Newsletter 5.2

December 2014

Antenna Magus version 5.2 released!

As we wish all of our customers a happy end to 2014 and a prosperous start to 2015, we are pleased to announce the release of Antenna Magus Version 5.2!

This release sees the addition of 4 new antennas - increasing the total number of antenna templates shipped with Antenna Magus to 259.

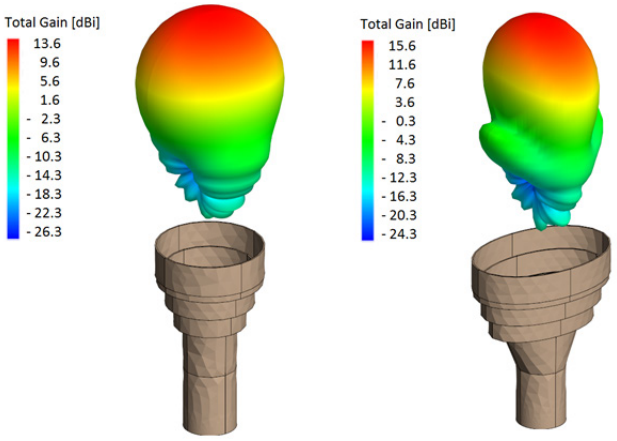
- Axial-choke elliptical horn antenna
- Dielectric-loaded folded half-loop
- Waveguide-fed conical horn with dielectric loading
- M-shaped monopole antenna

Axial-choke elliptical horn antenna

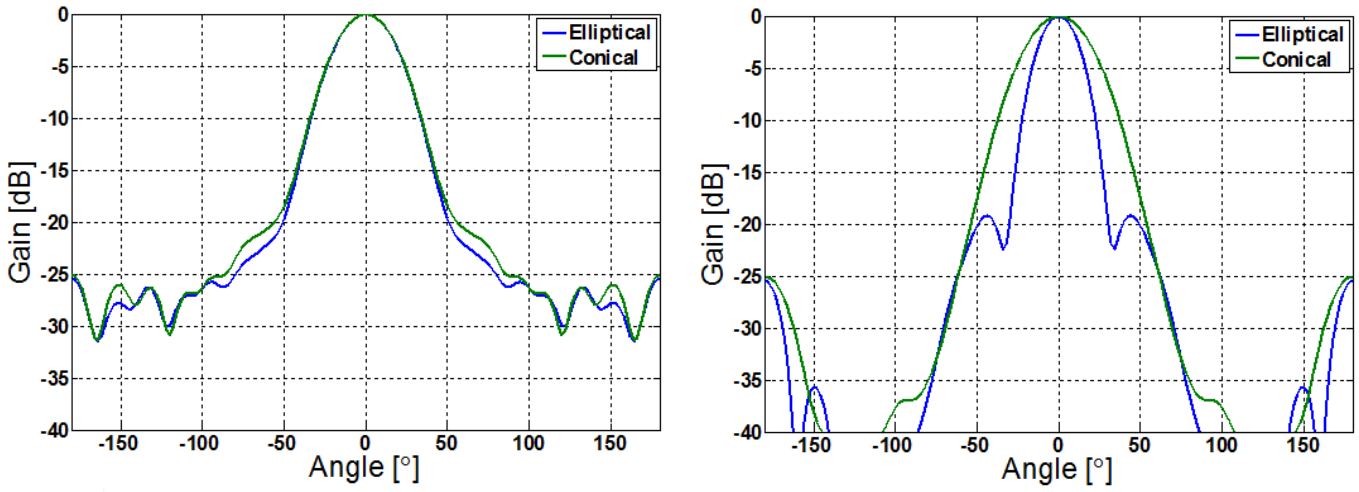
The *Axial-choke elliptical horn* is a variation of the Axial-choke conical horn also available in Antenna Magus.

By using elliptically shaped chokes, a directive, elliptically shaped radiation pattern (typically used as a feed for offset or truncated reflectors that require a non-symmetrical radiation pattern) can be achieved.

Antenna Magus allows the horn to be designed for a shaped radiation pattern (-3 or -10 dB E- and H-plane beamwidths specified) or a shaped radiation pattern with a peak gain level. In the figures below, the radiation pattern of an elliptical axial-choked horn designed to have -10 dB E- and H-plane beamwidths of 80° and 50° respectively are compared to those of a circular horn with equal -10 dB E- and H-plane beamwidths of 80°.



