

## Numerical study on the acoustic field of a centrifugal fan and the tonal noise sources

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### Abstract

The widespread use of squirrel cage fans, especially in ventilation and home and industrial environments, has led to the formation of many research efforts to improve performance and reduce the sound produced by this type of fan. In the literature, the most important factor in generating sound in this category of fans is the confrontation between the rotor exit flow and the volute of the fan. In this research, a numerical study was conducted to solve the unsteady fluid flow inside the fan, calculate the pressure fluctuations on the fan body and the intensity of this pressure field in different areas of the body, the study of the contribution of different areas of the body to the sound field fan and, and estimate the sound field pattern of fan. The results show a fluctuating pressure on the volute that is due to the collision of the jet-wake rotor exit flow with the volute. Also, the maximum contribution of the cut-off adjacent regions was observed in the formation of a dipole sound radiation pattern. Another main observation was the insignificant rotor's contribution in sound field compared to the volute.

**Keywords:** Centrifugal fan, Tonal noise, Flow-induced sound, Dipole sound, Numerical simulation.

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