

Development and characterisation of large area glass Resistive Plate Chambers for INO-ICAL detector

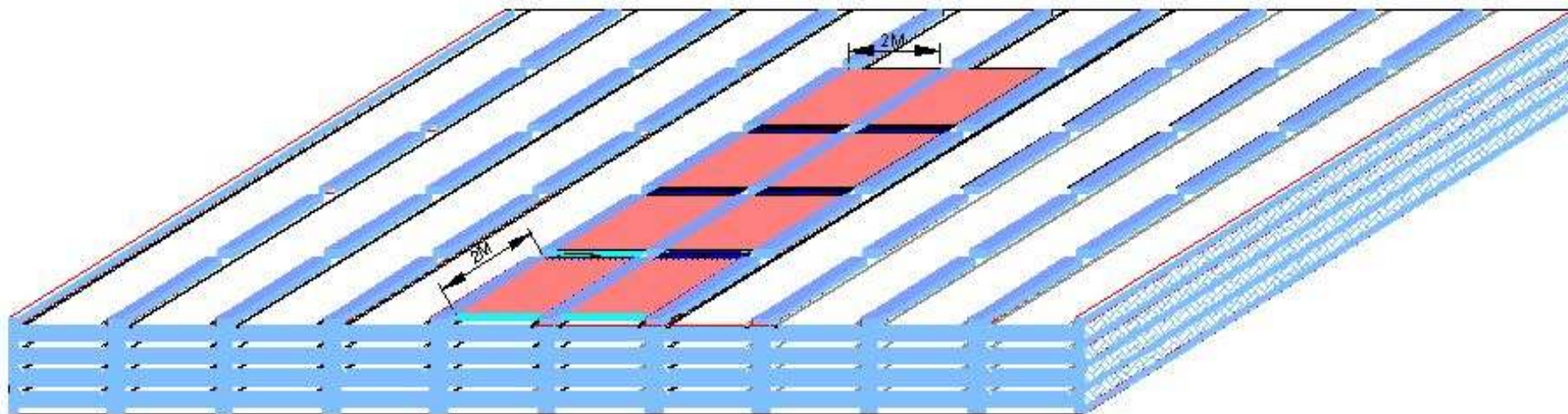
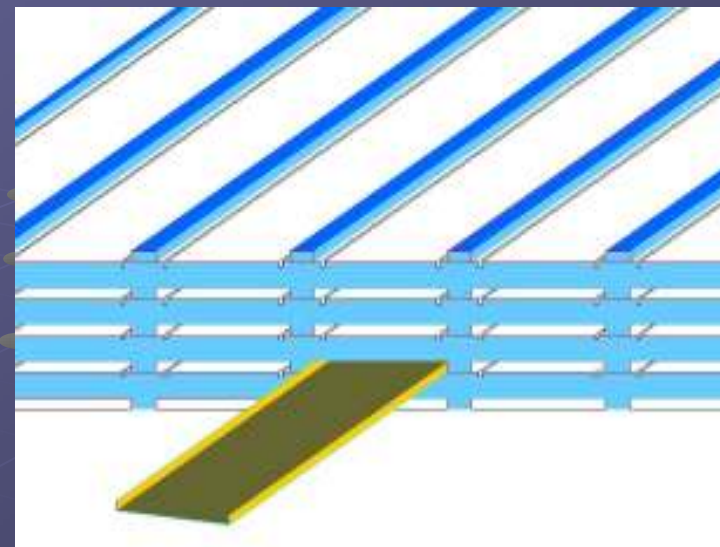
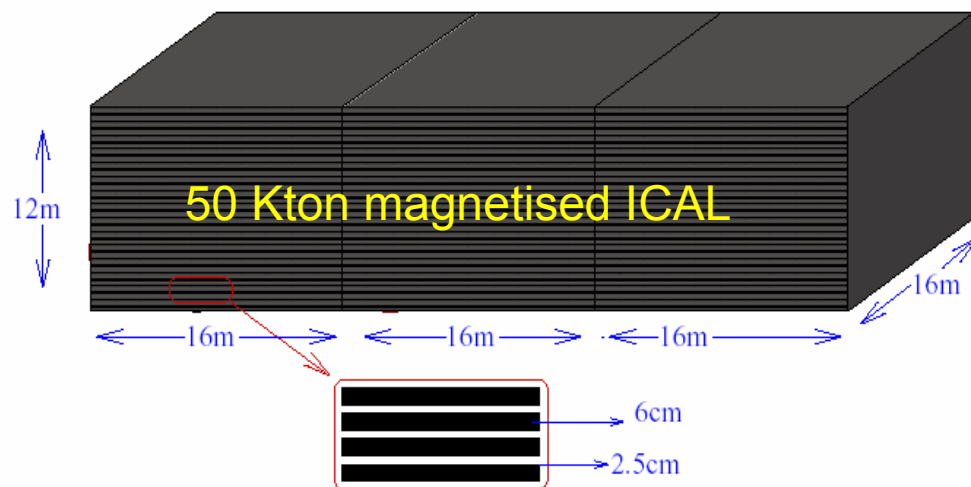
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ICAL detector concept



