Antennas for Field Day with good Isolation and Modeling with EZNEC and AutoEZ

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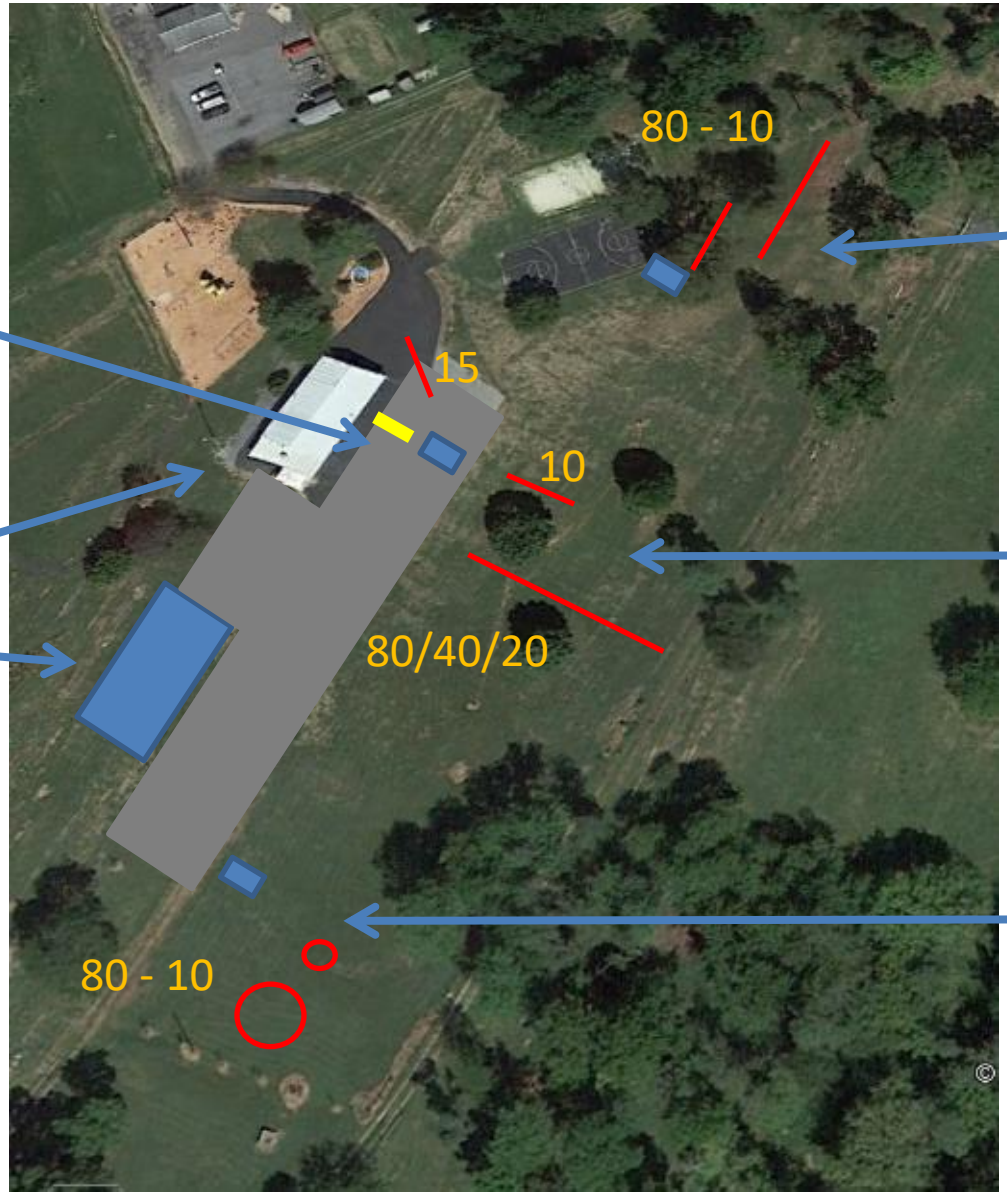
ARA antenna Layout for Field Day



Ramps for power and 20 meters phone coax

Metal buildings

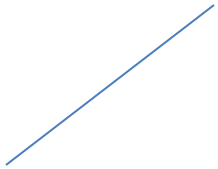
Digital setup in gazebo with trap dipole & end fed antenna

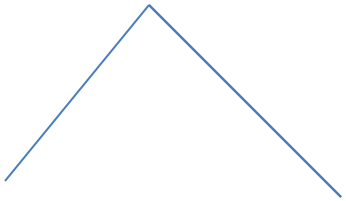
Phone setup in EmComm trailer and pavilion with 80/40/20 inverted vee and 10 an 15 meter dipoles

CW setup in CW trailer with vertical antennas

Three Antenna Clusters for HF Bands with Polarization Isolation

Digital 80/40/20/15/10
Trap dipole





80/40/20 fan
Phone inverted vee

80/40 33’ whip
20/15/10 R5
Verticals for **CW**

Antietam Radio Association
Field Day Solutions

- Target 70 dB isolation between rigs on the same band – Phone/Digital/CW
- 3 antenna clusters in different polarities for Phone/CW/digital
  - Arranged along a line of about 600 feet in length
    - 5-band trap dipole for digital end to end with tilt
    - Inverted vees at 90 degrees for phone
    - Verticals for CW
  - Baluns and antenna isolators used to prevent coax line radiation
- Rigs located near their antennas
- Separate power sources or isolated power sources
- Band-pass filters
- Triplexer and shared inverted vee for 80/40/20 phone
- Same band signal separation filters
- High performance radios
- Setup, test and adjust on Friday before Field Day

