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Design of dispersive layered SAW filters with CMOS low noise amplifier

Tadeusz Gryba[a], Julien Carlier[a], Etienne Ntagwirumugara[a], Victor Zhang[b] and Jean-Etienne Lefebvre[a]
[a]IEMN - DOAE, Université de Valenciennes, Le Mont - Houy, 59313 Valenciennes, France
[b]IEMN-CNRS, Av. Poincare, Cite Scientifique, B.P. 60069, 59652 Villeneuve d'Ascq Cedex, France

Up to now, RF front-end surface acoustic wave (SAW) filters for mobile communication are mainly fabricated on LiNbO3 and LiTaO3 substrates. A monolithic integration of these filters on Si substrates is highly desirable, but Si is non piezoelectric. One alternative is the deposition of a piezoelectric film on the semiconductor substrate. CMOS technology is very attractive for integrating the radio frequency modules in a single chip. This paper presents the analysis and realisation of a SAW passband filter on silicon substrate based on a piezoelectric ZnO thin film working near 1 GHz , integrated with a CMOS low-noise amplifier. We propose a modified coupling of modes (COM) approach for a layered ZnO/Si surface acoustic wave filter. The COM parameters in this formulation are the Rayleigh wave velocity, the electromechanical coupling coefficient, the complex reflection coefficient , the transduction coefficient and the inter-digital capacitance C. This is a dispersive SAW layered filter some parameters of which become frequency dependent due to the phase velocity dispersion. We present the theoretical and experimental results of the filter integrated with a CMOS low noise amplifier.