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Basics of SAW Filter Design

Outline

1. Properties of SAW Transducers

- 1.1. Frequency response of periodic SAW transducers
 - 1.1.1. Element factor and array factor
 - 1.1.2. Symmetry and periodicity properties
- 1.2. Synchronous and asynchronous transducers
- 1.3. Finger tap and gap (overlap) tap weighting
- 1.4. Impulse model and Fourier transform
- 1.5. Frequency and time response interpolation
 - 1.5.1. Frequency sampling
 - 1.5.2. Time domain sampling
 - 1.5.3. Oversampling and undersampling
- 1.6. Frequency transformations (shifting, scaling)
- 1.7. Z-transform
 - 1.7.1. Properties of Z-transform roots
 - 1.7.2. Elemental response of a Z-transform root
 - 1.7.3. Linear, non-linear, and minimum phase
SAW transducers

3. Non-Factorizational Synthesis of SAW Filters

- 3.1. Optimum design of SAW filters
- 3.2. Properties of the optimum frequency response

- 3.3. Reduction of the number of the optimized variables
 - 3.3.1. Frequency sampling
 - 3.3.2. Time sampling
- 3.4. Suboptimum synthesis of SAW filters
- 3.5. Design examples

4. Factorizational Synthesis of SAW Filters

- 4.1. Zero separation algorithms
- 4.2. Factorization features of different SAW filters
 - 4.2.1. Linear phase SAW filters
 - 4.2.2. Non-linear phase SAW filters
 - 4.2.3. Suboptimum minimum-phase SAW filters
 - 4.2.4. Optimum minimum-phase SAW filters
- 4.3. Practical implementation of the factorizational synthesis
 - 4.3.1. Roots searching algorithm
 - 4.3.2. Flow-chart of the root searching program
- 4.4. Design example, simulated and experimental results

5. Design of Non-Linear Phase SAW Filters

- 5.1. Statement of the approximation problem to the prescribed magnitude and phase response
- 5.2. Linearization of the non-linear problem
 - 5.2.1. Small tolerance approximation
 - 5.2.2. Linear approximation of the tolerance field
- 5.3. Iterative design
 - 5.3.1. Tolerance field cross-section method
 - 5.3.2. Complex Chebyshev norm
 - 5.3.3. Weighted least mean squares (WLMS)

6. Conclusions