Other techniques

- End-to-end dipoles
- Using Yagi's along a line that are placed side by side - works well for stations on the coasts
- Shared RX antenna placed as far as possible with good isolation from TX antennas
  - Usually combined with co-located rigs
  - TX antennas only need modest isolation
- QRP or lower power TX operation
- Disable RX preamps and RX attenuation

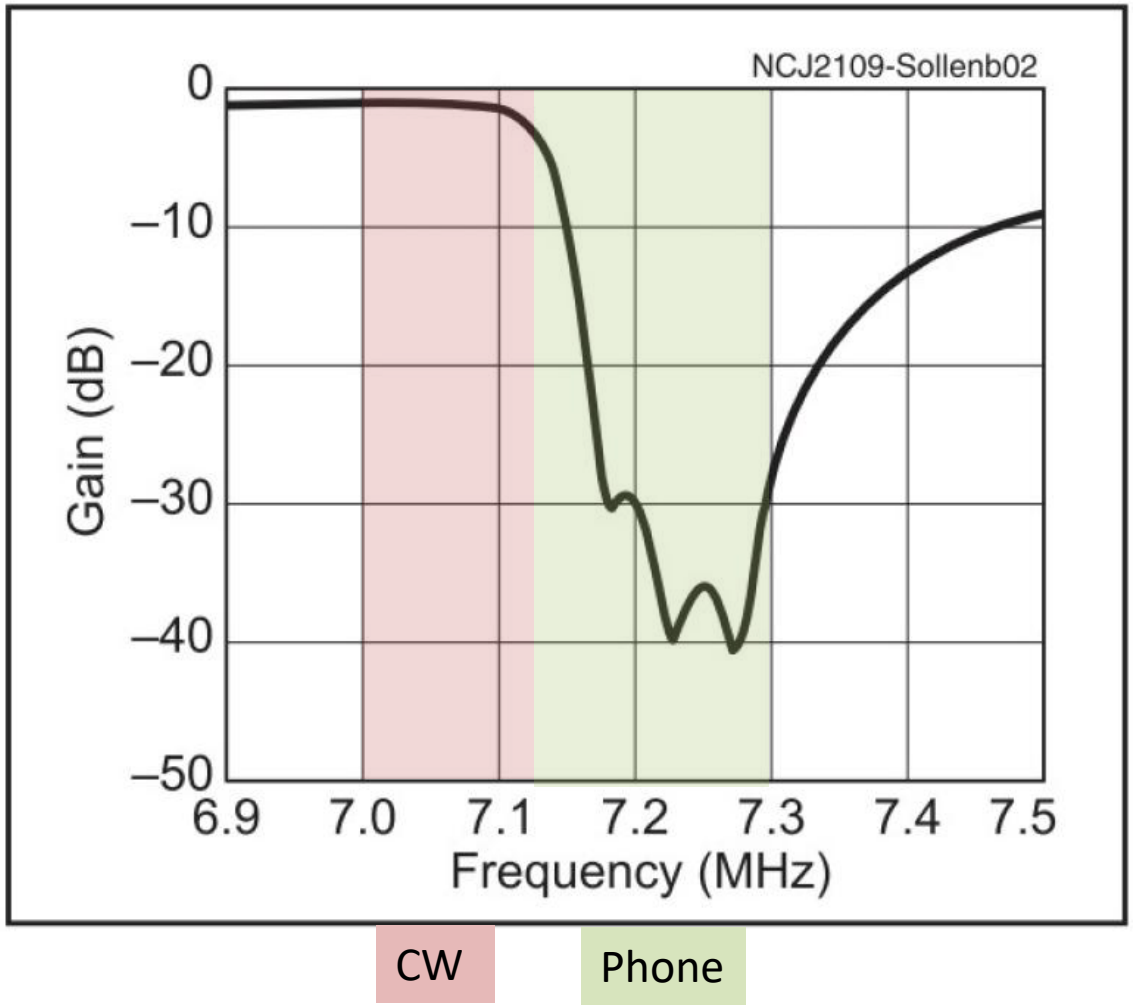
Things to Avoid to Achieve Good Antenna Isolation

- Antennas with mixed horizontal and vertical polarizations
  - G5RV
  - Carolina Windom
  - Sloper antennas
- Environments with close and large metal reflectors or hilly terrain
- Unbalanced antenna connections – use baluns and RF chokes to avoid coaxial feed radiation
- Power and ground connections that may couple conducted RF energy between radios

