Getting There ….

How do we reach the installation of the 4pi system?

Critical Items, Manpower, and Timeline

1. Completion of mechanical work, fine-tuning system (LBNL)

   key people: Syversrud (LBNL), Webber (UC Berkeley) -> technical support needed!

2. Deployment testing (LBNL + others welcome to join and visit)
3. System review and demonstration (collaboration)
4. Setting up cleanroom at LBNL (LBNL)
5. Materials Certification (Alabama, Caltech, Mozumi, LBNL)

   key people: Greg, Christopher, Kengo, Andreas -> who can champion this?

6. Setting up cleanroom at KamLAND (LBNL, Mozumi)
7. Development of initial calibration plan (collaboration)

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8	pre-assemble clean system	12/23/04	12/27/04
9	package system	12/28/04	12/29/04
10	ship to site	12/30/04	1/11/05
11	receive on site and unpack	1/12/05	1/16/05
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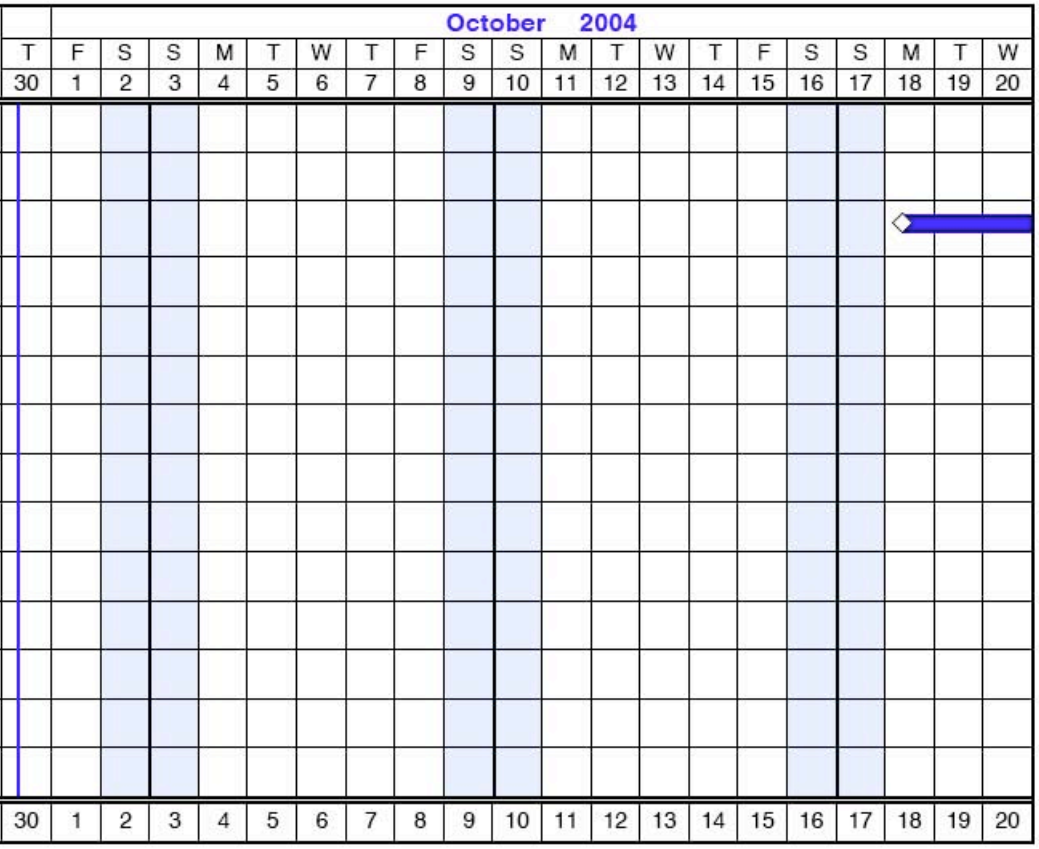
13	installation of deployment system	1/24/05	1/28/05
14	z-axis deployment tests	1/29/05	2/4/05



