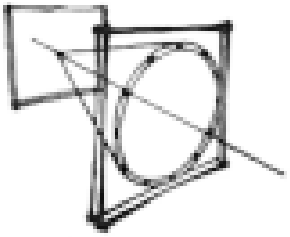

Contribution ID: **44** Type: **Oral presentation**

Research and Development Studies on a Silicon Photomultiplier based Camera for Imaging Atmospheric Cherenkov Telescopes

Thursday, 8 September 2016 15:40 (25 minutes)

The observation and study of faint signals at very high energy (E > 100 GeV) associated with cosmic phenomena constantly requires the development of advanced technologies and instruments to improve the sensitivity. Imaging Atmospheric Cherenkov Telescopes (IACTs) represent a class of instruments dedicated to the ground-based detection of cosmic VHE gamma ray emission based on the detection of the Cherenkov light produced in the interaction of gamma rays with the Earth atmosphere. One of the key elements of such instrument is a pixelized focal-plane camera consisting of photodetectors, each coupled to a light concentrator, commonly used to reduce the size of the dead area caused by the geometries of the photodetectors, as well as to reduce the amount of stray light entering at large field angles. To date, photomultiplier tubes (PMTs) have been the common choice given their high photon detection efficiency (PDE) and fast time response. Recently, silicon photomultipliers (SiPMs) are emerging as a an alternative. This technology is rapidly evolving. Currently, SiPMs have advantages, e.g., lower operating voltage and tolerance to high illumination levels and disadvantages, such as higher capacitance and cross talk rates. SiPM technology has a strong potential to become superior to that based on PMTs in terms of PDE, which would further improve the sensitivity of IACTs, and a reduced price per square mm of detector area. While the advantage of SiPMs has been proven for small IACTs and for IACTs based on a double-mirror Schwarzschild-Couder layout, it is yet to be demonstrated for large single mirrors designs. We are working to develop a SiPM-based module for the focal-plane cameras of the MAGIC telescopes, in view of a possible camera upgrade. We will describe the solutions we are exploring in order to balance a competitive performance with a minimal impact on the overall MAGIC camera design and present a comparison on the PDE based on ray tracing and Monte Carlo studies.

Registered

Yes

Primary author: ARCARO, Cornelia (University of Padova and INFN Padova)

Co-authors: MANEA, Christian (University of Padova & INFN-TIFPA Trento); CORTI, Daniele (University of Padova and INFN Padova); TESCARO, Diego (University of Padova and INFN Padova); REICHARDT, Ignasi (University of Padova & INFN Padova); DORO, Michele (University of Padova and INFN Padova); MARIOTTI, Mosè (University of Padova and INFN Padova); RANDO, Riccardo (University of Padova and INFN Padova)

Presenter: ARCARO, Cornelia (University of Padova and INFN Padova)

Session Classification: Cherenkov detectors in astroparticle physics

Track Classification: Cherenkov detectors in astroparticle physics