

# Acoustics Applications Using COMSOL Multiphysics® Software

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## Abstract

Multiphysics Acoustics is increasingly used to design products to meet sound, ultrasound and infrasound and other structural, thermal, electromagnetic requirements. In this paper, Multiphysics Acoustical applications such as digital stethoscope, glazing products and acoustical metamaterials are detailed. Stethoscopes are in use for more than 200 years for medical diagnostics, especially for auscultation in the healthcare domain. Recently, unprecedented growth in mobile technology has revived the use of stethoscopes for Telehealthcare. The acoustical and Multiphysics design aspects of the stethoscope for improved acoustical performance is detailed. A COMSOL® model was developed to investigate the effects of geometry, material of construction, noise and input pressure. The sound transmission efficiency of the components was investigated with Multiphysics models by coupling the acoustical and structural performances. The ultimate objective is to leverage the improvement in the acoustics of the stethoscope for use in Telehealthcare. Acoustic performance is becoming a critical requirement for glazing products due to the noise pollution and regulations requirements. The development of COMSOL® model to predict the sound transmission loss of double glazing products by coupling the acoustics and structural mechanics is described. The prediction results are compared with experimental results. The prediction is within + 1 dB of experimental measurements. Metamaterials are emerging as a futuristic engineered material with unusual electromagnetic properties for novel and unusual applications. Sample acoustical meta material design for Transparent Acoustics, Meta surfaces and sound absorbers will be highlighted.