Program Package OVERLAY Version 1.0 for Grating Structures Covered by Dielectric Thin Films.

K.Hashimoto, Dept. EEE, Chiba University

tel:++81-43-290-3318, fax:++81-43-290-3320

k.hashimoto@ieee.org

November 25, 2006

1 Outline

This computer package consists of (i) FEMSDO to calculate the complex velocities and electromechanical coupling factor K^2 of Rayleigh and/or Leaky-SAWs on fully periodic metallic grating structures with finite thickness covered by dielectric thin films, and (ii) SYNCO to calculate the input impedance per period of infinitely long interdigital transducer on the structure. These programs are based on the software FEMSDA and SYNC, respecitively, and their usage are quite similar to their originals.

2 Usage

Type "femsdo" or "synco" for execution.

1. Initial three steps are the same with the original programs.

2. "Enter 1 for Al, 2 for Au, 3 for Cu, 4 for SiO2 or 5 for air for Regions 1-6" to specify the film materials. The regions 1-6 are defined in Fig. 1. Note that the "air" is not the real one but equivalent to vacant both acoustically and electrically. Then the program prints two bulk wave velocities in the film.

3. "Enter Nmax, Nx1, Nx2, Ny1, Ny2, Ny3, vnorm, w/p, h1/p, h2/p and h3/p" where w, p, h_i $(i = 1, 2, 3)$ are the strip line-width, periodicity and heights (see Fig. 1). The integer N_{max} represents the number of Floquet expansions to be included for the calculation. The integers N_{x1} and N_{x2} represent numbers of FEM subdivions for $(p-w)/2$ and $w/2$, respectively. The integer N_{yi} $(i = 1, 2, 3)$ represents number of FEM subdivion for h_i.

We can specify $N_{y2} = 0$ and/or $N_{y3} = 0$ for one or two layer layer systems. In the case, h_2 and/or h_2 are automatically set to zero. The value V_{norm} represents arbitrary value used for the frequency normalization. Hereafter the operation frequency is normalized by V_{norm}/p. For FEMSDO, The value f_s of the relative frequency is also needed to specify and is used only for finding initial value of the SAW velocity in the next step. For returning to step 2, enter "0 0 0 0 0 0 0".

4. Remaing steps are exactly the same with the original software. Please refer to their correponding manuals.

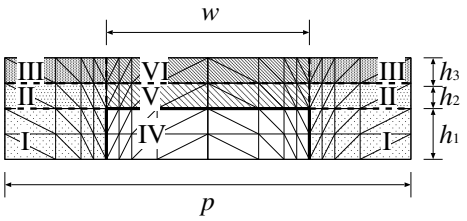

Figure 1: FEM mesh. In this case, $w/p = 0.5$, $h/p = 0.125$, $N_{x1} = N_{x2} = 4$, $N_{y1} = 2$, and $N_{y2} = N_{y3} = 1$.

3 Remarks

1. As an approximation, the equivalent dielectric constant in the overlays is derived from a structure where the substrate surface is uniformly covered by the layer system in the electrode gap, namely Regions 1-3. This is due to the fact that the dielectrics on the electrode may not contribute to the electrostatic field significantly.