Daya Bay Antineutrino Detector: Testing and Commissioning

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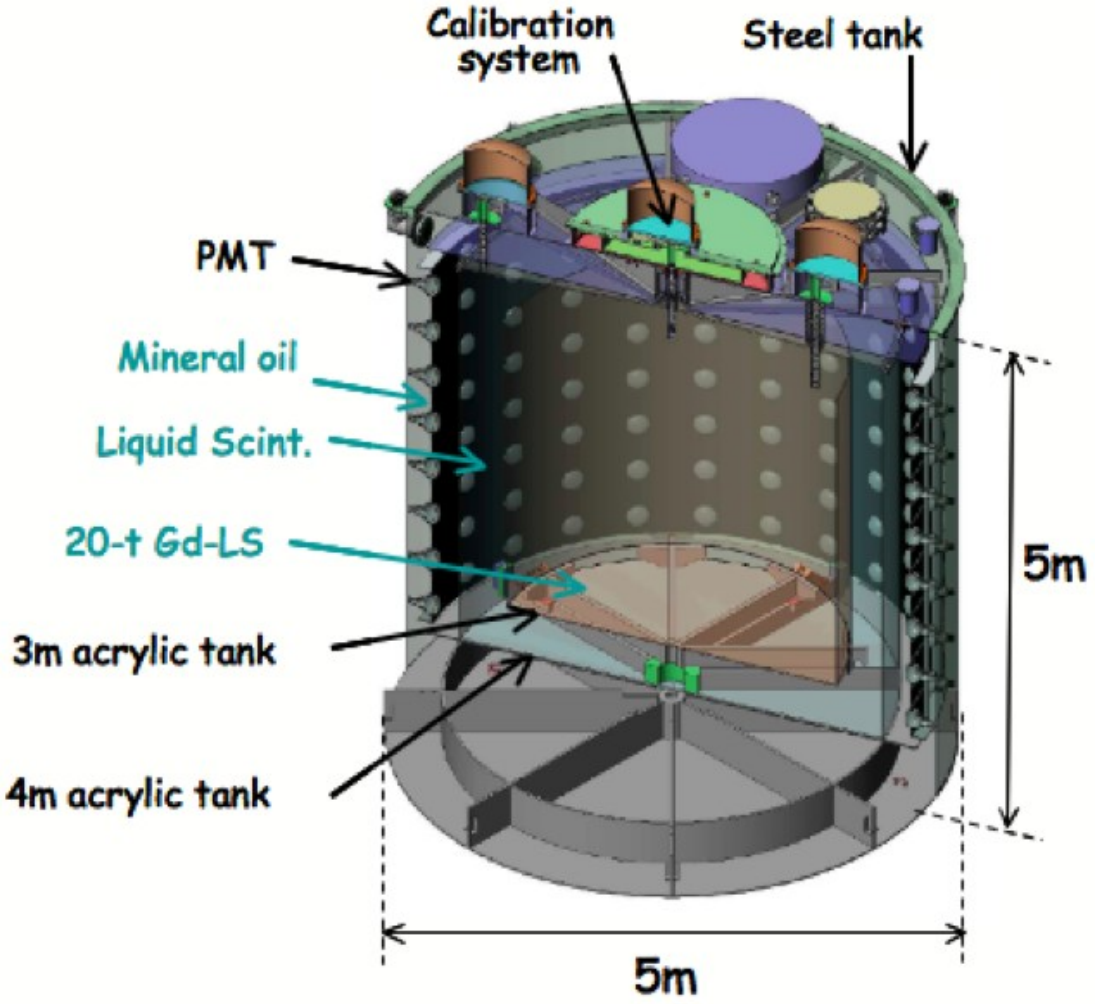
Caltech

