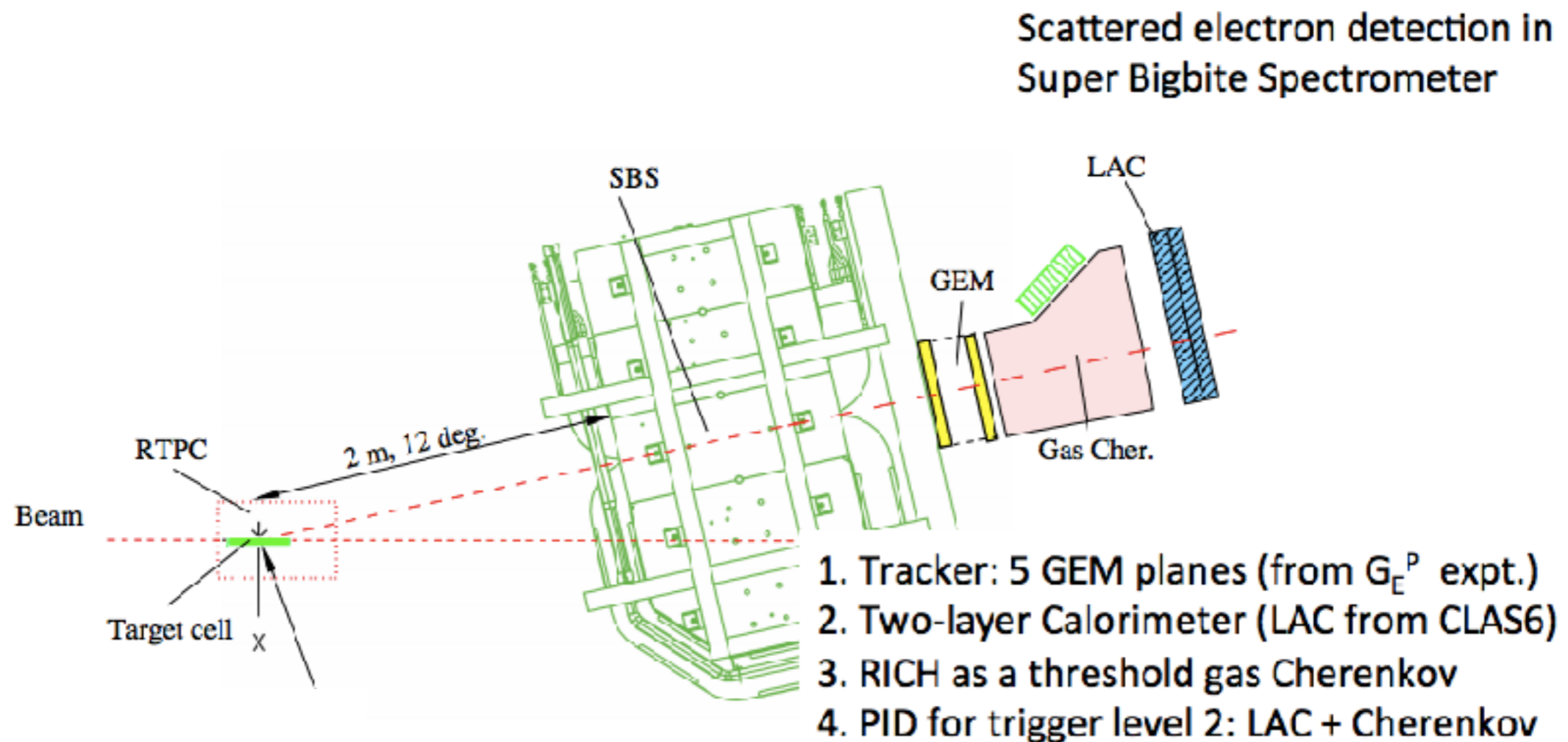


# **Update on the CLAS Large Angle Calorimeter for the SBS**

**Dipankar Dutta**  
**Mississippi State University**

# TDIS needs a calorimeter in the SBS

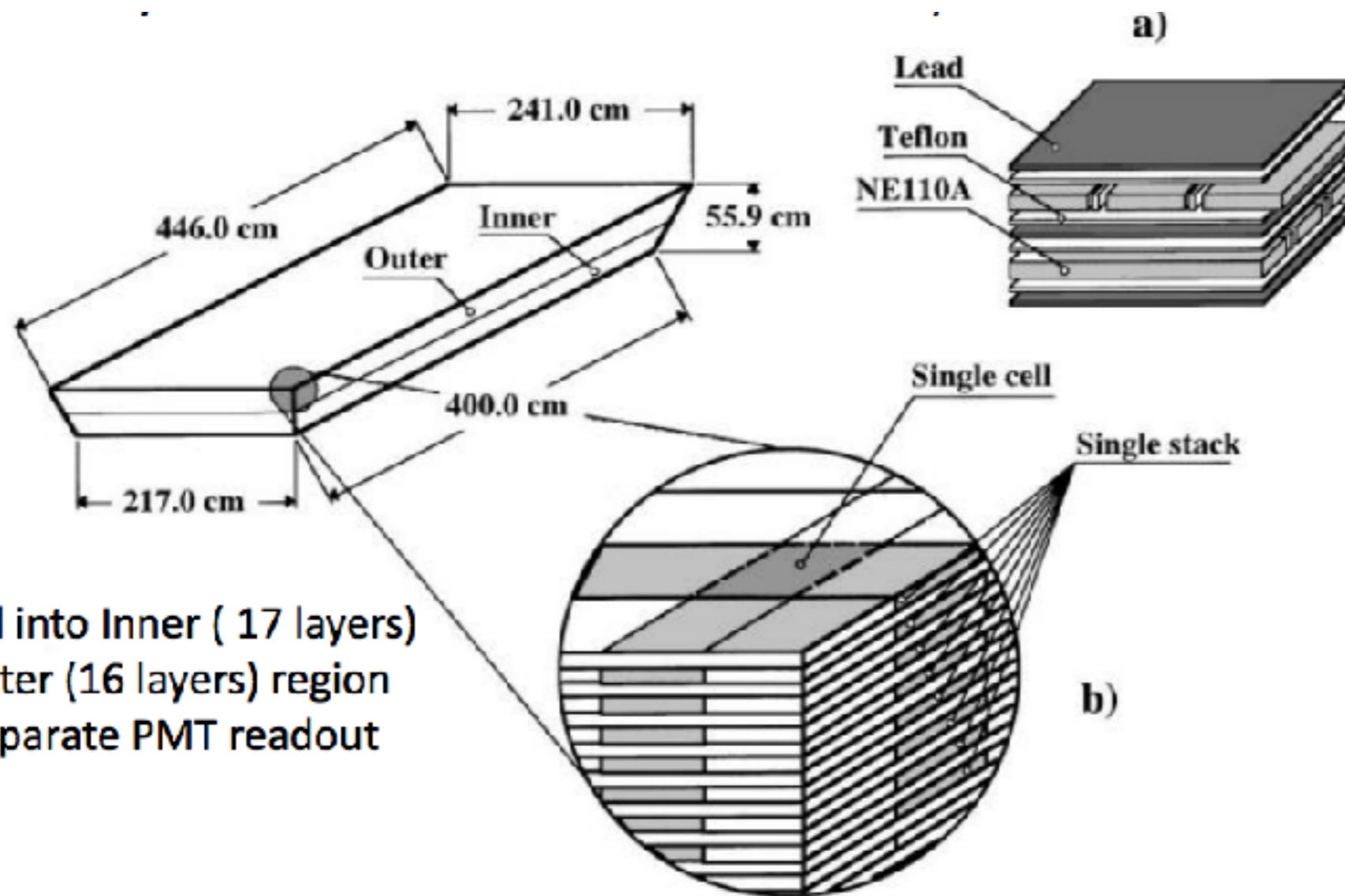
In order to use SBS as an electron spectrometer we need an E&M calorimeter and a Čerenkov detector.



We will repurpose the CLAS Large Angle Calorimeter (LAC) for use in the SBS