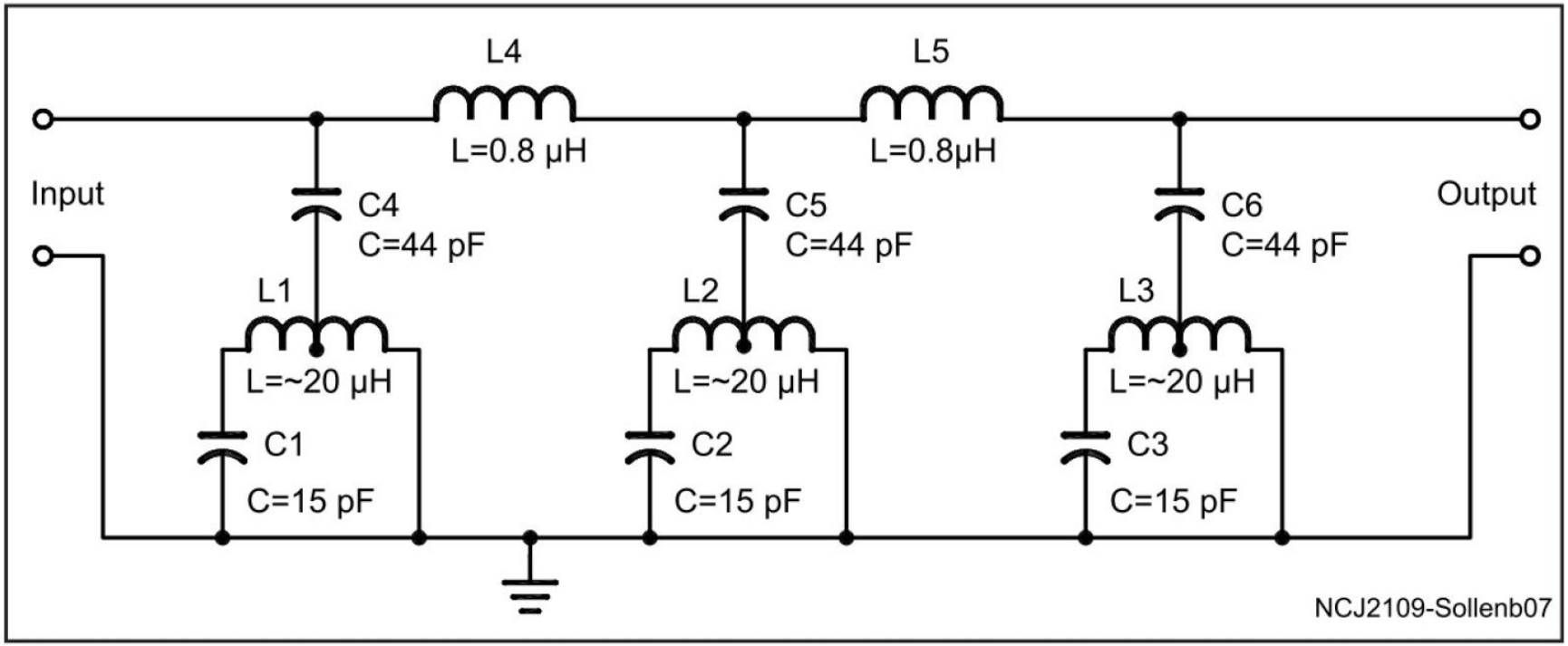
Common Myths/Misunderstandings

- Filters to separate CW from phone signals on the same band are not practical
- Grounding is a frequent cause of Field Day interference
- End to end dipoles are mutually in ideal nulls
- Antennas in different polarities are mutually in ideal nulls

40 Meters USLL CW Filter Measured Response

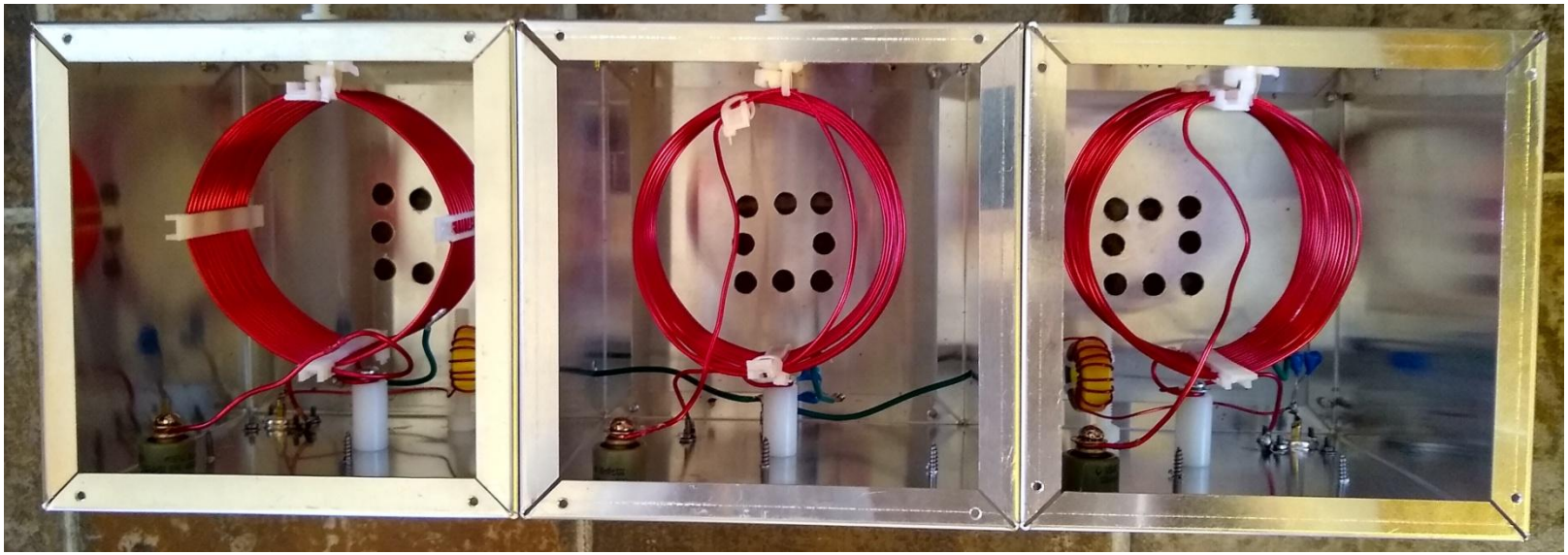


40 Meters CW USLL Filter Schematic



- 3 notch filter stages spread in frequency across the phone band
- coupled with inductors to form a band-pass bump in the CW band
-3.5” diameter homebrew coils for very high Q
- Capable of 100W TX to suppress TX noise as well as RX interference

