# E07-007/E08-025 status report

Carlos Muñoz Camacho

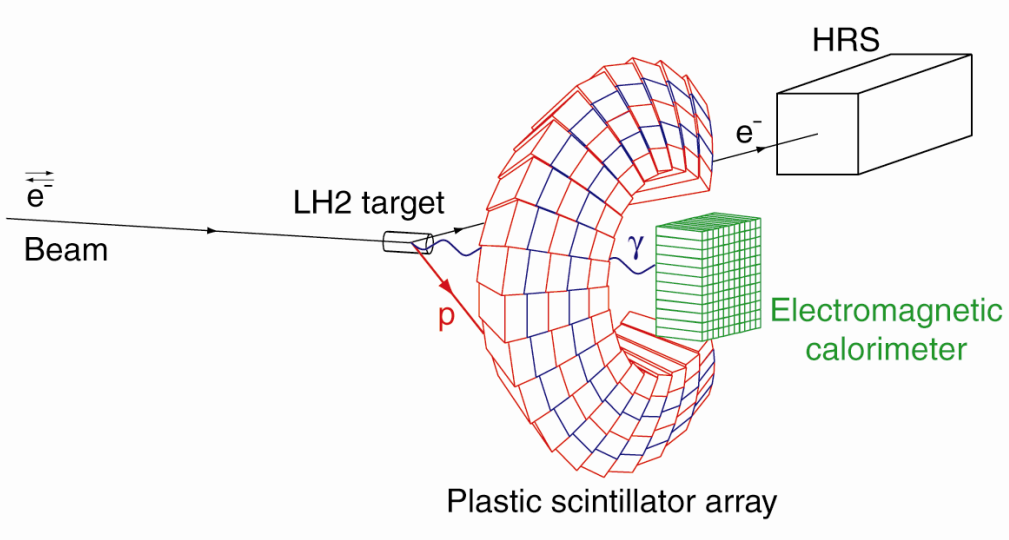
Laboratoire de Physique Corpusculaire, Clermont-Ferrand, IN2P3/CNRS

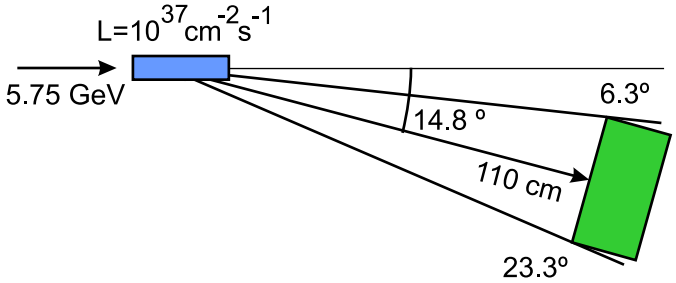
Hall A Collaboration Meeting
JLab, June 11-12 (2009)

# E07-007/E08-025

- Same setup for both experiments E07-007/E08-025
- Only target change from $LH_2$ to $LD_2$
- Tentatively scheduled to run simultaneously in Fall 2010 (installation Summer 2010)
- Only . . . 1 year ahead of us!

# DVCS experiments in JLab/Hall A (E00-110 & E03-106)

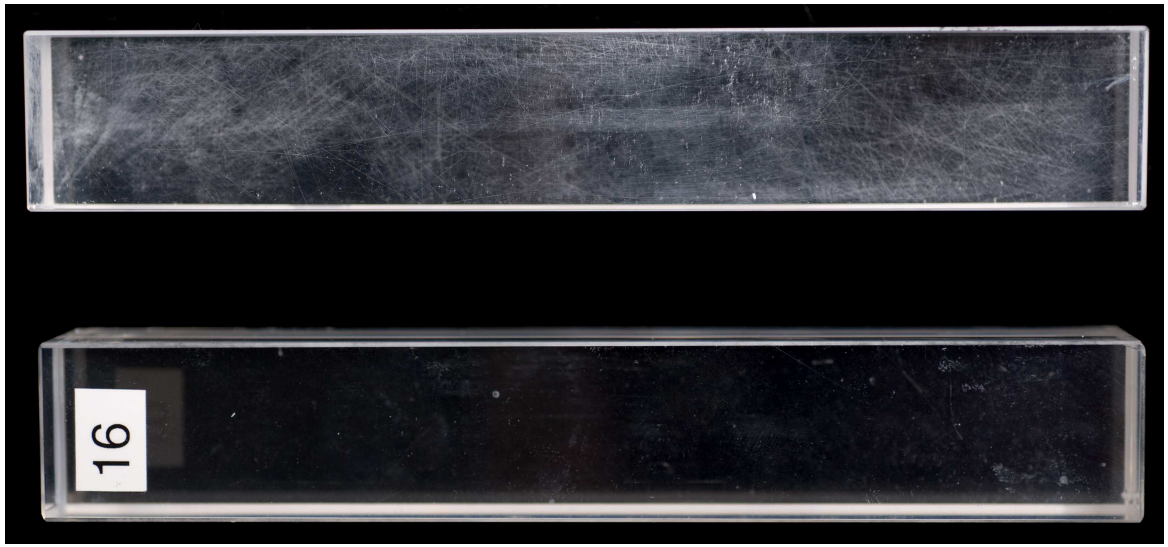



| | E00-110/E03-106 (2004) | E07-007/E08-025 (2010) | E12-06-114 ($\approx$ 2015) |
|---|---|---|---|
| $\mathcal{L}$ | $2 - 4 \cdot 10^{37} s^{-1} cm^{-2}$ | $4 \cdot 10^{37} s^{-1} cm^{-2}$ | $4 \cdot 10^{37} s^{-1} cm^{-2}$ |
| $\int \mathcal{L}\ dt$ | $25\ ab^{-1}$ | $50\ ab^{-1}$ | $90\ ab^{-1}$ |