Oct. 12, 2009

Anti-neutrino Detector

- **Progress of AD Assembly**

- **First Step in Commissioning:**
  AD Dry Run



AD = Anti-neutrino Detector

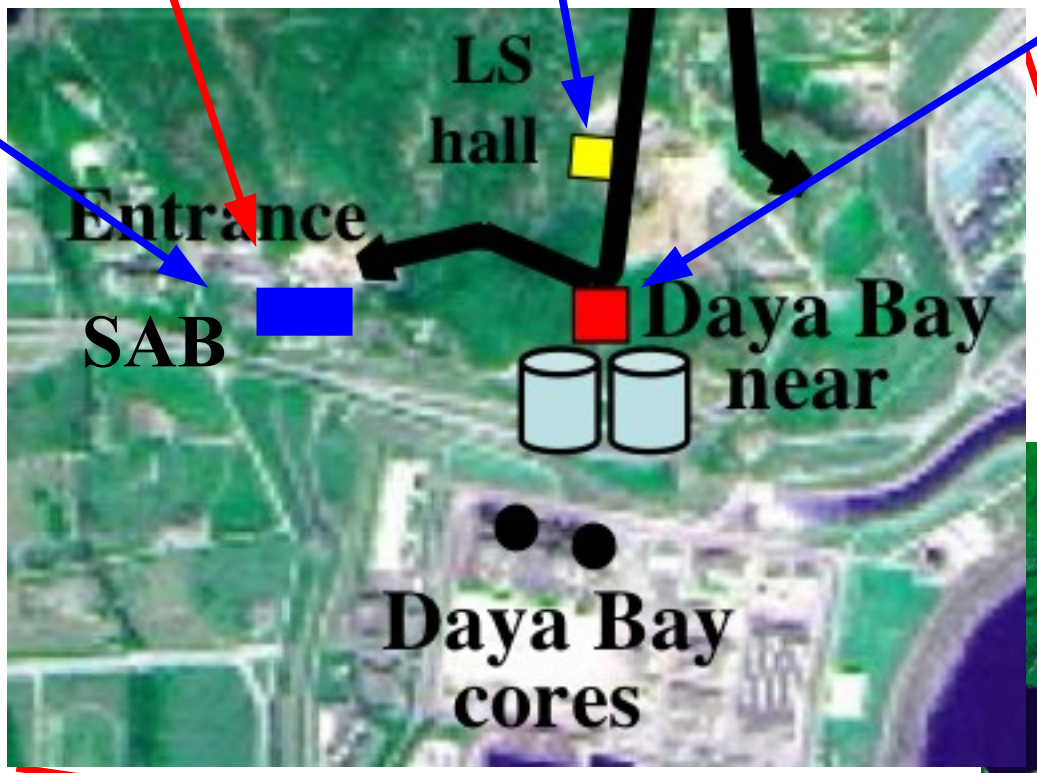
A Busy Year

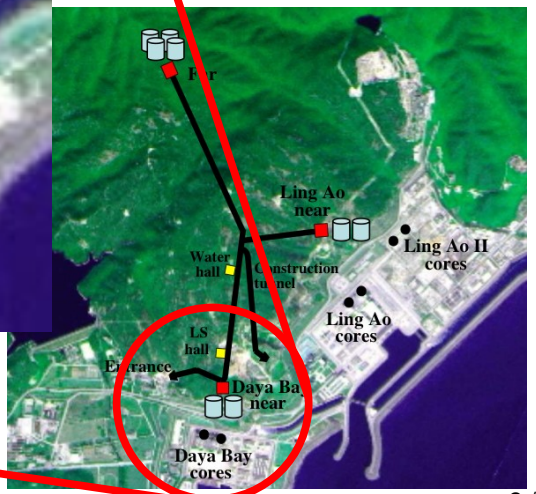
Early 2010:
AD Dry Run

Spring 2010: Transport underground and fill with scintillator.

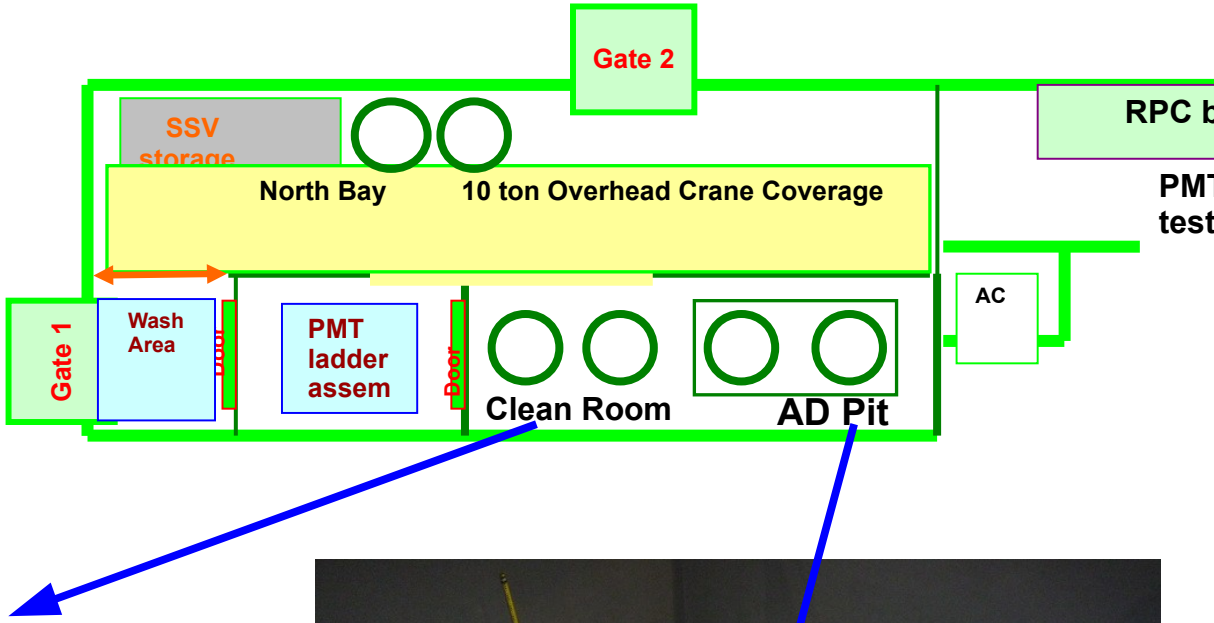
Summer 2010: Install at near site and begin taking data