USLL 40 Meters CW Filter



- 3 aluminum chambers measuring 6 inches per side
- Shown with top chamber covers removed
- 3.5” Coils mounted on 1 inch delrin insulators

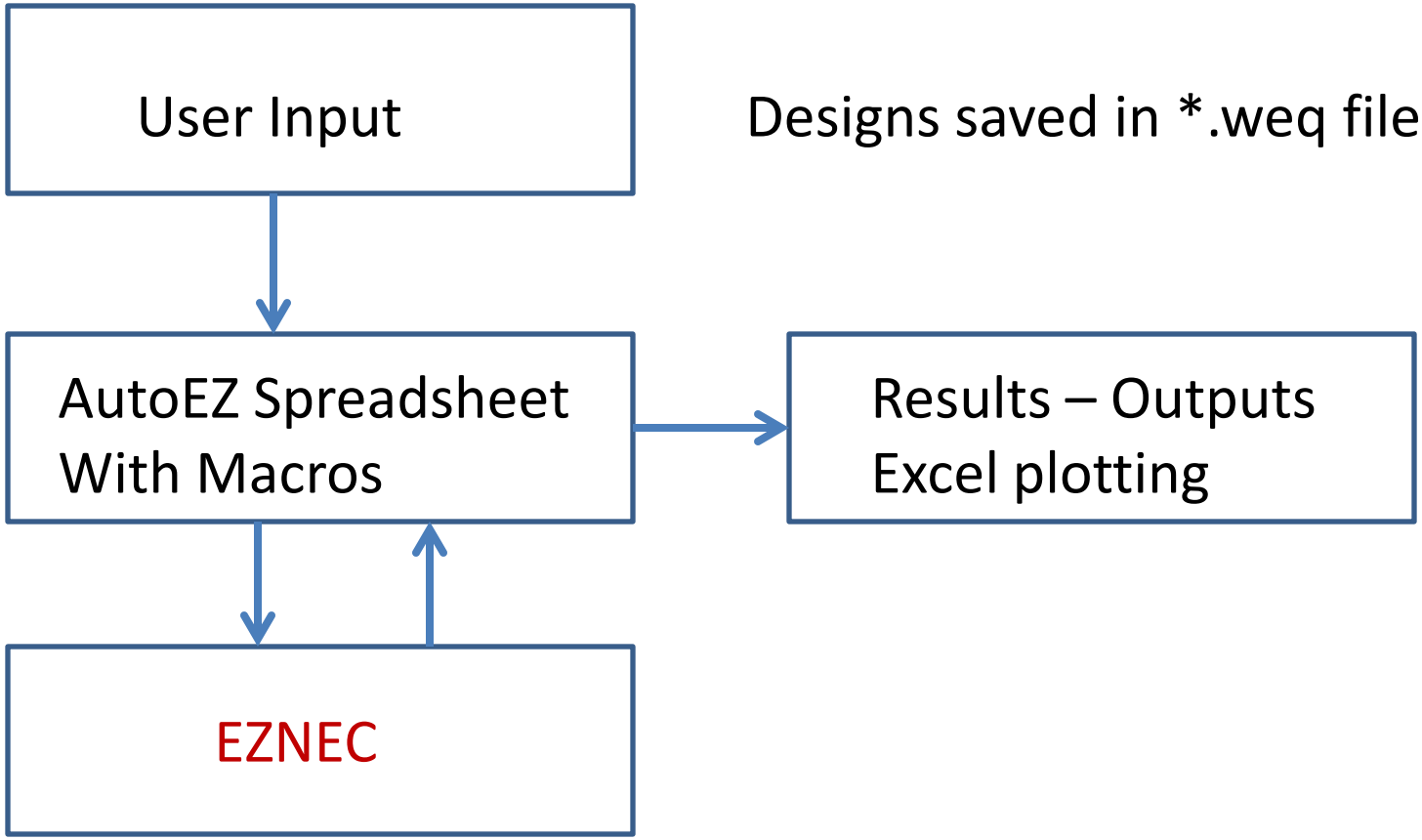
CW Filter Bank for Field Day

Small Filters are Bandpass Filters and
Large Filters are Same-Band 80/40/20 CW/Phone Separation Filters

Grounding for Field Day

- All power generators/supplies and rigs need a good earth ground for AC power safety and then for interference
- 2 approaches for interference
  - Space the rigs far apart with separate power sources and separate earth grounding
  - Co-locate rigs, power & grounding
- Bonding for co-located rigs & power is more important for interference than “RF grounding”
- There is no magic “RF ground”
- RFI filtering for AC power may be helpful