# $PbF_2$ blocks

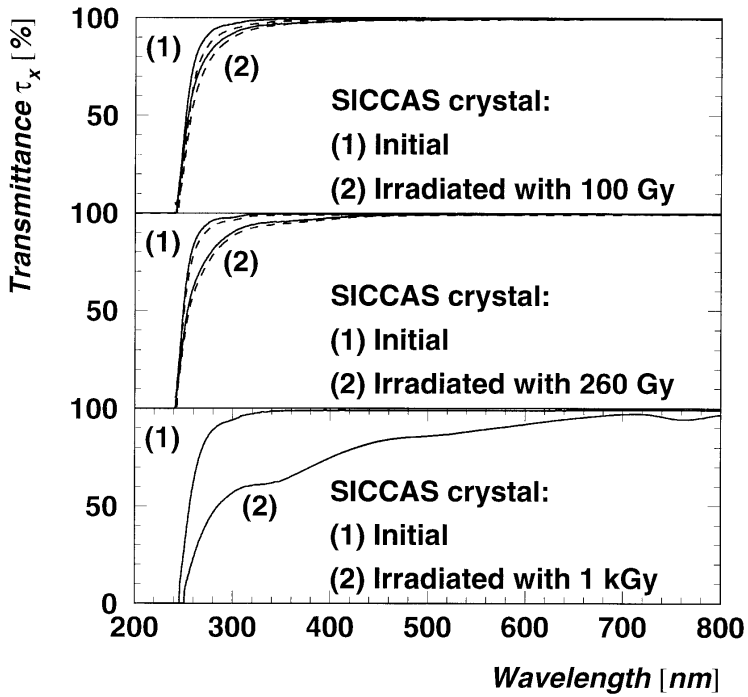
- 100 new $PbF_2$ blocks ordered to SICCAS ($\sim 1000$\$/ea, ANR)
  - First 30 blocks delivered to JLab last October
  - Mechanical (size & transmission) specs were met
  - Surface finish worse than previous (2003) delivery:




  - Blocks replaced by SICCAS (some additional delay)
  - Beamtime at Idaho for radiation hardness test
  - Remaining blocks to be delivered in the next few months

# Radiation tests on $PbF_2$ by the A4 collaboration

- Radiation tests with $^{60}$Co source ($\approx$ 1 MeV photons)
- Successful optical bleaching with light of $\lambda \gtrsim 365$ nm
- Multiple cycles of successful bleaching reported

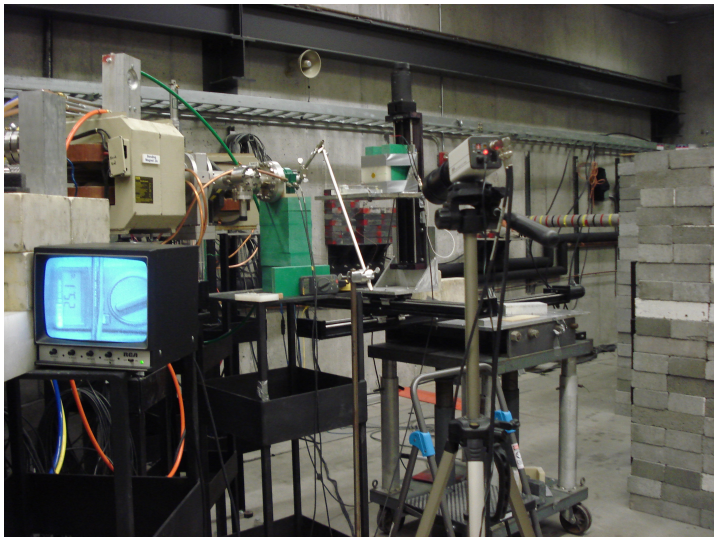


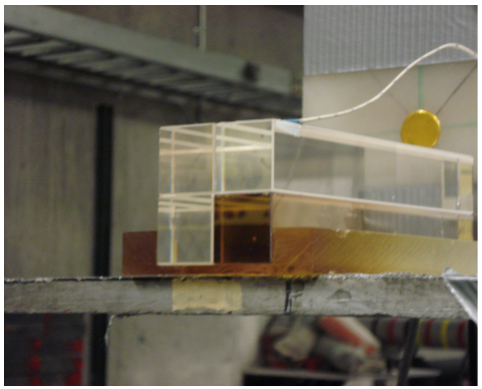

Achenbach et al. (1998)

