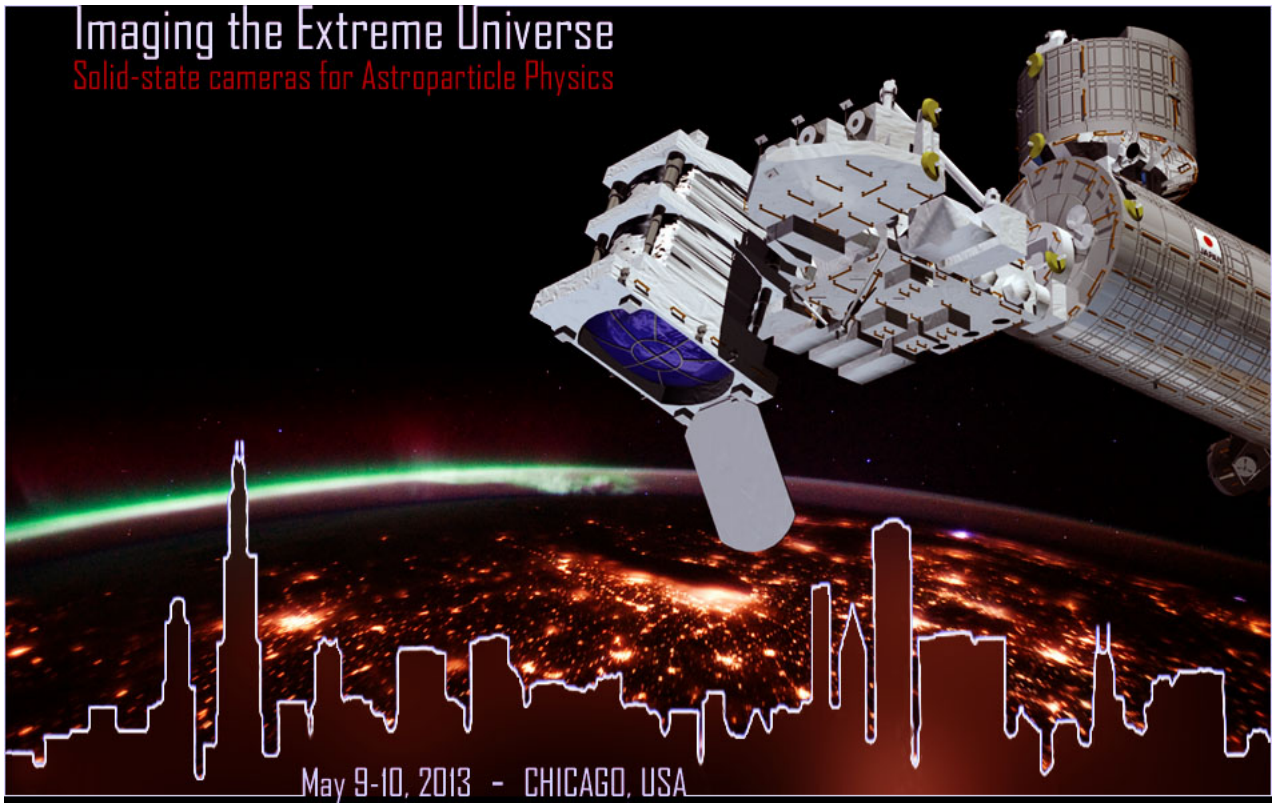

http://kicp-workshops.uchicago.edu/ieu2013/

WORKSHOP PRESENTATIONS

The Kavli Institute for Cosmological Physics (KICP) at the University of Chicago will host a two-day workshop focusing on solid-state technologies to build cameras for both space and ground-based astroparticle physics experiments. In particular, alternatives to MAPMTs for the JEM-EUSO focal plane and CTA cameras will be discussed including SiPM and G-APD. The workshop will be structured as a series of presentations with ample time for discussions and working sessions.

Local Organizing Committee

Pedro Facal
Kavli Institute for Cosmological Physics

Toshihiro Fujii
Institute for Cosmic Ray Research & Kavli Institute for Cosmological Physics

Jeff Grube
Adler Planetarium/EFI

Andrew McCann
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Angela Olinto
Kavli Institute for Cosmological Physics

Paolo Privitera
Kavli Institute for Cosmological Physics

Scott Wakely
Kavli Institute for Cosmological Physics

Christopher Williams
Kavli Institute for Cosmological Physics

1. **Thomas Bretz**, ETH Zurich
   FACT Telescope

   May 9, 2013 (2:30 PM - 3:15 PM)

2. **Marco Casolino**, RIKEN & INFN
   The Focal Surface of JEM-EUSO detector

   May 9, 2013 (10:10 AM - 10:50 AM)

3. **Hank Crawford**, University of California, Berkeley
   TBA

4. **Grzegorz W Deptuch**, Fermilab
   3D integrated and digitally read-out solid-state photo-multiplier - proposal

   May 10, 2013 (1:00 PM - 1:45 PM)

   Co-authors: Juan Estrada
   The postulated device is a pixelated device with each pixel hosting a Single Photon Avalanche Diode operated in the Geiger mode, i.e. above junction breakdown voltage. It is a SiPM (Silicon Photo-Multiplier), but built in such a way that actually all beneficial features of the digital nature of signals that are generated by individual discharges can be actually for the first time fully exploited by having every diode connected to its own electronics front-end. The fill factor is not compromised in this device, because the readout electronics is connected to the sensors by harnessing three-dimensional integration to the construction of this new electronic device. It is a transformational change with respect to conventional analog and monolithic digital SiPMs, existing so far. This new, postulated SiPM 3DDigSiPM. It form guarantees satisfactory electrical performances, in particular concerning noise, i.e. dark-counting rate, after-pulsing and crosstalk as a tier with SPADs is fabricated in a dedicated, optimized for this purpose process.

