



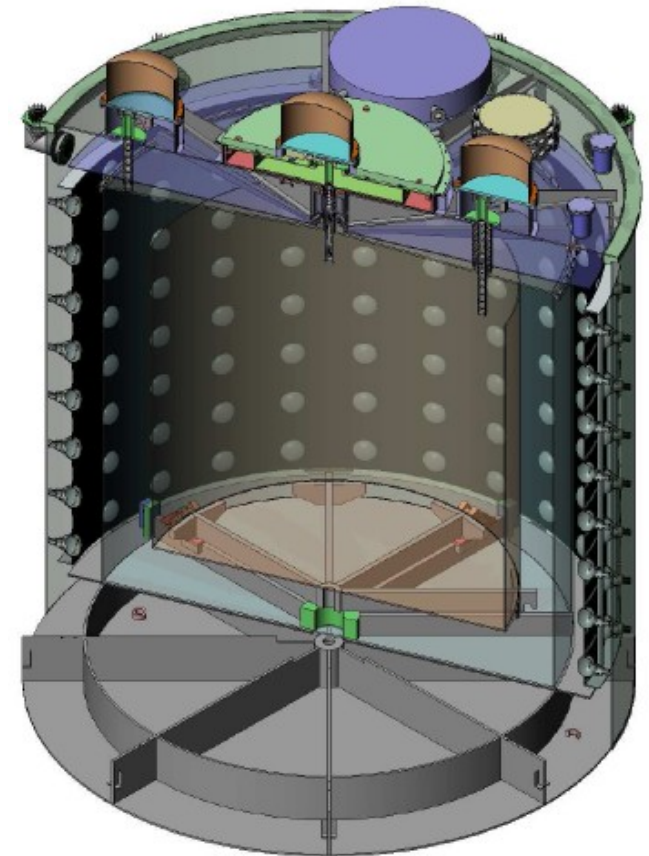
Daya Bay Antineutrino Detector: Testing and Commissioning

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(for the Daya Bay Collaboration)
Caltech

Oct. 12, 2009

Anti-neutrino Detector

- Progress of AD Assembly
- First Step in Commissioning:
AD Dry Run



AD = Anti-neutrino Detector

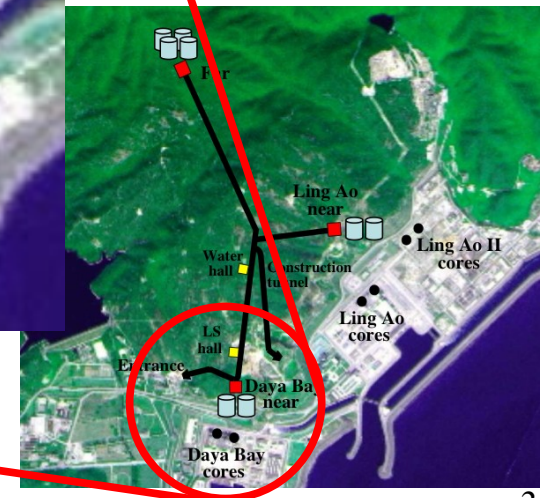
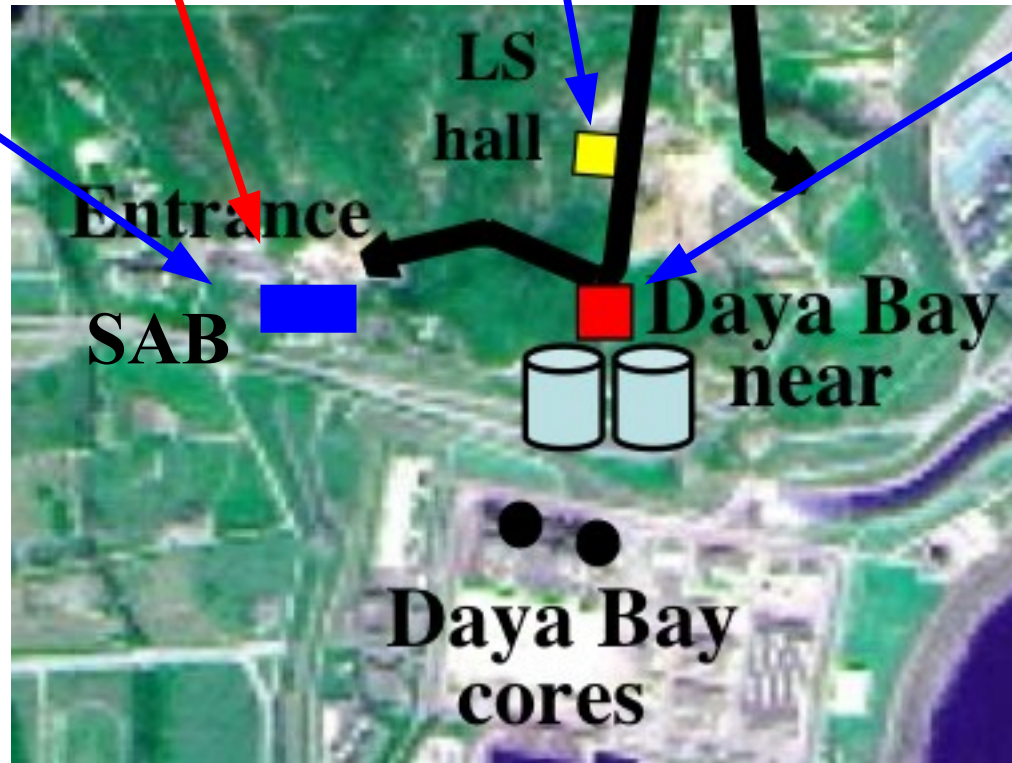
A Busy Year