# The CLAS Large Angle Calorimeter (LAC)

A lead/scintillator sandwich type calorimeter, 4 m x 2.2 m in area



2 mm Pb + 0.2 mm Teflon  
+ 1.5 cm x 10 cm scintillator

33 layers, 12.9 rad. length

Alternate scintillator layer  
rotated by 90°

Divided into Inner ( 17 layers)  
and Outer (16 layers) region  
with separate PMT readout

Built by INFN for CLAS6

M. Anghinolfi et al., NIM A537, 562 (2005)

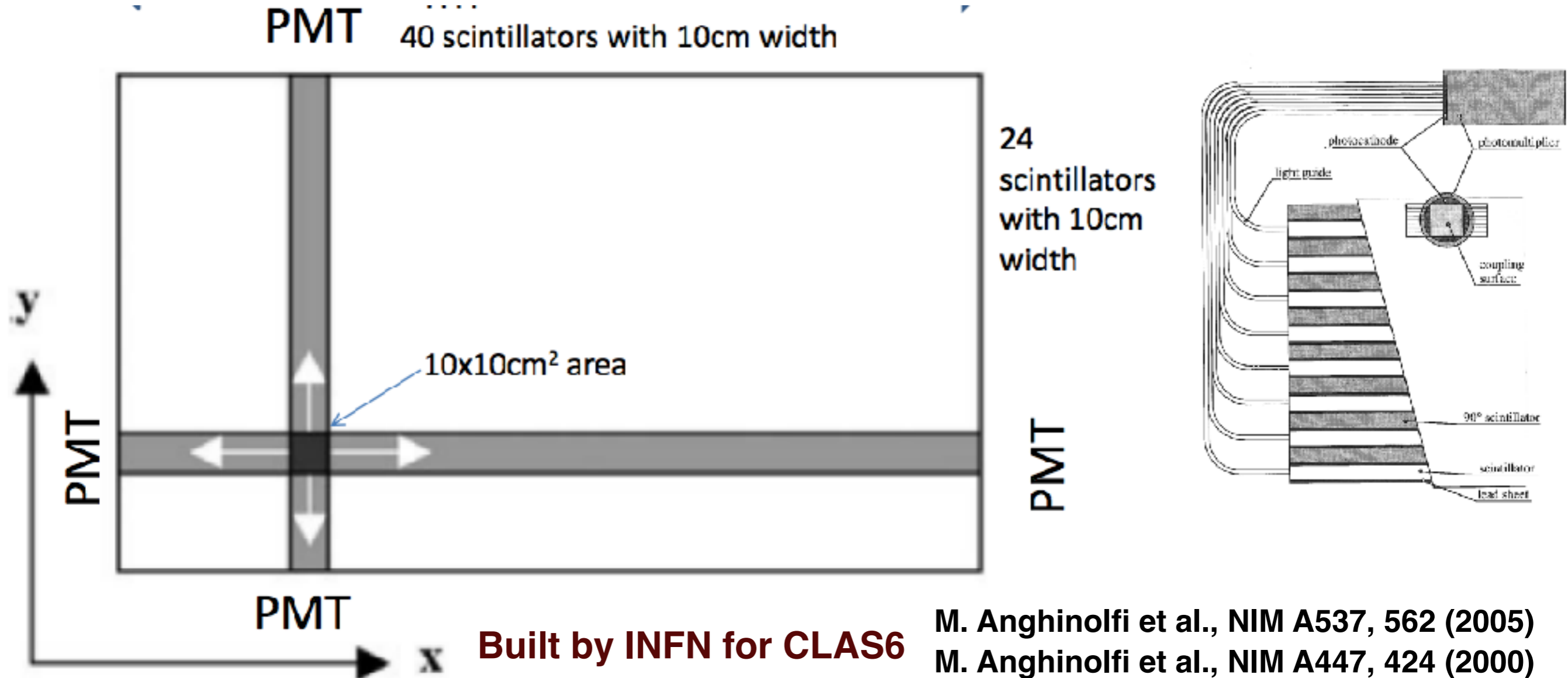
M. Anghinolfi et al., NIM A447, 424 (2000)