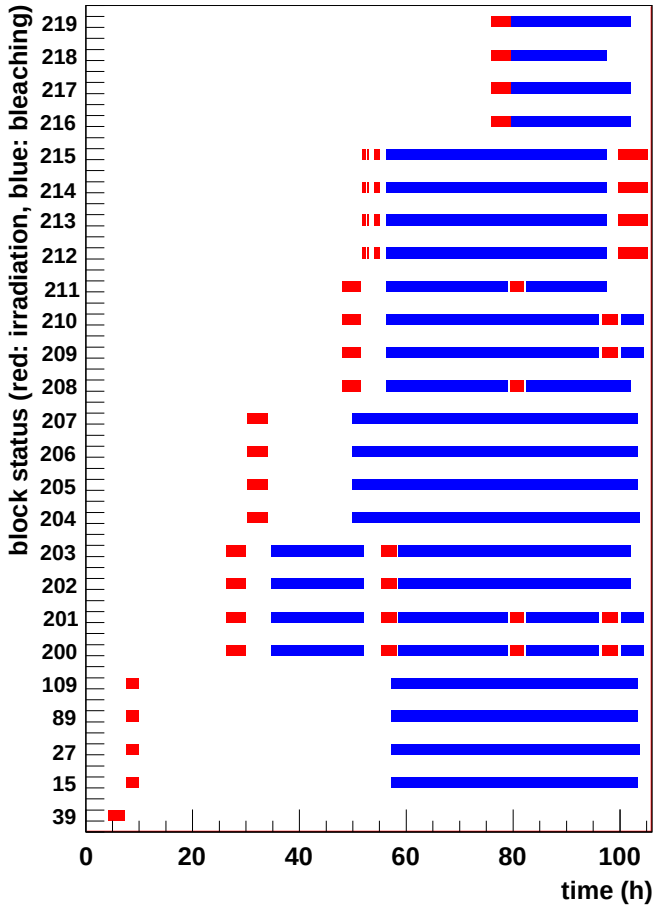
# Irradiations tests at Idaho Accelator Center (IAC)

50h of beam time (funded by JLab) to test radiation hardness

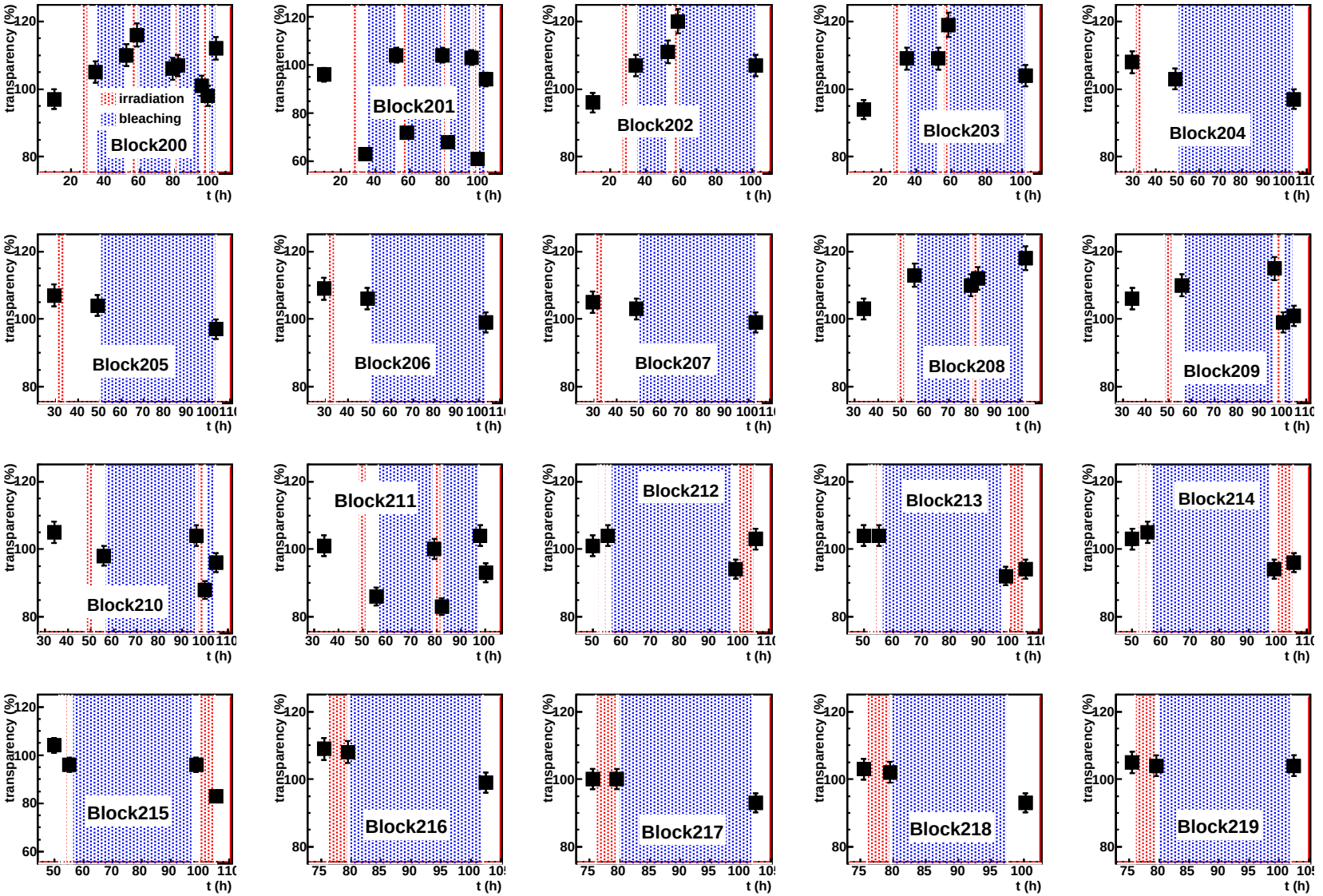
- Typical irradiation sessions: 3h/35kGy
- Transmission measurements before & after irradiation
- Blue light bleaching after irradiation







