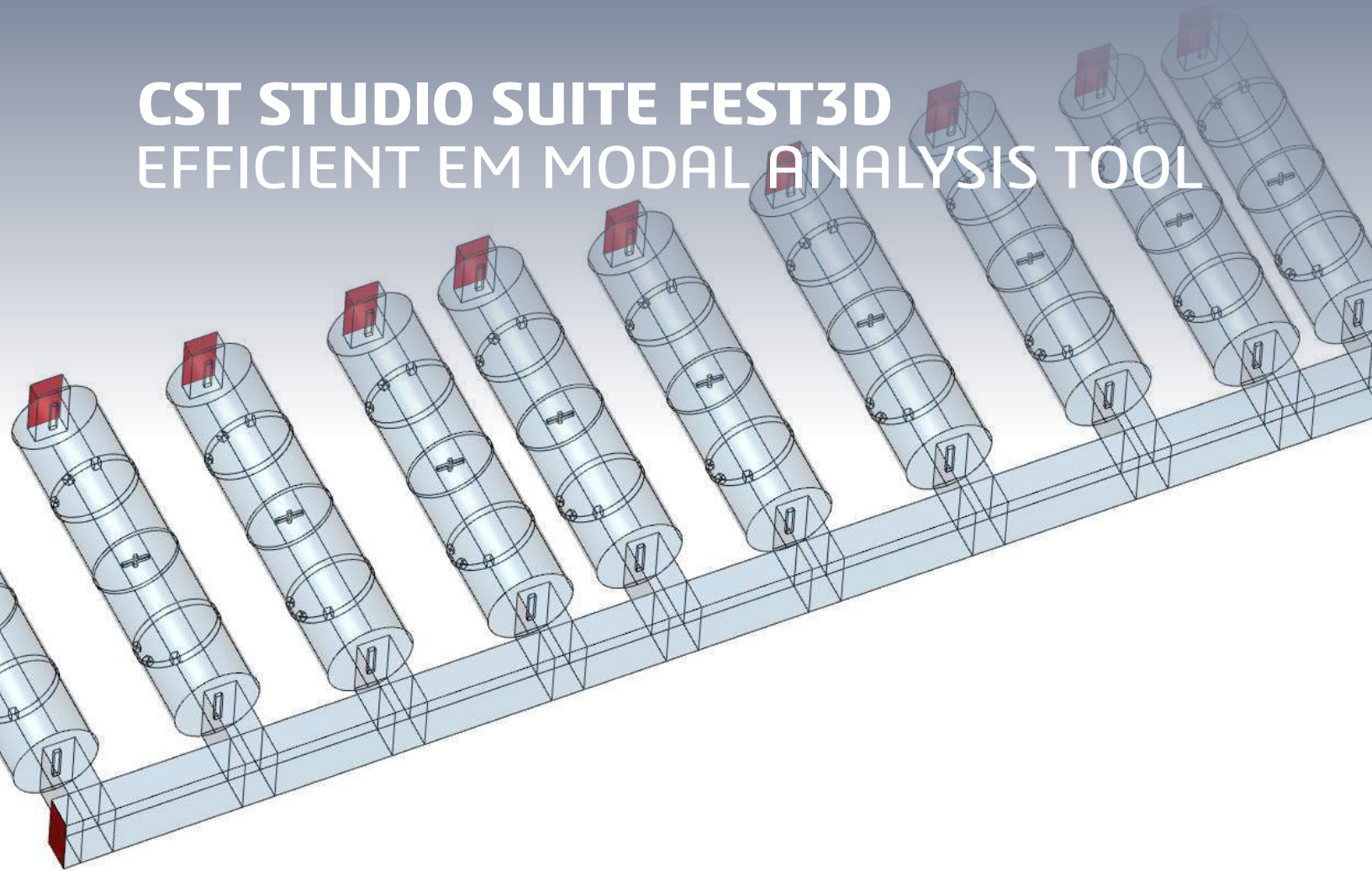


# CST STUDIO SUITE FEST3D EFFICIENT EM MODAL ANALYSIS TOOL



CST Studio Suite Fest3D is a software tool capable of analyzing complex passive microwave components based on waveguide and cavity technology in very short computational times with high accuracy. The main objective of this software tool is to support the microwave component design/manufacturing industries to decrease both the time to market and the development costs for the next generation of communication systems.

