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# What is the difference between a monopole and dipole antenna?

Antennas RF Basics

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Answer

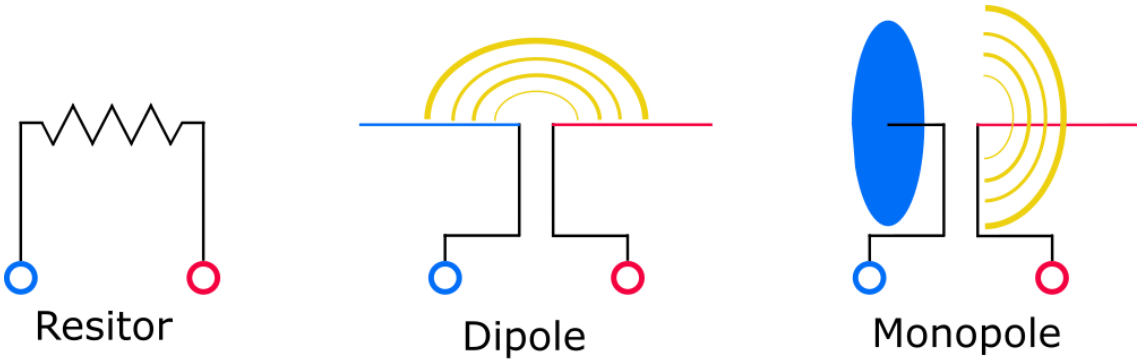
Glenn Robb - Antenna Test Lab Co
6/21/2017 3:47:28 PM

All antennas require two terminals, just as a circuit element such as resistor requires two terminals for current flow. It is easy to see that a resistor can have AC (RF) current applied to its two terminals, and dissipate energy.

With a dipole, the two terminals are intuitive as well. Each “arm” of the classic dipole is ¼ of a wavelength long, symmetrical, and each is connected to a terminal. However, the arms of a dipole do not have to be symmetrical, or even be the same shape. In an extreme version of this, one arm is a large shape.

Such large arm or shape of the antenna may be thought of as a “ground plane”. It could be a large metal disk, an array of radial wires, or even the rectangular ground plane of a PCB. In an extreme, it could even be the surface of the planet earth. In a true monopole antenna, we can see only one arm, and the other connection could be the earth. In all cases, there are still two connections!

The following graphic has been created to illustrate the similarities. For more antenna and antenna tutorials, you may visit the education area of Antenna Test Lab Co.




Dipole vs. Monopole by Glenn Robb, (c) Antenna test Lab Co

**Antenna Test Lab Co**
United States
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# How do you measure Antenna Gain?

Antennas

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1 Answer

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Answer

Glenn Robb - Antenna Test Lab Co
6/21/2017 2:13:31 PM

While antenna simulations can be an accurate predictor of gain, and duplication of known antennas can produce clones with predictable gain, these methods do not actually measure antenna gain. There are methods of measuring fields close to an RF excited around an antenna, called “near field scanning”, that simulate and predict the gain of an antenna.

However, all true measurements of antenna gain come back to the Friis Transmission Equation. I have written the equation here in the form of path loss, with units of decibels.

$$PL = G_1 + G_2 + 20\log\left(\frac{\lambda}{4\pi R}\right)$$

It says that the path loss between two antennas is the sum of their gains plus a term that relates frequency and their separation distance. In any test setup, you would know the test frequency and antenna separation distance, thus the sum of the antenna gains involved is easy to calculate.

Path loss is something that is easy to measure with a VNA, or any source receiver. You are probably already familiar (and equipped) to measure two port loss. Once you subtract the frequency/separation term from your measured path loss, you have the sum of two antenna

gains. If one antenna gain is known, then the unknown is resolved. If both antennas are identical, you may assume that each contributes half of the total sum game. A more detailed article on measuring gain can be found here.

In actual antenna gain testing, there are many other practical considerations, such as reflections, sweeping frequencies, and directional rotation (patterning). Some helpful educational links are available here.


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# What is an Anechoic Chamber?

Antennas Test & Measurement

Views 14

## 1 Answer

Can you answer this question?

