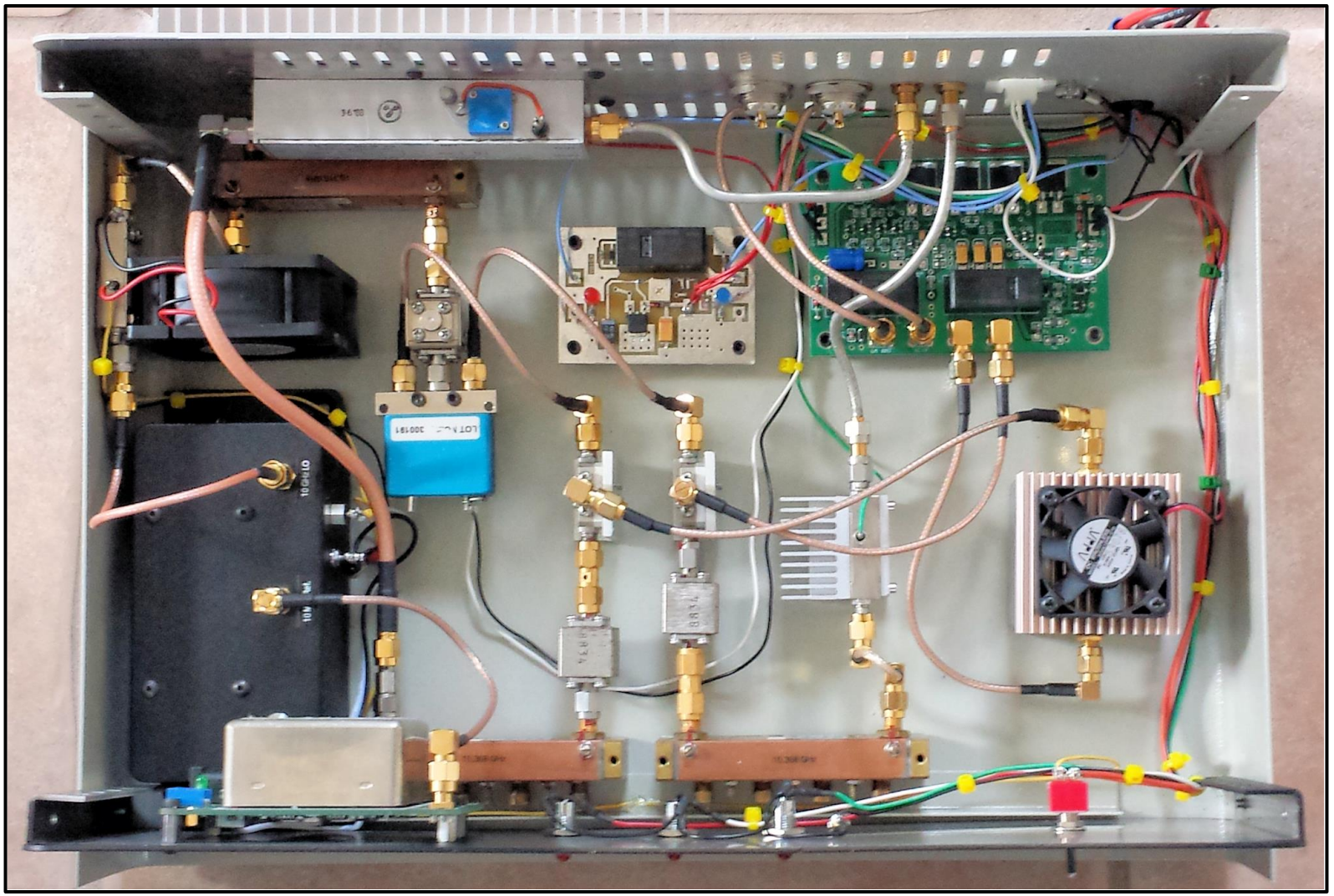
Remote PA and LNA – Huge Benefit

- 100’ LMR400 or 9913 is 5.5 dB loss at 1296 MHz
- A preamp at the antenna will be able to hear a 5 dB weaker signal !
- A PA at the antenna instead of in the shack will give 3.5 times the ERP. A 100W PA will sound like a 350W PA in the shack.
- VHF and UHF preamps need input filters to prevent overload and IMD from broadcast FM and TV.
- Microwave transverter RF line losses are higher; so, remote operation is beneficial .

