Supplemental material

The Suppression of Spurious Modes in TC-SAW Resonators by the Application of Bent Metal Strips

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1 The definition of SMSR

The SMSR is defined as $SMSR = G_{\text{main}}(dB)/G_{\text{spurious_max}}(dB)$, where $G_{\text{main}}(dB)$ is the relative hight of the conductance value of main resonance and $G_{\text{spurious_max}}(dB)$ is the relative height of the conductance value of strongest spurious (transverse) mode. The SMSR values are extracted from the conductance curve for every parameter sweep (h, L_1, and L_2) and the schematics of the $G_{\text{main}}(dB)$ and $G_{\text{spurious_max}}(dB)$ in the conductance curve is shown in Figure S1 below. It should be noted that the conductance values are expressed in the formula in $20\log_{10}(G)$, so the SMSR can be calculated as:

$$\begin{aligned} \text{SMSR (dB)} &= G_{\text{main}}(dB)/G_{\text{spurious_max}}(dB) \\ &= 20\log_{10}(G_{\text{main}})/20\log_{10}(G_{\text{spurious-max}}) \\ &= G_{\text{main}}\ \text{(dB)} - G_{\text{spurious_max}}\ \text{(dB)} \end{aligned} \tag{1}$$

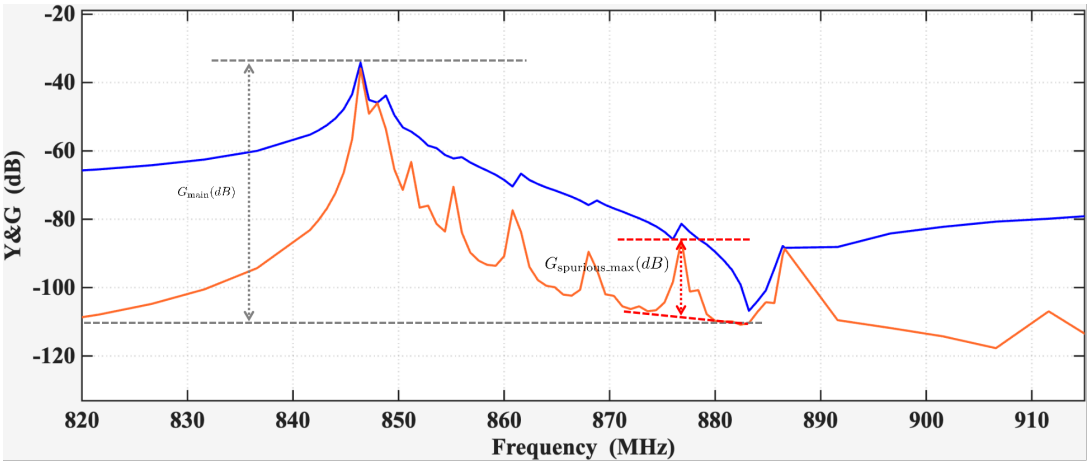


Figure S1. The schematics of the G_{main} and $G_{\text{spurious_max}}$ in the conductance curve.

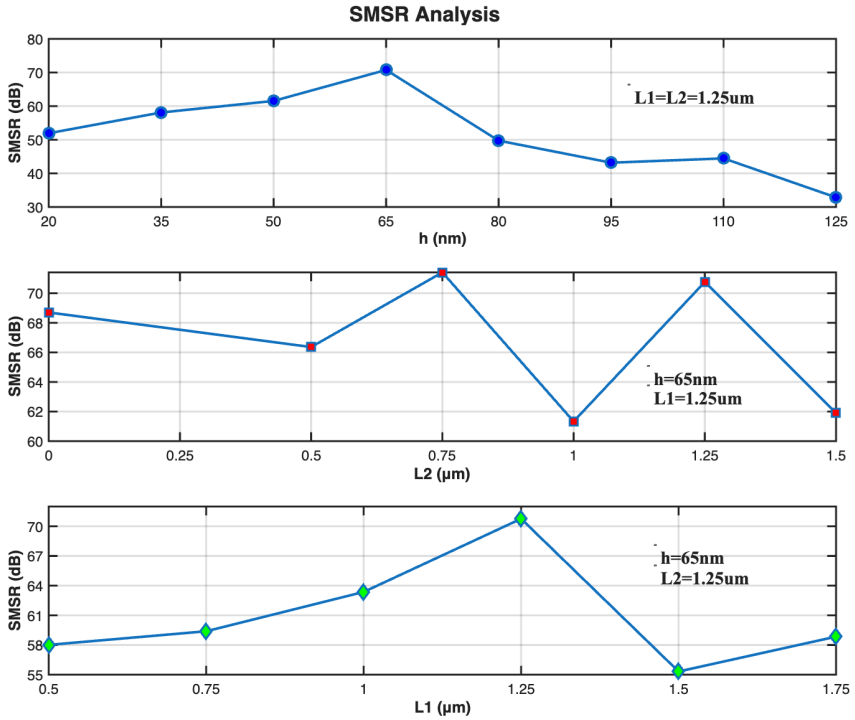


Figure S2. The SMSR value as a function of thickness h, length L_1 and length L_2.

Figure S2 shows the SMSR values extracted from the conductance curves as a function of each parameter (h, L_1, and L_2). These plots quantitatively demonstrate that the optimal parameters (i.e., $h \approx 65$ nm, $L_1 \approx 1.25\mu$m, and $L_2 \approx 1.25\mu$m) are not arbitrary, but in fact correspond to the optimal peaks observed in the SMSR curves. It should be noted that although the value of SMSR at $\boldsymbol{L}_2$= 1.25μm is not optimal, the number of spurious modes in the conductance curves of Figure 5(b) at this value is significantly less than the optimal value of $\boldsymbol{L}_2$= 0.75μm, and therefore 1.25μm was chosen as optimum value of $\boldsymbol{L}_2$. While we acknowledge this 1D decoupled optimization cannot entirely rule out other local optima (which would require the contour plot analysis), the SMSR analysis quantitatively justifies our chosen parameters as a robust local optimum that effectively suppresses spurious modes.