AutoEZ + EZNEC and Field Day Antenna Isolation procedures

These simulations and procedures are useful to analyze antenna isolation for Field Day setups, but may also be useful for QSO party setups or antenna farms with multiple antennas where isolation between the antennas is a concern or question.

Install both EZNEC (free) and AutoEZ (AutoEZ price is $79)

Create the desired antenna designs and layouts in EZNEC from existing designs, with modifications or from scratch, including a source on the active antenna and loads on the victim antennas.

Launch EZNEC and then AutoEZ with macros enabled to perform antenna isolation runs with antennas moved over a separation distance or with the rotation of Yagi's or other antennas. Load the EZNEC design, and configure AutoEZ to perform the desired antenna movement or rotations over a desired number of measurement points, and to calculate the antenna isolations based on the current in the victim antenna loads.

The column of results in AutoEZ from the "calculate" sheet can be copied into Excel and plotted linearly or in polar coordinates with the "radar" plotting function for modeling of rotating antennas. If desired, multiple columns of AutoEZ results can be copied into different columns in Excel to plot multiple results in Excel in the same graph.

AutoEZ sweeps of moving dipole/vertical/inverted-vee antennas in XYZ space to determine the impact of separation on isolation or sweeps of rotating Yagi's with coupling into victim antennas such as dipoles/verticals/inverted-vees/Yagi's

- Design/configure the Yagi or directional antenna in EZNEC and the victim antenna(s)
- Start AutoEZ and load the desired EZNEC design on the "wires" sheet
- On the "calculate" sheet
    - Click on "Generate test cases"
    - Set start and stop frequencies to the same in the desired band and set step size to 0.1
    - Set variable 1 to "H" with start of 0, end of 350 and step of 10 for rotation or start with 100, end of 1000 and steps of 50 for moving antennas in separation
    - Click on "OK"
    - Back on the main sheet for "calculate"
    - Set variable 2 to "J" and variable 3 to "K"
    - Set in row 11, the entry under "J" to =CurMag(2, 50, ROW()-10)
        - Change the "2" to the row of the antenna wire in the victim antenna with the load to measure the coupling/isolation
        - Change the "50" to the location in the wire where the load is placed (0 to 100)
        - Drag the entry in row 11 to all active rows (36 total)
    - Set in row 11, the entry under "K" to =20 * LOG(CurMag(2, 50, ROW()-10))
        - Change the "2" to the row of the antenna wire in the victim antenna with the load to measure the coupling/isolation
        - Change the "50" to the location in the wire where the load is placed (0 to 100)
        - Drag the entry in row 11 to all active rows (36 total)
- On the "wires" sheet
    - Select the wires that are part of the Yagi or directional antenna to be rotated or moved
    - Click on "rotate" or "move"
    - Enter "H" for degrees or "H" in one of the X or Y or Z delta box and 0 for the other 2 boxes
    - About this axis should be "z" for rotations
    - Set direction to "CW" for rotations
    - Apply this change to "only the wire in …."
    - Center of rotation is "z" with "use" coordinates are the center of the Yagi for rotations
    - Click on Apply
- On the "Insr Objs" sheet
    - Check on the location of the source
    - Check on the location of the 50 Ohm load (or other value) for the victim antenna
    - Check on the "calculate" sheet that the J and K column entries sample the loads on the correct wire and at the position of the load
- To run the simulation, go to the "calculate" page and click on "calculate all rows"

- The results in dB of isolation can be taken from the “K” column and copied to a separate spreadsheet column and then it can be plotted using the radar or linear plot functions, and multiple results can be plotted using multiple columns
- Internal to AutoEZ, results for a simulation can be plotted using the “custom” sheet. Set the X and Y axis to variables 1 and 3. Other fields and the scale can also be configured.

Using and Changing antenna designs in AutoEZ examples setup for 100 to 1000 feet antenna separation with one active antenna and one victim antenna – start with one of these files:

40 meters dual dipoles at 100 to 1000 feet spaced between centers and end to end at 50 feet height.weq

20 meters 3-element Yagi's at 100 to 1000 feet spacing end to end.weq

40 meters dual dipoles at 100 to 1000 feet spaced between centers and end to end at 50 feet height.weq

- On top page wires – there are 3 sets of wires
    - 1st set is of antenna wires that do not move and contains the source
    - 2nd set is a copy of the wires that move (but are not used directly in the simulation – they are marked with "m" in the far left column) and contains the load
    - 3rd set is a 2nd copy of the wires that move (and are used directly in the simulations)
- When changing wires to model different antennas with one antenna coupling to a second antenna
    - Maintain all 3 sets
    - The source on line 5 in on the "insr Objs" page may need to change if the antenna description in the 1 set of wires changes the wire or location of the source
    - You can insert and delete lines if more or less wires are needed for particular antennas
    - Be sure to set the proper operating frequency on line 11 of the "variables" page
    - If the number of wires change, you probably need further changes
        - Under "insr Objs" spreadsheet page, need to adjust line 40 to be the wire in the victim antenna with the load which is normally the 1st wire in the 2nd group
        - Under "calculate" spreadsheet page, find the variable names and values, and then the "j" and "k" variables
            - select the top box of J - you will see something like "=CurMag(4, 50, ROW()-10)" the 4 refers to the 4 wire as the place where the load current is measured – you may need to adjust it to the correct wire where the load is now located – the 50 refers to the location (0 to 100%) in the wire where the current is measured & should correspond to the location of the load - After entering any changes in the first entry under J, you need to extend this all the way down the J column by selecting the first entry that was just changed, grabbing the lower right corner and dragging the change all the way to the bottom of the J column
            - select the top box of k – do the same things as for J

- A plot of the results can be found on the page “custom” – you can change the x and y axis titles to agree with the simulation
- The isolation results can also be taken as the column on the page “calculate” as the “k” variable, this can copied into a regular spreadsheet and then plotted with other results