# Irradiation results



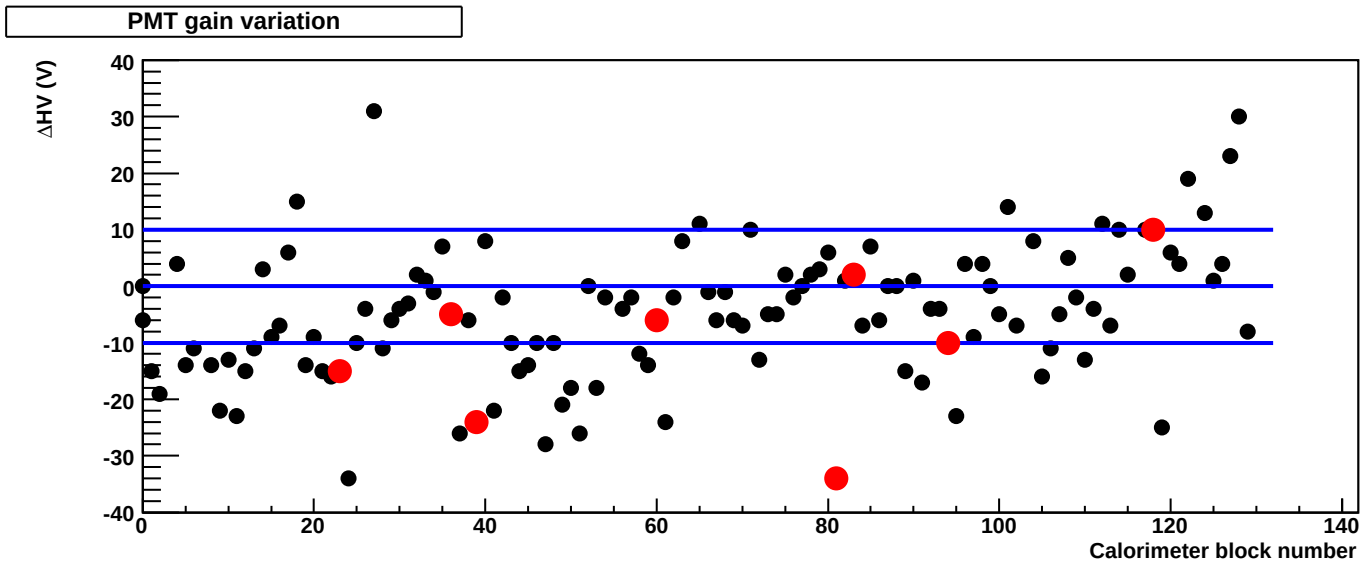
# A few conclusions

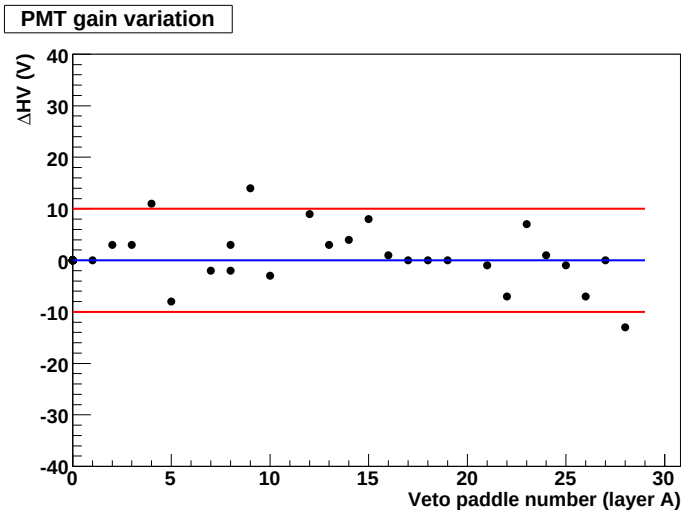
- Bad blocks show visible darkening after a few ($\sim 15$) min
- 15% (3 out of 20) blocks were found to be bad
- Blue bleaching works
  (more than $\sim 20$ h of illumination starts damaging the blocks)
- Initial irradiation can correct manufacturing defaults
- 1 more week (end of 2009) will be enough to test the remaining 80 blocks

