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# Measurement and evaluation of blade passage frequency fluctuations (A)

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## Abstract

In the active control of tonal noise from cooling fans, one factor that can limit the achievable attenuation is fluctuation of the blade passage frequency in time. Large fluctuations in a short time can hinder the algorithm from converging to the optimal solution. Some fans have steadier speeds than others, which can be due to unsteady driving mechanisms or the physical structure of the fan. Environmental effects, such as back pressure and unsteady blade loading, can also cause the fan speed to fluctuate. The shifting in the blade passage frequency will be measured using a zero-crossing technique to track the frequency of each cycle. Blade passage frequency fluctuations will be presented for various driving mechanisms and environmental conditions. Techniques to minimize frequency shifting will also be discussed.

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