

Operation and initial results of NEXT-DEMO TPC.

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DAQ

Gas System

HHV

NEXT-DEMO

FEE

Vacuum Pump

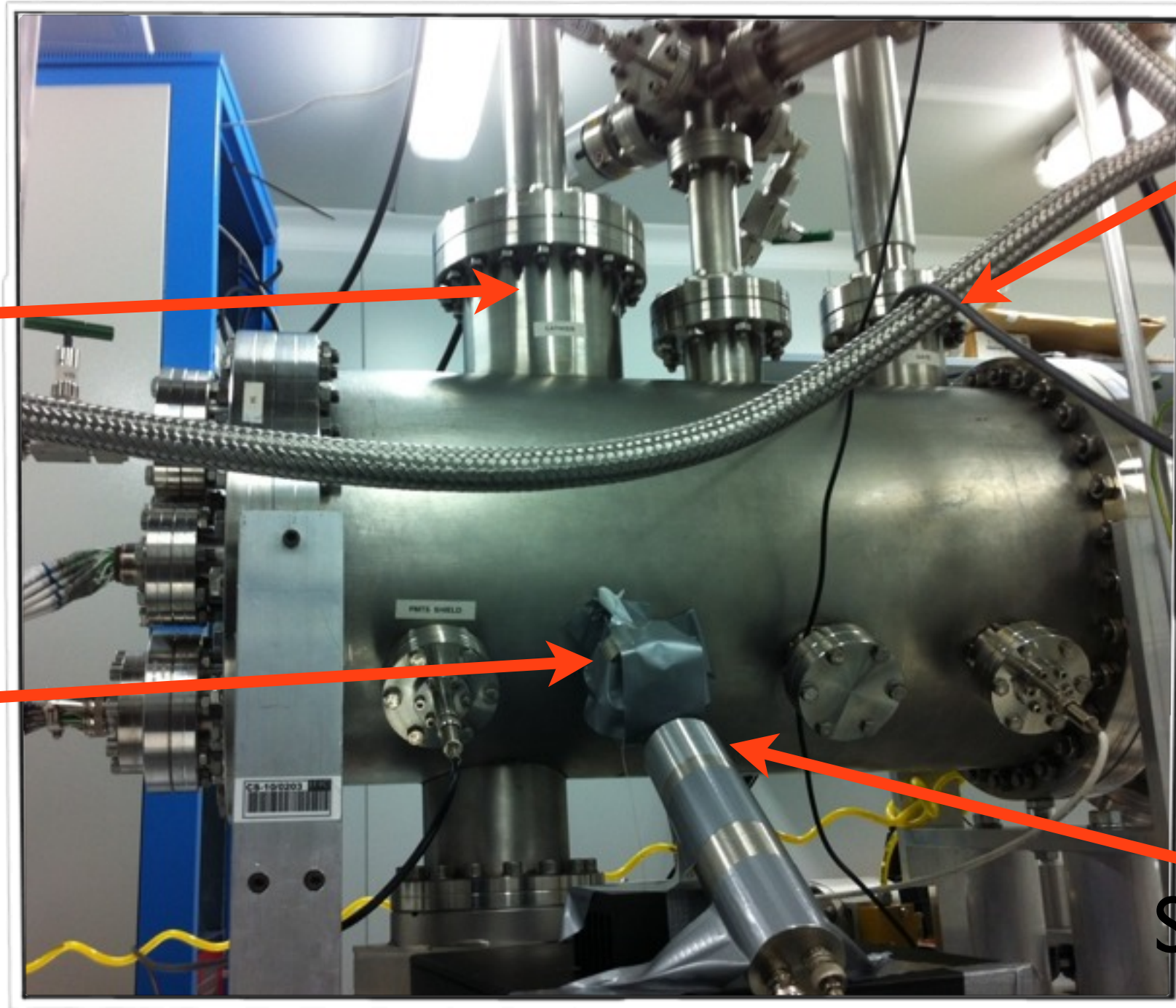
NEXT-DEMO

Cathode
32 kV

Gate
12kV

Na22
IuCi

NaI
Scintillator

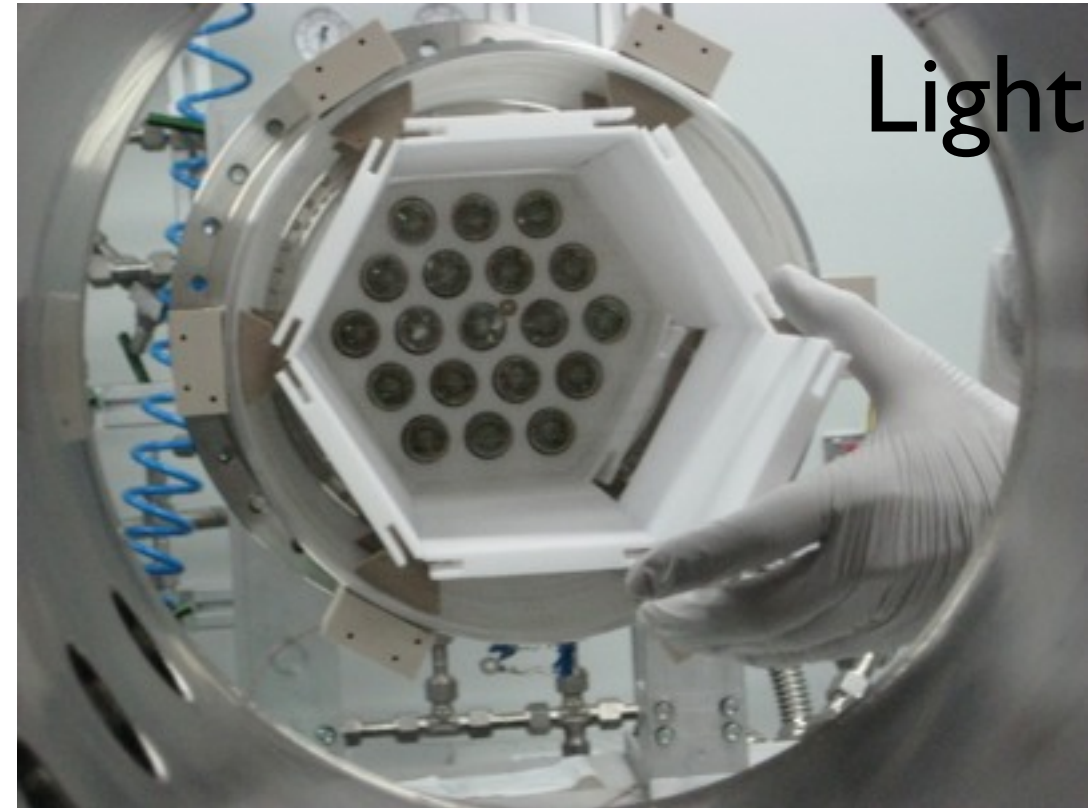


NEXT-DEMO

Perspective



Light Tube



Mesh



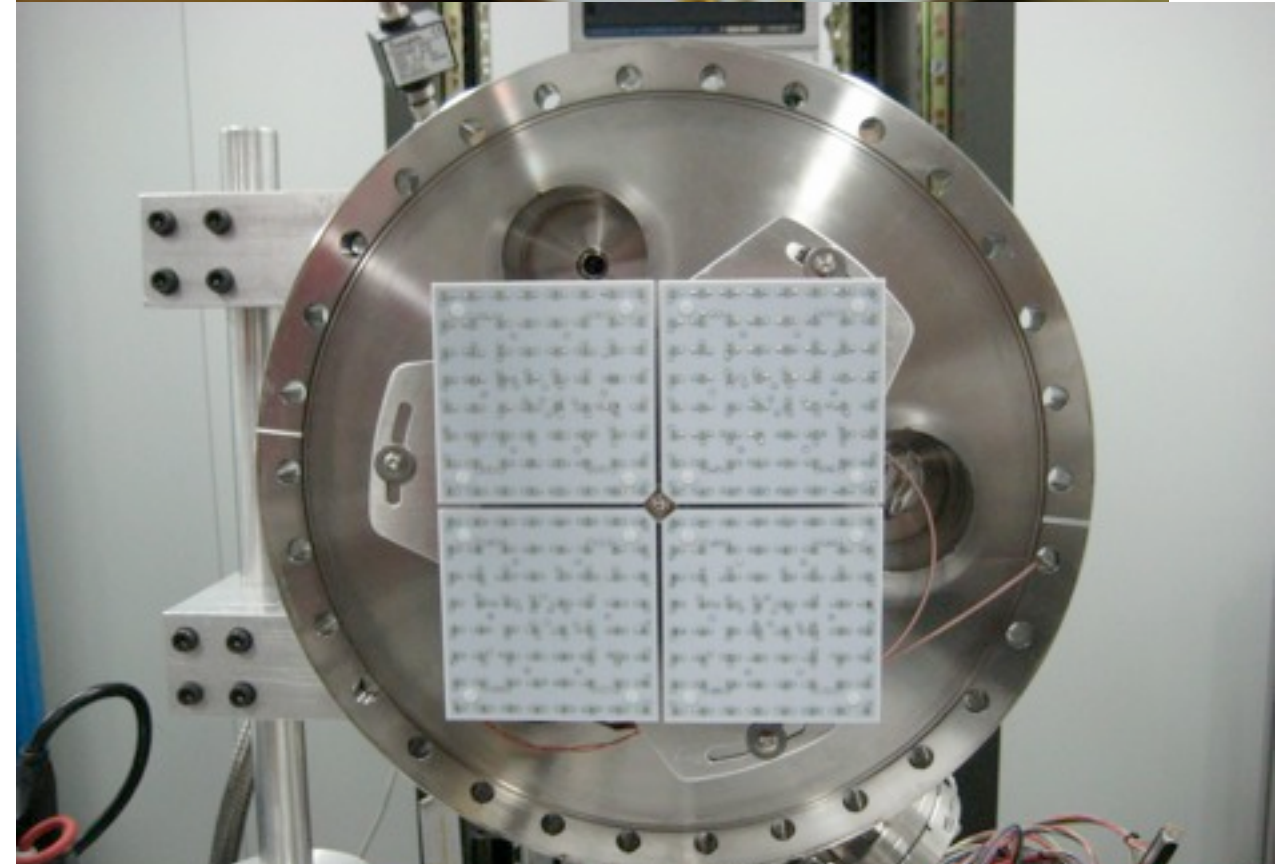
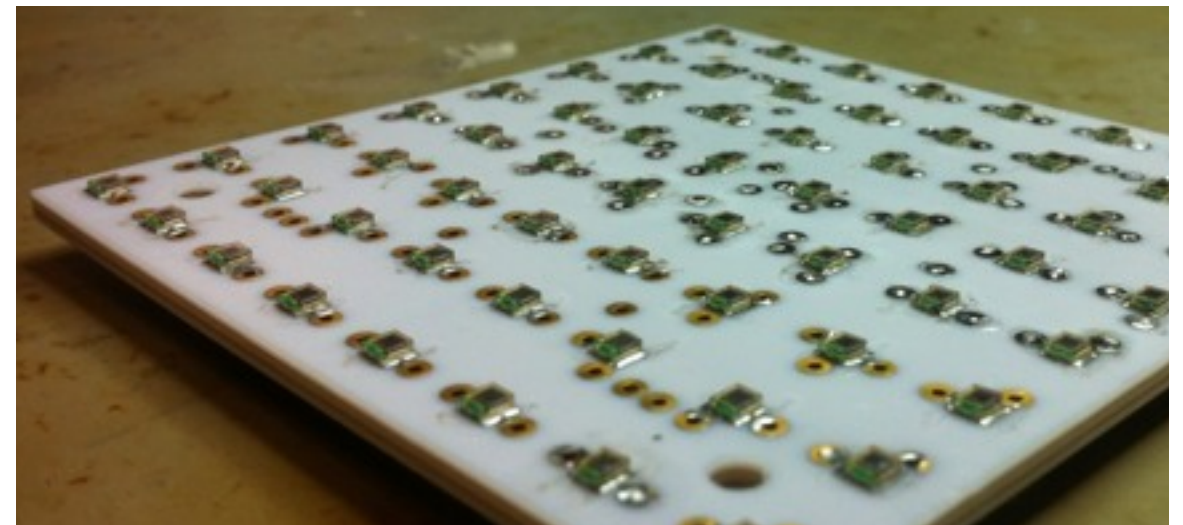
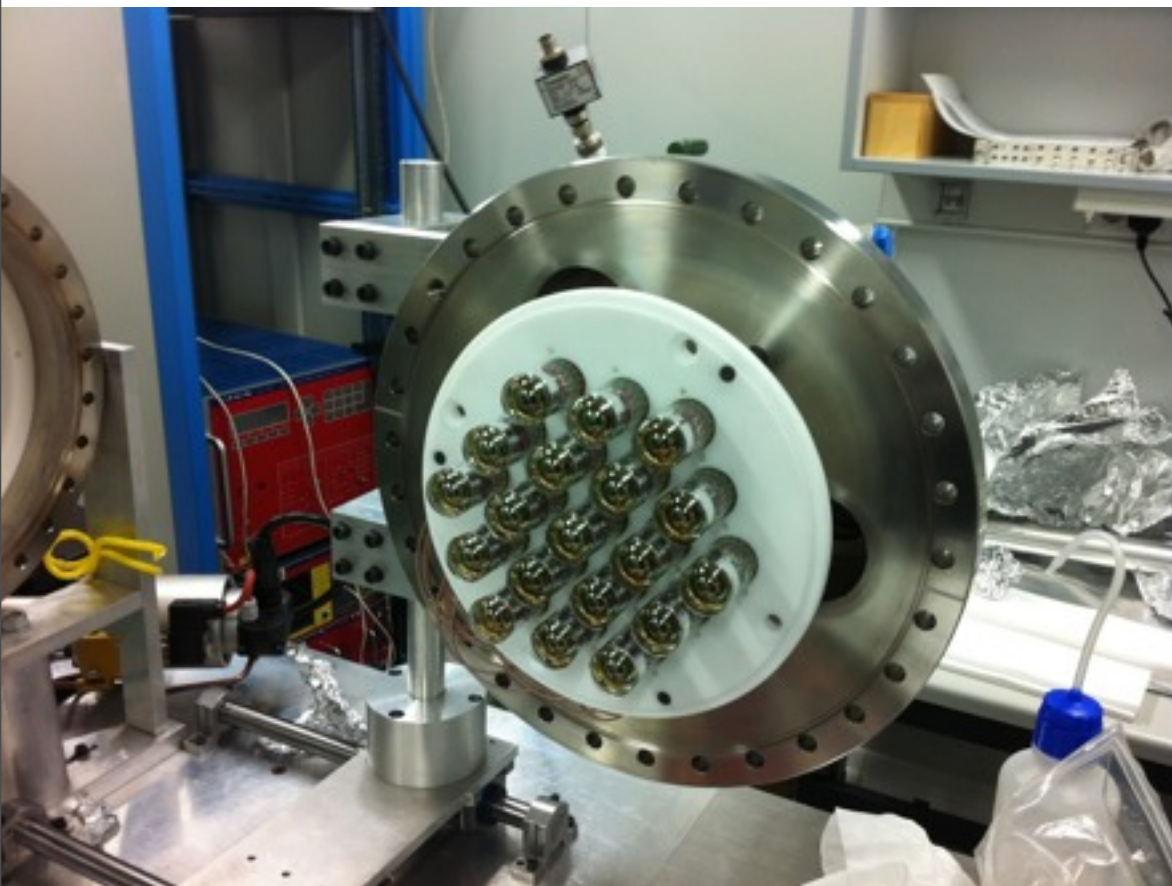
Field Rings



Configurations

Tracking with SiPMs

Tracking with PMTs



Operation Conditions



Pressure	10 bar
Cathode Voltage	32 kV
Anode Voltage	12kV
Drift Field	633 V/cm
E/p	2.4 kV/cm/bar



Detector Improvements



TPB



Detector Stability

DAQ_TEST

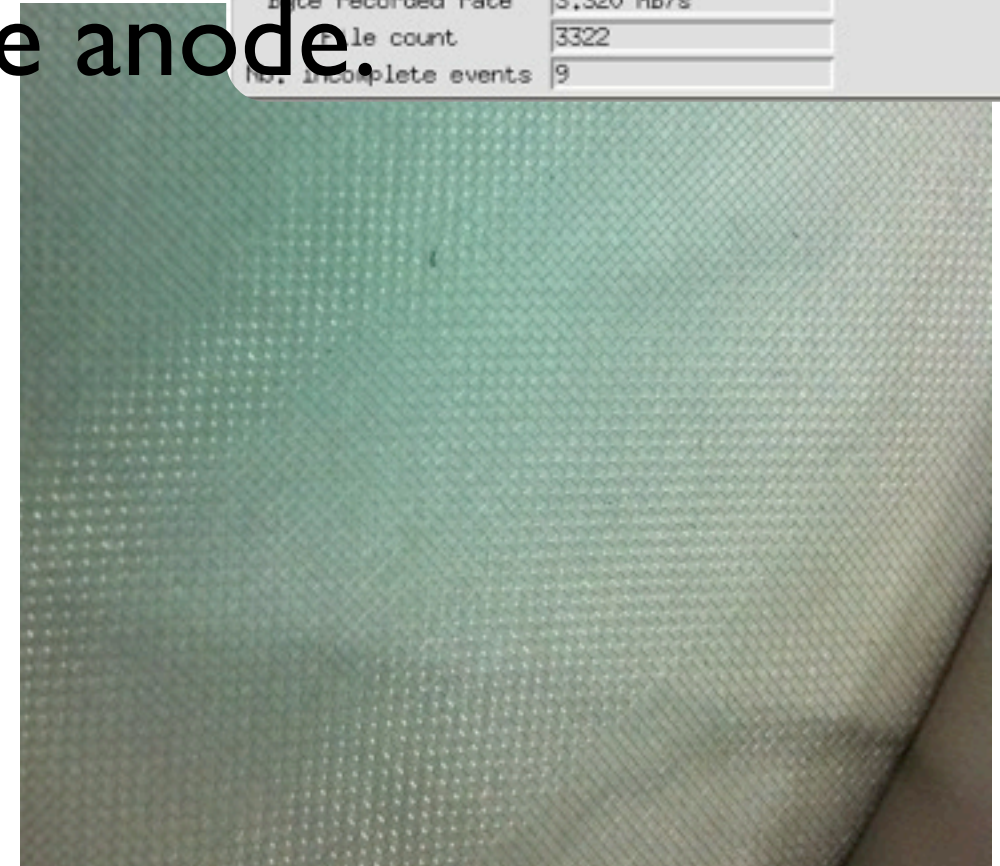
LDC status display

LDC name host	ldc2-LDC ldc2	ldc1-LDC ldc1
Current Trigger rate	1.333	1.167
Average Trigger rate	1.989	1.989
Number of sub-events	1003028	1003036
Sub-event rate	1	1
Sub-events recorded	1003030	1003038
Sub-event recorded rate	1	1
Bytes injected	999076060852	666080089476
Byte injected rate	1.328 MB/s	774.741 KB/s
Bytes recorded	999076060852	666080089476
Byte recorded rate	1.328 MB/s	774.741 KB/s
Nb. evts w/o HLT decis.	0	0
mem allocation failed	0	0
average time brAllocate		

GDC status display

GDC name host	ldc4-GDC ldc4
Number of sub-events	2006079
Sub-event rate	4
Events recorded	1003037
Event recorded rate	2
Bytes recorded	1665231357100
Byte recorded rate	3.320 MB/s
File count	3322
Nb. incomplete events	9

- Continuous operation for months without problems.
- Millions of events taken and processed.
- < 1 spark per day @ 12kV in the anode.