10 GHz Remote Transverter

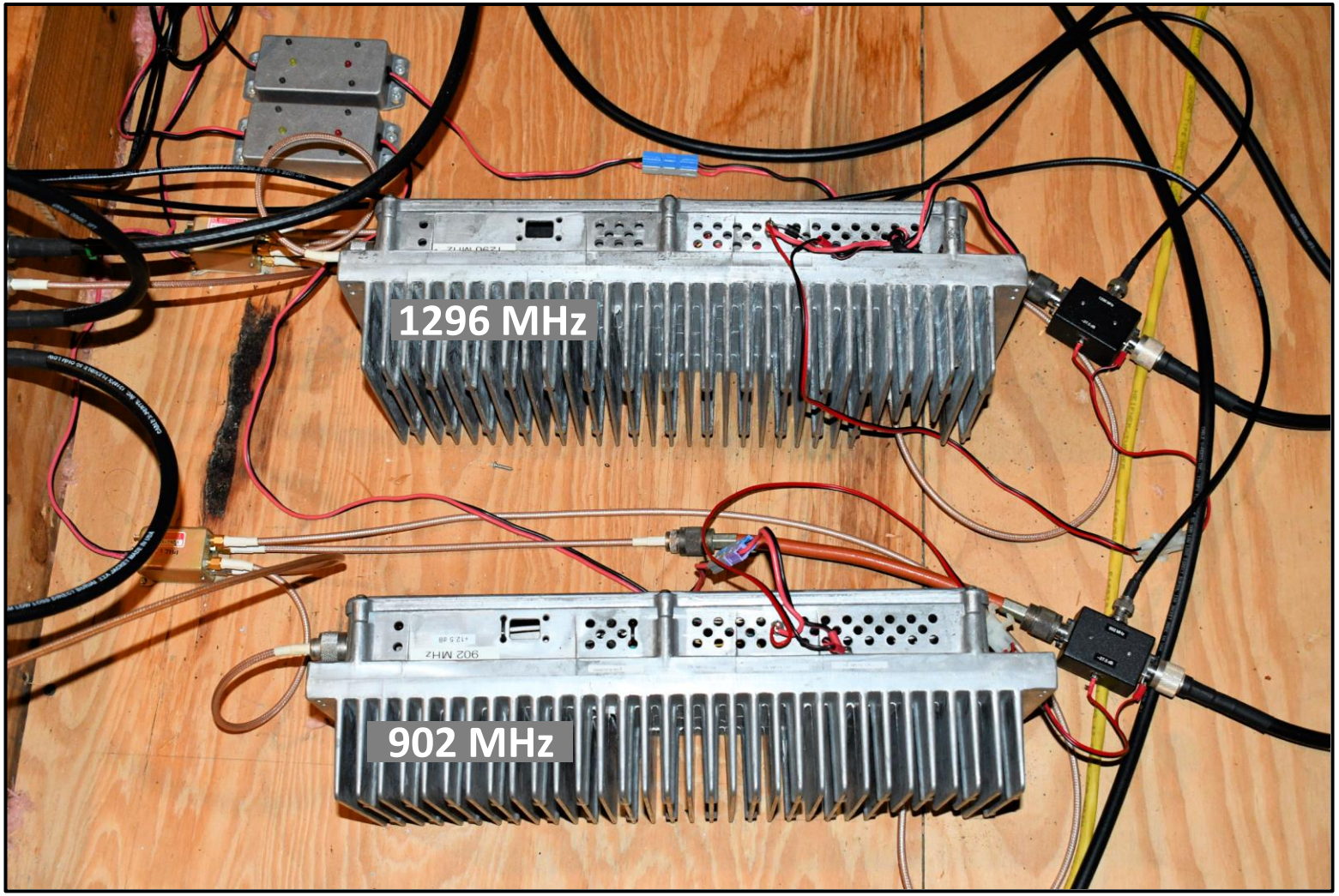


10 GHz Transverter Interior



2304 MHz Remote Transverter (50W)

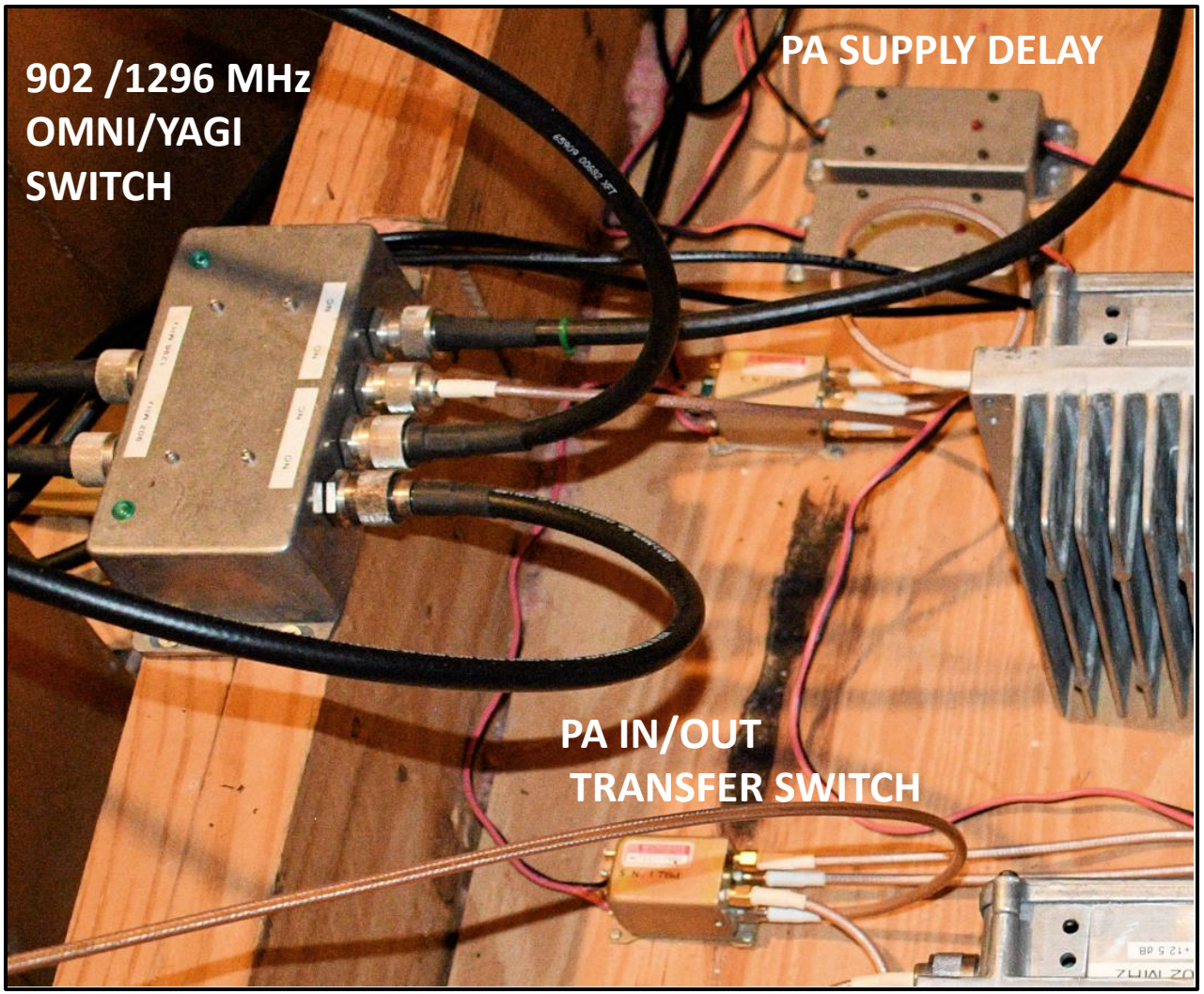
902 and 1296 MHz Remote PA & LNA



902 Bandpass Filters

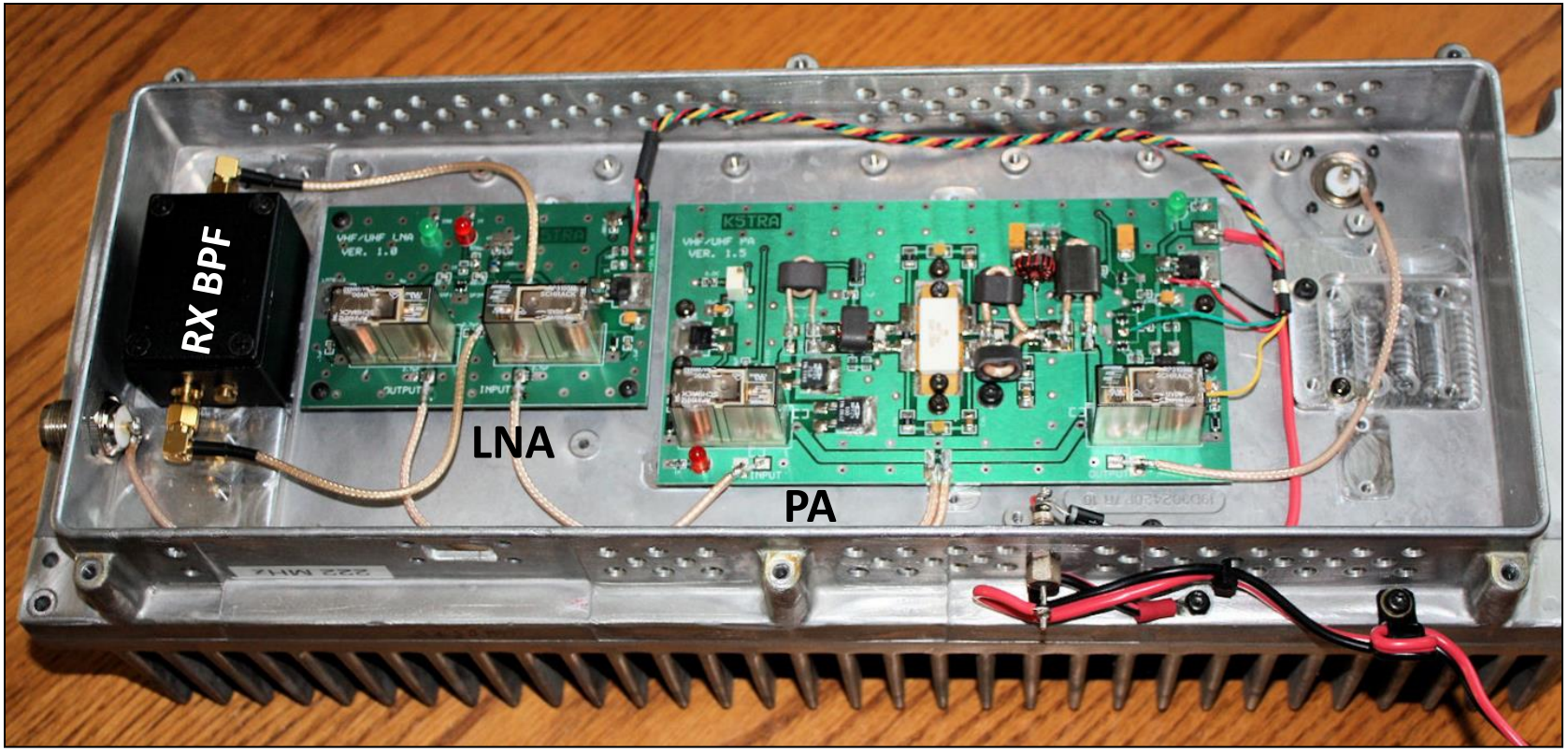
- 902.1 MHz filters to reject co-located 927 MHz repeater signals
- Filters are inline with 902 Yagi and circular collinear omni
- 0.6 dB insertion loss at 902.1 MHz
- > 100 dB rejection of 927 MHz