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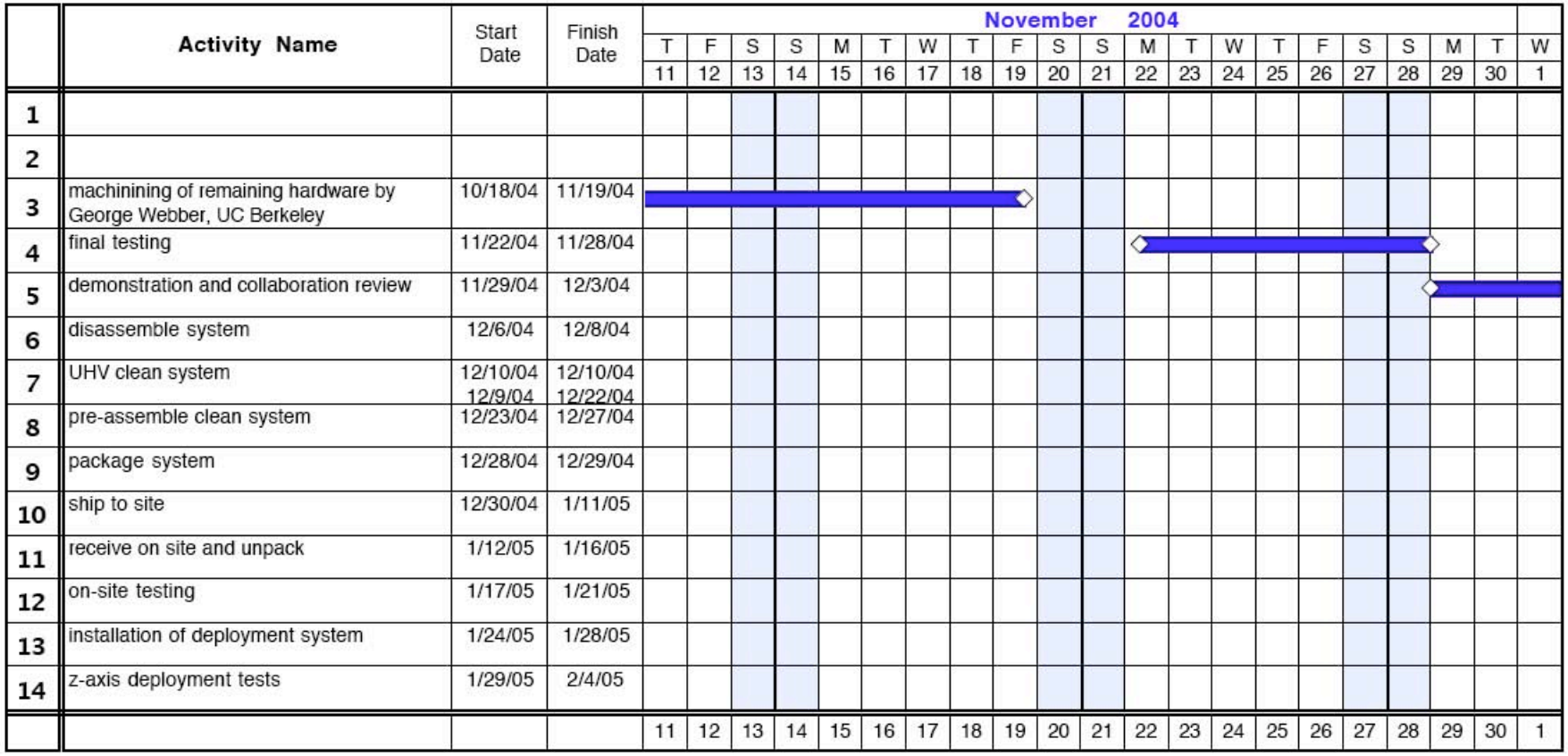

