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Metrology of Ultrasound and Underwater Acoustics at the National Metrology Institute of South Africa

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**Abstract content (Max 300 words)
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The National Metrology Institute of South Africa (NMISA) is responsible for realising and maintaining the SI and derived units. This is accomplished by developing and maintaining national measurement standards of physical quantities for South Africa and comparing them internationally to ensure global measurement equivalence and competitiveness. The Physical Metrology Division is one of the four divisions of NMISA, under which Ultrasound and Underwater Acoustics Laboratory (UA), part of the Acoustics, Ultrasound and Vibration section falls.

The NMISA UA is responsible for the establishment, validation, maintenance and dissemination of ultrasound power and ultrasonic transducer standards. The ultrasonic power, measured in watts, is realised by means of a radiation force balance (RFB) which traces it back to the mechanical quantities (i.e. kilogram, meter and second). Transducer sensitivity, measured in volts per pascal, is realised by means of reciprocity methods in accordance with the International Electrotechnical Commission (IEC) 60688, and traces the quantities back to electrical and mechanical quantities (i.e. ampere, kilogram, meter and second).

Sound propagation and measurement in water is applied to a variety of applications such as research, communication, medical and Non-destructive Testing (NDT). Such applications require transducers to be completely waterproof, corrosion resistant, electrically shielded and have a low level of self-generated noise especially for weak signal measurements. Transducers are often used continuously over long periods. This requires their characteristics such as sensitivity and frequency response to remain stable with time. Hence, these devices need regular calibration in accordance with the international standards (e.g. IEC 60565) to be traceable to national standards.

The UA, guided by the NMISA vision, seeks to support the country's manufacturing, trade, people's quality of life and environmental protection by supporting hospitals and clinics, occupational and environmental health, local industries, and offshore marine activities.

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