902 and 1296 MHz Switching

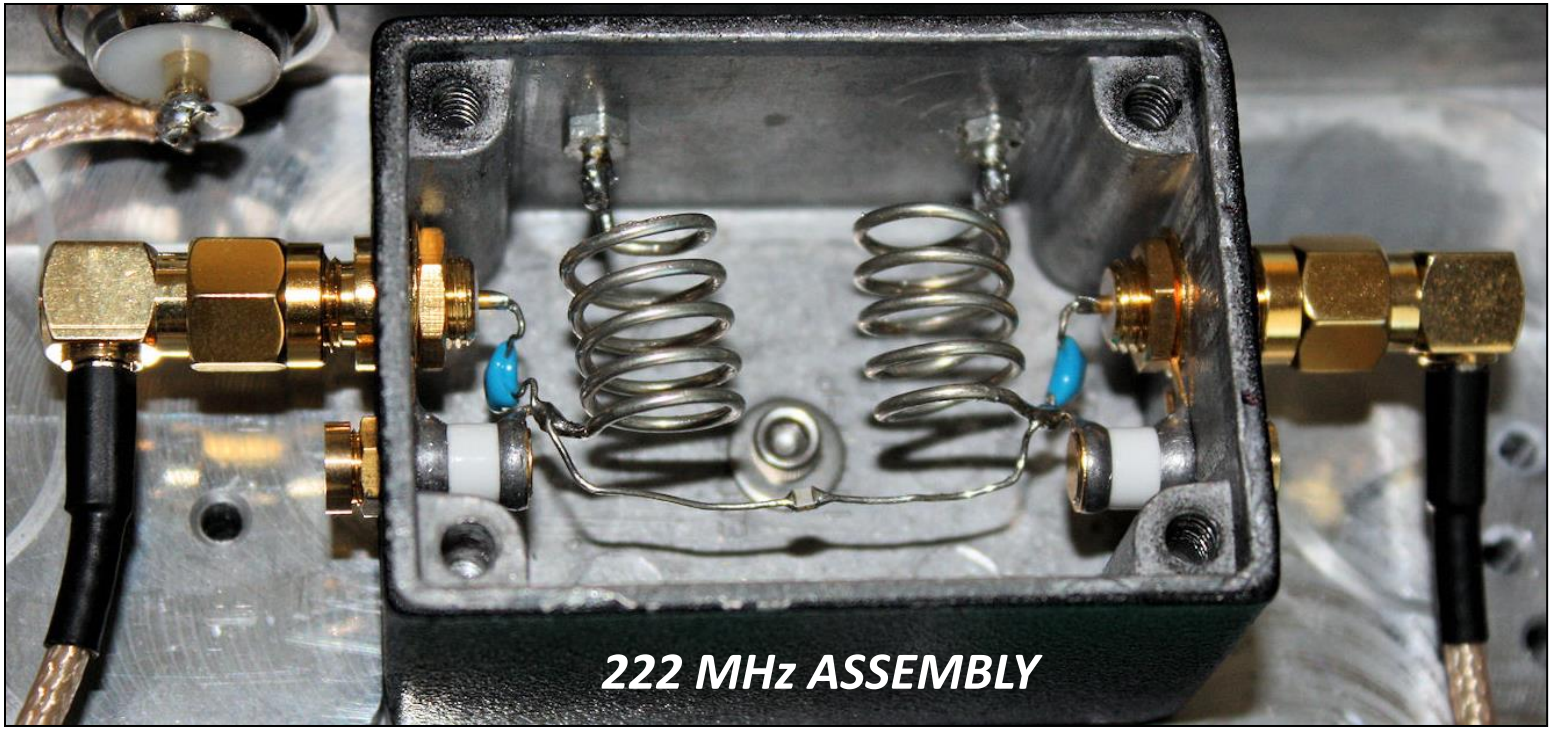


VHF-UHF Remote PA and LNAs

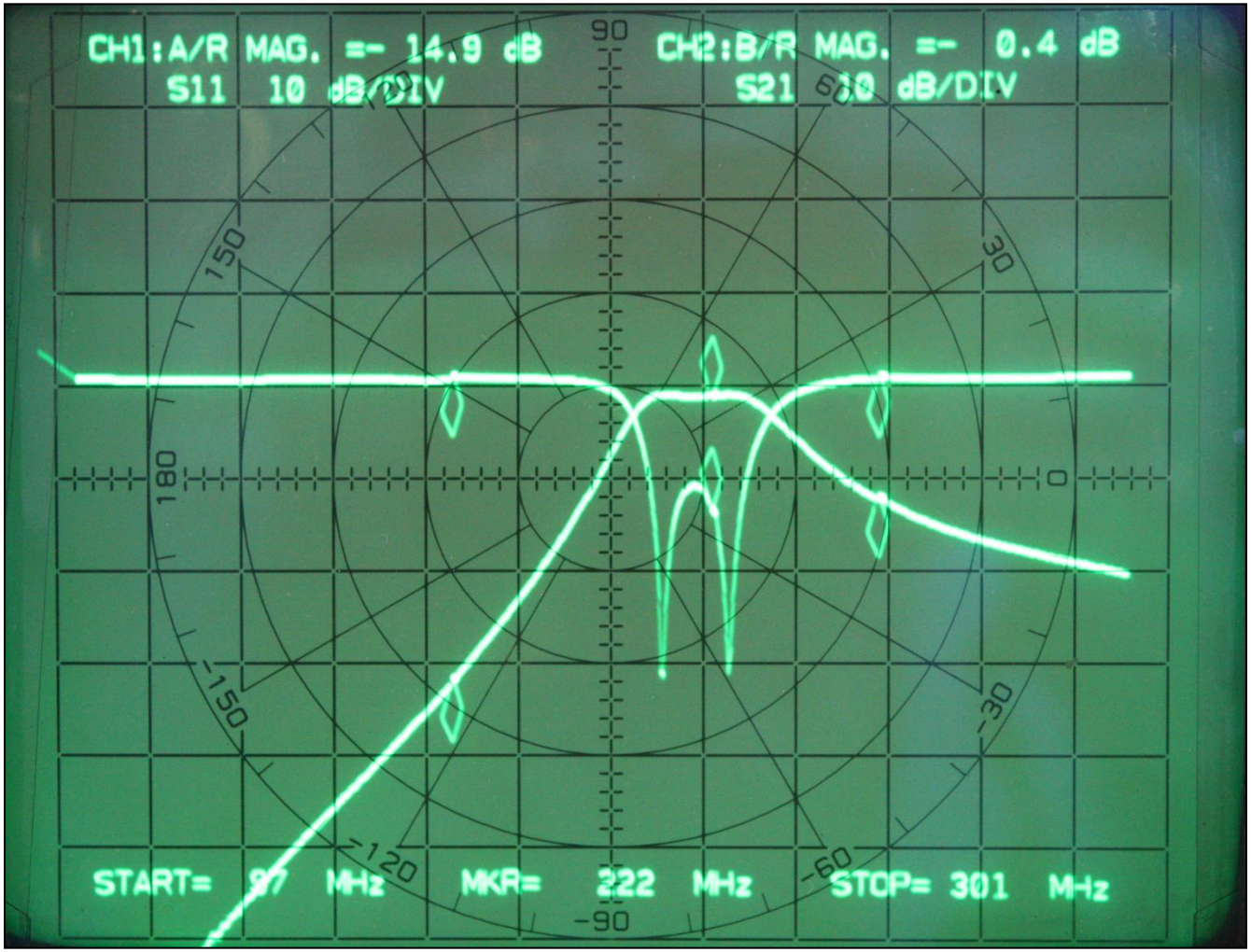
VHF-UHF PA-LNA Interior



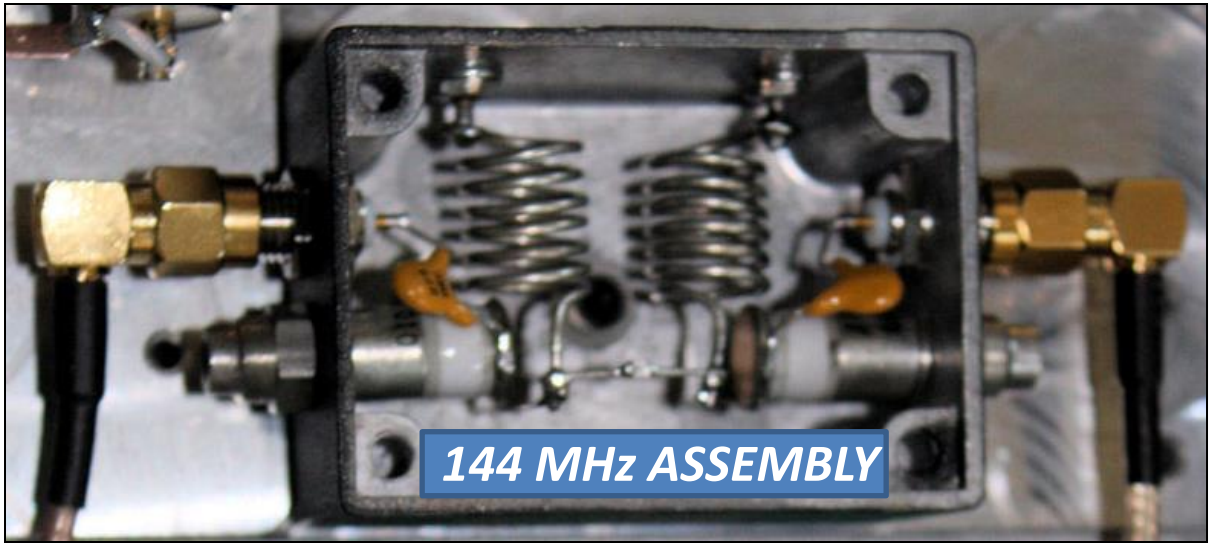
Helical BPF



