

VNIIFTRI

In 2000 IMVP GP “VNIIFTRI “, Russia continued to pursue research in the field of the primary caesium frequency standard, MCs-102. More than 60 cycles of comparisons between the MCs-102 and hydrogen frequency standard incorporating into the State primary standard have been made to analyze the MCs-102 metrological characteristics. In each cycle of measurements additional determination of the C-field value and mean velocity of the caesium atoms in the beam was performed in the automatic mode. To determine a correction for a phase difference frequency shift the beam reversal was performed in each cycle of measurements. An RMS frequency shift of the MCs-102 (averaged for 2 months) from the mean value for 1 year of observations was $\leq 2 \times 10^{-14}$. In 2000 a normalized difference between the units of time intervals of the MCs-102 and TAI was $-0,5 \times 10^{-14}$. The stated uncertainty for the MCs-102 evaluated to be equal to $\pm 2 \times 10^{-14}$.

The UTC (SU) time scale was formed by an ensemble of hydrogen standards (6 sets).

A daily instability of some standards was \leq (from 3 to 7) $\times 10^{-15}$. A weighting coefficient was applied to each standard when forming a group of standards. The difference between the TA(SU) and TAI was $-0,4 \times 10^{-15}$ in 2000 and their relative instability for (1- 6) months was $\leq 3 \times 10^{-15}$.

The work is being done on the caesium fountain clock at VNIIFTRI. The progress is as follows:

- A laser part of the system including a driving laser, two injection lasers and a laser preventing optical pumping was developed. The lasers can be stabilized by caesium fluorescence lines; a laser frequency and power is being controlled with the help of an acoustic-optical modulator. A software and interface for controlling a laser system by a computer is in the course of finishing off. The work on beam extension with a spatial filtration of modes is being continued.
- A vacuum system of the physical part with soldered windows, a caesium oven and graphite absorbers was developed and at present it is in the course of annealing and pumping out. The magnetic shields are made, thermostat construction is being finished and an assemble of the physical part is in the course of preparation.
- A hydrogen standard with an increased power was developed as a reference standard to perform a synthesis of the probing signal. The signal on 9192631770 Hz with an instability of not worse than 1×10^{-13} for 1 second should be synthesized on the basis of the standard.
- In 2001 we intend to take preliminary experiments on trapping and cooling the atoms and controlling their movement.