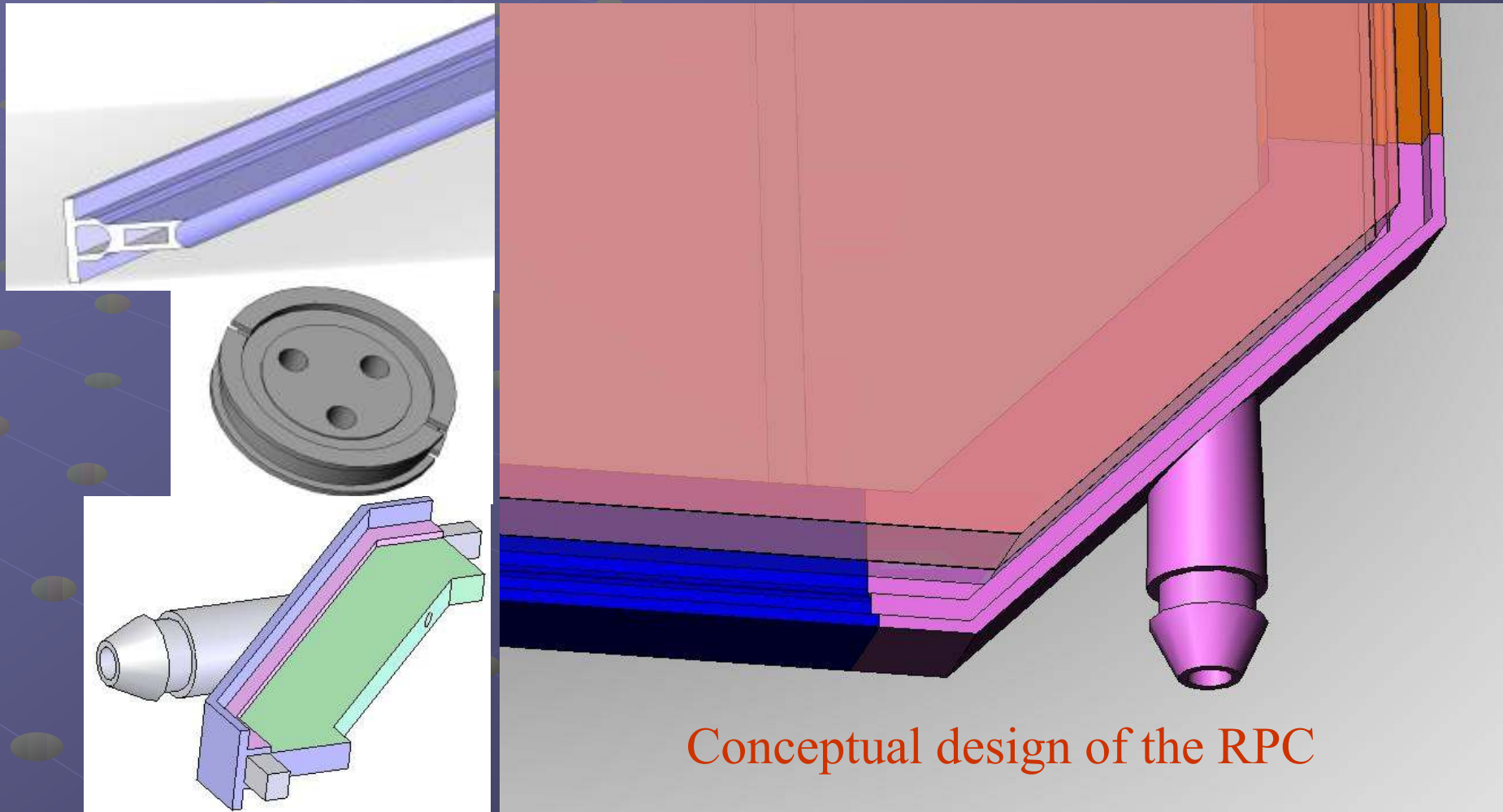
ICAL detector fact sheet

No. of modules	3
Module dimensions	16 m X 16 m X 12 m
Detector dimensions	48 m X 16 m X 12 m
No. of layers	140
Iron plate thickness	6 cm
Gap for RPC trays	2.5 cm
Magnetic field	1.3 Tesla
RPC dimensions	2 m X 2 m
Readout strip width	3 cm
No. of RPCs/Road/Layer	8
No. of Roads/Layer/Module	8
No. of RPC units/Layer	192
No. of RPC units	26880
No. of readout strips	3.6×10^6

