Researchers racing to develop world's most accurate thermometer

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The University of Queensland (UQ) physicists are on a quest to build the world's most accurate thermometer.

After receiving a $150,000 Precision Measurement Grant for 2012, UQ's ARC Centre of Engineered Quantum Systems' researchers will join the world race to improve the accuracy of temperature measurement.

Lead researcher Dr Tom Stace of UQ said the grant would support the research team in using quantum mechanics to create a thermometer capable of measuring temperature to an accuracy of better than one part in a million.

The team also involves Professor Andre Luiten of the University of Adelaide and Professor Eric May of the University of Western Australia.

The grant, awarded by the US National Institute of Standards and Technology, will fund theoretical research at UQ, and optical experiments based at the University of Adelaide with support from UWA.

Dr Stace said the grant paves way for an exciting project that was critical in a century-long international physics effort to base measurement units, like the meter and the Kelvin on fundamental physical constants, rather than specific physical, reference objects.

As part of this effort, the physics community wants to define fundamental constants as exact quantities.

"The speed of light is already there, and now forms the basis for the modern value of the meter, which was once determined by the length a particular metal bar, held in Paris," Dr Stace said.

"Others, including Boltzmann's constant, which relates energy to temperature, are still subject to measurement uncertainty.

"Once we have built this new kind of thermometer, we will contribute to the final definition of this key fundamental constant."

The Precision Measurement Grants, which started in 1972, are notoriously competitive and have never before been awarded outside North America.

Of 25 proposals submitted this year, only two were successful.

"One of the key lasers we will use was developed by Professor Ted Haensch, for which he won the 2005 Nobel Prize in Physics," Dr Stace said.

"It's notable that he was one of the earliest recipients of the Precision Measurement Grant, in 1974.

"Three other awardees have subsequently won Nobel prizes, so we are in very good company."

This project supports the Centre of Engineered Quantum System's research into quantum measurement and control, and will extend the centre's capability to construct new technologies from quantum building blocks.

The centre is an Australia Research Centre of Excellence that seeks to initiate the "Quantum Era" in the 21st century by engineering designer quantum systems.

Through focused and visionary research the centre will deliver new scientific insights and fundamentally new technical capabilities across a range of disciplines.

The institute's measurements support the smallest of technologies—nanoscale devices so tiny that tens of thousands can fit on the end of a single human hair—to the largest and most complex of human-made creations, from earthquake-resistant skyscrapers to wide-body jetliners to global communication networks.

Provided by University of Queensland