Feed Protect

Ehnanced satellite antenna feed protection

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GCV FeedProtect provides a series of enhancements to the traditional Mylar system used for protection of microwave antenna feed systems:

- Increased thickness, thus increased robustness for protection against hail and birds.
- Wideband RF characteristics for incident waves up to Ka Band.
- Long lasting material (sand, salt, high temperature, UV deterioration), capable of being effective over 5 years after installation (for traditional mylar a 2 year replacement is suggested by suppliers).
- Better waveguide pressurization.
- Lower downtime costs, no more need of manlift urgently delivered at site to secure feed systems.

FeedProtect is available with thickness up to 5mm for low frequency applications (VHF/UHF horns), it’s built with CNC equipment, can be replicated on request as many times as needed, holes are already present on the body, leading to faster installation, the supplier can keep a database of specific designs on request of the customer.

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The following report lead to the construction of FeedProtect and was performed by the Turin Polytechnic on our behalf:

In this short report results are provided on the computed transparency properties of a Teflon layer with a variable thickness from 1 to 5 mm. The analysis is carried out in a wide frequency range (from 10 to 30 GHz) and for various angles on incidence and for both TE and TM polarization.

The intended application of this study is to use layers of appropriate thickness as a monolithic radome for Ku and Ka band feeds in large ground satellite antennas. In this sense, this analysis is a rough approximation, because the field radiated by the feed and impinging on the radome has not a definite incidence angle: the angular spectrum is relatively wide, and it depends on the geometry of the feed. An accurate analysis would require the exact knowledge of the geometry of the feed, and would imply the computation of the angular plane wave spectrum of the radiated field, the analysis of the transparency for the various spectral components and the integral of all the transmitted components. Alternatively, full wave analysis methods can be used. However these results can allow a first estimate of the attenuation and of the required thickness: it can be seen, for example, that for better performances, a variable thickness layer would definitely provide better transparency.

The results are organized as follows: for all the different thicknesses (1 to 5 mm, step 1 mm) and with the given material characteristics (relative dielectric constant, 2.1; loss tangent 0.00007) are shown:

- the contour plot of the amplitude (in dB) of the TE and TM reflection coefficients, for variable frequency and incidence angle.
- the contour plot of the amplitude (in dB) of the TE and TM transmission coefficients, for variable frequency and incidence angle.
- The graph of the reflection coefficients vs frequency, for normal incidence and for oblique incidence at 40 degrees, TE and TM polarization;
- The graph of the transmission coefficients vs frequency, for normal incidence and for oblique incidence at 40 degrees, TE and TM polarization.

As it can be seen, at appropriate frequencies the layers may behave as a half-wavelength radome, i.e. with almost zero reflection and almost total transmission. For the bands of interest, the 4 mm and 5 mm layers have a good behaviour in the Ka band; for the Ku band none of the considered thicknesses reach the half-wavelength, so that it is preferable to choose the smallest value, to approximate the 0-thickness case.

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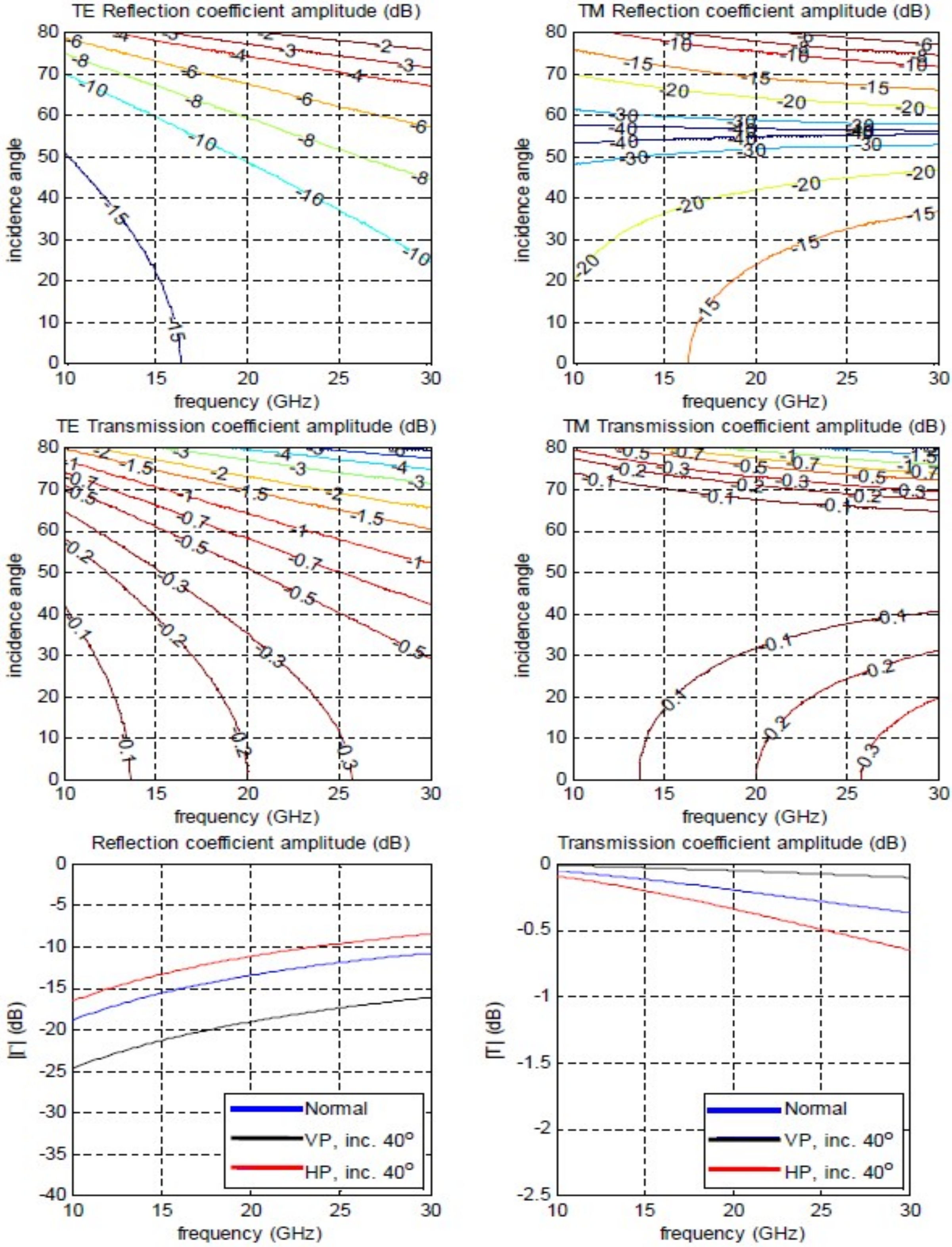

Fig.1: Reflection and transmission charts, Teflon thickness 1 mm

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