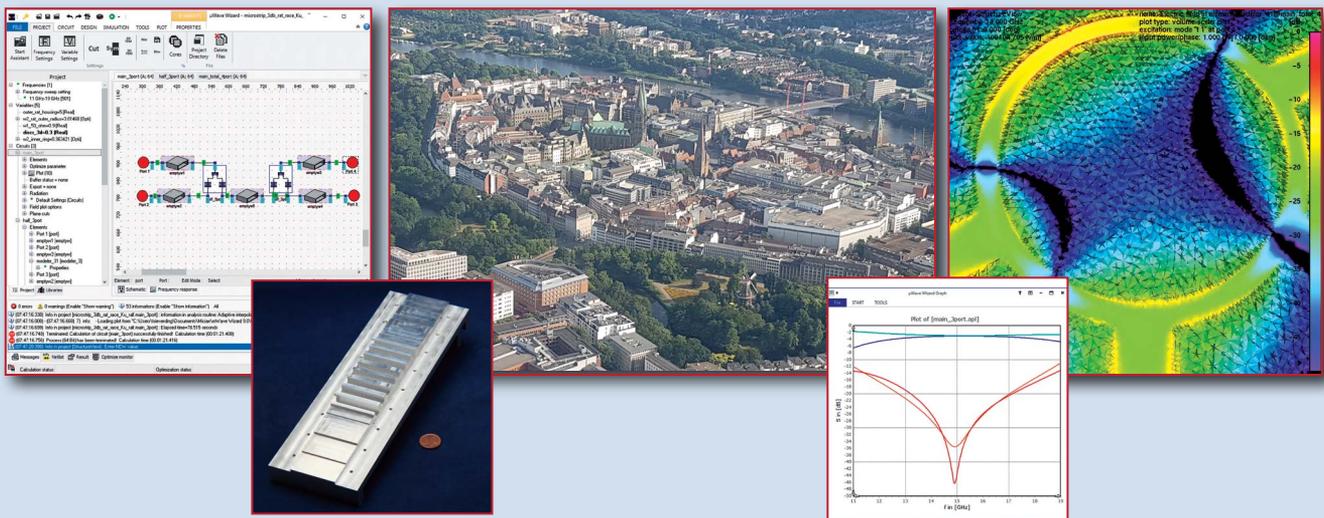


# FABS and LABS

## Mician: Fast, Accurate Simulation Wizard Speeds Microwave Design



In the beginning, RF design was a long, slow iterative process, with designers crafting their skills through trial and error, gradually developing an intuition of what works by accumulating many failures from what did not work. Successful designers who honed their capabilities were considered gurus, practitioners of both science and magic. Computer-aided design has since transformed RF design, beginning with linear circuit simulation, then evolving to nonlinear simulation and electromagnetic (EM) analysis. Software powered by ever-improving computational hardware has drastically reduced design risk and development time, making the holy grail of first-pass success achievable for many RF, microwave and mmWave designs.

Reflecting the desire to make accurate, fast EM simulation accessible to all, Mician was formed in 1998 by two friends who were PhD candidates at the University of Bremen. While 3D solvers provide the most comprehensive circuit analysis, the calculations consume time. Mician's founders thought they could streamline 3D analysis by applying mode-matching (MM) techniques and derivatives, even for structures which seemingly required 3D analysis. The gestation of their goal rolled out in 2001 and was subsequently named  $\mu$ Wave Wizard™. The  $\mu$ Wave Wizard platform combines MM with 3D finite element modeling (FEM) and other techniques in a hybrid solver with an easy-to-use graphical interface. The hybrid solver taps the flexibility of FEM and the speed and accuracy of MM, yielding a cost-effective simulation tool for passive microwave circuits, including antennas.

Mician's hybrid solver cascades predefined circuit elements from  $\mu$ Wave Wizard's libraries with user-generated elements created by the conventional approach: drawing

the structure in 3D. Each circuit element is simulated using the fastest, most accurate solver for its geometry, and the S-parameters of the complete structure are simply the cascaded responses of all the individual components.  $\mu$ Wave Wizard's libraries contain irises, cavities, junctions, orthomode transducers, polarizers and horns, each described by a modal scattering matrix. The designer determines the accuracy and speed of the simulation by choosing the number of modes for each, which are defined by the cutoff frequency of the highest considered mode. This hybrid approach—combining predefined elements with user-generated geometries, rather than developing a 3D model of the entire structure—significantly improves the computational efficiency.

Several versions of  $\mu$ Wave Wizard are available: the standard  $\mu$ Wave Wizard, a rental version with more capabilities and customized versions tailored to contain only the features needed by the customer. Mician continues to improve  $\mu$ Wave Wizard's capabilities by improving the speed and accuracy of simulation, adding library elements and interfacing with third-party applications.

More than 20 years after its founding, Mician retains its roots in Bremen from an office near the Weser River, with one in Redondo Beach, California, to better support its North American customers. The longstanding team remains committed to the founders' vision of accuracy, speed and user friendliness, which has made  $\mu$ Wave Wizard the preferred simulation tool for many microwave designers around the world. They rely on Mician's responsive support and its stream of software updates, which continually improve the platform and their designs.

[www.mician.com](http://www.mician.com)