LNA Preselector Response

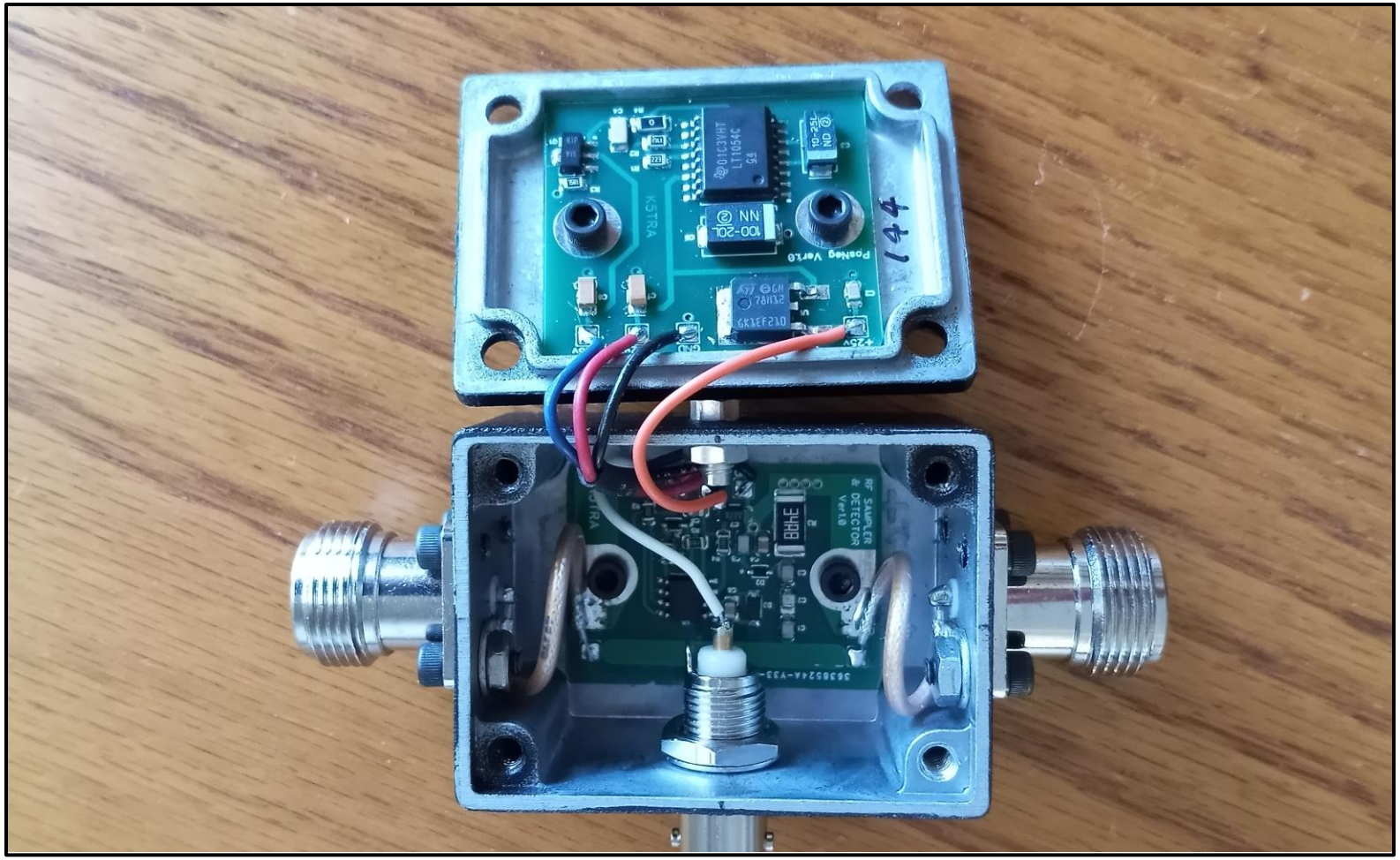


More Helical BPFs



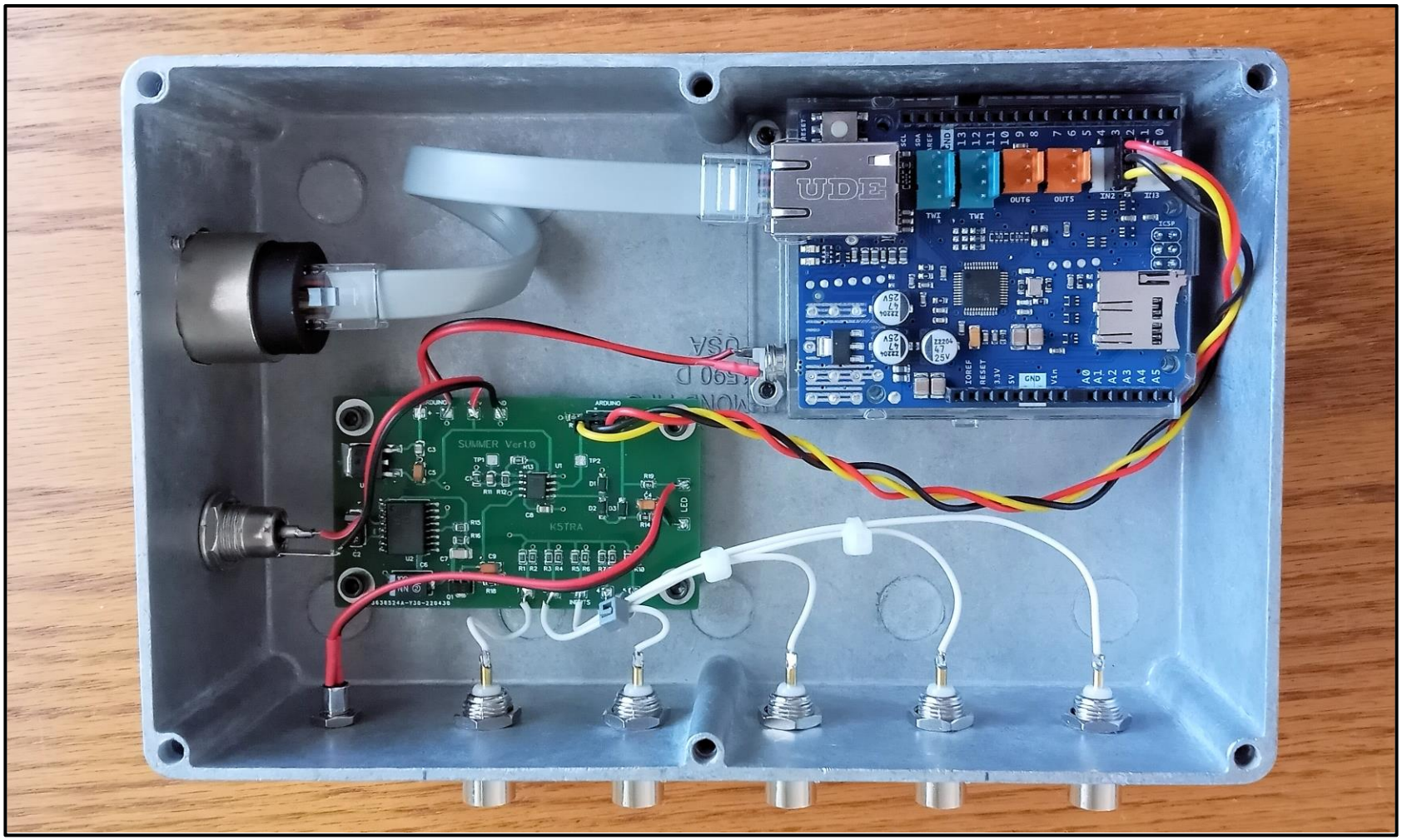
RF Sampler Detectors

RF Sampler Detector Interior

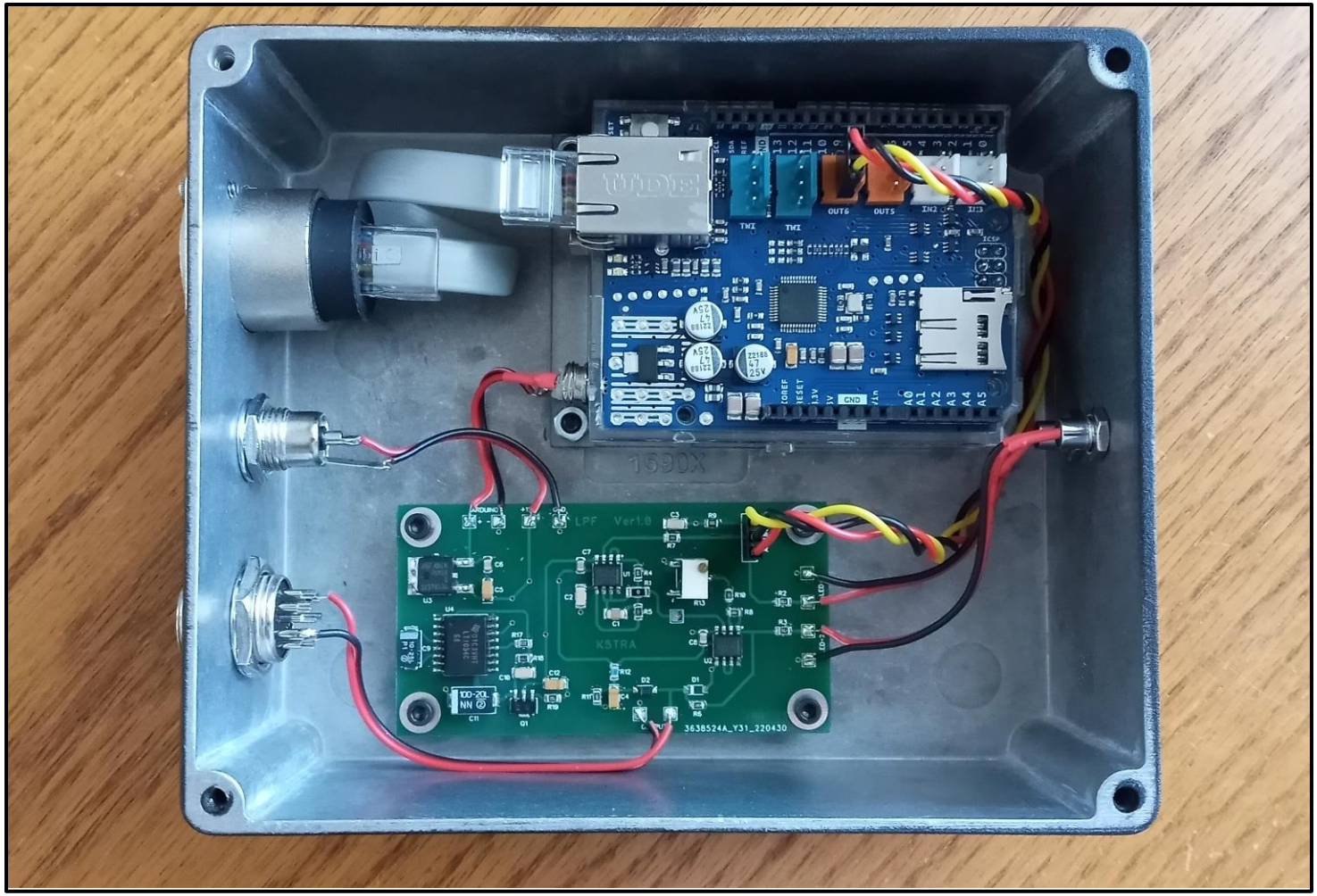


