**Dynamic Characteristics and Study the Effect of Complex Vibrational Modes on Exciting Horn Ultrasonically**

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**Abstract:**

During last decades, part of studies have been carried out on study the combining different modal responses, which can provide opportunities to improve the vibration behaviour of the output faces of tuned ultrasonic horns to deliver more ultrasonic energy. Investigation the benefits of combining different modal responses with a view to optimizing the energy transfer from a range of power ultrasonic devices that rely on tuned horns is essential. This work aims to investigate the use of combining and exciting different vibration modes in order to design an efficient ultrasonic horn used for delivering power to many engineering and medical applications. The research is extended to study the possibility of design an ultrasonic transducer after add some features in which can operate in multiple vibration modes by modify its geometric features. The longitudinal- torsional mode is selected first because of its wide applications in ultrasonic field. The effect of geometrical modifications of transducer's matching part is being analyzed analytically, numerically and experimentally. Cutting slots, reduction in cross sectional area and adding mass at nodal line are suggested to be the modification of excited horn and convert its longitudinal mode into combining longitudinal torsional mode. The simplicity of excitation and manufacturing of the tool will results to consider the main advantage of the proposed horn for delivering energy in efficient manner.

**Biography of presenting author** (should not exceed 100 words)

Ziad Al Sarraf an academic lecturer (Senior) working in the Department of Mechanical Engineering at University of Mosul, IRAQ, since 2000. He qualified his PhD (Applied Mechanics – Ultrasonic Power Techniques) in the Department of Mechanical Engineering – University of Glasgow – Scotland – United Kingdom in the year 2013. He did his MSc (Applied Mechanics) in the Department of Mechanical Engineering at University of Mosul, IRAQ, in the year 2001. Also, He did his BSc (General Mechanics) in the same University in the year 1998. He has been published many article inside and outside Iraq. In addition, and participate many international conferences. He is a member of academic staff engineering.

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