

# Towards a Transportable Optical Frequency Standard on Neutral Ytterbium Atoms

**G.S. Belotelov**, *belotelov@vniiftri.ru*

*Federal State Unitary Enterprise “National Research Institute for Physicotechnical and Radio Engineering Measurements” (FSUE “VNIIFTRI”), Mendeleevo, Moscow region, Russian Federation*

**D.V. Sutyurin**, *sutyurin@vniiftri.ru*

*Federal State Unitary Enterprise “National Research Institute for Physicotechnical and Radio Engineering Measurements” (FSUE “VNIIFTRI”), Mendeleevo, Moscow region, Russian Federation*

**S.N. Slyusarev**, *serslyu@mail.ru*

*Federal State Unitary Enterprise “National Research Institute for Physicotechnical and Radio Engineering Measurements” (FSUE “VNIIFTRI”), Mendeleevo, Moscow region, Russian Federation*

**Abstract.** The achievement of an accuracy and instability level of several units  $10^{-18}$  for optical frequency standards opens up new possibilities for the application of these systems in engineering and fundamental physics. The practical realization of such possibilities requires the creation of transportable optical frequency standards. Many leading research centers in the world perform developments to create such installations. The aim of our work is to improve such characteristics of the optical frequency standard as compactness, mass, power efficiency while maintaining the levels of relative frequency stability and accuracy of laboratory optical frequency standards. In this article, we present a justification for the development of a transportable optical frequency standard based on cold ytterbium atoms and the first results of developments of modules and components for it. The device under development may be used for creating a map of Earth’s gravitational potentials, and for conducting tests of fundamental physics, as well as for the remote, including intercontinental, frequency synchronization of optical frequency standards. The results of this work may serve as the basis for the creation of onboard precision navigation systems using optical frequency standards.

**Keywords:** ytterbium, cold atoms, laser cooling, space, gravimetry