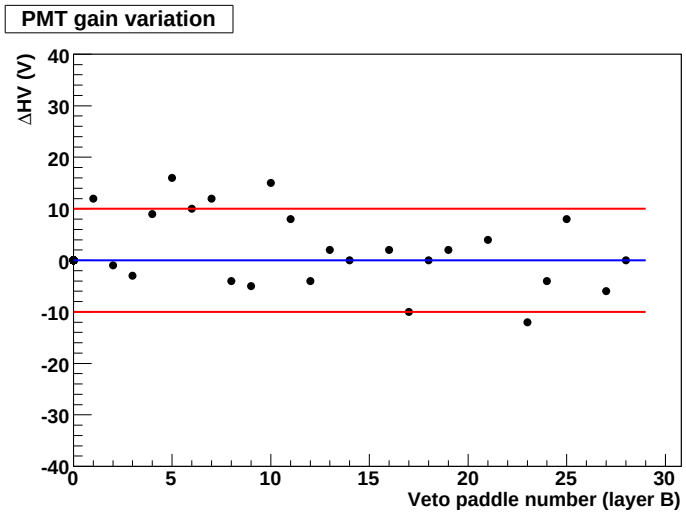
# Hamamatsu PMTs

- 100 new PMTs were ordered last November: same model ("ATLAS") as before ($\sim 600$ Euro/ea, CNRS/IN2P3), $\rho \sim 20\%$. Delivered.
- All PMTs have been tested and meet specifications
- 16 additional high efficiency ($\rho \sim 40\%$) PMTs ($\sim 800$ Euro/ea, ANR) were also order for 12 GeV studies
  - Not clear at this point whether calorimeter resolution is limited by photostatistics or shower fluctuations

