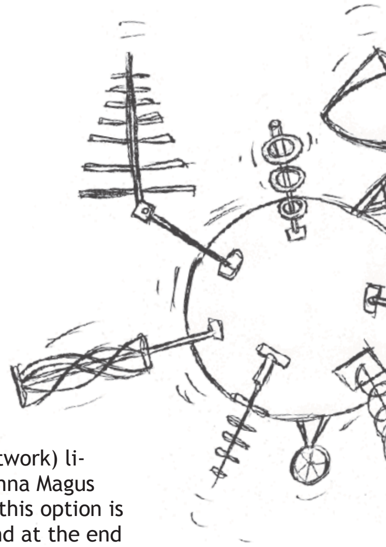


Newsletter 2.4

December 2010

Antenna Magus version 2.4 released!

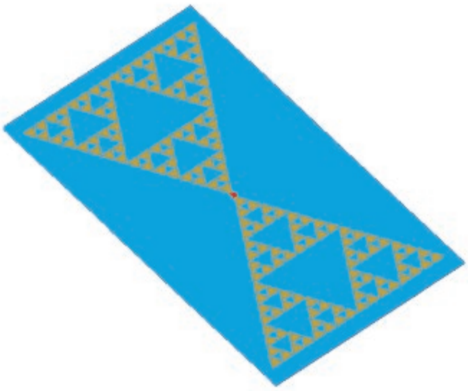
An update to Antenna Magus - Version 2.4 - is now available for download. This update features 8 new antennas—6 of which are dielectric-supported helical antenna variations. The other two antennas are the Sierpinski gasket antenna and a blade antenna. The Sierpinski gasket was a very popular antenna in the late 1990's when fractal antennas were being widely researched, while the blade antenna family is one of the most frequently requested antennas in our communications with Antenna Magus users.

In addition to these antennas, floating (network) licences have been made available for Antenna Magus from this release. More information about this option is available on the Antenna Magus website and at the end of this newsletter.

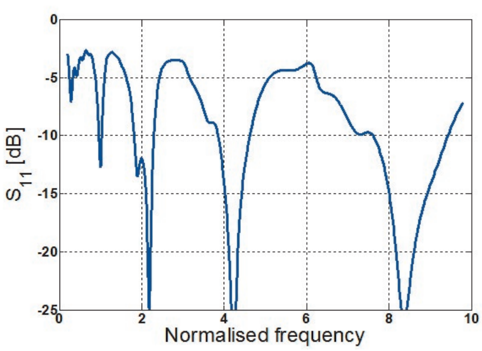
This will be the last update to Antenna Magus in 2010. The next release will be a highlight release of Version 3.0 in 2011 – we can hardly wait!

New antennas

Sierpinski gasket antenna



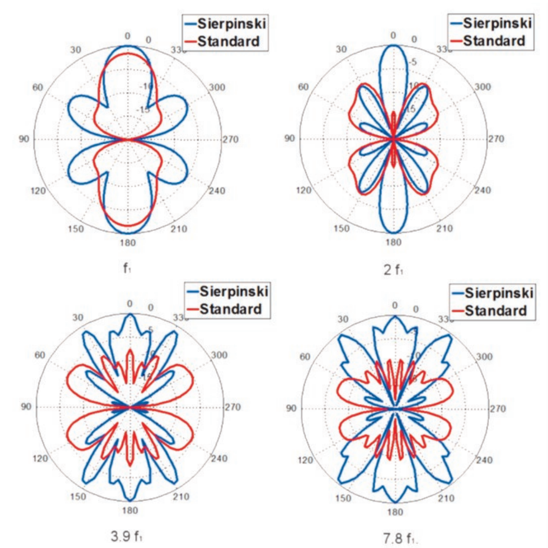
The *Sierpinski gasket* is a simple fractal geometry that provides multi-band performance in antenna applications. This antenna's bands are typically spaced factor 2 apart (as shown in a typical s11 vs frequency plot below – the first 3 operating bands are shown here). By adjusting the fractal geometry, other band spacings are can be achieved.



Typical reflection coefficient vs frequency (normalised by the first iteration fractal operation band frequency f_1) with reference impedance of 100 Ω.

The antenna's pattern and impedance performance in each band are identical, up to the point where truncation and substrate effects come into play. This makes the *Sierpinksi* bowtie suitable for applications where matched multi-band performance is important.

