

The mode-matching technique (MMT) is employed to analyze and design the transition from substrate integrated waveguides (SIWs) to substrate mounted waveguides (SMWs) that are mounted on top and/or at the bottom of the substrate. Coupling between the layers is facilitated by apertures of the thickness of the substrate's metallization. By appropriately segmenting the transition, a simple and fast MMT routine is developed. The results obtained for a single waveguide resonator mounted on the substrate agree well with simulations in CST and HFSS and, thus, validate the MMT code. Furthermore, the routine is extended to accommodate the design of more complex structures. A five-resonator SMW filter with additional SIW resonators to add transmission zeros and a diplexer are presented and prototyped. All the measured results are in good agreement with the MMT and the CST simulation results, thus validating the design procedure.