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**Detection and Classification of High Energy Beta Radiation Induced
Damage of Raspberry Pi Zero intended for OPAL CubeSat**

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Abstract

Radiation survivability of a *Raspberry Pi Zero* was studied with extended exposures from 0.2 to 2.5 MeV beta radiation of >200krad of total ionizing dose (TID) while undergoing continuous diagnostic cycles. Determining the threshold for radiation damage of inexpensive commercial-off-the-shelf (COTS) components is critical as a cost-saving method in the construction of spacecraft. Characterizing radiation induced damage of COTS with TID allows for proper precautionary measures to maintain spacecraft functionality over the duration of their mission. The specific point and type of failure due to TID is determined to mitigate deleterious effects through enhanced shielding and software or hardware redundancy. TID in the memory and processor units before system failure was measured, along with type, frequency of error, and possibility of system recovery. Careful determination of heat conduction *in vacuo* of IC's was conducted to avoid overheating due to delivered battery power and radiation energy deposition. The results will facilitate construction and design of the USU-led OPAL CubeSat, to determine if this COTS can survive >200krad TID received during its 1-2yr mission in LEO orbit.

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