Physically the *Sierpinski* bowtie is quite similar to the standard bowtie and similar construction techniques may be used. Although the *Sierpinski* bow tie is more complex to manufacture when compared to a standard bowtie antenna, its impedance and 3D pattern are much more stable across band. The images below compare typical gain performance between the *Sierpinski* gasket and a standard bow tie with the same outer dimensions at various frequencies. The last image shows comparison of typical boresight gain (θ=0, ϕ=90) vs frequency for both these antennas.



Comparison of typical normalised gain (ϕ=90) in dB vs. Angle for Sierpinski and standard bowtie antenna with the same outer dimensions at 1x, 2x, 3.9x and 7.8x f_1.

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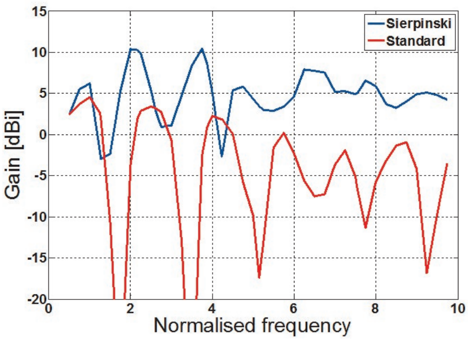
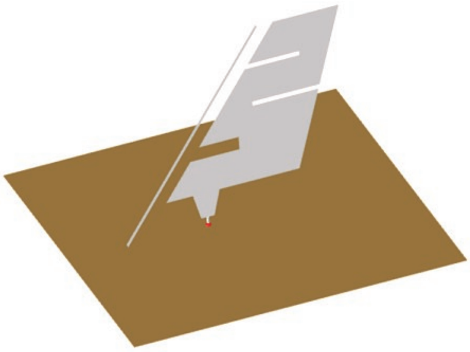


Comparison of typical boresight gain (θ=0, ϕ=90) vs frequency (normalised to the first iteration fractal operation band frequency f_1) in dBi for a Sierpinski gasket and standard bowtie of the same outer dimensions.

Blade antenna

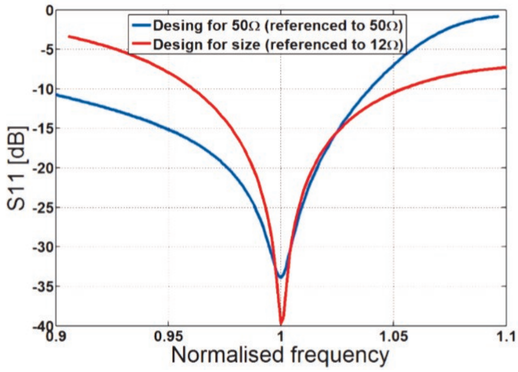


Antennas for airborne communications systems must have good omnidirectional coverage and efficiency, and must be well matched to the transceiver. For high performance aircraft, aerodynamic effects should be minimised and installation should be simple, to reduce aircraft modification costs. The antenna must also be designed to cope with environmental phenomena such as lighting strikes, rain and hail erosion, UV degradation, water ingress and static charge build-up. These factors invariably require the antenna to be enclosed in a fin-radome and mounted on the centre line of the fuselage, with a DC discharge or connection path to the ground or reference plane of the feed electronics.

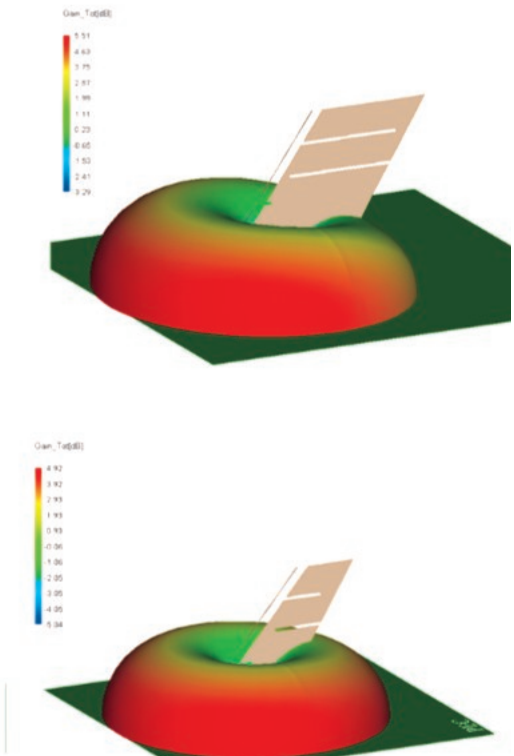
Blade antennas meet these requirements in the VHF, UHF and microwave bands due to their small size, light weight and low drag. There are a large variety of blade topologies and designs, some of which include integrated impedance matching networks to comply with bandwidth specifications.

