**Effects of total ionizing dose on bipolar junction transistor**


## Abstract

Problem statement: The amount of ionizing radiation that Bipolar Junction Transistor (BJT) devices encounter during their lifecycle degrades both of their functional and electrical parameter performances. The different radiation environments either in space, high energy physics experiments, nuclear environment or fabrication process as well as for standard terrestrial operation possess an impact on the devices. Approach: In this research, analytical studies of the effects of ionizing radiation introduced in Commercial-Off-The Shelf (COTS) NPN BJTs by 60Co gamma (γ) rays had been performed. Results: It was observed that exposure of BJTs to 60Co caused ionizing radiation damage. Ionizing radiation damage was caused mainly by excess charges trapped on or near the surfaces of their insulating layers and interfaces. This phenomenon reduced the minority carrier lifetime and thus, leading to a decrease in the current gain of the BJTs. Conclusion: This ionizing radiation effect was found to arouse either a permanent or temporarily damage in the devices depending on their current drives and also the Total Ionizing Dose (TID) absorbed. The performance and degradation of selected BJT devices during irradiation with respect to total dose 60Co were presented in this study.