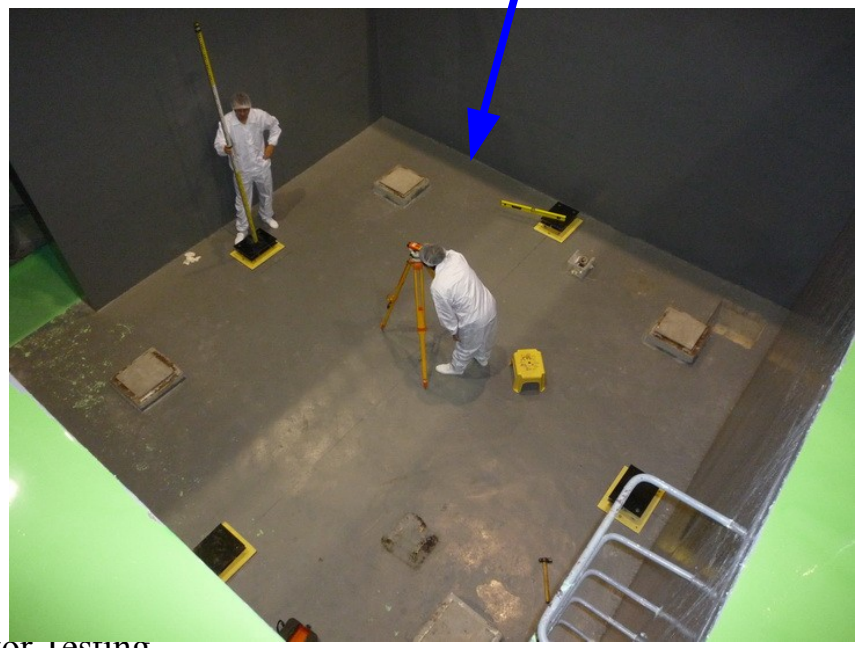
Now: Assemble 1st pair of detectors above ground





Surface Assembly Building

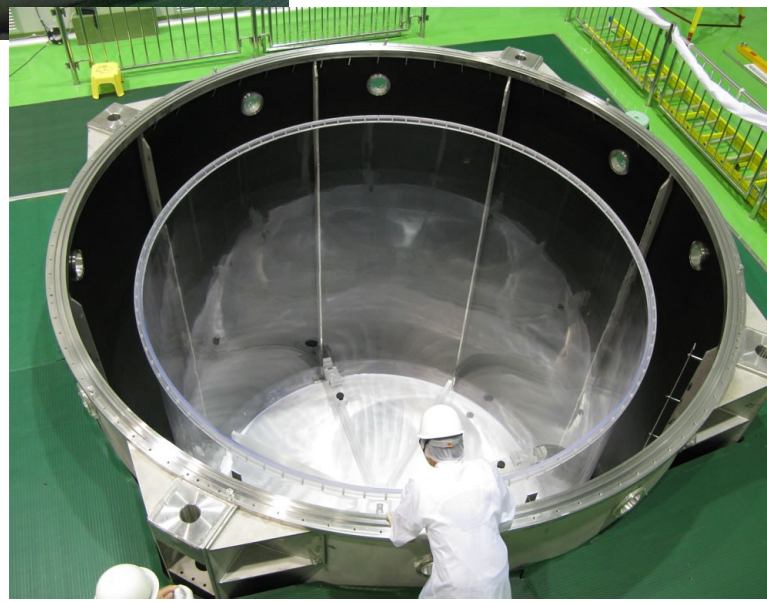




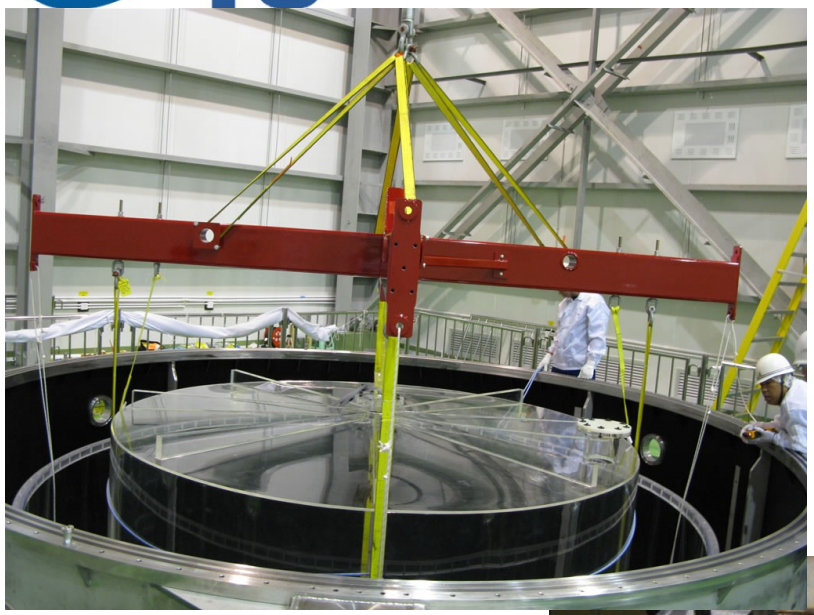
Detector Assembly

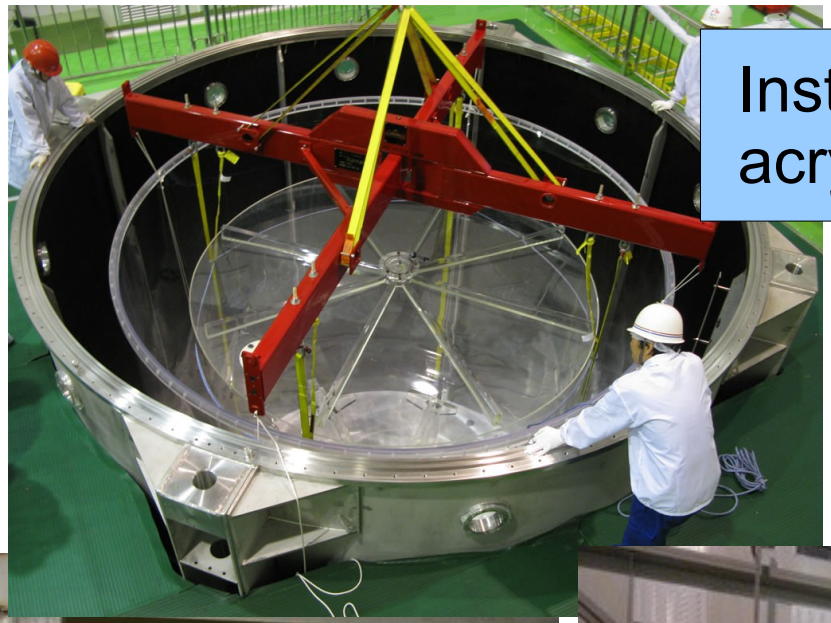
Lower 5m stainless steel vessel into pit

