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**Investigation of headphones suitable
for psychophysical experiments**

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Abstract

In order to find the appropriate headphone for the psychophysical experiments, the frequency response of twelve headphones were measured by three physical methods; on an IEC coupler (B&K 4134), on a C coupler attached to a head and torso simulator (Kohken SAMRAI) [K.Okabe *et al.* J. Acoust. Soc. Jpn. (E) vol.5 pp.95-104] and by using a probe microphone in actual ears. The results showed a very few electro-static circumaural headphones (*e.g.* STAX SR-Lambda Pro.), have relatively flat frequency characteristics with excellent invariance among the measuring methods. In contrast, many dynamic supra-aural headphones (*e.g.* Rion AD02, Beyer DT48, Elegacous DR831, etc.), have poor frequency characteristics, especially at lower frequencies, and differ a lot among the three measuring methods. For these headphones, the energy leakage at lower frequency region is inevitable, since the headphone pad fitting to the pinna is usually incomplete, and acoustic impedance of the diaphragm is very high. These undesirable characteristics might affect the psychophysical experiments. As one example, results were severely affected by headphone differences in the vowel identification test using several synthesized vowels of which F0 component amplitude were manipulated. The physically-determined frequency responses were contrasted with those from a psychophysical loudness matching procedure [K.Ueda, *et al.*, J.Acoust.Soc.Am.87, Suppl.1].

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