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

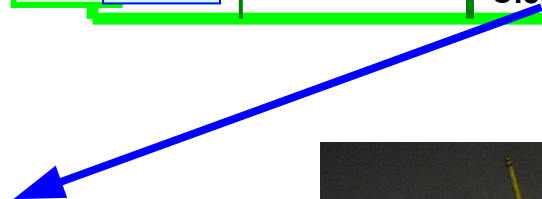
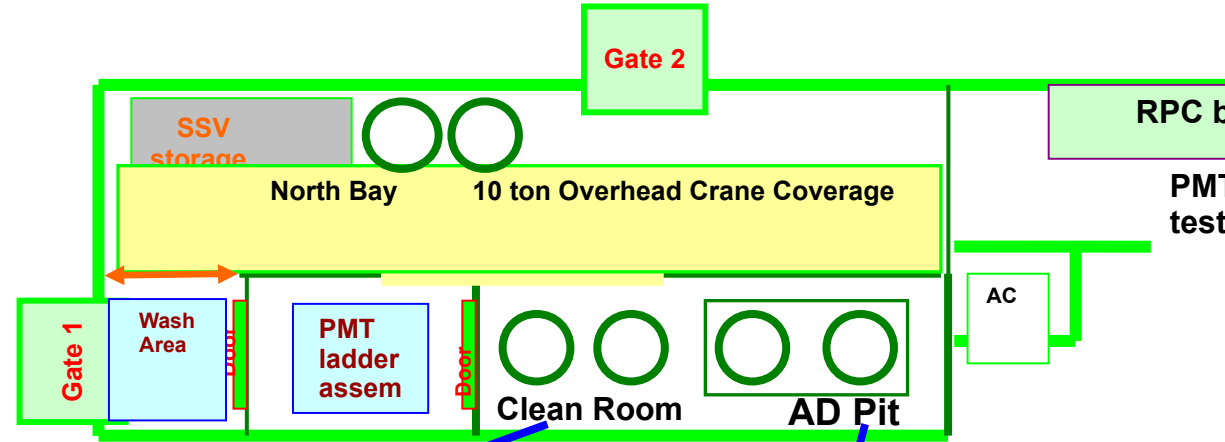