Install 4m outer acrylic vessel



Detector Assembly





Install 3m inner acrylic vessel

Mount PMTs on support structure and lower into vessel

Detector Assembly

Close lid, install calibration units, etc.

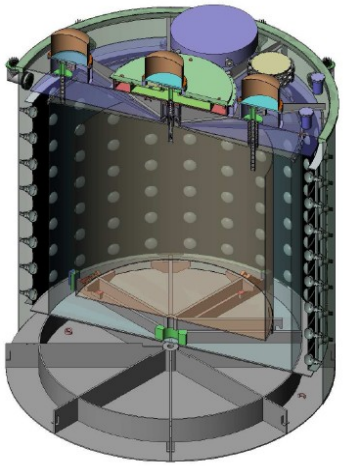
Wash, rinse, repeat: 8 detectors in total.

Before moving detector, opportunity to check that it all works...

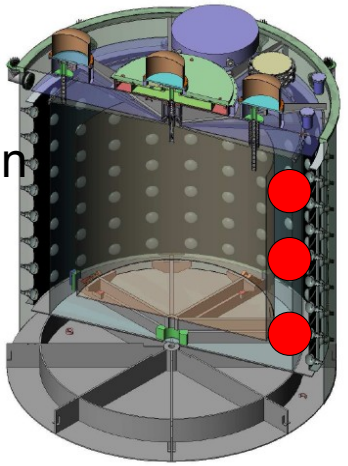
→ **AD Dry Run**

AD Dry Run

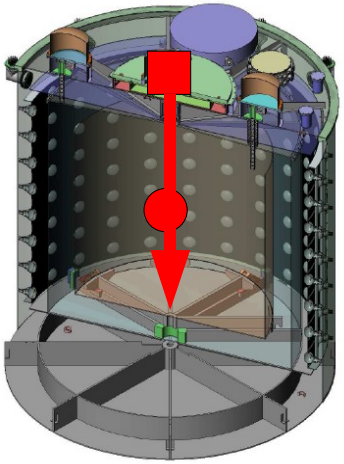
System check before filling with scintillator



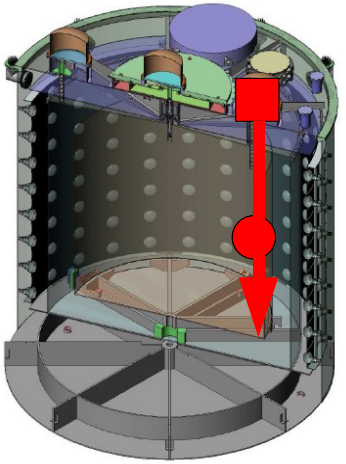
1. Dark Hits:
-Verify PMT readout and system integration



