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Design and Development of Spiral UWB Antenna

Ashutosh Sharma

Southern Federal University, 105/42, Rostov-on-Don, Rostov Oblast, Russia

ashutosh@sfedu.ru

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Abstract

When compared to conventional methods, there are numerous advantages to using UWB technology. For example, there is no radio frequency. Instead, timed bursts of electromagnetic radiation are emitted by UWB. This means that the transmitter and receiver components needed for mobile devices can be easily manufactured. Spiral antennas are particularly useful in a short list of antennas that are both UWB, circularly polarised, and machine-produced in a micro-band environment with FI properties. The lumped circuit is automatically extracted from IE3D simulation and optimised for IE3D in this study. With its functions, IE3D is extremely beneficial to RFIC developers.

Key words: *Electromagnetic radiation, UWB antenna, FI properties, IE3D simulation*

Introduction

As interest in developing and employing effective antenna devices that can easily be incorporated into various shapes and conform to their external structures has grown in recent years, some desirable aspects are being sought after in the technology. Antennas are primarily required for satellite communication, the air and space industries, or missile applications because of their mass, weight, weight, budget, and efficiency. MSA antennas meet these specifications. Antennas that meet these specifications must be small in size, light in weight, strong, and conformable.

United States Federal Communications Commission (FCC) designated a 3,1–10,6 GHz unlicensed frequency spectrum for UWB. Short-range UWB communications benefit from UWB's cost-effectiveness, quietness, and incredibly high information rate. The ultra-wideband (UWB) systems of communication received a lot of attention from both academic and industrial sectors. A UWB scheme can be broken down into two types: the MB-OFDM (UWB) and the MB-OFDM (UWB) (UWB). Two types of UWB systems exist: The DS-UWB project envisions two different carrier frequencies at 4.104 (3.1–5.15 GHz) and 8.208 GHz (5.825–10.6 GHz), while the IEEE 802.15.3 format is MB-OFDM with a 3.1–10.6 GHz interval and 14 subintervals. Assumptions in this proposal are drawn from DS-UWB.

Spiral antennas are frequency-independent antennas that can work on a wide range of frequencies. The polarisation, radiation pattern, and impedance of such antennas remain constant throughout a wide bandwidth. These antennas have a minimal gain polarisation and are fundamentally circular. The spiral antennas' profits can be boosted by expanding their operating range.

In the short list of antenna types that are UWB simultaneous, circularly polarised, and machine-manufacturable in a microstrip context, spirals are especially valuable because of their frequency-independent (FI) features. Devices with amplitude and comparison methods can be found using spiral antennas. In order for a manoeuvring aircraft to be ready to respond to any particular danger signal orientation, circular polarisation is an important feature for directions. Rather than using any polarisation, hazard signals are typically linearly polarised radiators.Numerous applications, from military surveillance to ECM and ECCM to numerous commercial and private sector applications such as a variety of LPD antennas on transport vehicles, are possible with spiral antennas due to their ability to maintain coherent gain and input impedance over wide bandwidths. An ideal bandwidth of 100:1 is required for high-gain antennas that can be mounted on vehicles on land, air, or sea, with frequencies ranging from 0.5 to 18 GHz. Army and economic interests in particular have a substantial presence.

Research Methodology

The following are the steps to design the rectangular spiral antenna:

Step 1

After Installation of this software in the PC ,just we have to click on the “Start button” option and then click on “All Programs” .Different folders are available in that click on “Mentor Graphics SDD” .Hyper Lynx 3D EM folder is opened. Click on that, different applications are available, in that click on “Program manager” Option. After that a new window is opened which is shown in figure 1.

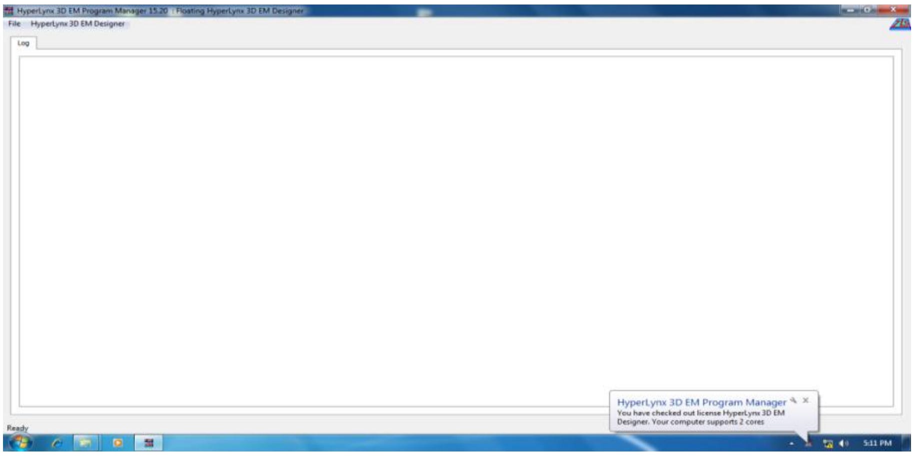

Fig 1: Hyper Lynx 3D EM Program Manager

Step 2

In the “Hyper Lynx 3D program Manager “window click on “Hyper Lynx 3D Designer” Option .After that different applications are displayed such as MGRID, PATTERN VIEW, MODUA and so on.

