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Photon Detection Systems for Modern Cherenkov Detectors

Bjoern Seitz, University of Glasgow

TIPP 2011, Chicago, IL

Open Problems in Hadron Physics

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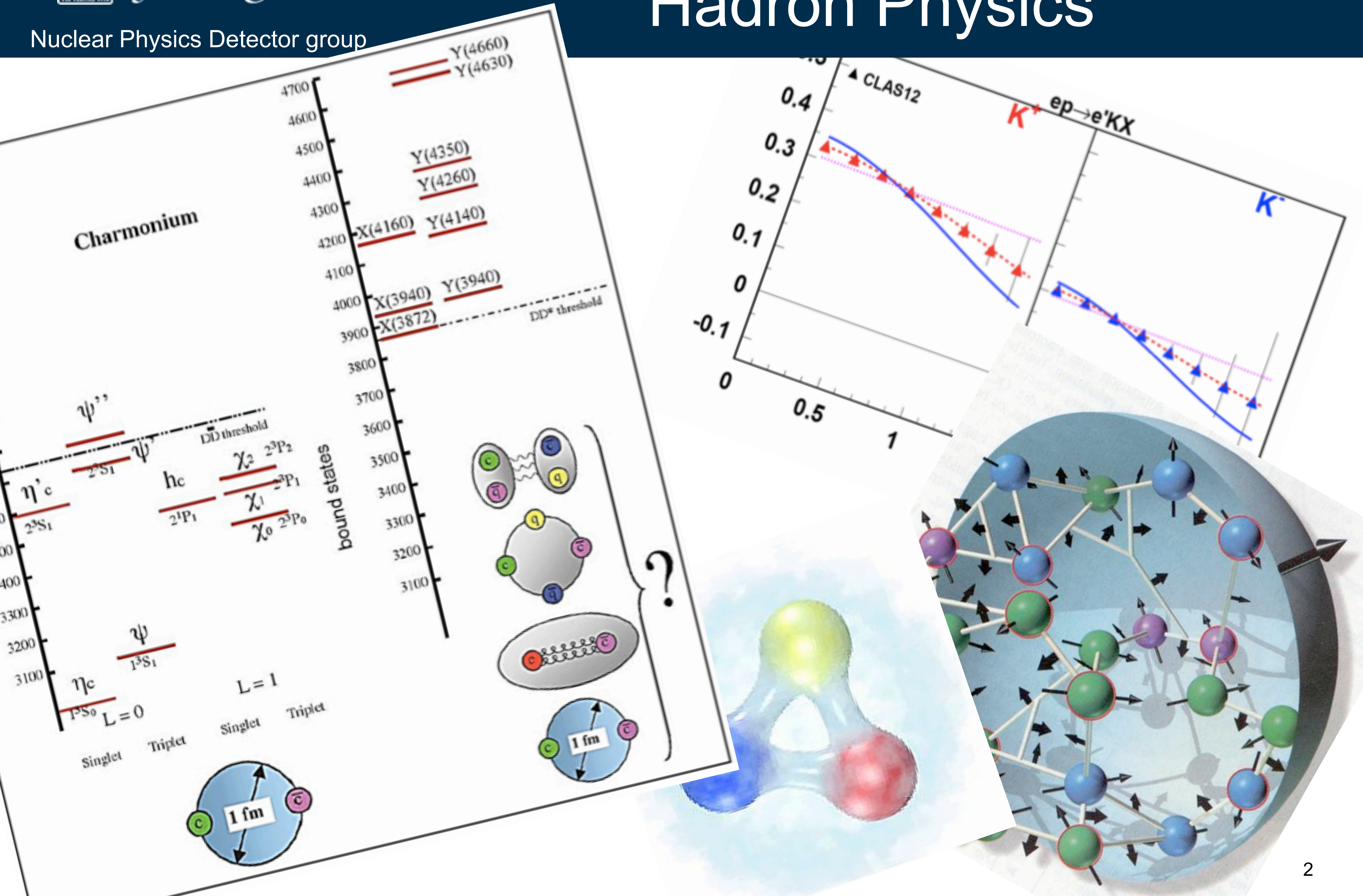

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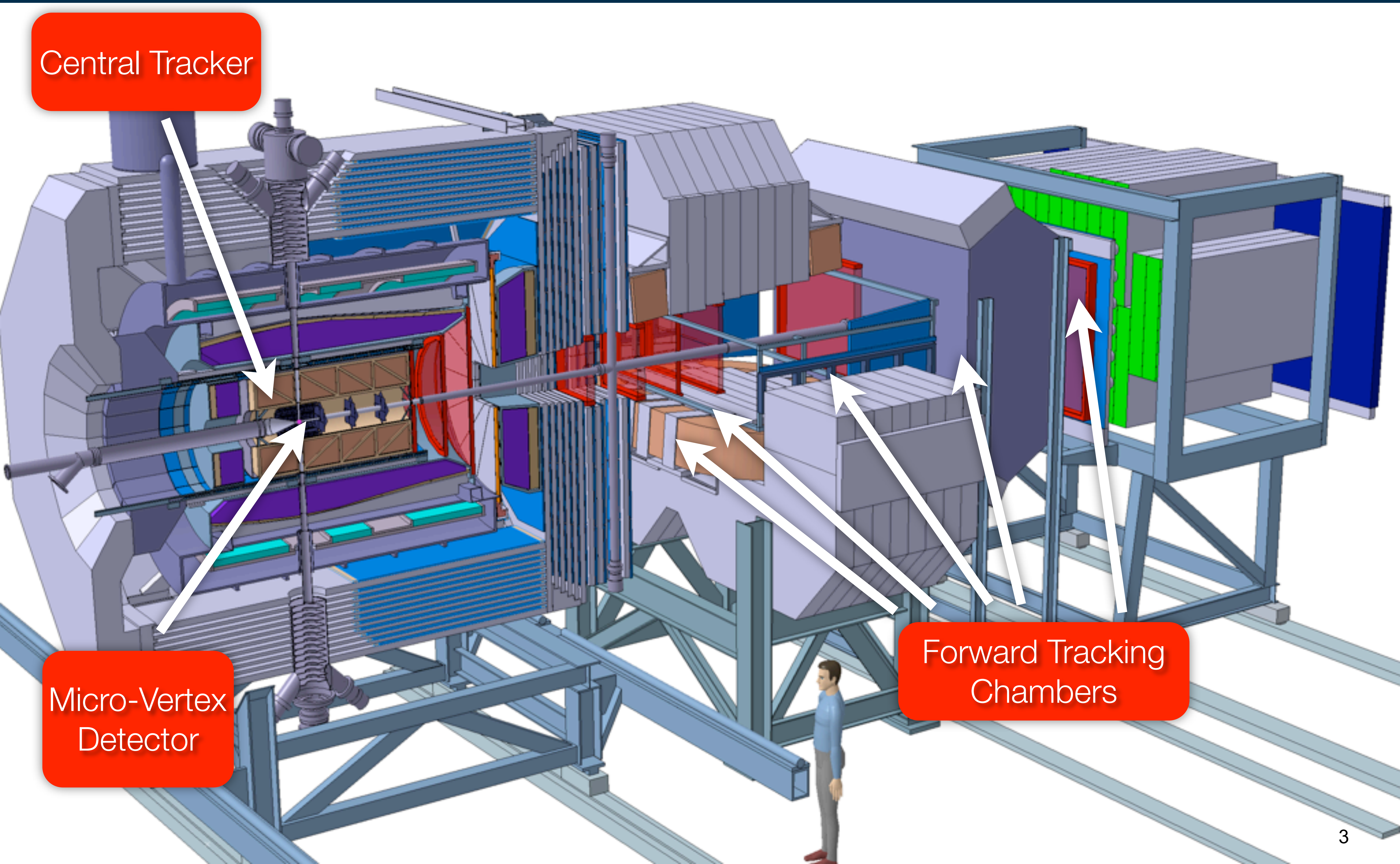

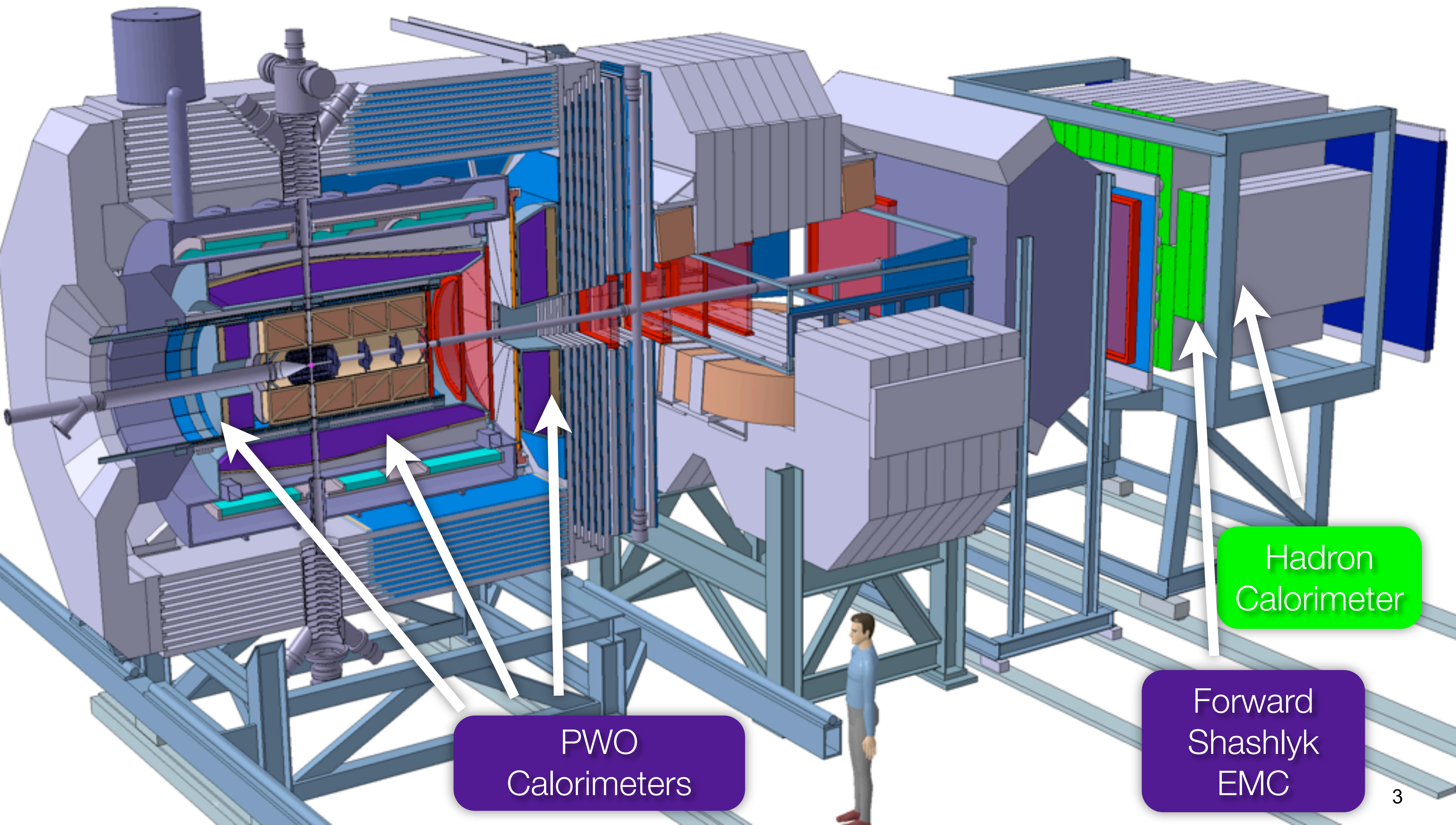
PWO
Calorimeters
Hadron
Calorimeter
Forward
Shashlyk
EMC

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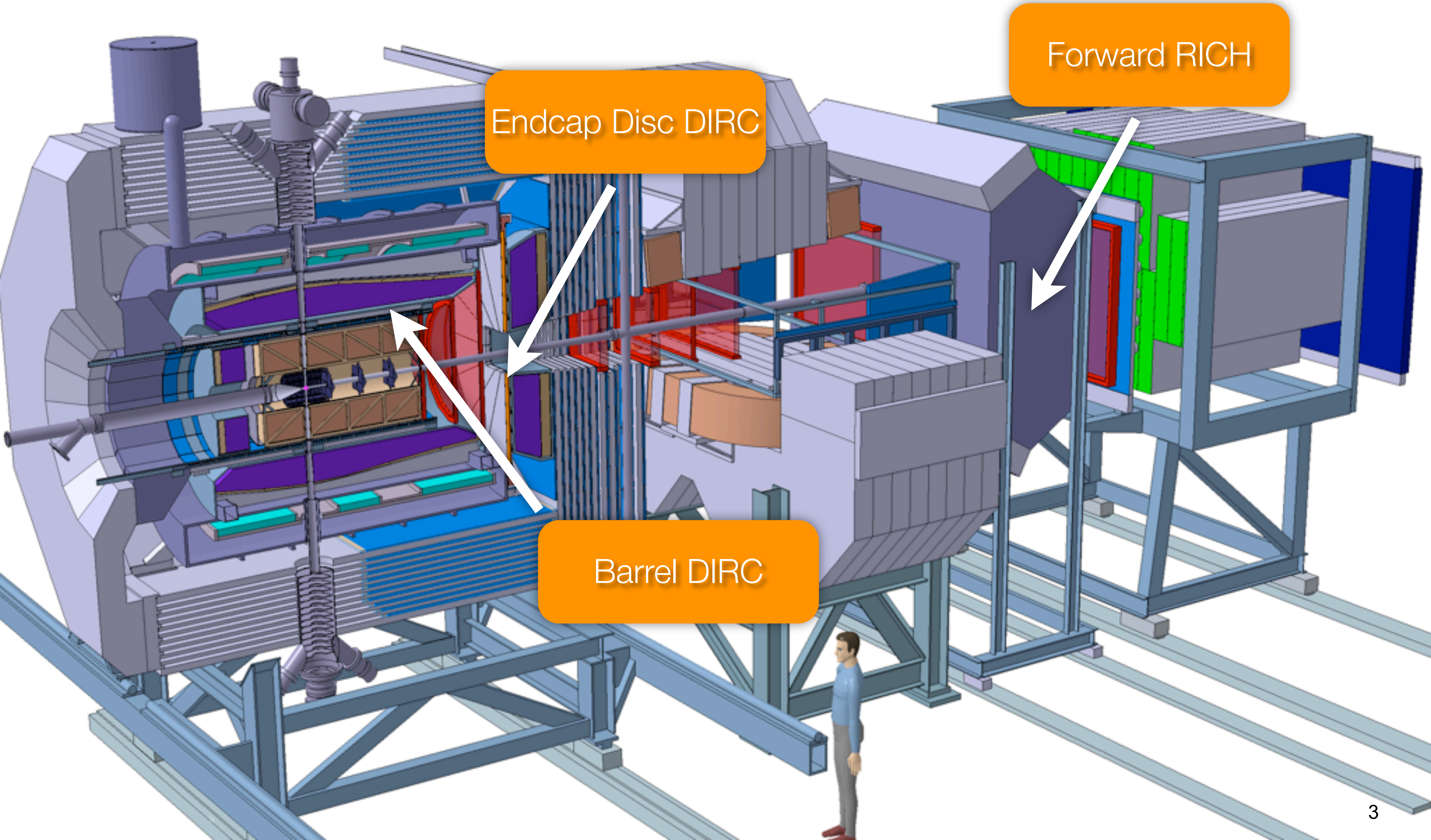

CLAS 12 -Jlab upgrade

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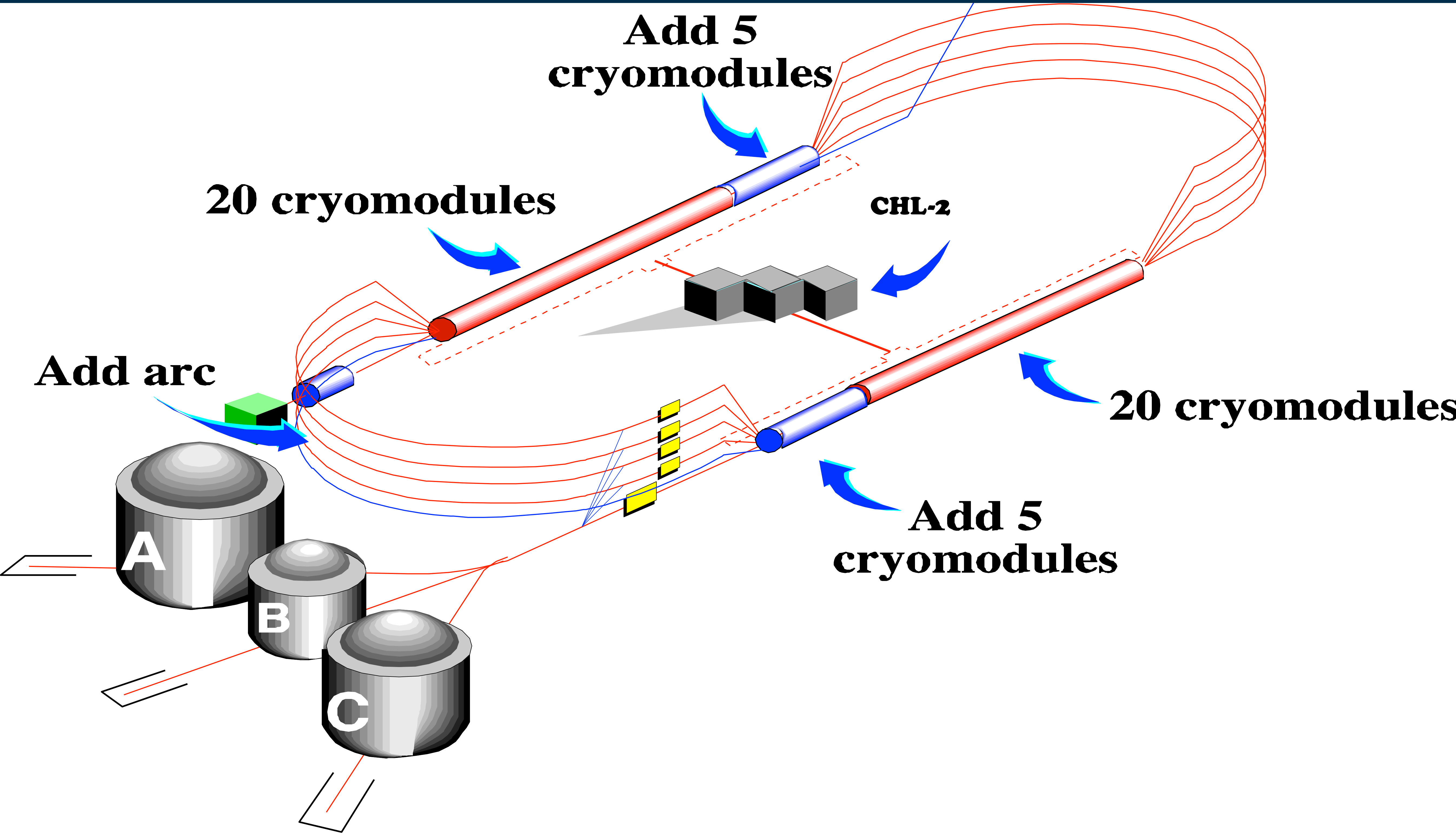