The blade antenna included in the Antenna Magus database for the Verison 2.4 release is a simple planar meander-monopole blade, with a base-feed and a conducting leading edge for mechanical support and lightning protection. This topology is simple and lends itself to housing in an radome structure.

The blade can either be designed for optimal S11 or optimal size. When designing for a good 50Ω match the antenna will have a +- 3 dB front to back ratio and will be approx. 50% larger than when designing for optimal size. The optimal size design results in a near perfect omnidirectional pattern with a front to back ratio of less than 1dB. The two images below show typical S11 vs frequency and 3D gain patterns for these two design approaches.

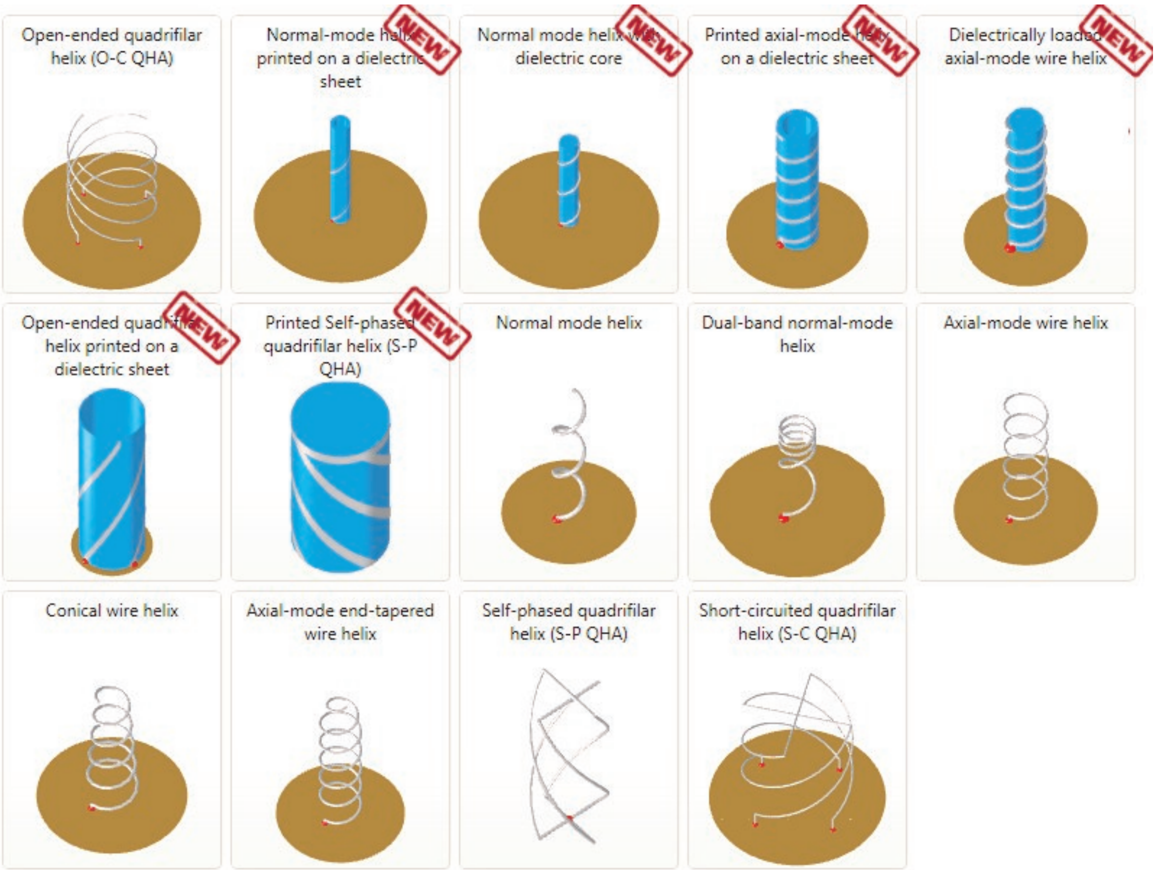


Typical S_{11} for the two different design approaches available in Magus. Note the different reference impedances used.



Typical total gain patterns at the center frequency of the two design approaches available in Magus. Design for 50Ω (top) , design for size (bottom).