Surface Assembly Building

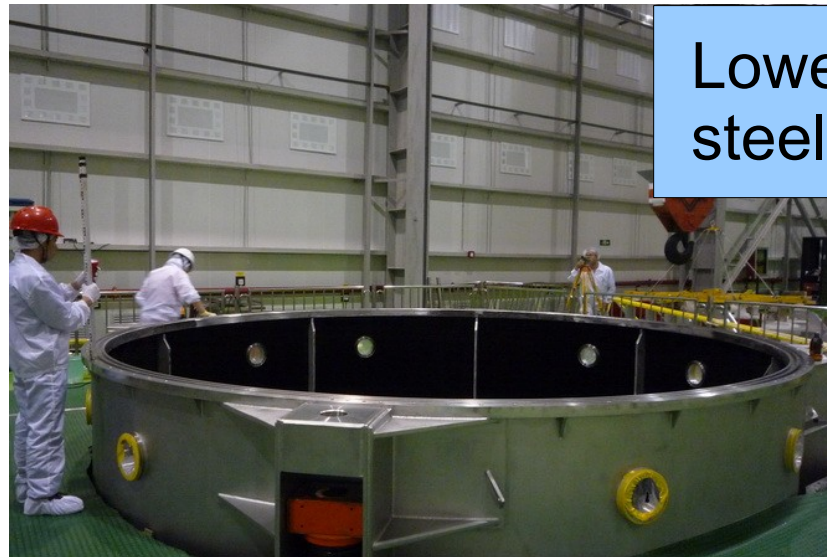
进入隧道入口场地鸟瞰图



黄河勘测规划设计有限公司

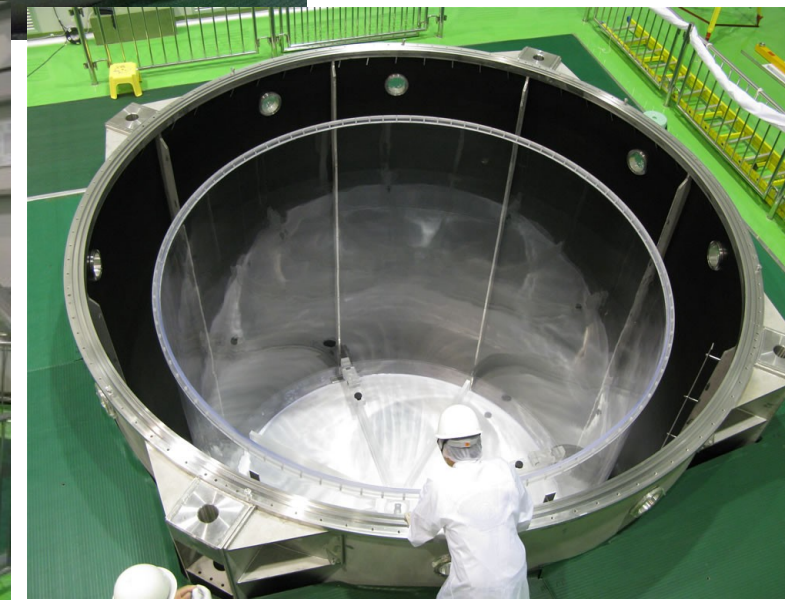


Detector Assembly

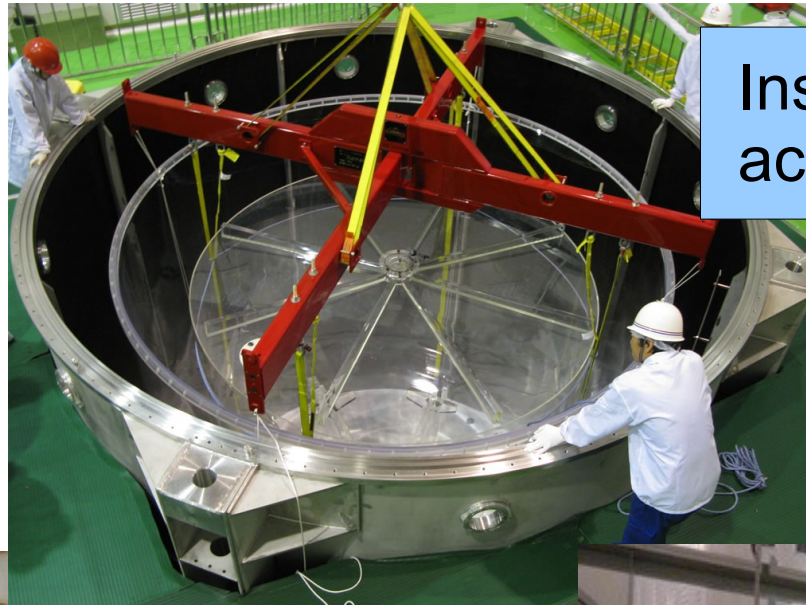
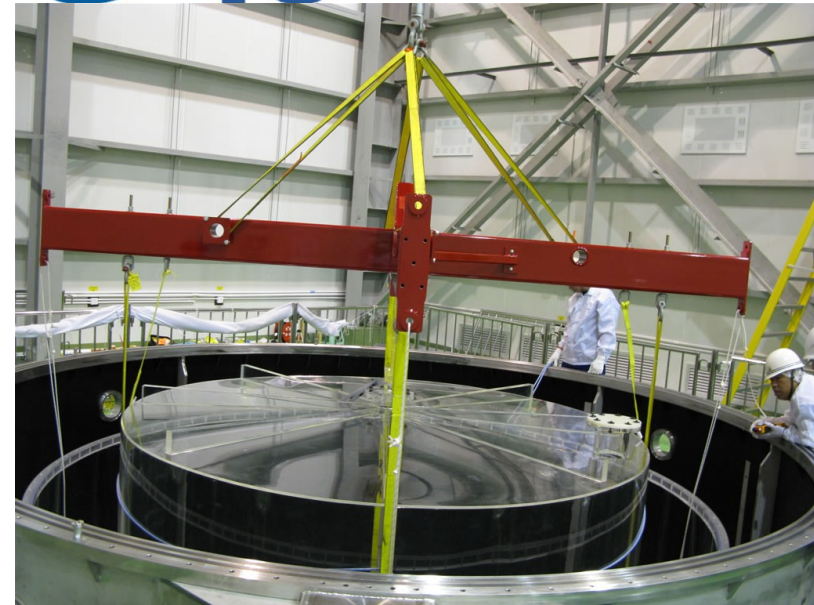