Remote Telemetry Transmitter

Remote Telemetry Transmitter - Interior

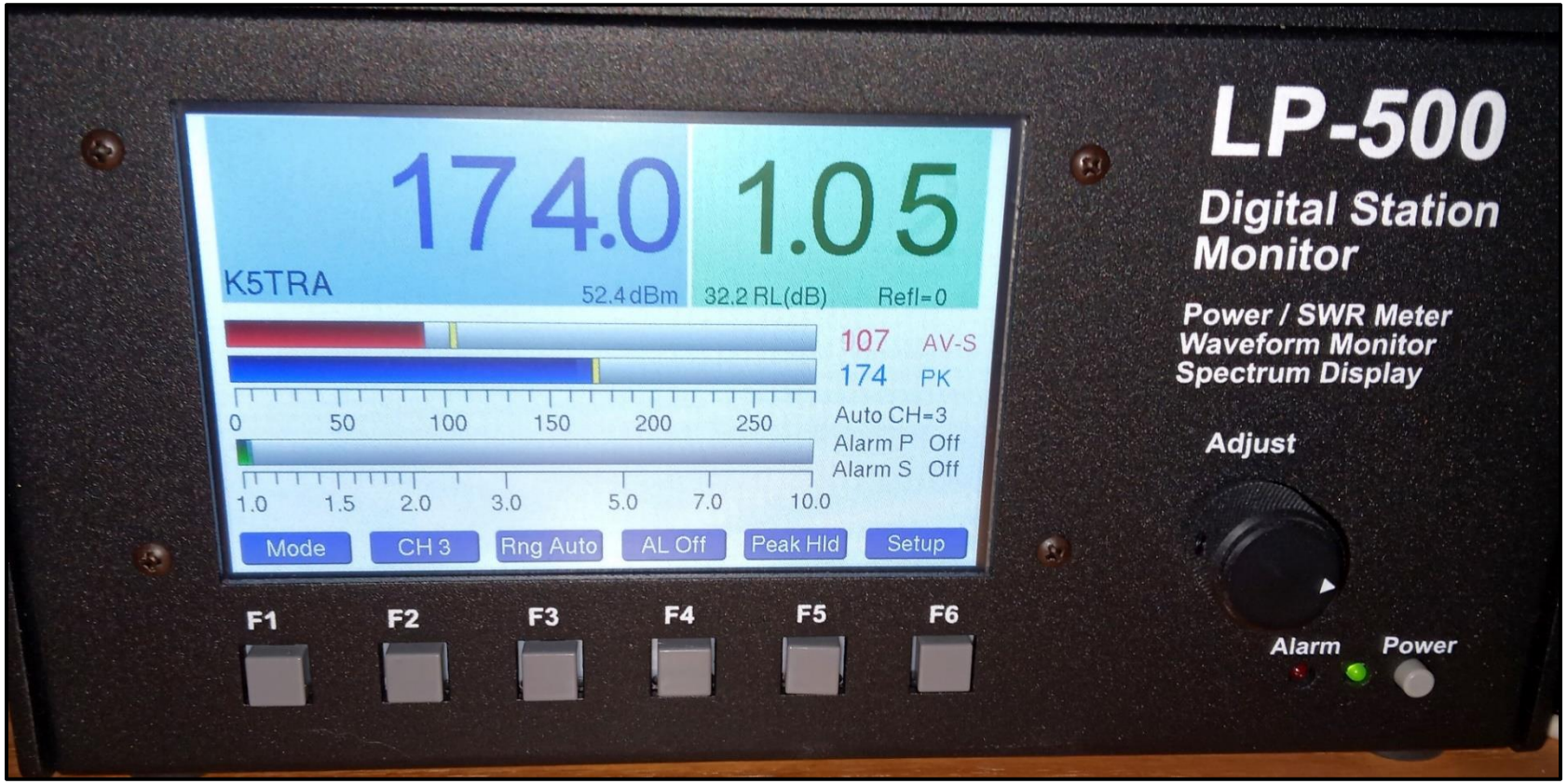


Telemetry Receiver - Interior



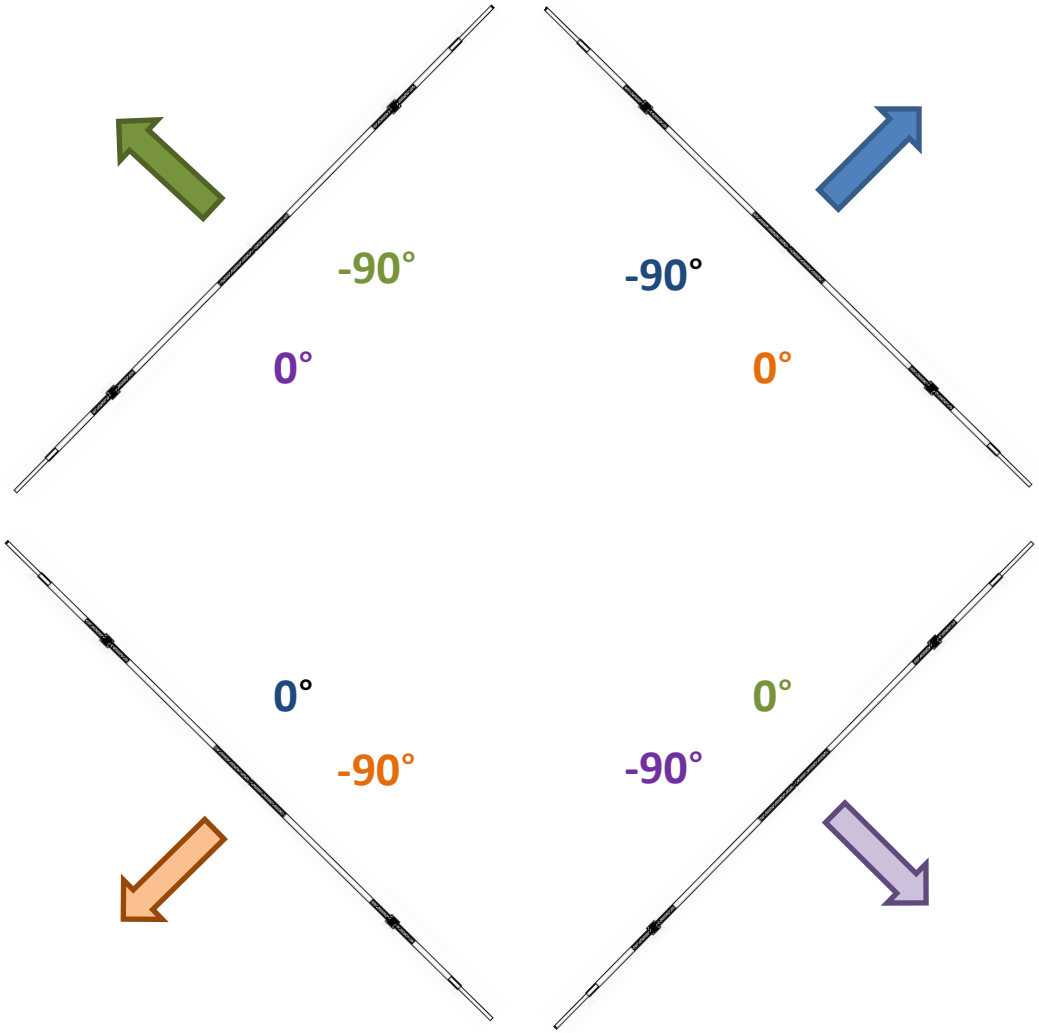
Telemetry Receiver (in shack)