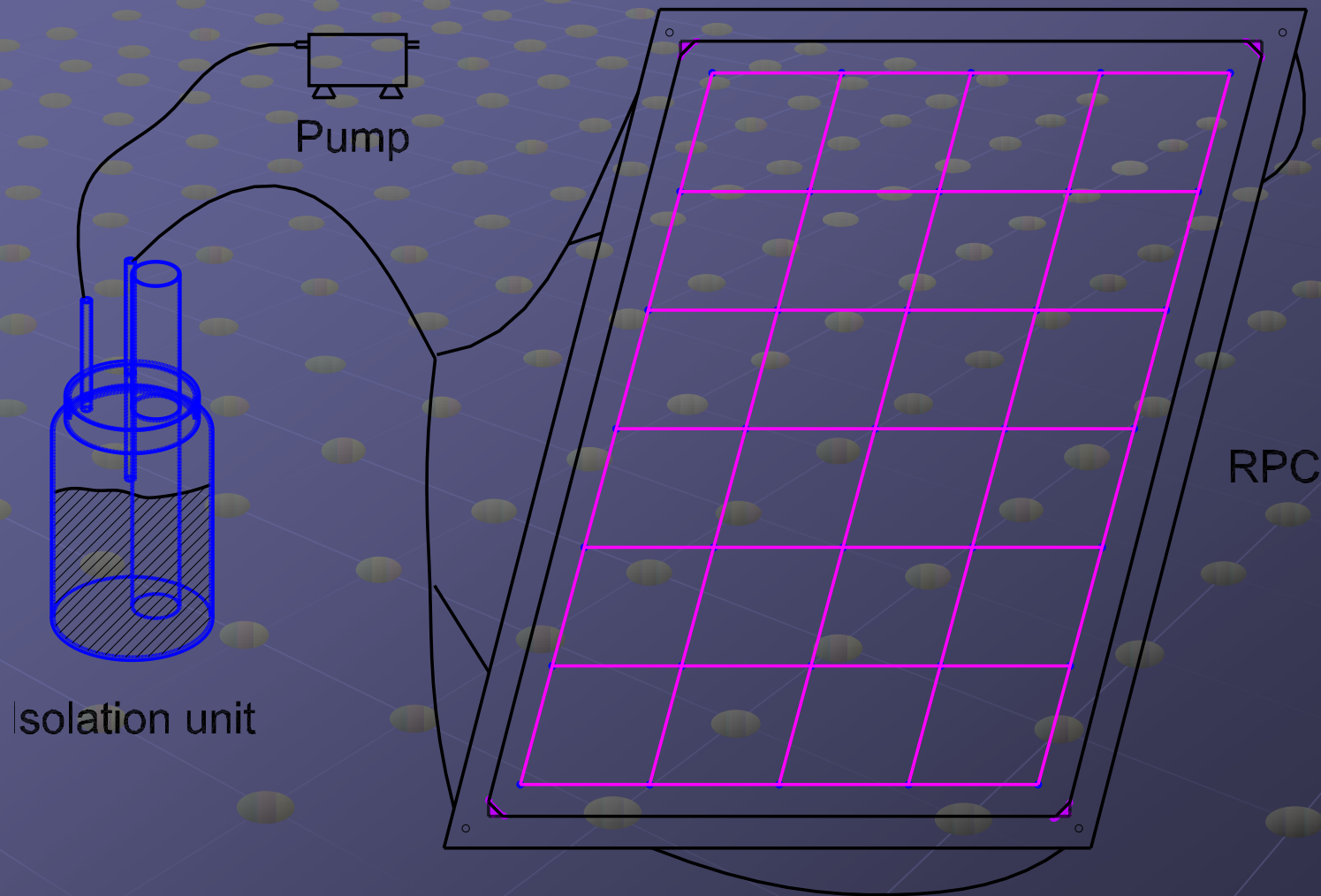
Development of RPC materials and procedures

- Electrode glass and characterisation
- Frames, spacers, buttons, gas nozzles etc
- Gases and gas proportions
- High Voltage insulating Mylar sheets
- Adhesives, cleaning agents etc
- Pickup panel designs and characterisation
- Electrode coating & resistance measurement techniques
- Gap assembly procedures
- Spark free high voltage contacts
- Gas leak and assembly testing of RPCs
- High voltage holding tests etc
- Quality control parameters and procedures

