-B-field characterization and equivalent circuit modeling of a poly SiGe-MEMS based Xylophone Bar Magnetometer

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Abstract:

This paper reports a quantitative characterization of a poly-SiGe MEMS-based Xylophone Bar Magnetometer (XBM), thereby following a novel characterization method that is based on the measurement of the forward/backward transmission gains $S_{21}/S_{21}$ of the XBM treated as a two-port network. More specifically, this was done through monitoring the absolute amplitude of the resonant peaks of $S_{21}$ and $S_{12}$ with changing magnetic induction $B$. Also, we present for the first time a novel equivalent circuit for the two-port XBM, modeling effectively the electro-magneto-mechanical behavior of the magnetometer. The experimental measurements showed that poly-SiGe XBM is capable of being a linear magnetic sensor in nT range with a sensitivity $0.1 \text{dB}=\text{mT}$ with an excitation power $5 \text{dBm}$ fed to the electrodynamic/electrostatic port and a biasing voltage $14 \text{V}$ applied through the sense/drive capacitor.

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