2. Buffer LEDs:
-Verify coordination of Calibration and DAQ

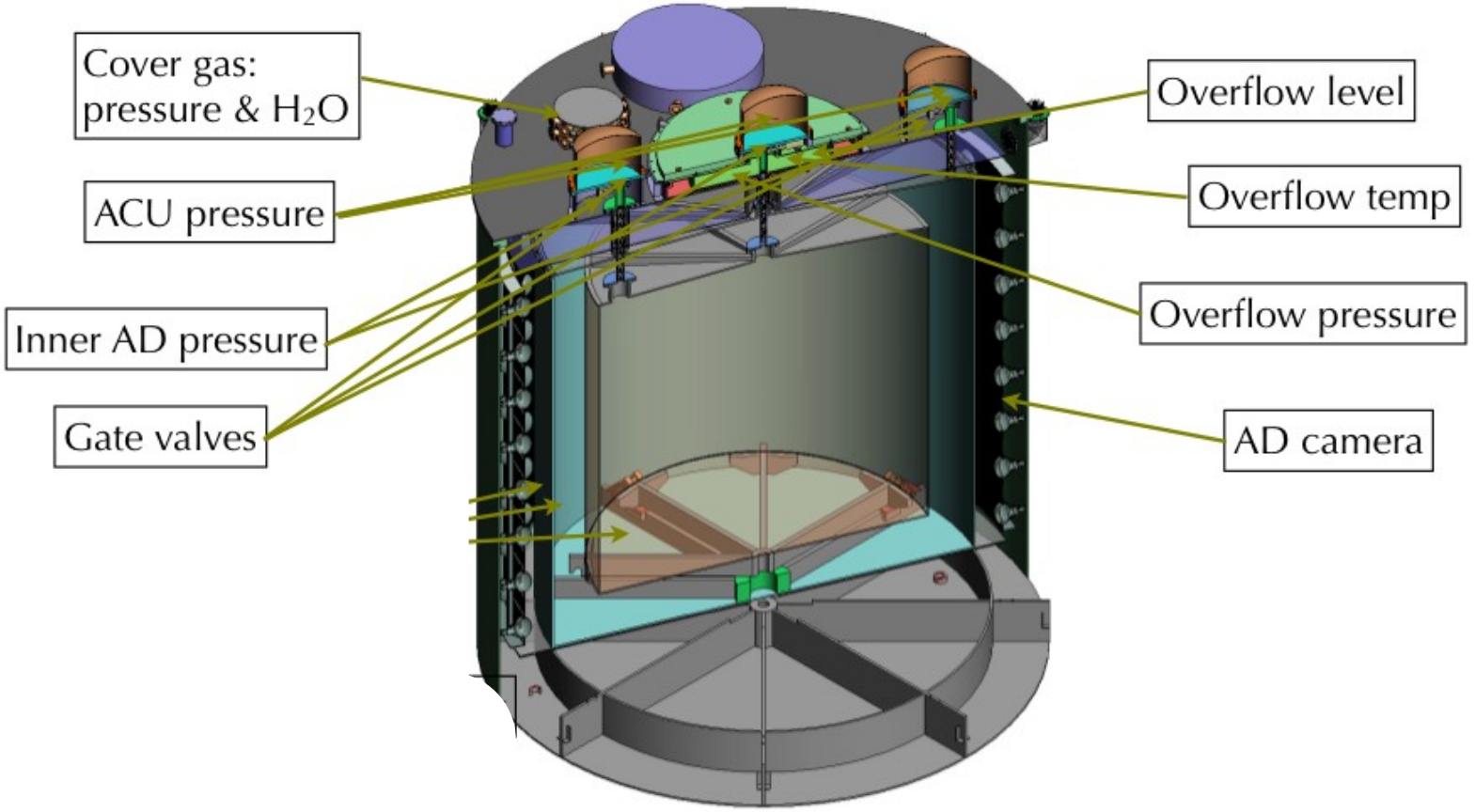


3. Central LED:
-Initial Calibration
-PMT measurements:
-timing offsets
-gain
-P/V ratio
-relative efficiency



4. Off-Center LED:
-Reference data for optical modeling

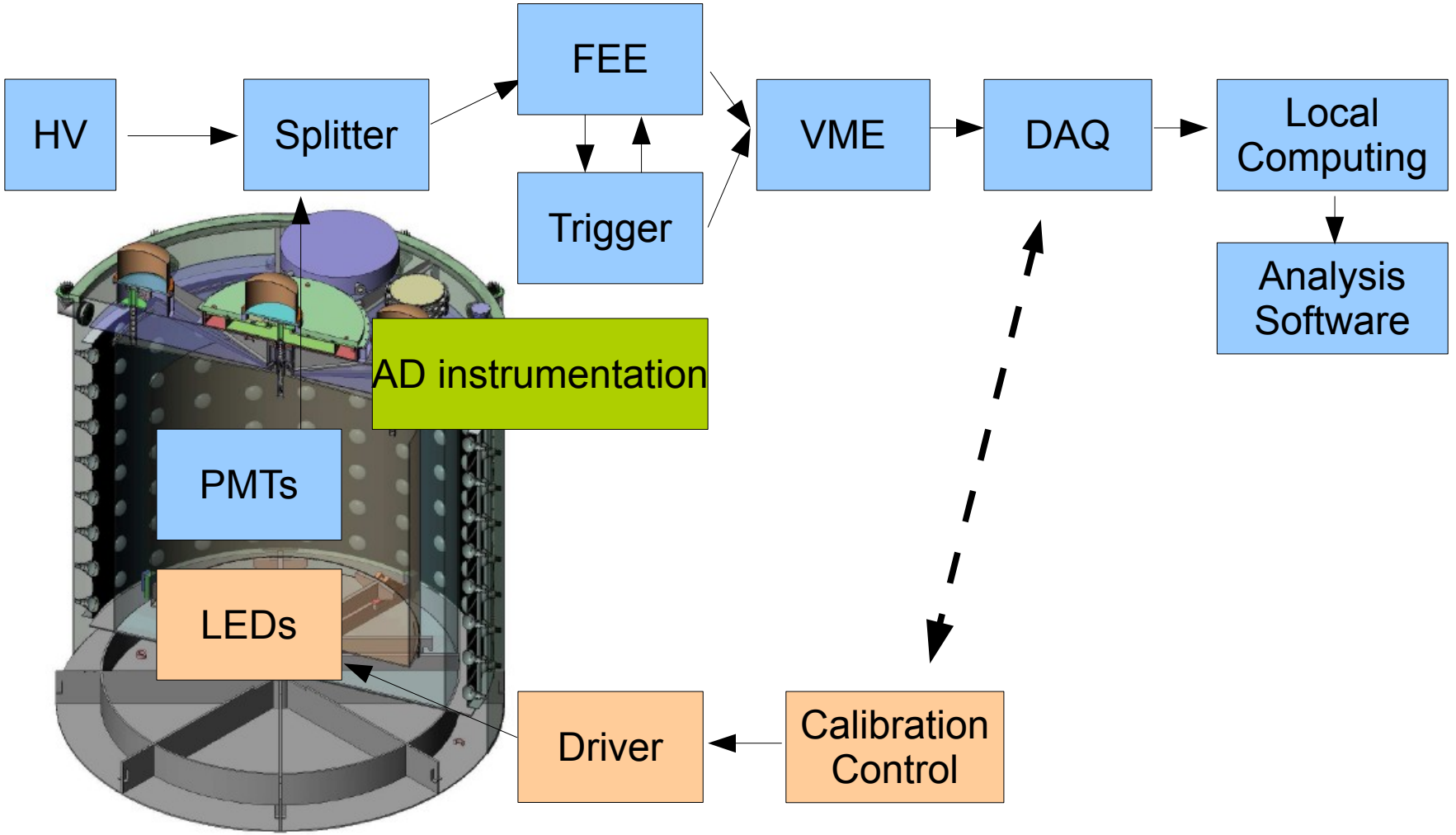
AD Dry Run



Check instrumentation is working correctly

