Bulk Acoustic Wave Mediated Multiferroic Antennas

Tech ID: 25355 / UC Case 2015-618-0

SUMMARY

UCLA researchers in the Departments of Electrical Engineering and Mechanical & Aerospace Engineering and have designed a novel low profile antenna with suppressed platform effect.

BACKGROUND

The increasing applications of antennas in wireless communications have hastened the development of miniature antennas such as low-profile antennas. There has been a growing interest in the use of multiferroic materials for low-profile antennas due to their high permittivity and permeability, which allows miniaturization by several orders of magnitude. However, in traditional conduction current based antennas, the extent to which low-profile antennas can be miniaturized is limited by the platform effect.

INNOVATION

Dr. Yuanxun Ethan Wang and colleagues have designed a strain-mediated multiferroic antenna that uses dynamic strain induced by a bulk acoustic wave resonator to generate the electromagnetic waves. The bulk acoustic wave resonance is used to enhance the coupling between the acoustic waves generated by the dynamic strain and the electromagnetic waves. Dr. Wang and colleagues have also developed a one-dimensional finite-difference time-domain technique to model the dynamic two-way interactions between the acoustic waves and electromagnetic waves. Analytical and simulation analyses showed that the platform effect could be significantly reduced, and an antenna with a thickness of only few micrometers above the conducting plane can be built.

APPLICATIONS

The proposed invention can be potentially used for all applications of low-profile antennas such as:

- Telecommunications
- Medical systems
- Wireless networking
- Defense communication
- Wideband communication
- Satellite communication
- GPS communication
- Aviation
- Industrial, residential, and commercial end-use

ADVANTAGES

- Miniature design - thickness of only a few micrometers above the conducting plane
- Absence of any Ohmic loss of conducting current
- Suppression of platform effect
- Ease of impedance matching in the vertical direction
- No need for conducting elements above the conducting plane, which achieves low observability and robustness against interferences
- Works as both transmitter and receiver

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OTHER INFORMATION

KEYWORDS

antenna, multiferroic antenna, mutliferroic, bulk acoustic wave, platform effect, q factor, piezoelectric, magnetorestrictive, bulk acoustic wave resonator

CATEGORIZED AS

- **Communications**
  - Wireless

RELATED CASES

2015-618-0

STATE OF DEVELOPMENT

The antenna structure has been designed and tested using simulations.

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	10,218,072	02/26/2019	2015-618

RELATED MATERIALS

- Yao, Z., Yang, Y. E., Dynamic analysis of acoustic wave mediated multiferroic radiation via FDTD methods. IEEE International Symposium on Antennas and Propagation, 2014.

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