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The generation of binaural signals from a regularly sampled soundfield using a beamforming approach

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Auditorium designs can be evaluated prior to construction by numerical modeling of the design. Subjective assessment of the design requires auralization of the computed soundfield at a desired listener position and the binaural format is dominant for representation of the soundfield. For high accuracy the modeling is based on solving the wave equation numerically, which typically produces the sound pressure on a rectangular grid. Such a sampled soundfield is not straightforward to convert to a binaural format. This paper investigates binaural conversion from the sound pressure at a selected number of grid points using a least squares beamforming approach. Low-frequency axisymmetric emulations are derived assuming a solid sphere model of the head, and an open spherical array of 640 microphones is used to emulate ten measured HRTF data sets from the CIPIC database for half the audio bandwidth. The microphone positions might be displaced from the exact spherical surface to fit the mesh sample points. The spherical array can produce high-accuracy band-limited emulation of any human subject's measured HRTFs for a fixed listener position by using individual sets of beamforming impulse responses.