4NEC2 Tutorial: Electric Dipole Antenna Simulation

Dr. Ryan S. Adams

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1 Download and Install Required Components

Two routines are required to provide full functionality of NEC simulation, 1) Latest 4NEC2 default version (5.7.5) and 2) 4NEC2 3D extension (5.7.5). I downloaded the Windows setup routines from the website `http://home.ict.nl/~arivoors/` as shown in Figure 1. The installer worked with Windows Vista; default installation steps worked fine for me.

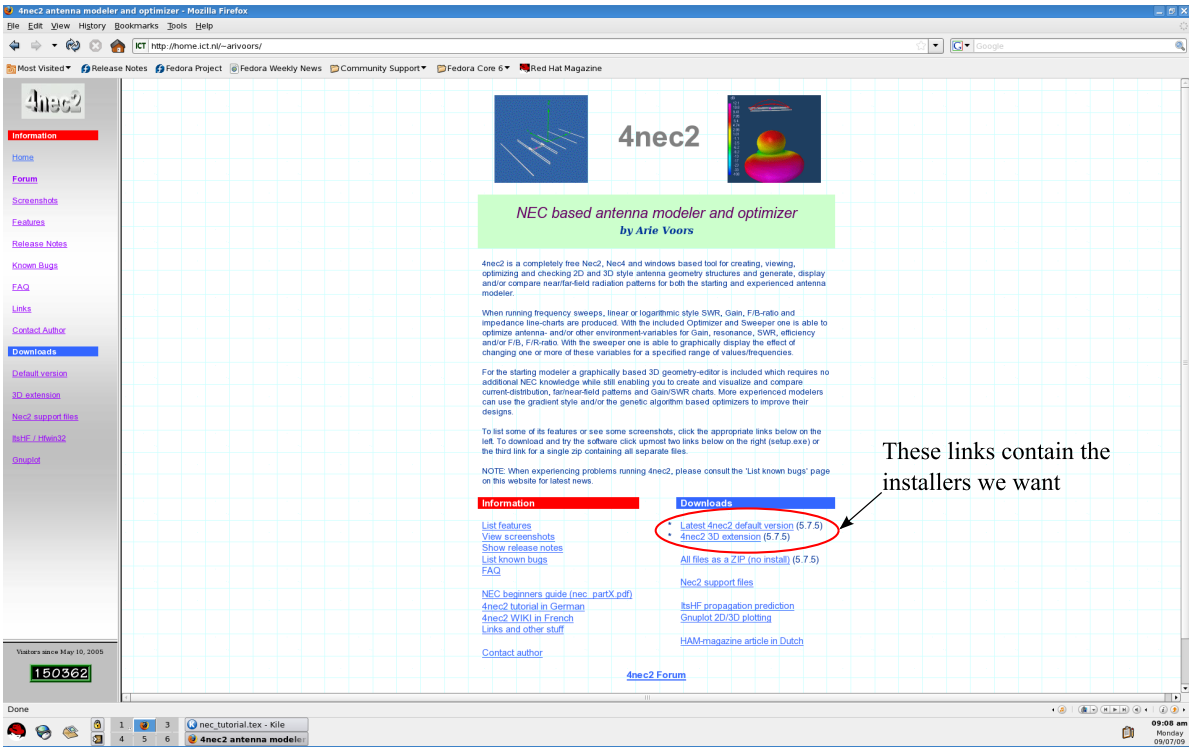

Figure 1: *The website used to download 4NEC2 with 3D extensions.*

2 User Interface

When you first run the program, you should see something like:

