

Abstract Submitted
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Next Generation Manometer: Design of Speed of Sound Apparatus for NIST Oil Ultrasonic Interferometer Manometer¹ MARY ZISCHKAU, University of Dallas, JACOB RICKER, NIST Physical Measurement Laboratory, Thermodynamic Metrology Laboratory — Among the four ultrasonic interferometer manometers (UIM) employed to maintain national pressure standards at the National Institute of Standards and Technology Low Pressure Manometry Laboratory, the oil UIM is in highest demand, calibrating approximately 75% of the devices under test. The oil UIM operates from a range of 1 mPa to 140 Pa in absolute mode and uses Di-2-ethylhexyl sebacate (DEHS), a nontoxic liquid with a low vapor pressure, as the working fluid in comparison to the three other manometers that use mercury, a neurotoxin that is slowly being eliminated from use in the US. Currently, the oil UIM requires comparison with the mercury manometers in order to determine pressure measurement uncertainties since the speed of sound in oil has not been measured. A measurement of the speed of sound in DEHS eliminates the need for traceability to the mercury UIMs which will be phased out in the next 5 years in place of a new optical pressure standard. An apparatus was designed to determine the speed of sound by measuring change in the displacement and time of flight for ultrasound in DEHS using ultrasound and laser interferometry. The calculations and experiments performed with this apparatus will provide proof of concept for the next generation oil manometer.

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