

LANL AC-LGAD test capabilities

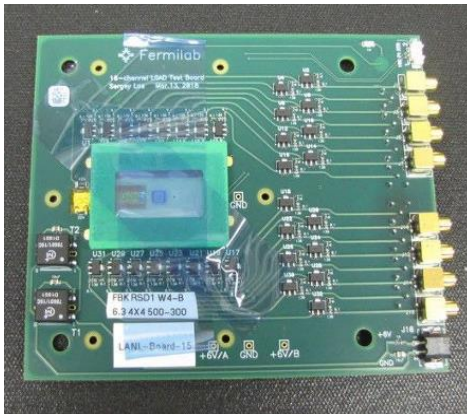
Xuan Li (xuanli@lanl.gov)

Physics division, Los Alamos National Laboratory

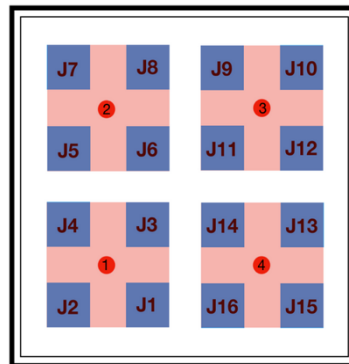
AC-LGAD test bench at LANL

- Characterization of AC-LGAD prototype sensors has been done at LANL supported by a previous LDRD project.
- Full test bench includes a 2.5 GHz oscilloscope, a telescope setup, HV/LV power modules and CAEN 1730s digitizers.

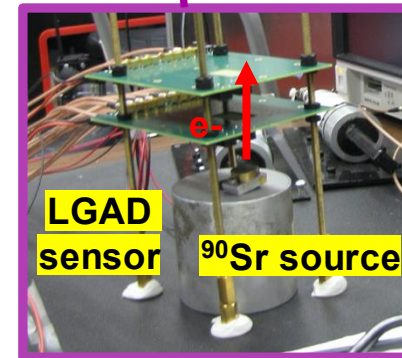
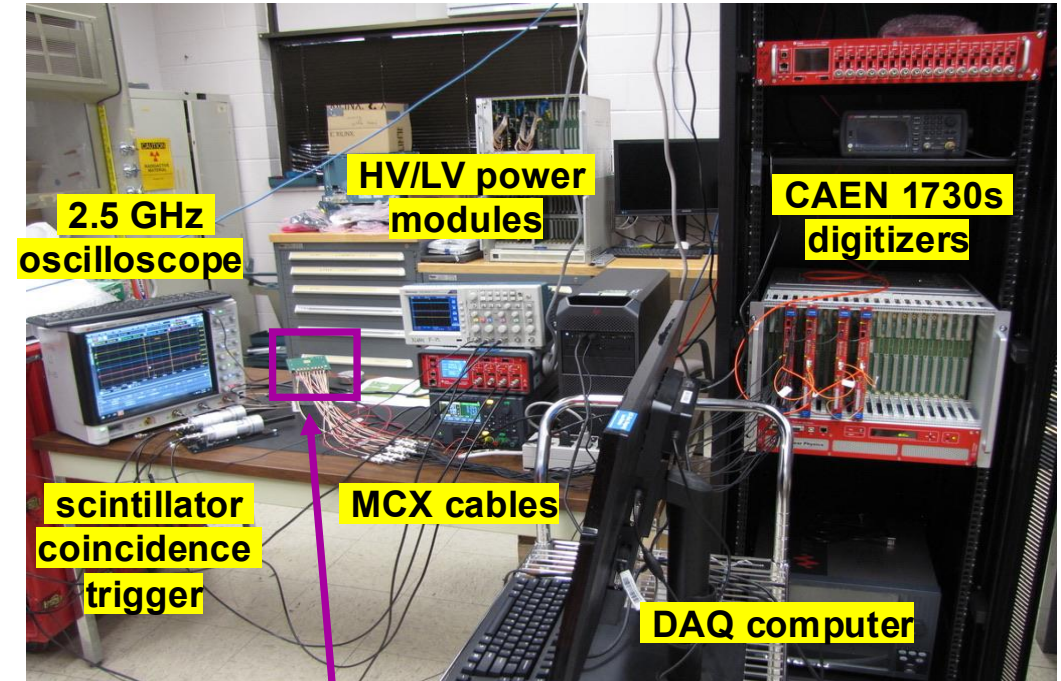
AC-LGAD Carrier Board