# Test of old (E00-110/E03-106) PMTs

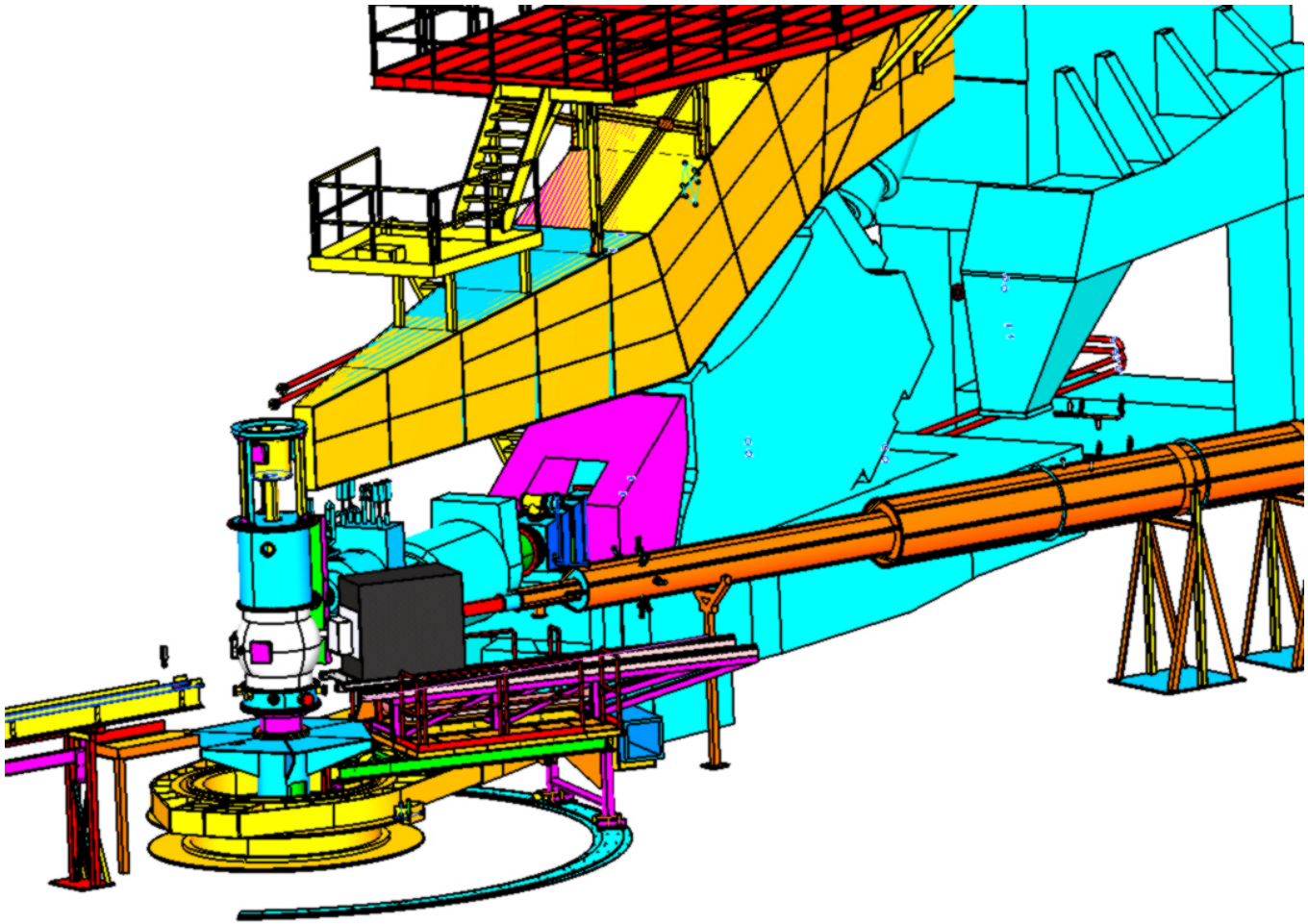


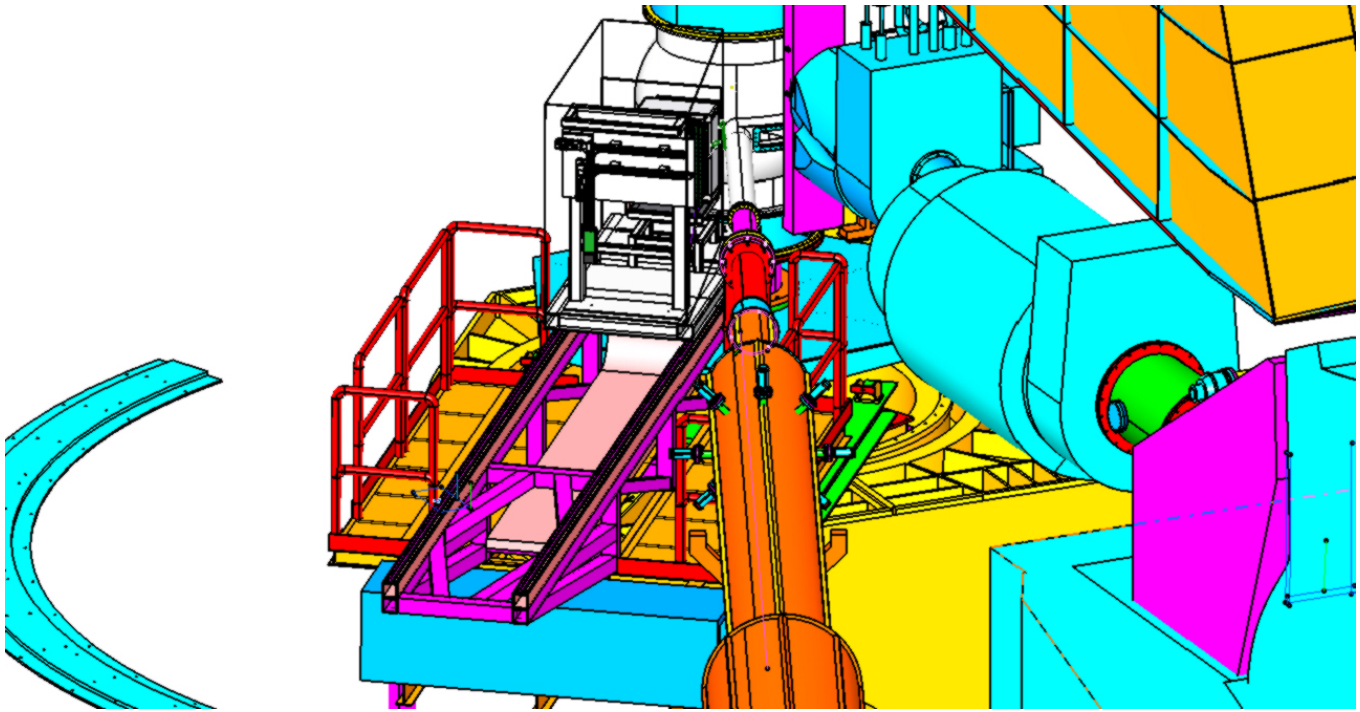
# Black-box and calorimeter dessign (LPC)

- Preliminary dessign finished



# Black-box and calorimeter dessign (LPC)

- X-Y table and blue light curing system integrated
- No vertical motion of the calorimeter
  - Beam energy change enough for elastic $ep \rightarrow ep$ calibration
- Construction expected to start summer 2009 at LPC



