

Abstract Submitted
for the 4CF13 Meeting of
The American Physical Society

Developing an amplitude compensation method for obtaining high-resolution acoustic directivities from played musical instruments
NICHOLAS J. EYRING II, WILLIAM J. STRONG, NATHAN G.W. EYRING,
Brigham Young University — When considering the acoustic radiation of a source, far-field directivity patterns are useful graphical representation of sound propagation in a given direction and frequency. Directivity measurements of played musical instruments present several experimental challenges, including the need for musicians to play consistently and reproducibly. Some researchers have chosen to implement fixed, limited-element microphone arrays surrounding instruments for rough directivity assessments. Unfortunately, with practical numbers of microphones, this approach limits spatial resolution and field decomposition bandwidth. Higher-resolution data may be obtained with a given microphone count by rotating a musician in sequential azimuthal angle increments under a fixed semicircular microphone array. The musician plays a selected note sequence with each increment, but corrections must be made for playing variability. For 5° resolution this results in 2664 measurements with $M=37$ in the polar angle θ and $N=72$ in the azimuthal angle ϕ . This paper explores the development of an amplitude compensation method that utilizes reference microphones that are fixed in the rotating reference frame. By approximating the reference and arc microphones as the input and outputs of an LTI system, transfer functions, \hat{H}_{MN} , may be computed. The resulting set of \hat{H}_{MN} are invariable under scalar changes in amplitude that are identical at both the reference and arc microphone positions. An experimental validation using a source with random variations in amplitude will be presented.

Nicholas J. Eyring II
Brigham Young University

Date submitted: 13 Sep 2013

Electronic form version 1.4