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Precise airborne sound field characterization using a miniaturized laser interferometer of 1 MHz bandwidth

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In order to determine the spatial pressure distribution of an airborne sound field, idealized mathematical simulations are often relied upon. However, these do not always account for real life situations, for instance for emitter degradation over time, or emitter surface damages. Thus actual measurements of airborne acoustic fields can be of significant importance for emitter manufacturers and users. Special purpose applications such as air-coupled ultrasound material inspection (NDT), gas flow rate measurement or human gesture tracking require optimization of sound pressure level, frequency matching or focal alignment. With an effective sensing area of 0.6 mm^2 and a frequency bandwidth of 1 MHz, the presented optical microphone is ideally suited for high-resolution scanning of ultrasound fields. The sensing principle is based on measuring the pressure-induced refractive index change using solely a fibre-coupled, rigid Fabry-Pérot cavity, and does not feature any post-pulse ringing of mechanically moveable parts. Contrary to laser vibrometers, the detection laser remains confined to the microphone capsule. Measurement results will be presented, revealing nearfield interference, side lobes and focal spots of resonant piezoelectric transducers as well as broadband emitters.

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