Calculation of Surface Acoustic Waves on a Piezoelectric Substrate Using Amazon™ Cloud Computing

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Abstract

Surface acoustic waves (SAW) are created by applying a high frequency voltage to a finger electrode structure on a piezoelectric substrate material (e.g. LiNbO3). To tune these waves with respect to the propagation direction, possible superposition and efficiency, a profound knowledge about the waveform is necessary. Due to the fact, that the real time measurement of these waves with just a couple of nanometers of amplitude is very difficult, we seek to simulate the SAW for a better understanding.

Therefore, we use COMSOL Multiphysics™ with the Solid Mechanics interface to create first simple 2D and 3D models with reduced geometry to achieve principle results of the wave forms. For more complex and realistic interactions between the waves and the electromechanical boundaries, a standard workstation (computation) with limited memory (RAM) has usually not a sufficient computing power. Thus, this work presents results of complex 3D simulations utilizing the Amazon Cloud Computing (AWS) with COMSOL.

We report SAW calculation results on AWS cloud computing in comparison to a standard workstation. With this, we were able to simulate more realistic structures/models and thus achieve further understanding of SAW behavior and interactions.

Figures used in the abstract

Figure 1

Figure 2

Figure 3

Figure 4