# The CLAS Large Angle Calorimeter (LAC)

A lead/scintillator sandwich type calorimeter, 4 m x 2.2 m in area

40x24 matrix of 10x10 cm<sup>2</sup> cells, read out on all 4 sides

2 readout layers (improved e/pi separation)  
⇒ 256 PMTs (EMI 9954A)



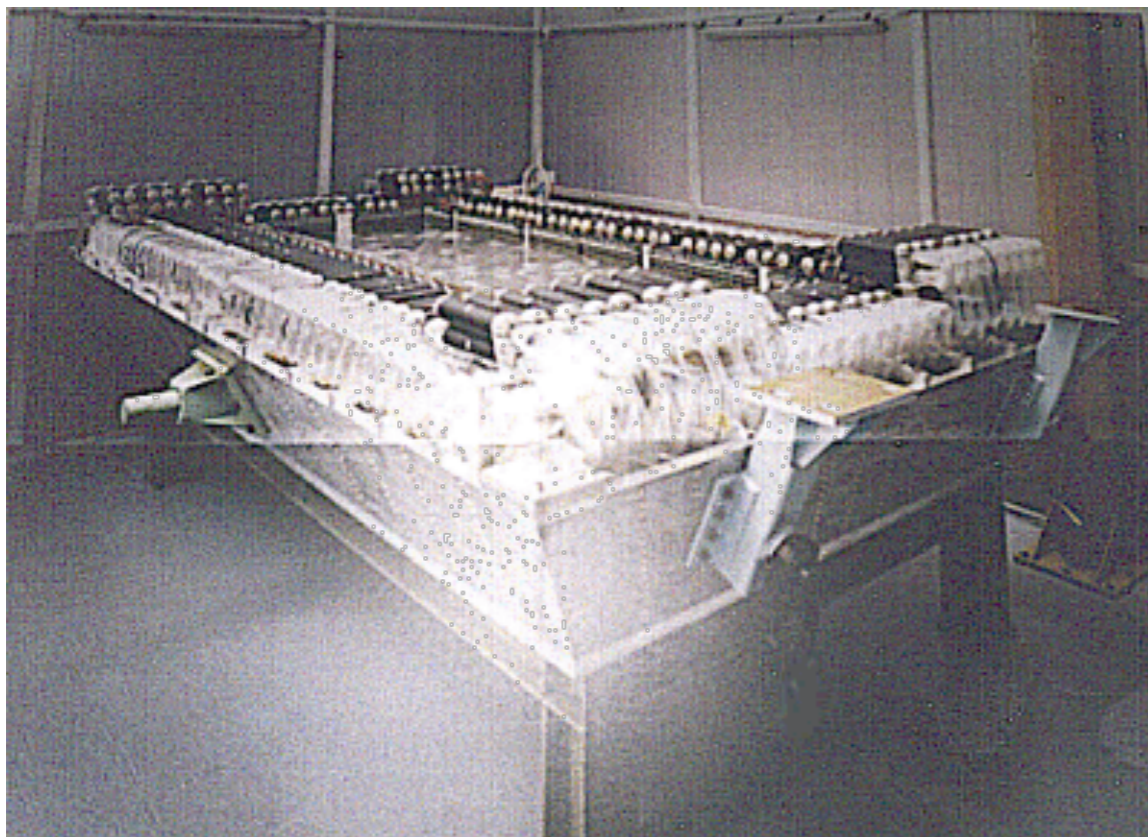


# The CLAS Large Angle Calorimeter (LAC)

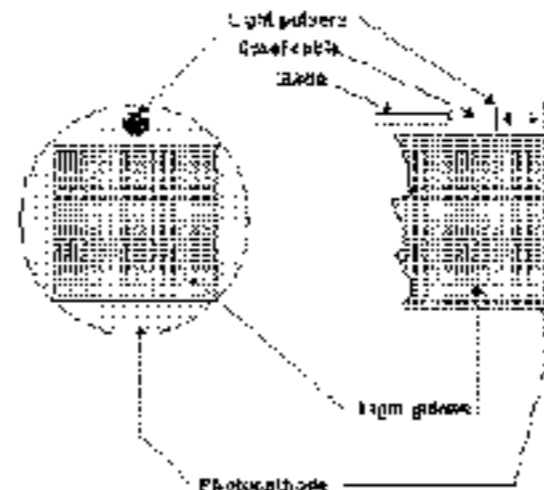
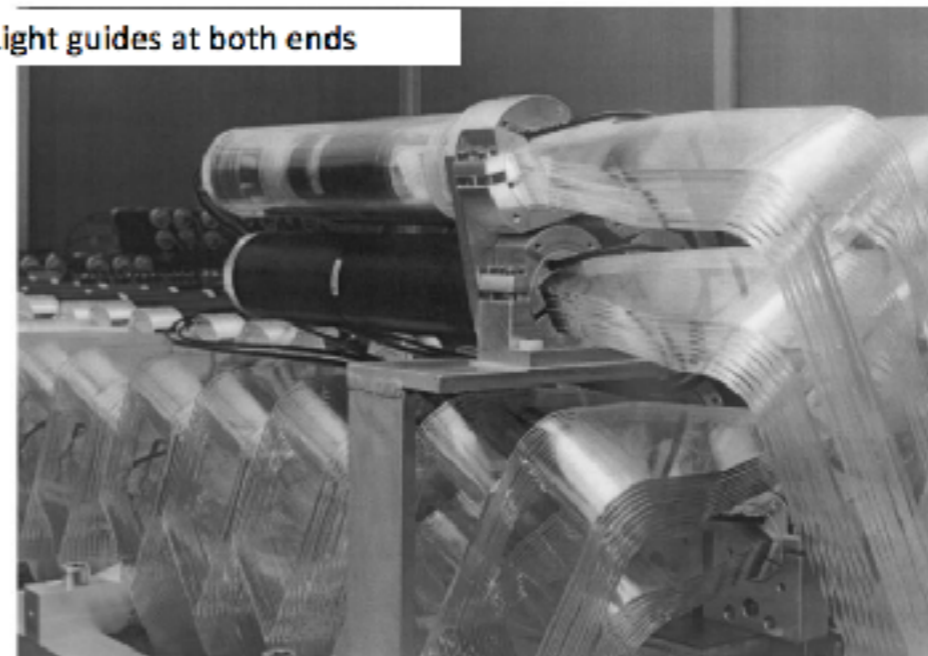
A lead/scintillator sandwich type calorimeter, 4 m x 2.2 m in area