Radiation pattern at the centre frequency for a circularly- and an elliptically-shaped aperture



Normalised radiation pattern cuts at the centre frequency in the E-plane (left) and the H-plane (right)

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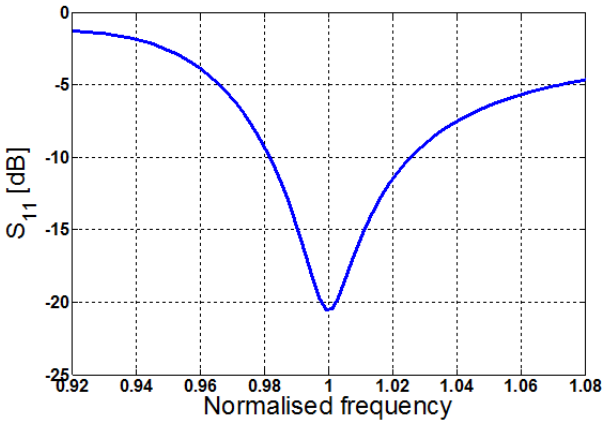
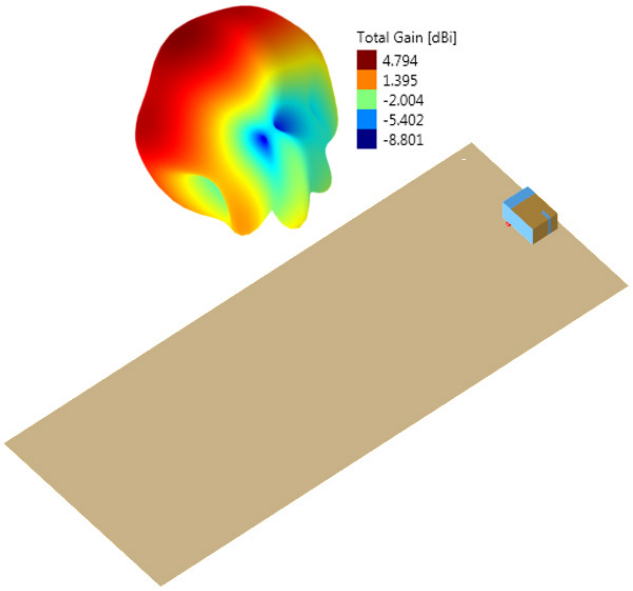
Dielectric-loaded folded half-loop

The *dielectric-loaded folded half-loop antenna* (DLFHLA) is a variation of the folded loop antenna, where a half-loop is folded around a dielectric block to reduce the antenna size.

Mainly used for WiFi applications, the DLFHLA is a self-balanced structure. This means that currents flowing on the ground plane are reduced while still maintaining good performance - a trait which makes the DLFHLA a very good candidate for MIMO (Multiple Input Multiple Output) applications. As such, the DLFHLA provides improved isolation between multiple antennas mounted on the same ground plane when compared to other popular mobile antennas (such as Planar Inverted-F antennas).



The reflection coefficient of the DLFHLA in a 50 Ohm system, showing the narrow impedance bandwidth.

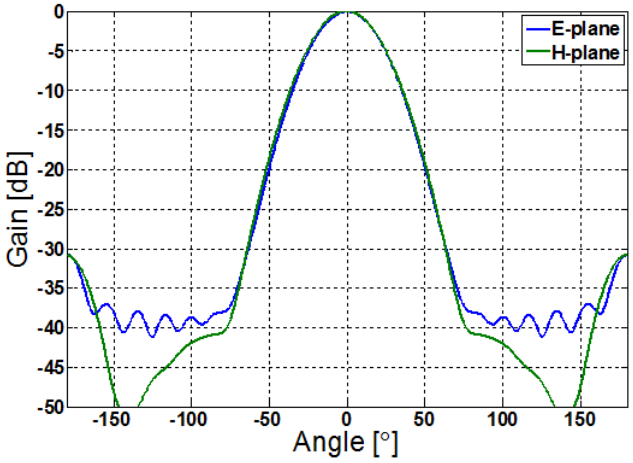


Radiation pattern of the low-profile corrugated feeder showing medium broadside gain.

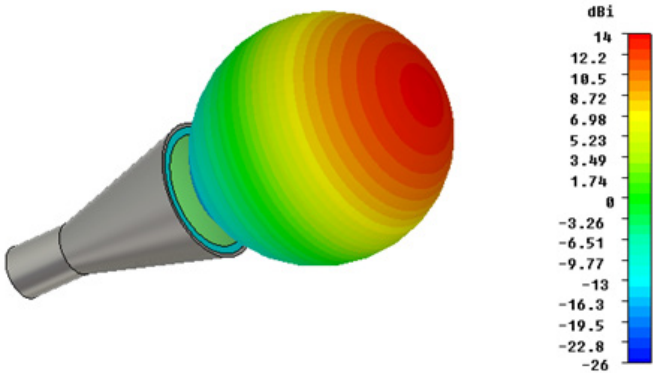
Typically the DLFHLA is matched to 50 Ohm and has a narrow impedance bandwidth. The radiation pattern is mainly broadside, but becomes less directive as the permittivity of the dielectric is increased.