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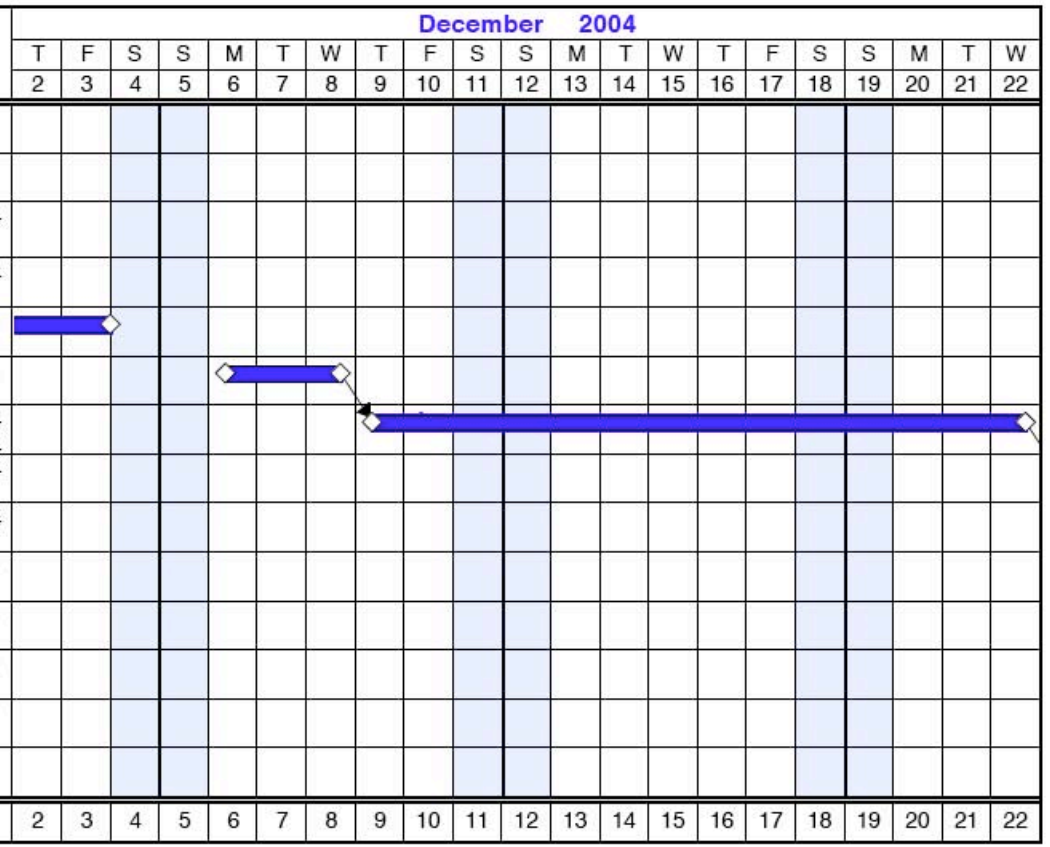

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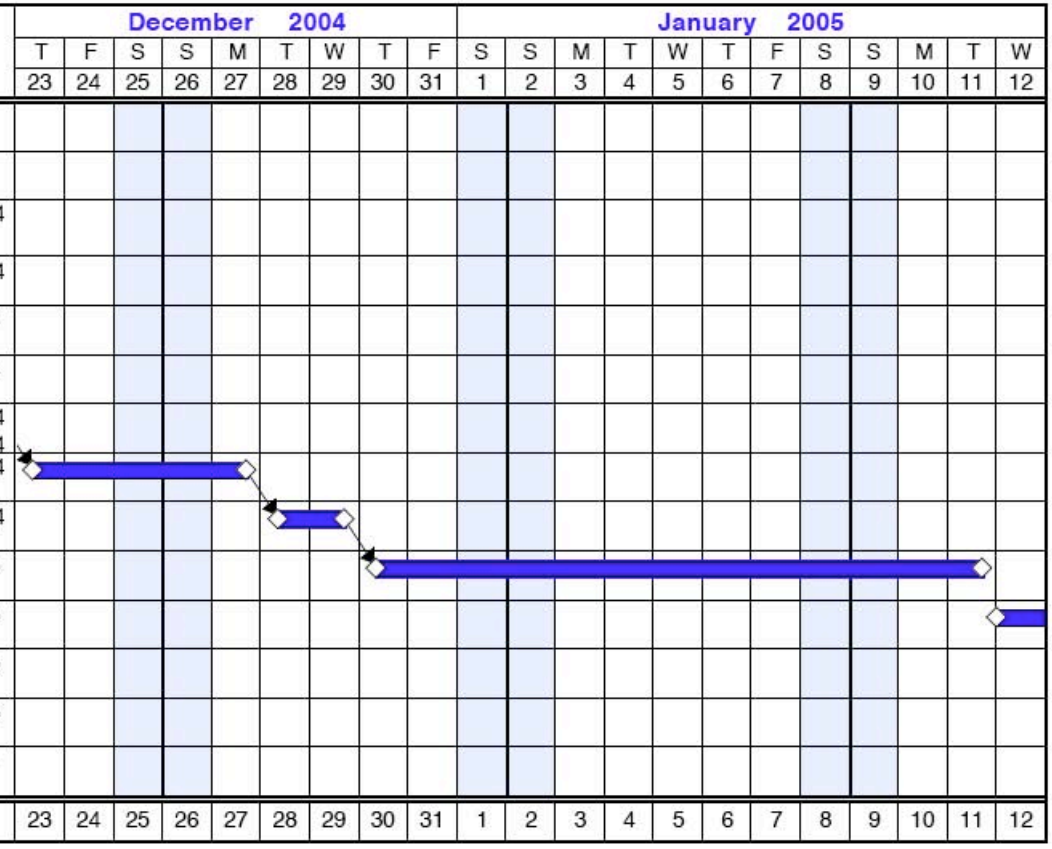

