



Primary results of cosmic-ray recognition for a Plastic Scintillation Detector Using Machine Learning

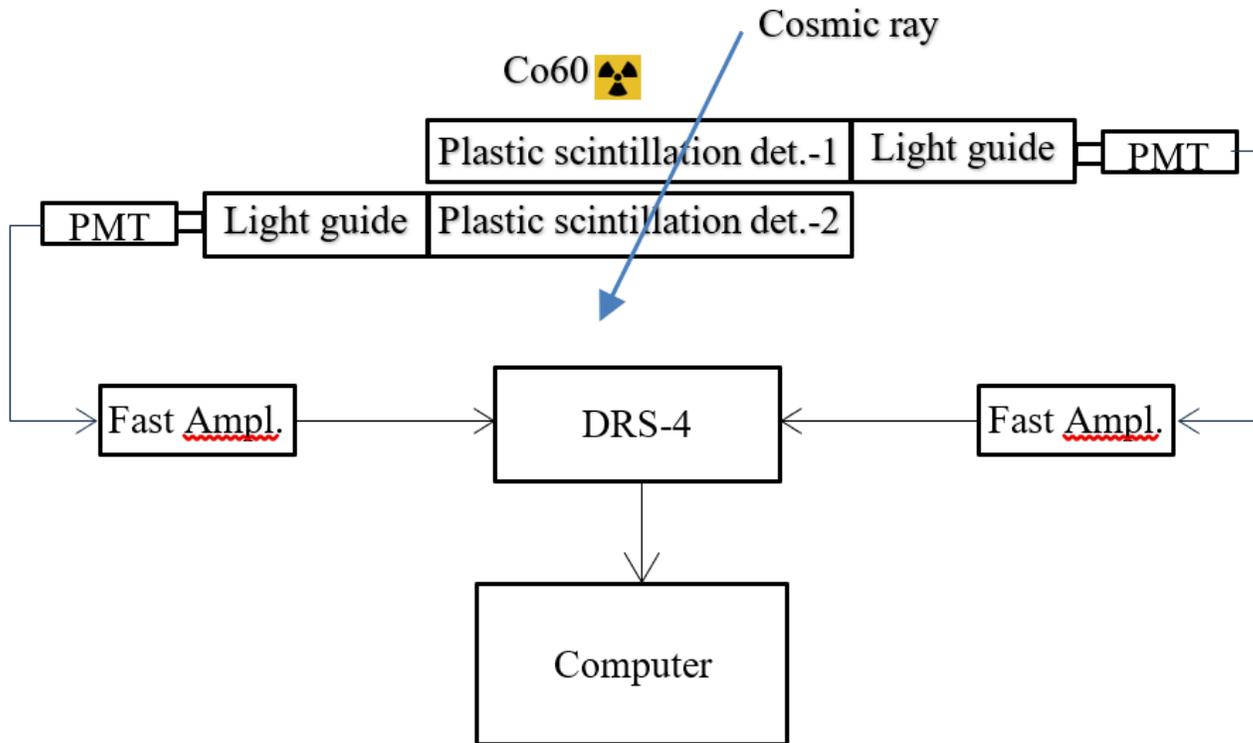
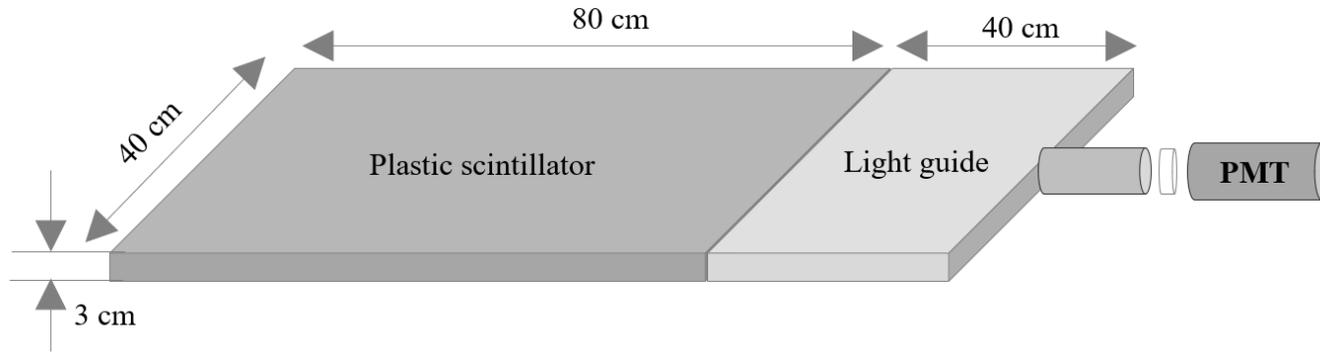
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Poster ID: 180

