7 Conclusions

Edge diffracted waves resulting from surface discontinuities contribute significantly to the radar cross section of an object. Although this problem could be alleviated by altering the shape of the discontinuity, this is not always possible due to other mission requirements.

The use of isotropic surface wave absorbing materials is often advocated to remedy the problem of edge diffracted waves. However, this work has shown that the efficacy of isotropic surface wave absorbing materials is strongly polarization dependent. Hence, isotropic surface wave absorbing materials are only useful in a limited number of applications.

A superior solution consists in replacing the scattering surface by a soft surface. When properly oriented, a soft surface will suppress all radiation (both space wave and surface wave) in the direction of the radar, independently of the radar polarization and the polarization of the edge diffracted waves. In this process, the incident radar energy is not absorbed but reradiated in directions away from the radar.

Notwithstanding the limited applicability of isotropic surface wave absorbers, there is still an enormous amount of interest in characterizing these commercially available materials. A new measuring apparatus based on a partially filled rectangular waveguide has been developed for determining the attenuation constant and phase constant of plane surface waves along metal-backed isotropic surface wave absorbing materials. Measurements have been performed which validate this new measuring method.

Further Work

A better understanding of the mechanisms that lie at the origin of edge diffracted waves is needed. More information could be obtained by developing a computer program that solves the coated wedge problem.

Little is published on the propagation of surface waves along anisotropic and gyrotropic materials. This is important because nearly all of today's new aircraft have a high number of parts or are completely constructed out of carbon fibre, which is an anisotropic material.

The new measuring apparatus for characterizing surface wave absorbers still needs to be tested with multi-layered and lossy materials. Furthermore, the test cell was designed to interrogate the fundamental E-type plane surface wave at X-band frequencies. A similar cell could be build to interrogate the fundamental H-type plane surface wave. It may also be very interesting to have test cells for other radar frequency bands. The stealth design community would welcome a database containing the characteristics of existing surface wave absorbers at different radar frequencies.

Further work should also focus on the new technology of soft surfaces. To the author's knowledge, RCS measurements of objects with soft surfaces have not been reported in literature yet. Finally, efforts should be made to develop a broad-band soft surface.