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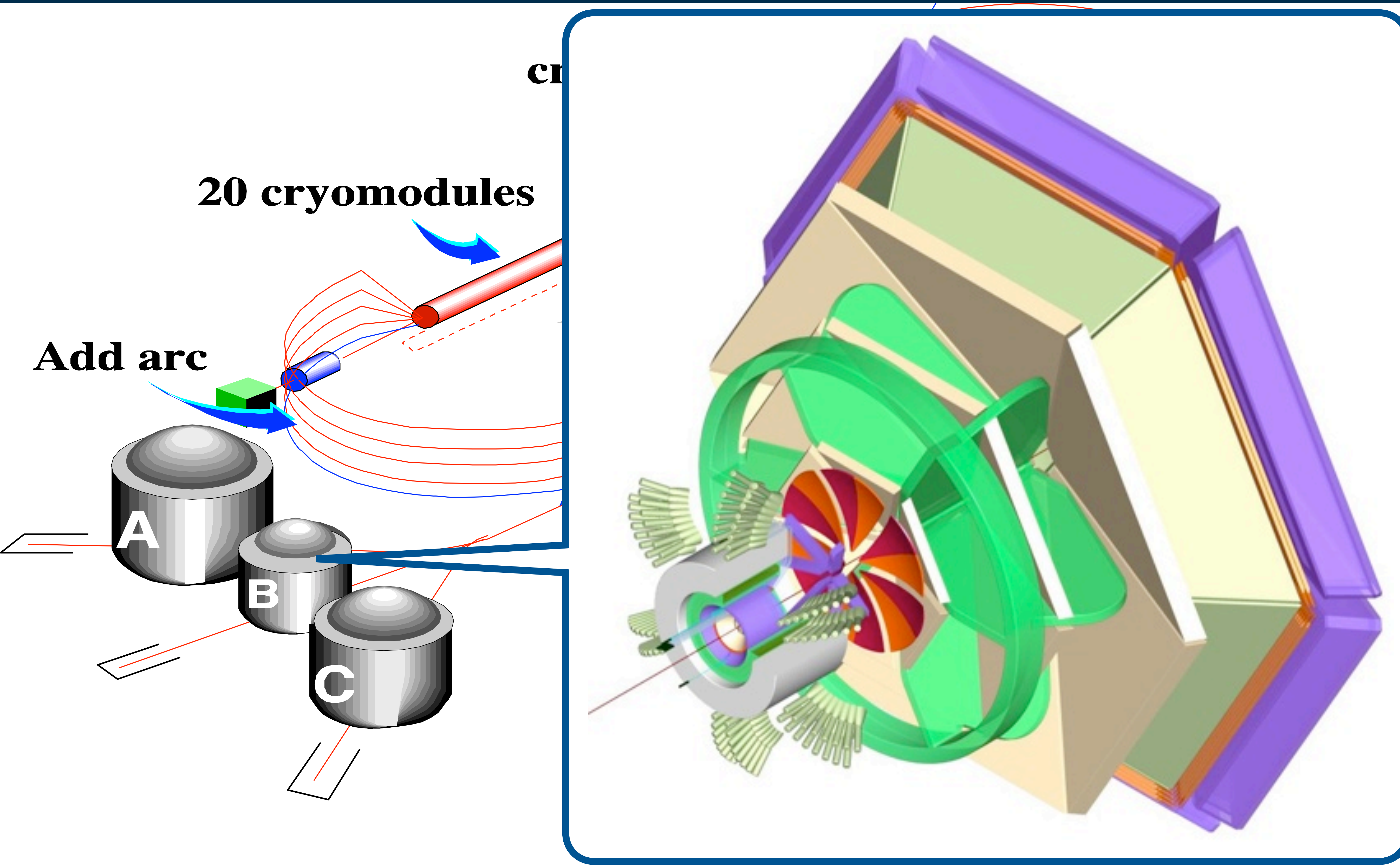
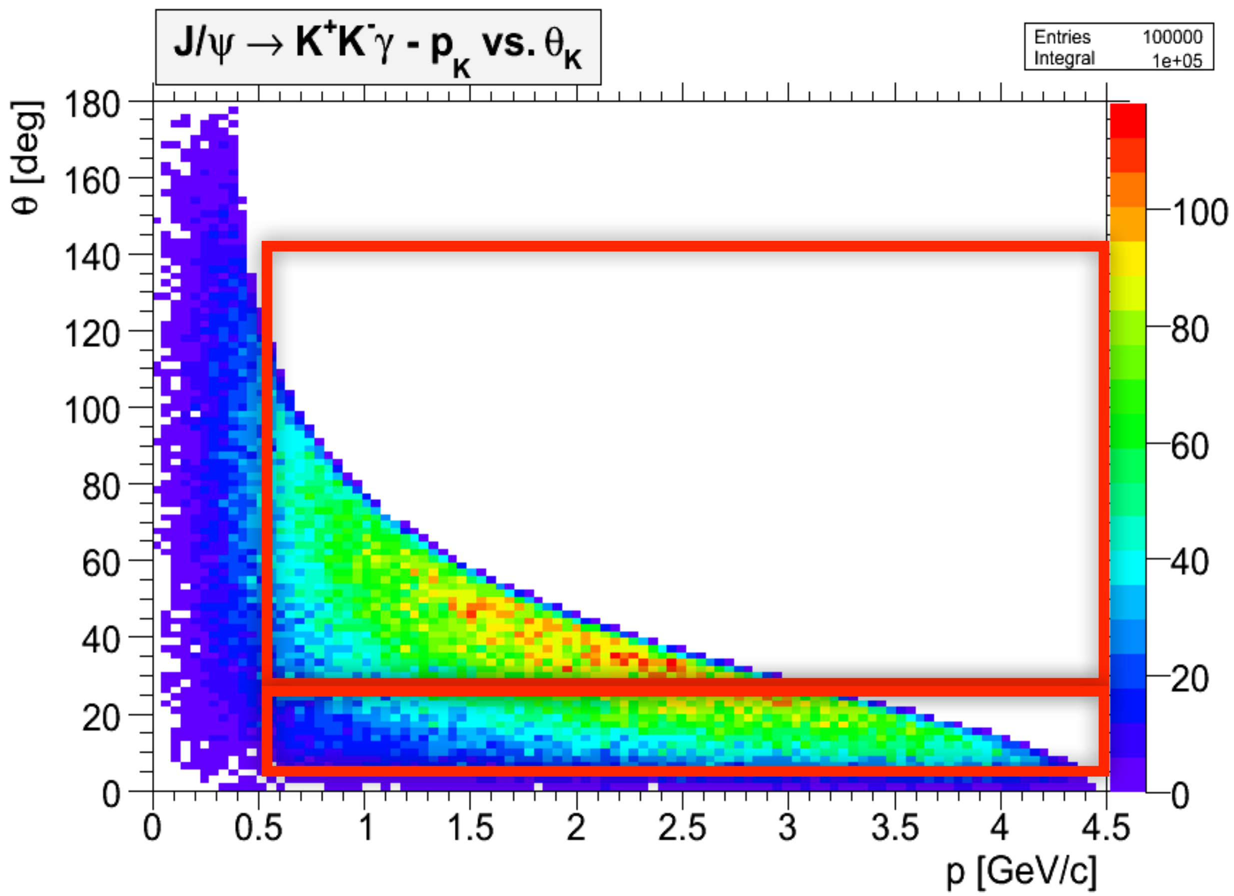
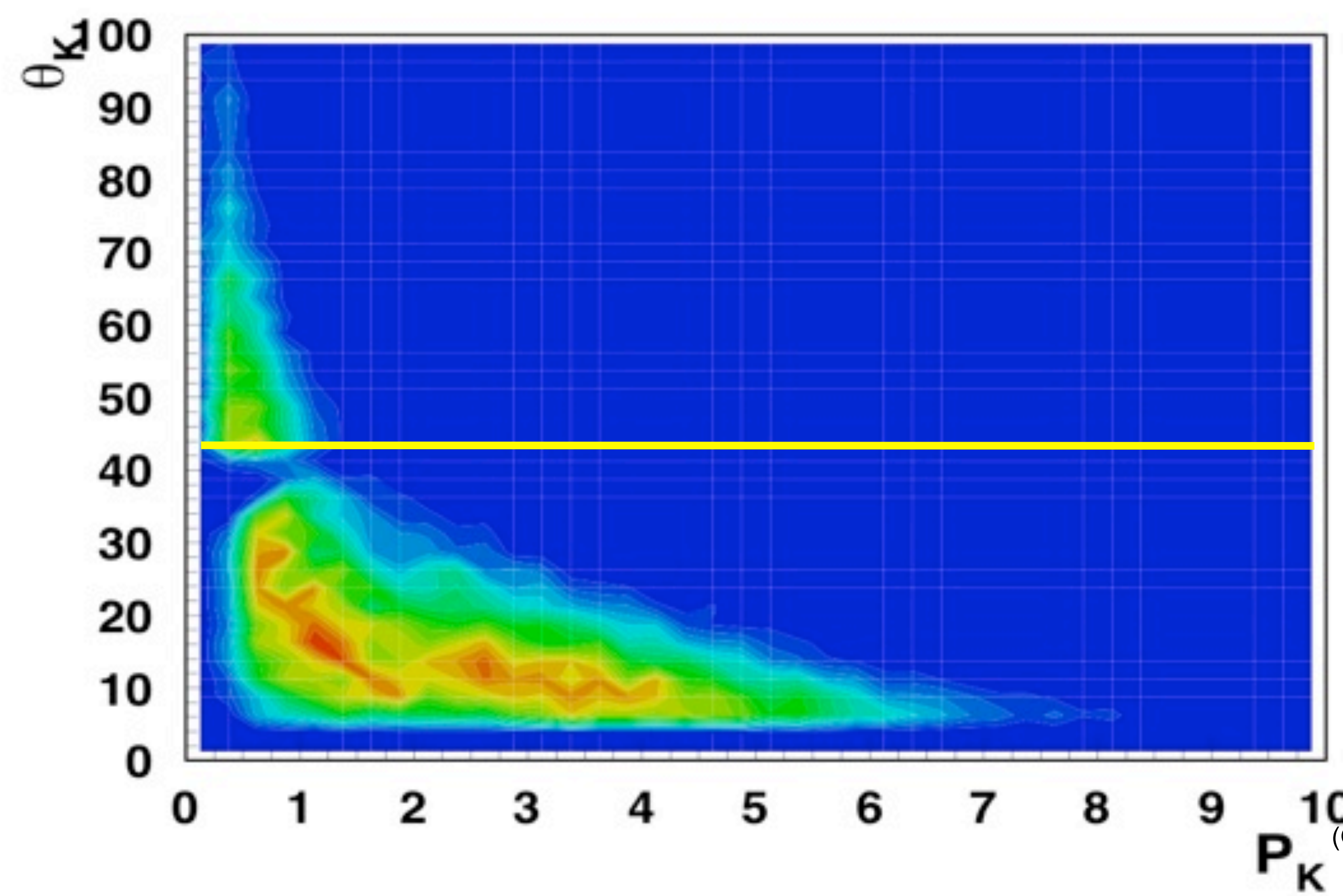
CLAS 12 -Jlab upgrade



