

## **ACOUSTICS2008/1492 High-Output and High-Fidelity Microsized Driver System**

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Active noise reduction (ANR) for aircrew hearing protection in harsh noise environments such as military and civilian flight operations requires a high-performance, microsized driver that provides not only high acoustic power, at least 130 dB SPL, but also high fidelity sound quality, especially in low-frequency ranges below 100 Hz. A new microsized smart material actuator (MSMA) is being developed by using high-density and direct-conversion piezoelectric exciters combined with a unique acoustic structure, unlike conventional moving coil/magnet-type drivers. The dimensions of the MSMA are 6 mm in diameter by 7 mm long, small enough for ear-canal application as an earplug driver, maximizing ANR effectiveness. The MSMA system consists of a microscale earplug driver, a protective package made of medical-grade stainless steel, and a compact actuation amplifier easily connected to or embedded in an external ANR controller. Performance tests show the system produces over 130 dB SPL in a 1 cc trapped cylindrical volume with very flat frequency responses even below 100 Hz. The total harmonic distortion of the MSMA is lower than 4% over all audible frequency ranges, without phase delay or discontinuities.