Use of Silicon Photo-Multipliers in Cosmic Muon Measurements

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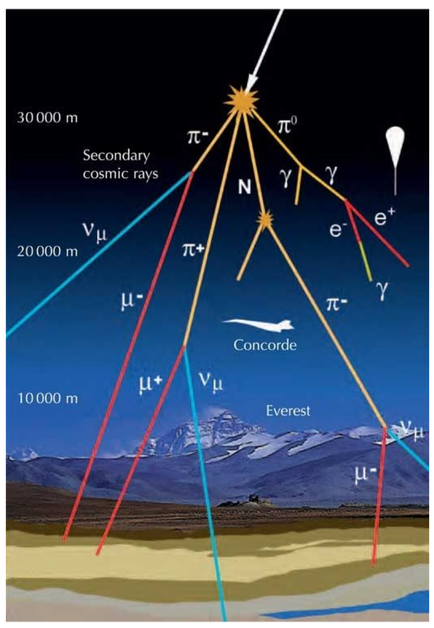
Introduction:



Use of Silicon Photomultiplier (SiPM) Electronics

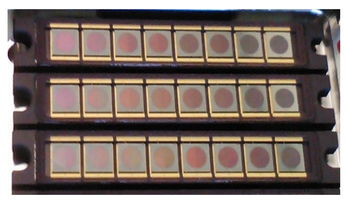
SiPMs replace HPDs & Photomultiplier as photo sensors in detector

Their use has a number of advantages if compared to other photo sensors:

- Immunity to magnetic field
- Better light detection efficiency
- Better signal to noise ratio
- Solid state reliability

A certain infrastructure is required for SiPM operation

- Precise voltage control
- Individual sensor current monitoring
- Temperature stabilization / monitoring



Packaged HPK SiPM photo-sensors (aka "SiPM strips")

Set-up goals

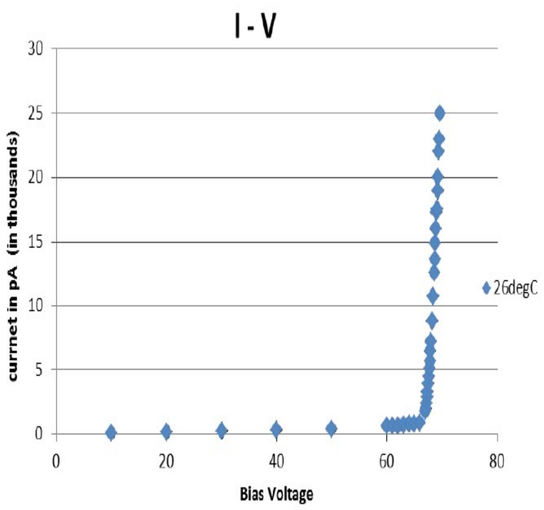
Silicon Photo-multipliers are used now extensively in high energy physics experiments .

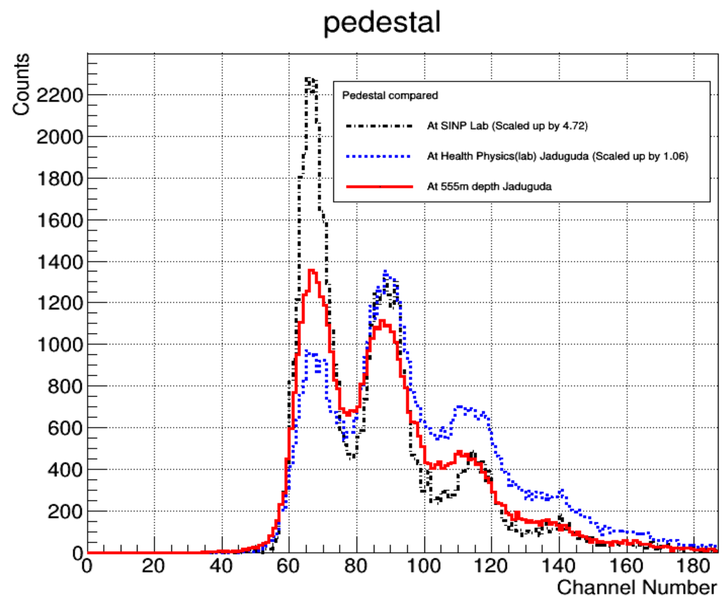
They will eventually replace the conventional photo-multipliers

Our prototype setup is to estimate cosmic-ray background.