Core requirement: Kaon Identification

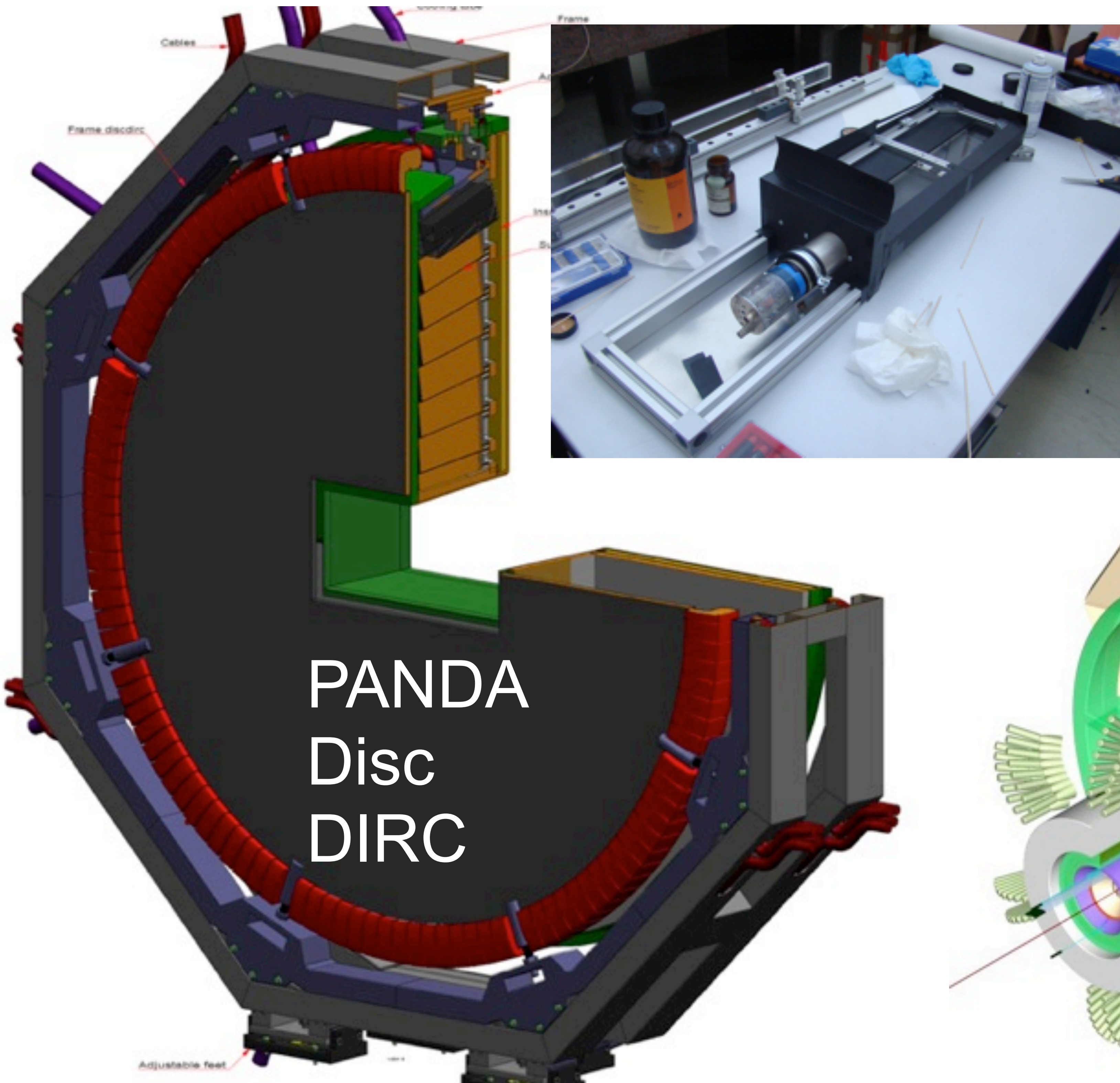


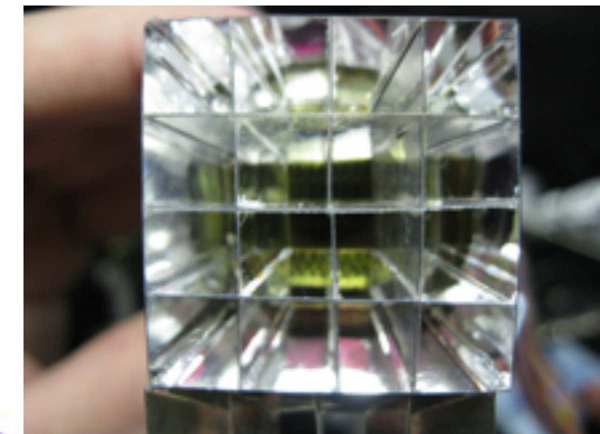
PANDA DIRCs

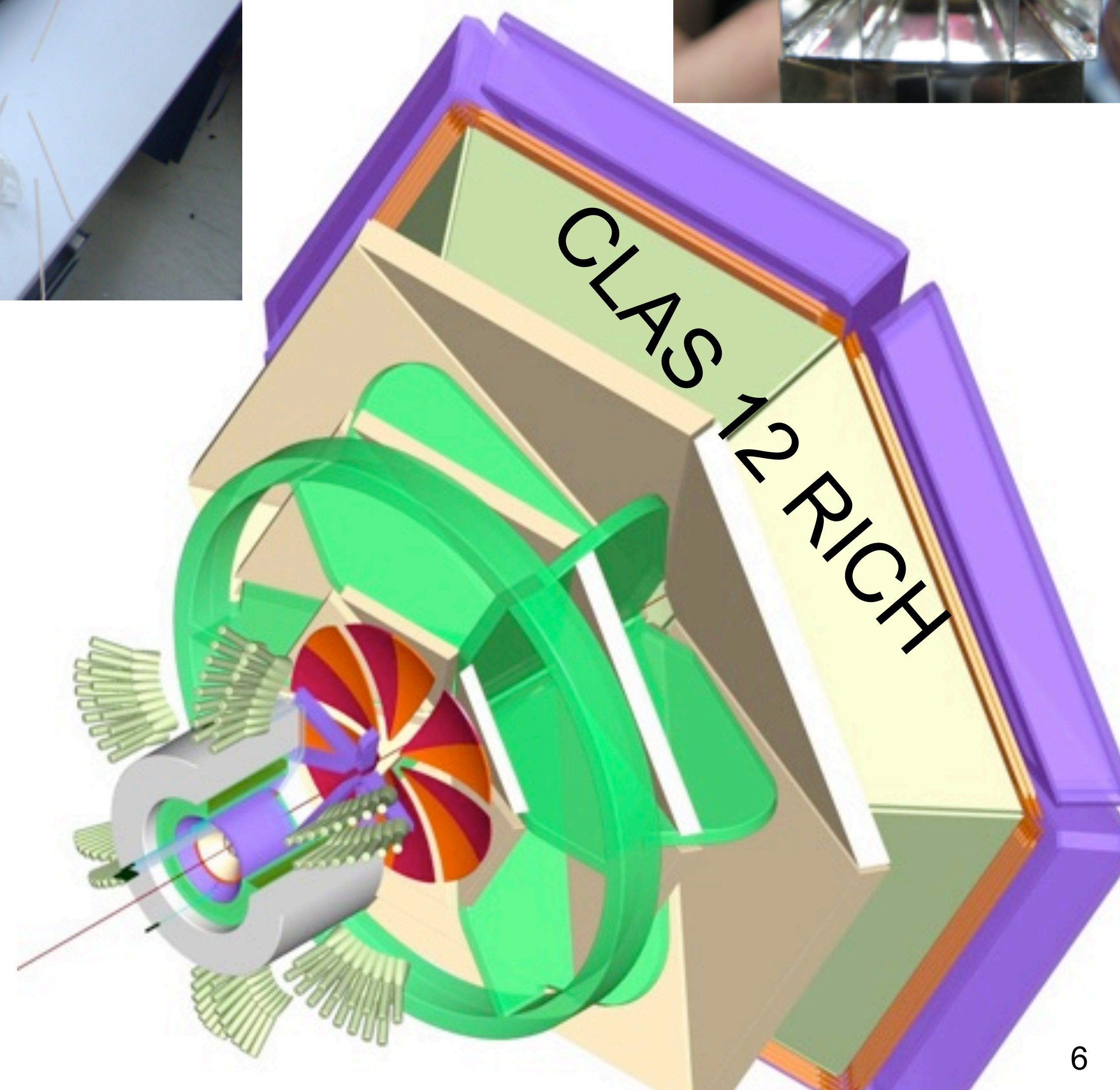


CLAS 12 RICH

Cherenkov Counters







Fast position sensitive photon detectors

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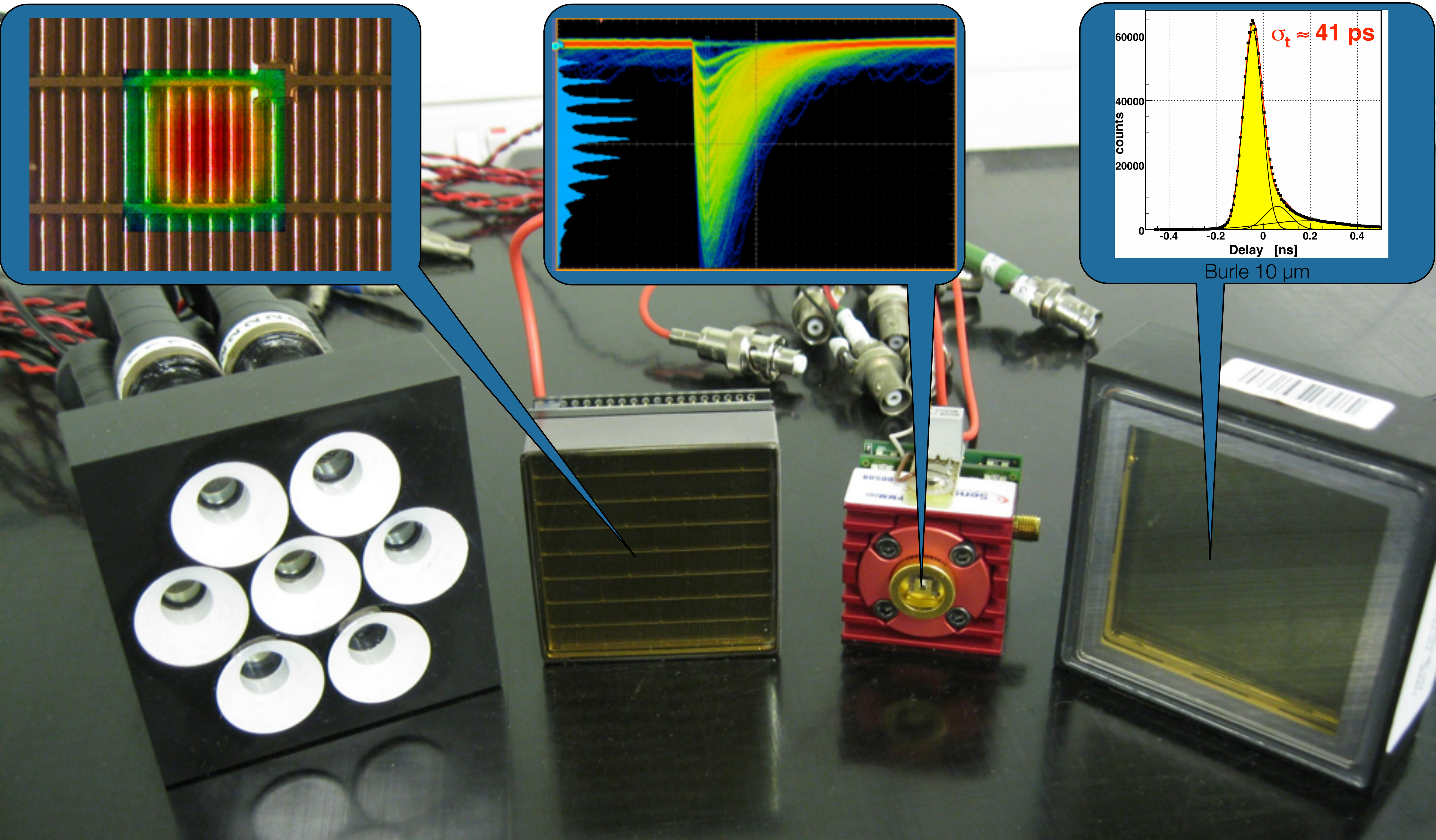
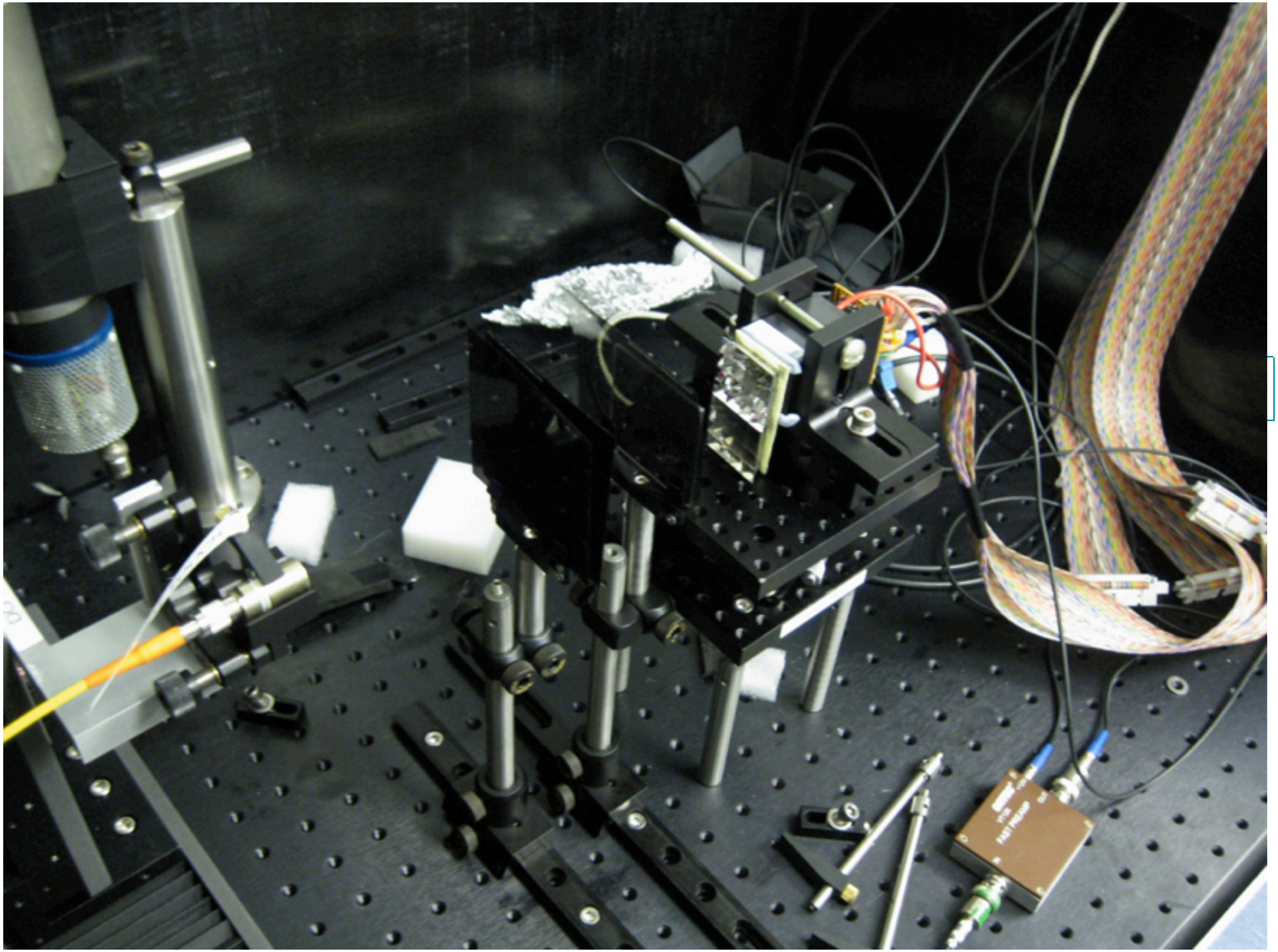
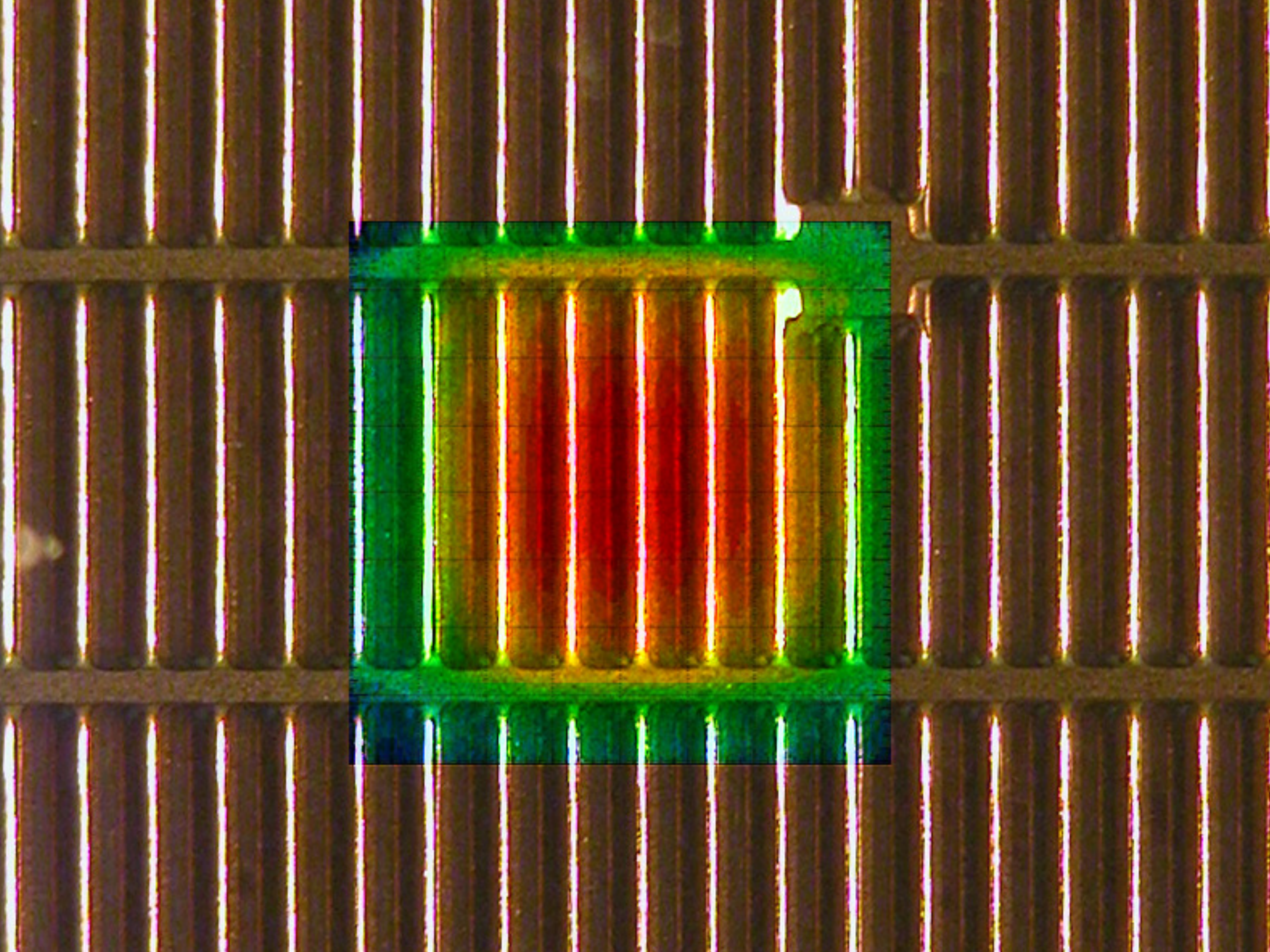


Position Sensitive PMT Test Setup





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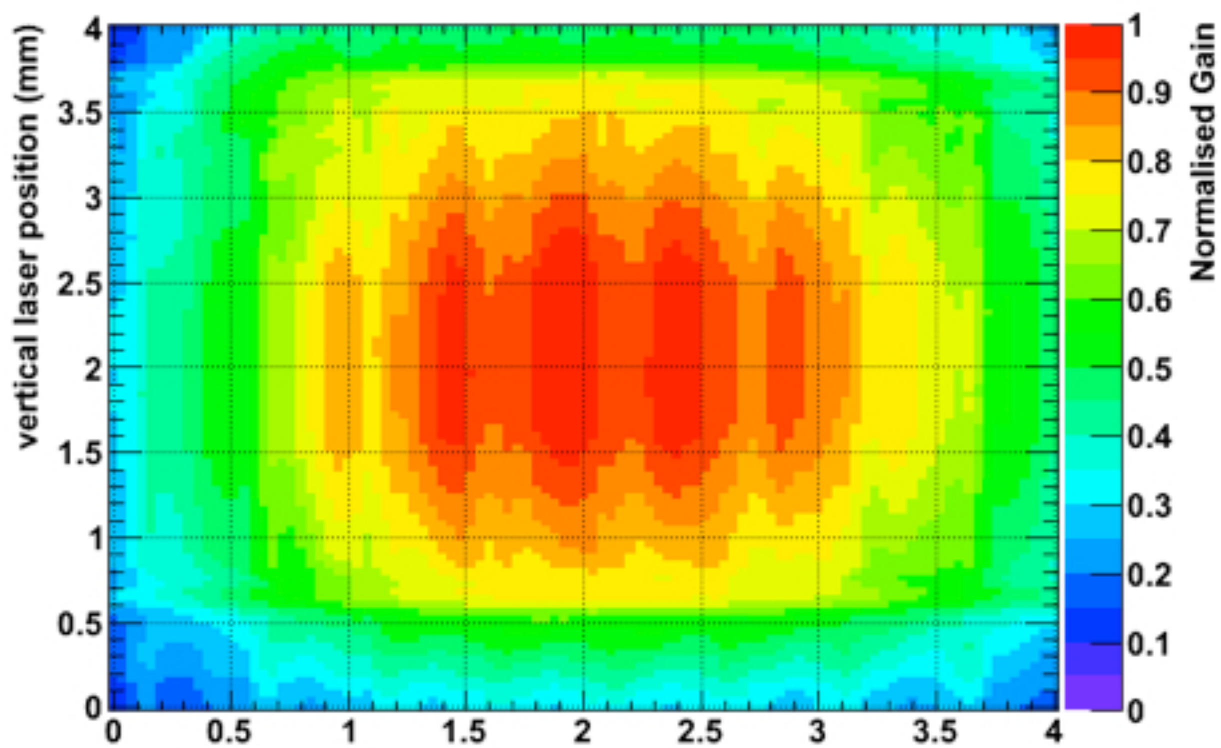
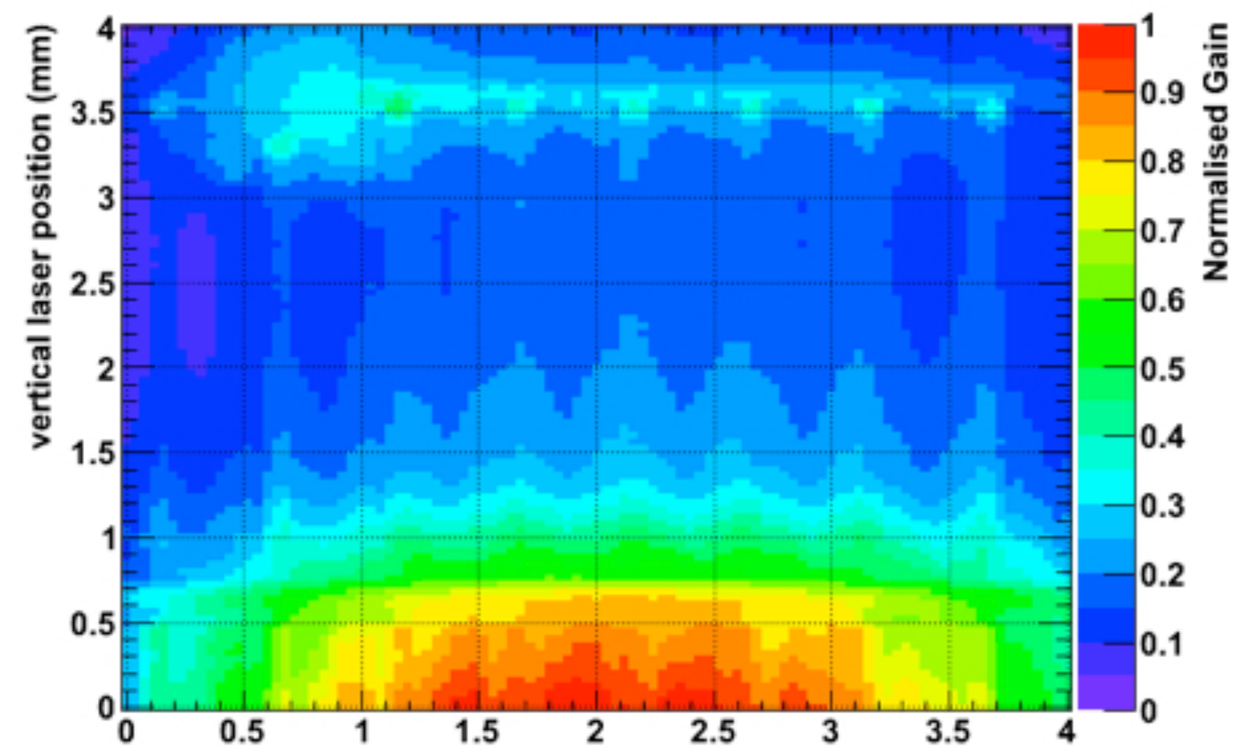
Precision Pixel Studies