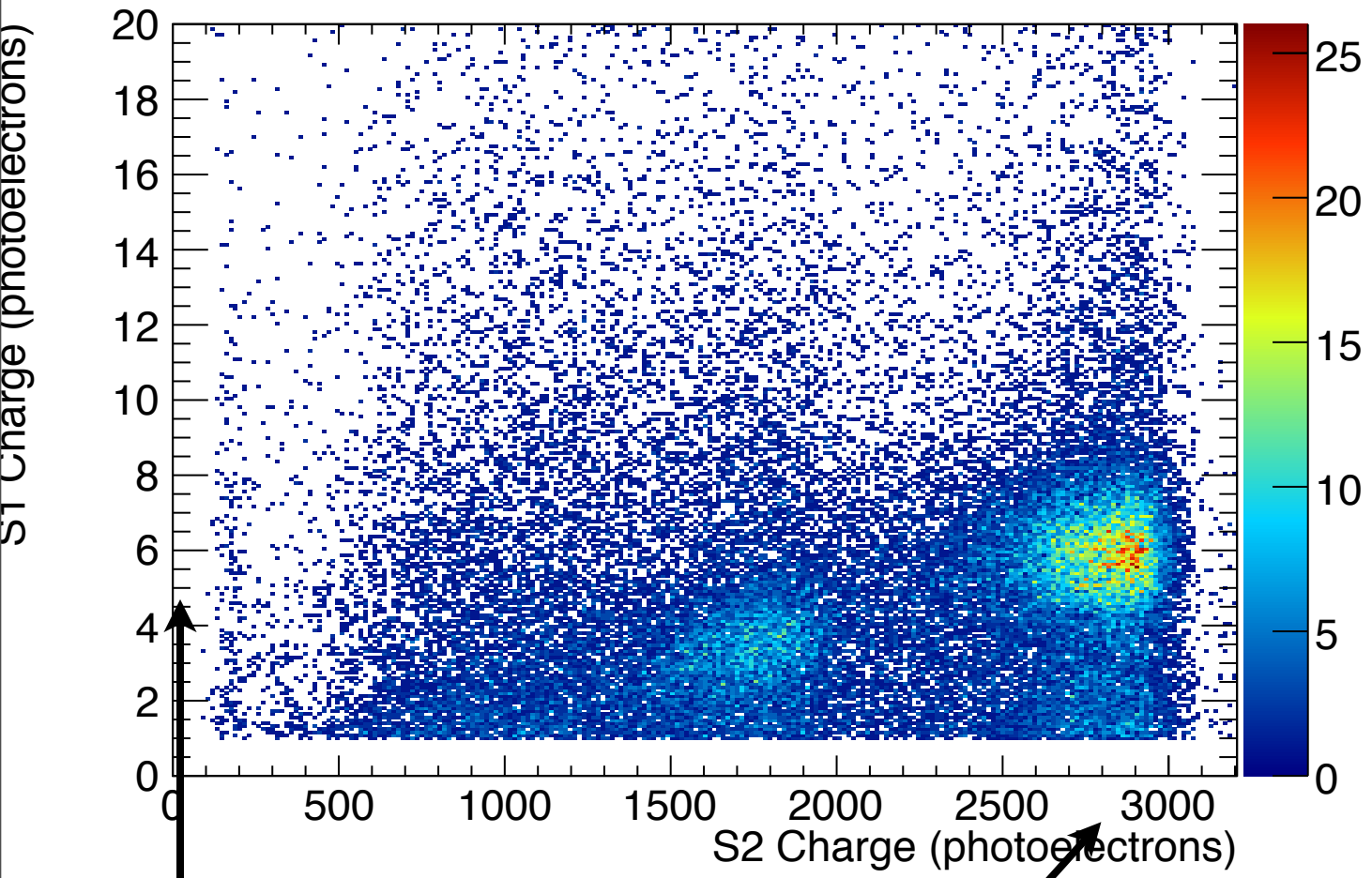


Trigger

- Digital trigger used.
- Extremely flexibility allowed using scalable read-out system (RD51)
 - Pulse Height
 - Pulse width
 - Pulse area
- Trigger used:
 - NaI+S2
 - NaI+S1
 - S1
 - S1+S2

Objectives

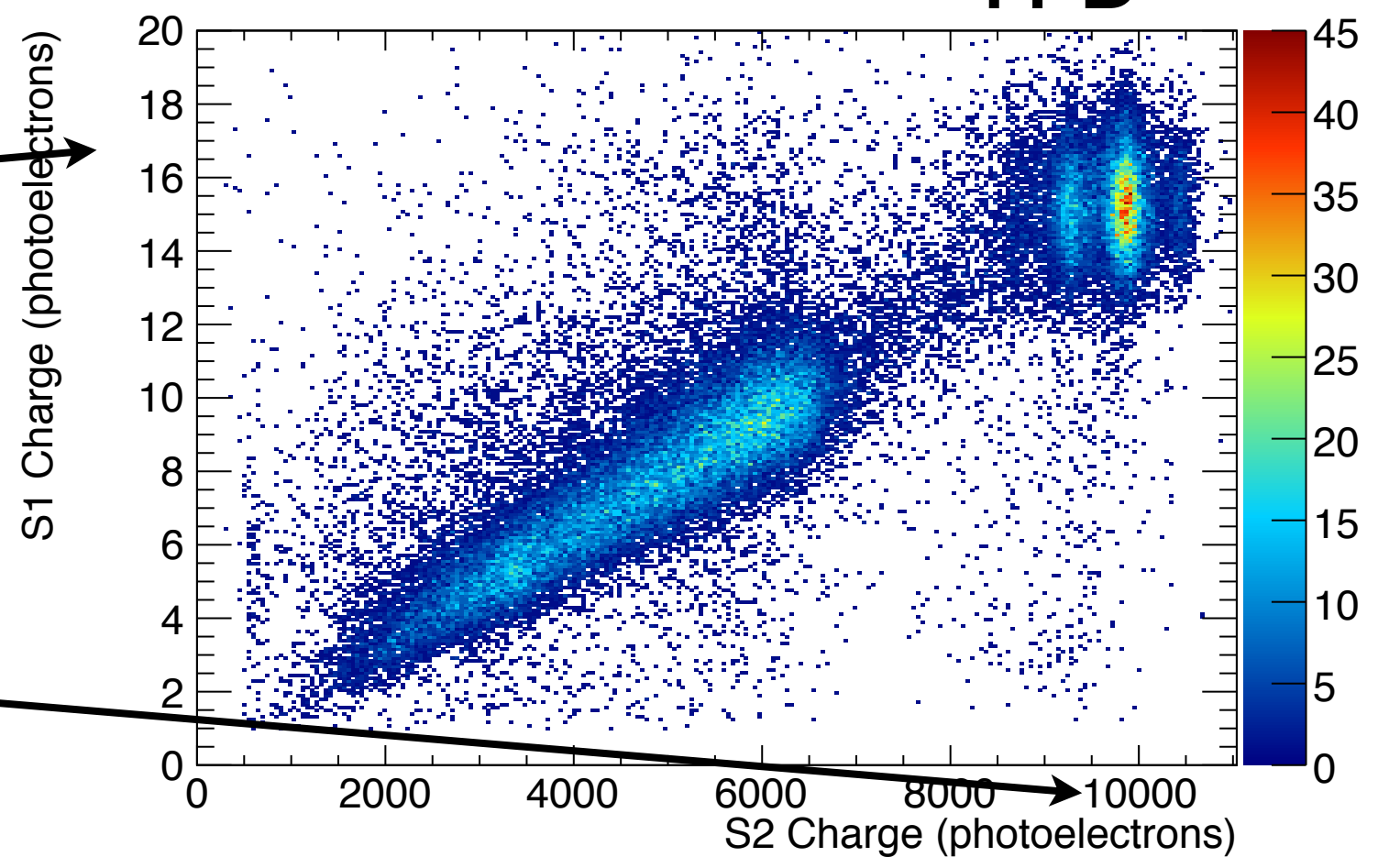
- Prove energy resolution better than 1% @ Qbb.
 - Total light recorded.
 - Electron lifetime.
 - Deconvolution of geometrical effects.
 - Detector effects.
- Tracking
 - Topology identification of events.