Development of spacers, buttons and nozzles



Vacuum jig for gluing glass electrodes



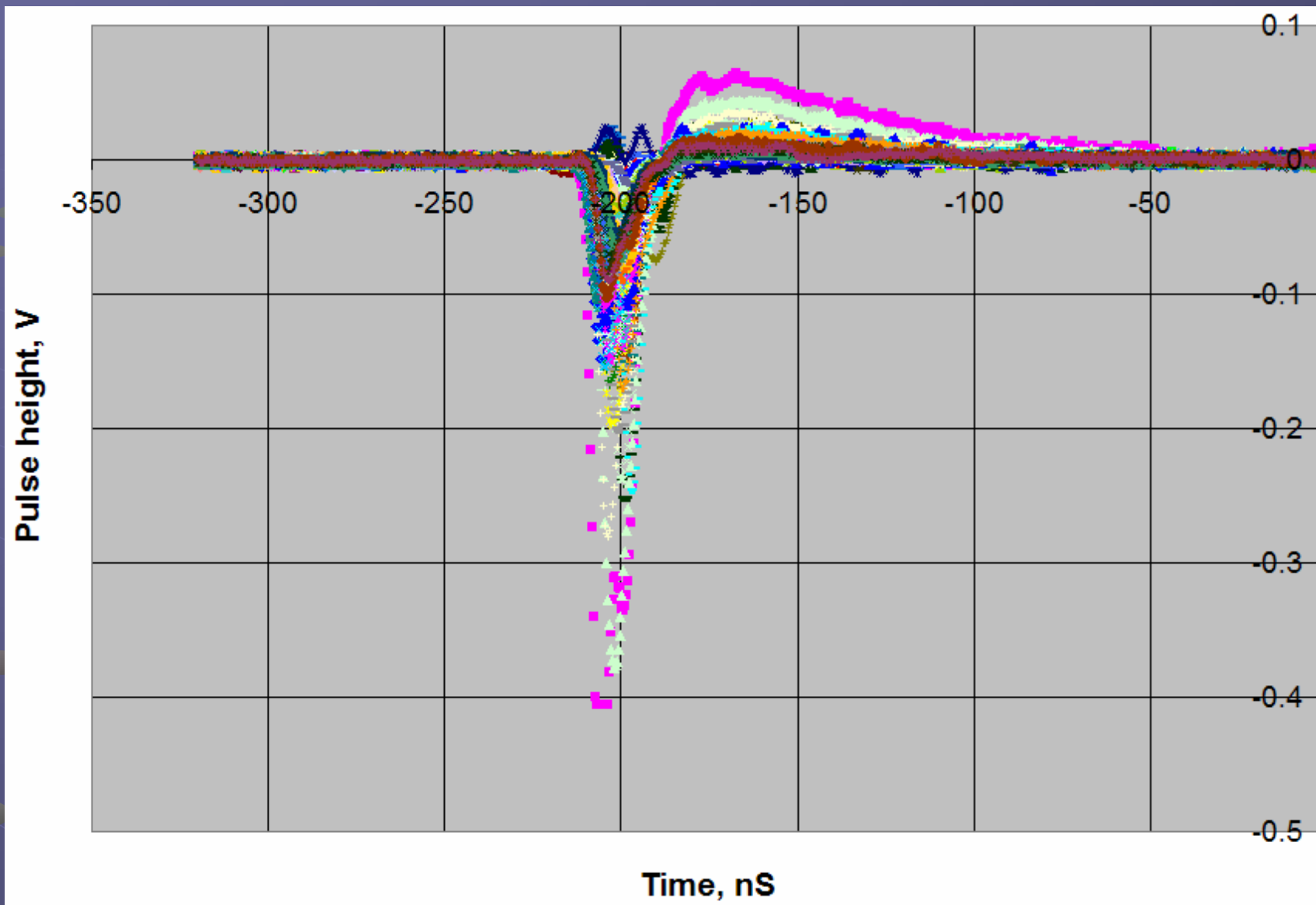
Development of large sized RPCs



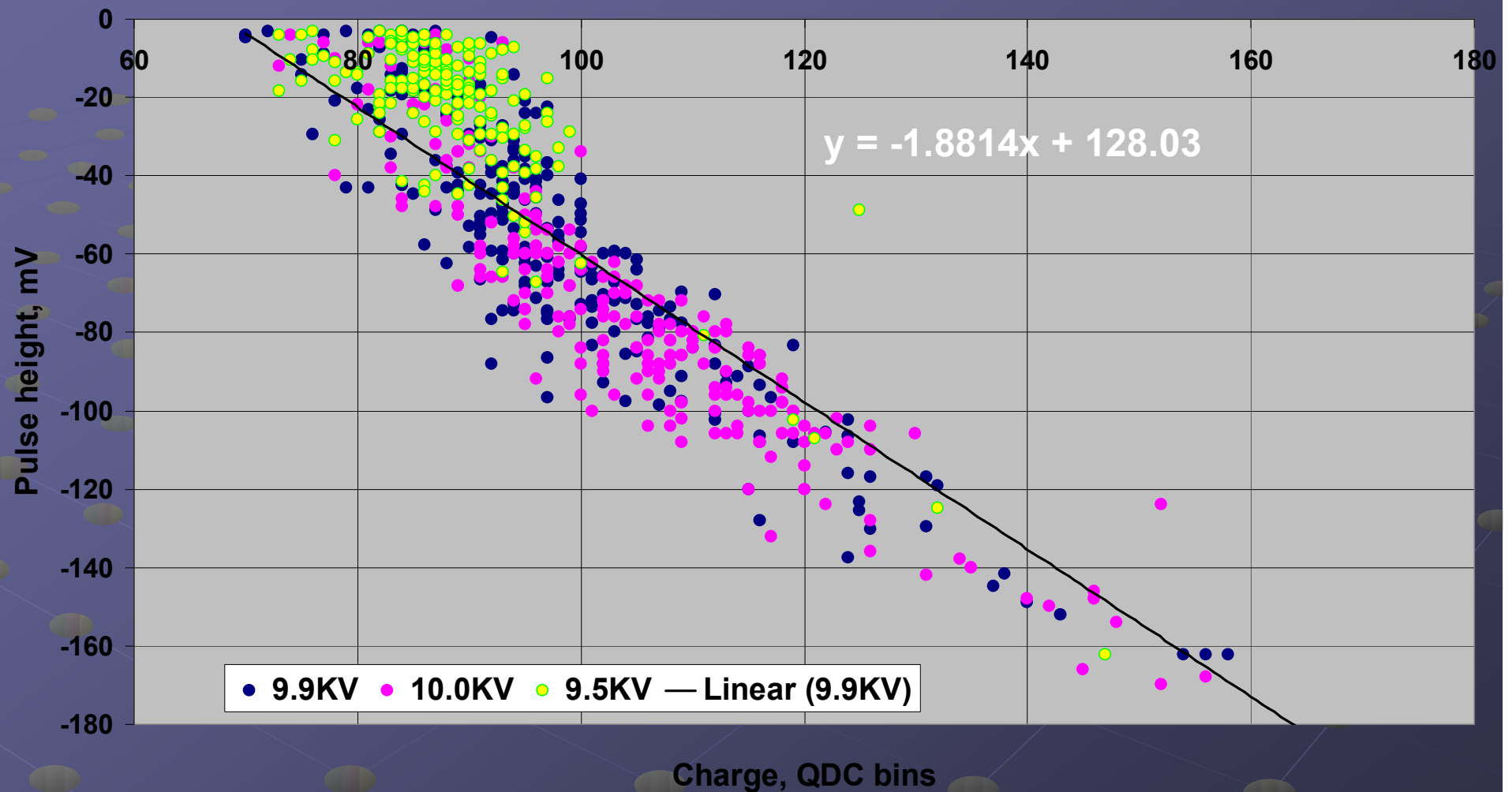
INO ICAL prototype RPC



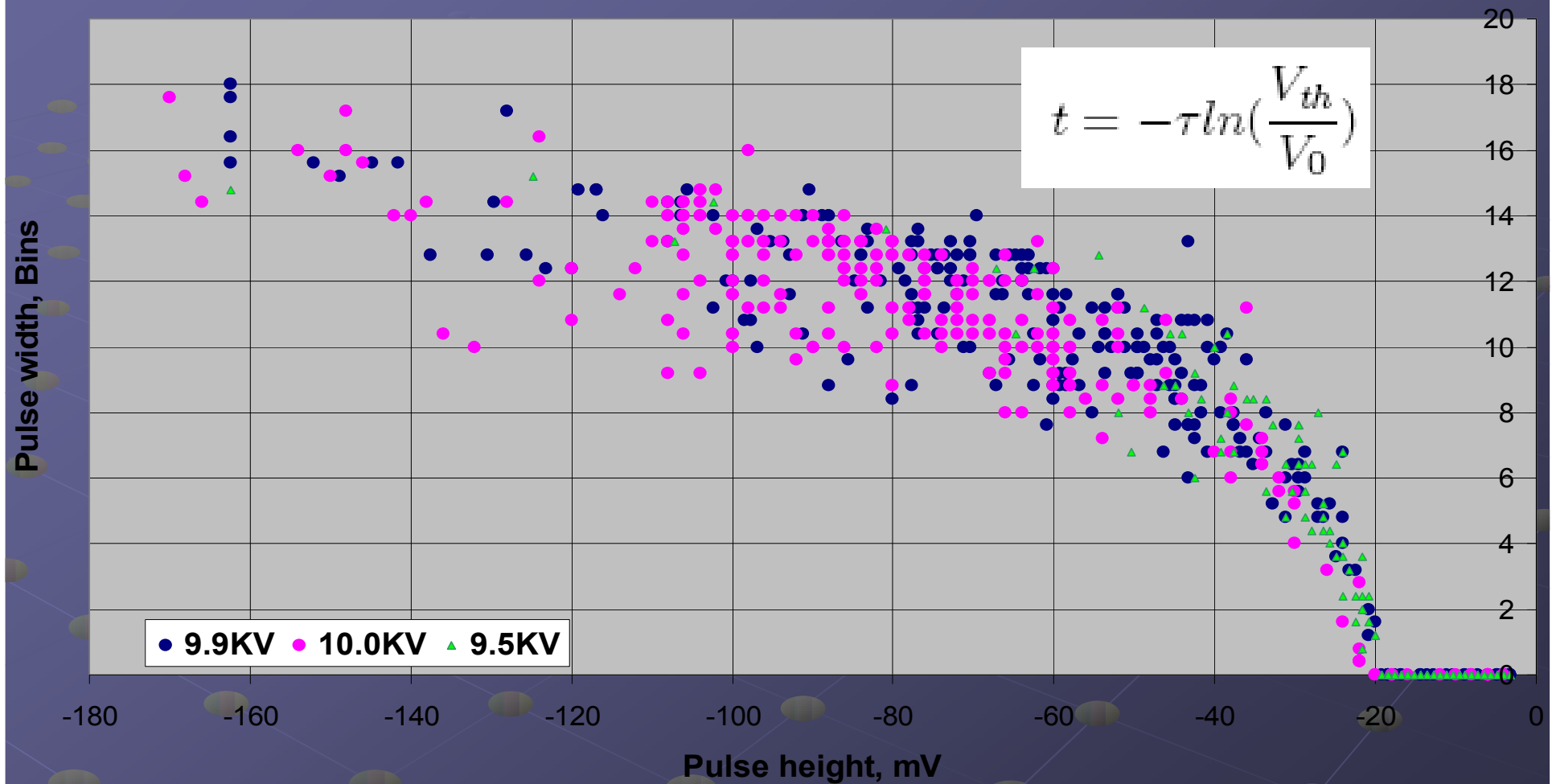
Preamplifier pulses on trigger