Waveguide-fed conical horn with dielectric loading

The *hybrid-mode horn* employs dielectric material inside the horn to achieve low cross-polarisation and low sidelobes over a wide frequency range. When compared to corrugated horns – which are also popular candidates for wideband performance with reduced sidelobes - the horn may offer a simpler structure which is easier to design, analyse and manufacture. Dielectric losses, however, may be prohibitive (particularly at higher frequencies) and the gain that can be achieved will be lower than that of an un-loaded conical horn.



The typical E- and H-plane pattern cuts show the excellent symmetry and low sidelobes achieved by the hybrid mode horn.



The typical radiation pattern of the dielectrically loaded conical horn is a rotationally symmetric single lobe.

The *hybrid-mode horn* essentially comprises of four parts: a waveguide feed section, a conical flare, a spherical sector dielectric core and a dielectric wall.

As with any conical horn, the flare section serves as a transition between the waveguide mode and the free-space mode. Pattern symmetry and good cross-polarisation performance are achieved by the design of the dielectric loading, allowing the structure to support the hybrid HE11 mode.

The surface of the dielectric loading in the flare aperture is shaped like a lens to achieve a plane phase front over the aperture.

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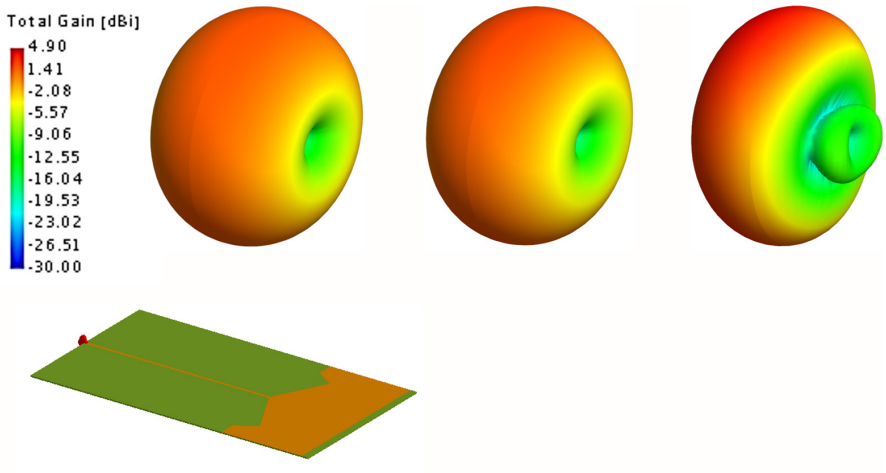
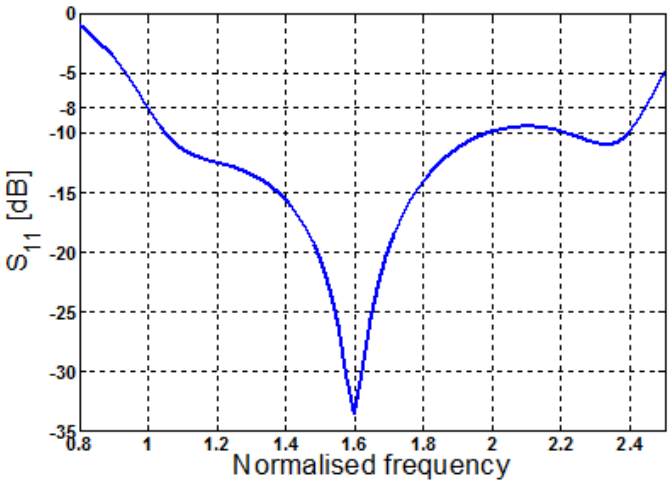
M-shaped monopole antenna

This antenna forms part of a class of planar antennas that employ various shaped monopole elements (such as elliptical or tear-drop shapes) to achieve widband performance. These antennas are typically suitable for use in mobile devices that operate over multiple frequency bands for wireless communication and networking, as they provide omnidirectional, linearly polarised radiation with medium gain with very wide impedance bandwidths.

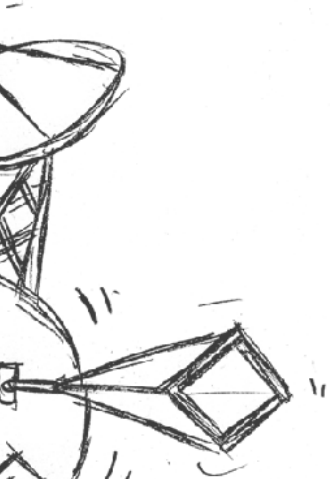
The *M-shaped monopole antenna*, however, is unique in that it provides improved operation at lower frequencies when compared with planar monopoles of similar size. This improvement in low frequency performance is achieved by the inclusion of a T-shaped groundplane extension below the monopole element.



Radiation pattern of the M-shaped monopole antenna at the minimum frequency, at 1.7 x the minimum frequency and at 2.35 x the minimum frequency



The M-shaped monopole antenna has a wide impedance bandwidth



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