24th IEEE Real Time Conference, Apr 2024, ICISE Quy Nhon, VN

Experimental details

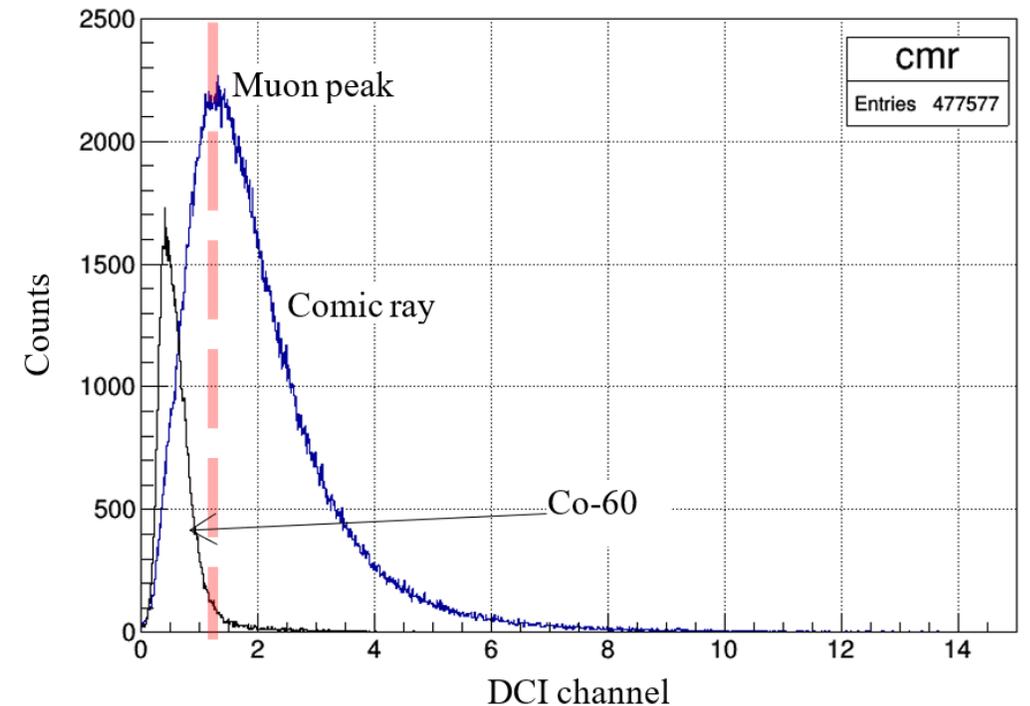


Output from PMT is amplified by a fast amplifier and recorded by the digitizer of DRS-4 as basic waveforms.

