Introductory Course on Microwave filters

Purpose of the course: To introduce the concepts behind microwave filters highlighting the potential and limitations of these devices in the practical applications

Hours: 8 (4 lessons of 2h)

Program

Lesson 1: Introduction – Definition of filters- Specifications: Filter Mask - Design approaches for distributed-parameters filters – General recipe for microwave filters design. Software aids. Recall of microwave circuit fundamentals for filters design: equivalent circuit concept, resonators, resonant modes, coupled resonators, examples and discussion. Fabrication technologies and their impact on filters feasibility

Lesson2: Basics of lumped filters synthesis: equivalent low-pass domain, frequency transformation, impedance conservation property. Analytical solutions for all-pole functions (Butterworth, Chebycheff). Equations for the elements of ladder low-pass prototype. De-normalized band-pass network suitable for microwave implementations. Universal parameters characterizing the de-normalized filter model (coupling coefficients and resonating frequencies). Examples of all-pole in-line microwave filters (waveguide, microstrip and coaxial implementation).

Lesson 3: Why to introduce transmission zeros in the filter response. Approximating characteristic including transmission zeros (Generalized Chebycheff). Topological solutions (cross-coupled and extracted-pole topologies). The normalized coupling matrix. Practical examples (coaxial & waveguide) and discussion.

Lesson 4: Introduction to microwave filters dimensioning (with the aid of circuit and EM simulators)