Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

Radiation Hard Electronics for the ITER Service Vacuum System KURT VETTER, FRANCIS RUPPEL, NANCE ERICSON, CHARLES BRITTON, KATHRYN ROYSTON, Oak Ridge National Laboratory, STEPHEN WILSON, Los Alamos National Laboratory, EVA DAVIDSON, Oak Ridge National Laboratory, JINAN YANG, SCOTT MOSHER, Los Alamos National Laboratory, SHANE FRANK, LLOYD CLONTS, FRANK IVESTER, CLAUDELL HARVEY, Oak Ridge National Laboratory — ITER's operational characteristics of high-power long-pulse DT operation present a complex and challenging radiation environment. The nuclear radiation source consists of both the plasma and activated water. Activation of tokamak cooling water results from neutron irradiation of oxygen in water resulting in ^{16}N gammas and ^{17}N neutrons as reaction products. The need for radiation hardened electronics was established based on a detailed radiation transport and shielding analysis undertaken at Oak Ridge National Laboratory for combined plasma and activated water sources. The analysis demonstrated that it was not possible to implement sufficient shielding (due to space and weight constraints) to moderate neutrons sufficiently to comply with the Total Neutron Flux (TNF) alert threshold of 10^{-2} n/cm^2. Having established mixed gamma and neutron radiation field requirements, a modular solution was devised based on the CERN GigaBit Transceiver (GBT) custom radiation tolerant ASICs initially developed for the LHC ATLIS, CMS and ALICE detectors at CERN.

Kurt Vetter
Oak Ridge National Lab

Date submitted: 02 Jul 2020 Electronic form version 1.4