

## HIGH PRECISION WIDE BAND LASER INTERFEROMETER FOR MONITORING EARTH STRAINS

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During several years SAI MSU carries out the long-term observation of strains in the North Caucasus, in one of the most active in geodynamic respect region of Russia. The wide-band laser interferometer is installed in an underground tunnel of the Baksan Neutrino Observatory. The optical scheme is the two passes ( $N=2$ ) Michelson-type interferometer with unequal arms working in the regime of space separated beams that are realized by use of the corner reflectors. The measurable arm length is 75 m. The radiation of a commercial frequency-stabilized He-Ne laser is modulated at the frequency of  $60\text{kHz}$ . The mirrors, the beamsplitter and the optical passes are placed in vacuum ( $10^{-5}\text{ mbar}$ ). The radiation unit (laser and telescopic system) and the vacuum chamber containing the optical cells of the interferometer are mounted on the three independent footings. The long-term monitoring strains of the Earth is provided in two frequency bands: below  $0.1\text{Hz}$  and in the bandwidth of  $0.5\text{ Hz}$  around frequency of  $1.62\text{ kHz}$  (the monitoring of quadrature components). The sensitivity in the high frequency band is about  $10^{-14}\text{ Hz}^{-1/2}$ . The instrument possesses unique capabilities with respect to both the frequency and the dynamic ranges. Pressure and temperature are monitored too.

Long term observations are used to study the time variation of deformation properties of the active tectonic area, relations with others geophysical fields of the region (for example, seismicity). The unique property of the laser strainmeter- wide frequency band - allows to study the character of relation between the acoustic emission and the long-period strains and to use the change of this relation for indication of the medium state. Results testify the non-linear and active character of the real geophysical medium. A very high sensitivity of the laser interferometer allows to monitor and study the earthquakes with magnitude of about 4.5 (the Richter magnitude scale) or greater which occur over the world. Continuous monitoring of crustal strains and registering the free oscillation of the Earth background are also used for searching the earthquake precursors.

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