5. **Juan Estrada**, Fermilab
   MAPMT Performance compared with Requirements Discussion

   May 9, 2013 (11:00 AM - 12:00 PM)

7. **Ardavan Ghassemi**, Hamamatsu
   Latest MPPC Developments from Hamamatsu 1

   May 9, 2013 (1:00 PM - 1:30 PM)

6. **Ardavan Ghassemi**, Hamamatsu
   Latest MPPC Developments from Hamamatsu 2

   May 9, 2013 (1:00 PM - 1:30 PM)

8. **Jeff Grube**, Adler Planetarium/EFI
   CTA Science Overview

   May 9, 2013 (9:30 AM - 9:50 AM)

   The Cherenkov Telescope Array (CTA) will be a new observatory for the study of very high energy (VHE) gamma-ray sources. It seeks to achieve an order of magnitude improvement in sensitivity in the ~30 GeV to ~100 TeV energy band over currently operating instruments (VERITAS, MAGIC, HESS). CTA will probe the known VHE sources with unprecedented sensitivity and angular resolution, and detect hundreds of new sources. The presentation focuses on how CTA will be able to address key science topics such as the indirect detection of dark matter, cosmic ray acceleration, and very high-energy gamma-ray production in relativistic jets.

9. **John W Mitchell**, Goddard Space Flight Center
   SiPMs and G-APD Discussion

   May 9, 2013 (4:00 PM - 5:00 PM)

10. **Eric Oberla**, UChicago HEP
    Development of large area Micro-channel Plate Photodetectors for imaging and fast-timing applications

    May 10, 2013 (2:00 PM - 2:45 PM)

    Progress towards the development of 20x20 cm2 active area micro-channel plate photomultiplier tubes (MCP-PMT) with sub-nanosecond time-of-flight resolution of single photons is presented. The Large-Area Picosecond Photodetector Collaboration (LAPPD) is developing these large-area, planar, glass-packaged phototubes using novel MCPs made from borosilicate micro-capillary arrays and functionalized with atomic-layer deposition. A gain of greater than 107 is measured with a chevron stack of two MCPs. The photodetector anode employs an array of 50-ohm micro-strip lines, in which the position, time, and energy of an incident pulse are extracted from the full waveforms recorded at both anode terminals. A custom 10 GSa/s waveform sampling application specific integrated circuit was designed for the compact front-end anode readout. Additionally, a prototype detector-integrated data acquisition system has been designed and implemented for initial detector characterization. With this system, differential (2-end anode) timing resolution ~10 ps is achieved, corresponding to a spatial resolution of ~1 mm for large signals (~10 photoelectrons). The potential use of these large-area MCP-PMTs towards ultraviolet cameras in astrophysical applications will be discussed.

11. **Angela Olinto**, Kavli Institute for Cosmological Physics
    JEM-EUSO Science Overview

    May 9, 2013 (9:10 AM - 9:30 AM)

12. **Nepomuk Otte**, Georgia Tech
    Nuisances of SiPMs and how to deal with them in Cherenkov telescopes on the example of the CTA SC-MST

    May 9, 2013 (1:30 PM - 2:15 PM)

    The silicon photomultiplier (SiPM) is in many aspects superior to other photon detectors that could be used in Cherenkov telescope cameras. It would indeed be an almost perfect sensor if there would not be optical crosstalk, a temperature dependence of the breakdown voltage, and slow signals in available devices. These effects lead to a decrease of the instrument performance by causing instabilities and an increase of the energy threshold if not properly taken care of. I review the nuisances, how they affect the performance of a Cherenkov telescope, and discuss how they are handled with in the CTA Schwarzschild Couder telescope that is presently being constructed.

13. **Marco Ricci**, INFN, Laboratori Nazionali Frascati - ITALY
    Mechanics and Thermal Requirements Discussion

    May 9, 2013 (5:00 PM - 6:00 PM)

14. **Paul Rubinov**, Fermilab
    Electronics for large focal plane arrays

    May 10, 2013 (10:15 AM - 11:00 AM)

15. **Justin Vandenbroucke**, KIPAC, SLAC
    Waveform digitization with the TARGET chip

    May 10, 2013 (11:05 AM - 11:50 AM)

16. **David A Williams**, University of California, Santa Cruz
Characterization of SiPMs for Use in Cherenkov Telescopes

May 10, 2013 (9:00 AM - 9:45 AM)

We have received samples of SiPM from several manufacturers and are evaluating their performance. I will discuss the range of performance we have observed in those parameters most critical to the performance of atmospheric Cherenkov telescopes and present results of simulations studying the impact of SiPM performance on the the sensitivity of the telescopes. Prospects for improvement in some of the key parameters, based on discussions with the manufacturers, will also be presented.