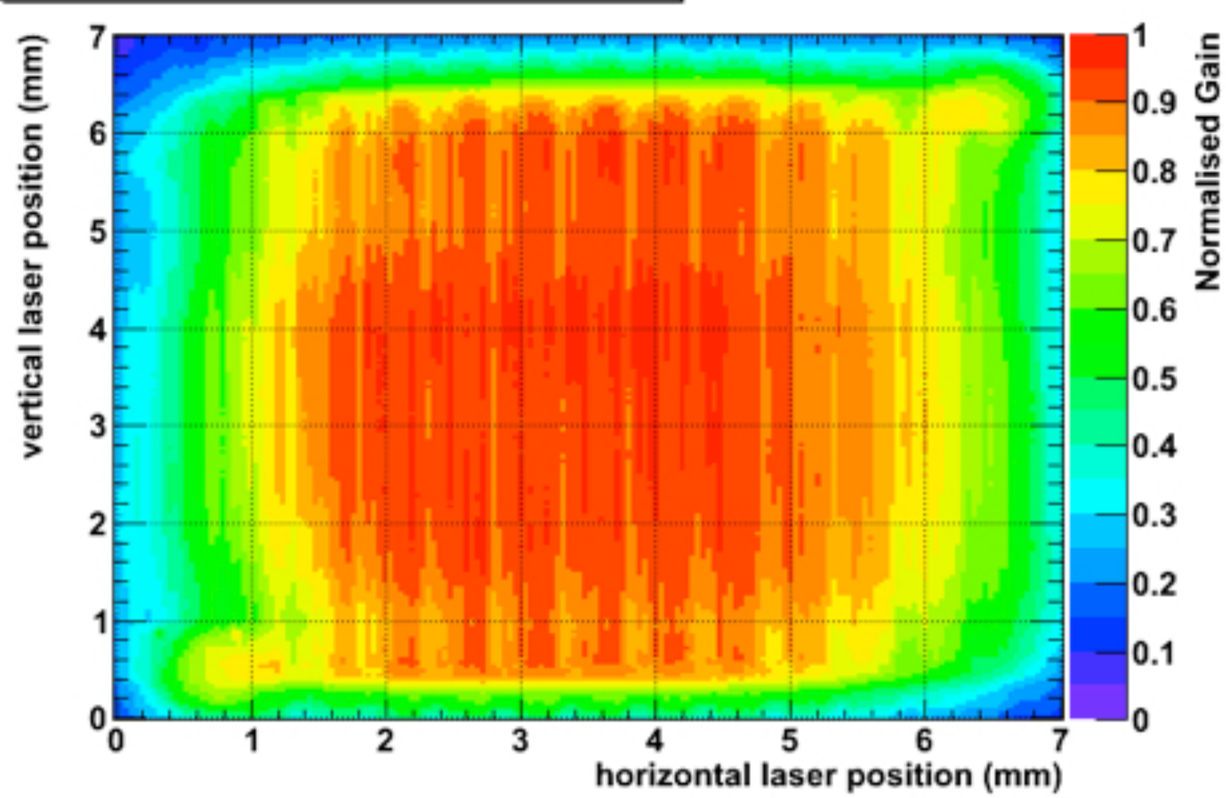
H9500 Gain Map - QDC Channel 22



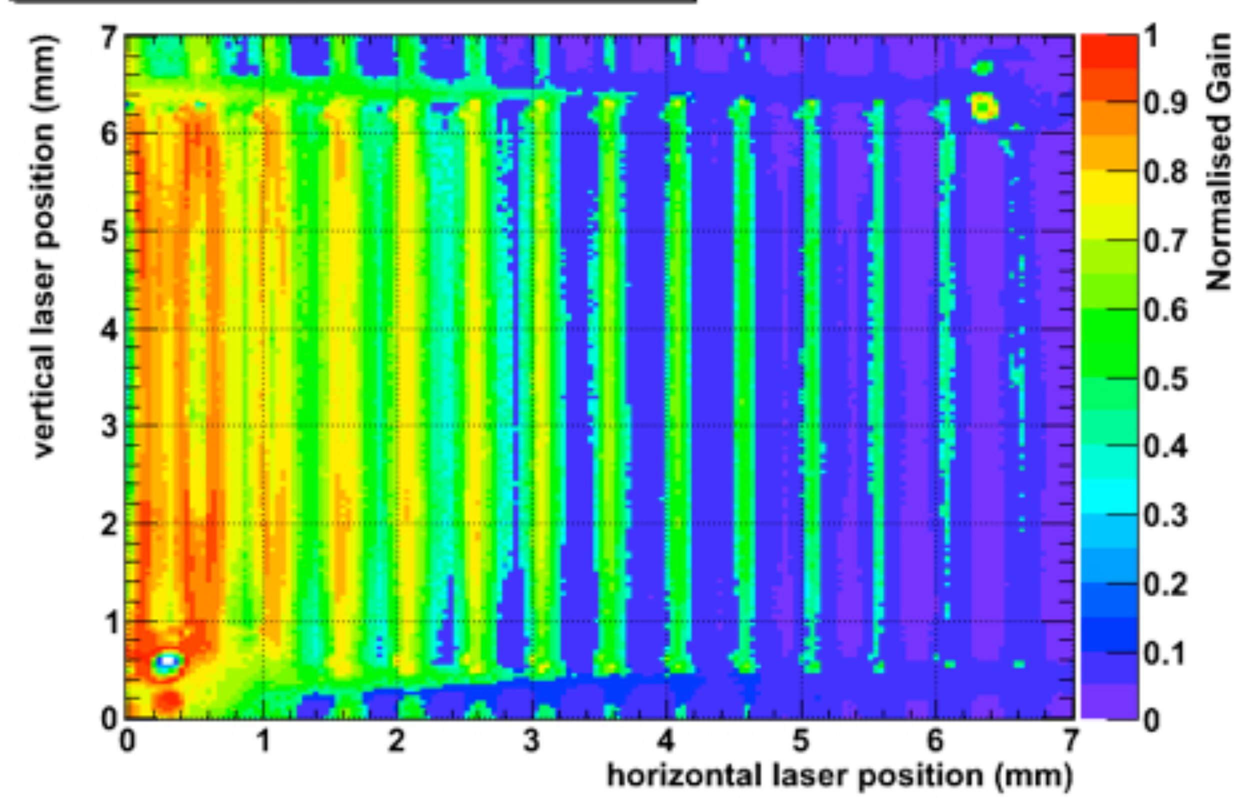
H9500 Gain Map - QDC Channel 24



H8500 Gain Map - QDC Channel 40



H8500 Gain Map - QDC Channel 24



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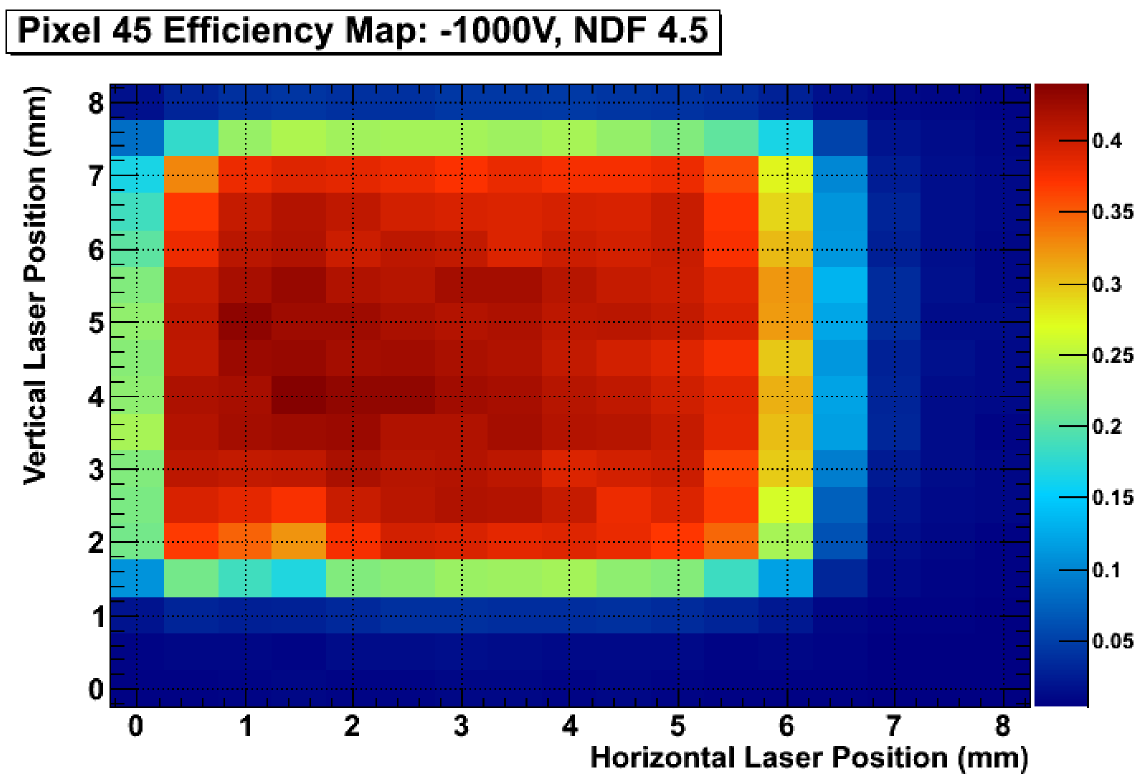
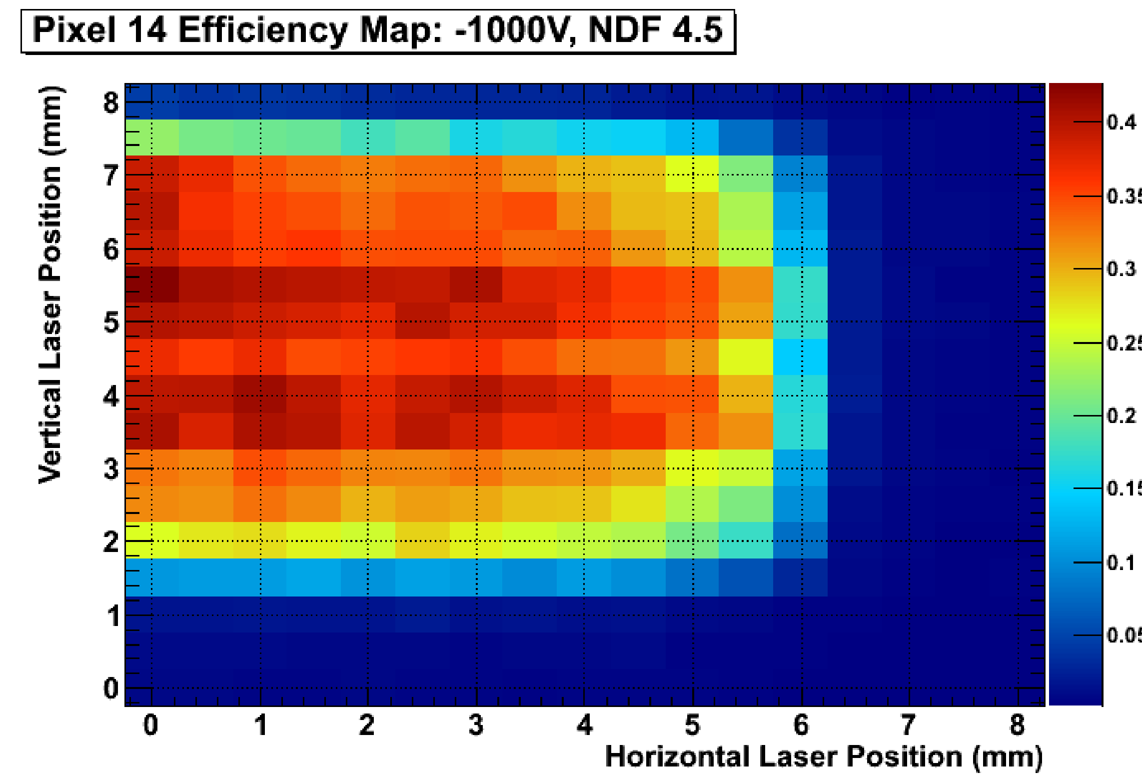
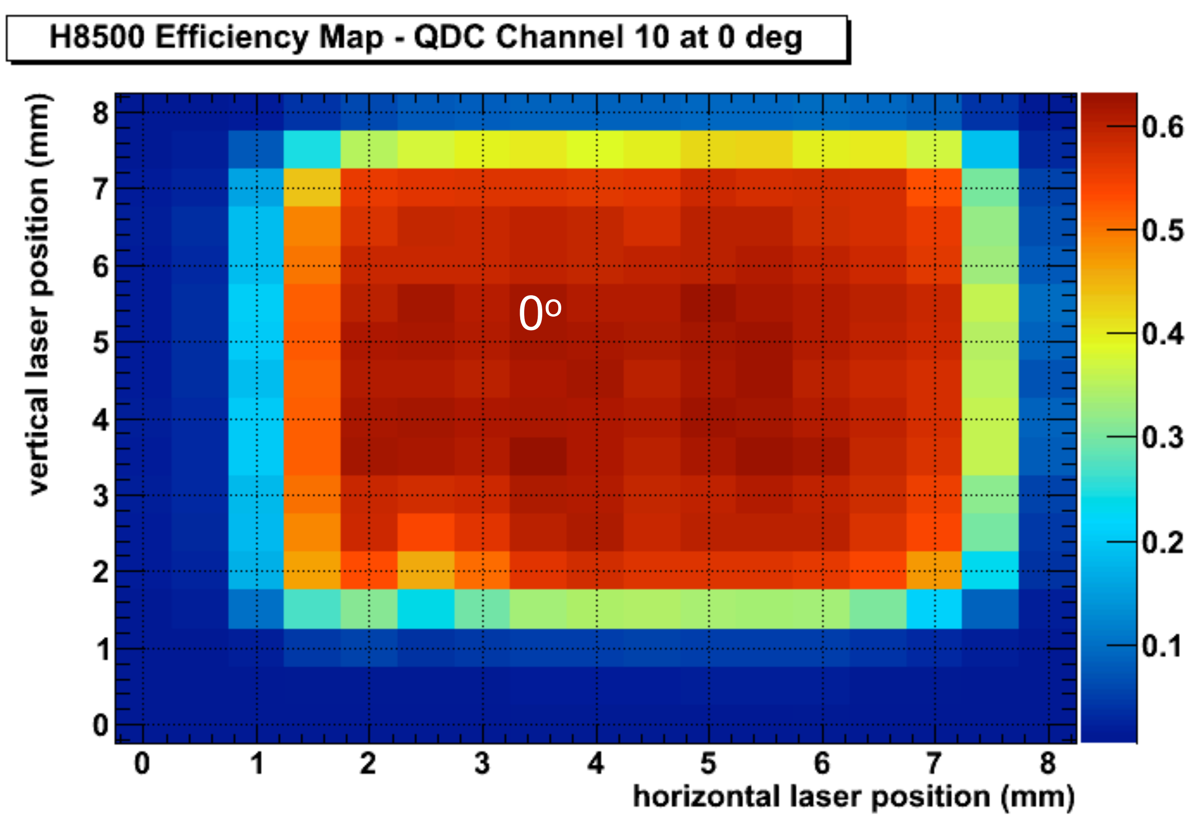
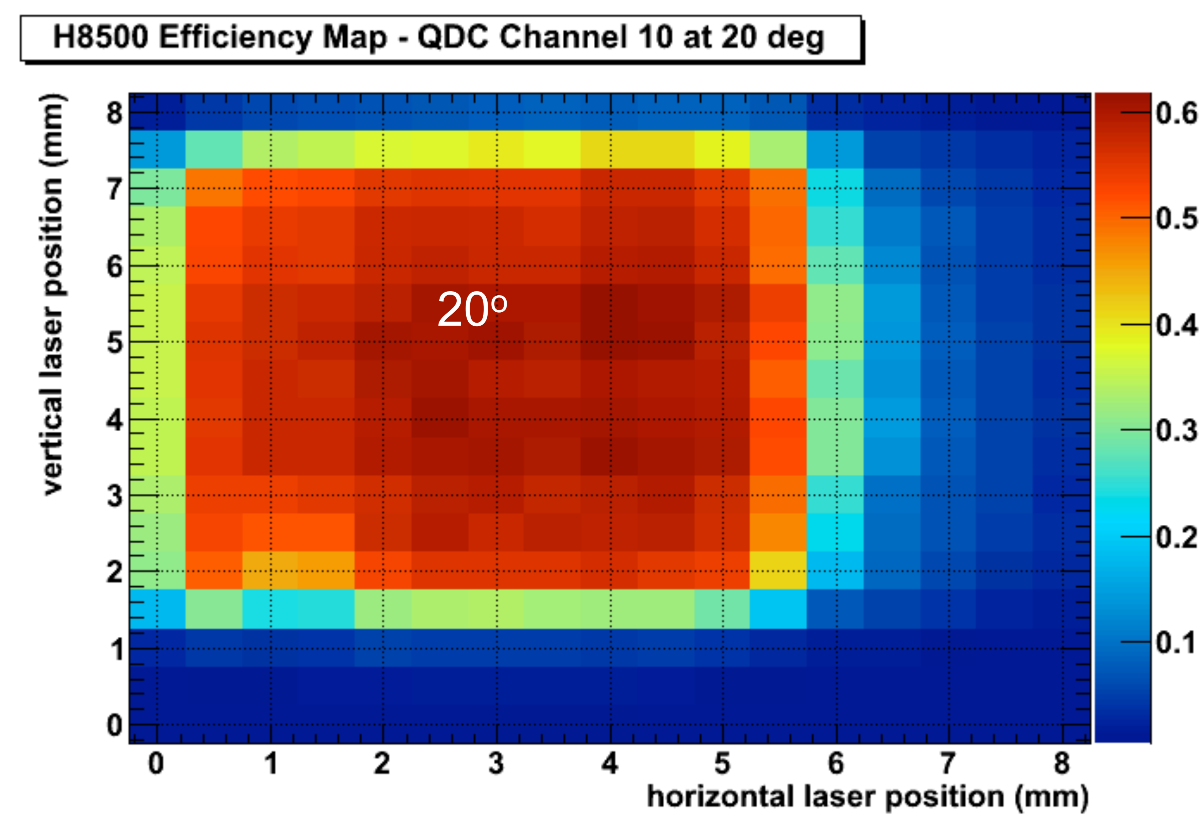
Pixel Differences