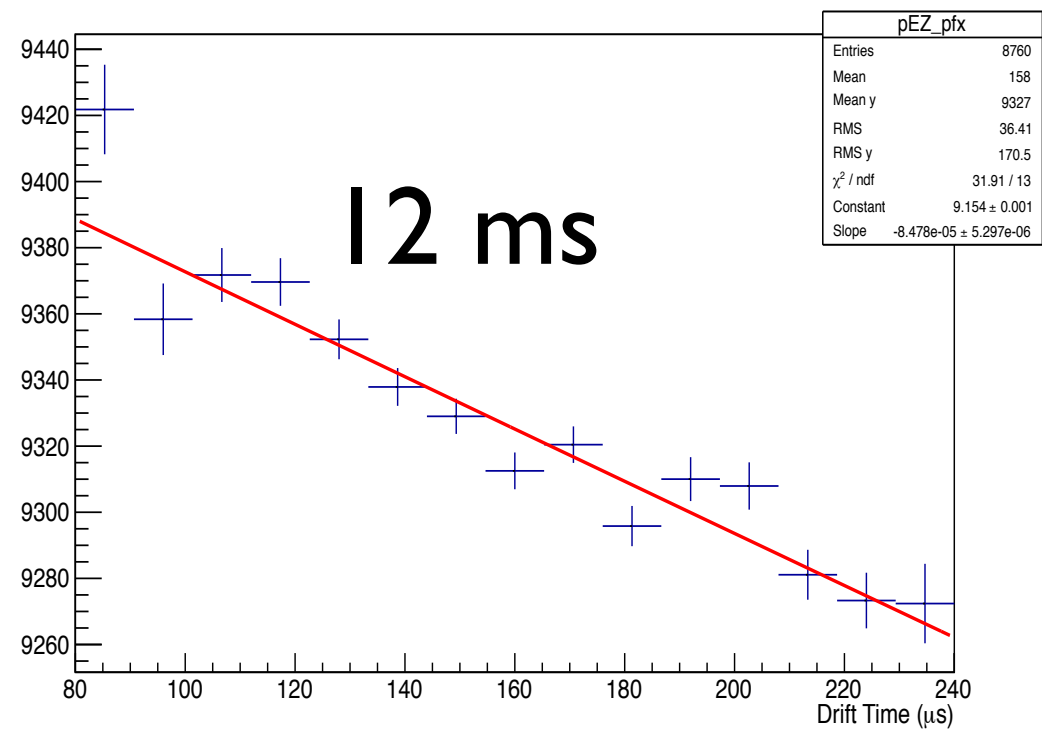
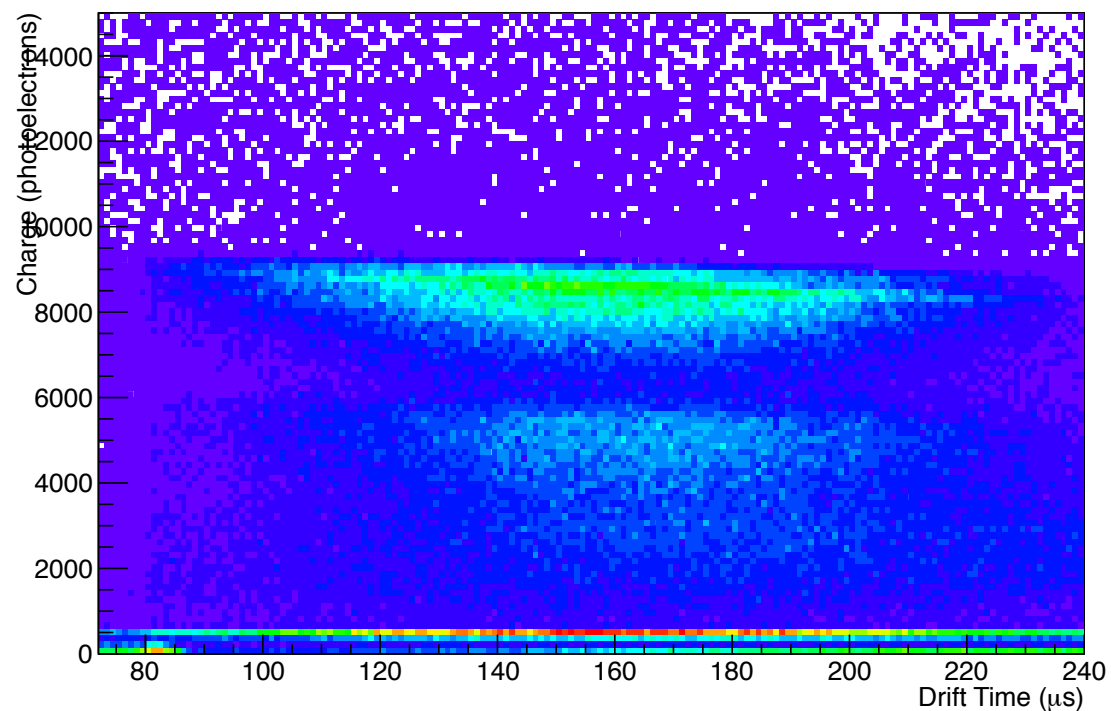
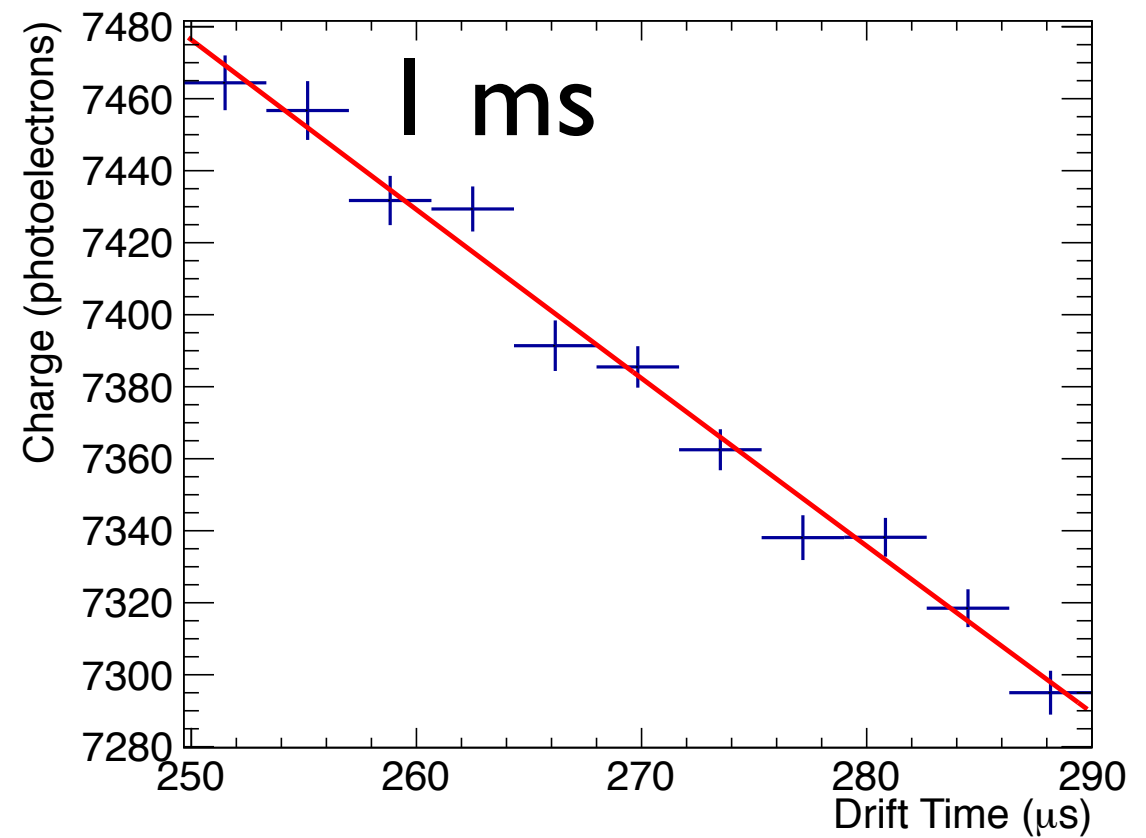
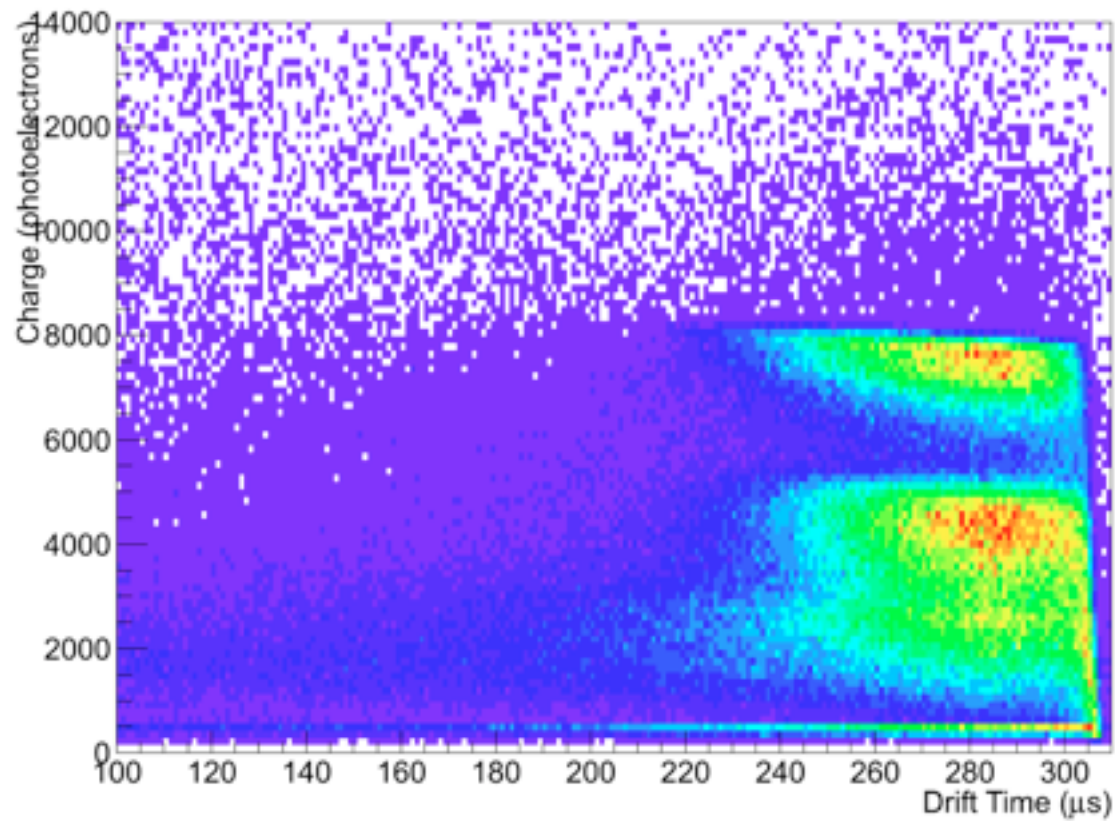
TPB gives ~3 times more light

