10.5 Discone antenna

Basic theory

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.

Fig. 10.5A.1 *Discone antenna on the roof*

Omnidirectional, vertically polarized and exhibiting unity gain, it is exceptionally wideband, offering a frequency range ratio of up to ~10:1. The radiation pattern in the vertical plane is quite narrow, making its sensitivity highest in the plane parallel to the Earth.

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

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 ~2:1 over the range of the design frequency to the second harmonic and ~3.1 thereafter.

A discone antenna typically has at least three major components: the disc, the cone, and the insulator.

The disc should have an overall diameter of 0.7 times a quarter wavelength of the antenna's minimum frequency. The antenna's feed point is at the center of the disc. It is usually fed with 50 Ω coaxial cable, with the center conductor connected to the disc, and the outer conductor to the cone.

The length of the cone should be a quarter wavelength of the antenna's minimum operating frequency. The cone angle is generally from 25 to 40 degrees.

The disc and cone must be separated by an insulator, the dimensions of which determine some of the antenna's properties.

In order to extend low-frequency response, a vertical whip may be placed affixed vertically to the disc. But this may reduce efficiency at higher frequencies. In this configuration, at lower frequencies the discone may more closely resemble a ground plane antenna or a coaxial dipole.

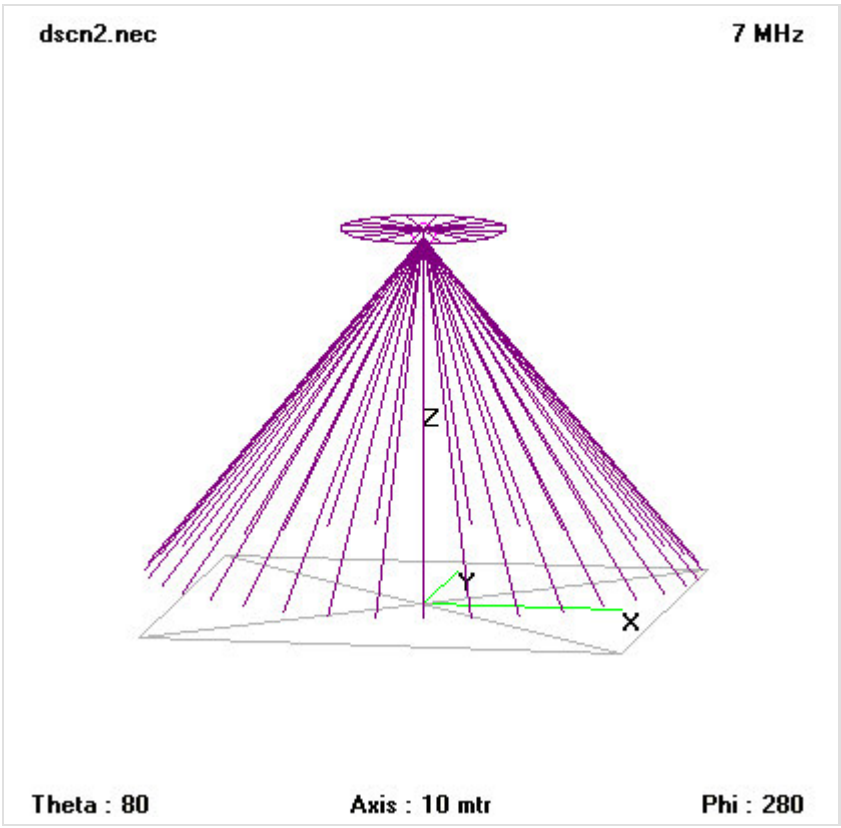

Fig. 10.5A.2 *Wire model of a discone antenna*

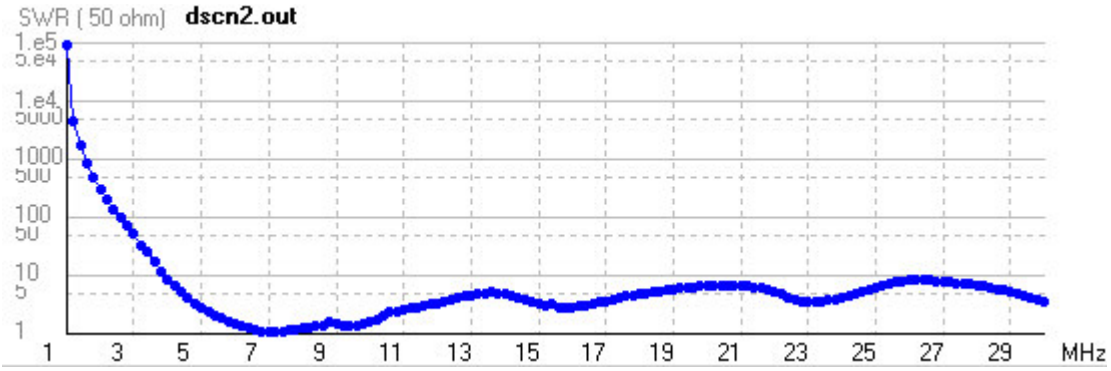

Fig. 10.5A.3 *Frequency response of standing wave ratio of a discone antenna (radius of cone d = 4.2 m, the length l = 16.8 m)*