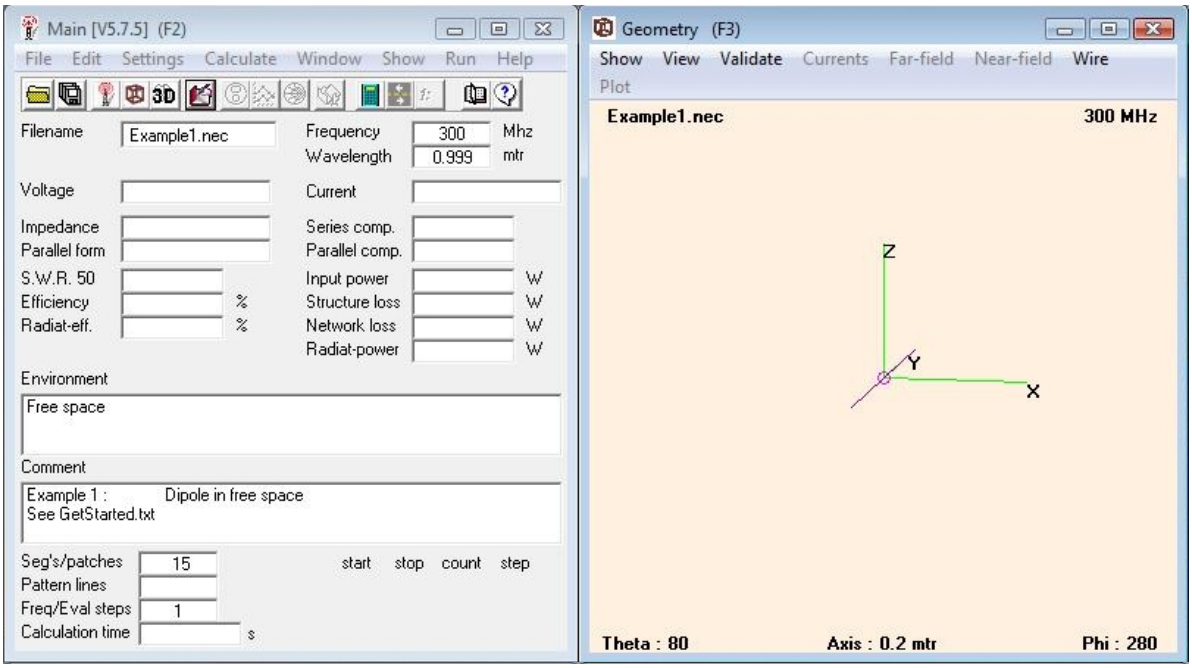

Figure 2: *View of 4NEC2 when first installed.*

On the left is the main screen, and on the right is a view of the current geometry. You can click and drag in the geometry screen to view the current antenna from different angles. To create a new antenna, we focus on the buttons along the top of the main window (on the left in Figure 2).

2.1 Edit Screen

We begin with the *edit* button (the sixth from the left). When this button is clicked, a window opens as shown in Figure 3 This new window consists of several tabs. We will be most concerned with the *Geometry*, *Source/Load*, and *Freq./Ground* tabs.

2.1.1 Geometry Tab

Under the *Geometry* tab, we see a table environment that allows us to create the metal geometry that will make up the antenna. The columns in this table are the following:

- **Type:** This field gives options of different types of structures. In this course, we will only use the wire type.
- **Tag:** This field allows you to identify the current wire with a unique tag that will be referenced when we define the sources.
- **Segs.:** This field defines the number of segments that the antenna will be broken into for the simulation. The more segments you choose, the more accurate the solution will be, but more segments will require more computational resources.