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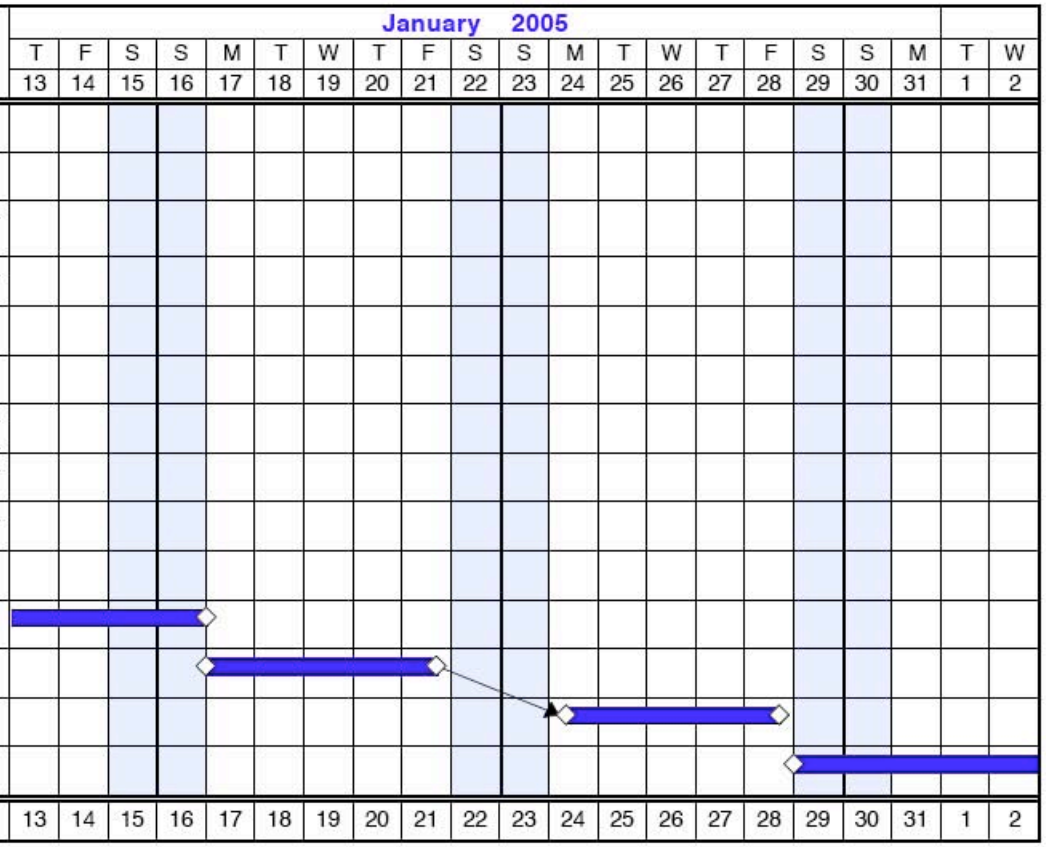

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Cleanroom for Handling of 4π System?

Use existing cleanroom at Berkeley

- Pre-assembly of UHV-cleaned components at Berkeley before shipment to KamLAND.

Use existing cleanroom at Berkeley

- Soak test of cleaned 4pi components.

Question:

- Do we need a temporary cleanroom at KamLAND for 4pi preparations?

Purpose: Assembly and test of 4pi system before installation.

Step I - Installation of Hardware

Goal: Installation of glovebox extension and deployment system.

Required Decisions Prior to Phase I (critical decision I)

→ Ready to start installation of 4pi hardware. Materials approval.

Data Taking & Calibrations

→ Can largely continue quality reactor neutrino data taking.
→ No z-axis calibrations possible.

Work Plan

- Closing gate valves.
- Lift glovebox and exchange of rotary stage. Seal and check stage afterwards
- Remove z-axis system.
- Open top of existing glovebox.
- Install new winch system.
- Clean glovebox and calibration tent.
- Install glovebox extension (penthouse).
- Seal new glovebox and leak test.
- Install drip pan, connect to 4 swage lock connectors
- Modify/connect N2 purge tubes.
- Purge glovebox.

4+2 days

Critical Personnel

Don Syversrud
Berkeley 4pi group

Step II - Final Hardware Tests and Certification

Goal: Final test and certification of installed hardware.

Required Decisions Prior to Phase II

→ None.

Data Taking & Calibrations

→ Can largely continue quality reactor neutrino data taking.
→ No z-axis calibrations possible.