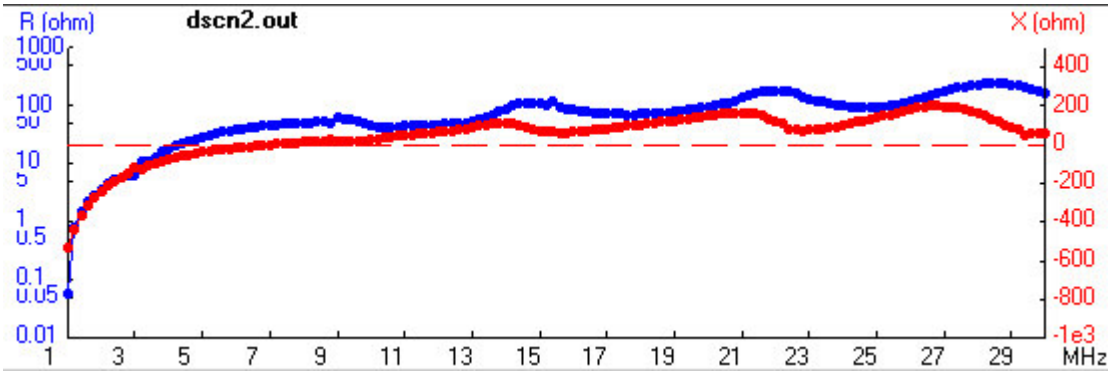

Fig. 10.5A.4 *Frequency response of input impedance of a discone antenna (radius of cone d = 4.2 m, the length l = 16.8 m)*