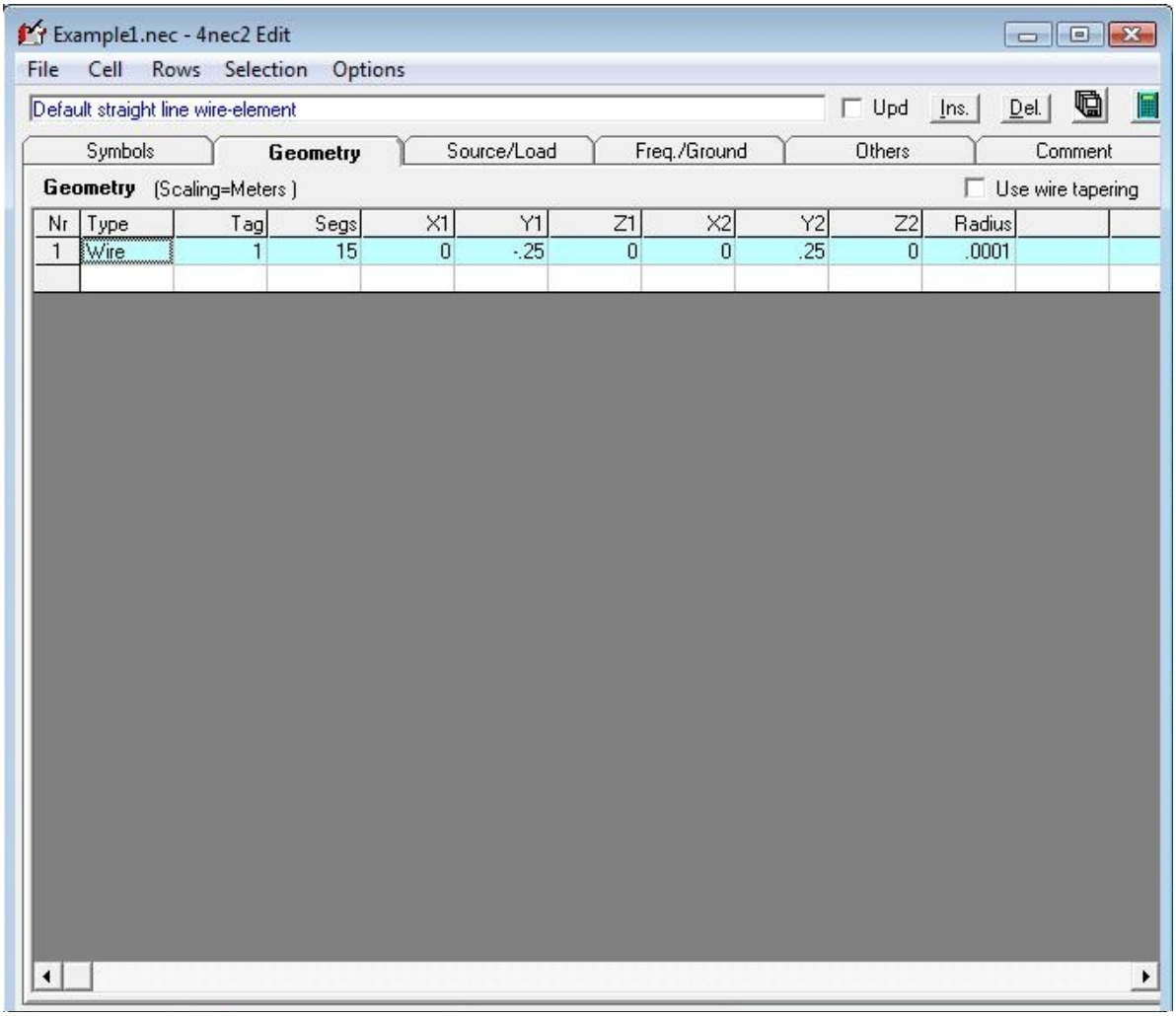

Figure 3: *The edit window.*

- **X1, Y1, Z1:** These fields define the x, y, and z coordinate locations of one end of the wire.
- **X2, Y2, Z2:** These fields define the x, y, and z coordinate locations of the other end of the wire.
- **Radius:** This field defines the radius of the wire in meters.

2.1.2 Source/Load Tab

2.1.3 Freq./Ground Tab

2.2 Generate Screen

The *generate* button (the eleventh from the left) allows us to generate field and impedance data for our geometry and is shown in Figure 4

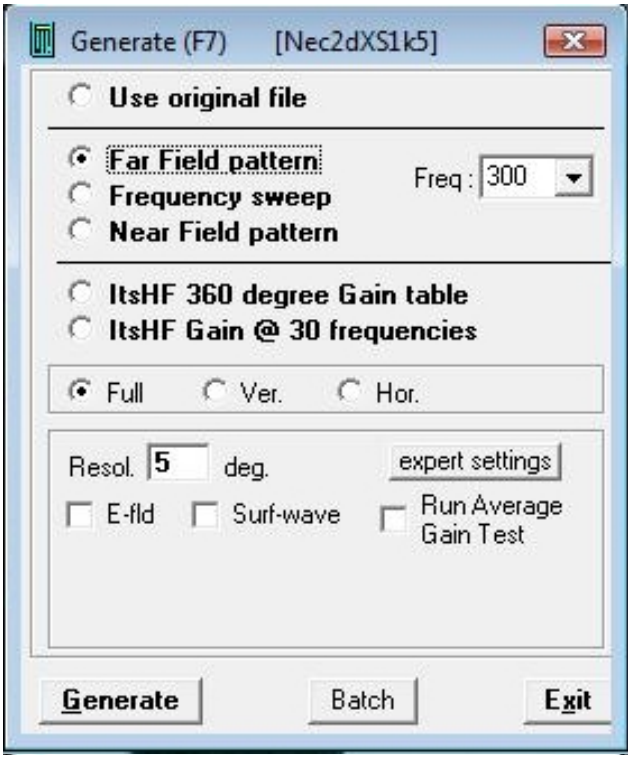

Figure 4: *The generate window.*

2.3 3D Viewer Screen

This screen (Figures 5 and 6) is an add-on that allows you to view three-dimensional images of the antenna structure, currents, and patterns. The default for this window is to display the antenna structure as shown in Figure 5. As with the geometry viewer, you may click and drag to rotate the structure. To view the far-field pattern, change the values in the drop-down menu buttons along the right-hand side to read 1) Structure, 2) Multi-color, and 3) Tot-gain. This choice will display the far-field gain pattern of the antenna chosen antenna structure as shown in Figure 6.