Lower 5m stainless steel vessel into pit

Install 4m outer acrylic vessel



Detector Assembly



Install 3m inner acrylic vessel

Mount PMTs on support structure and lower into vessel



Detector Assembly



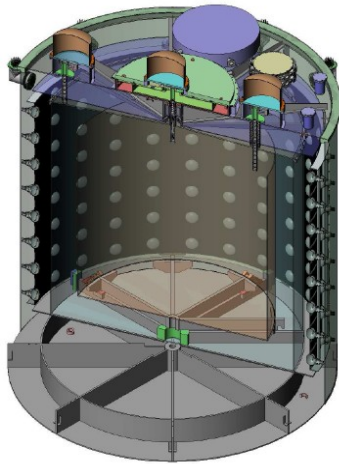
Close lid, install calibration units, etc.

Wash, rinse, repeat: 8 detectors in total.

Before moving detector, opportunity to check that it all works...
→ **AD Dry Run**

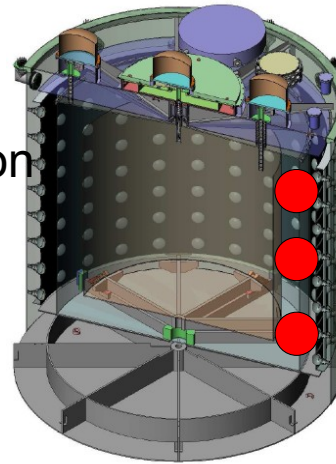
