ACOUSTICS2008/2588
Across-frequency processes involved in auditory detection of coloration

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When an early wall reflection is added to a direct sound, a spectral modulation is introduced to the signal's power spectrum. This spectral modulation typically produces an auditory sensation of coloration or pitch. Throughout this study, auditory spectral-integration effects involved in coloration detection are investigated. Coloration detection thresholds were therefore measured as a function of reflection delay and stimulus bandwidth. In order to investigate the involved auditory mechanisms, an auditory model was employed that was conceptually similar to the peripheral weighting model [Yost, JASA, 1982, 416-425]. When a "classical" gammatone filterbank was applied within this spectrum-based model, the model largely underestimated human performance at high signal frequencies. However, this limitation could be resolved by employing an auditory filterbank with narrower filters. This novel filterbank was designed to approximate auditory filter-shapes measured by Oxenham and Shera [JARO, 2003, 541-554], derived from forward masking data. The results of the present study demonstrate that a "purely" spectrum-based model approach can successfully describe auditory coloration detection even at high signal frequencies.