S1

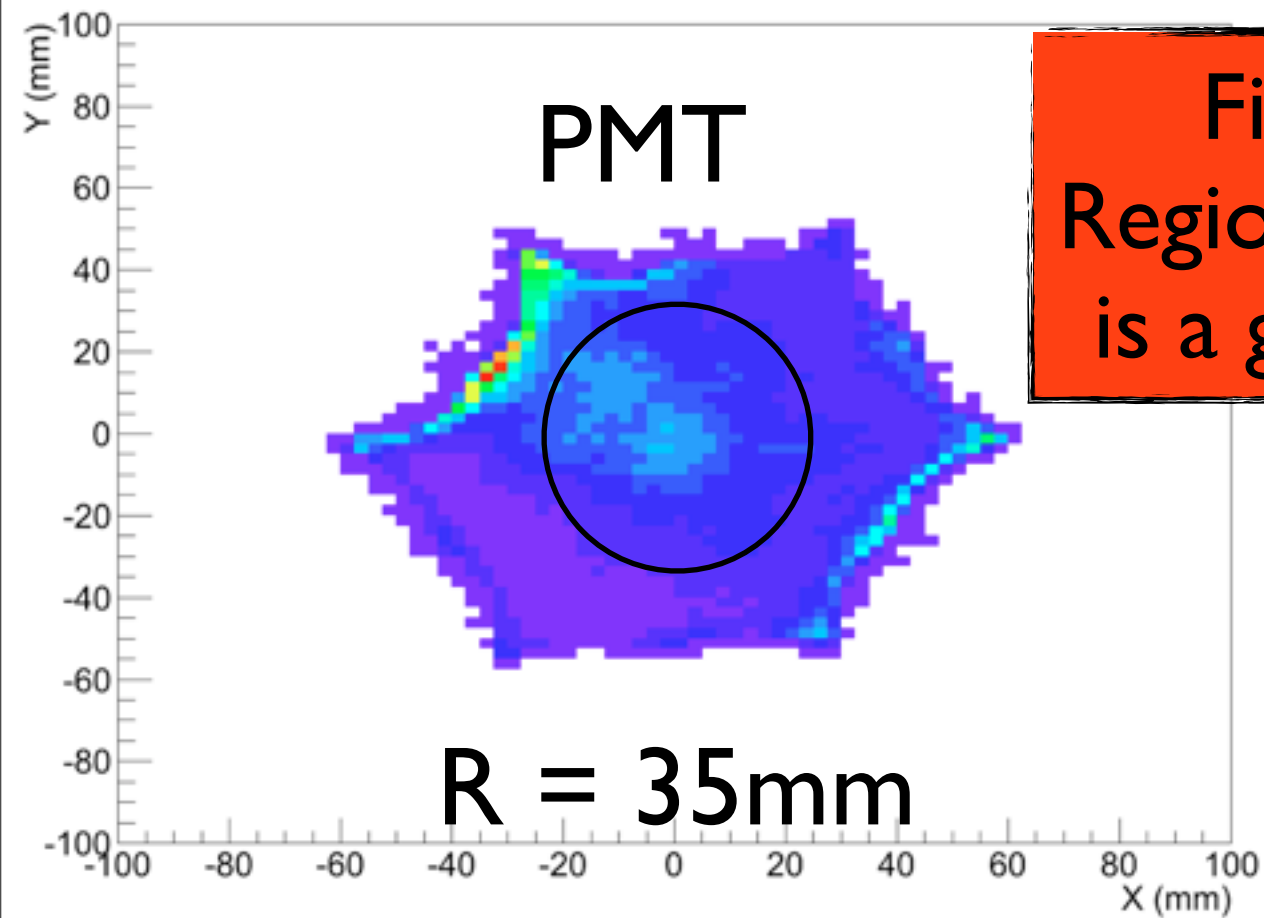
S2



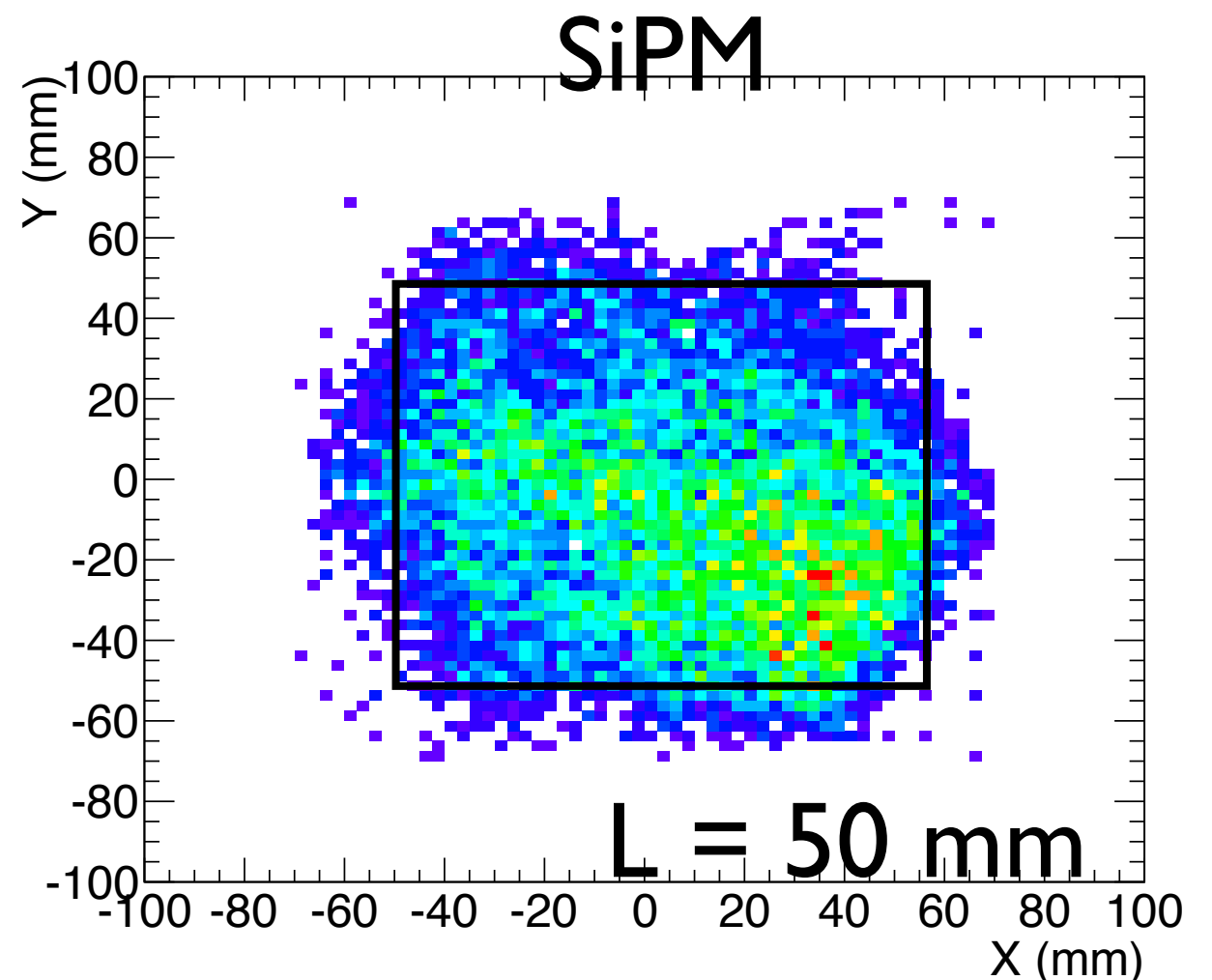
e- lifetime



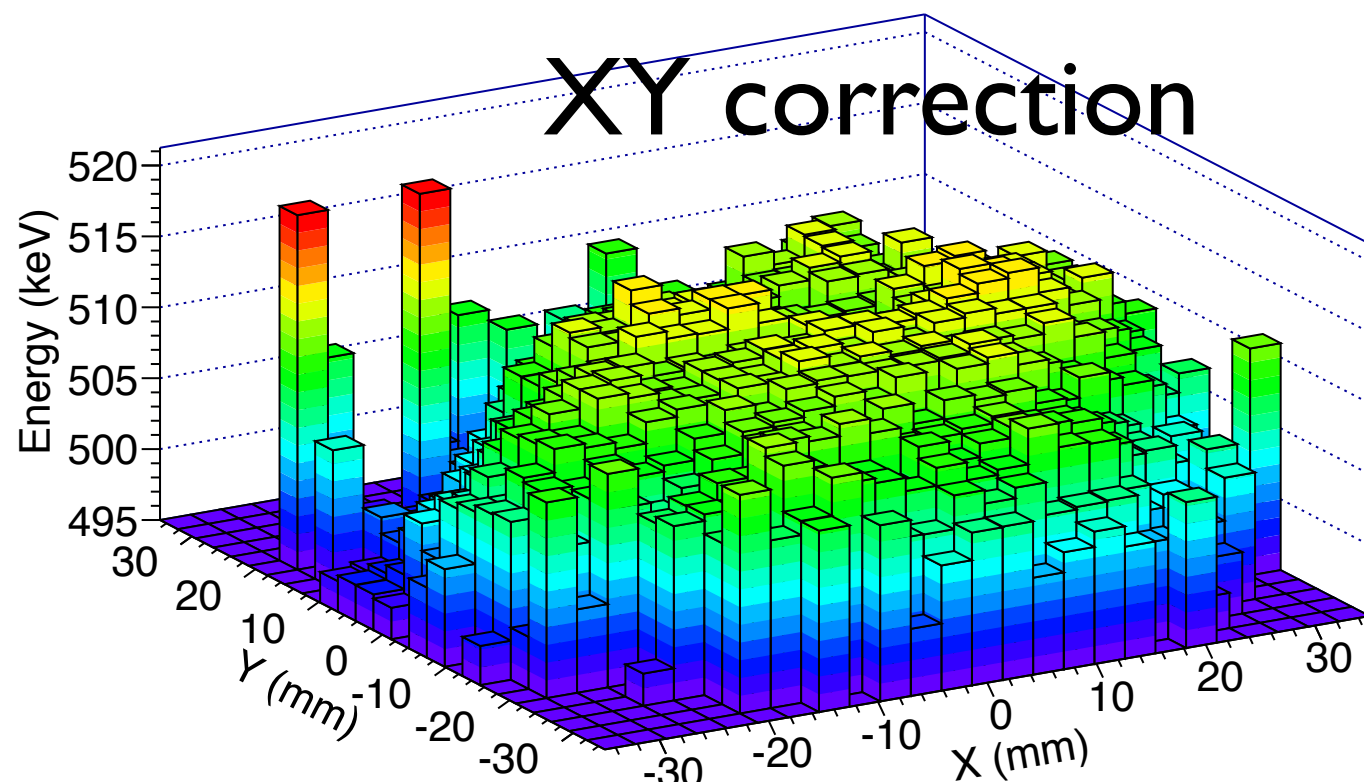