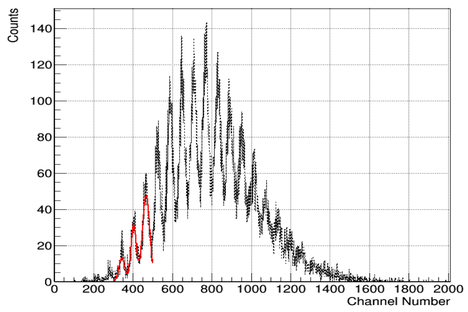
Hence can be used for future dark matter Indian endeavour.

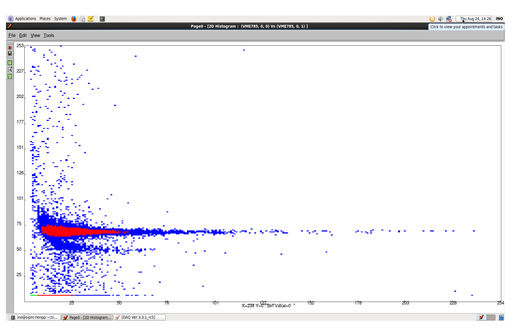
Set-up inside (at 555m) Laboratory :

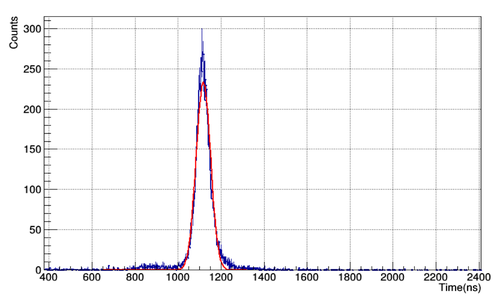


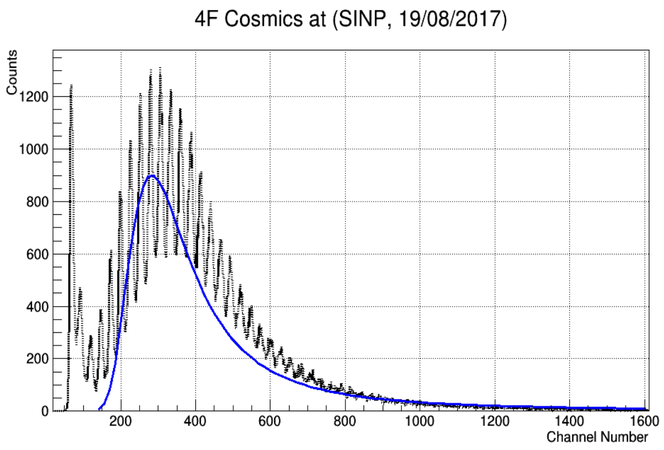


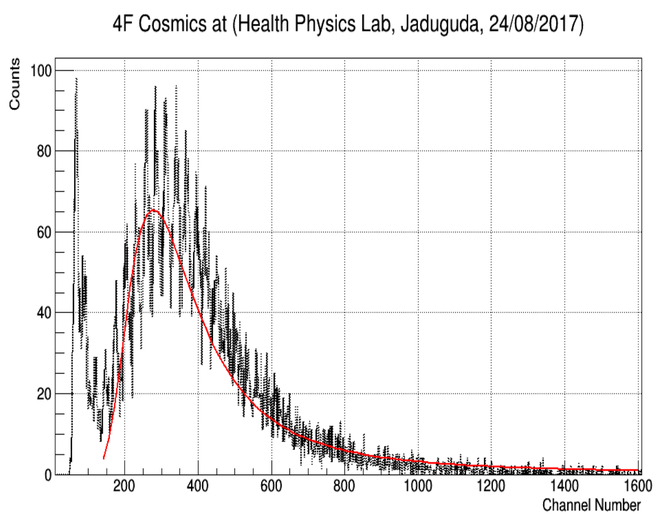
Low intensity Light plot (below)











Summary and Outlook

We have made a prototype setup to estimate the cosmic-ray background.

We plan to collaborate with the Health Physics group, UCIL, Jaduguda, to take this study forward.

Ongoing studies give us compelling motivation to extend this study at further lower level.

We plan to make bigger arrays for this purpose.

This will help us plan setup for studying fundamental problems in Physics.