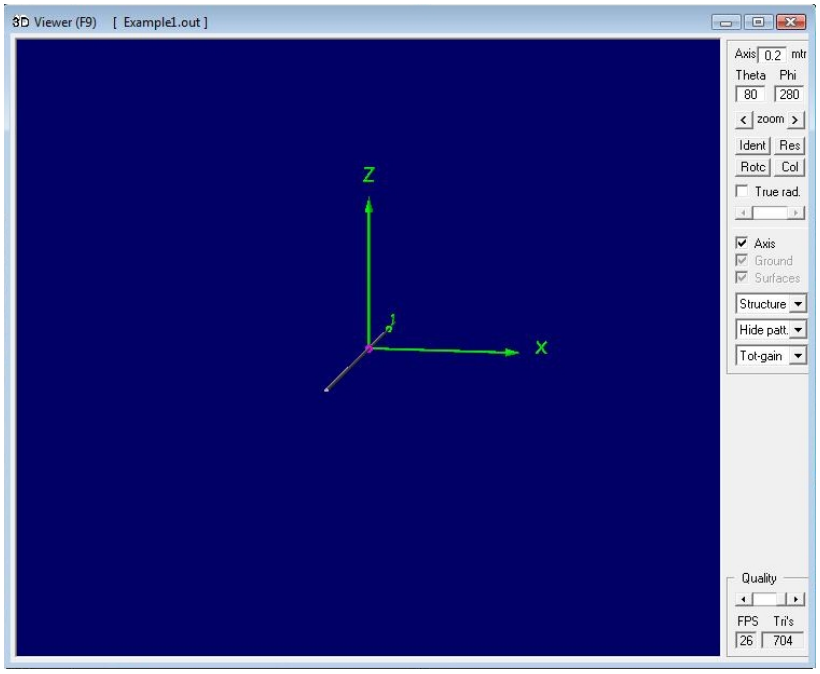

Figure 5: *The 3D viewer window displaying a three-dimensional image of the antenna structure.*

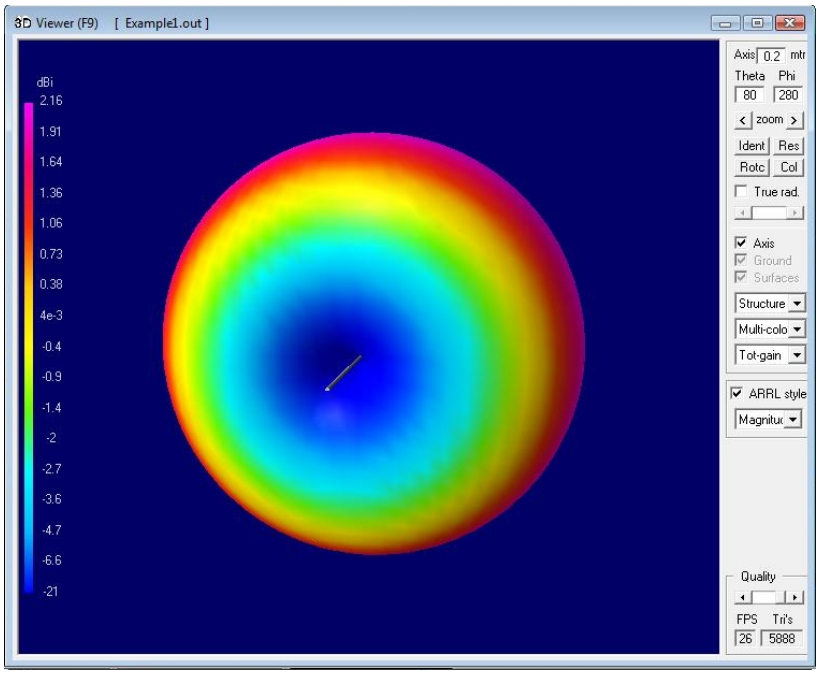

Figure 6: *The 3D viewer window displaying a three-dimensional image of the far-field antenna pattern.*