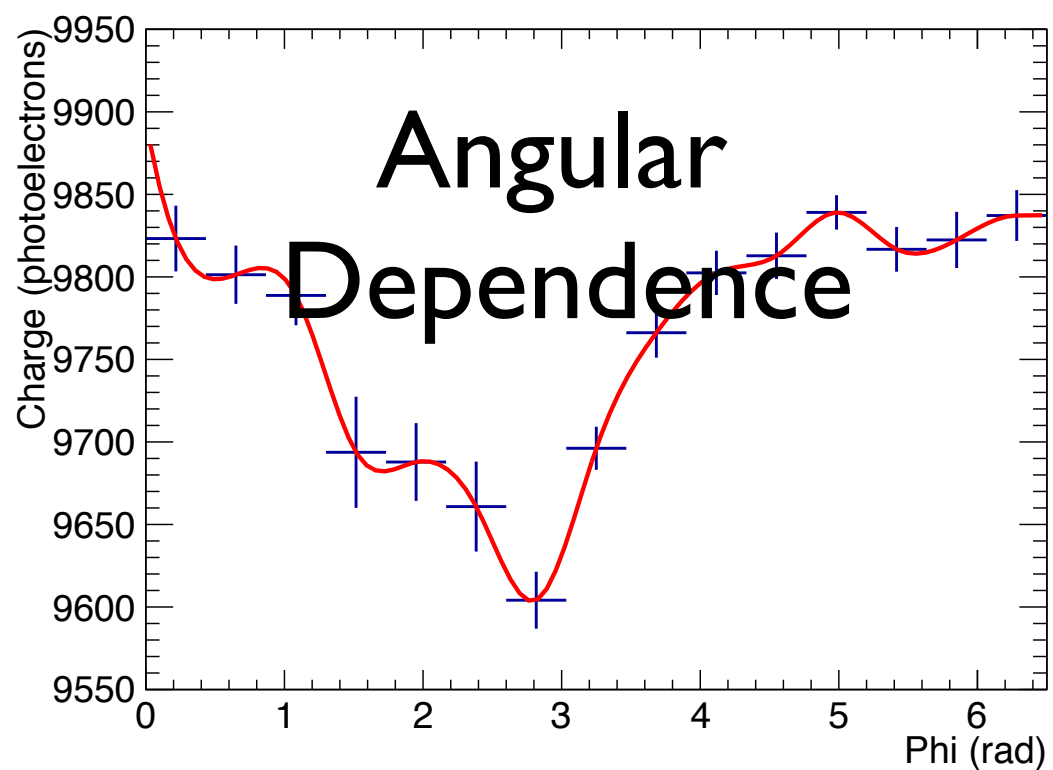
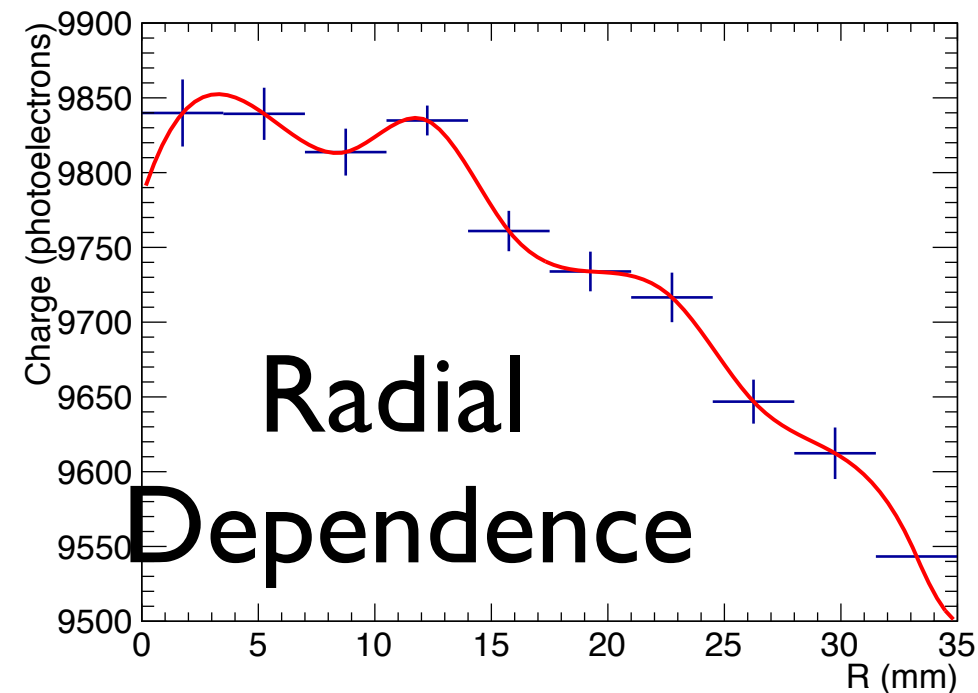
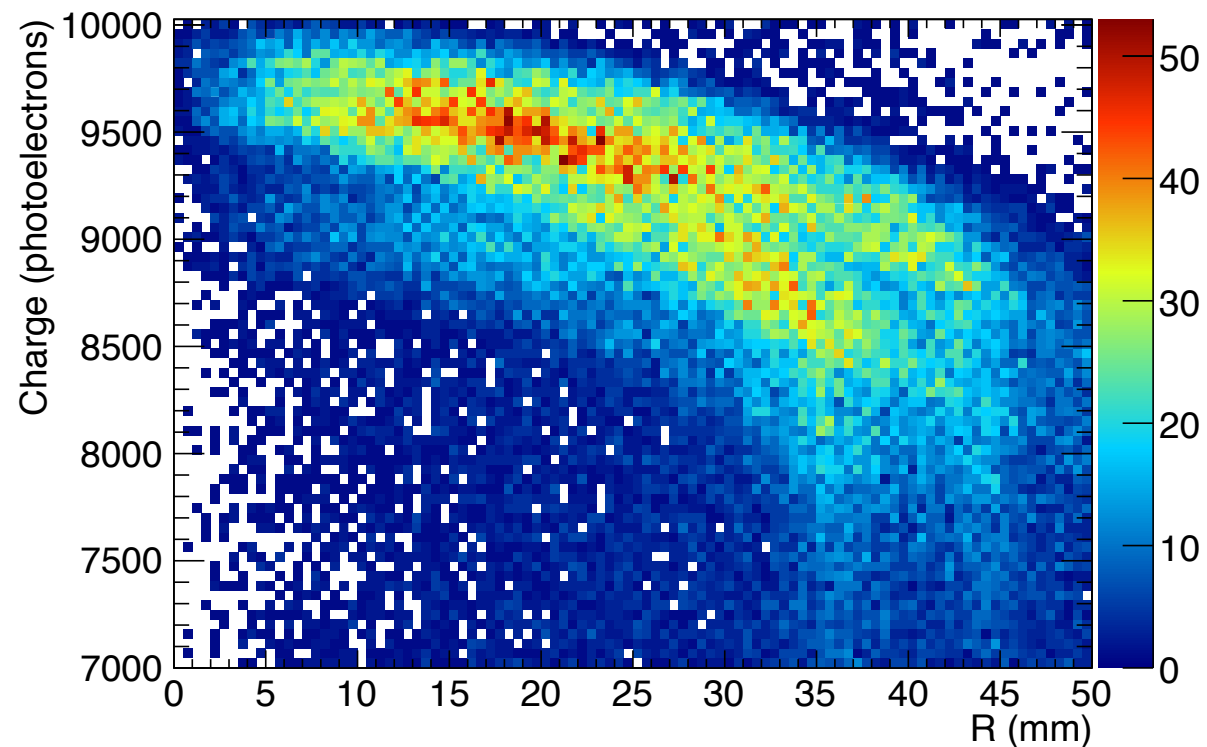
Fiducial Volume