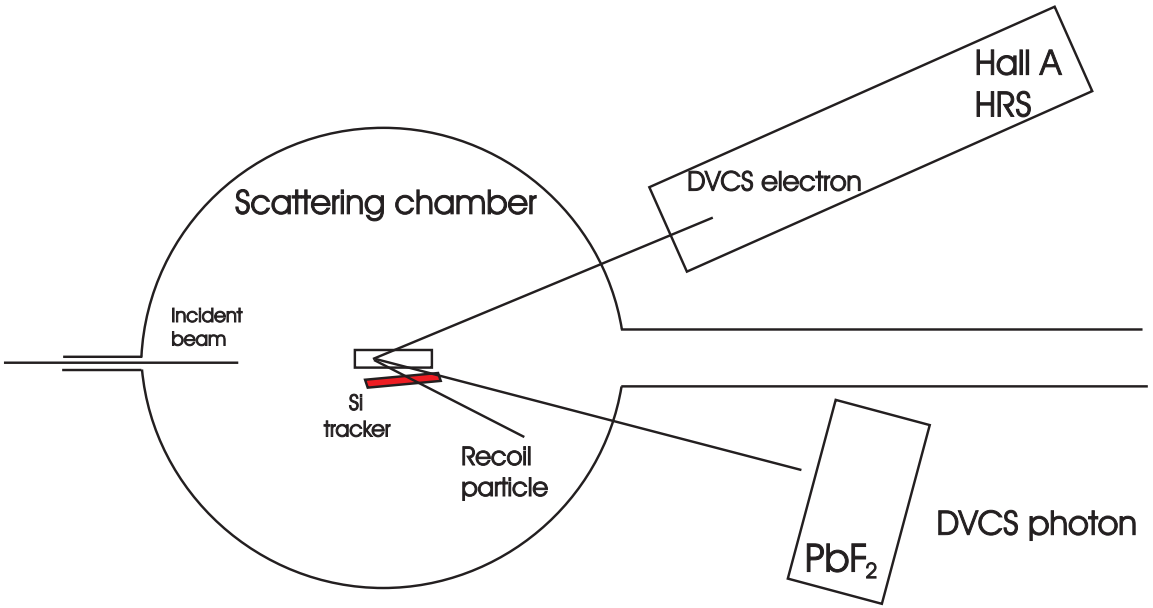
# Scattering chamber and support dessign (JLab)

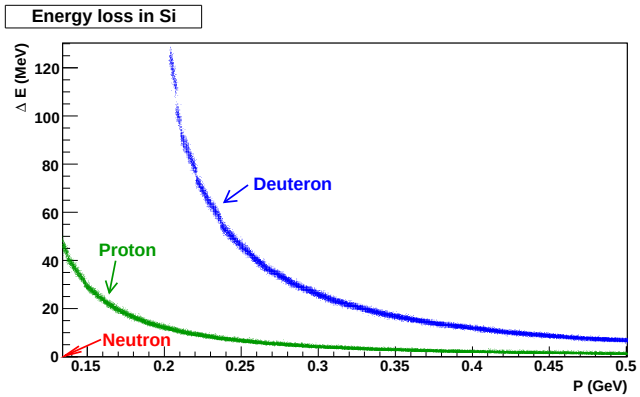
- Using same scattering chamber as E00-110/E03-106
- Exit beam pipe needs to fix
- Support structure will need modification to hold new calorimeter black box
- Work need to be started, but should be straight-forward

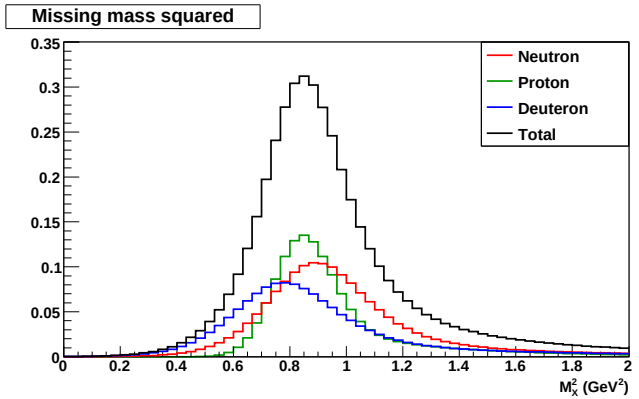
# Possible upgrade to experimental setup: $Si$ recoil detector

$\Delta E$ for $d$ is at least one order of magnitude higher than $p$:

- Allows for a high detection threshold



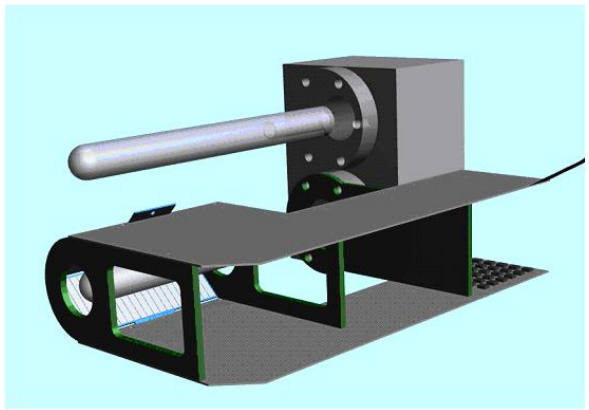



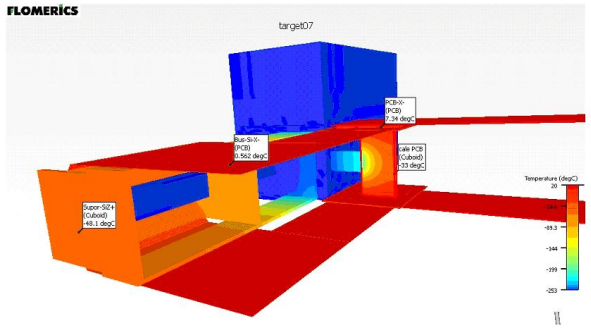

Challengues:

- High background (deuteron break-up...)
- Radiation damage
- Temperature control

