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# 3D Simulation of periodic surface wave inter-digital transducer using finite element/boundary element analysis

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Spectacular advances have been made during the past years in the development of surface acoustic wave thanks to technology improvements but also to a strong effort in the modelling and design of such devices, taking into account their actual structure to benefit from second order effects (for instance the influence of the metal strip shape used in inter-digital transducers on the wave propagating under periodic gratings).
In this paper, we present a 2D-periodic 3D-simulation approach to compute the spectral response of one period of a surface wave transducer, accounting for the actual shape of the electrodes as well as realistic guiding conditions and acoustic properties of the propagation surface. The idea consists in meshing the inhomogeneous part of the transducer, i.e. the electrodes and the bus bar, as well as a thin layer of the substrate to match the finite element section with surface boundary elements simulating the acoustic contribution of the substrate (propagation and radiation). Periodic boundary conditions are applied in both surface direction, allowing for the exploitation of spectral Green's function-based boundary elements, but additional absorbing conditions are added in the transverse direction (from both part of the bus bars) to suppress any unwanted modes generated by the mesh.