40x24 matrix of 10x10 cm<sup>2</sup> cells, read out on all 4 sides

2 readout layers (improved e/pi separation)  
⇒ 256 PMTs (EMI 9954A)



Light guides at both ends



Gain monitoring system on each PMT

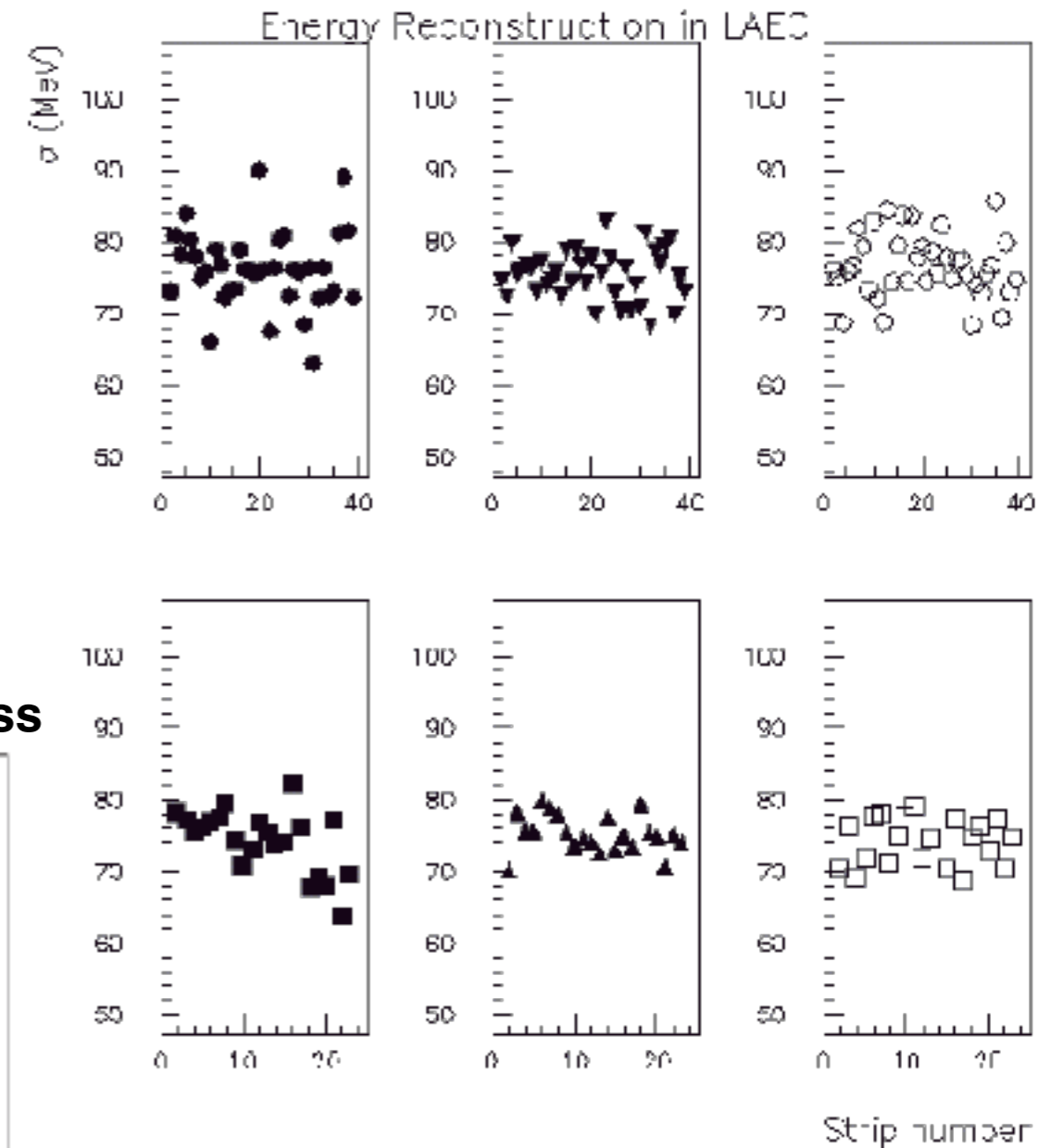
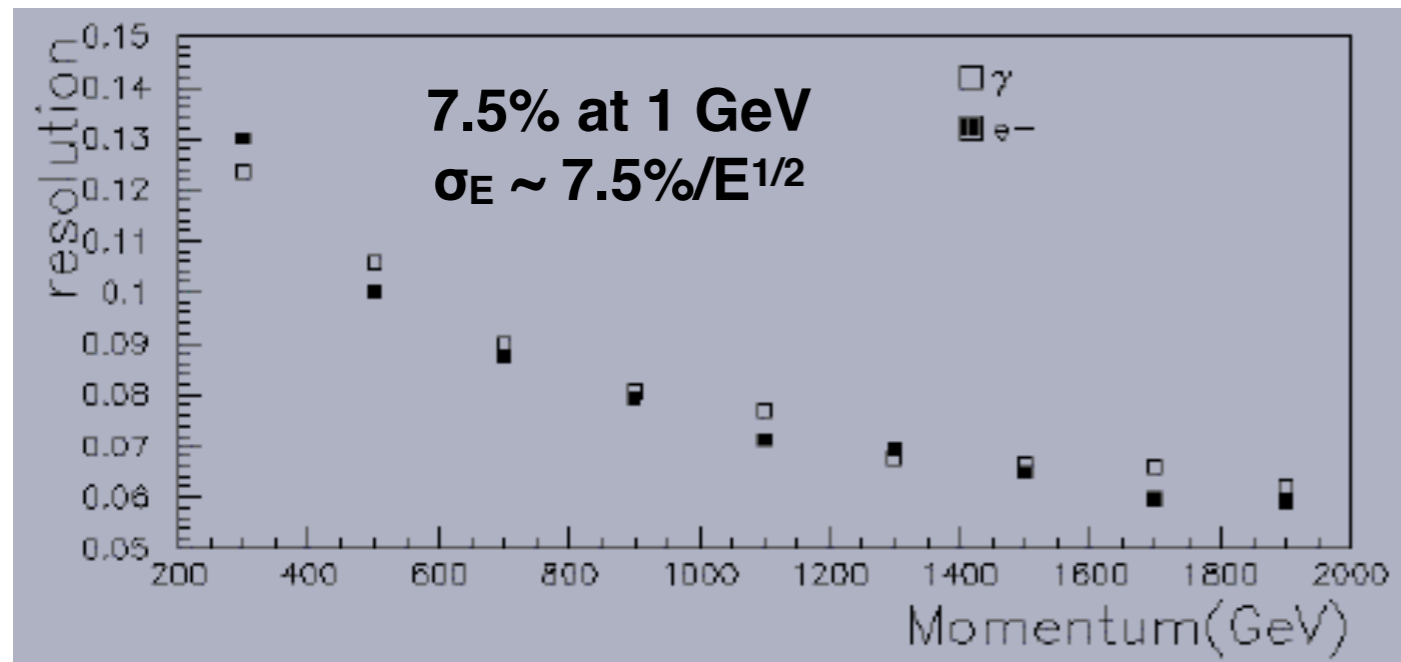
radioactive light pulsers,  
YAP: Ce+<sup>241</sup>Am

