Jungwirth Mario
(scientific collaborator)

Research topic:

Consideration of transversal inhomogeneities
in the simulation of SAW filters

Industrial partner:

EPCOS (Electronic Parts & Components) Munich

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Overview

- Simulation of diffraction on SAW–Filters
  - On free surface (TD Diffraction Theory)
  - In guiding structures (Waveguides)
  - Modelling of diffraction including reflections in the filter structure

- Verification of simulations by measurement
  - Measurement of profiles with Michelson–Laser–Interferometer
    (Cooperation with HUT Finland)

- Simulation tool: MATLAB

Modeling of Transversal Coupling and Diffraction Phenomena in SAW Multi–Track Transducers and Filters

Diploma Thesis

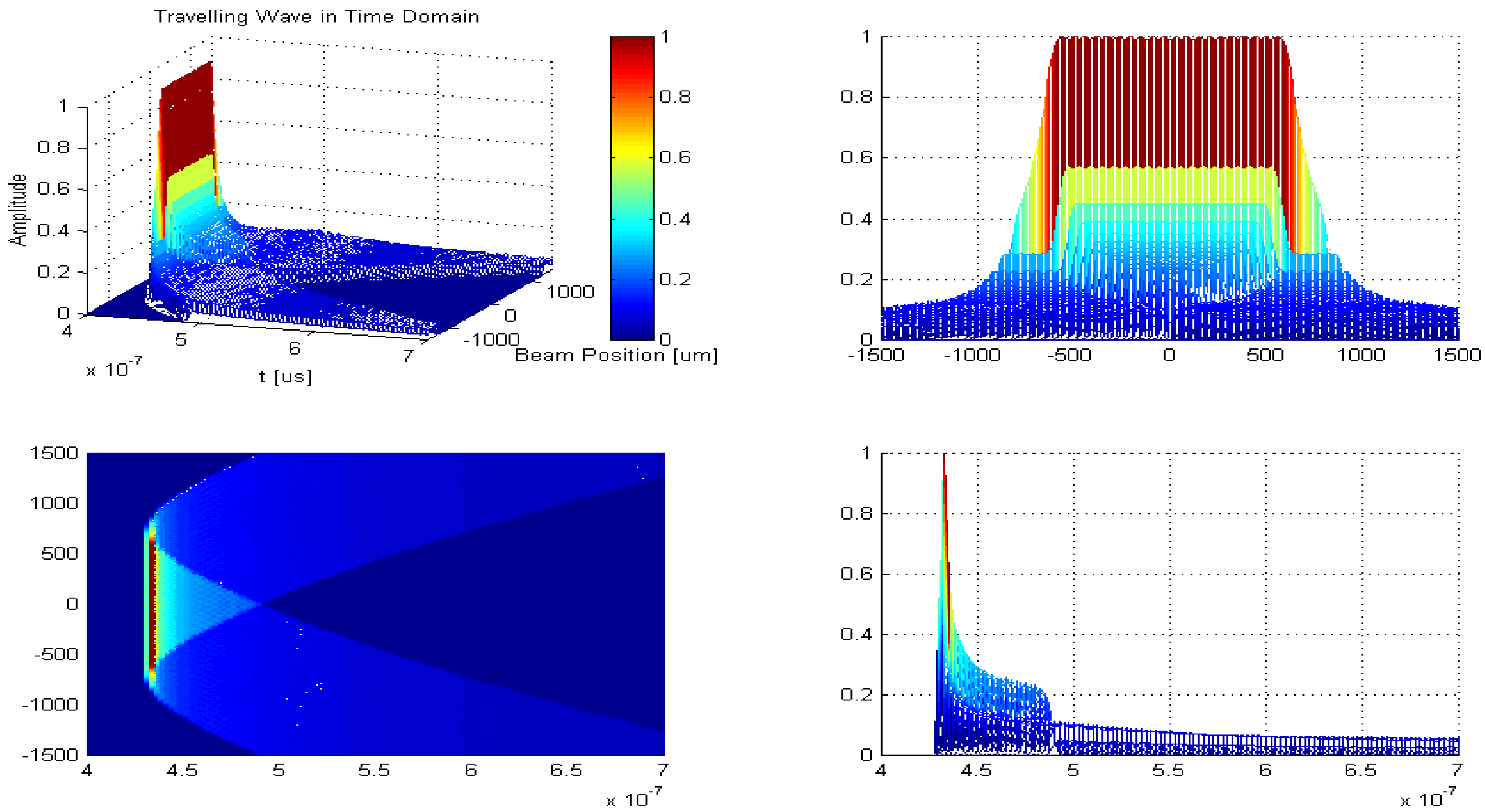
T. Greifeneder, K. Scheiblhofer, A. Stögmüller