AD Dry Run

System check before filling with scintillator



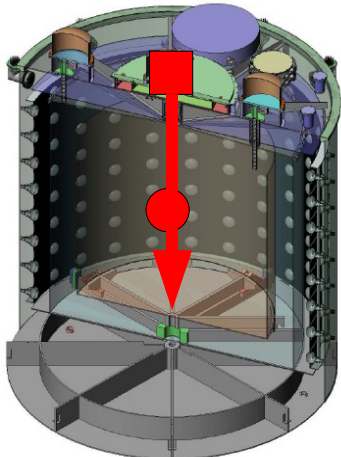
1. Dark Hits:

- Verify PMT readout and system integration



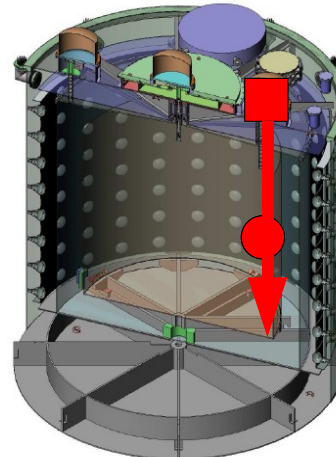
2. Buffer LEDs:

- Verify coordination of Calibration and DAQ



3. Central LED:

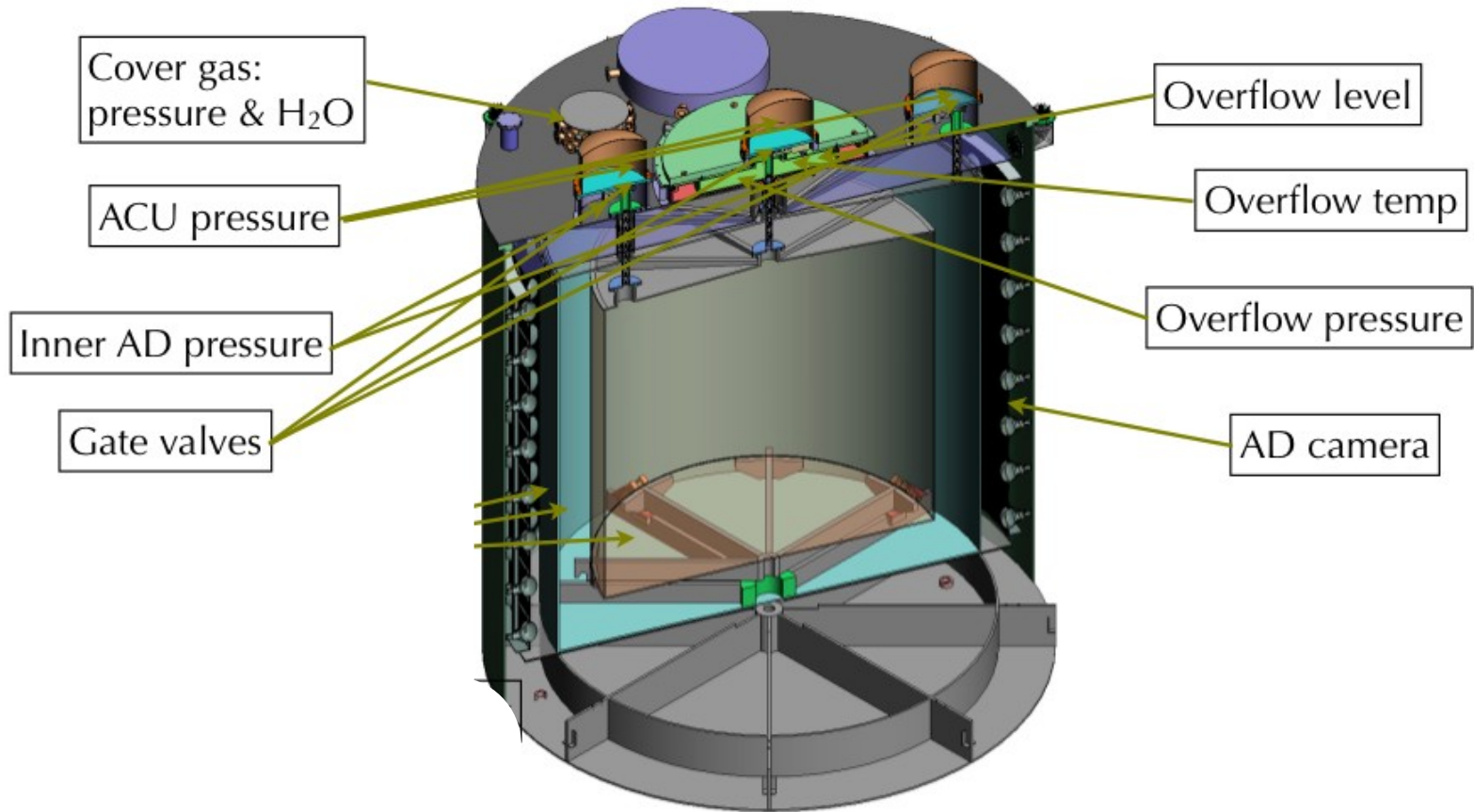
- Initial Calibration
- PMT measurements:
 - timing offsets
 - gain
 - P/V ratio
 - relative efficiency