Work Plan

- Monitor leakage of new glovebox.
- Test functionality of new hardware in glovebox.
- Have calibration experts and on-site coordinators review the installed hardware.
- Collaboration (or executive) decision that new hardware can be used.
- Report to collaboration.

2+1 days

Critical Personnel

Berkeley 4pi group
Calibration experts
On-site coordinators
Executive committee

Step III - Z-Axis Calibration with New Deployment Hardware

Goal: Demonstrate that z-axis calibrations can be performed with new deployment system (calibration and analysis).

Required Decisions Prior to Phase III (critical decision II)

→ Ready to use new deployment hardware.

Data Taking & Calibrations

→ Can largely continue quality reactor neutrino data taking.
→ Z-axis calibrations *possible* with new deployment system.

Work Plan

- Deploy standard calibration sources with new system.
- Analyze calibration data and compare to previous z-axis calibrations.
- Evaluate consistency of calibration data and backgrounds before, during, and after calibration.
- Report to collaboration.

} 3+3 days

Critical Personnel

Berkeley 4pi group
Calibration experts
Analysis groups

Step IV - First Symmetric Off-Axis Calibrations

Goal: First off-axis deployment of sources using short pole (eg. 2 segments).

Required Decisions Prior to Phase IV (critical decision III)

→ New z-axis calibrations found to be consistent with old z-axis calibrations.

Data Taking & Calibrations

→ Can largely continue quality reactor neutrino data taking.
→ First off-axis calibration data.

Work Plan

- Deploy standard calibration sources with short pole segment.
- Evaluate success or problems of first off-axis deployment.
- Report to collaboration.

} 2 days

Critical Personnel

Berkeley 4pi group
Calibration experts
On-site coordinators

Step V - Extended Symmetric Off-Axis Calibrations

Goal: Off-axis deployment of sources using multiple pole segments.

Required Decisions Prior to Phase IV

→ No problems found with first off-axis deployment.

Data Taking & Calibrations

→ Multiple off-axis deployments of sources.
→ Reduced livetime for reactor neutrino data taking.

Work Plan

- Deploy standard calibration sources with calibration pole of different lengths.
- Evaluate success or problems.
- Evaluate readiness and need to use counterweight.
- Report to collaboration.

} 5 days

Critical Personnel

Berkeley 4pi group
Calibration experts
On-site coordinators

Step VI - Asymmetric Off-Axis Calibrations

Goal: Asymmetric off-axis deployment of sources using multiple pole segments.

Required Decisions Prior to Phase IV

→ No problems found with extended symmetric off-axis deployment.

Data Taking & Calibrations

→ Multiple off-axis deployments of sources.
→ Reduced livetime for reactor neutrino data taking.

Work Plan

- Deploy standard calibration sources with calibration pole of different lengths and counterweight.
- Evaluate success or problems.
- Report to collaboration.