AC-LGAD pixel map
4X4 Matrix



LGAD (AC-LGAD) sensor characterization with the ^{90}Sr source test

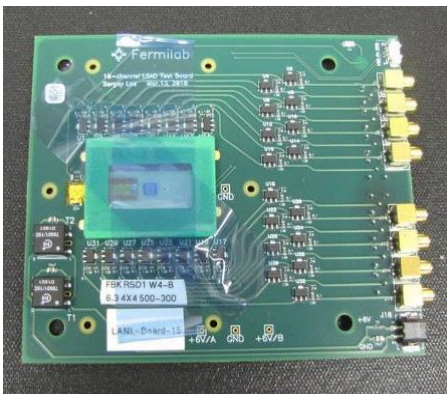


2-layer LGAD
telescope

AC-LGAD Sensor Data Processing Flow

- Data flow chart:

AC-LGAD sensor



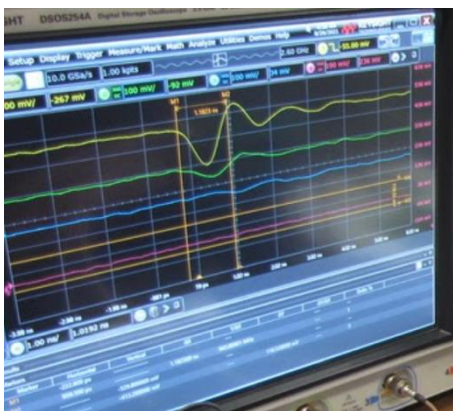
CAEN 1730s digitizer



DAQ computer

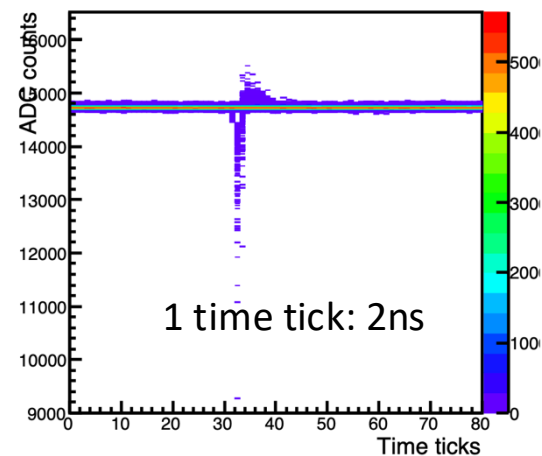


Raw analog signal



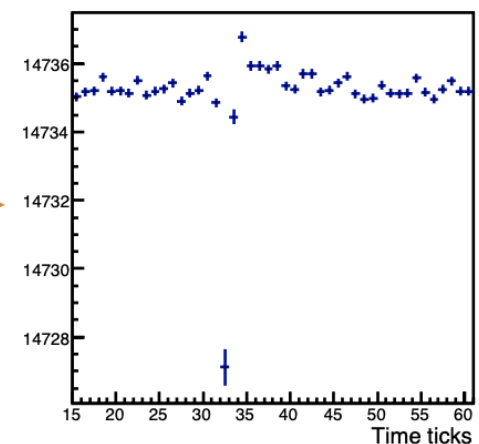
Accumulated pulse distribution

Digitizer channel 1



Extracted average pulse shape and charge

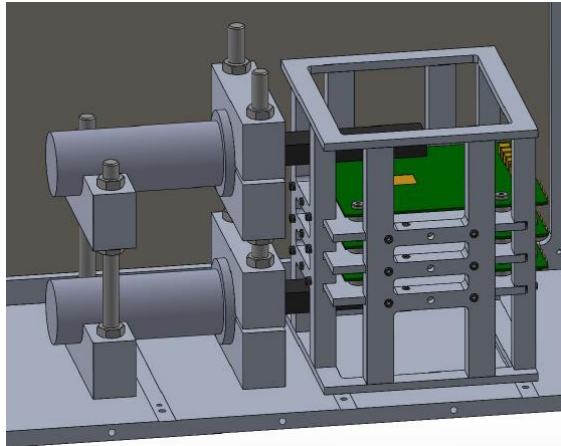
Digitizer channel 1



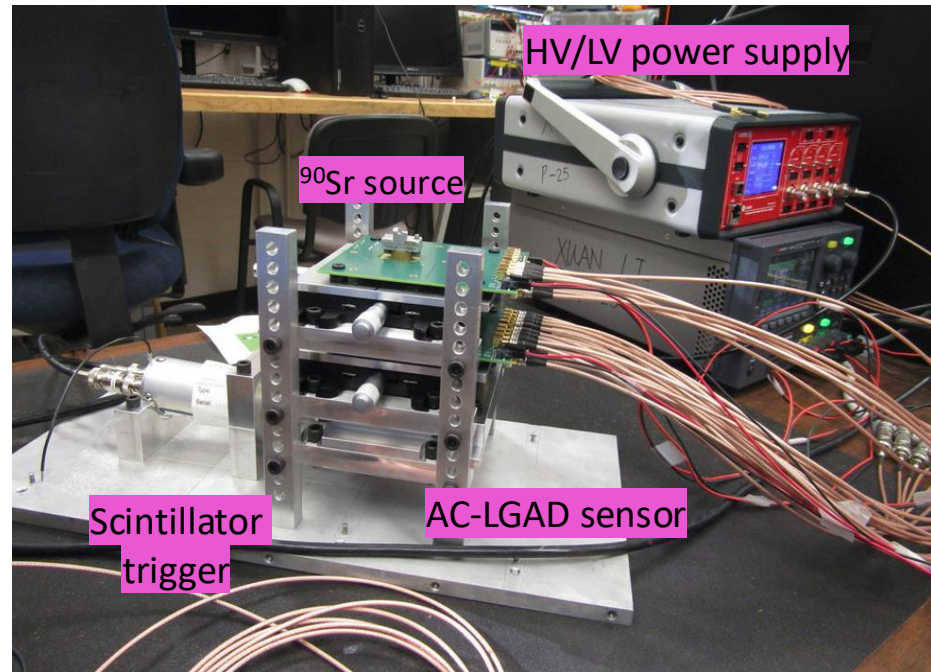
AC-LGAD sensor R&D test results

- Feasibility tests of a two-layer AC-LGAD telescope using a ^{90}Sr source.

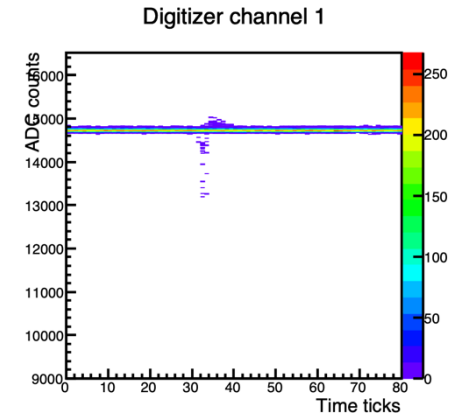
Mechanical design of 3-layer LGAD (AC-LGAD) telescope