4. Off-Center LED:

- Reference data for optical modeling

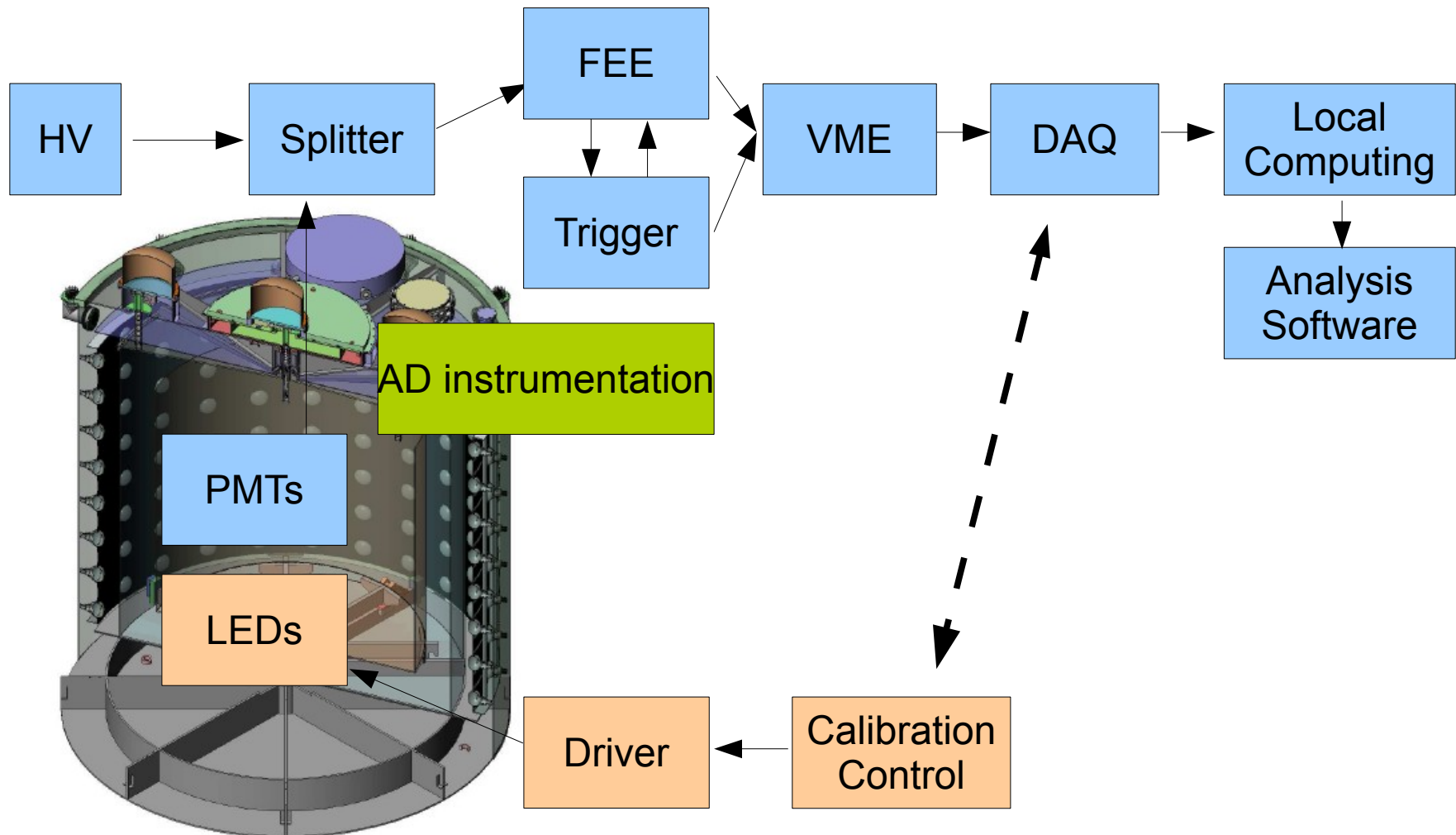
AD Dry Run



Check instrumentation is working correctly

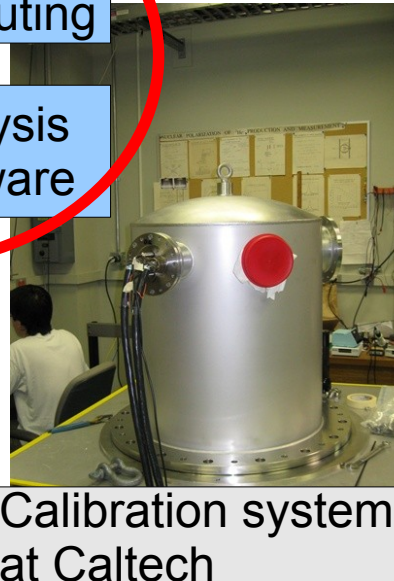