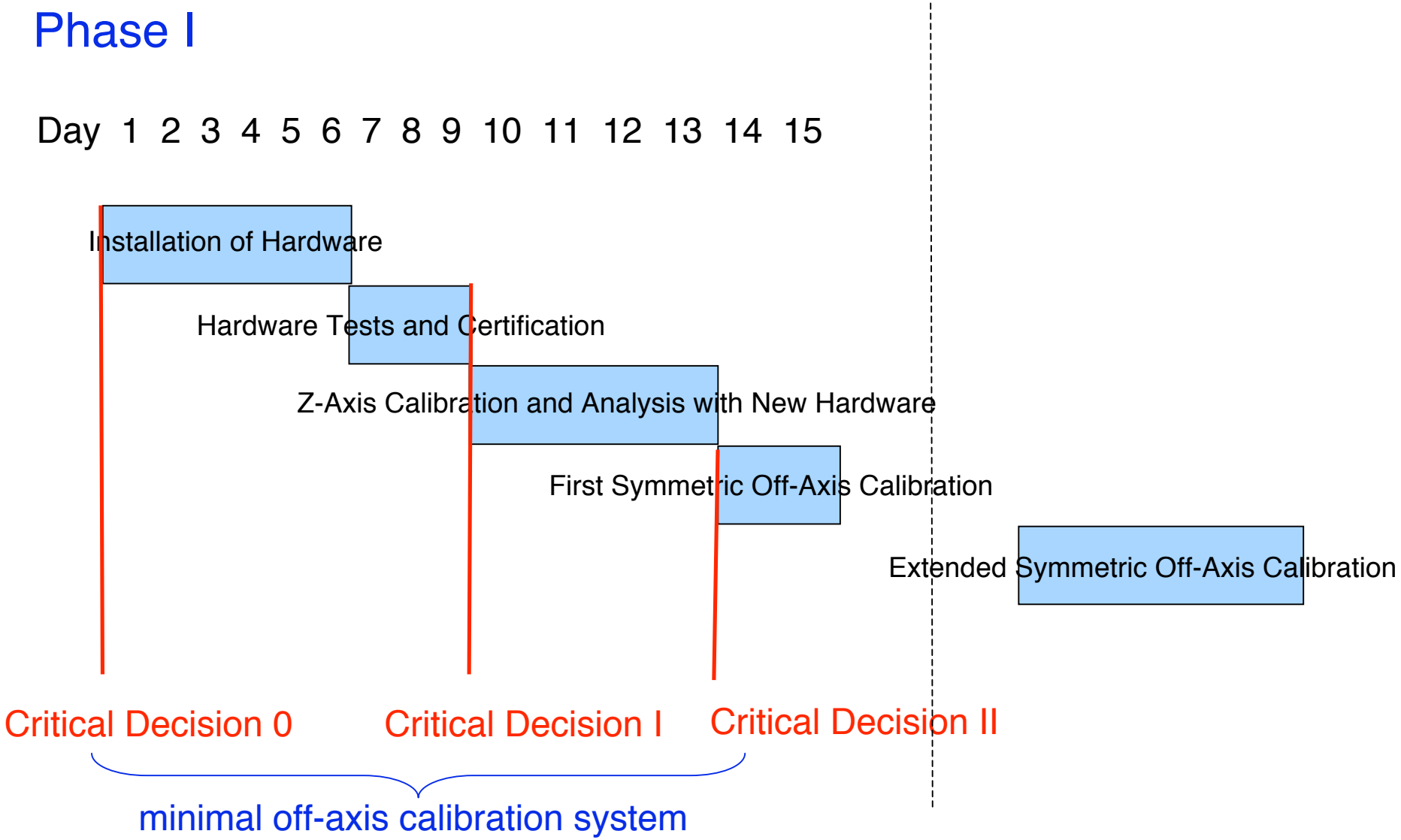
} 5 days

Critical Personnel