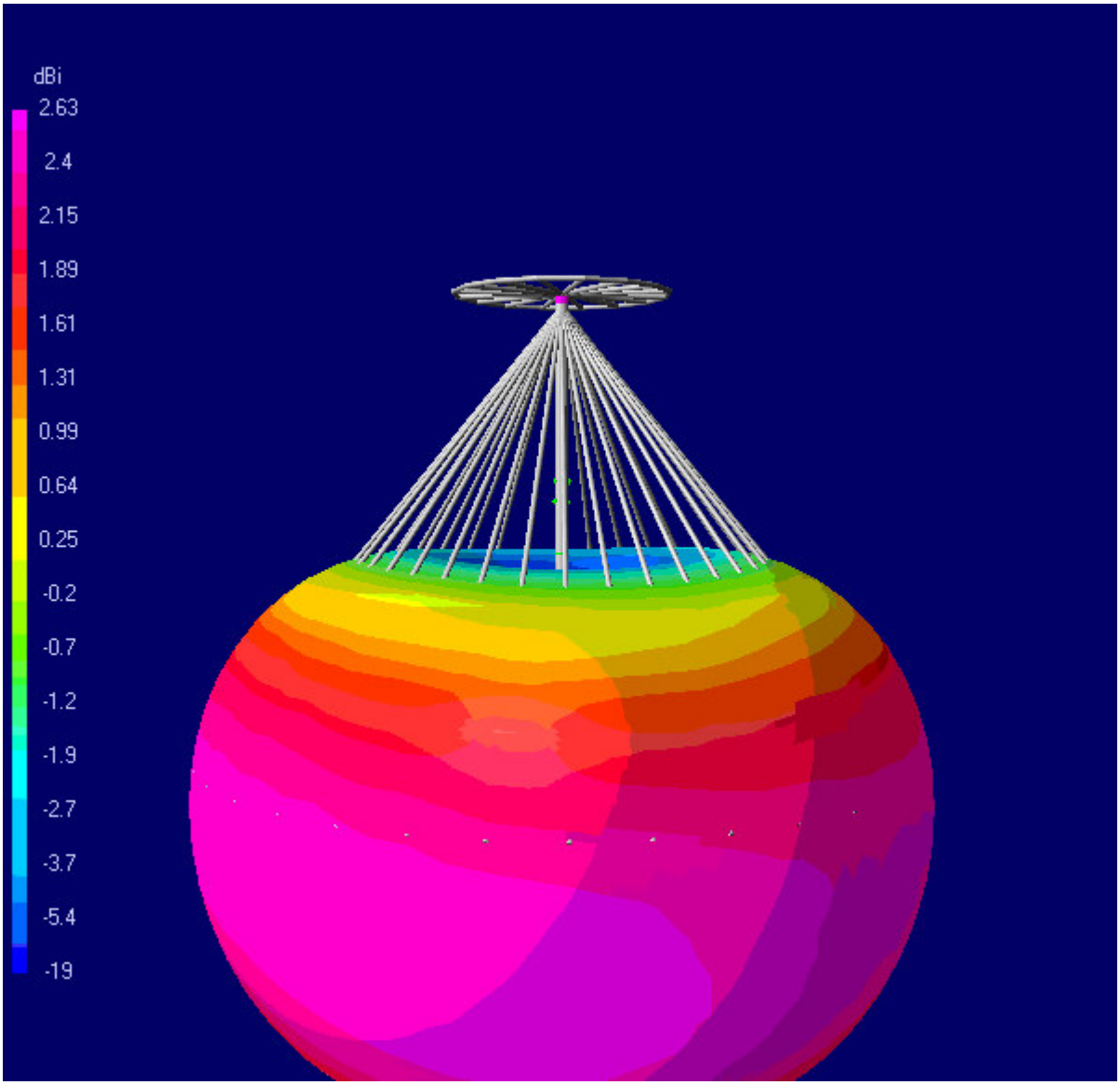

Fig. 10.5A.5 *Radiation pattern of a discone antenna at 7 MHz (radius of cone d = 4.2 m, the length l = 16.8 m)*