Remote Power Display



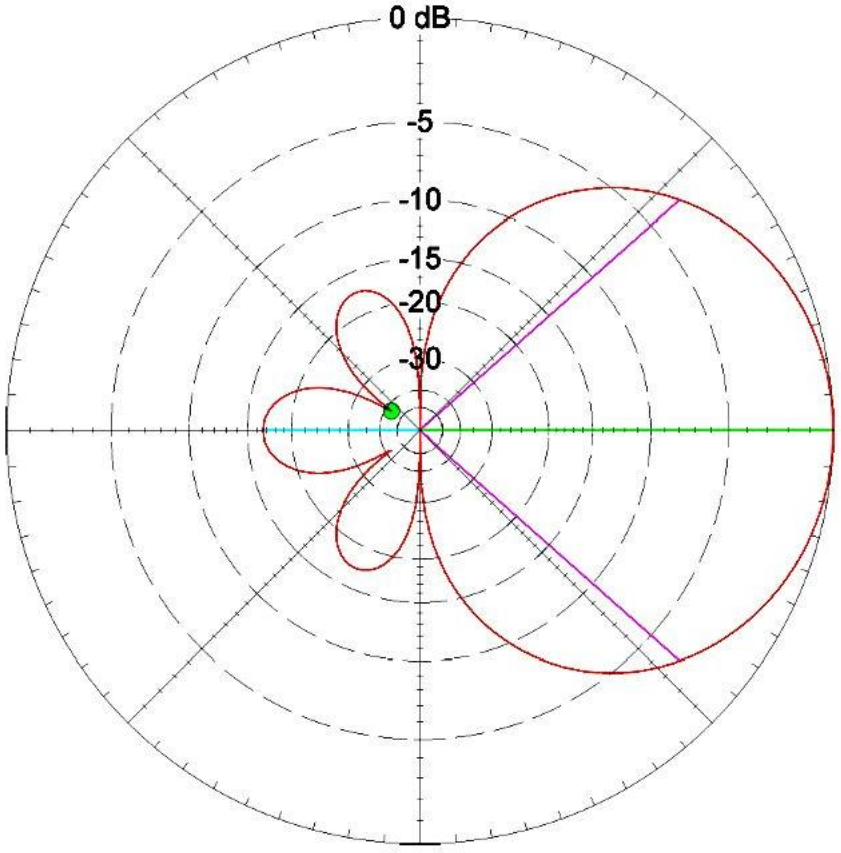
6m Phase Steerable Array

Phase Steerable Gain Direction



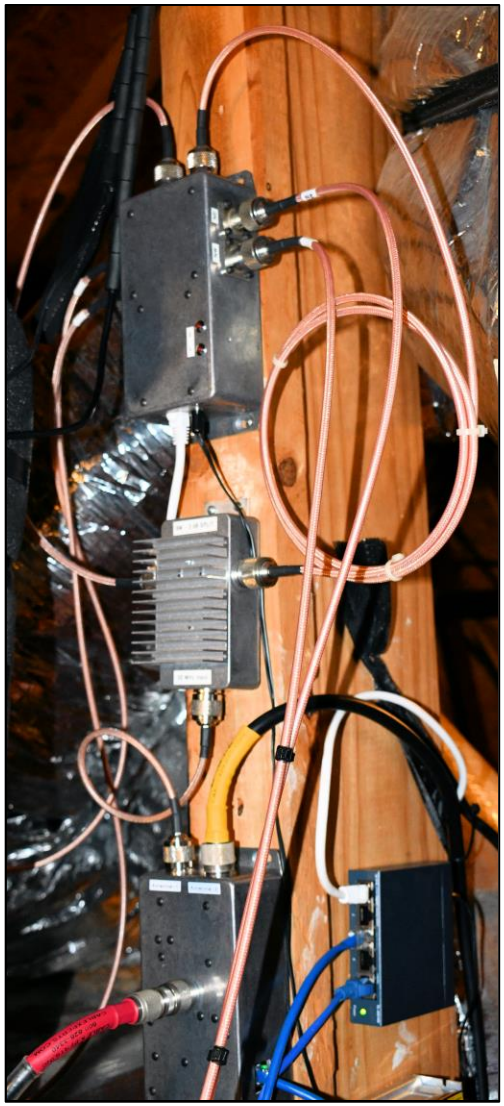
Azimuth Pattern

TWO DRIVEN ELEMENTS
90° PHASE SHIFT
EQUAL DRIVE

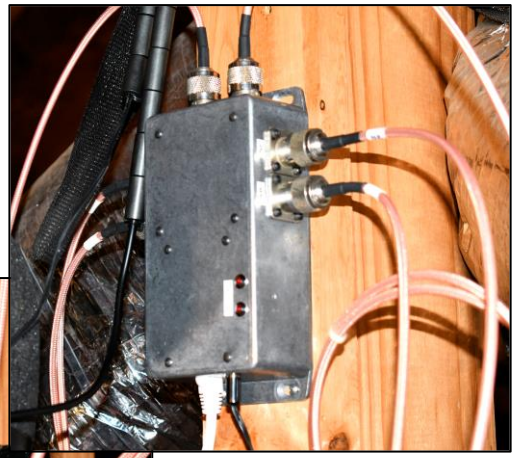


Azimuth Plot	
Elevation Angle	0.0 deg.
Outer Ring	4.71 dBi
Slice Max Gain	4.71 dBi @ Az Angle = 0.0 deg
Front/Back	19.6 dB
Beamwidth	84.4 deg.; -3dB @ 317.8, 42.2 deg.
Sidelobe Gain	-11.41 dBi @ Az Angle = 117.0 deg.
Front/Sidelobe	16.12 dB

