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Laboratory synthesis of industrial noise environments with predetermined statistical properties

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High-level nonGaussion noise is commonly found in a variety of industrial environments. Recent experiments have shown that for a given energy level, the statistical properties of a noise can have a strong effect on the extent of hearing loss produced in exposed individuals. In order to study, in an animal model, the effects on hearing of such noise environments, the statistical properties of the noise as embodied in the kurtosis metric must be under experimental control. For a fixed value of kurtosis and energy level the following four variables will have a strong effect on hearing loss: (1) peak histogram; (2) interval histogram; (3) duration of noise transients; and (4) level of any background Gaussian noise. Simulations have shown that the relations among kurtosis and these variables are nonlinear. However, under certain restricted conditions, these relations may be linear. Accordingly, two strategies for designing controlled industrial noise exposures are presented: (1) the interval-priority model and (2) the duration-priority model. Computer simulations and measurements of actual acoustic environments showed that these two models could be effectively used to simulate a wide variety of realistic industrial noises.