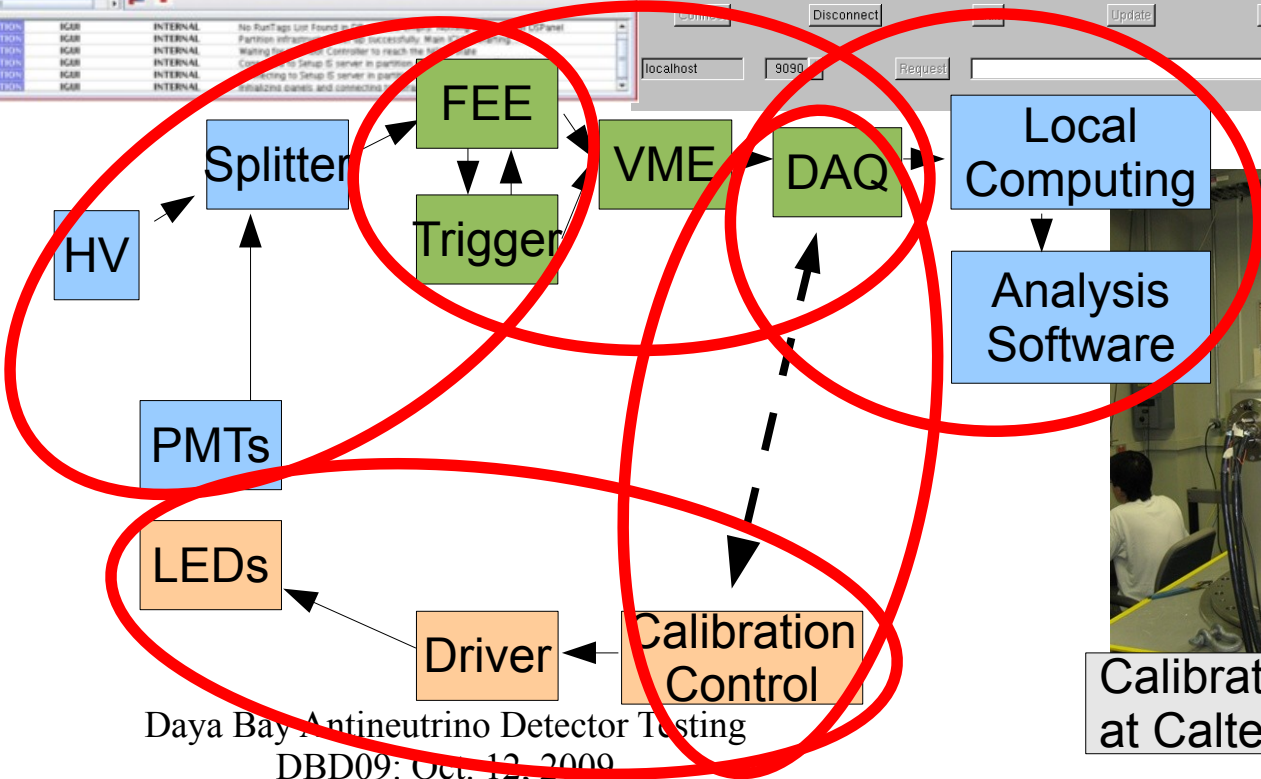
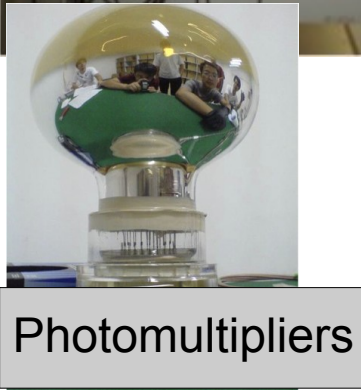
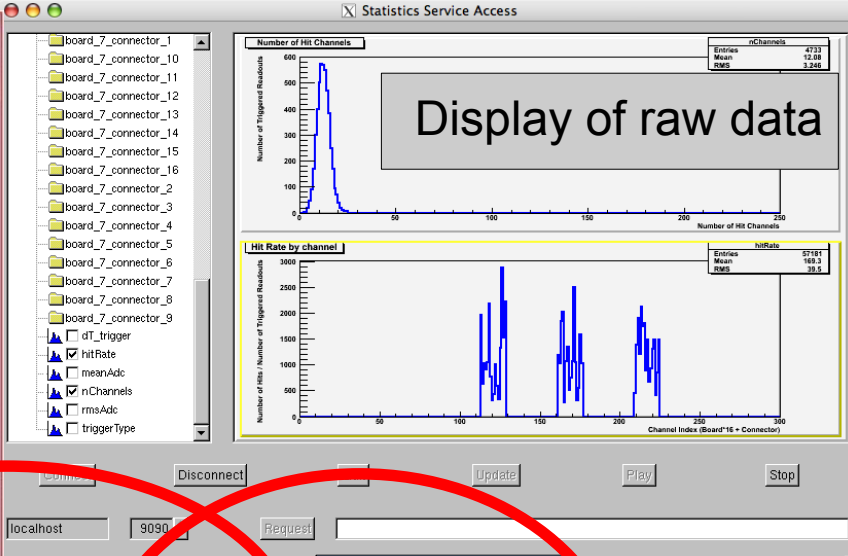
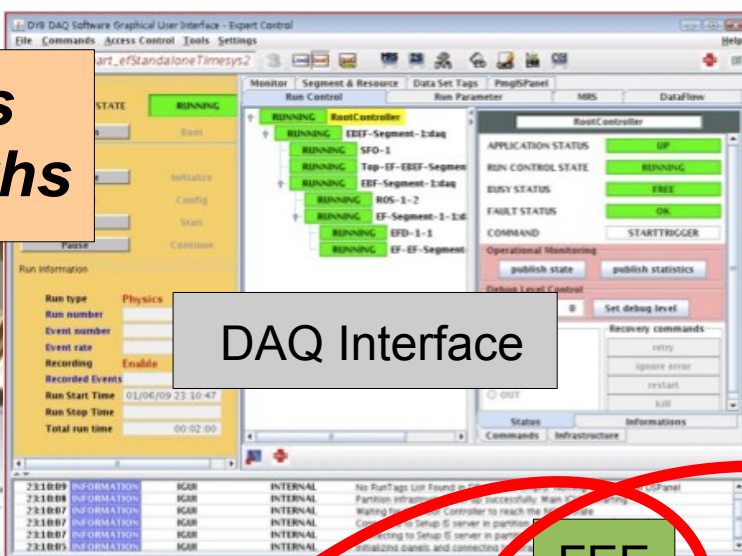
AD Dry Run