Institute for Communications and Information Engineering,
University of Linz, Austria

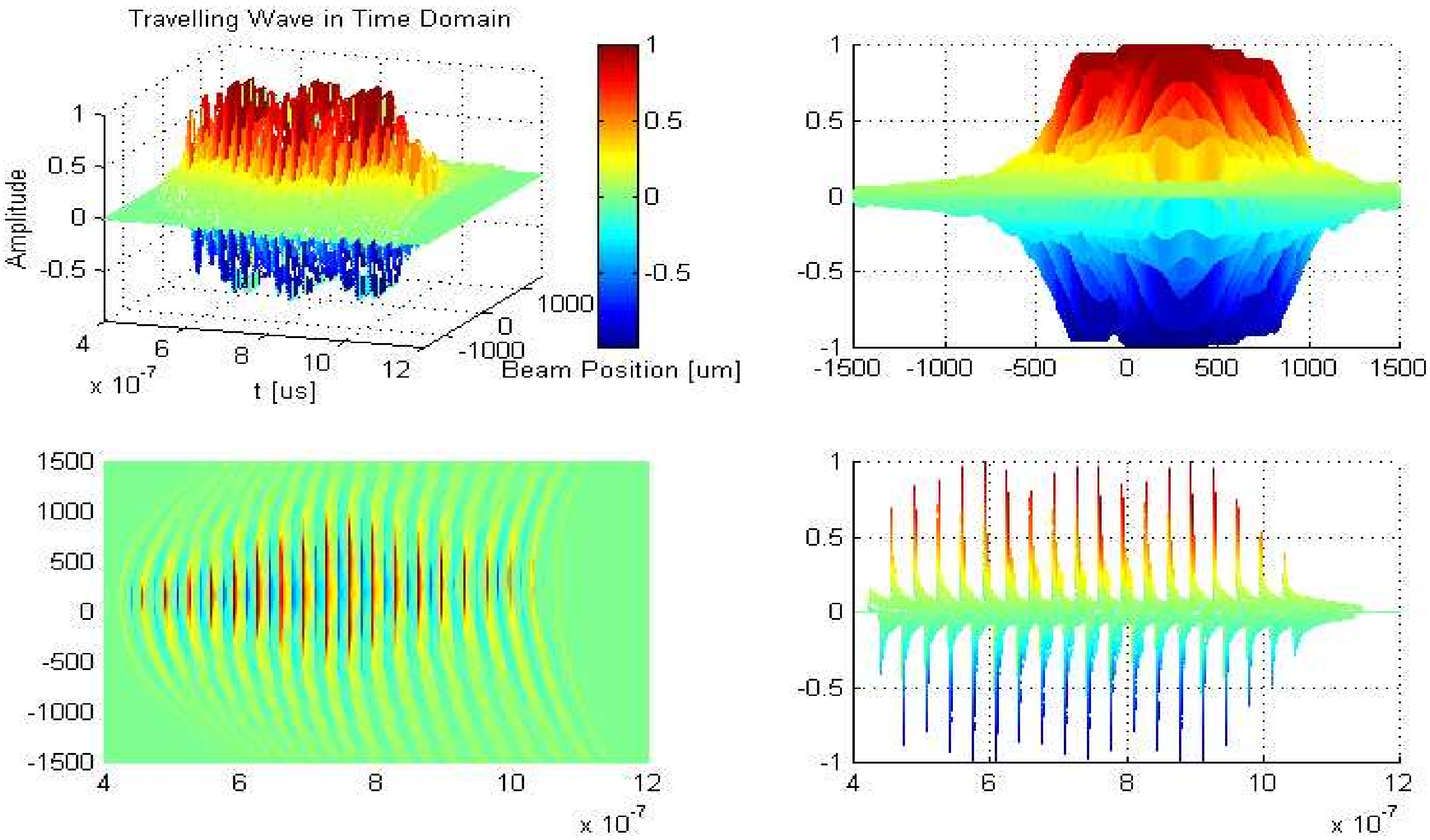
Time Domain Diffraction Theory and Analysis

- 2D analysis tool for SAW diffraction on general anisotropic substrates
- Alternative analysis to angular spectrum of waves for conventional transducers
- Analysis of complex SAW structures
- Cooperative project between the University of Linz, Austria, the University of Central Florida, USA and Siemens AG, Germany

Time Domain Diffraction Theory and Analysis



Quartz Angle = 30 degree



Waveguides with arbitrary transverse velocity profile

Diploma thesis by Norbert Pöcksteiner

How can we calculate wave propagation?

