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# Influence of the shape of the membrane of computed cMUT using FEA/BEM analysis

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The possibility to excite and detect acoustic waves in fluids using capacitive micro-machined ultrasonic transducers (cMUT) built on silicon using clean room techniques offers attractive opportunities for manufacturing high quality low cost imaging probes. CMUTs developed for acoustic imaging exploit the first flexural mode of thin and stiff membranes, leading to bandwidth larger than 100%.
These transducers can be accurately designed using mixed finite element analysis/boundary element methods (FEA/BEM). Periodic FEA particularly allows for the simulation of devices exhibiting complicated shape interfaces and involving materials of different nature. BEM also are particularly well-suited to provide an accurate description of any stacked medium assuming flat interfaces for the radiation area and the layer interface for 2 and 3D structures as well.
In this work, we have analysed the influence of the shape of the MUT membrane on the spectral response of the transducer. 3D Computations have been conducted considering radiation coniditions in the substrate on the backside (silicon) and in viscous water on the front side. we have particularly focused the computation on solutions allowing for reducing parasitic modes in the actual operation of the transducer. The efficiency of the different configuration are compared in termes of emitted pressure contributions.