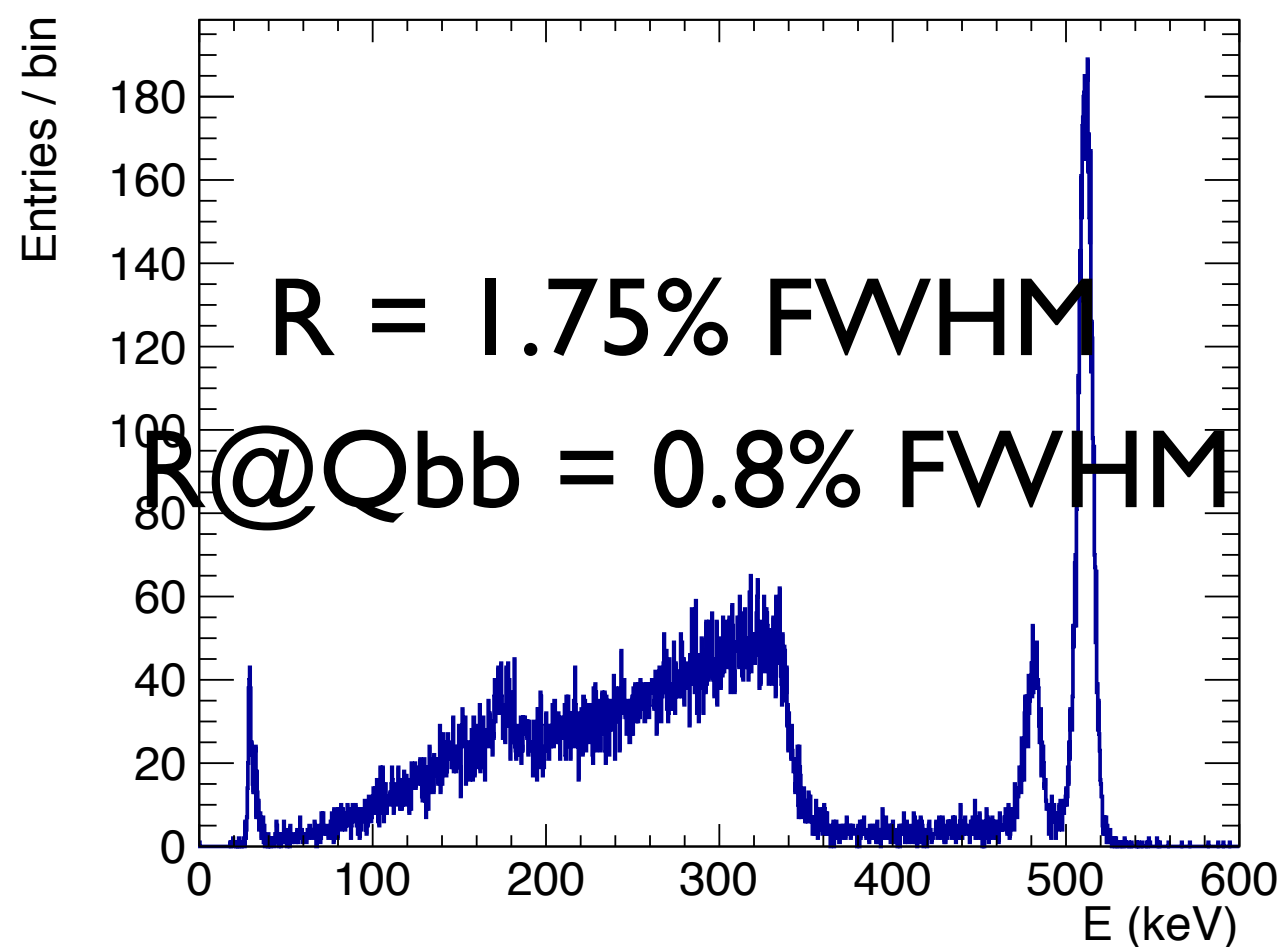
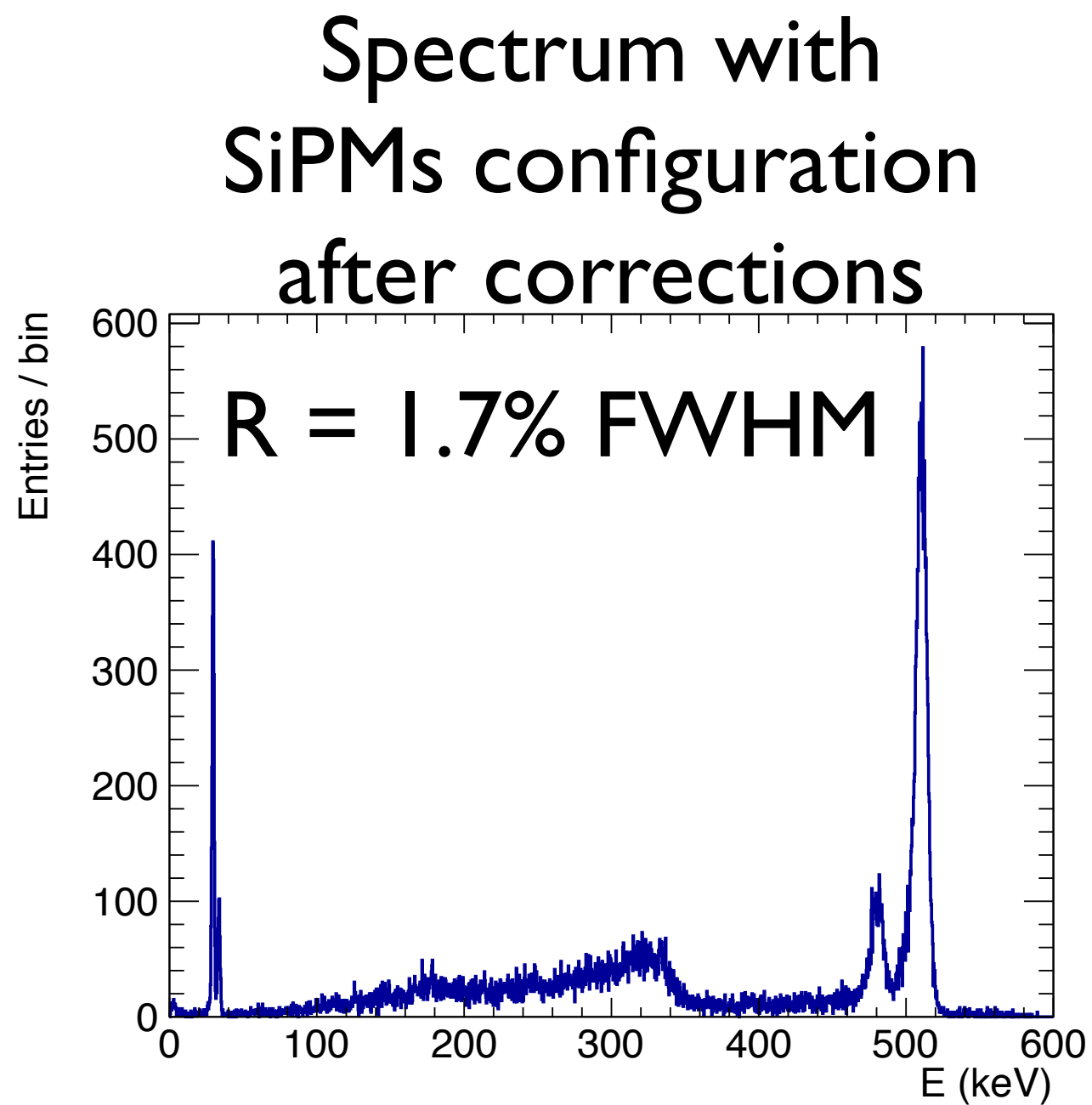
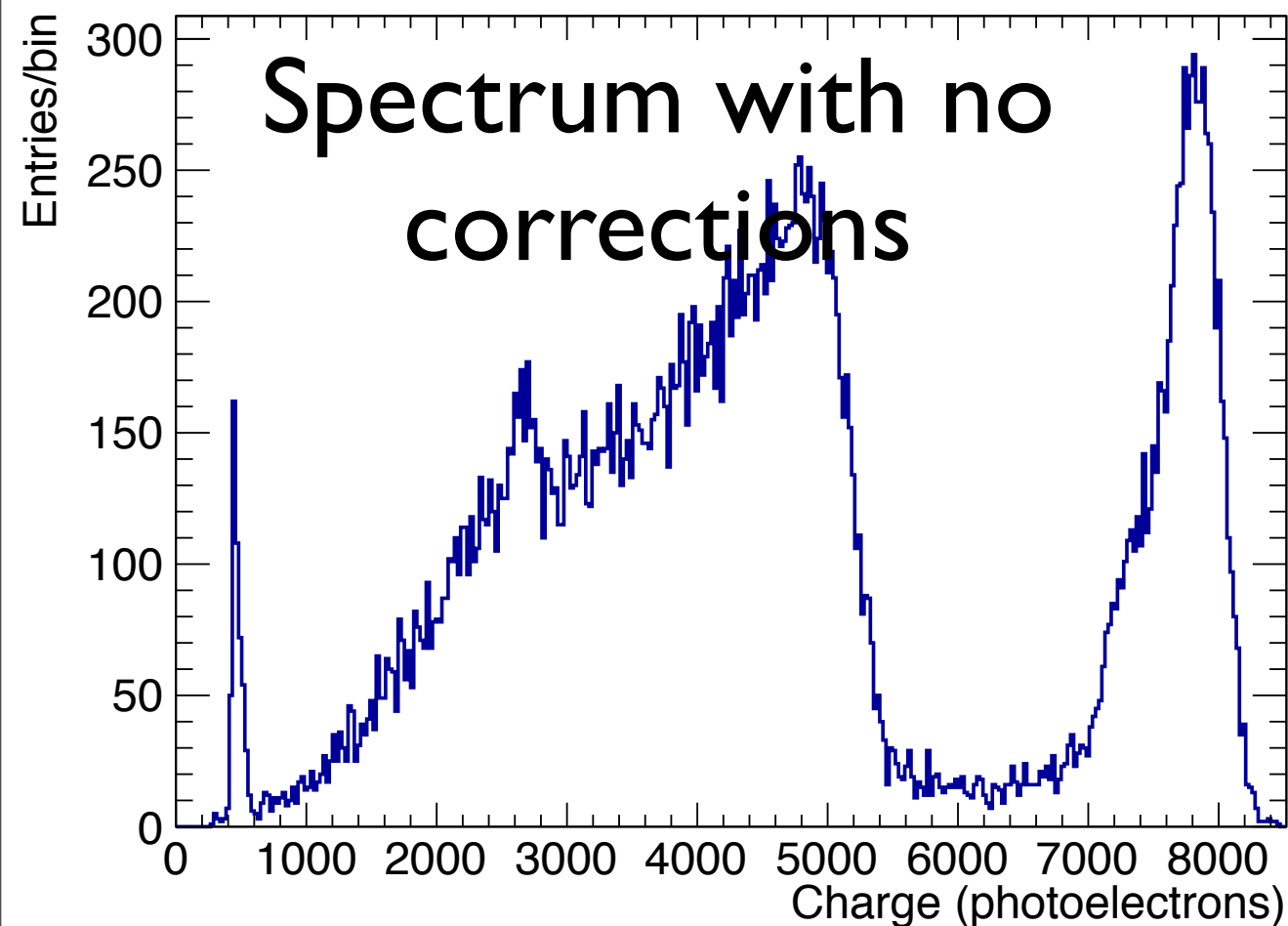