M. Anghinolfi et al., NIM A537, 562 (2005)

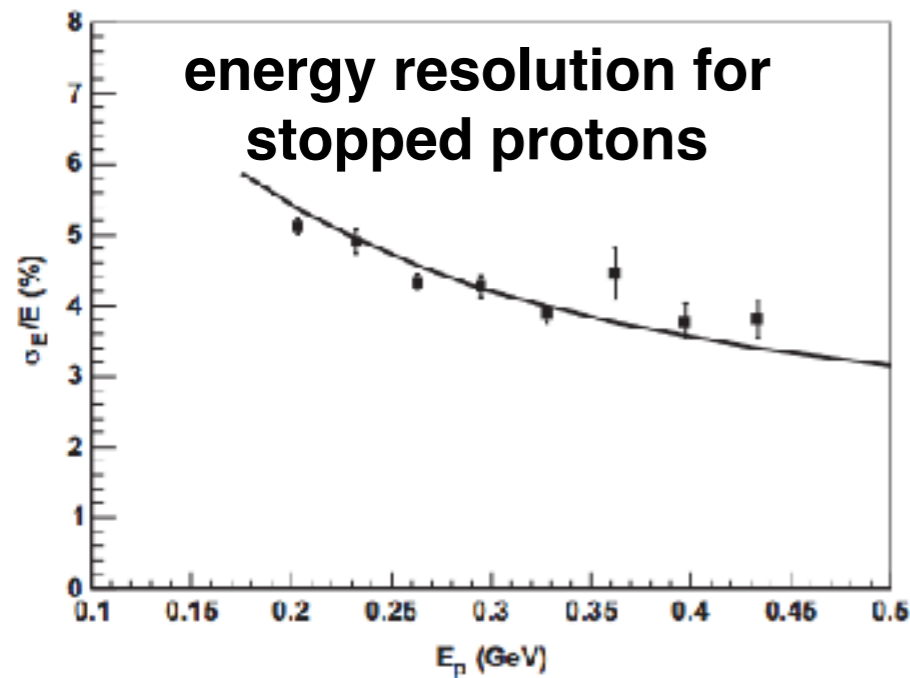
M. Anghinolfi et al., NIM A447, 424 (2000)

# The LAC's performance parameters

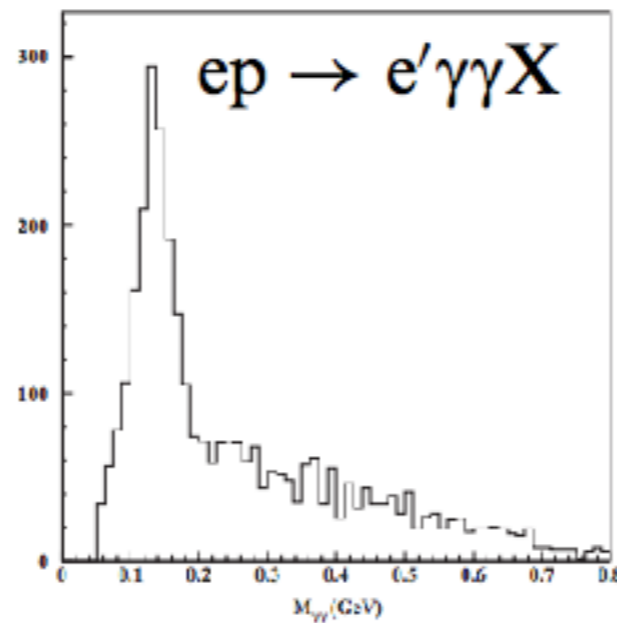
## Energy resolution



Energy reconstruction of 1 GeV electrons vs position (uniformity of response)