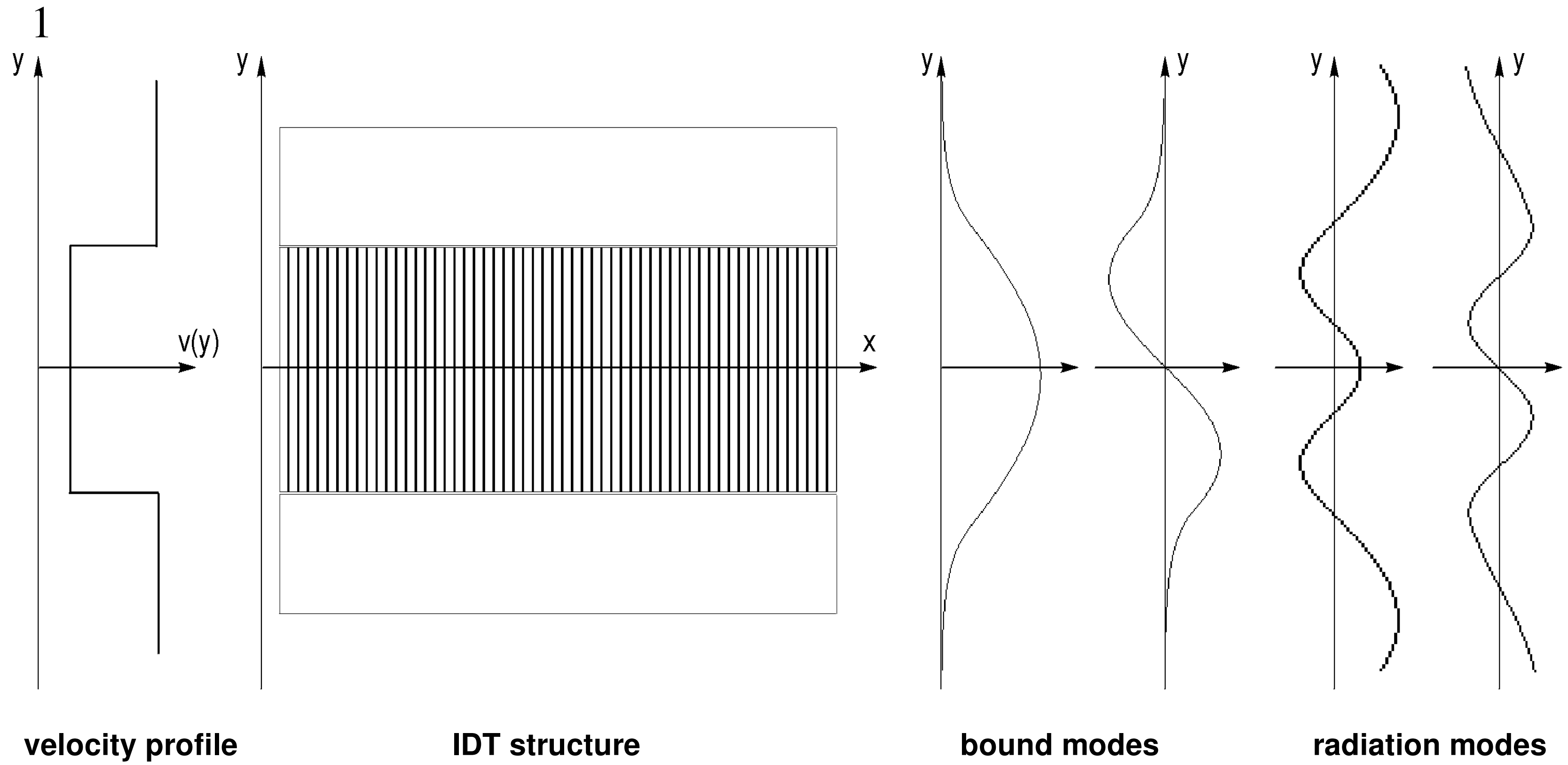
Recipe:

1. Calculate modes of your configuration (mode = solution of wave equation which obeys the boundary conditions)
2. Expand your disturbance (excitation) into these modes
3. Let each individual mode propagate for the desired distance
4. Recombine the modes to get the propagated field

Conclusion: If we know the MODES of our configuration, we have all we need!