Fiducial Volume defined using MC.
Region where reconstructed XY position
is a good estimator of the true position



Deconvolution of Geometrical effects

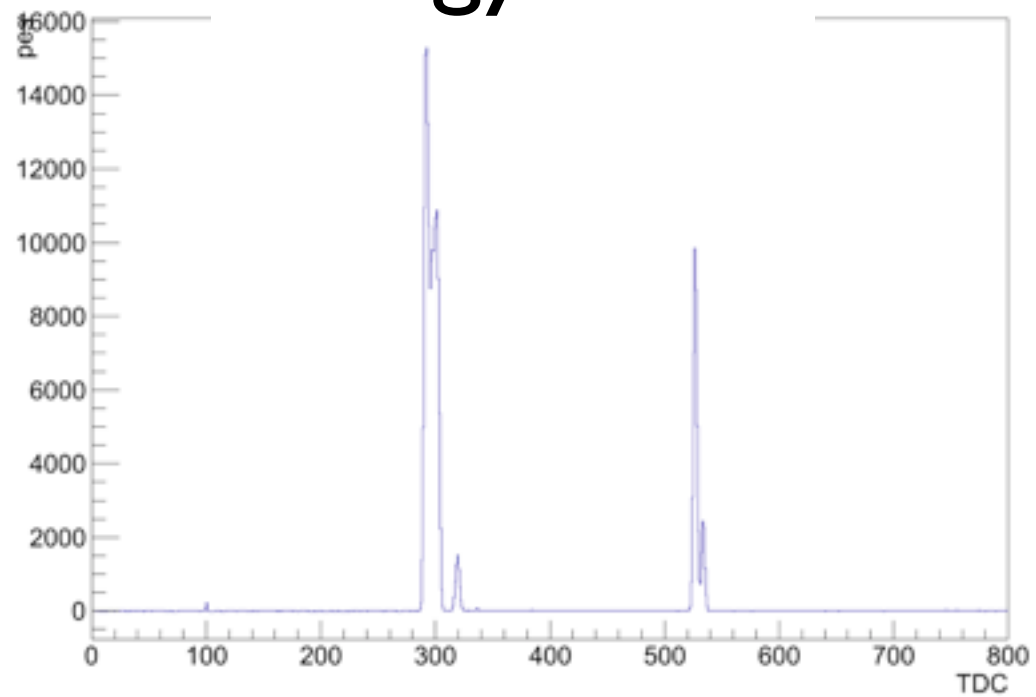




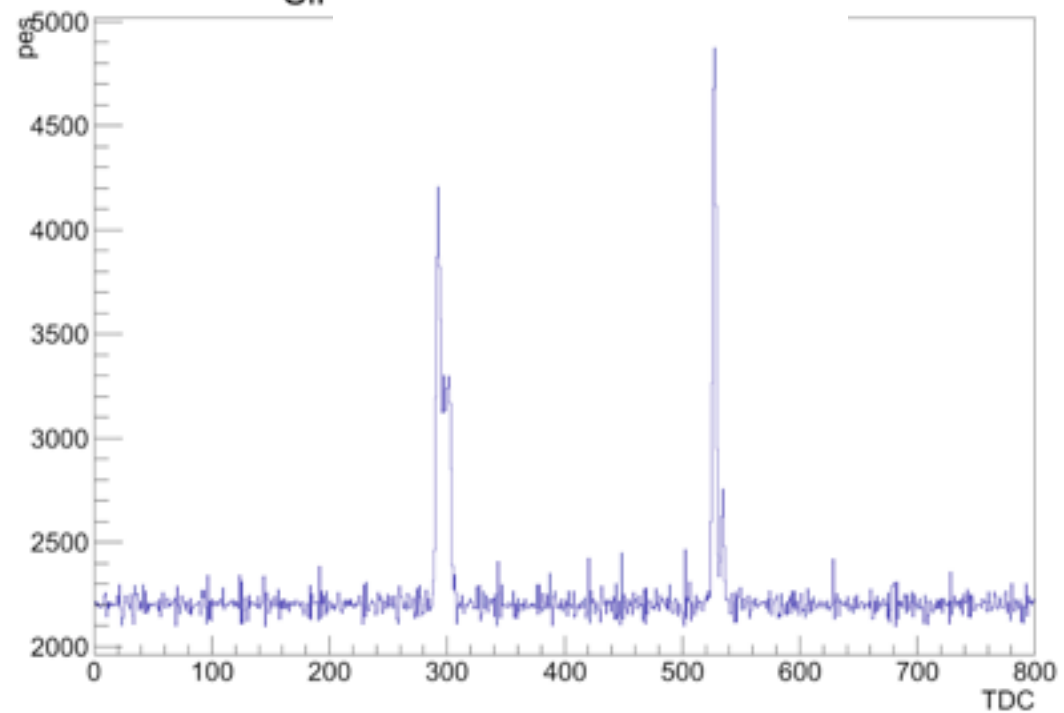
[arXiv:1211.4838](https://arxiv.org/abs/1211.4838)

SiPM

Energy Plane



SiPM Plane



Conclusions

- Largest HPXe currently operating in the world.
- I/O NEXT-100.
- Stable operation for ~2years.
- Energy resolution $\sim 0.7\%$ @ Q_{bb} achieved.
- Innovative technology for tracking based on SiPMs.
First detector of this type.
- First studies of topology already show capabilities for signal recognition.
- Demonstrates NEXT-100 design.