

RF Exposure Safety Compliance for Three Multi-band Inverted L Antennas — QEX Files

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Description of NEC files

Most of my experience with NEC modeling is with *EZNEC*, so I built the models with that application. All compliance distances are from high resolution linear scans with *EZNEC*. For an overview of the fields to guide the *EZNEC* scans, I used medium resolution 2-dimensional scans with *4nec2*. (It can import .EZ files and convert them to .nec files.)

EZNEC offers an automatic segment tapering feature for the radial wires, making short segments near the central junction point and gradually increasing segment length away from the junction. Each of the 32 radials is represented by multiple wires, so the nec file is rather long. For the *4nec2* scans I did not use segment tapering.

Nec-file-1.txt is a listing of the *4nec2* file for the 13 ft high inverted L, including 32 non-tapered radials.

Nec-file-2.txt demonstrates the effect of tapering. For the 13 ft high inverted L, it shows the vertical wire, horizontal wire, and the wires representing a single, tapered radial. An excerpt from the *EZNEC User Manual* about segment length tapering is,

Multiple wires joining at an acute angle sometimes require shorter segments than single straight wires or wires joining in a line, particularly when a source or load is near the junction. This is seen with antennas such as multiple dipoles connected to a common feedpoint. Another case is with very low elevated radial systems. The straightforward solution in this situation is to increase the number of segments. However, doing so increases computation time. The technique described here provides high accuracy with a smaller total number of segments.

Instead of making the entire wires out of short segments, the segments can be made short near the junction, gradually increasing, or tapering, to a greater length away from the junction. *EZNEC* automates this process but it's useful to know how the procedure works so you can optimize it for your particular purpose. The basic procedure is to replace the original wire with several wires of different lengths. The new wire closest to the junction is made very short and with one segment. The second wire is made twice the length of the first, also with one segment. This process is continued until the segment length becomes long enough (say, 1/20 wavelength), and the remainder of the original wire is made up of a multiple-segment wire of approximately this segment length. In the automated process, you can choose the minimum and maximum segment lengths or use the default values of 1/400 and 1/25 wavelength.

Nec-file-3.txt is a listing of the *4nec2* file for the 6 ft high inverted L, including a counterpoise that is connected to perfect ground.

— Peter DeNeef, AE7PD