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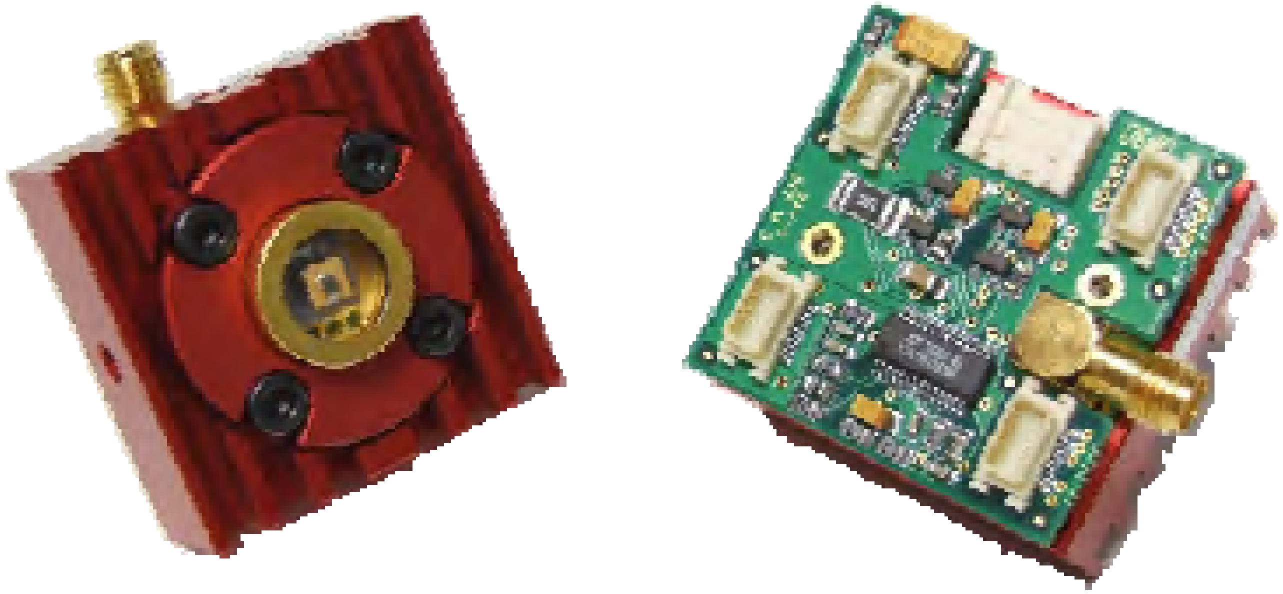
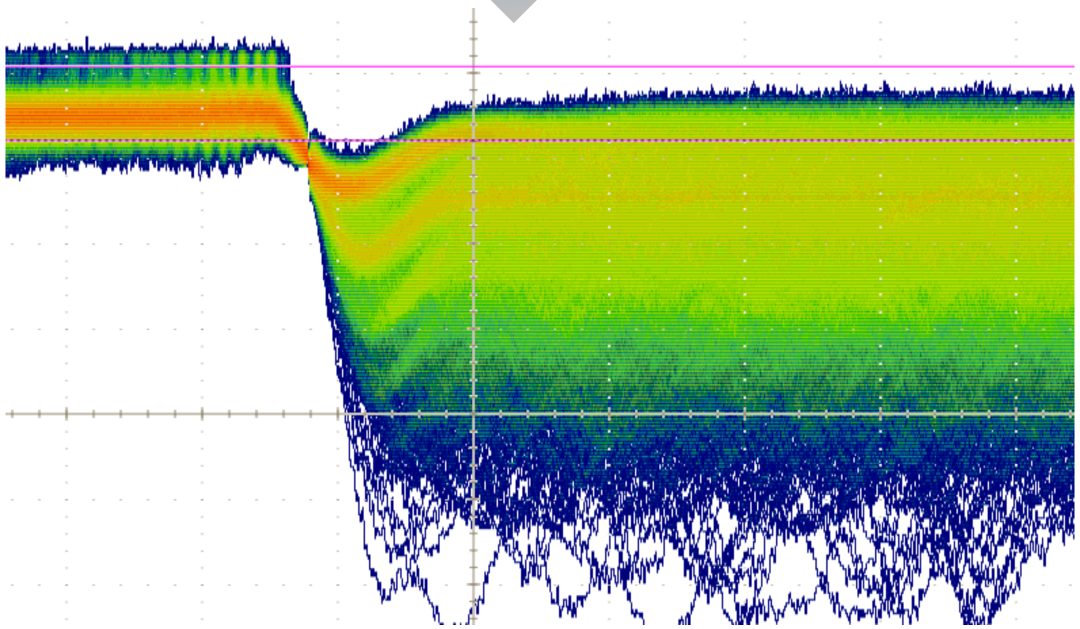
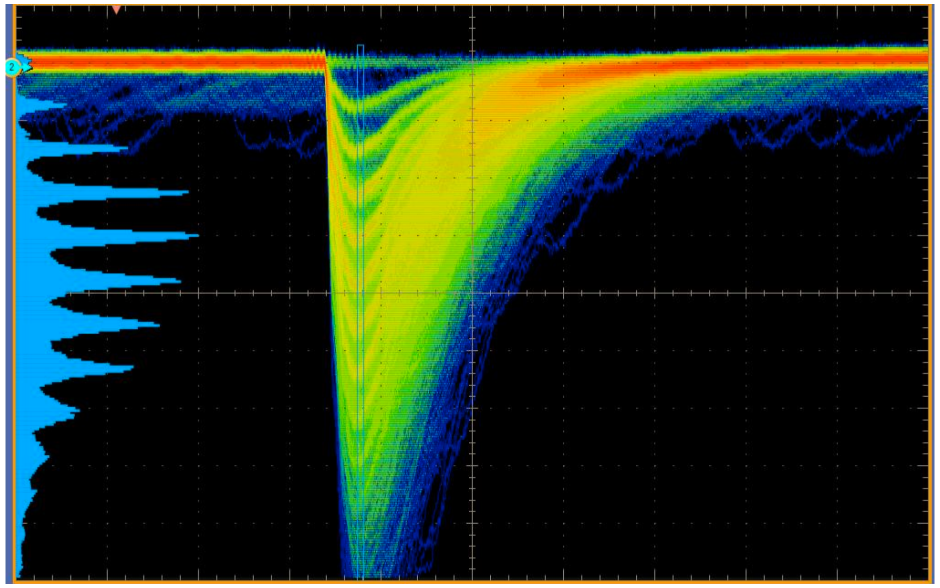
Silicon PhotoMultiplier

SPMArray4 (SensL)



SPMMini (SensL)





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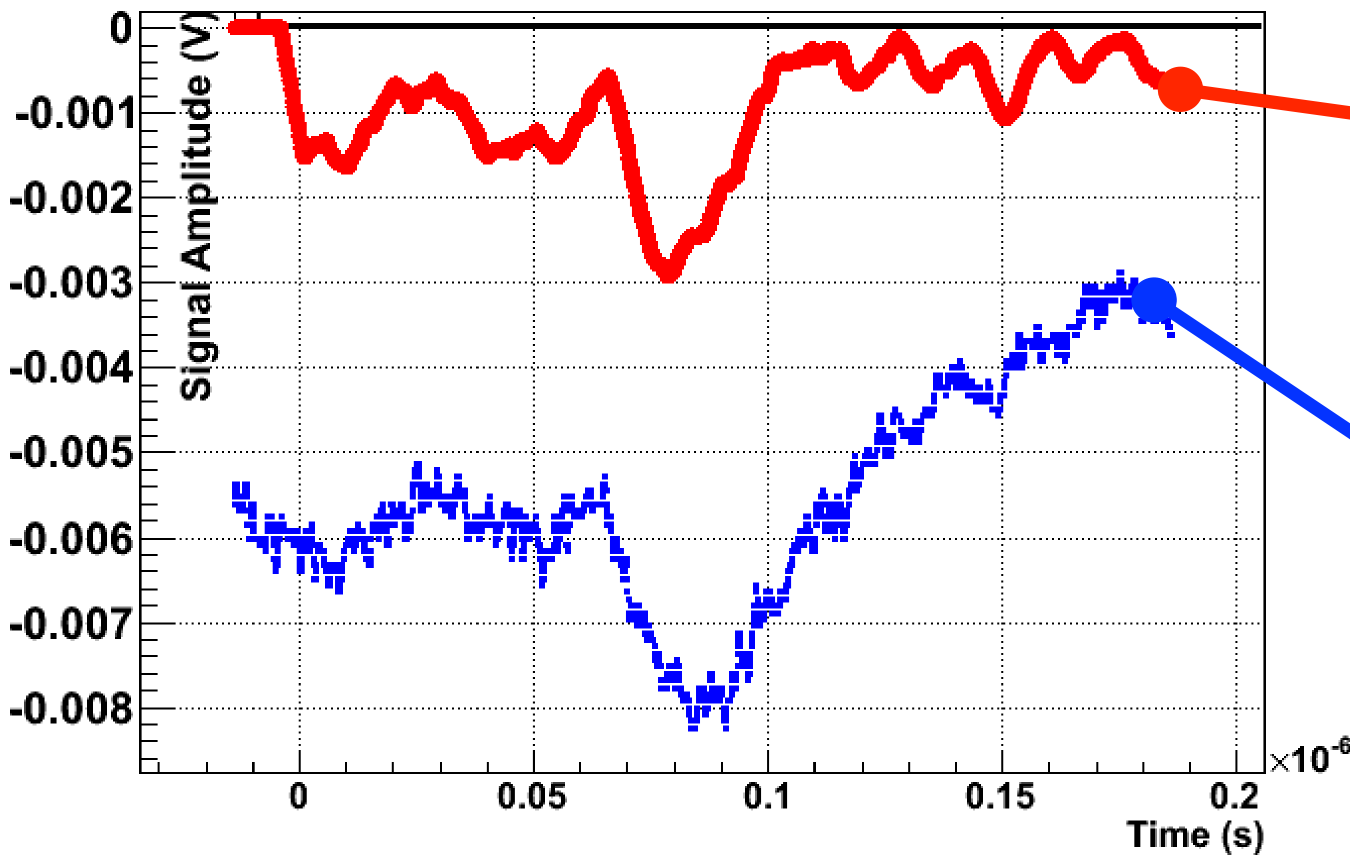
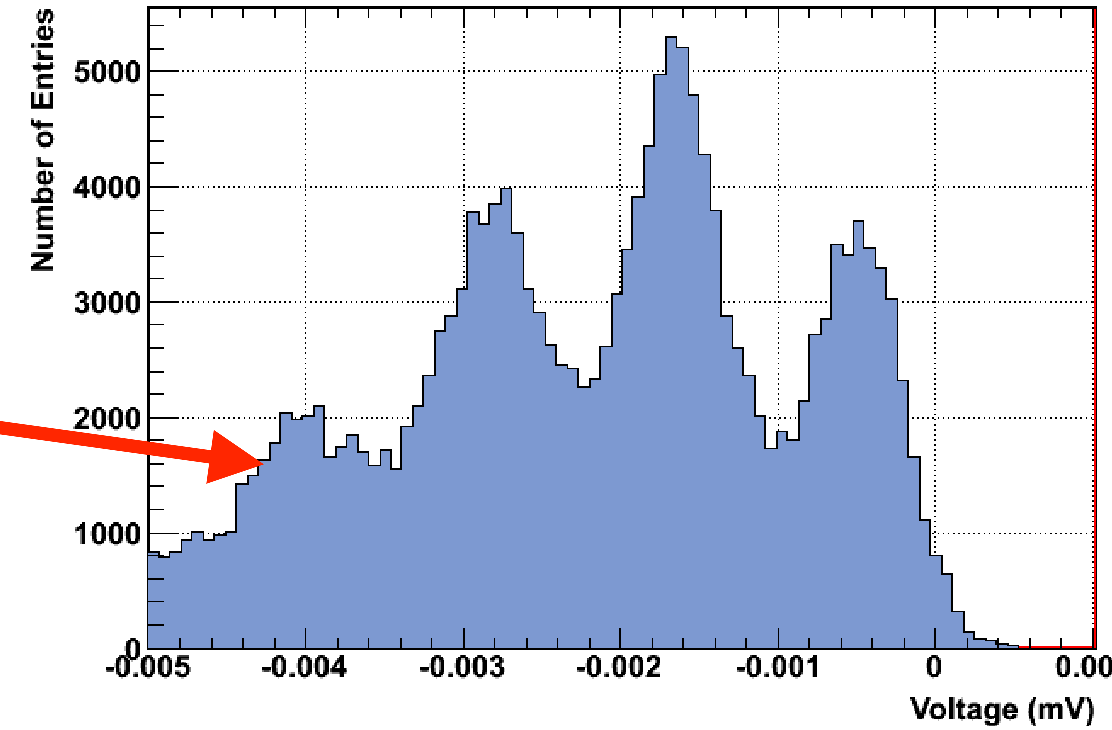
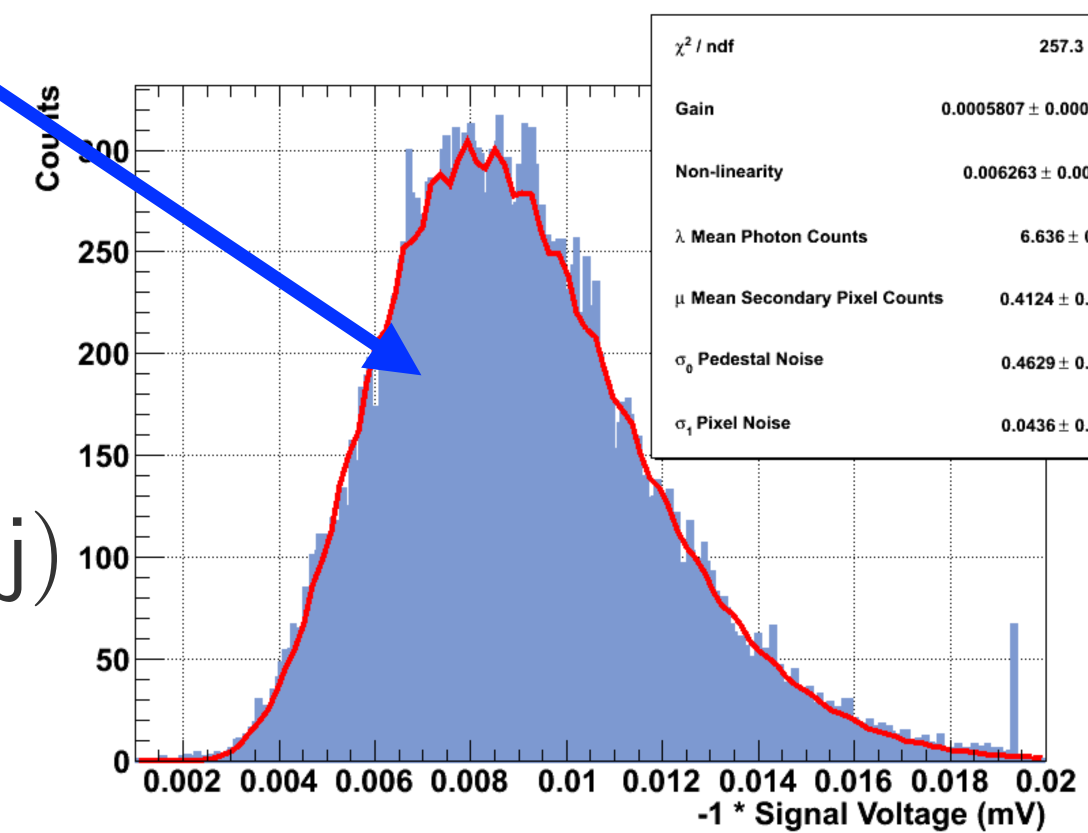
Digital Filters



