An Investigation of Loudspeaker Simulation Efficiency and Accuracy Using 1.) a Conventional Model, 2.) the Far Field Functionality and 3.) the Rayleigh Integral

R. Christensen[1], U. Skov[1]

[1]iCapture ApS, Roskilde, Denmark

Abstract

Simulation on loudspeaker drivers requires a conventional fully coupled vibroacoustic model to capture both the effect of the loading mass of the air on the moving parts and the geometric shapes of the cone, dust cap and surround. An accurate vibroacoustic model can be time consuming to solve - especially in 3D. In practical applications this results in poor efficiency concerning the decision-making process to move on to the next simulation model. To overcome this the loudspeaker designer can use either the far field functionality in COMSOL Multiphysics® or post-process only structural results via the Rayleigh integral to reduce or totally eliminate the computational demand on the open air domain in front of the speaker. These simplifications come with a cost of reduced accuracy. This paper compares the efficiency and accuracy of a conventional fully coupled vibroacoustic model where the acoustic signal is sampled inside the air domain with respectively a reduced air domain model using the far field functionality and a model relying on the Rayleigh integral post-processing.