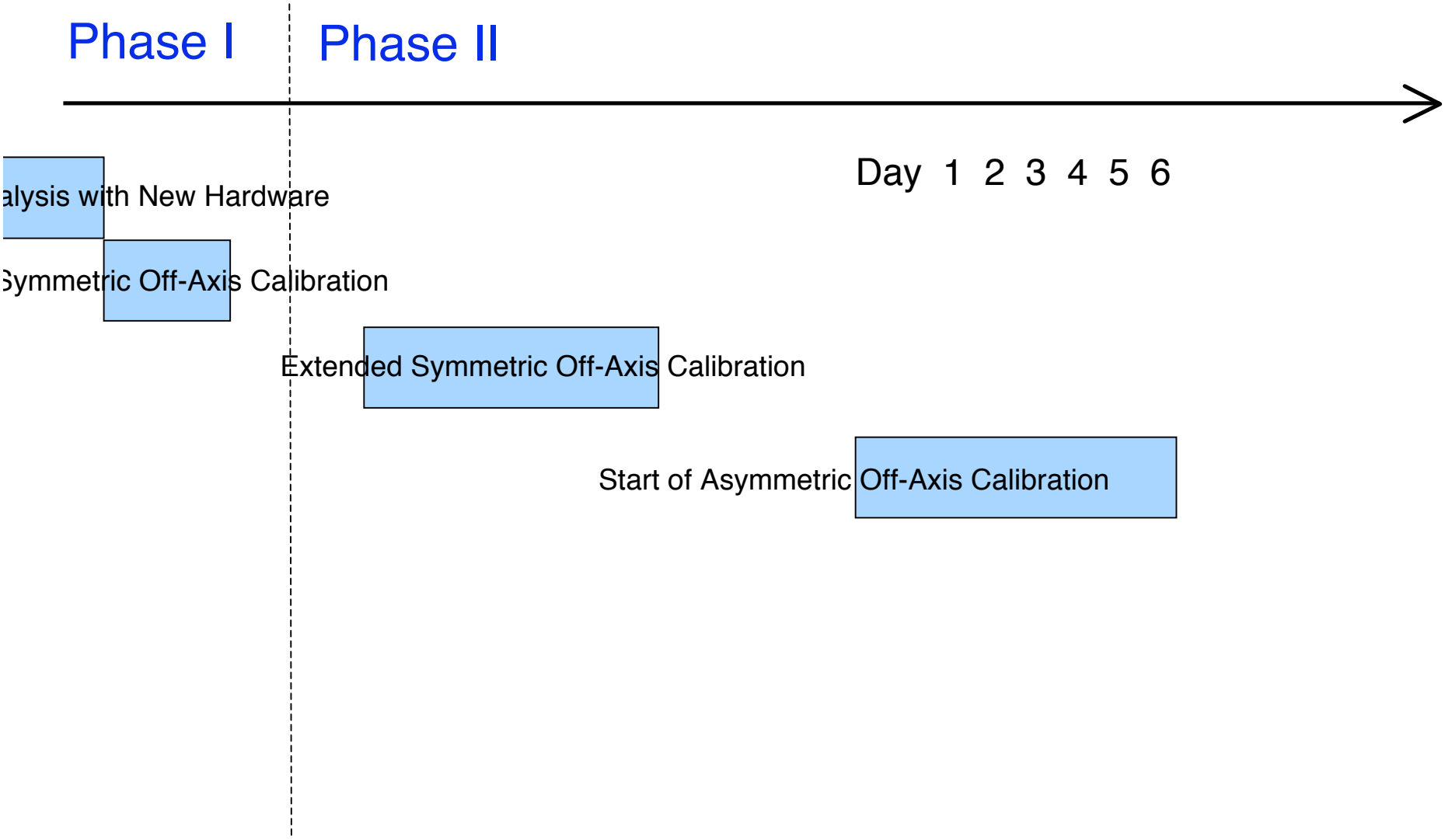
Berkeley 4pi group
Calibration experts
On-site coordinators