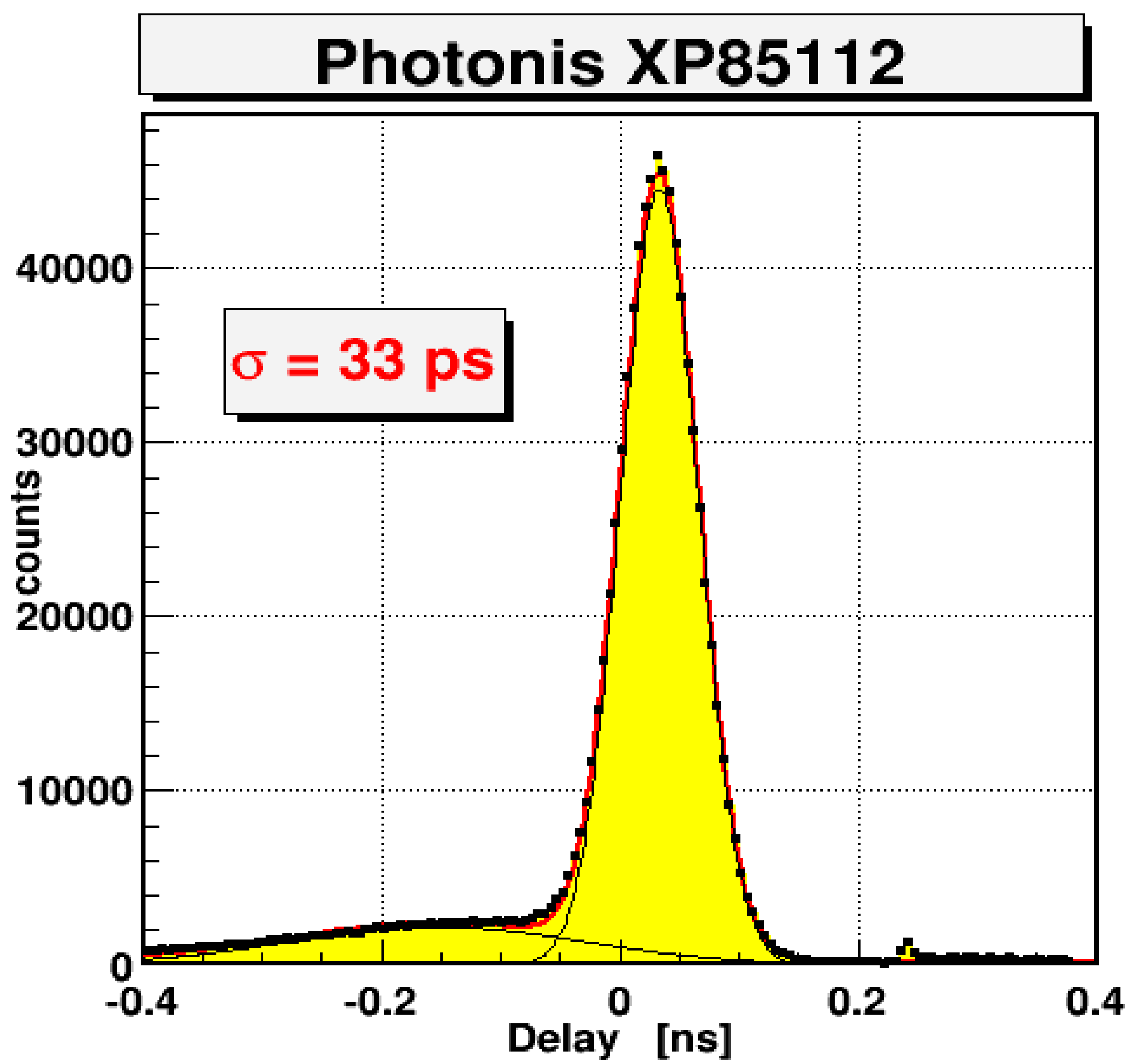


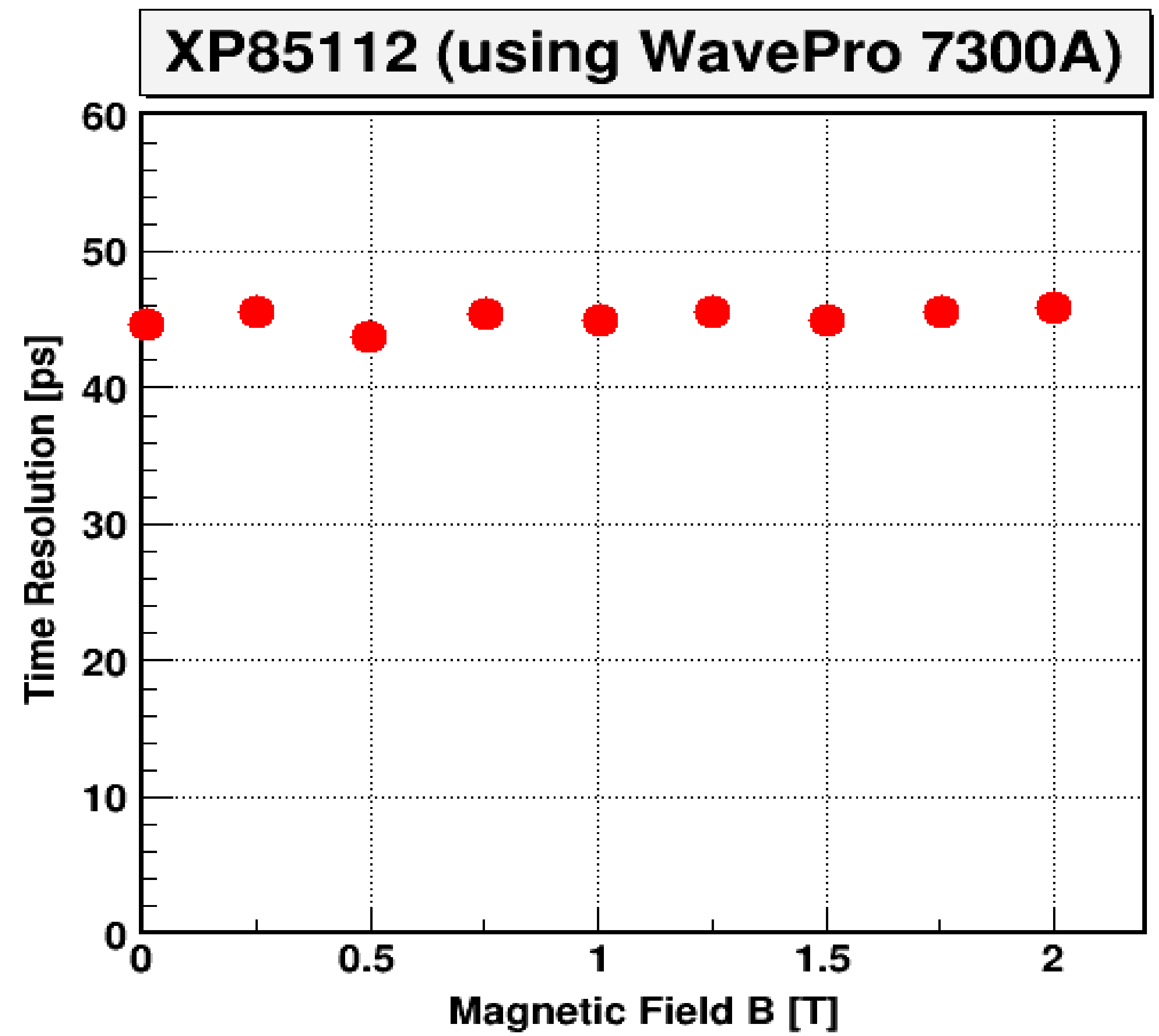


$$WD_M(i) = (x(i) - x(i-M)) + \frac{1}{\tau}\sum_{j=i-M}^{i-1} x(j)$$

MCP PMTs

Nuclear Physics Detector group with F. Uhlig, A. Lehmann, A. Britting, W. Eyrich, S. Reinicke Universität Erlangen-Nürnberg





MCP PMTs

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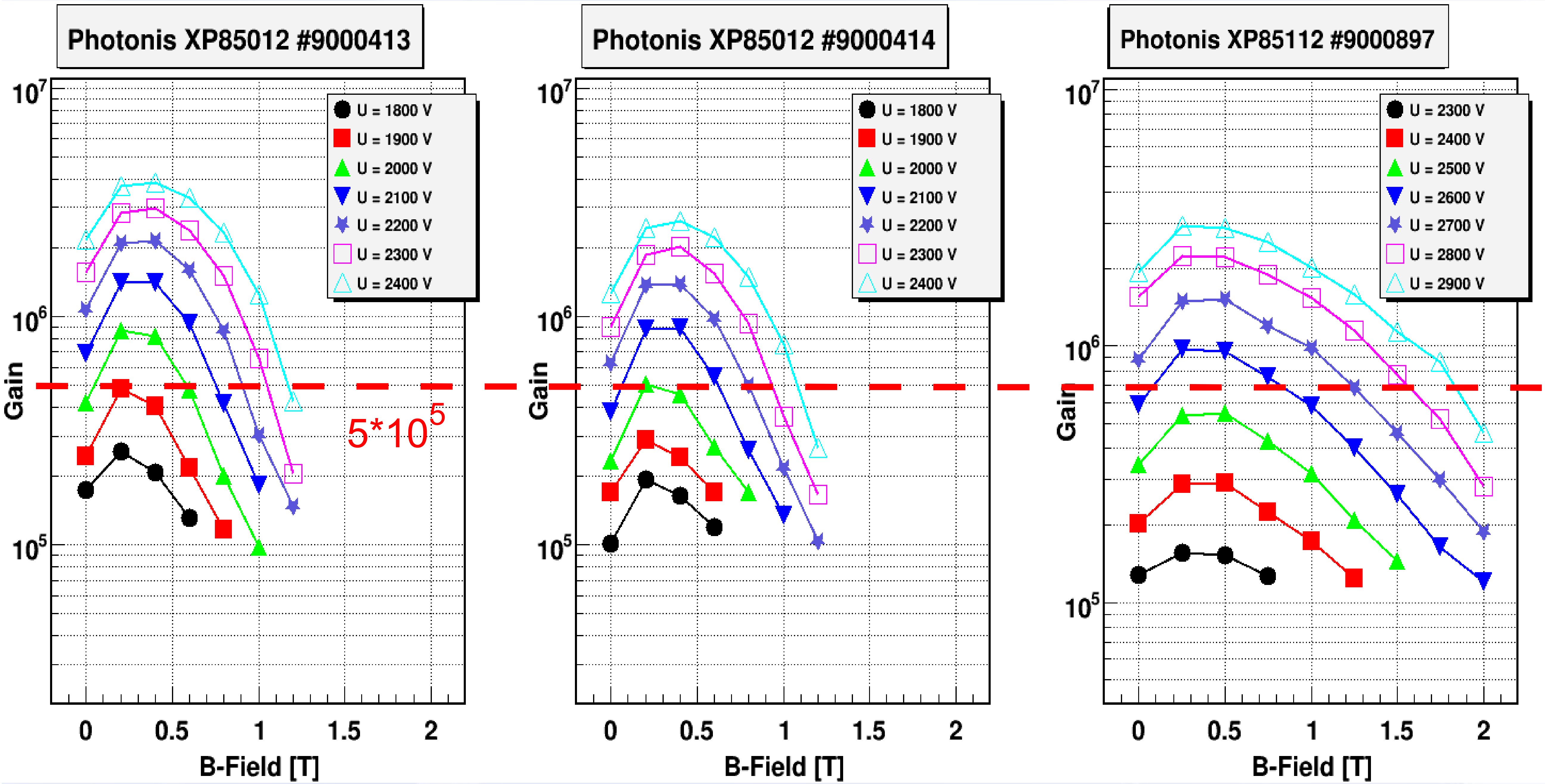

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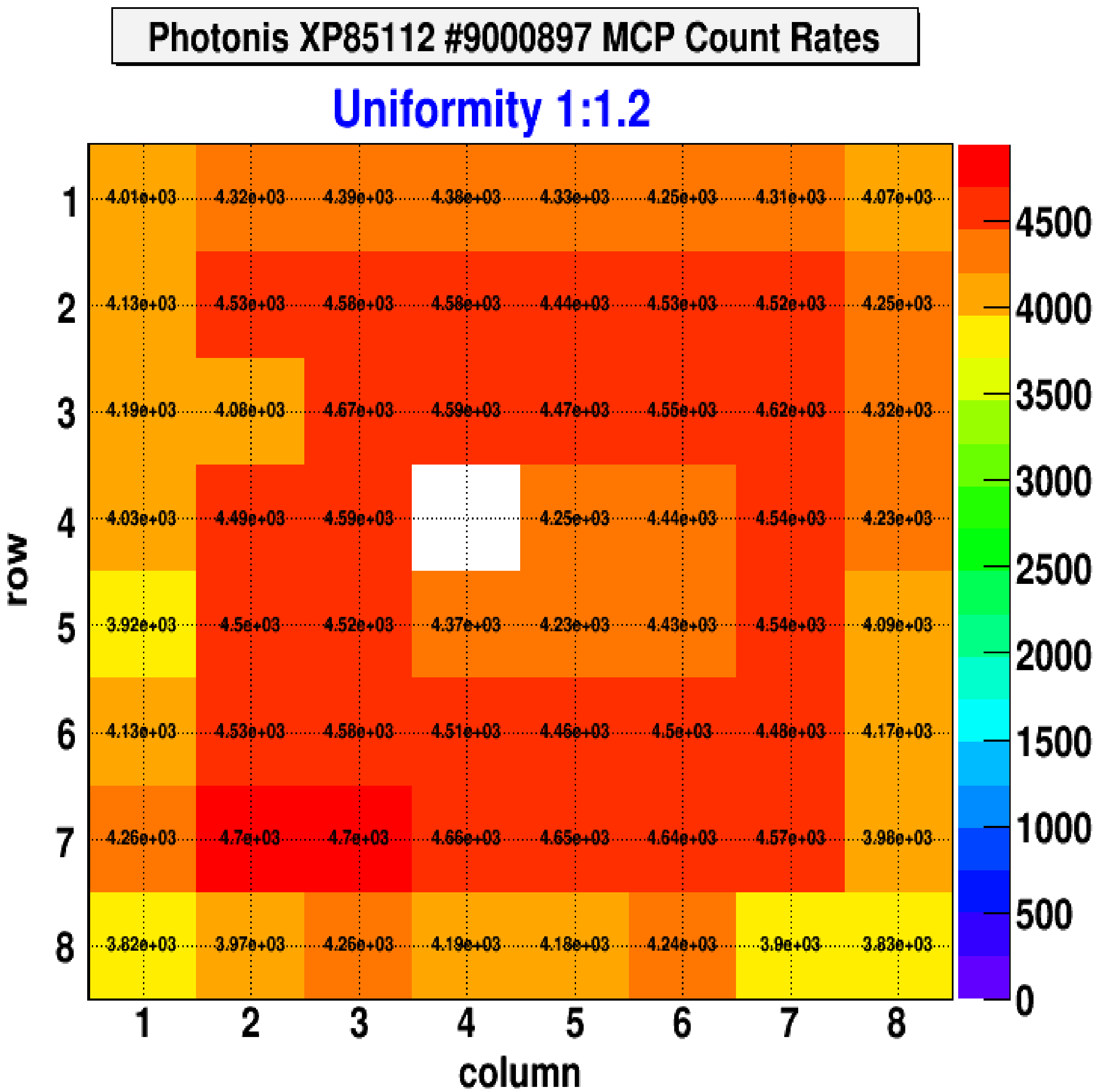

