A Focused Cosmic Ray Instrumentation Workshop

Motivation and Project Ideas

A high school outreach workshop
Salinas Airshower Learning And Discovery (SALAD) project

Links to the American Physical Society Meetings abstracts
http://meetings.aps.org/Meeting/APR15/Session/K6.9
http://meetings.aps.org/Meeting/APR15/Session/J6.8
http://meetings.aps.org/Meeting/FWS15/Session/S1.6

Student focused novel cosmic ray physics experiments
Using cost effective silicon photomultiplier light sensors.

2-day Saturdays workshops
To enlighten, to engage and to introduce enriching modern physics ideas to high school students and their teachers.

Workshop program include: hands-on learning activities in modern electronics, detector assembly, data acquisition, data analysis and programming the arduino microcontrollers and Raspberry Pi Computers.
A Portable Cosmic Ray Telescope using Silicon Photomultipliers

Key Components:
- AdvanSiD SiPM
- UltraVolt P/S
- Mini-Circuits amp
- Elgen Scintillator
- Saint Gobain fibers

Telescope assembly made by Hartnell College STEM students
Silicon Photomultiplier Coincidence Setup

SiPM → AND Logic Circuit → DRS4 Digitizer

Dual channel Comparator board

Single Channel Comparator board

DRS4 Waveform Digitizer

Amplifiers and 50 Ohm splitter
Data Acquired with SiPM based cosmic ray telescope

Summer 2015

Singles rate, 250 Hz to reduce noise, set to higher threshold
Digitized Waveforms, 5000 events, triggered in coincidence
Mini-Circuits Gali74+ preamp, Data taken over 24 hours

**Waveform number 202 in mVolt**

- **Raw Waveforms**
  - 0.19 nsec per channel bin, 1024 channels

- **Averaged Waveforms**
  - Using 21 point moving average filter

**Histogram of Amplitudes**

- **AdvanSiD**
  - SiPM
  - 3x3mm²
  - Channel 1

- **AdvanSiD**
  - SiPM
  - 3x3mm²
  - Channel 2