Step 3

Run MGRID. Choose File->New. The MGRID dialog displayed in figure 2 will show you the basic parameters. Choose the Unit as "mil" in the Length band. Change the highest frequency (F max) to 18 GHz, and wavelength (N cell) to 20 cells in the set of meshing parameters. In the Layout and Grids cluster, double press "Grid Size No.1..." Switch to 0.25 miles and choose OK if the Grid Size is being edited.

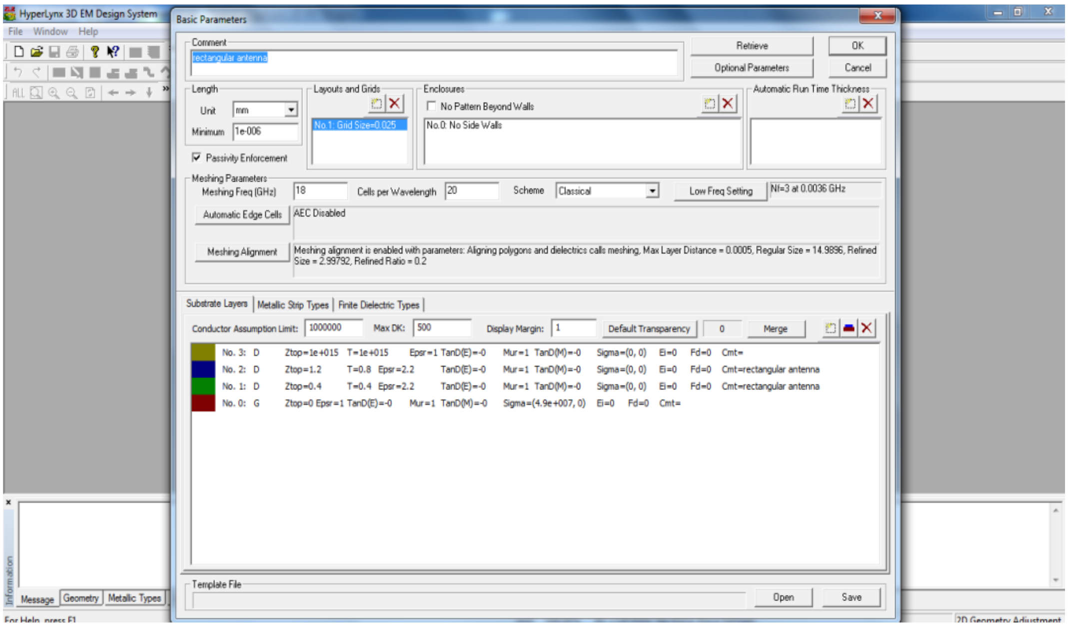

Fig 2: Basic Parameters window of Hyper Lynx 3D Designer synthesis

In the substratum layers cluster, select the Insert (or New) key. As shown in fig 3, MGRID prompts you for "insert new substratum." Enter the 0.4 (mile) entry "Top Surface, Z top." Enter the Constant Dielectric, Epsr= 2.2. Choose OK and the substratum reached will be displayed in the Substrate Layers list cabinet. The types of metal strip must not be changed because plastic losses are not usually critical to antennas if the frequency is not very big. To go ahead, select OK.