Commissioning Schedule

Phase I

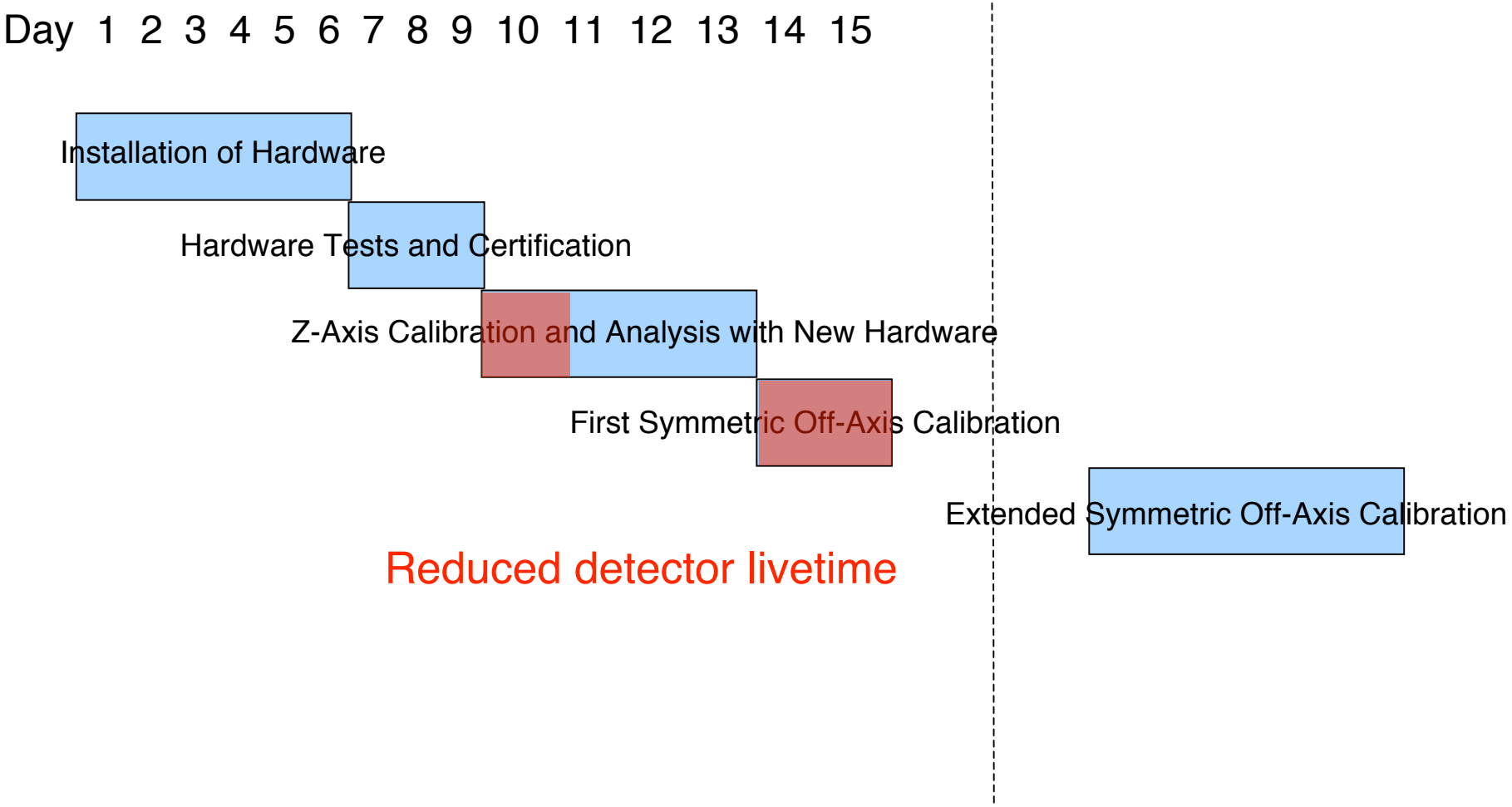


Commissioning Schedule



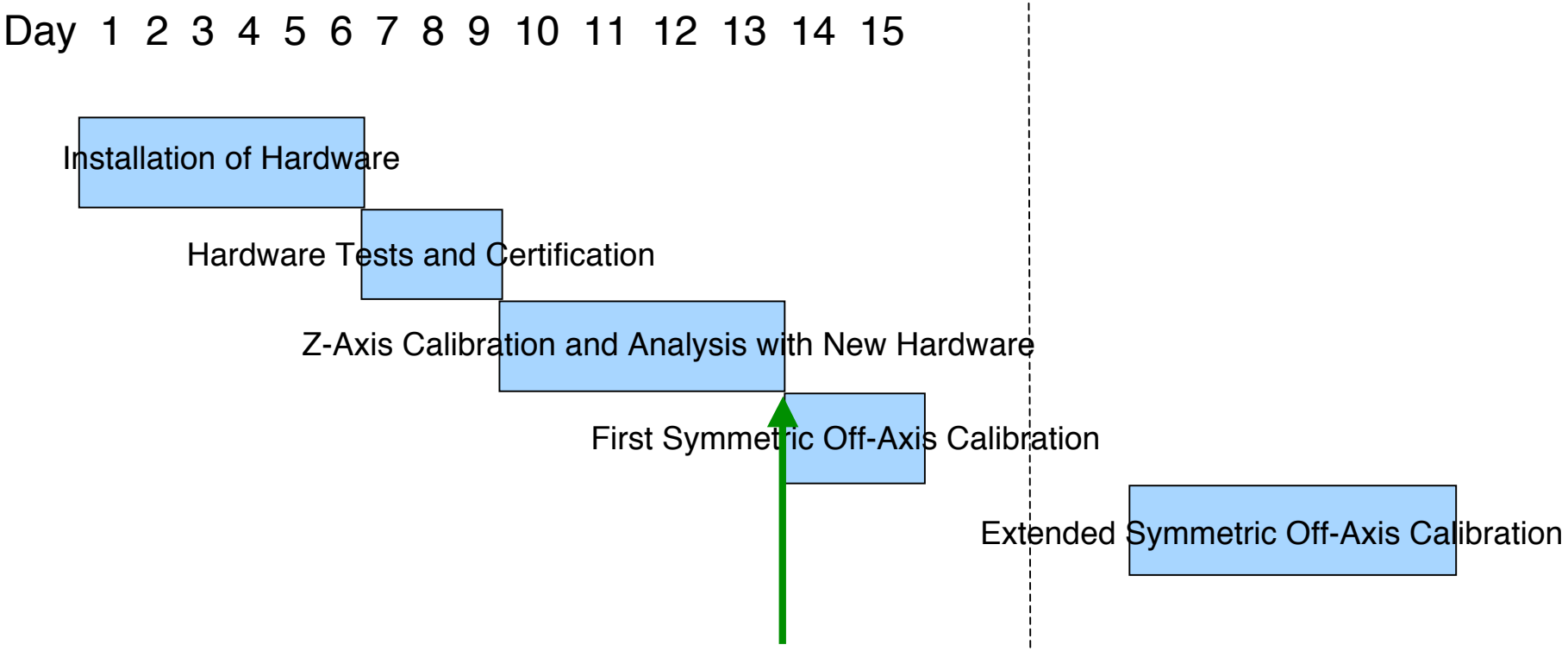
Commissioning Schedule

Phase I - Commissioning and Data Taking



Commissioning Schedule

Phase I - Physics Potential of Symmetric Off-Axis Calibrations



What can we learn from a deployment of the minimum off-axis calibration system?