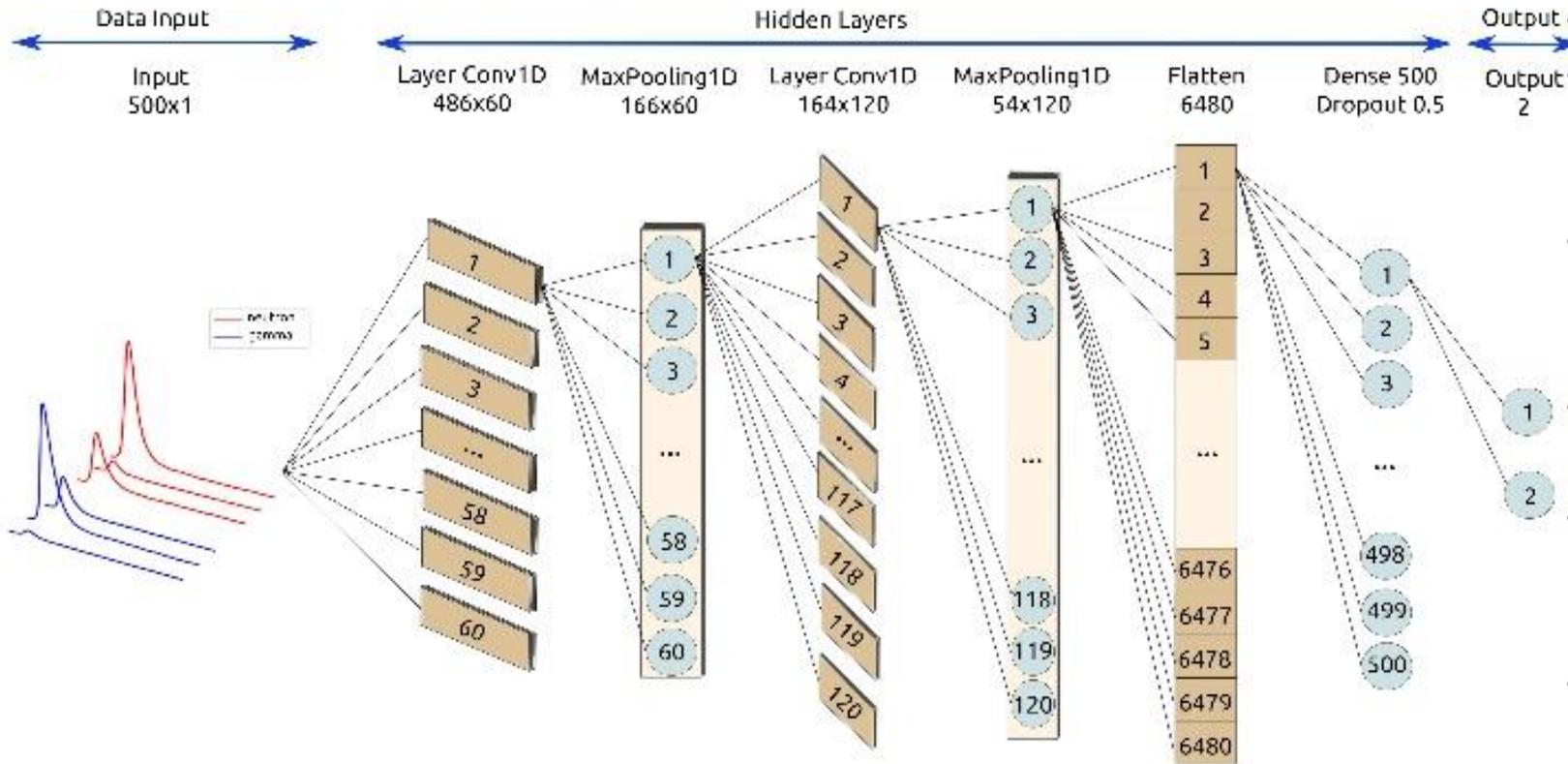
DRS-4 board:

- Sampling rate: 2GSPS.
- Timing and Voltage calibrations are executed before measurement.