AutoEZ

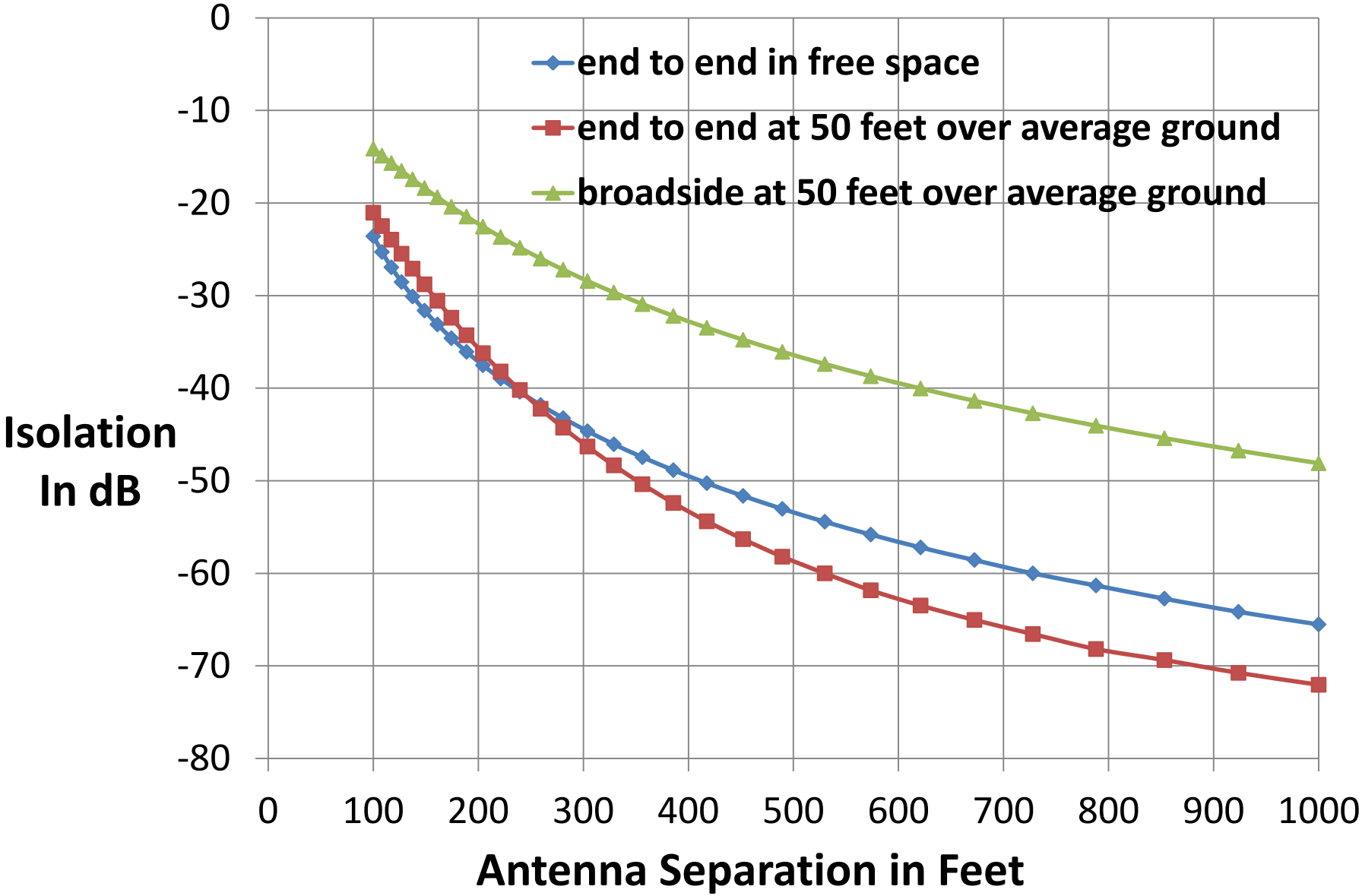


Examples for Field Day

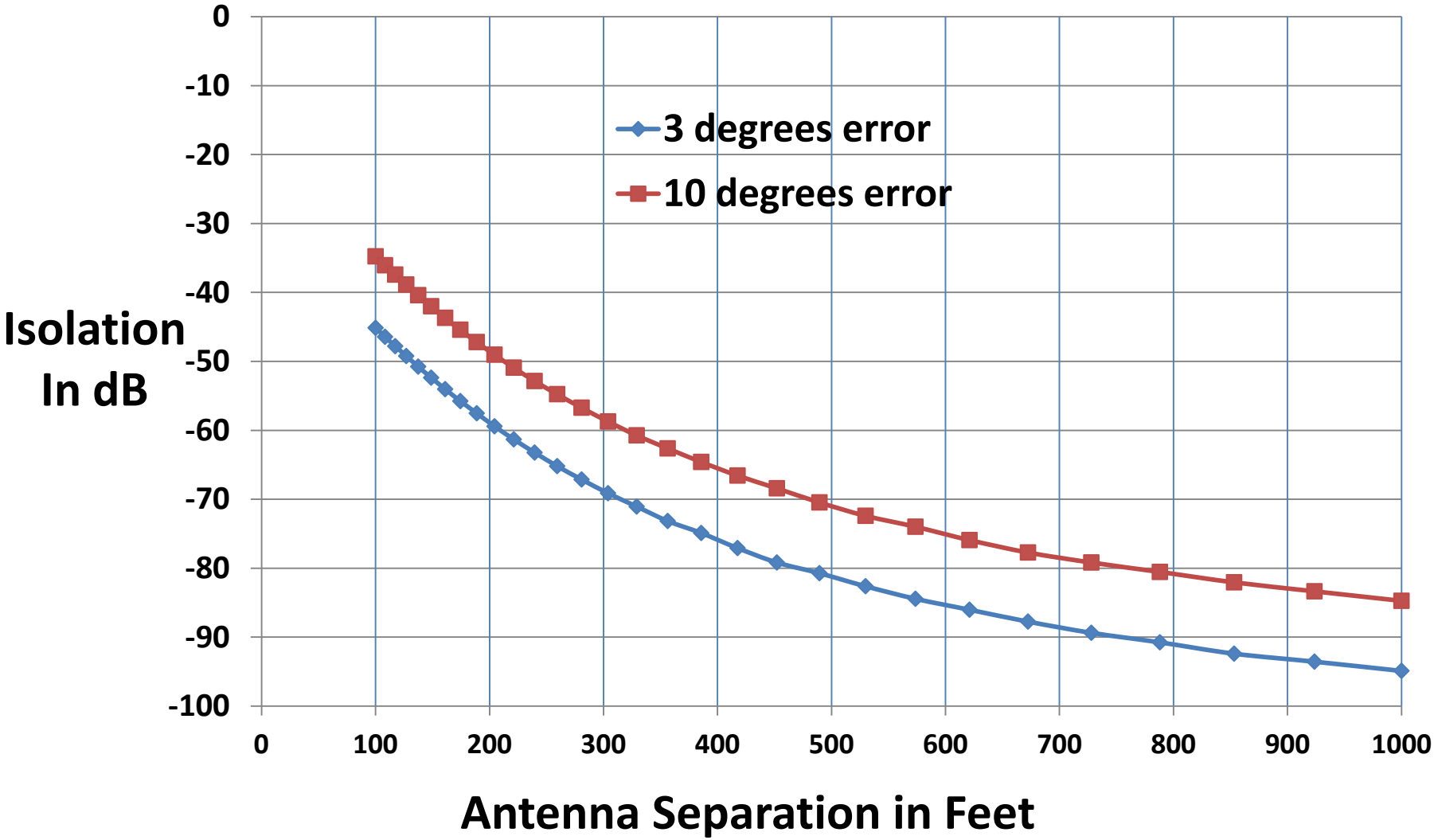
www.ka2c.com/field-day-interference/autoez/