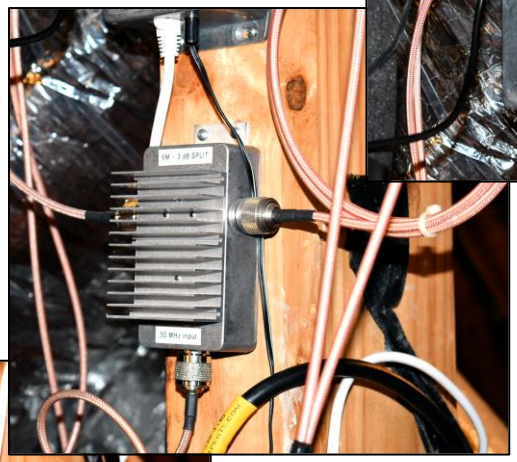
6m Antenna Control

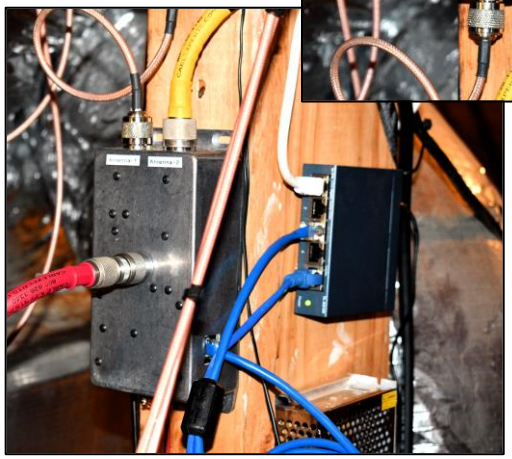


PHASE
SWITCH



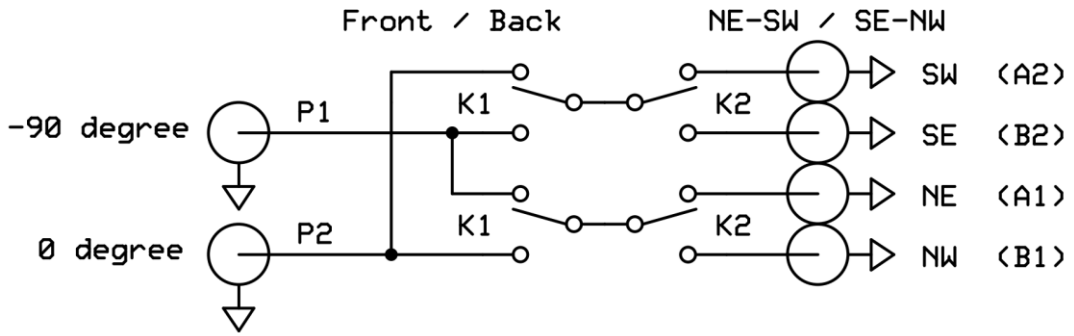
3dB
SPLITTER

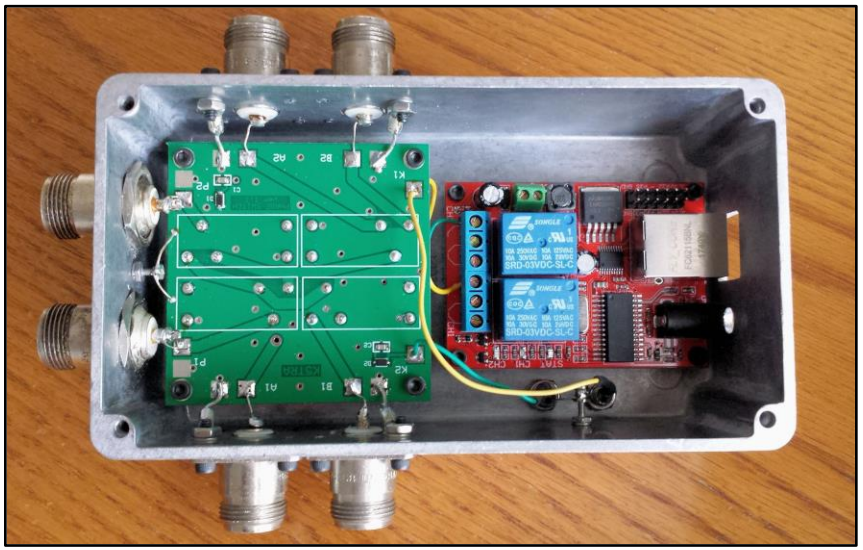




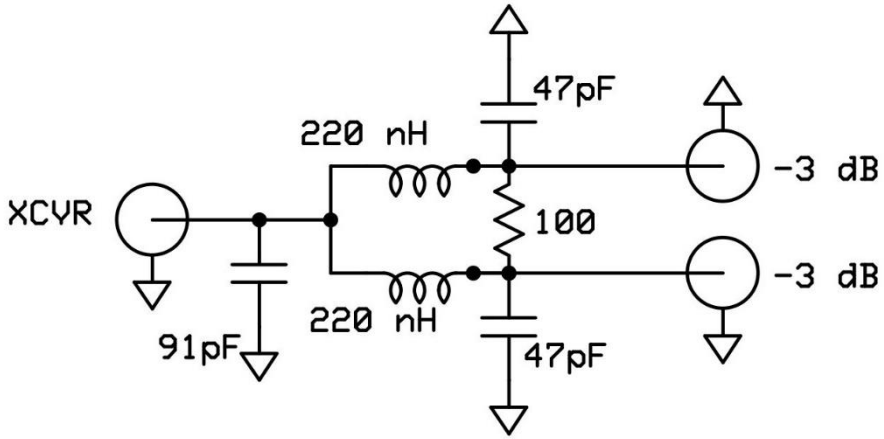
ANTENNA
SPDT
SWITCH

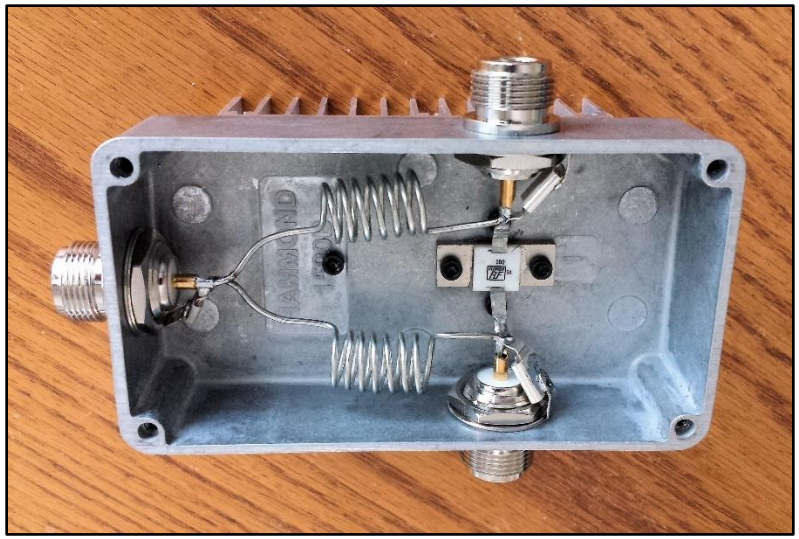
RF Phase Control Circuit

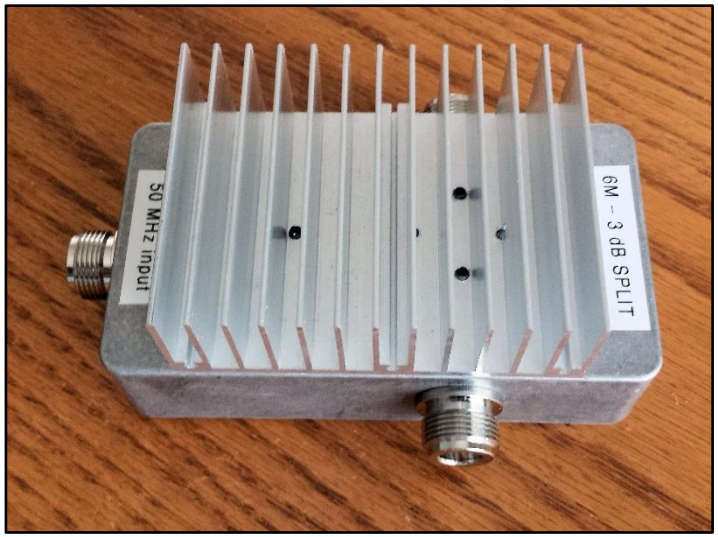




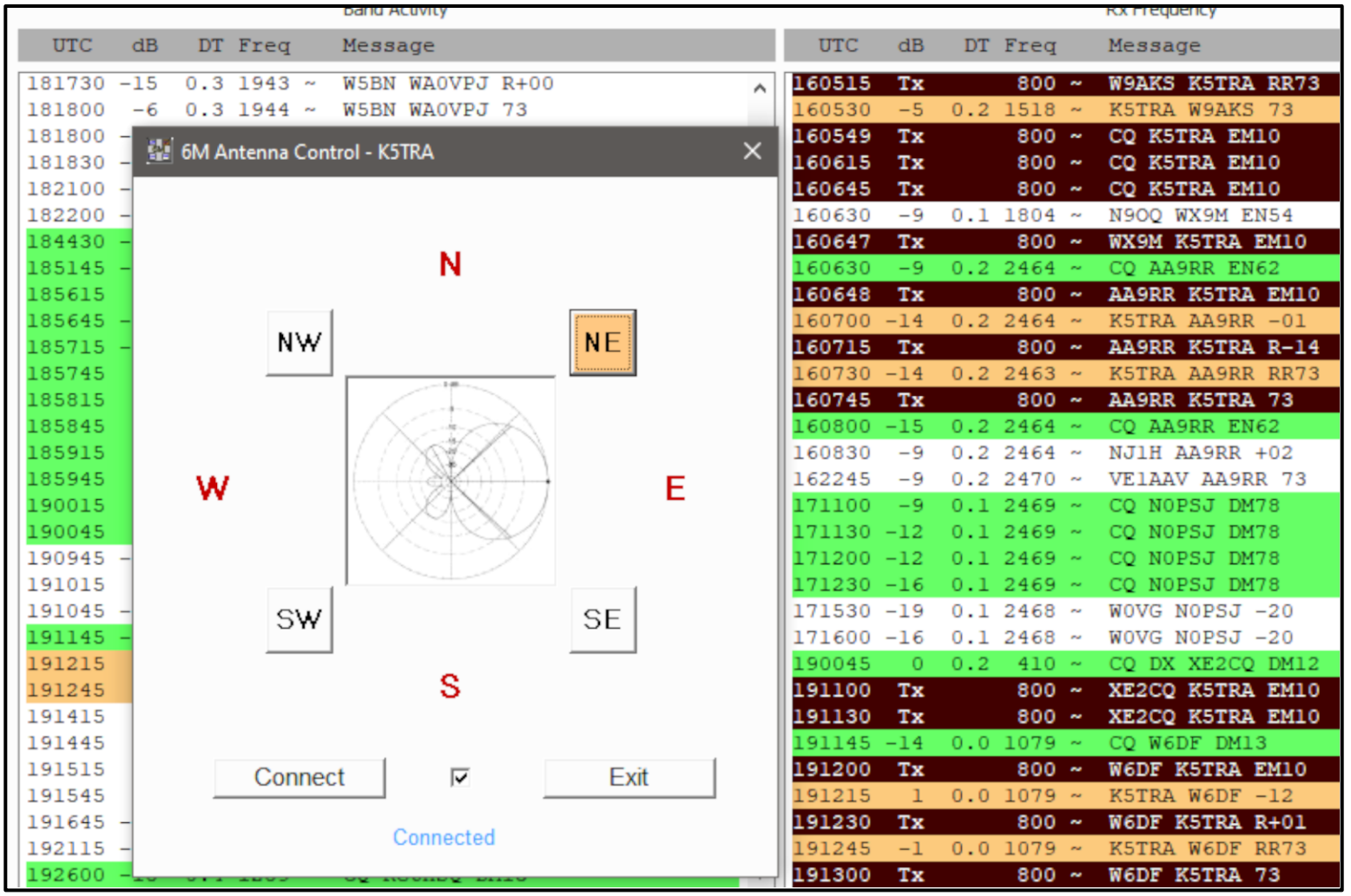
6m Lumped Wilkinson Splitter







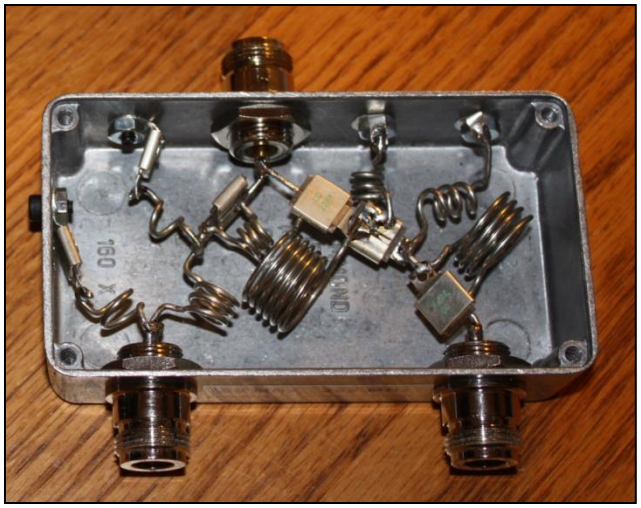
6m Ethernet Control Interface



Link Radios Share Feedline and Antenna

Crossband Couplers

(BAND SPLIT DIPLEXERS)



LAN Control

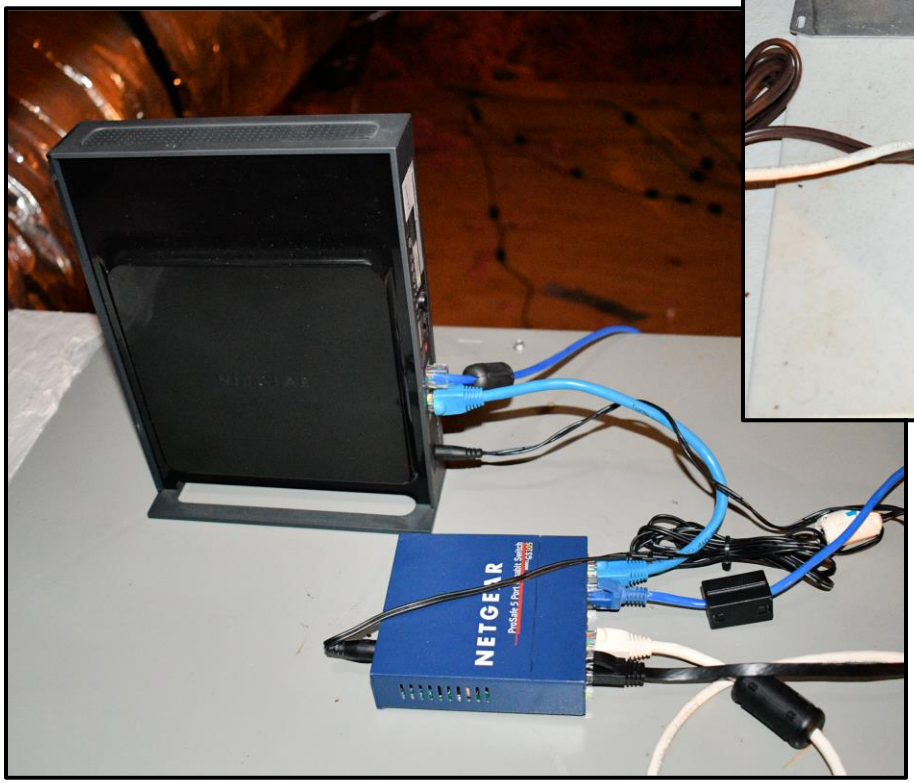
On/Off power supply control