Digital charge integration (DCI) applied with time window: 200 ns

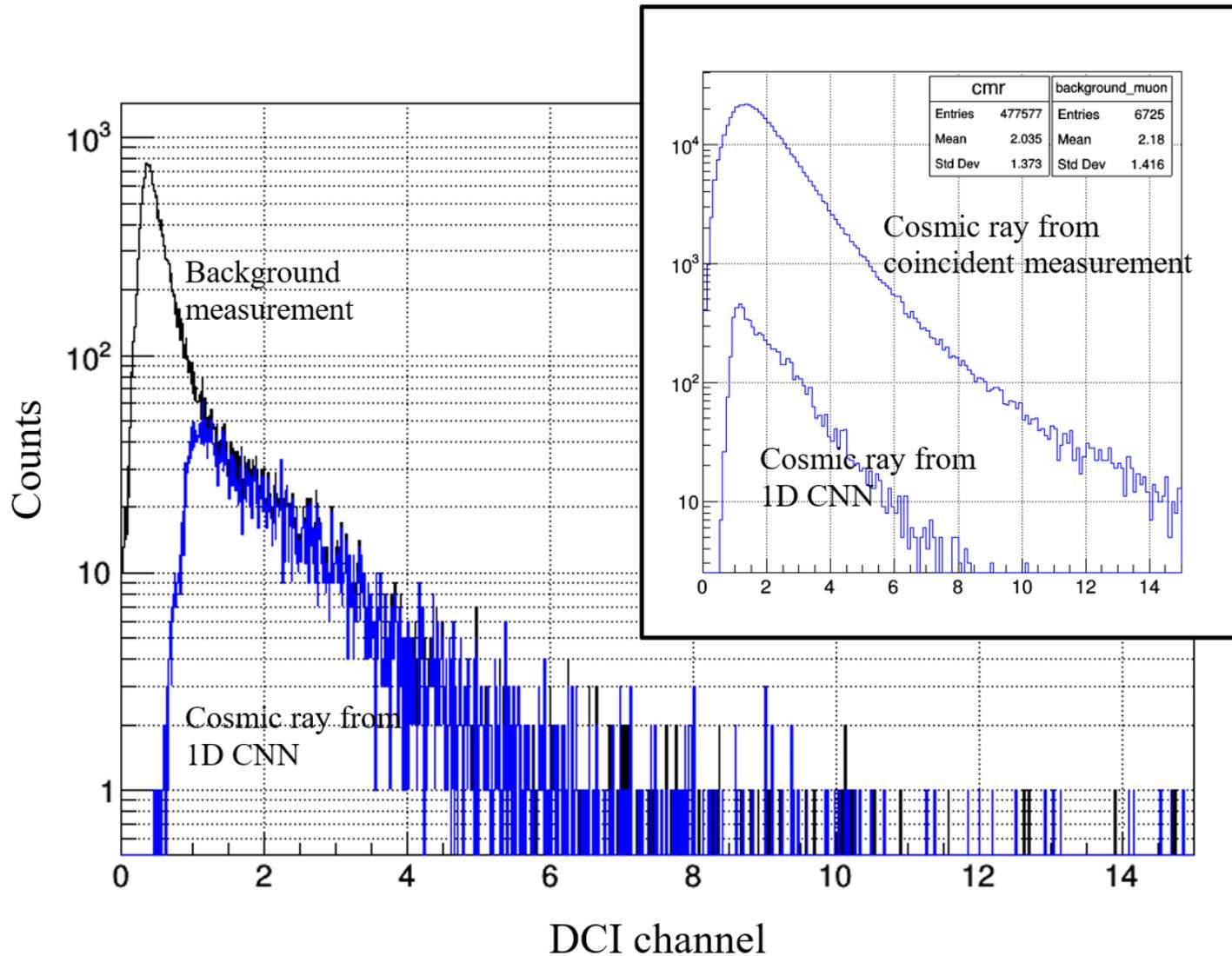


1D-CNN



- Keras library with TensorFlow
- Each waveform a unique input
- ReLU activation functions (hidden layers) + Softmax activation function (output layer)
- SGD optimizer, sparse_categorical_crossentropy loss function
- Dataset: 78,000 cosmic-ray + 78,000 gamma events.
- Cosmic-ray and gamma events are identified using coincidence measurements and Co-60 source.
- 80% dataset for training and 20% for validation. After 1000 epochs, validation loss of 0.33 and validation accuracy of 0.87

Results and discussion



Radiation background measurement for plastic scintillation detector-1

1D-CNN analysis showcased the capabilities to identify the cosmic-ray muons (blue line), demonstrating similarities to cosmic-ray measurement with the coincidence of two detectors.

Cosmic ray component can be extracted from the radiation background: 1.4% of total background.



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