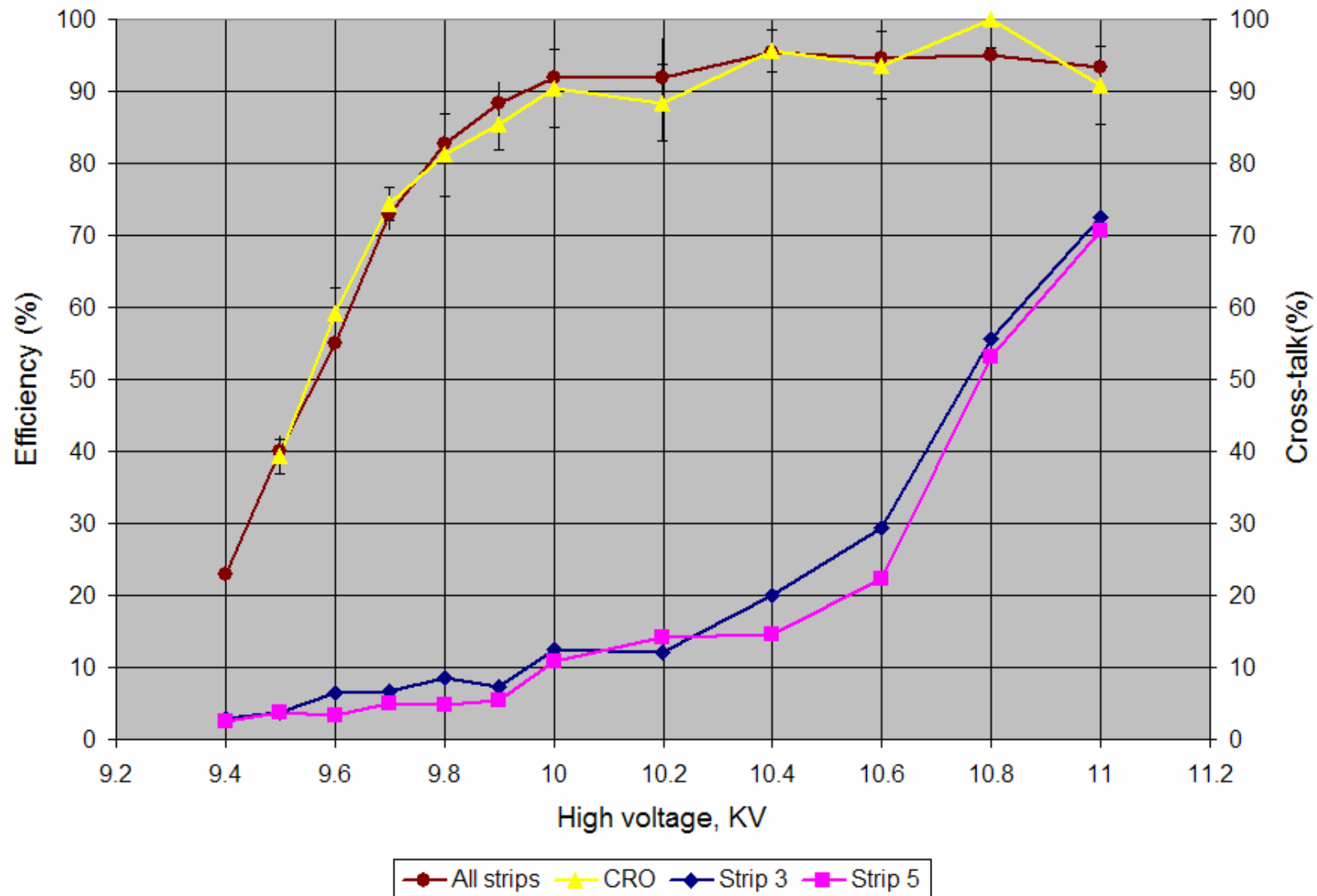
Charge-pulse height plot



Pulse height-pulse width plot

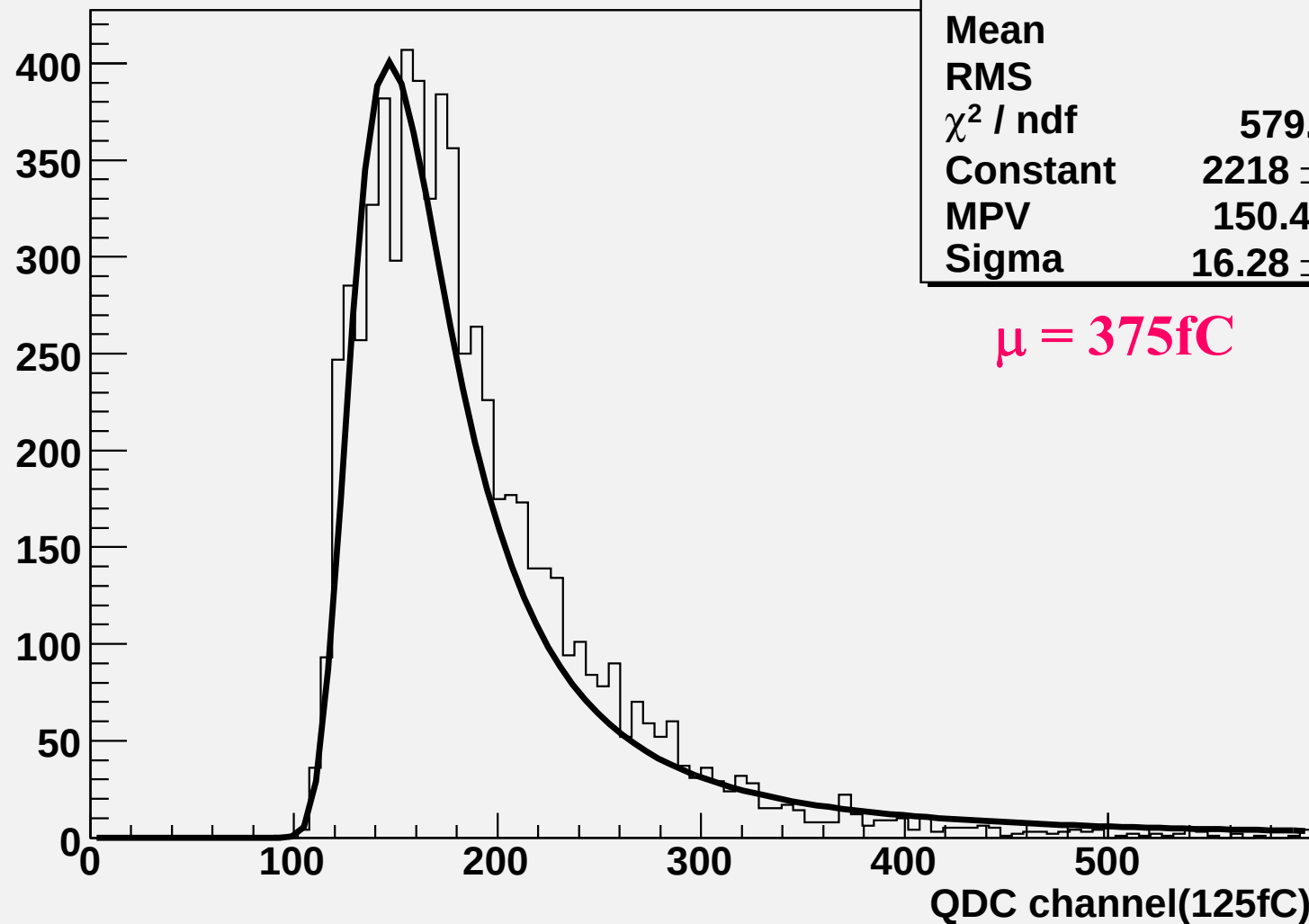


Typical efficiency plateau



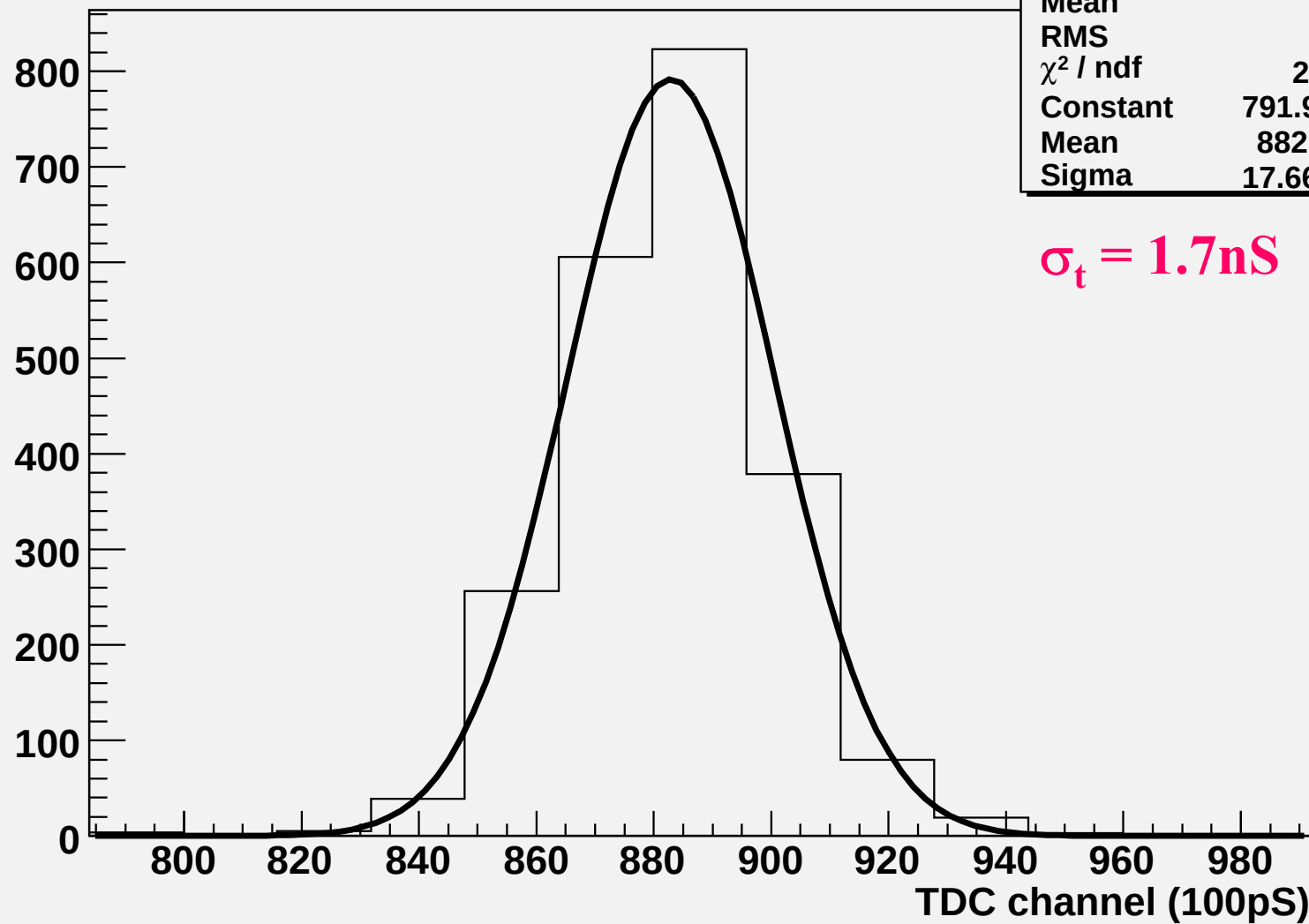
Charge spectrum of the RPC

QDCX: Strip 4

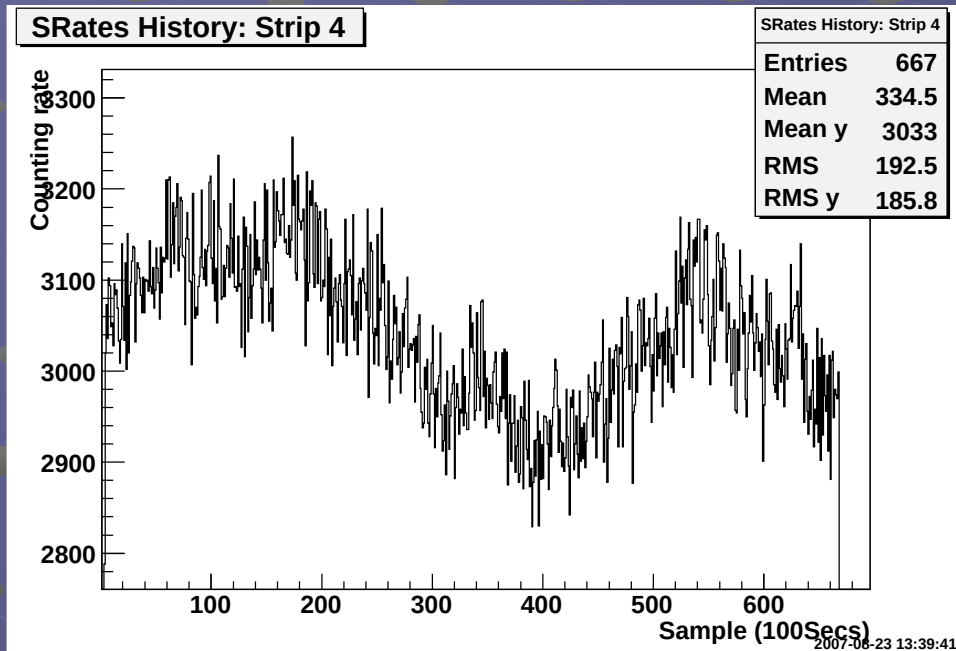


