
# Mode couplings in high-frequency thickness-extensional vibrations of ZnO thin film resonator based on weak boundary condition

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# Highlight

- This paper studies the mode coupling vibration of finite ZnO thin film resonator (FBAR) operating at the thickness-extensional mode. The Hamilton principle is firstly used as weak boundary condition (WBC) to analyze the coupling vibration problem in piezoelectric acoustic devices. Two other WBCs are employed to study the same coupling problem to prove the validity of Hamilton principle. The obtained frequency spectra can predict the relationship between the extent of mode couplings and plate length/thickness ratios. The desirable values of plate aspect ratios where thickness-extensional mode weakly couples to two spurious modes can be determined according to the frequency spectra. Besides, the frequency spectra predicted by Hamilton principle have wider flat part than those from other WBCs providing more structural choices for device designers.