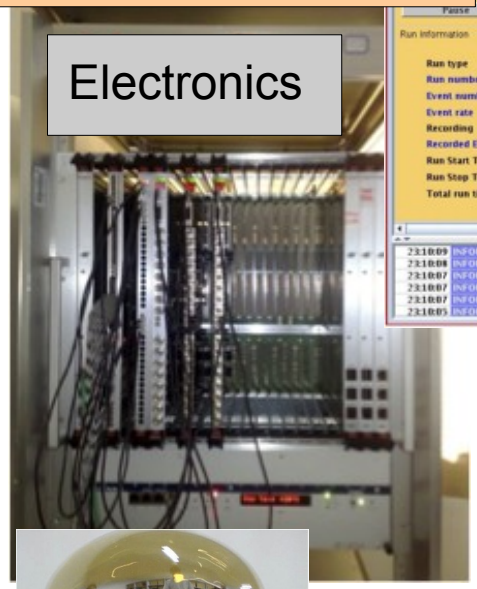
AD Dry Run

Integrated test of complete AD system

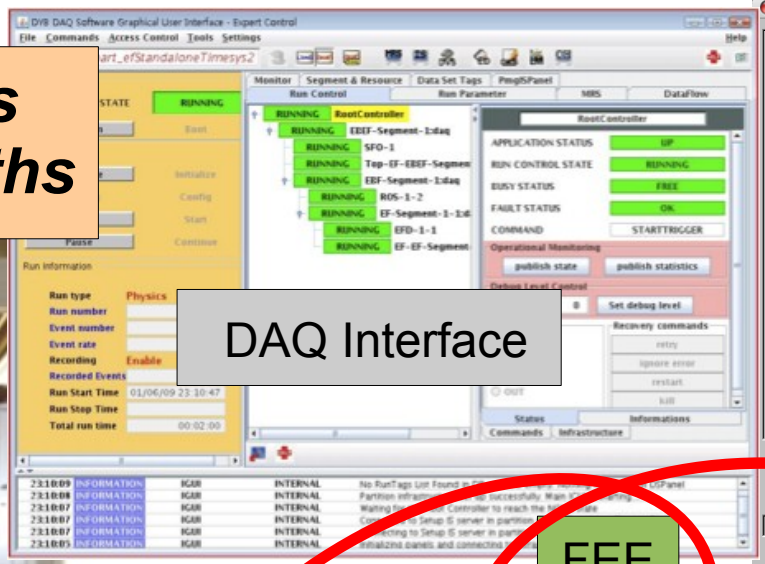


Piecewise Integration

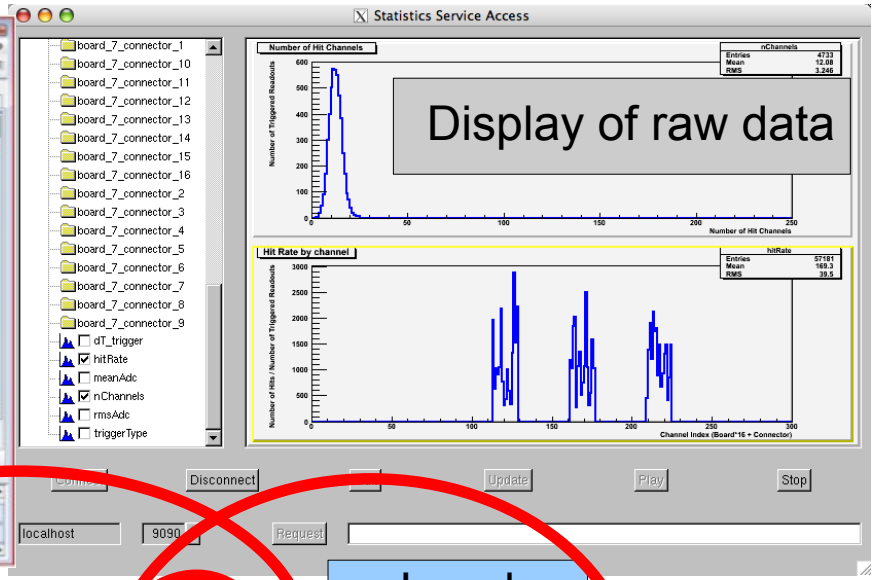
Much progress in recent months



Electronics

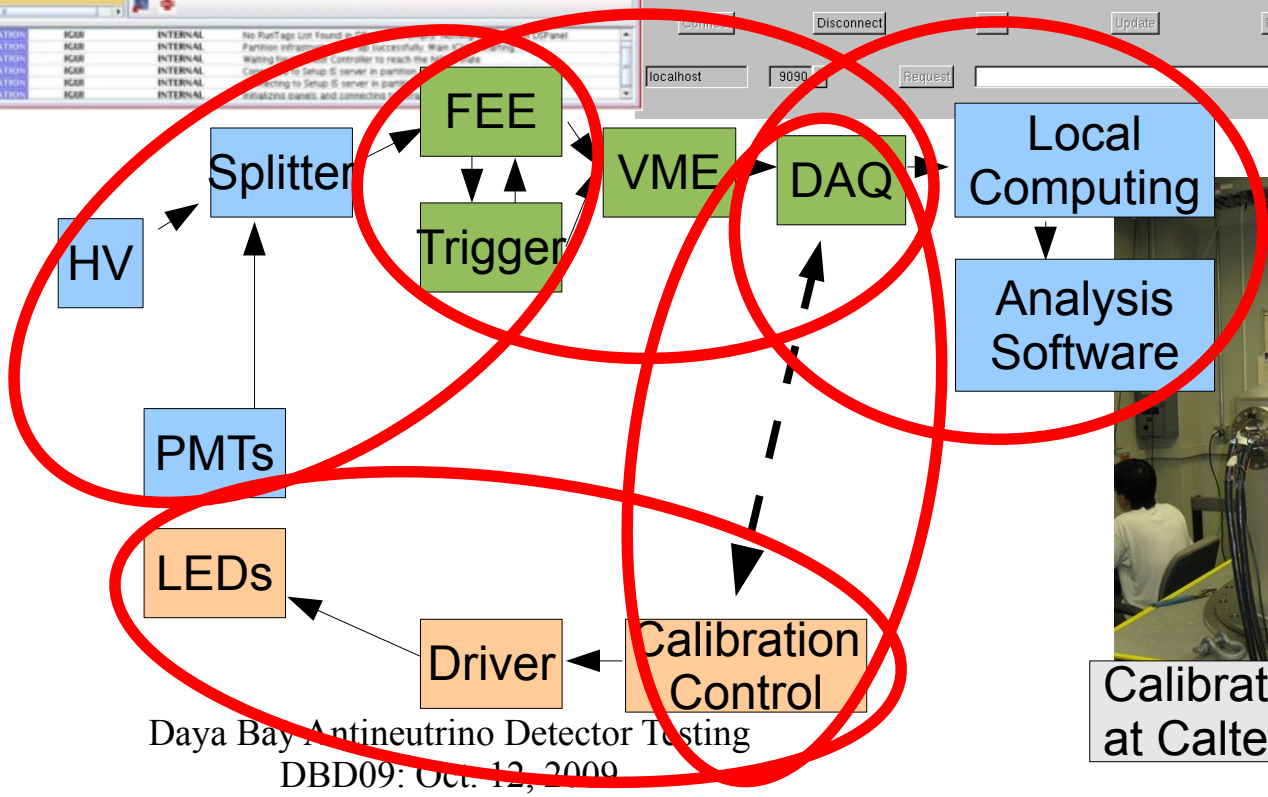


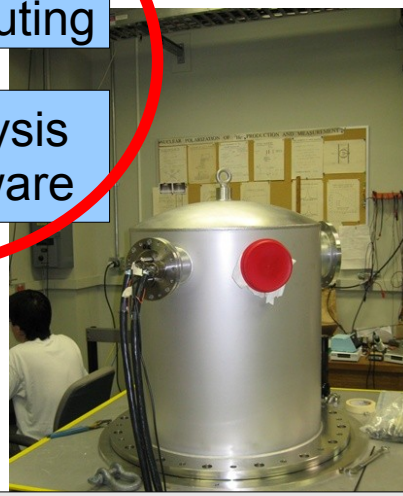
DAQ Interface



Display of raw data

Photomultipliers