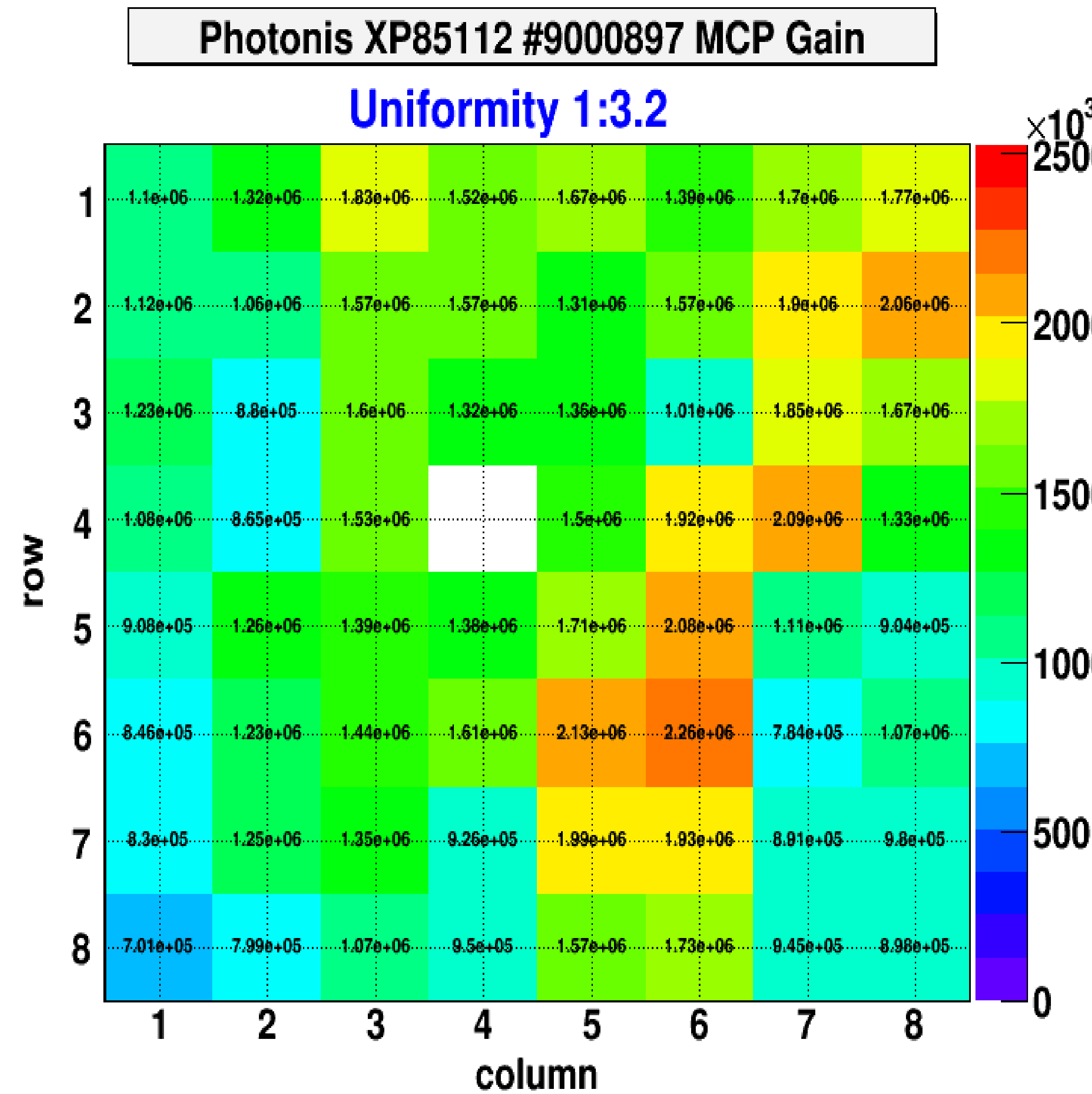

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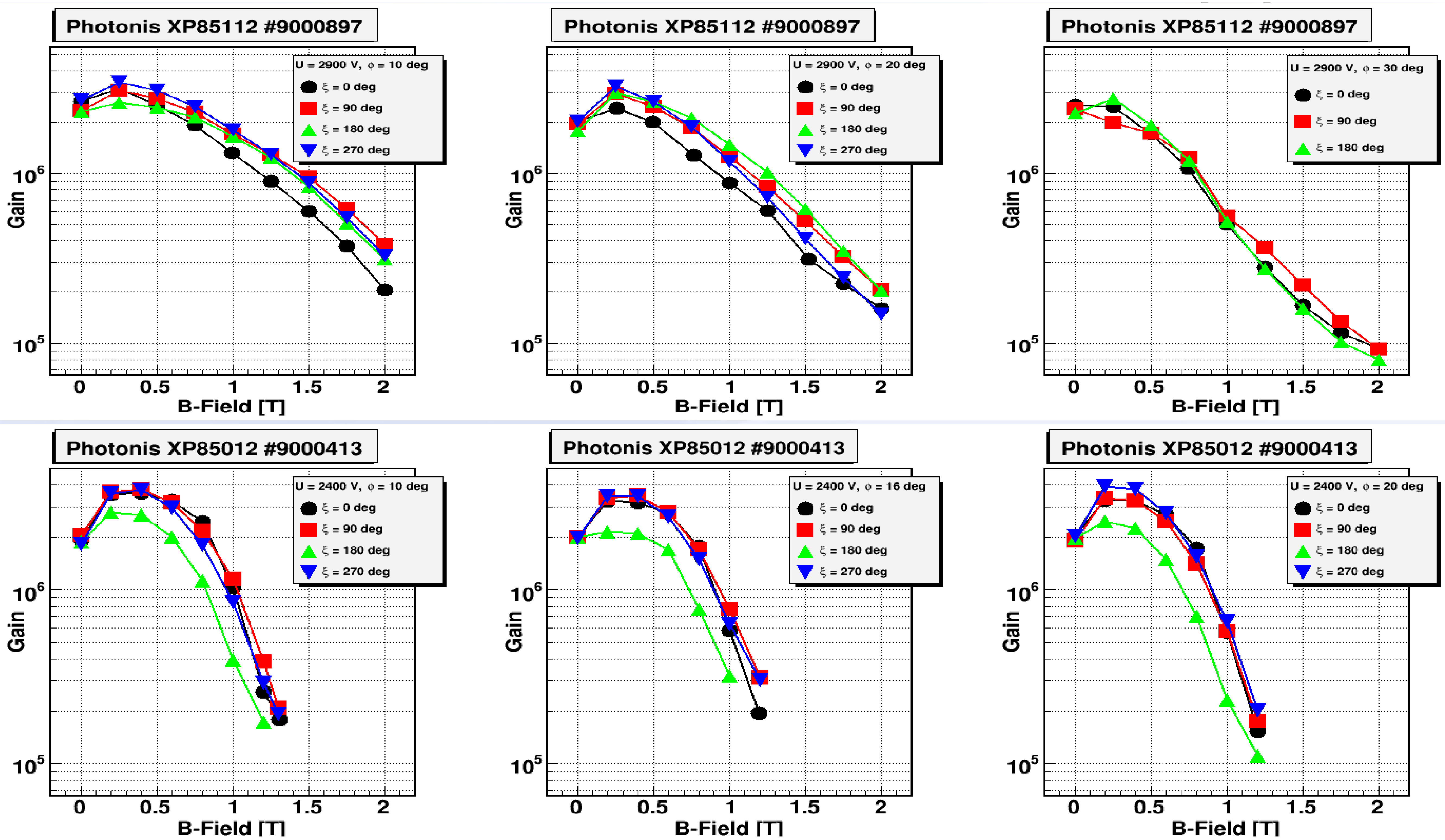
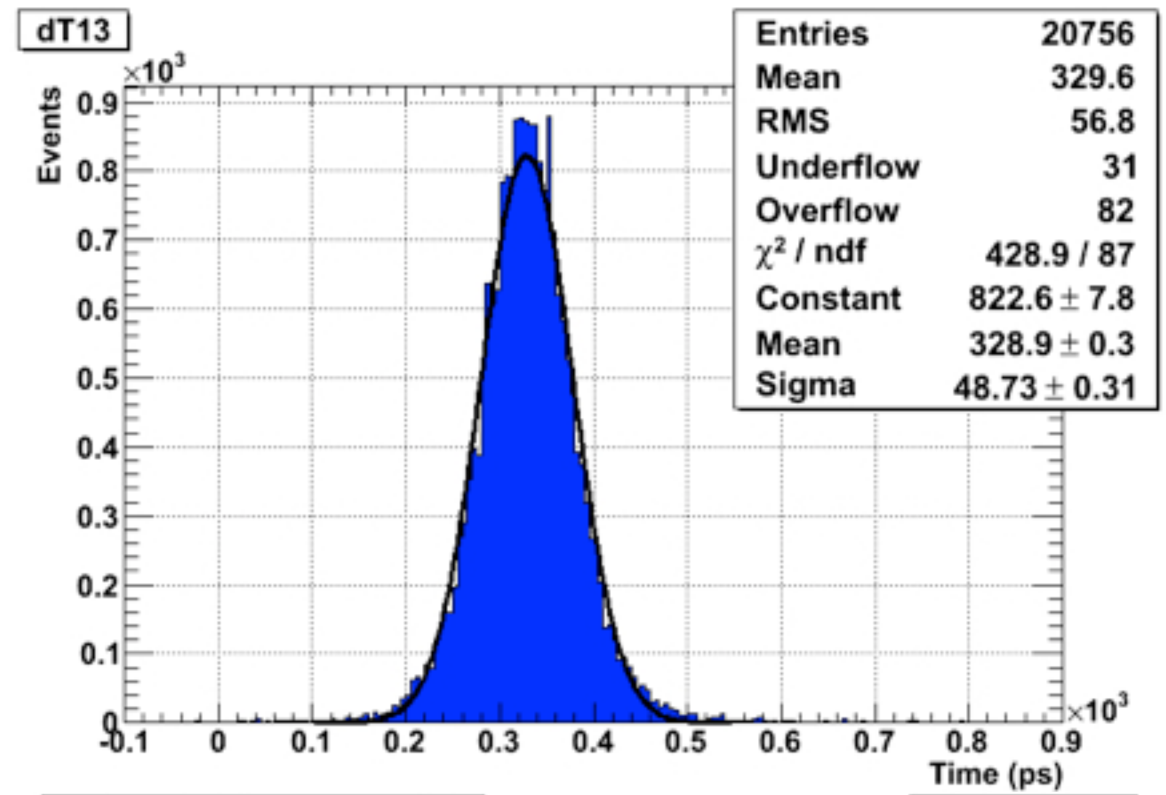
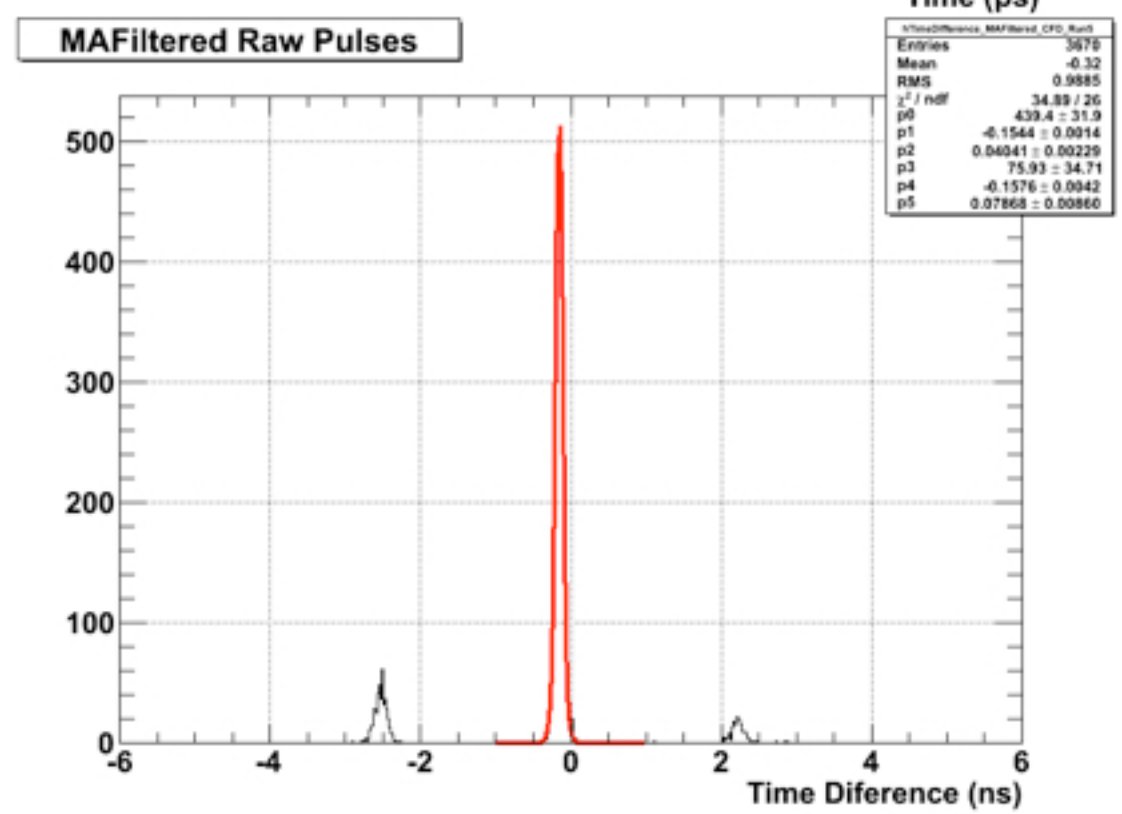


Offline Studies

Nuclear Physics Detector group

with ATLAS Forward Physics Project (Quartic test beam @CERN SPS)





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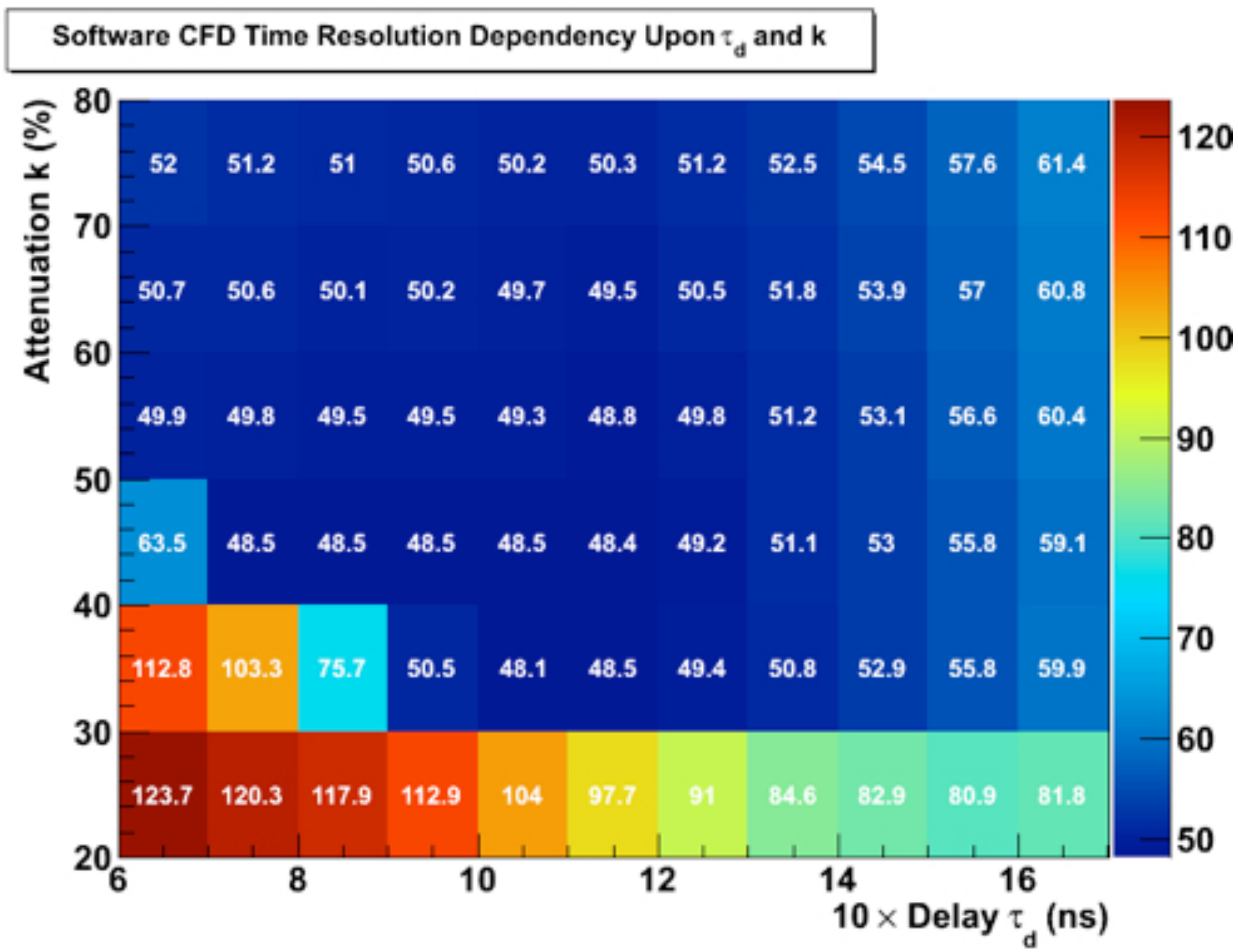
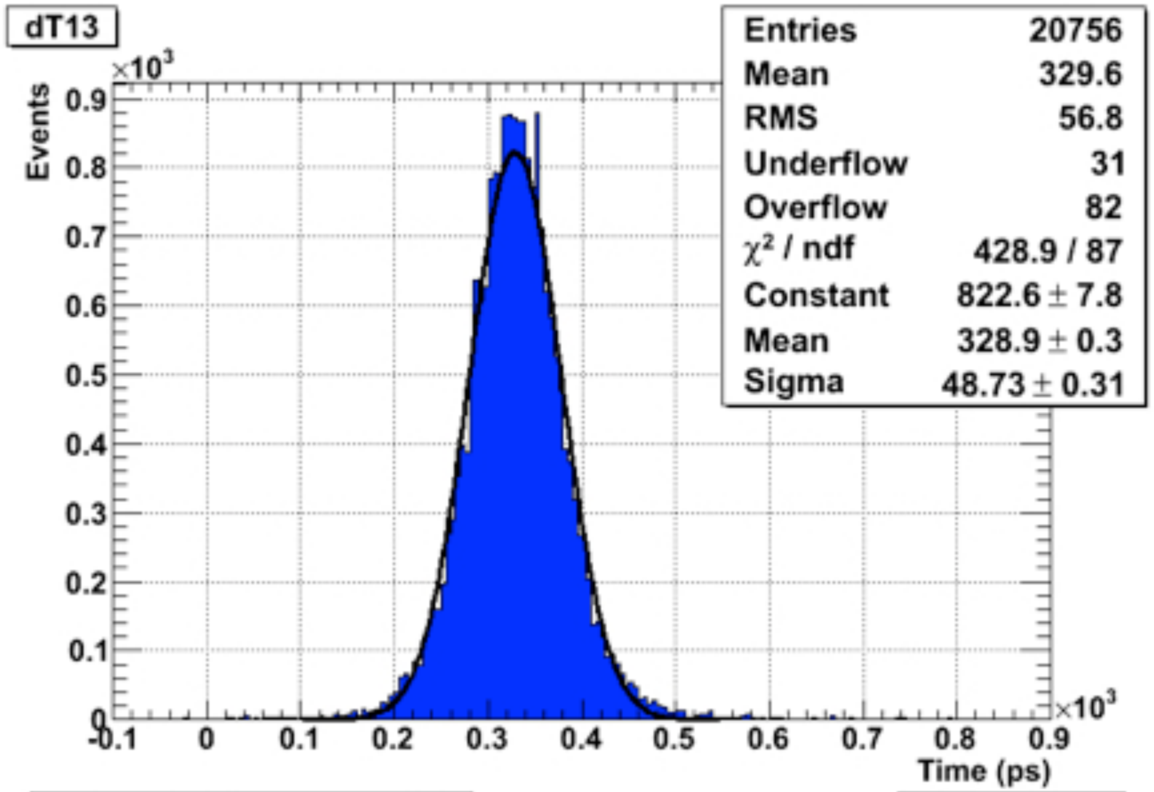
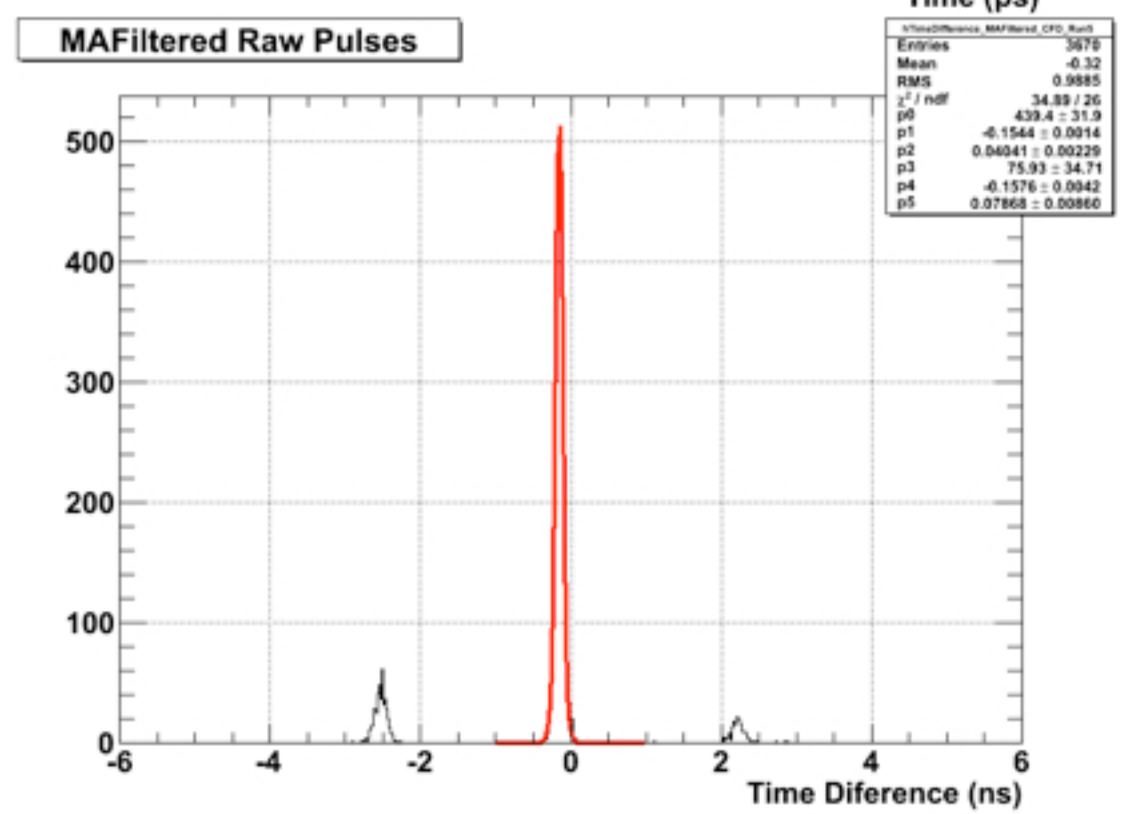
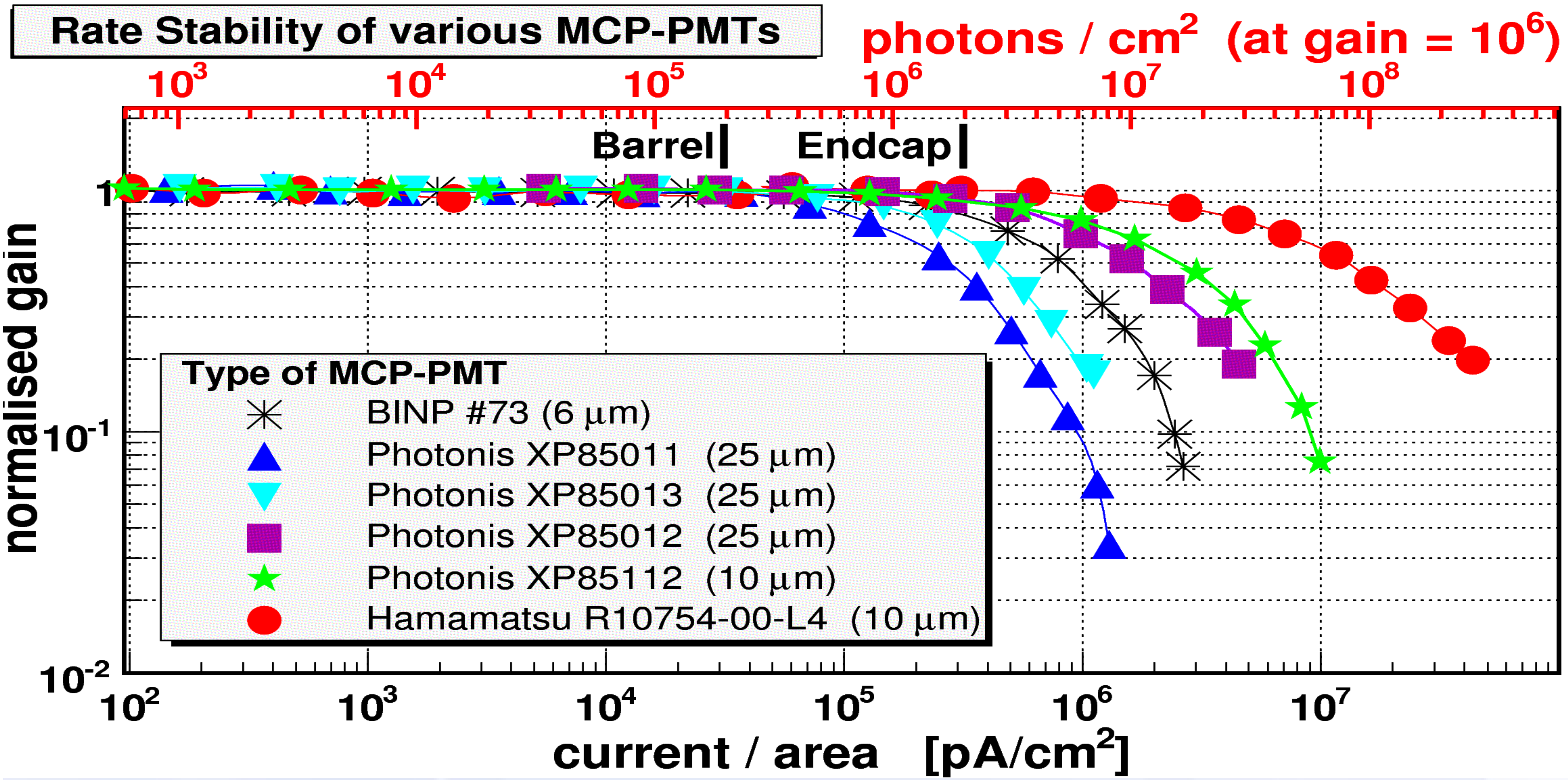






