Discone antenna

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A **discone antenna** is a version of a biconical antenna in which one of the cones is replaced by a disc. It is usually mounted vertically, with the disc at the top and the cone beneath.

Omnidirectional, vertically polarized and with gain similar to a dipole, it is exceptionally wideband, offering a frequency range ratio of up to approximately 10:1. The radiation pattern in the horizontal plane is quite narrow, making its sensitivity highest in the direction of the horizon and rather less for signals coming from relatively close by.

Mounted discone antenna designed for VHF and UHF coverage.

Discone made of solid copper sheets, theoretically covering 700MHz to 2GHz.

Contents

History

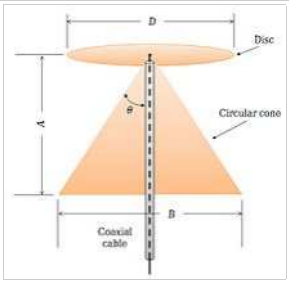
On February 6, 1945, Armig G. Kandoian of New York was awarded U.S. patent number 2,368,663 (assignor to Federal Telephone and Radio Corporation (later merged with ITT Corporation) for a "broad band antenna", from an application made on May 15, 1943.

Excerpt from the Kandoian patent:[1]

> In keeping with progress made during the last few years in the development of ultra-high frequency radio technique, and applications thereof to aircraft communication, direction finding, and so forth, it has become necessary to develop special antennas and antenna systems suitable for installation on such aircraft. Flying conditions are such that these antennas must necessarily be small and rigid in their construction and also offer a minimum of wind resistance, in order that the flying efficiency of the aircraft will be unimpaired. In accordance with my invention I have provided a small rigid antenna suitable for mounting on the surface of the fuselage or other component of the airplane structure and in certain embodiments I have also provided a streamlined protecting shield or housing covering or so cooperating with the construction of the antenna system as to greatly reduce wind resistance.

Description

The discone antenna has a useful frequency range of at least 10 to 1.[2][3] When employed as a transmitting antenna, it is often less efficient than an antenna designed for a more limited frequency range. SWR (standing wave ratio) is typically 1.5:1 or less over several octaves of frequency.[4] A discone antenna consists of three main parts: the **disc**, the **cone**, and the **insulator**.



Drawing of dimensions

- **The disc**: The disc should have an overall diameter of 0.7 times a quarter wavelength of the antenna's lowest frequency. The antenna's feed point is at the center of the disc. It is usually fed with 50-ohm coaxial cable, with the center conductor connected to the disc, and the outer conductor to the cone.
- **The cone**: The length of the cone should be a quarter wavelength of the antenna's lowest operating frequency.[2] The cone angle is generally from 25 to 40 degrees.
- **The insulator**: The disc and cone must be separated by an insulator, the dimensions of which determine some of the antenna's properties, especially on near its high frequency limit.

Construction materials

A discone may be made from solid metal sheet (often copper), which is practical for small indoor UHF antennas, such as for Wi-Fi.

At lower frequencies a sufficient number of metal wires or rods in a spoke configuration is often used to approximate a solid surface. This simplifies construction and reduces wind loading.

The spokes may be made of stiff wire, brazing rods or even coat hanger wire.

The optimal number of rods comprising the disc and cone is often quoted as being from 8 to 16.

Applications

The discone's wideband coverage makes it attractive in commercial, military, amateur radio and radio scanner applications.

The discone's inherently wideband nature permits it to broadcast undesirable spurious emissions from faulty or improperly filtered transmitters.

Extending low-frequency response

A vertical whip may be affixed to the center of the disc in order to extend the low frequency response, but this may compromise efficiency at higher frequencies. In this configuration, at lower frequencies the discone may more closely resemble a ground plane antenna or a coaxial dipole.

See also

- Antennas
- Biconical antenna
- Very high frequency
- Ultra high frequency
- Scanner (radio)
- Amateur radio

References

1. ^ Patent Application for a Discone Antenna by Armig G. Kodoian (http://www.pentodepress.com/receiving/patents/2368663.pdf)
2. ^ [a] [b] Paul Lee (1996). *The Amateur Radio Vertical Antenna Handbook* (2nd ed.). CQ Communications, Inc. pp. 50–51. ISBN 0-943016-14-2.
3. ^ Kennedy, G. and Davis, B. (1992). *Electronic Communication Systems* (4th ed.). McGraw-Hill. pp. 298–300. ISBN 0-07-112672-4.
4. ^ Jerry Hall (1991). *ARRL Antenna Book* (16th ed.). American Radio Relay League. pp. 7–17. ISBN 0-87259-206-5.

External links

- UHF Discone Antenna (http://www.northcountryradio.com/Articles/discone.htm)
- The Discone Antenna (http://www.qsl.net/kb7qhc/antenna/Discone/discone.htm)
- Parabolic Discone (Michael Lake KD8CIK) (http://hamdomain.com/para-discone/)
- Broadband radial discone antenna: Design, application and measurements (http://arxiv.org/abs/physics/0612043)

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