SAW Lectures

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This page contains links to Surface Acoustic Wave (SAW) lectures by Dr. Alexander Rukhlenko. This collection of advanced lectures covers the theory, design, modeling, and simulation of SAW devices. In particular, the lectures discuss theoretical foundations of periodic bidirectional and unidirectional SAW interdigital transducers (IDTs), optimal and suboptimal design of linear- and nonlinear-phase IF SAW filters, SAW filter synthesis and analysis in the quasi-static approximation, charge-distribution and static-capacitance calculation, admittance calculation for unapodized and apodized IDTs, as well as practical simulation techniques and algorithms implemented using *MATLAB®* and *Keysight® Pathwave Advanced Design System (ADS)*.

Furthermore, the lecture series covers mixed scattering matrix theory and its application to SAW filter modeling, COM analysis of uniform reflective SAW transducers, multistrip coupler (MSC) modeling, and simulation of multiport and multitransducer SAW devices. In addition, it addresses the design, modeling, and simulation of low-loss IF SAW filters based on Single-Phase Unidirectional Transducers (SPUDTs) and Reflective SPUDTs (RSPUDTs). Overall, the lectures demonstrate analytical and numerical methods for designing and modeling SAW filters. Moreover, practical simulation examples illustrate modeling procedures, computational algorithms, SAW-device performance analysis, and interpretation of simulation results.

Learning Objectives and Target Audience

The lecture series provides a progressive learning path. The lectures begin with fundamentals of periodic SAW transducers and subsequently advance toward SAW filter modeling, MATLAB software development, and device-level simulations. Consequently, they may be of interest to engineers, SAW researchers and designers, as well as graduate students working in the field of SAW devices, RF filters, microwave electronics, and wireless communication systems.

Each lecture includes a detailed abstract and lecture outline, together with theoretical background, mathematical derivations, and practical simulation examples. In addition, most lecture materials are accompanied by live computer demonstrations based on MATLAB software developed by the author. Finally, the author demonstrates his proprietary SAW Filter Analysis Toolbox (SAWFAT) using tutorial SAW filter design examples.

Lecture Index and Navigation

This page is structured as a reference index for quick navigation to individual lecture contents.

Click one of the links below to read the corresponding abstract and lecture outline:

Web version: *SAW Lectures of Dr. Alexander Rukhlenko*