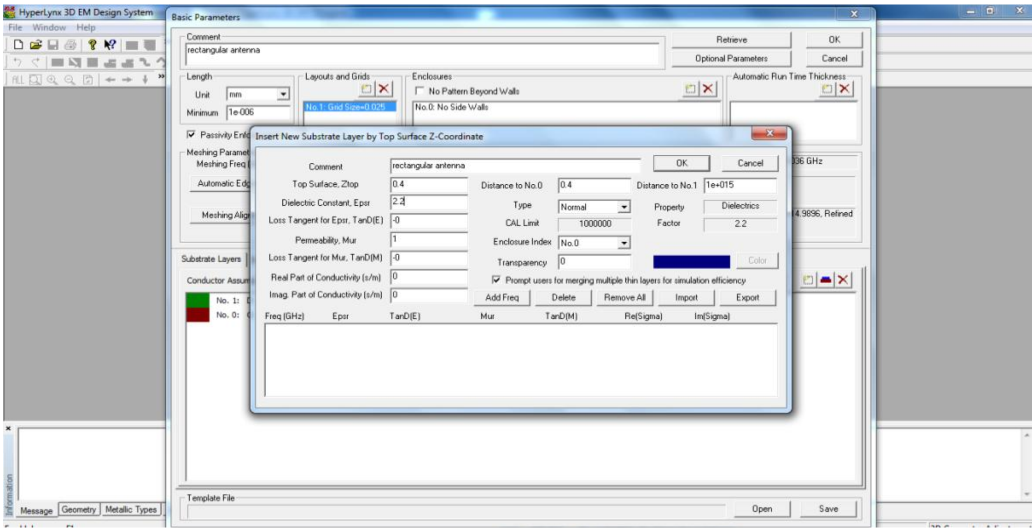

Fig 3: Insert new substrate window

Step 4

MGRID is ready for geometry input. After that, we have to click on predefined rectangular antenna structure available in the top of the window. After that rectangular type structure is displayed in the window as shown in fig 4 after giving the specified values such as spiral width value is 12, strip width is 0.4, spiral height value is 12, and gap width value is 0.2.

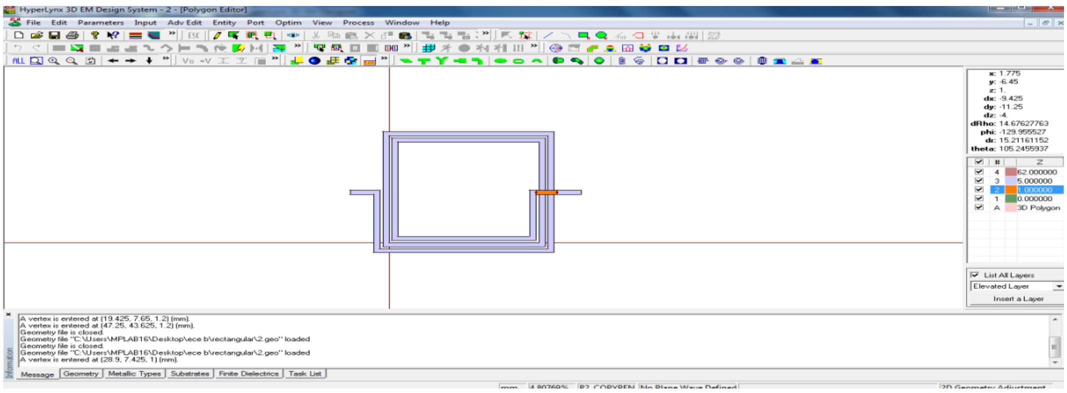

Fig 4: Rectangular spiral antenna structures

Step 5

Click on "port" option available in the window for finding out the different parameters of an antenna. Different options are available after doing that ,in that select "port for edge group" option and then a new window is displayed .In that window click on "Advanced extension" option and click ok to continue .After that just drag by using the mouse on edges of the structure. Different port numbers are displayed after doing the process. Structure with port numbers as shown in fig 5.

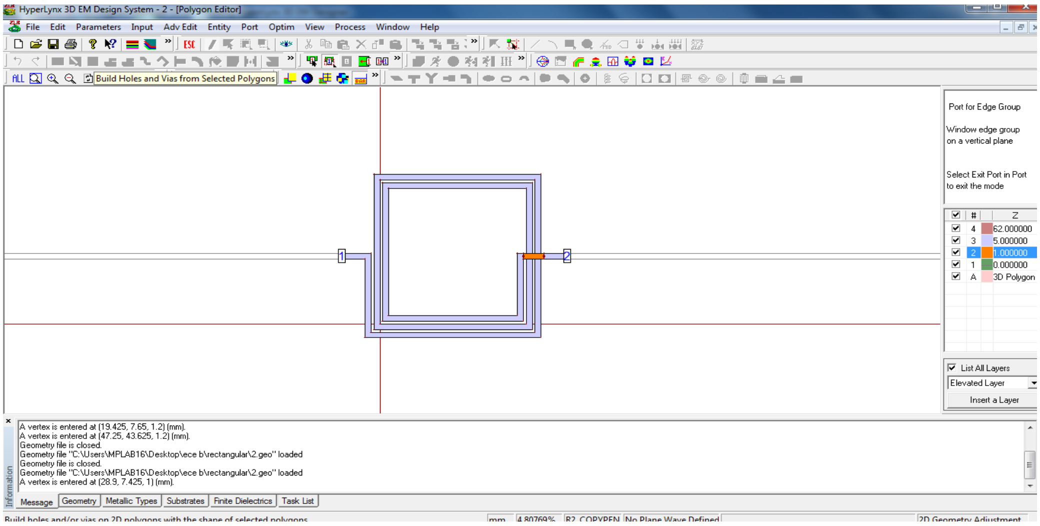

Fig 5: Structure with port numbers window

Conclusion

An excellent IE3D tool has been used to model and analyse spiral antenna design. With the IE3D, electromagnetic simulation has become the most flexible, easy-to-use, and accurate tool. It is possible to create a variety of spiral antennas for different frequencies. The dielectric constant and substrate materials can also be varied to test this concept.

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