MCP PMT Blues

Nuclear Physics Detector group with F. Uhlig, A. Lehmann, A. Britting, W. Eyrich, S. Reinicke Universität Erlangen-Nürnberg



MCP PMT Blues

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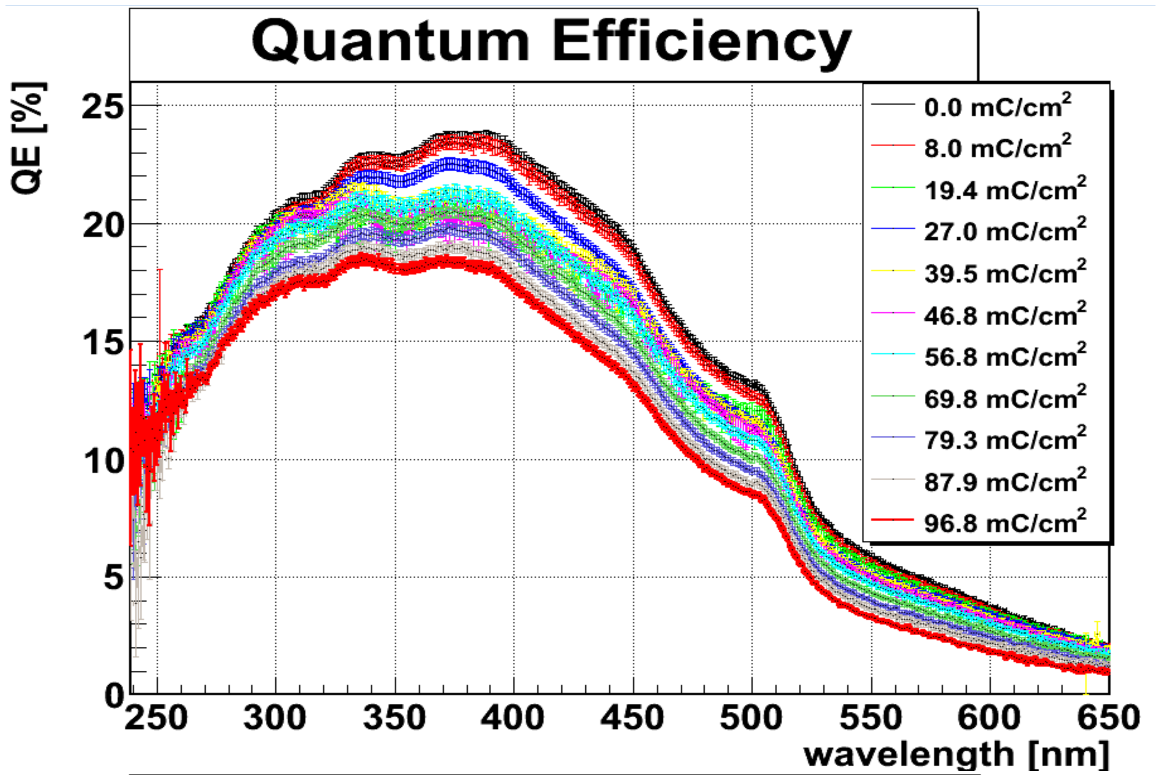

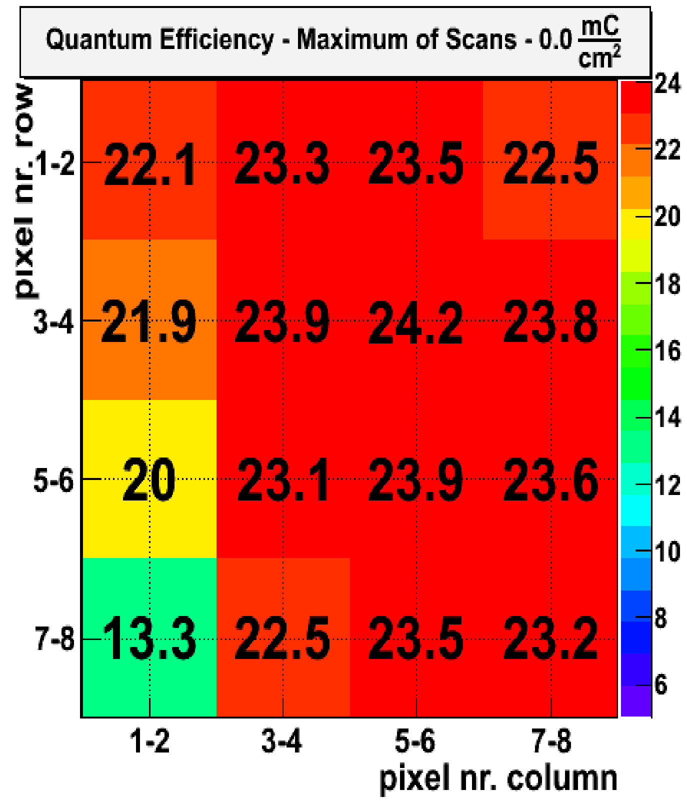

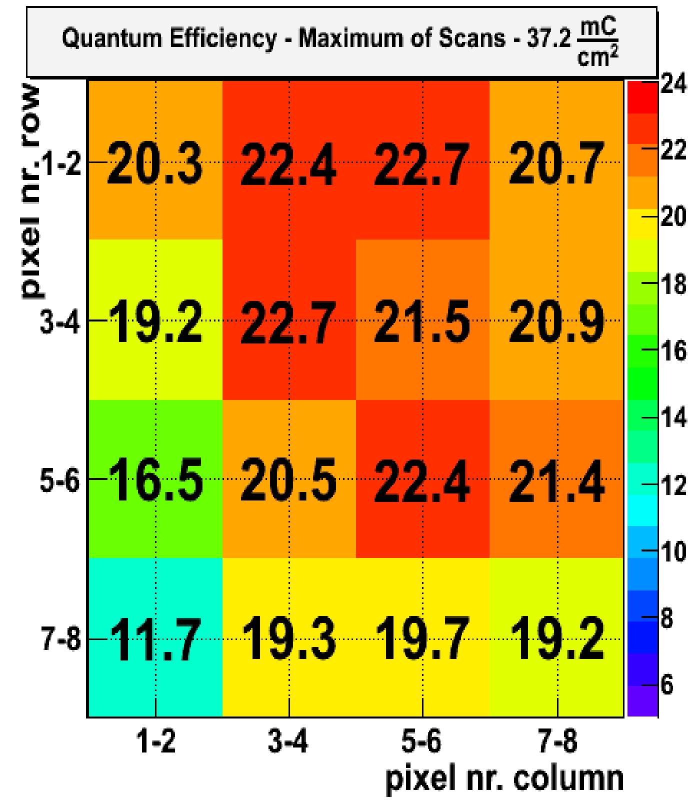

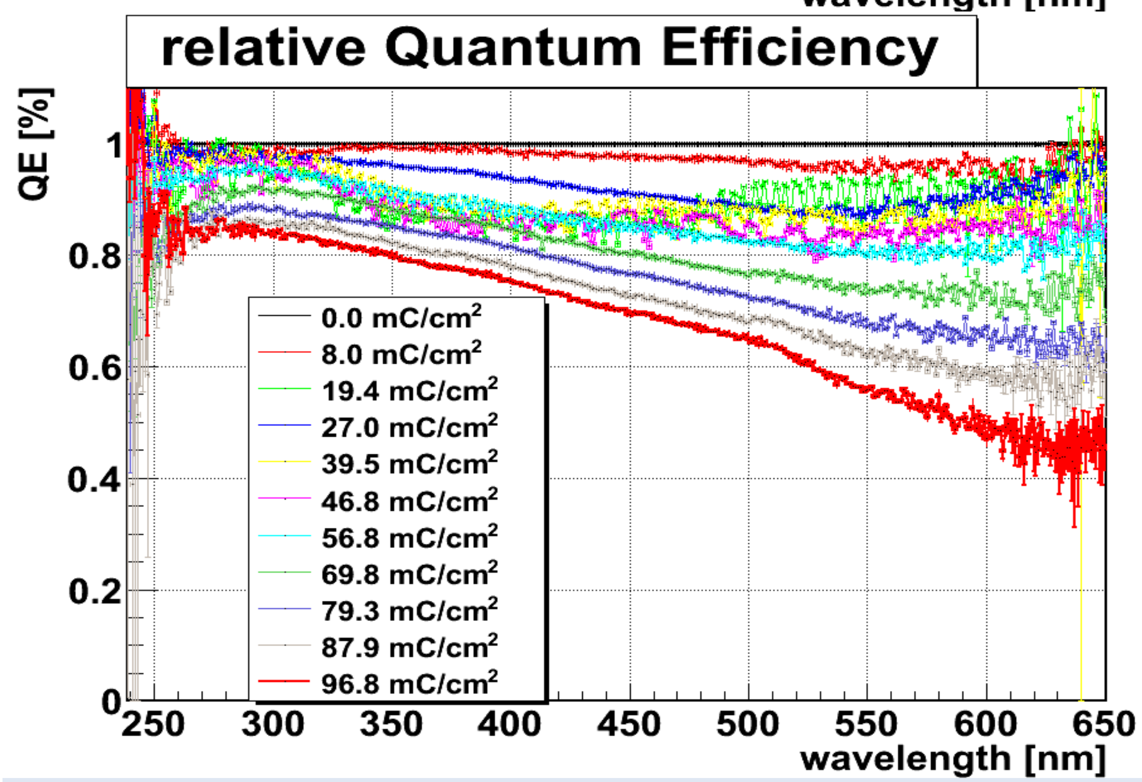

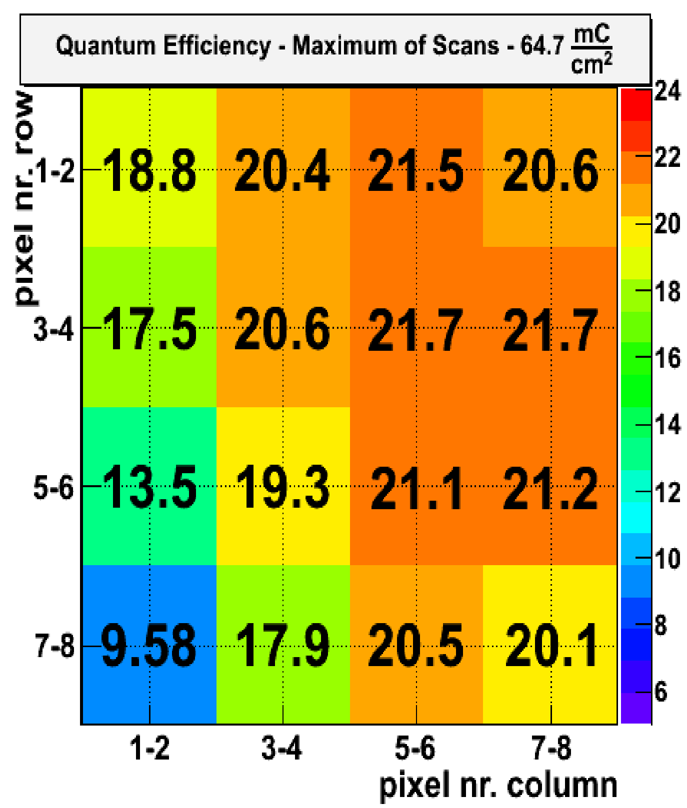

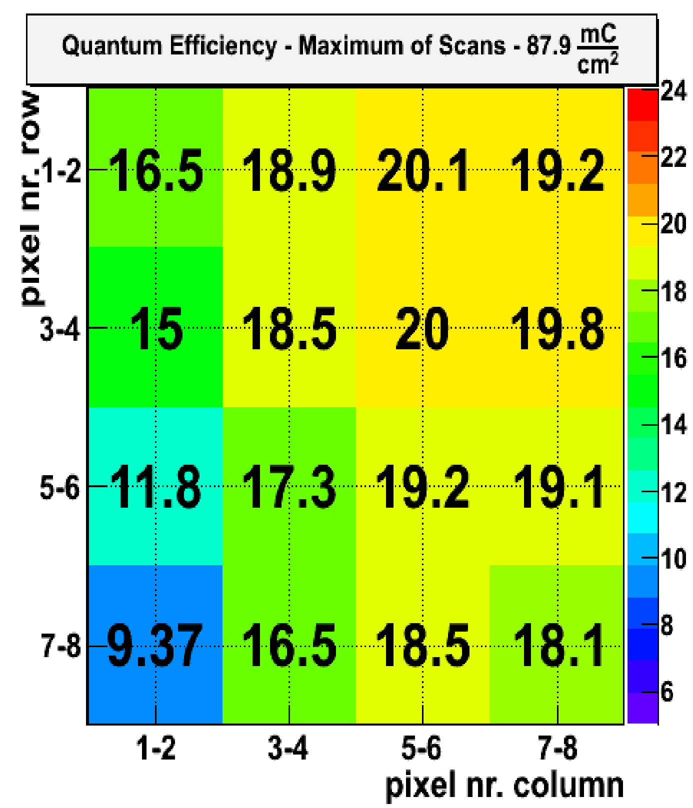

Summary

- Modern detectors in hadron physics require high rate particle identification detectors
- Cherenkov detectors are the method of choice of PANDA at FAIR and CLAS 12 at Jefferson Laboratory
- These detector system require position sensitive, very fast photon detection system
- We studied position dependent responses of MAPMTs, SiPM Arrays and MCP-PMTs
- MCP-PMTs look promising, but have serious issues at high rates and with cathode lifetime
- New generation of PMTs needed ?