TUTORIAL AT THE SPRING AES CONVENTION IN MADRID, SPAIN, JUNE 15-17, 2024

The Human Auditory System and Audio by Milind N. Kunchur

Description:
This tutorial reviews the human auditory system, elucidating the complete chain of events between physical sound and its perception. Despite audio's long history, many discussions and conclusions related to it are based on an incomplete and incorrect understanding of how hearing works. Customary relationships between frequency, time, and phase for linear systems, do not apply straightforwardly to the hearing process. Auditory temporal resolution for certain processes can be a hundredth of the period of the signal, and can extend down to microseconds. Also the ear is sensitive enough to detect a basilar-membrane amplitude of a picometer, which is a hundred times smaller than an atom. And the resolution of sonic detail, represented by the neural excitation pattern of 30000 auditory nerve fibers, is beyond astronomical. This explains the problem with quick AB blind tests that rely on limited short-term memory, instead of extended-listening protocols that invoke the more durable and infinitely more detailed long-term memory. An in-depth understanding of the auditory system provides an objective basis for the design and evaluation of audio equipment. Concrete electrical measurements will be described that can better predict perceived sound quality.

WORKSHOP AT THE SPRING AES CONVENTION IN MADRID, SPAIN, JUNE 15-17, 2024

High-performance audio through the lens of a new understanding of hearing
Panel: Hans van Maanen, Menno van der Veen, Milind N. Kunchur, Thierry Heeb, Rens Tellers

Description:
The perceptual benefits of High Resolution Audio (HRA) and High End Audio (HEA), collectively referred to as high-performance audio, have been controversial for a long time, having eluded both psychoacoustic confirmations and objective measurements. We propose this workshop as a follow-up on the earlier workshop titled "Towards an Objective Understanding of High-End Audio" given at 154th AES Convention in Helsinki, Finland, in which a meta-analysis on HRA papers showed that trained listeners could perceive quality differences despite a lack of correlation with common specifications ["Fourier" is too restrictive; people have been doing other measurements but even those are not sufficient].Some resolution of the conundrum was provided based on the complexities of human hearing. In this new workshop we propose to expand and extend the discussion of HRA/HEA in the light of the latest findings regarding human hearing. In particular, we will prescribe objective measurements for assessing time smear in recording/playback chain, which affects attacks/decays of sounds, and for assessing low-level resolution in the signal chain, which gets compromised by subtle imperfections that mask micro-details of sounds.