### Experiment – 6: Simulation of half wave dipole antenna using Ansys HFSS

- 1. Aim: To design and analyze a half wave dipole antenna
- 2. Objective: Design, Simulate and Analyze a half wave dipole antenna using ANSYS.

## 3. Requirements

**ANSYS Software** 

#### 4. Pre-experiment Exercise:

#### **Brief Theory**

The dipole antenna is cut and bent for effective radiation. The length of the total wire, which is being used as a dipole, equals half of the wavelength (i.e.,  $1 = \lambda/2$ ). Such an antenna is called as half-wave dipole antenna. The range of frequency in which half-wave dipole operates is around 3KHz to 300GHz.

It is a normal dipole antenna, where the frequency of its operation is half of its wavelength. Hence, it is called as half-wave dipole antennaAfter rectangular patch the next configuration is the circular patch (as shown in figure 1) which has varying applications as a single patch element as well as in arrays. The circular patch has only one degree of freedom to control i.e. radius of the patch.

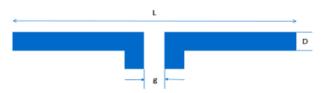


Figure 1: Plane view of Half-Wave Dipole Antenna.

In order to design a rectangular microstrip patch, the following design procedure is used:

#### 5. Laboratory Exercise

#### A. Design Calculations:

Sr. No.	Parameter	Value
1.	Resonant Frequency (fo)	
2.	Radius of the dipole cylinder (a)	

#### **B.** Procedure:

- 1) Open HFSS and create new project
- 2) Create a substrate of required size.
- 3) Use to draw option to draw a Cylinder button from the toolbar.patch on the substrate, edit the parameters of the Cylinder patch.
- 4) The next step is to build the symmetric of dip1. To do that, Right -Click the drawing area and select Edit -> Duplicate -> Around Axis.
- 5) Select the required substrate from the library.
- 6) Create a Lumped Excitation Port and then draw the radiation box of required dimensions, also assign radiation boundaries.
- 7) Add the required simulation set up, proceed with validation check, save the file and simulate the dipole antenna structure.
- 8) Open the  $S_{11}$  graph and interpret the same, add markers to find the resonant frequency and the bandwidth.

#### 6. Post Experiment Exercise:

#### 6.1 Results:

Sr. No.	Parameter	Theoretical values	Simulation Result
1.	Resonant frequency $(f_o)$		
2.	Impedance Bandwidth		
3	VSWR Bandwidth		
4	Gain		

Radiation pattern description with diagram:

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Conclusion						
	Conclusion	Conclusion	Conclusion	Conclusion	Conclusion	Conclusion

# **6.3 Questions:**

- 1. Explain types of dipole antenna.
- 2. Derive the expression for radiated power and radiation resistance of a dipole antenna.