# R&D for a Si (vertex) detector

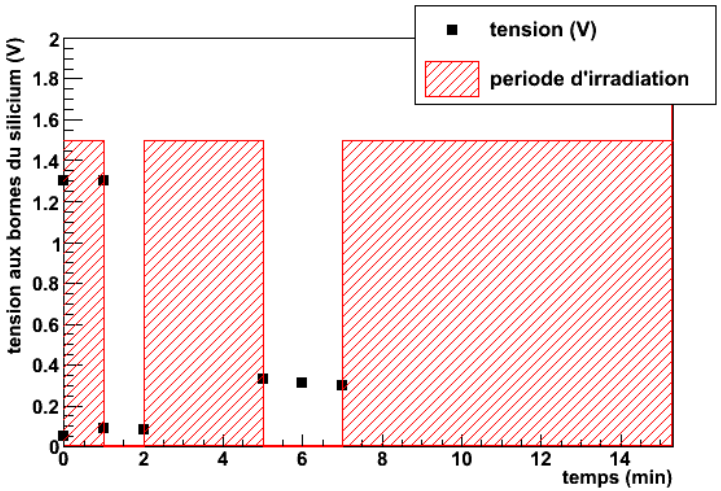
- Preliminary mechanical design
- Temperature study:
  - Si detector around -50° C, electronics at ∼10° C
- Background: fast signal are crutial. Working on read-out as close as possible to the detector
- Radiation damage test at IAC

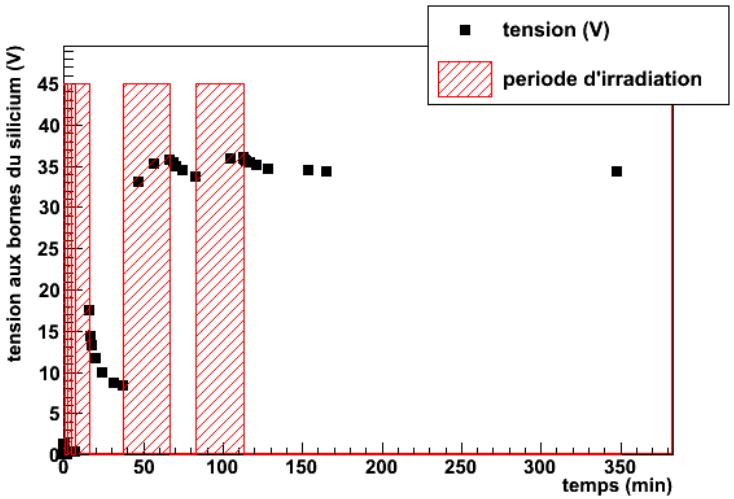




# Irradiation of Si detector at IAC

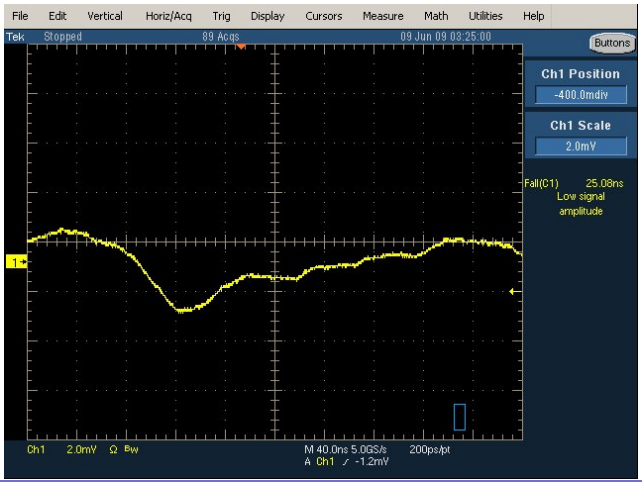
(1 V=1$\mu$A)




Before irradiation

After irradiation



# Electronics (LPC)

- Using the same sampling ARS system to record PMT signals
- Upgrade of VME protocol to increase bandwidth
- Use of a FIFO buffer memory to reduce deadtime
- Prototype ARS card under testing, production early next year
- Calorimeter trigger will follow same dessign, but different algorithm:
  - Trigger on total energy deposited in the calorimeter (not local sum as previously)
  - Recording of all block signals at every trigger
- Trigger dessign to be started as soon as ARS production is launched

# Software status

- Simulation:
  - E00-110/E03-106 analysis based on a GEANT3 simulation
  - New GEANT4 written and under evaluation
- Offline:
  - Based on C++/ROOT libraries with MySQL database for calorimeter analysis (used during E00-110/E03-106)
  - HRS analysis based on C++ Analyzer and HRS DB based on text files
- Computer resources:
  - Production will probably be done in CC-IN2P3 (France) as last time
  - JLab farms will be used for online (during the experiment running) and first pass (where CODA libraries are needed)

# TODO lists

- Start construction of black-box ($\rightarrow$ Jul 09)
- JLab work on support structure & scat. chamber ($\rightarrow$ Oct 09)
- Si recoil detector: R&D on signal read-out
- Electronics:
  - ARS (underway)
  - Trigger (underway)
- Software:
  - Calibration codes (now!)
  - DAQ software (2009)
  - Online monitoring (end 2009)
- Calorimeter assembly (Jan 2010) and testing ($\rightarrow$ Jun 2010) (workspace at JLab from Oct-Nov 09)
- Installation in Hall A (Jun 2010)