

Japan clocks keep time for 16 billion years

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Japanese researchers have built a pair of clocks which they say are so accurate they will lose a second only every 16 billion years—longer than the Earth has been around.

"Cryogenic [optical lattice](#) clocks" are not pretty—they look more like giant stripped-down desktop computers than ordinary wall clocks—but they are so precise that current technology cannot even measure them.

The research team led by Hidetoshi Katori, a professor at the University of Tokyo, believes it has taken the technology way beyond the [atomic clocks](#) that are currently used to define the "second".

The new clock uses special lasers to trap strontium atoms in tiny grid-like structures, according to the team, which published the study this month in the journal *Nature Photonics*.

It then measures the frequency of the vibration of the atoms, using them like "the atomic pendulum,"

according to the study.

The system is so delicate that it must operate in a cold environment, around -180 Celsius (-292 Fahrenheit), to reduce the impact of the surrounding electromagnetic waves and to maintain the machine's accuracy, the team said.

Researchers connected the two clocks for a month, and estimated that it would take some 16 billion years for them to develop a one-second gap.

That is significantly more accurate than the caesium atom clock, used to define "one second", which can develop a one second error every 30 million years, they said.

The technology could be applied to satellite-based global positioning systems and communications networks, while also serving as a foundation for various precision technologies, the team said in a statement.

"Through improved precision, we hold high hopes for accelerated discussions on redefinition of the 'second'," the statement said.

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