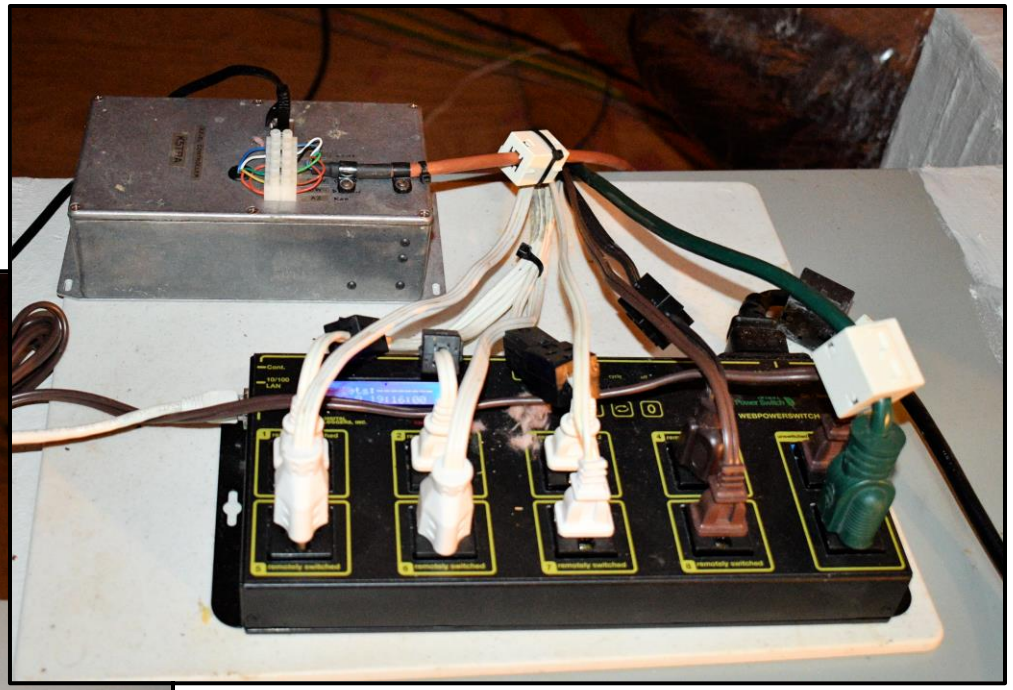
- LNA-PA (144, 222, 432, 902, 1296)
- 13cm and 3cm transverters
- Attic camera

Additional remote control and telemetry

- 3cm dish azimuth-elevation control
- 6m antenna switching
- Remote power telemetry

LAN Control





Summary

- Location, location, location ! (elevation, elevation, …)
- Plan before you begin
- Key to performance:
  - Remote LNA with BPF ⇐ Establish NF limit at antenna !
  - Remote PA ⇐ Reduced line loss is free ERP !
  - Filters needed for co-located links and repeaters
  - Crossband couplers for efficient use of coax runs
  - Link radios can share feed and antenna through cavity duplexer
- No rain, lightning or UV deterioration
- Easy maintenance