www.ka2c.com/field-day-interference/eznec/

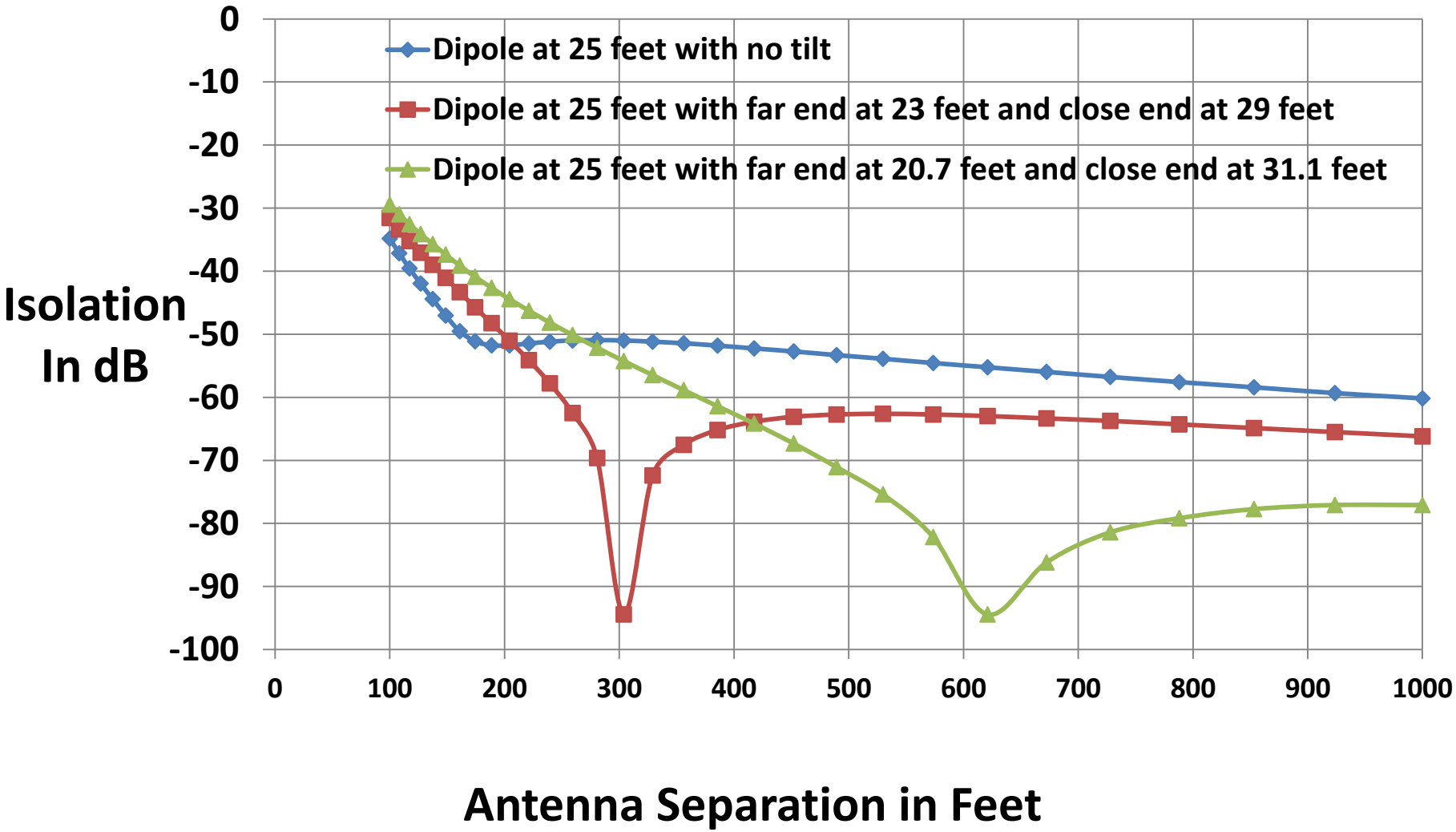
40 Meter Dipoles