## MAIN FEATURES

**Fast & Accurate** Fest3D is based on a modal approach in which the device is divided into different blocks connected through the electromagnetic modes at the interface. Thanks to this divide-and-conquer approach, and to the use of unique algorithms, Fest3D ensures a high degree of accuracy while reducing the need of computational resources.

**Versatile** In order to cope with complex 2D and 3D building blocks, Fest3D uses an efficient electromagnetic numerical method—the Boundary Integral-Resonant Mode Expansion (BI-RME)—which is able to provide a broadband analysis efficiently. In addition to this, and thanks to the integration of the High Frequency solver (based on Finite Elements) of CST Studio Suite, Fest3D is capable of simulating most of the components in waveguide and/or cavity technology.

**Integration into CST Studio Suite** Fest3D solver is available within the CST Studio Suite schematic. This allows the creation of large structures combining CST Studio Suite and Fest3D projects. In addition, Fest3D can use most of the features in CST Studio Suite such as optimization through the coupling matrix for filter design, parameter sweeps, etc. (by using the FD3D software tool).

## EM ANALYSIS

The Fest3D analysis method uses a multimode equivalent network representation of waveguide junctions. This way, each element in the complete circuit is solved with the best available algorithm, making Fest3D very efficient compared to methods based on segmentation techniques such as finite elements or finite differences.

Unlike traditional mode-matching techniques, the electromagnetic simulation algorithms employed in Fest3D minimize the problems of relative convergence, leading to confidence in the results. Furthermore, the implemented integral equation technique extracts part of the frequency dependent calculations, resulting in very short simulation times per frequency point when compared to standard mode-matching techniques.

Some of the components types that Fest3D can analyze are:

- Filters (cavity, dielectric-loaded, dual-mode, band-stop, etc.)
- Multiplexers (Diplexers, OMUXs, etc.)
- Couplers & Polarizers
- OrthoMode Transducers (OMTs)
- Waveguide networks

## DESIGN

Fest3D includes several ad-hoc tools for the automatic design of different component types based on user specifications. A particular strength is the design of band-pass filters, low-pass filters, rectangular tapers, and dual-mode filters. The automatic design stage uses specific algorithms for each case resulting in a very good initial design (dimensions of the component). This way, the user can design, within seconds, low-pass as well as band-pass filters (up to 25-30% of relative bandwidth) without the need for post-optimization.

In addition to this, Fest3D can use both built-in and CST Studio Suite optimizers to achieve the desired response by tuning the geometrical dimensions of the component.

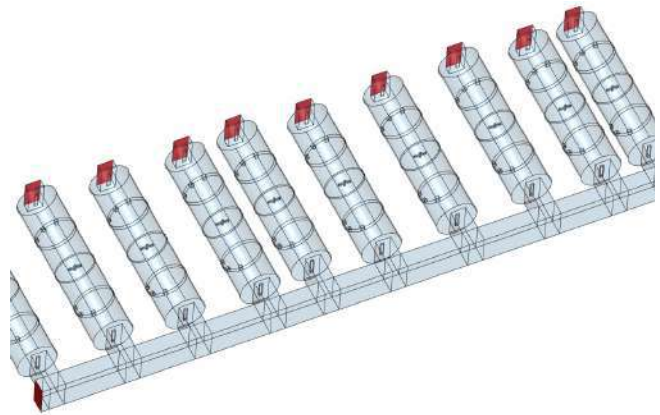


Fig. 1 3D model of a 10-channel output multiplexer designed with Fest3D

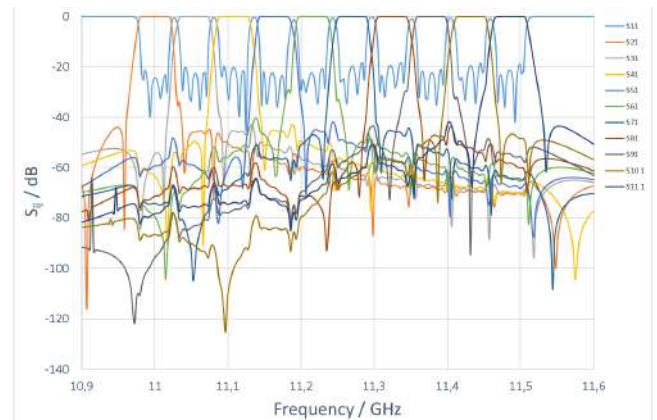


Fig.2 S-parameter response of the 10-channel output multiplexer

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