Time spectrum of the RPC

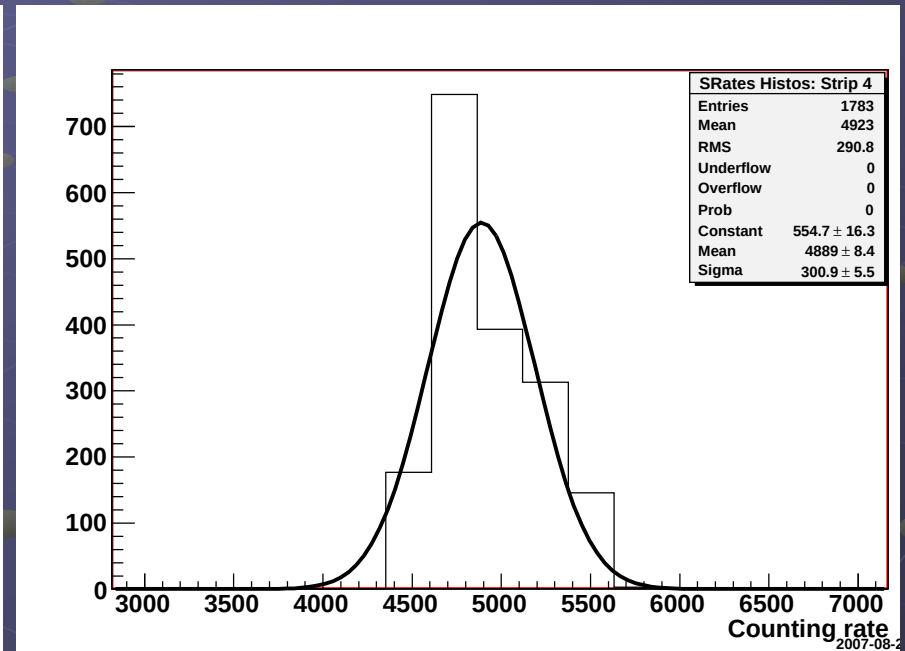
TDCX: Strip 4



Single/Noise monitoring



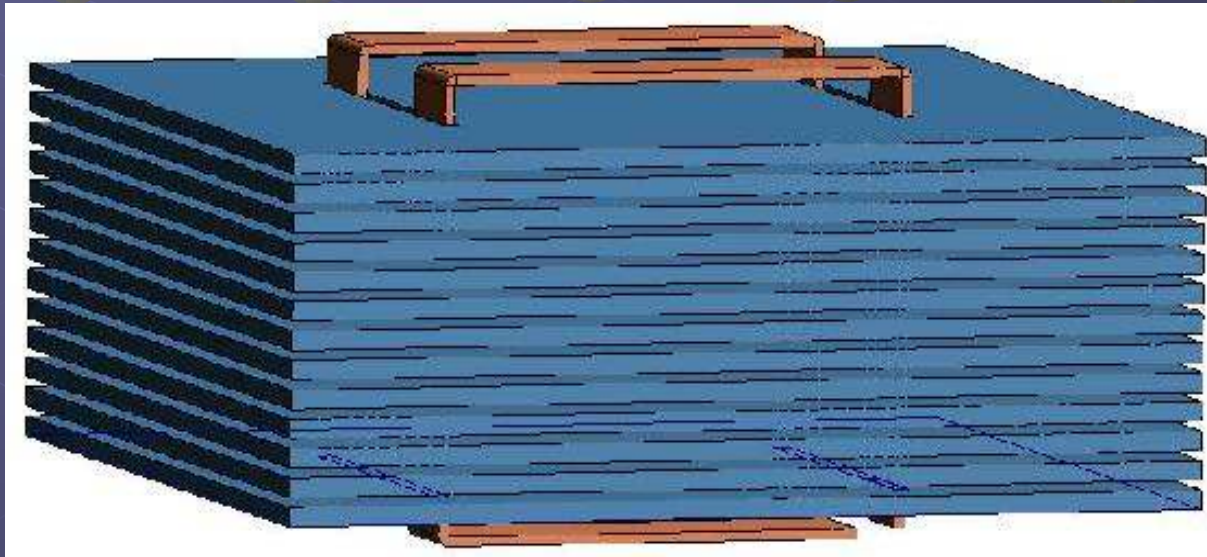
Time profile



Rate distribution

INO ICAL prototype detector

- 13 layers of 5 cm thick magnetised iron plates
- 40 ton absorber mass
- 1.5 Tesla magnetic field
- 12, 1m² RPC layers
- About 800 readout channels
- Trigger on cosmic ray muons (RPC and scintillation paddles)
- Record strip hit and timing information
- Chamber and ambient parameter monitoring



Prototype detector stack & DAQ



Summary

- R&D on small sized RPCs and tests on their long term stability concluded successfully
- Development of various materials, processes and vendors required for industrial production of large area RPCs is in progress
- INO ICAL prototype detector is being readied and assembled; will start operating shortly at VECC, Kolkata
- Gearing up to fabricate INO ICAL RPCs of 2m×2m in area