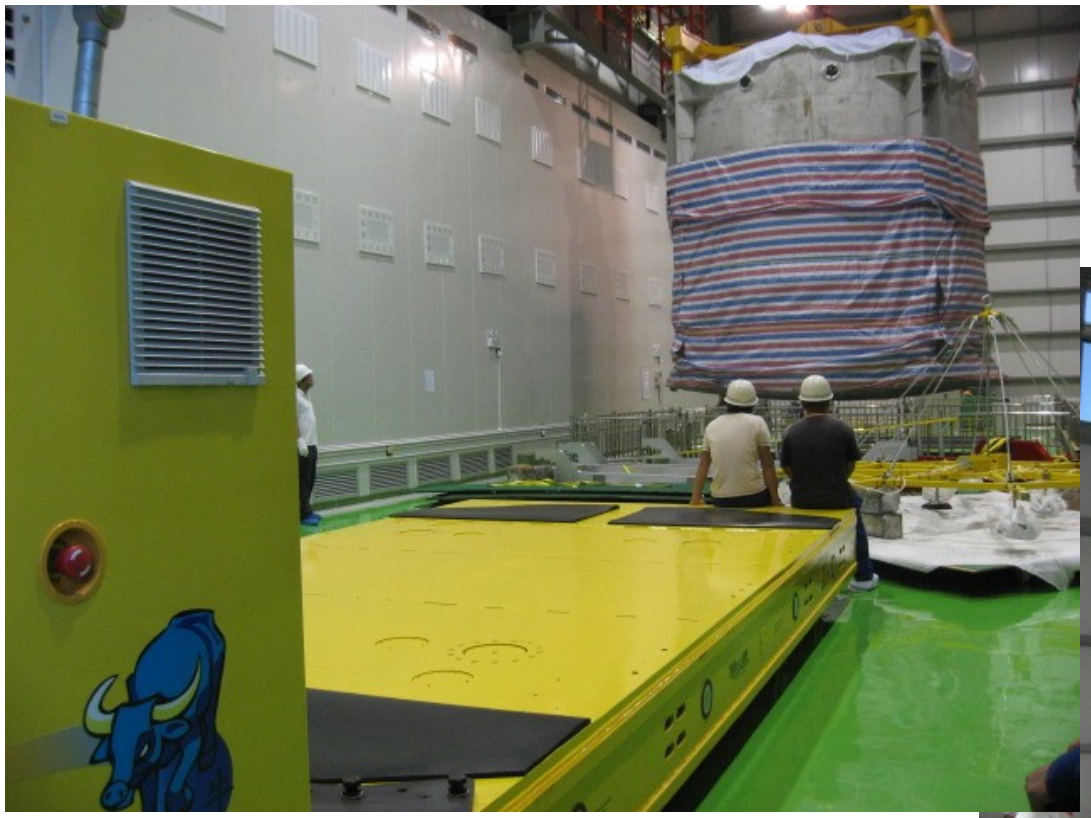




Calibration system at Caltech

On the Road

Detector is moved underground for filling / installation

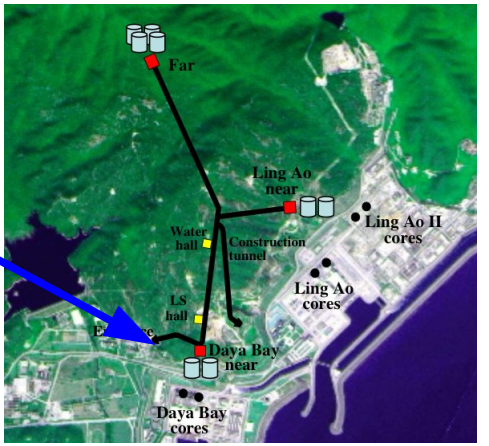


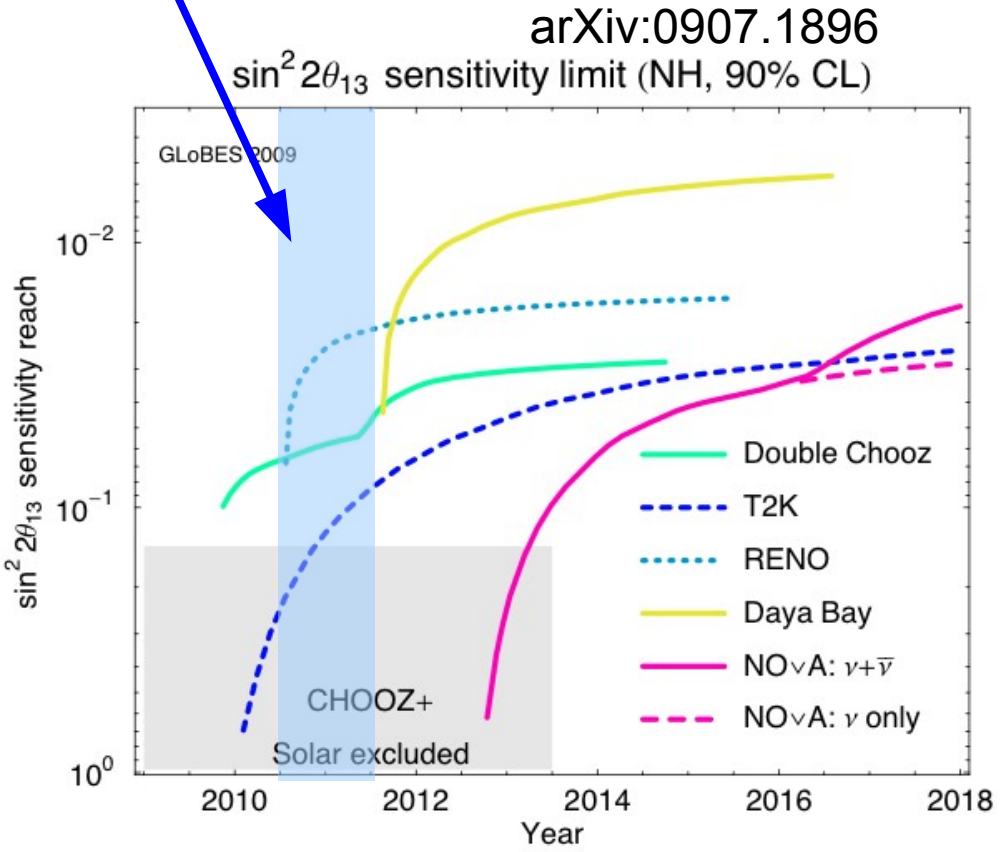
Lift detector out of assembly pit

Tranport into mine using specialized vehicle

A Final Note

Near Site Commissioning Run: Summer 2010
~10,000 $\bar{\nu}_e$ per week





Can study:
- Reactor anti-neutrino spectrum
- Backgrounds
- "Identical" detector systematics

Potential for quick results!

Detector systems must be tested and ready.

Summary

- **Detector assembly is starting**

- **Testing program**
  - Ensure prompt data taking and analysis

- **AD Dry Run**
  - Requires integrated test of all AD subsystems
  - Subsystem integration tests in progress