Integrated test of complete AD system



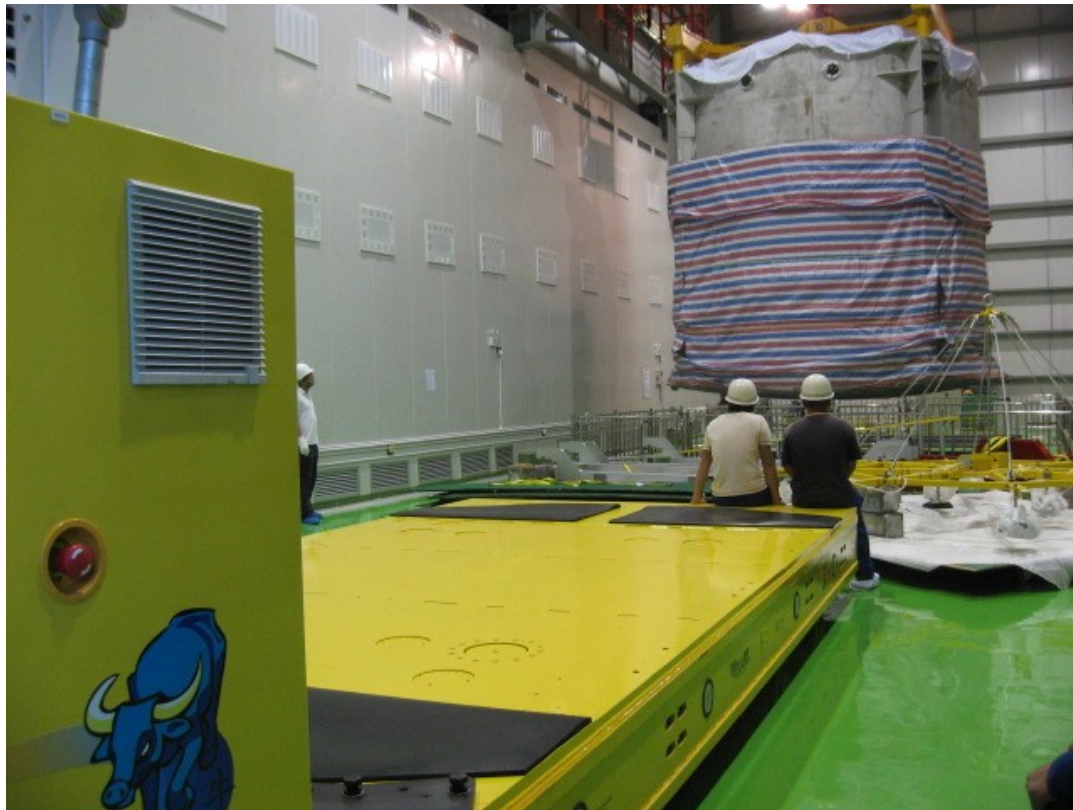
Piecewise Integration

Much progress in recent months



On the Road

Detector is moved underground for filling / installation



← Lift detector out of assembly pit



Transport into mine using specialized vehicle →

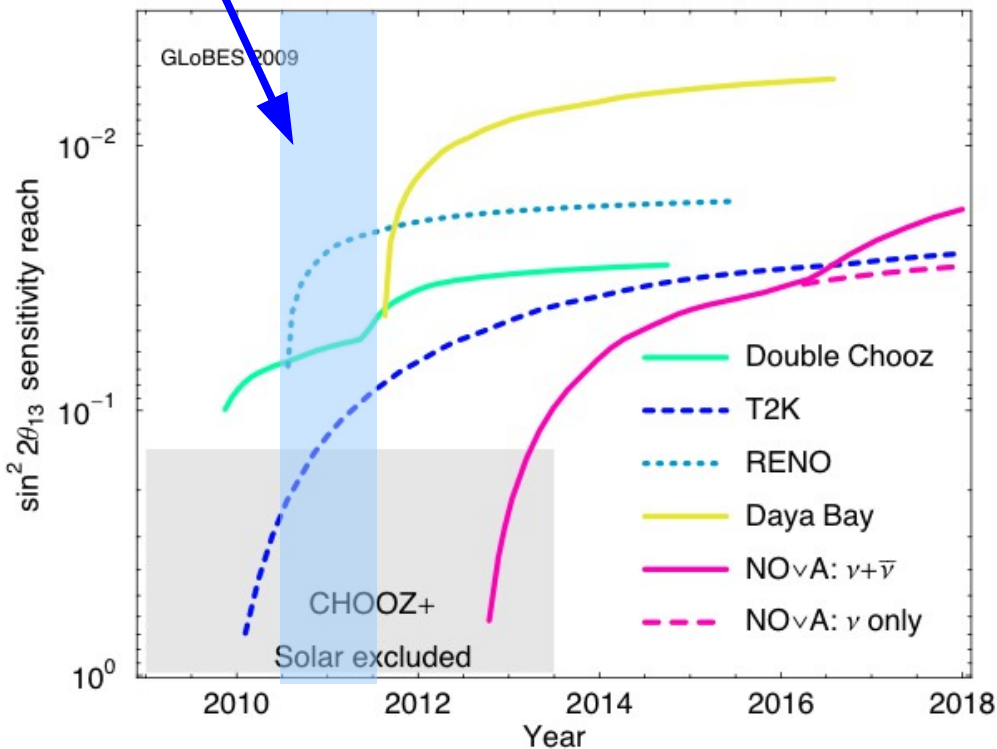
A Final Note

Near Site Commissioning Run: Summer 2010

~10,000 $\bar{\nu}_e$ per week

arXiv:0907.1896

$\sin^2 2\theta_{13}$ sensitivity limit (NH, 90% CL)



Can study:

- Reactor anti-neutrino spectrum
- Backgrounds
- “Identical” detector systematics

Potential for quick results!

Detector systems must be tested and ready.

- **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