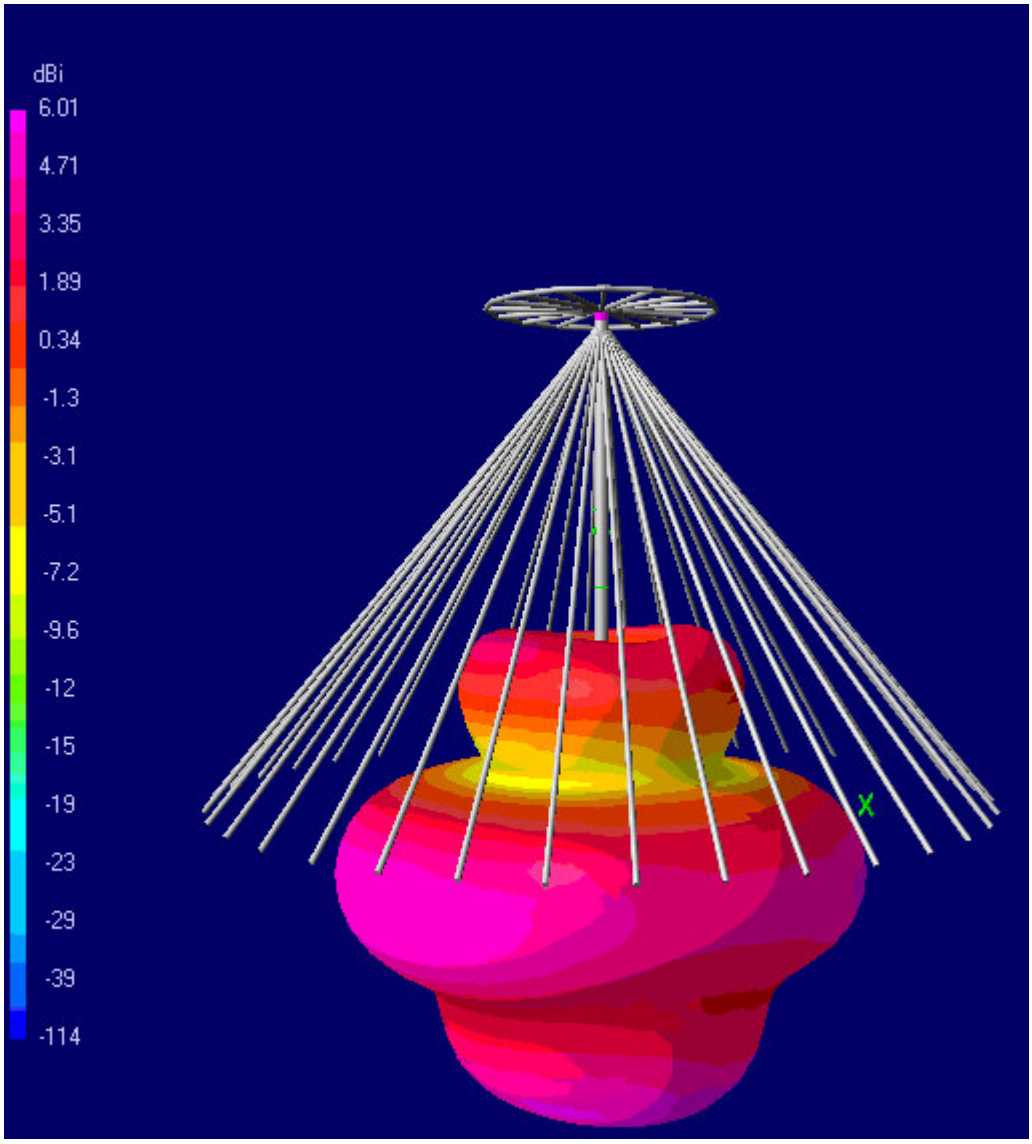

Fig. 10.5A.6 *Radiation pattern of a discone antenna at 14 MHz (radius of cone d = 4.2 m, the length l = 16.8 m)*

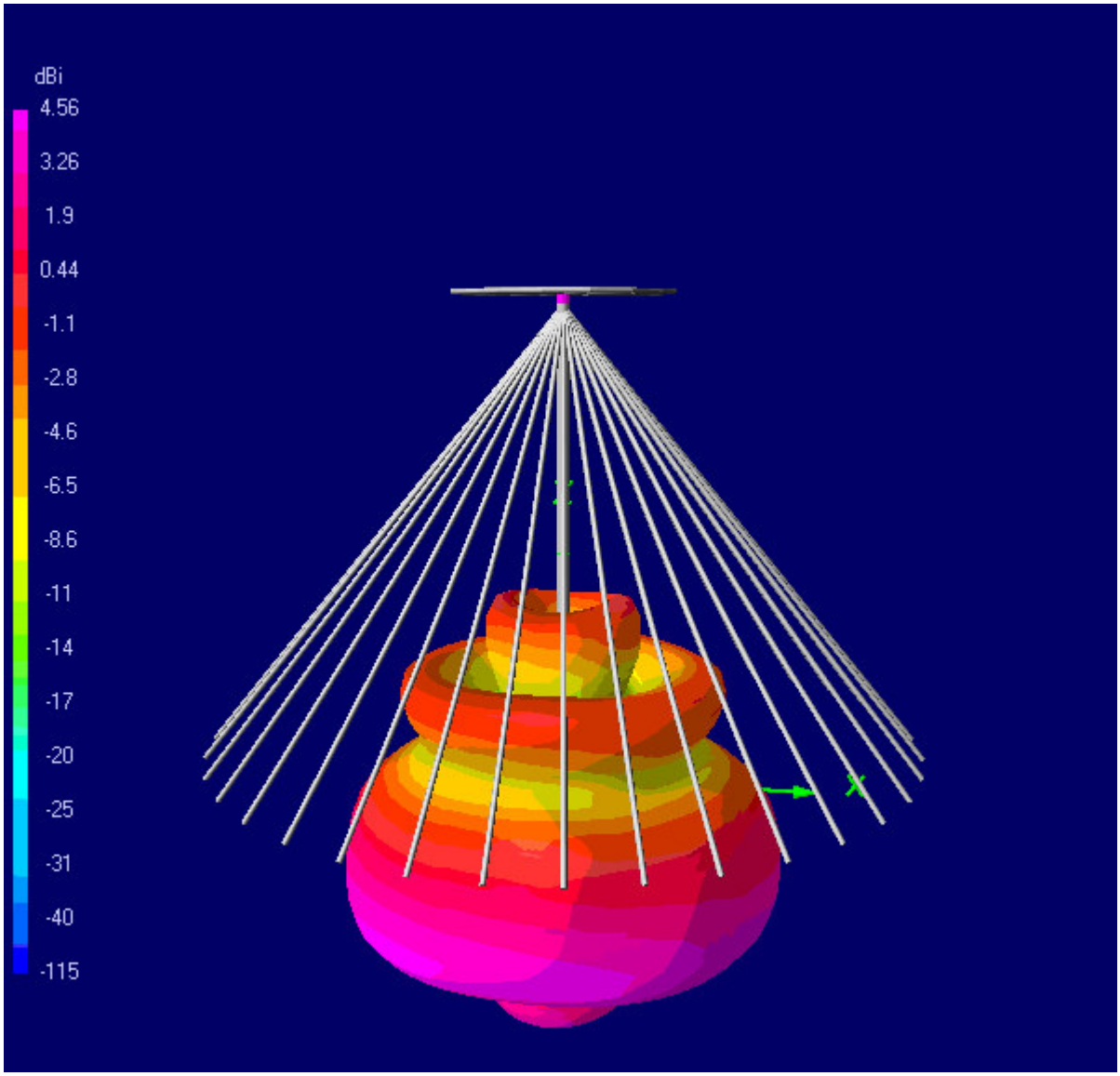

Fig. 10.5A.7 *Radiation pattern of a discone antenna at 21 MHz (radius of cone d = 4.2 m, the length l = 16.8 m)*

