Design of planar Ceramic filters, Microstrip and Substrate Integrated Waveguide Solutions, for Space Applications.

Professor Eric Rius
University of Brest

Abstract: High selectivity, low insertion loss, low size and low cost are all essential issues in the design and manufacturing of many microwave circuits and systems. Unfortunately, a simple traditional technology, either planar or non-planar, is unable to provide, at once, all of these characteristics. For a given selectivity, rectangular waveguides present excellent insertion losses and a good flatness, even when high rejections are needed. Unfortunately, they are bulky, and their manufacturing cost is high. Moreover, their integration with microwave planar circuits is uneasy, and such waveguides require transitions from planar to non-planar circuits. Concerning the planar technology, it suffers from poor electrical performances due to its low quality factor. However, planar filters are small, easy to fabricate, cheap, and more compatible than waveguides with traditional integrated-active devices.

A straightforward solution is to combine both solutions in a single structure to benefit from their respective advantages. For this reason, the concept of the substrate-integrated waveguide (SIW) was proposed by K. Wu and D. Deslandes: the waveguide is, in fact, buried into the substrate and delimited by linear arrays of metallized via-holes for the side-wall and by classical planar metallization process for the lower and upper faces throughout the waveguide.

This presentation is dedicated on the design of planar ceramic C-Band filters for a specific space application. Through this example a comparison between microstrip and Substrate Integrated Waveguide solution is made. The advantages of each one are highlighted. Perspectives on the design very compact with high K ceramics will be given and discussed.