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Possibility of constructing the gravity potential meter by using atomic clocks

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In the classical mechanics since the age of I. Newton (1687), the gravitational potential has been, in a sense, 'a metaphysical concept in physical sciences' that cannot be observed. However, since the advent of general relativity by A. Einstein (1915), it has come to be 'the object of physical observation'. In other words, the gravitational potential, which differes place to place, has come to be a function of time (namely, the proper time). This means that one can make direct observations of gravity potential field by using clocks (substantially, atomic clocks). With the recent development of the atomic clocks, particularly after the significant proposal of the notion of ' optical lattice clock' by H. Katori (2001), the precision of the atomic clock has been markedly improved aiming at the frequency stability of 10**(-18). This stability of 10**(-18) is a quantity that can detect the gravity potential difference corresponding to the height difference of about 0.0 1 m on our Earth (i.e. the geopotential difference for the height difference of 0.01 m). The theory of general relativity is now in its dawning stage of application to more familier fields on our Earth, daring to say, to the geosciences or civil engineering, as well as to such conventional fields as astrophysics or cosmology.
Under these technical background, the authors report,in the presentation, the possibility of constructing the gravity potential meter: the apparatus for direct measurements of geopotential field as an application of the general relativity. The topics will be focused on the potential survey, multi-paths potential measurements, potential tomography, and so on.

Keywords: gravity potential, general relativity, atomic clock, proper time, coordinate time