Laser acclerator for radiation hardness assessment of microelectronic devices

Safronov K V[@], Flegentov V A, Gorokhov S A, Shamaeva N N, Bashkin D I, Tischenko A S, Zamuraev D O, Shamraev A L, Kovaleva S F, Fedorov N A, Potapov A V, Dubrovskikh S M, Pilipenko A S, Kustov A S and Shibakov E A

Federal State Unitary Enterprise "Russian Federal Nuclear Center—Academician Zababakhin All-Russian Research Institute of Technical Physics", Vasilieva 13, Snezhinsk, Chelyabinsk Region 456770, Russia

[@] constantine@dezcom.org

Charged particles of outer space pose a significant threat to on-board electronics of spacecrafts. At present, testing of candidate microelectronic devices is carried out at bulky radio-frequency proton and heavy ion accelerators. The use of compact laser-plasma accelerators will significantly reduce the duration and cost of test campaign.

At a 200 TW femtosecond laser facility, experiments on irradiation of a 180 nm micro-controller (MC) by laser-accelerated protons were conducted. There were registered errors in MC memory cells after irradiation. Analisys shows that errors are caused by single event upsets.

There were carried out experiments on irradiation of 130 nm RAM chip by relativistic electrons accelerated at interaction of 30 fs 60 TW laser pulses with a gas cell target. After irradiation, a massive failure of memory cells was observed as a result of total ionizing dose effect.