## reconstructed inv. mass



position resolution : 2.9 cm; time resolution : 250 ps ; pi-rejections ~ 10-20



# The current status of the LAC



**Was kept in Hall-A shed  
until Nov, 2016**



**moved to  
the ESB in Nov, 2016**



# The current status of the LAC

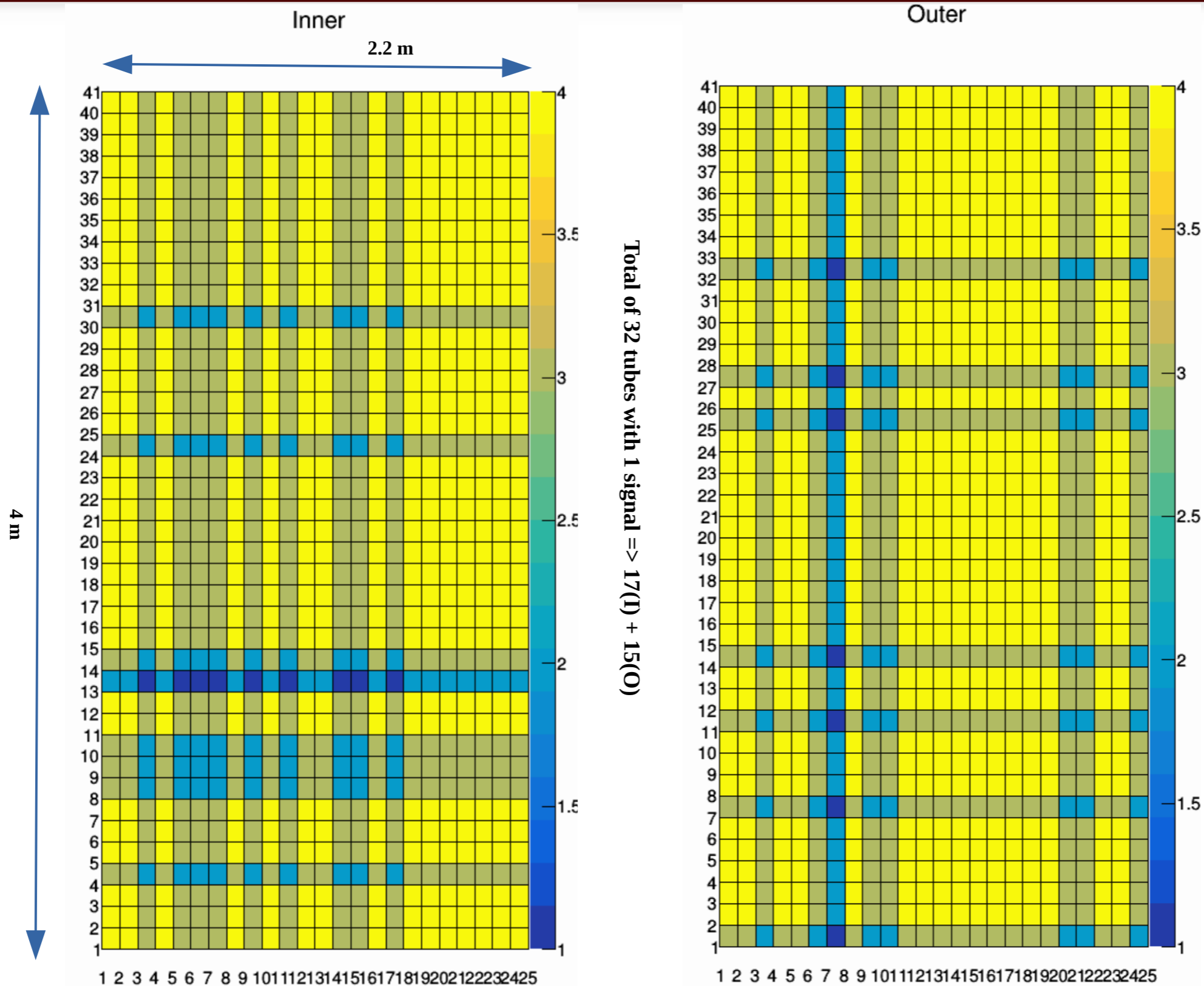
**moved to  
the ESB in Nov, 2016**





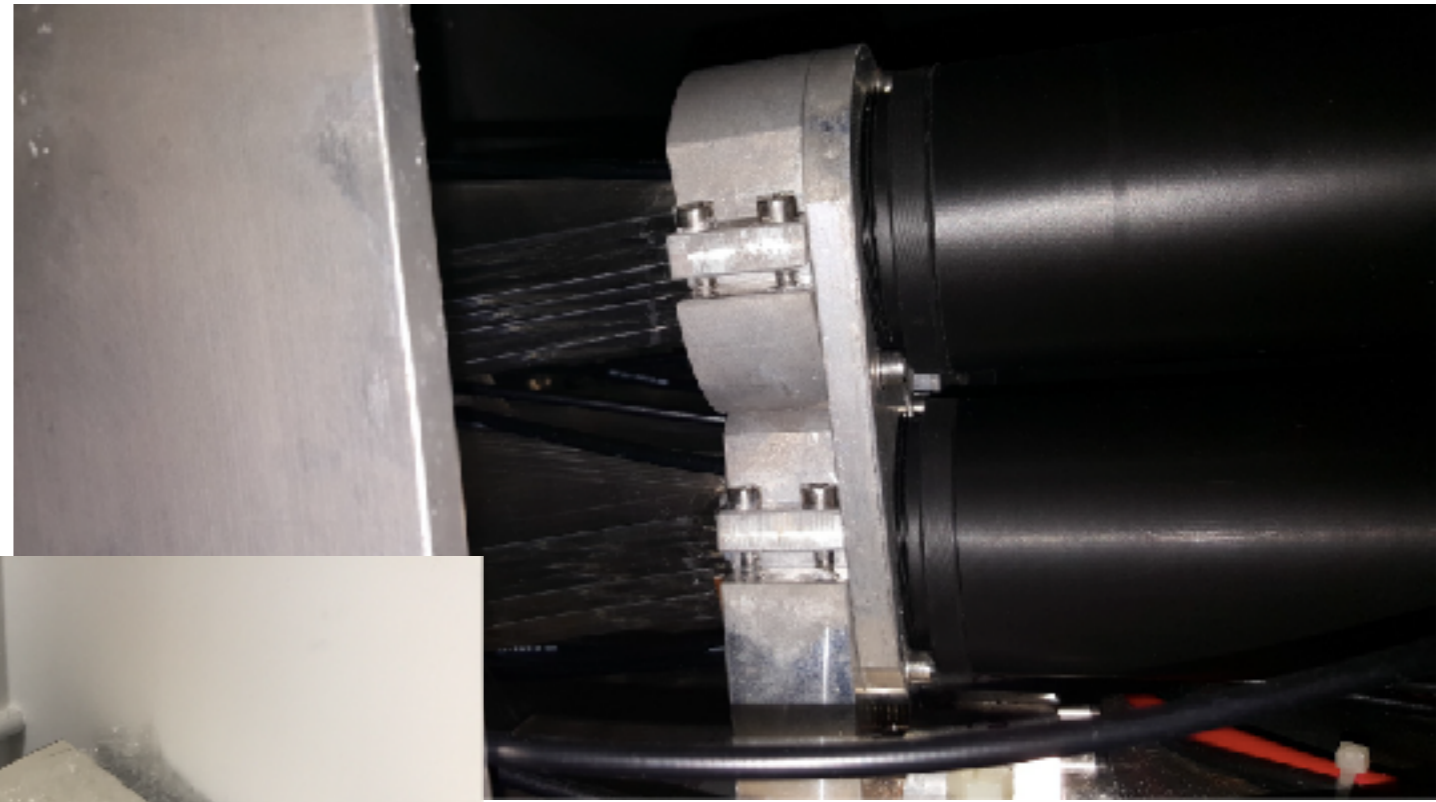
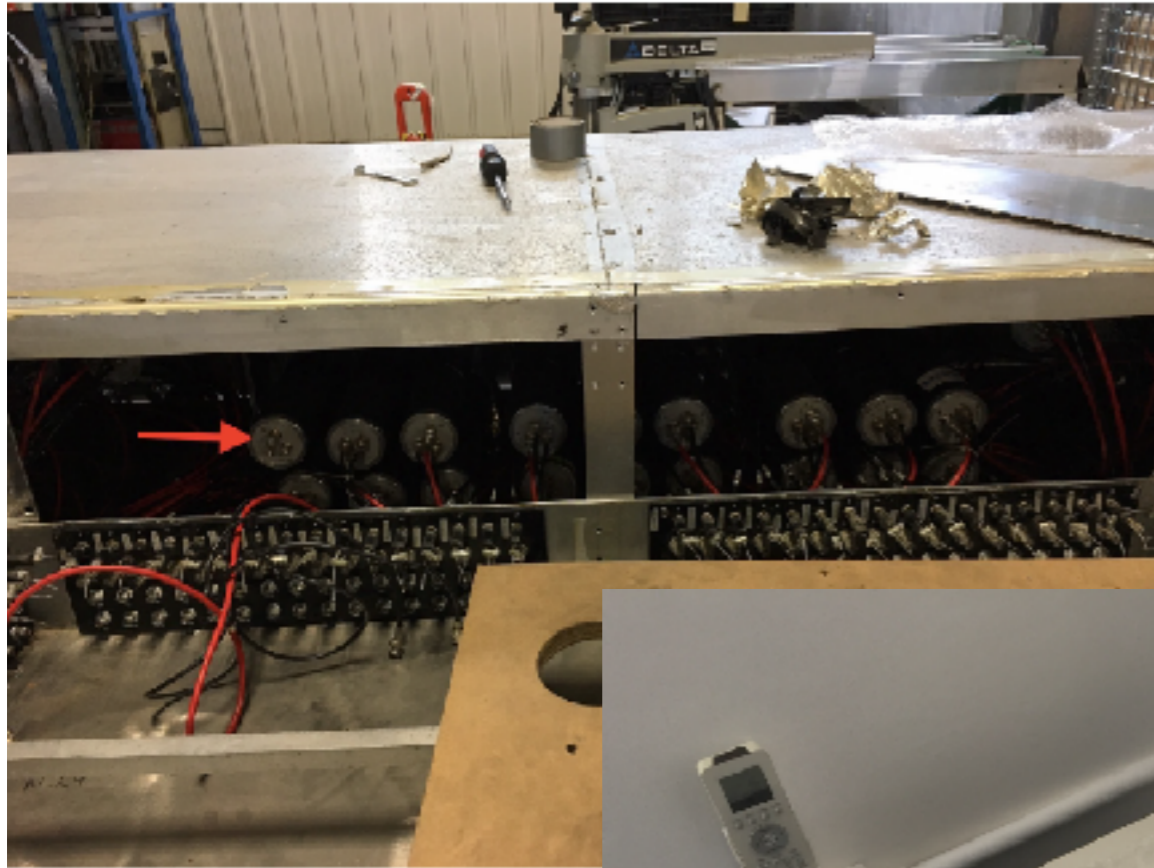


