66th International Astronautical Congress 2015

MATERIALS AND STRUCTURES SYMPOSIUM (C2)
Space Environmental Effects and Spacecraft Protection (6)

Author: Dr. Epifanio Cruz-Zaragoza
Universidad Nacional Autónoma de México, Mexico, ecruz@nucleares.unam.mx

Mr. Yair Israel Piña López
Universidad Nacional Autónoma de México, Mexico, yair.israel@ciencias.unam.mx

CMOS SENSOR AS IONIZING RADIATION DETECTOR AND THERMOLUMINESCENCE RESPONSE

Abstract

Recently, the CMOS active pixel sensors have has been tested for several applications and thus have increased the demand for improving the performance thereof. This type of sensors has an APS (Active Pixel Sensor) architecture, which is formed by an integrated circuit with a matrix of pixels where each pixel itself contains a photodetector. At present, the pixel size is less than 2 micrometers which is possible thanks to microelectronics. In addition to imaging applications, new perspectives in various research areas could be opened by a different type of devices such as CMOS sensors. As an example, these devices could be used for detection of ionizing radiation with the possibility of a submicrometer measurement. In this work we have investigated the possibility of using a CMOS sensor with an area of 640x480 pixels, which previously has been integrated into an electronic circuit for detection of ionizing radiation and charged particles testing from radioactive sources at the Nuclear Sciences Institute (UNAM) of México; such as: Am-241, Natural Uranium (U-234, U-235 and U-238), Sr-90, and Cs-137. The CMOS sensor response was appropriated in each variations of energy from the radioactive sources. The graph in the figures shows the area and positions of the sensor surface where the impacted particles and gamma rays.The higher peaks show each energy type from radiation source. The frequency of activity of the sources was very well determined. Due to the composition within the pixels by the photosites, exposure of the sources was in the absence of external light in order to avoid the outer photons excite each of the photosites. When the CMOS sensor was tested under continuous irradiation for a long period of 168 hours (1 week) using the largest energy source (Am-241), the sensor had not loss of functionality.