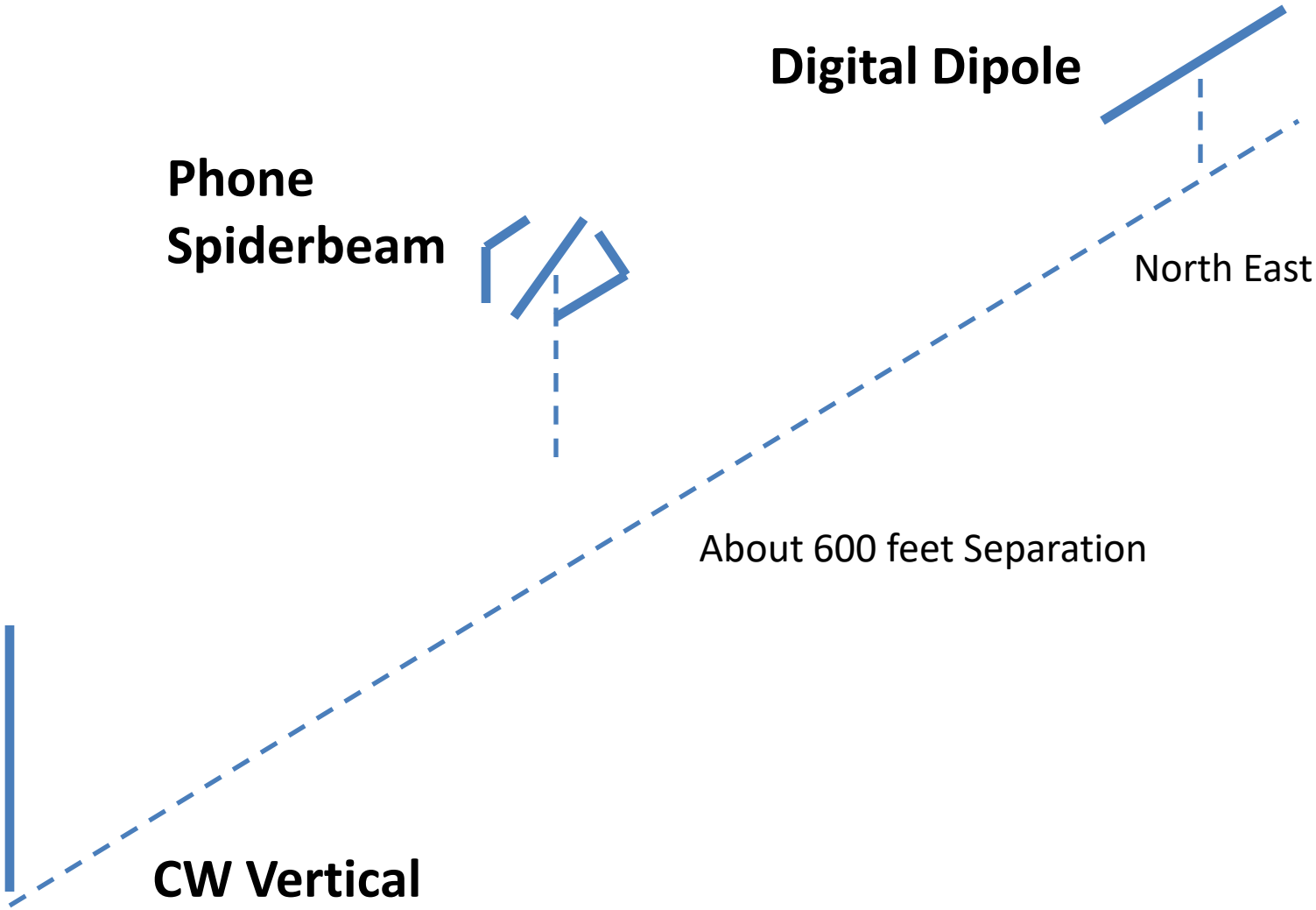
40 Meter Dipoles in Cross-Polarization at 25 Feet with Location Error



