

# International Workshop on Radiation Imaging Detectors iWoRID 2014

Contribution ID : 96

## Simulations of the LUCID experiment in the Low Earth Orbit radiation environment

Wednesday 25 Jun 2014 at 10:00 (00h20')

### Content :

The Langton Ultimate Cosmic ray Intensity Detector (LUCID) experiment [1] is a satellite-based device that uses five Timepix hybrid silicon pixel detectors [2] to make measurements of the radiation environment at an altitude of approximately 635km, i.e. in Low Earth Orbit (LEO).

The experiment is due to launch aboard Surrey Satellite Technology Limited's (SSTL's) TechDemoSat-1 in Q2 of 2014.

The Timepix detectors, developed by the Medipix Collaboration [3], are arranged to form the five sides of a cube enclosed by a 0.7 mm thick aluminium covering, and will be operated in Time-over-Threshold mode to allow the flux, energy and directionality of incident ionising radiation to be measured.

To understand the expected detector performance with respect to these measurements, the LUCID experiment has been modelled using the Allpix package, a generic simulation toolkit for silicon pixel detectors built upon the GEANT4 framework [4].

The work presented here summarises studies completed using the grid infrastructure provided by the GridPP Collaboration to both perform the simulations, store the resultant datasets, and share that data with the LUCID Collaboration.

The analysis of these datasets has given an indication of the experiment's expected performance in differing space radiation environments (for example, during polar passes or when over the South Atlantic Anomaly), and has allowed the LUCID Collaboration to prepare for when data is transmitted back to Earth later in 2014.

Keywords: LUCID Pixel detector Silicon detector Space radiation Timepix GEANT4 Grid computing GridPP

References:

- [1] L. Pinsky et al., *Radiation Measurements* 46 (2011) 1610-1614
- [2] X. Llopart et al., *Nucl. Instr. Meth. A* 581 (2007) 485-494
- [3] <http://medipix.web.cern.ch/>
- [4] A. Agostinelli et al., *Nucl. Instr. Meth. A* 506 (2003) 250-303

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**Session classification** : --not yet classified--

**Track classification** : pippo

**Type** : oral