

Proposed Ion Clock May Be 100x More Accurate Than Atomic Clock

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AsianScientist (Mar. 12, 2012) - A proposed new time-keeping system tied to the orbiting of a neutron around an atomic nucleus could have such unprecedented accuracy that it neither gains nor loses 1/20th of a second in 14 billion years - the age of the Universe.

“This is nearly 100 times more accurate than the best atomic clocks we have now,” says Scientia Professor Victor Flambaum, Head of Theoretical Physics in the University of New South Wales (UNSW) School of Physics, a co-author on the study.

“It would allow scientists to test fundamental physical theories at unprecedented levels of precision and provide an unmatched tool for applied physics research,” he predicted.

In a paper to be published in the journal *Physical Review Letters* - with U.S. researchers at the Georgia Institute of Technology and the University of Nevada - Flambaum and colleagues report that their proposed single-ion clock would be accurate to 19 decimal places.

These days, the exquisite precision of atomic clocks make them widely popular in applications ranging from GPS navigation systems and high-bandwidth data transfer to tests of fundamental physics and system synchronization in particle accelerators.

“With these clocks currently pushing up against significant accuracy limitations, a next-generation system is desired to explore the realms of extreme measurement precision and further diversified applications unreachable by atomic clocks,” said Flambaum.

According to Flambaum, while atomic clocks use the orbiting electrons of an atom as the clock pendulum, here, by using lasers to orient the electrons in a very specific way, one can use the orbiting neutron of an atomic nucleus as the clock pendulum to create a 'nuclear clock' with unparalleled accuracy.

Because the neutron is held so tightly to the nucleus, its oscillation rate is almost completely unaffected by any external perturbations, unlike those of an atomic clock's electrons, which are much more loosely bound.

The submitted version can be found at arxiv.org: [Campbell CJ et al. \(2012\) A Single-Ion Nuclear Clock for Metrology at the 19th Decimal Place.](#)

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