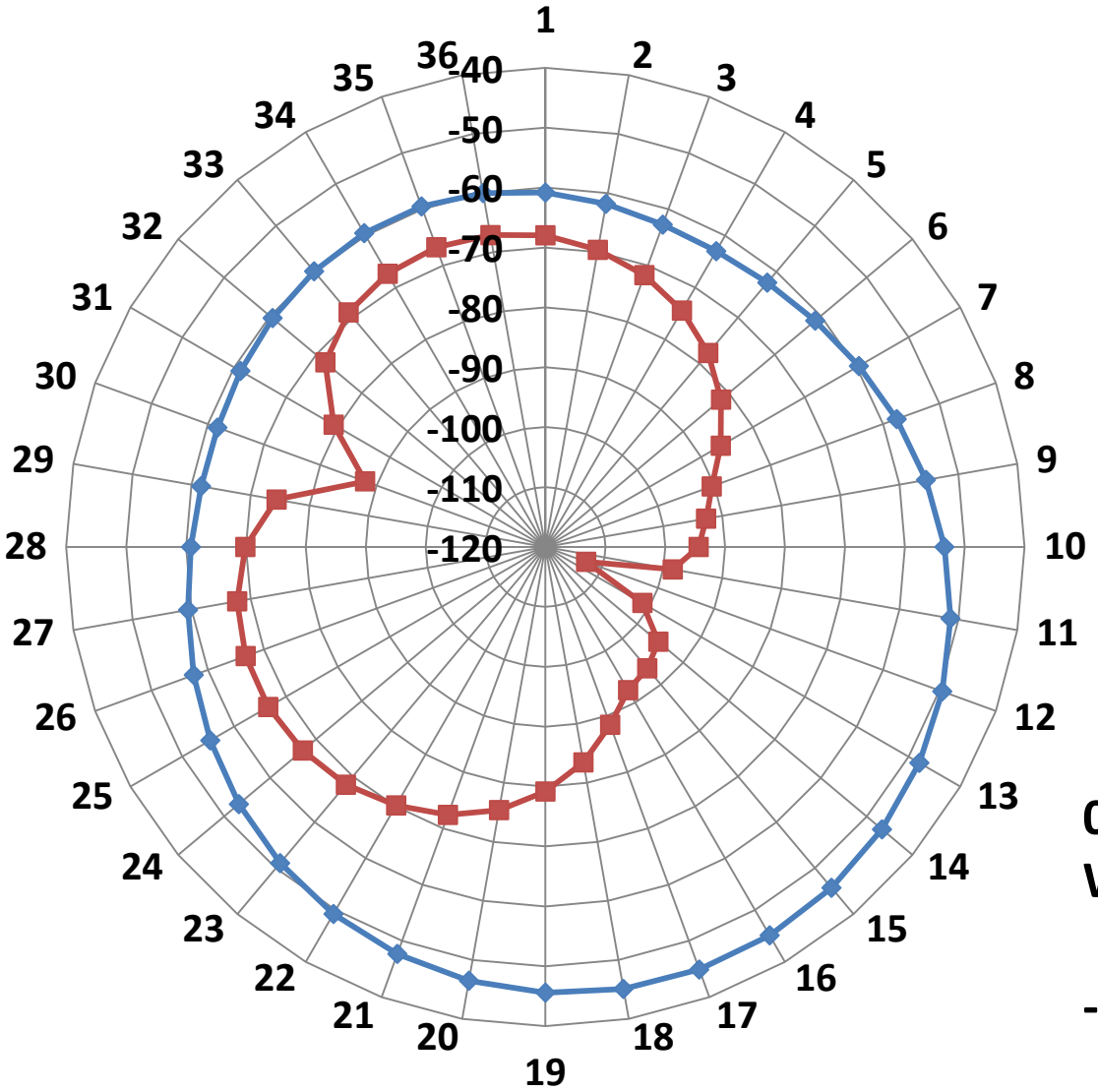
40 Meters Dipole end to end to a Vertical with Tilt



Adding A Spiderbeam for 20/15/10 phone in 2022 Facing West for ARA



Spiderbeam for Phone rotating to Dipole for Digital Station and Vertical for CW



0 to 360 degree rotations
With "1" facing due west

-120 to -40 dB Isolation

Environment with Metal Reflectors, Uneven Ground,….

- Metal reflectors such as metal buildings
  - ARA Field Day site includes several metal buildings
  - Isolation was considerably less than in an open field
- Uneven ground, trees,…
- Adjustment of Inverted vee legs can significantly improve isolation
  - ARA adjusted inverted vee legs on phone antennas to improve isolation with CW verticals
  - 50 to 60 dB of isolation was achieved with adjustments which is short of the 70 dB goal (close to 70 dB was achieved for tests in an open field)
- An open flat field site is best for good antenna isolation for Field Day

Getting Started with EZNEC and AutoEZ

- Download and install EZNEC and AutoEZ
- See presentations/vidoes/web-pages/manuals on usage
- Many sample antennas available from ARRL on the Internet and with the Antenna Handbook
  - Define active antenna
  - Define victim antennas
- Isolation is determined from the current in the victim antenna at the load (typically 50 Ohms)
- Launch EZNEC and then AutoEZ with macros enabled
- Examples and details on procedures for antenna isolation modeling found at: www.ka2c.com/field-day-interference/
- Basic knowledge of antennas needed
- Basic usage of Excel needed

Conclusions

- EZNEC and AutoEZ are great tools to model antenna systems for Field Day for good isolation
- Managing and eliminating Field Day interference is a multiple faceted problem
- Non-ideal/uniform RF environment will limit isolation achieved by antenna orientation
- Same band filters can compensate for limits on antenna isolation
- Field Day operation without phone/CW/digital interference is a pleasure

References/Resources

- https://www.eznec.com/
- https://www.ac6la.com/autoez.html
- http://www.ka2c.com/field-day-interference/
- Mitigating Field Day Multistation Interference -- Part 1 & 2, Milliken, Barrett, KC9CHG and Toman, Tim, N9TO, Sept & Nov 2010 – NCJ
- https://www.kkn.net/dayton2009/W3AO_2009.pdf
- https://www.kkn.net/dayton2009/Dayton_FD_W2RDX.pdf
- https://www.contestuniversity.com/wp-content/uploads/2021/05/Transceiver-Performance-for-the-HF-Contest-and-DX-Operator-CTU-2021-NC0B.pdf
- Grounding and Bonding for the Radio Amateur, H. Ward Silver - N0AX, ARRL
- Filters for Separating Same-Band Signals, Nov 2021, NCJ
- Field Day Interference Management, May 2022, NCJ

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