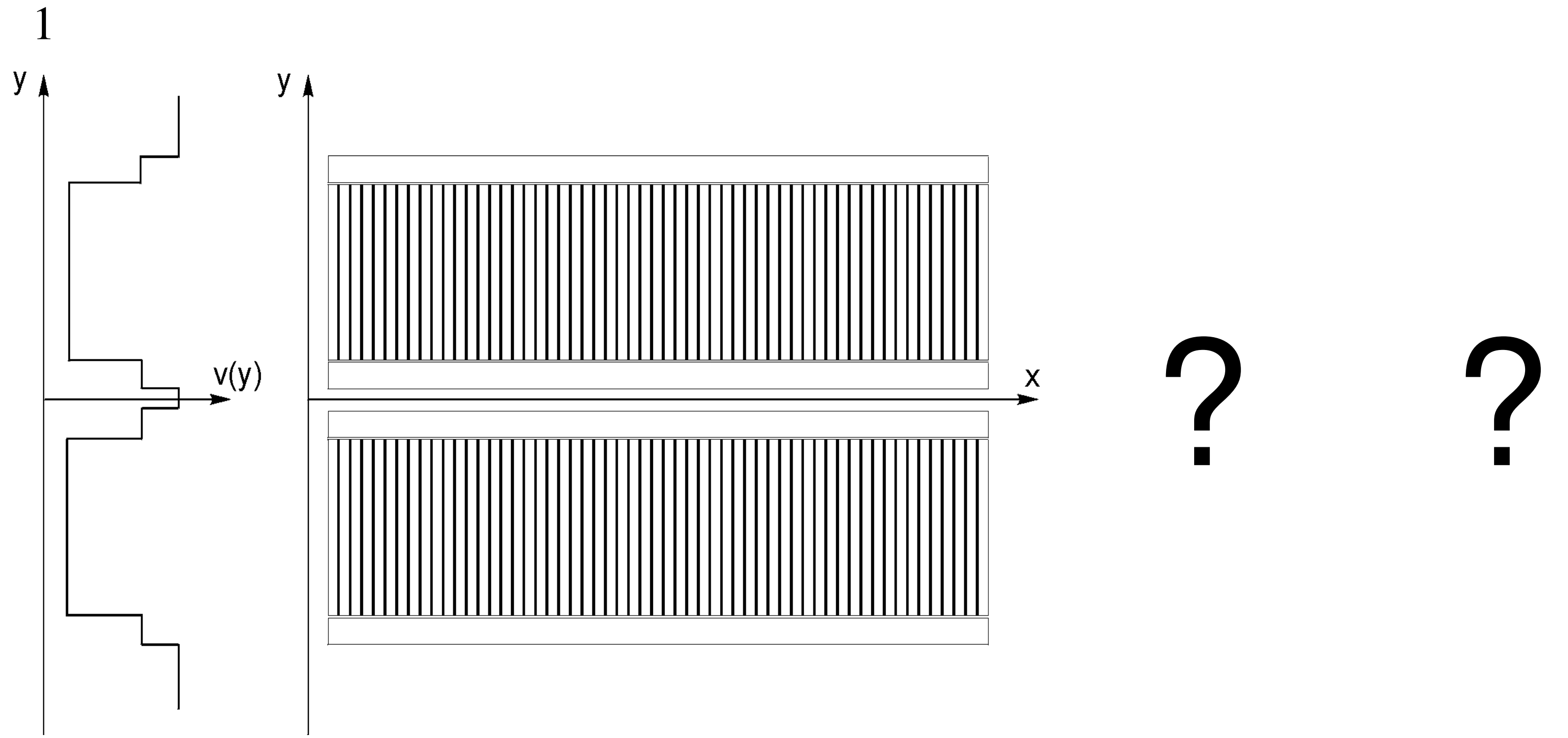
Mode profiles

of a classical waveguide (also valid for interdigital SAW−Transducer)



Mode profiles

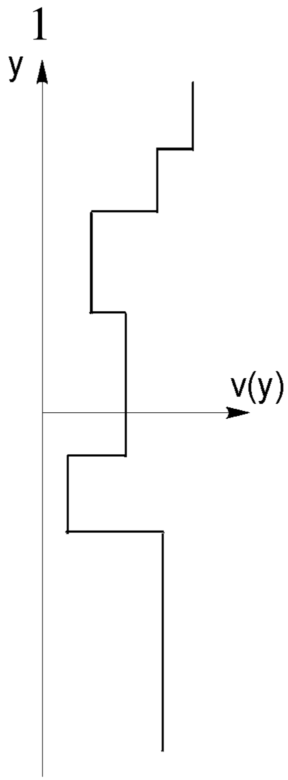
of a more complex configuration (here: Transverse Mode Resonator Filter)



velocity profile **TMR structure** **bound modes** **radiation modes**

Mode profile types

of an arbitrary transverse velocity profile



velocity profile

Possible mode types in this general case:

MODE TYPE	SPECTRUM	SOLUTIONS*
BOUND	DISCRETE	ONE
SEMI–BOUND	CONTINUOUS	ONE
RADIATION	CONTINUOUS	TWO

* Number of solutions per eigenvalue

Goal of this thesis: Determine modes and corresponding spectra in the general case