IO ITER POLICY ON ELECTRONICS EXPOSED TO RADIATION

I. Semenov, N. Marusov, E. Mironova, S. Portone

«Project Center ITER» Russia, Moscow, Kurchatov sq, 1, bld.3, [i.semenov@iterrf.ru](mailto:i.semenov@iterrf.ru), [n.marusov@iterrf.ru](mailto:n.marusov@iterrf.ru), [e.mironova@iterrf.ru](mailto:e.mironova@iterrf.ru), [s.portone@iterrf.ru](mailto:s.portone@iterrf.ru)

As a large industrial installation, ITER belongs to the class of facilities with “hazardous activity”. French legislation ([http://www.ineris.fr/aida](http://www.ineris.fr/aida/)) strictly regulates the development and the operation of such facilities in France. ITER installation is identified as “nuclear facility” and falls under correspondent regulations of IAEA (International Atomic Energy Agency), ASA (Autorite de Surete Nucleaire), CEA (France Atomic Energy Commission), ASN (Regulator for Basic Safety and Nuclear Licencing Regulation) as French national regulator and others. This means that all the technological systems of the machine (there are more than 150 of them), depending on their functionality, must have a due level of reliability, and in some cases must be certified against the nuclear requirements. These requirements are also applied to control systems (i.e. sensors, actuators, elecronics and software). In early 2013 the neutron and gamma radiation maps in the most unsafe buildings (11 – Tokamak Complex, 21 – Hot Cell Building, etc.) have been specified. Radiation causes the loss of reliability. It can damage or destroy electronic components or sensors, corrupt signals in analogue or digital circuits, corrupt data in memories, etc.

ITER has issued a range of regulations which enable to assess the reliability loss of electronic components and control systems of technological equipment exposed to radiation (in ITER plasma diagnostics are also belong to technological systems). The Handbook of European Space Agency has been taken as a reference kick-off document.

This report considers the methology for assessment of the reliability loss of control systems due to cumulated ionization or due to a single highly ionising particle (so-called SEE – Single Event Effect). In the case of the reliability loss below required thresholds the IO radiation mitigation strategy is provided. Starting from 2014 «Project Center ITER» promulgates these requirements for the equipment produced in Russia within the ITER project.

The report is will be interesting to ITER systems designers and to personnel involved in the creation of large fusion installations.