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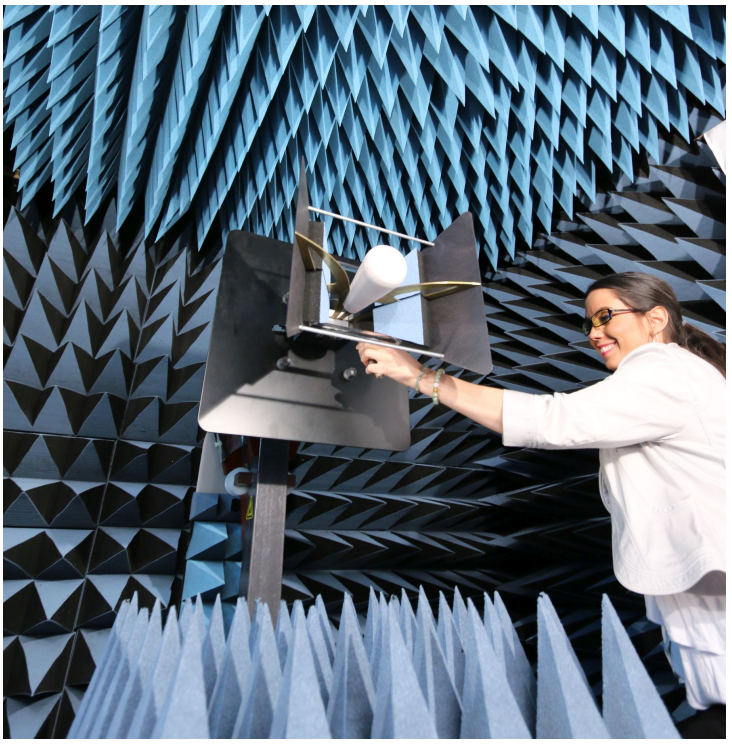
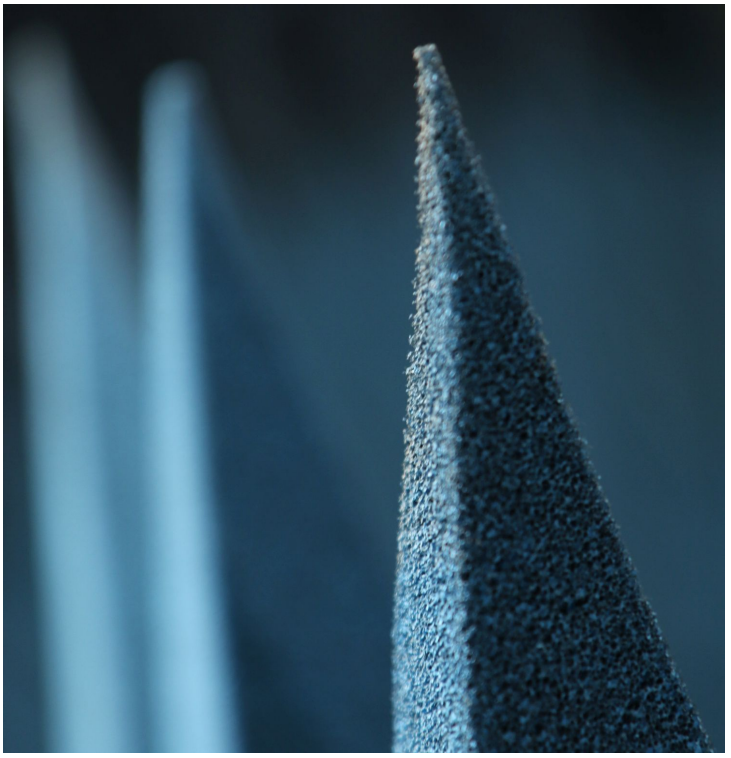
Answer

Glenn Robb - Antenna Test Lab Co
6/21/2017 2:36:03 PM

Anechoic means without echoes. Simply put, it is a chamber (a box or room) without reflections from the walls, ceiling, or floor. It may be an acoustic anechoic chamber, where the walls are treated with fiberglass sound absorbers to suppress echoes. In our RF world, we are talking about a shielded room, where the inner surfaces have been treated with radio wave absorbers. Typical absorbers may be foam pyramids loaded with carbon (for frequencies above 500 MHz) , or ferrite tiles (for frequencies below 500 MHz).



In RF engineering, the anechoic chamber is used for “Over The Air” (OTA) measurements, as opposed to “conducted” (in coax) measurements. The RF anechoic chamber environment allows antenna patterning and radiated measurements from antennas or devices with embedded antennas … without reflections or ambient radio signals. For more information, you may view an anechoic chamber description here.

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