3-layer AC-LGAD telescope ^{90}Sr test setup with 2 sensors connected to the readout

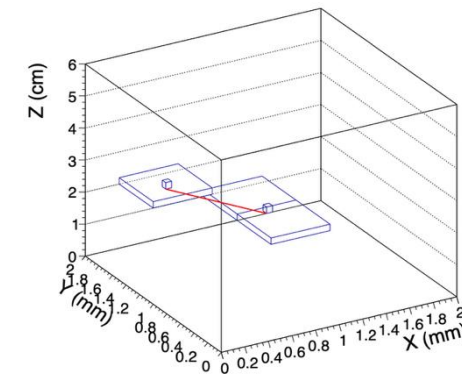


Digitized pulse shape VS time tick (2ns) for individual pixel of from the ^{90}Sr source tests.

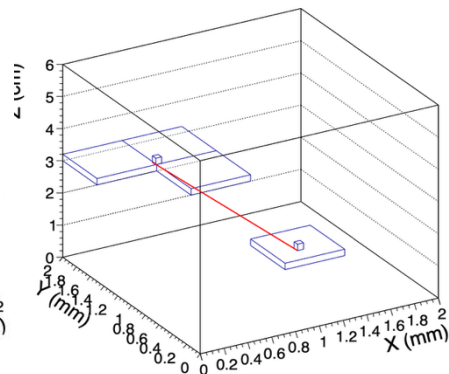


Event display of reconstructed electron tracks

Event display 6



Event display 16



- Please see more details in <https://pos.sissa.it/420/042/pdf>

EIC silicon detector irradiation tests and path forward

- Irradiation tests performed with the LANL LANSCE facility 500 MeV proton beams to test the radiation hardness of LGAD and AC-LGAD prototype sensors with 10^{13} - 10^{16} $n_{eq}cm^{-2}$ doses in 2022.
- Open to future irradiation tests for new AC-LGAD sensors and associated readout electronics.

LGAD and AC-LGAD irradiation tests at LANSCE

