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Perceptual effects of radiation control with a multi-loudspeaker device

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This study investigates the perceptual issue of acoustical radiation control with the following hypothesis : radiation control can reduce the perceptual gap between a sound coming from an acoustical source (e.g., an instrument) and a sound coming from an electro-acoustical device (e.g., the recording of an instrument played by a loudspeaker). The work is technically supported by a generic multi-loudspeaker device that allows sound reproduction with controlled directivity patterns in a given number of spatial dimensions. The conducted experiment involves two distinct sound corpus : speaking/singing voice (recorded and spatially measured) and a struck plate (synthesized and spatially computed with modeled directivity). Incremental levels of radiation pattern control, in terms of precision of the reproduction, are also considered by combining several diffusion systems and different directivity patterns. Participants are asked to evaluate the stimuli on three semantic differential scales: source width (largeur), distance (distance) and realism (réalisme). The results show a global significant effect of radiation on sound perception: the acoustical/electro-acoustical gap is significantly reduced through radiation control, especially when considering the scales of width and distance. Theoretical principles, technical elements, experimental set-up and overall results will be presented, detailed and discussed during the presentation.