Poster Session #A
Laboratory tests of gravitation

A17

Transportable optical lattice clocks to test gravitational redshift in a broadcasting tower

Noriaki Ohmae (Fukuoka University)

State-of-the-art optical atomic clocks with an uncertainty of 10^{-18} allow measuring height differences of a centimeter via the gravitational redshift. We demonstrate an 18-digit-precision frequency comparison in a broadcasting tower, TOKYO SKYTREE, by developing transportable optical lattice clocks. The tower provides a 450 m height difference to test gravitational redshift at $1.4(9.1) \times 10^{-5}$. Our experiment shows optical clocks resolving centimeters are technically ready for field applications, such as monitoring spatiotemporal changes of geopotentials caused by active volcanoes or crustal deformation and for defining the geoid. We present the details of our transportable clocks and the result of the gravitational redshift measurement.