# About 30 tubes need to be replaced





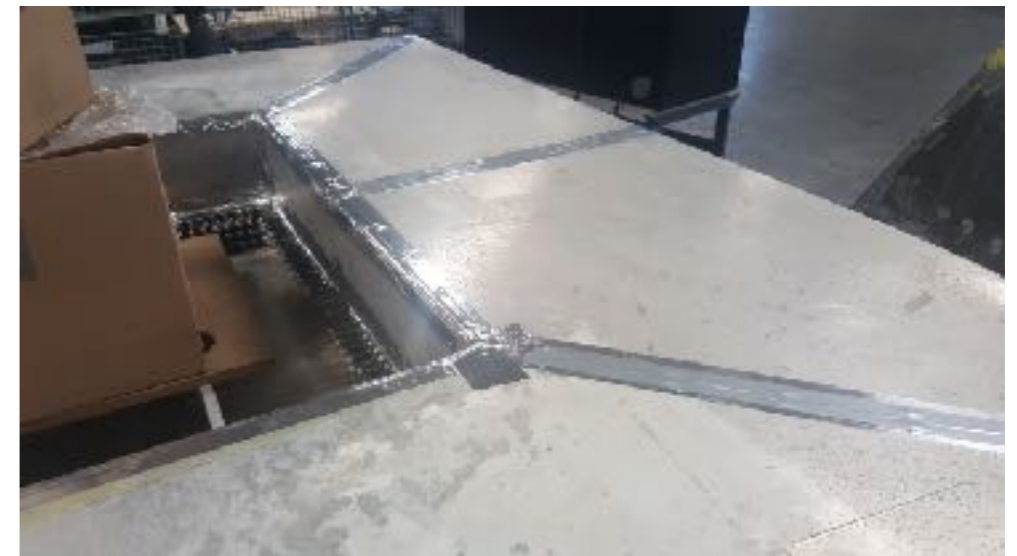
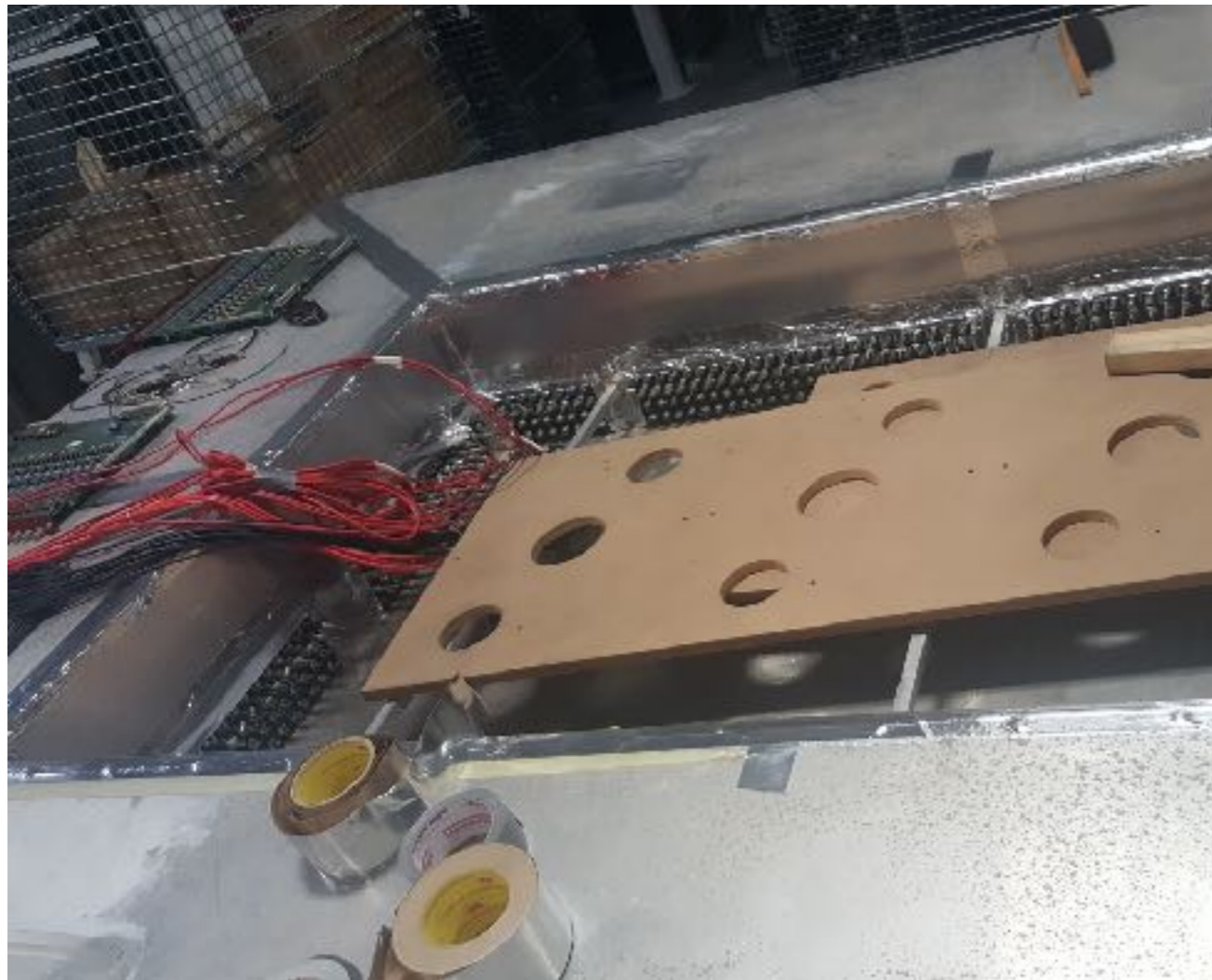
# All defective PMTs replaced with spares from INFN



**Tube replacement work completed in Dec 2017, next phase is testing**



# The LAC has been sealed and made ready for testing.



**Tube replacement work completed in Nov 2017, next phase is testing**

# Full scale test with cosmics planned

**Test of detector response to cosmic rays is being planned for summer 2018**



**Will use the veto scintillators from PrimEx**

**All HV crates and electronics used for the LAC are currently stored in the ESB in a single INFN cage/basket**

**Will need to setup a DAQ computer**