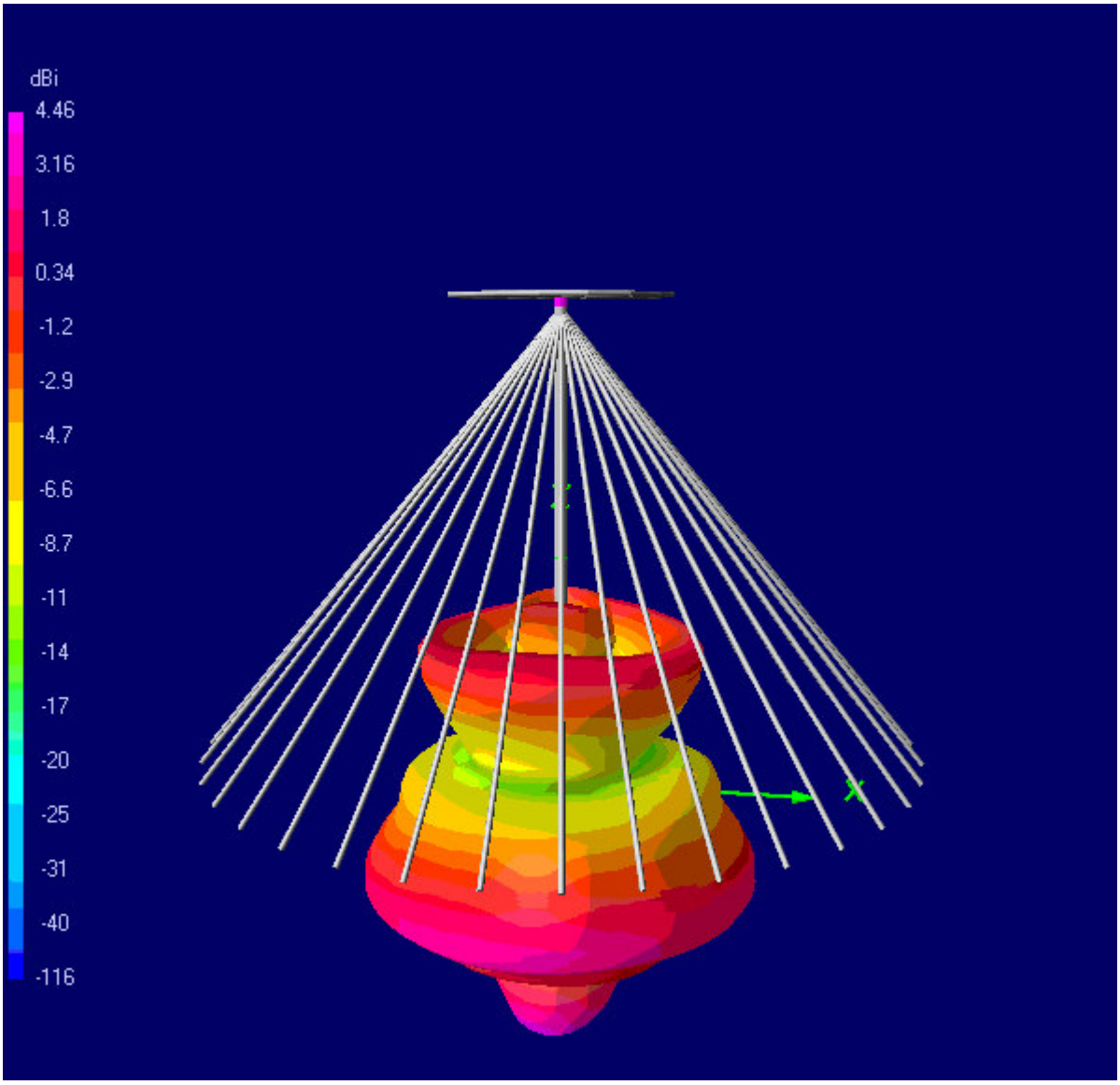

Fig. 10.5A.8 *Radiation pattern of a discone antenna at 28 MHz (radius of cone d = 4.2 m, the length l = 16.8 m)*