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A Mechanical Transmitter Based on Magnetoelectric Heterostructures

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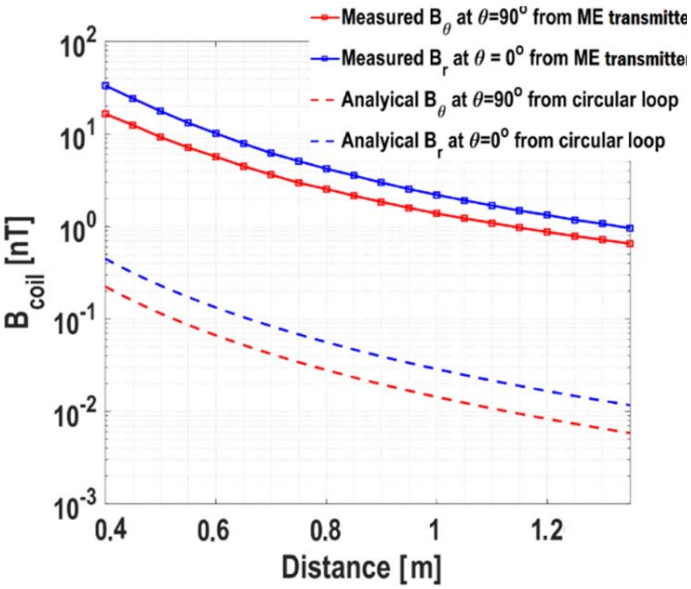
Abstract

A new magneto-mechanical-electric (ME) transmitter consisting of Metglas/Pb(Zr,Ti)O_3 laminates has been developed. The proposed ME transmitter emits electromagnetic waves through the ME effect around its resonance frequency, which was around a very low frequency (VLF) of 30 kHz. The working principle of the ME transmitter was, the piezoelectric layers was driven by AC electric voltage at its electro-mechanical resonance (EMR) frequency, that would cause a shape change on the piezoelectric layers, and the shape change was transmitted to the magnetostrictive layers, which in turn converted the strain to a magnetic flux output. Our measurement demonstrated that the ME transmitter performed like a magnetic dipole, revealing its radiation capabilities.



Biography

Junran Xu has been pursuing his PhD degree since July of 2015. He works in Prof. Viehland's group. He did the research on the applications of magnetoelectric gradiometer, including the vibration rejection of the ME gradiometers, and the magnetic source detection based on ME gradiometers with 2D & 3D configurations. He also worked on the low frequency mechanical ME transmitter, which revealed the potential of the radiation capabilities based on ME heterostructures. He is currently doing the calculations on the intrinsic noise floor reduction of the ME laminates for his theoretical works.