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Abstract - In multi-band frequency compression, the speech spectrum is divided into a number of analysis bands, and the spectral samples in each band are compressed towards the band center by a constant compression factor, resulting in presentation of the speech energy in relatively narrow bands, for reducing the effect of increased intraspeech spectral masking associated with sensorineural hearing loss. Earlier investigation assessing the quality of the processed speech showed best results for auditory critical bandwidth based compression using spectral segment mapping and pitch-synchronous analysis-synthesis. The objective of the present investigation is to evaluate the effectiveness of the technique in improving speech perception by listeners with moderate to severe sensorineural loss and to optimize the technique with respect to the compression factor. The listening tests showed maximum improvement in speech perception for a compression factor of 0.6, with an improvement of 9%–21% in the recognition scores for consonants and a significant reduction in response times.