Featuring helical antennas in version 2.4



***A selection of helix antennas in Antenna Magus*.**

Up until now, Antenna Magus has provided information, models and designs for 8 different helical antennas in the basic helix antenna classes, namely: axial-mode helices, normal-mode helices and quadrifilar helices. All of the helices, however, were 'self-supporting' (i.e. no dielectric support structures were included).

With the release of Antenna Magus 2.4, 6 more helical antennas have been added (2 axial-mode helices, 2 normal-mode helices and 2 quadrifilar helices). The newly added antennas are aimed at the design of helical antennas that include dielectric structures in their construction. The addition of dielectrics inevitably complicates the design of the antennas, but is usually done to either miniaturize the antenna, or to provide mechanical support for it. These new additions to Antenna Magus make for very practical, realizable helical antennas – particularly at higher frequencies and when using popular low-cost mass production techniques.

The effect of dielectric support structures on the performance of each of the different classes of helices is quite different, as each class of helix has an entirely different mechanism of operation.

Axial mode (or end-fire) helices support a travelling-wave with phase-velocity slightly less than c, and exponential amplitude decay along the length of the helix - due to radiation losses. The addition of a dielectric support structure affects the phase-velocity of the traveling-wave axial mode helices and the pitch angle and helix dimensions need to be modified to maintain the traveling-wave performance at the required frequency. The interaction between the dielectric support structure and the helix is complex and the addition of a dielectric tube support is very different to that of a solid dielectric core. Generally, the higher the relative permittivity of the core dielectric, the lower the operating bandwidth of the antenna without specific miniaturization effects and lower permittivity support dielectrics are preferred for good performance.

The normal mode helices, however, have a resonant or standing-wave current distribution along the length of the conductor. The effect of a dielectric support is therefore primarily related to the electrical length of the conductor in the effective dielectric medium at the dielectric/air interface.

There are many more additions and adjustments that can be made to helical antenna structures to make them more practical. These include more complex feed structures and integration of matching sections at the feed point as well as other topologies and variations for specific applications. While we hope to add more helices to Antenna Magus in future, the 14 helices that are available provide a good foundation for design of helix antennas for a wide range of applications and situations.

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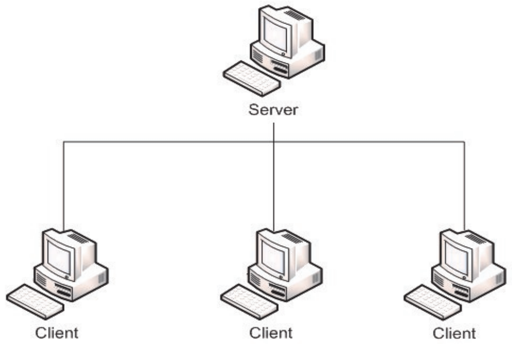
Floating licences now available…

Floating (or network) licences allow Antenna Magus to be installed on many computers within a LAN using one license. A single purchase allows for two concurrent users of Antenna Magus within the LAN. Floating licences also allow Antenna Magus to be accessed via remote desktop. The addition of this option will help users where node-locked licensing is inconvenient. It will also allow the Antenna Magus installation to be consistent with the installation of similar software products.

Please contact your reseller to find out more about the pricing and availability of this licensing option.



Still more in Antenna Magus 2.4!

This newsletter only contains the highlights of the 2.4 release. There are many improvements that are made to existing algorithms and models in each release. Please keep your Antenna Magus installation up to date, to avoid being frustrated by using an algorithm or model that has been updated or improved. Please go to www.antennamagus.com/release-notes.php for a detailed list of all the changes in this release.

Antenna Magus 3.0 coming soon...

Although it is nearly the end of the year and most people are changing into holiday mode, everyone at Magus is hard at work rounding off new features that will be made available with the next major release – verison 3.0 in early 2011. One of the major features planned for version 3.0 created a lot of excitement amongst internal users as well as some existing customers who helped us with specifications – the feature that allows you to “add you own antenna” to Antenna Magus.

Festive greetings

“Youth is when you're allowed to stay up late on New Year's Eve. Middle age is when you're forced to.”

“An optimist stays up until midnight to see the new year in. A pessimist stays up to make sure the old year leaves.”

- Bill Vaughnv

I hope no person nor pessimism forces you to stay up late on New year’s eve! Have a great festive season and a happy 2011

– from the Magus team.

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