



SLAC

ATF2 High Availability DC Magnet Power Supplies

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19-21 Dec 2007

5th ATF2 Project Meeting

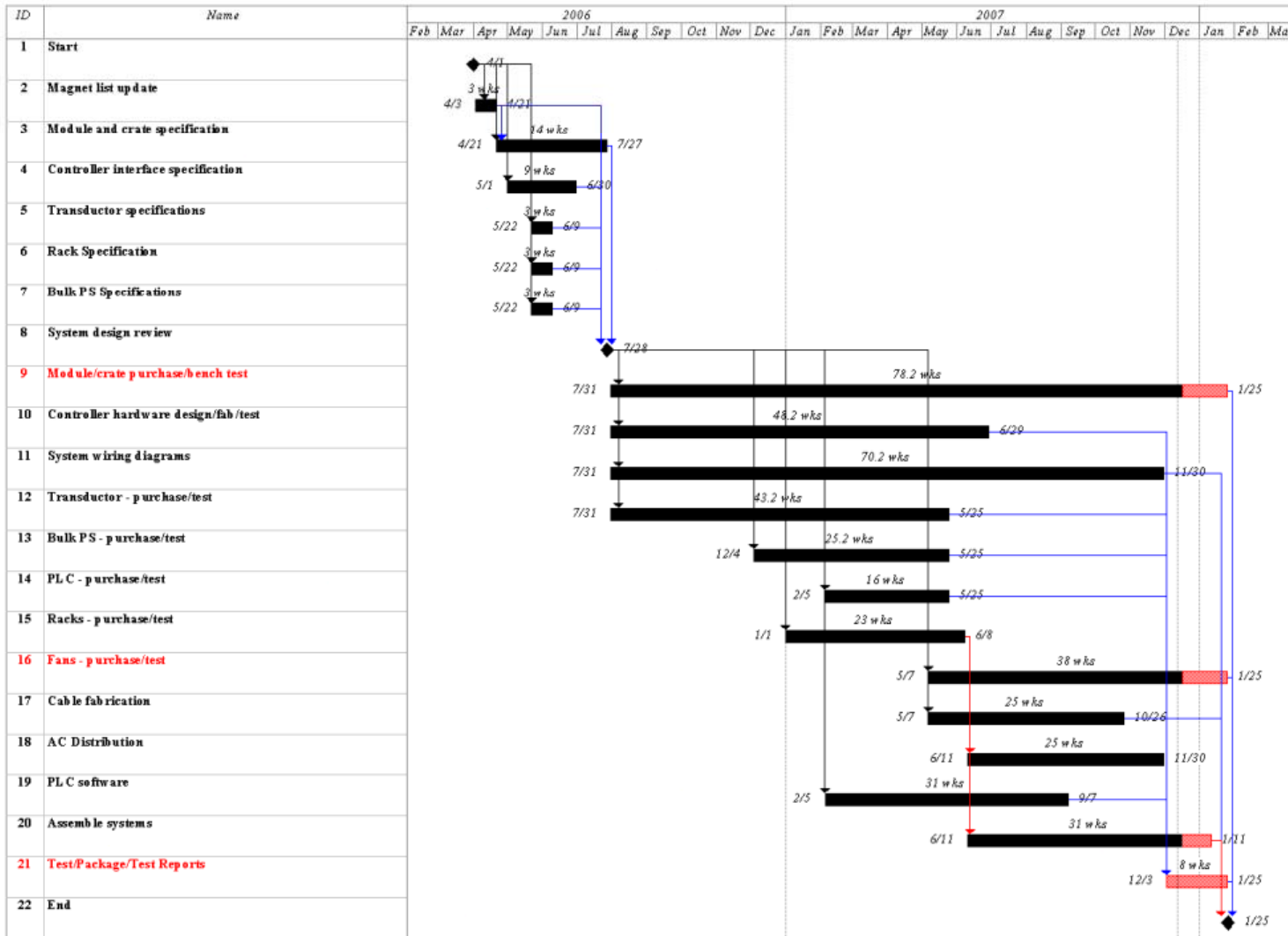
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- Phase 2 – Procurement and testing
 - Schedule
 - Progress
 - Test Results
 - Control System
- Phase 3 – Commissioning
 - Schedule
 - Property Transfer
 - Delivery
 - Responsibilities



SLAC Phase 2 - Schedule





- EPSC (Ethernet Power Supply Controller)
 - 38 units with 7 spares
 - 2 local control boards
- PLC (Programmable Logic Controller)
 - 1 complete chassis, no spares
 - Commercially available parts (Allen-Bradley ControlLogix)
- Bulk Power Supply
 - 6 units with 1 spare
 - Commercially available (Lambda-EMI ESS 40-375)
- DCCT (Current Transductor)
 - 38 regulating and 38 auxiliary units with 4 spares
 - Commercially available (Danfysik Model 866)
- Racks
 - 3 double bay racks
 - 400V distribution panel for bulk power supplies
 - Grounded for EMI and safety



- HA PS
 - Prototype
 - Received Sep 07
 - Tested for stability performance
 - Firmware finalized and tested
 - 1st Batch
 - Shipped on 12 Dec 07
 - In LAX as of 16 Dec 07
 - 12 dual-50A power supplies (24 power supplies)
 - 2nd Batch
 - Ship by the end of Dec 07
 - Remainder 100A, 150A and 200A power supplies
 - Parts Summary
 - Dual 50A PS Crate: 10 units with 2 spares
 - Full PS Crate: 19 units with 2 spares
 - Power Modules: 116 units with 23 spares



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Progress



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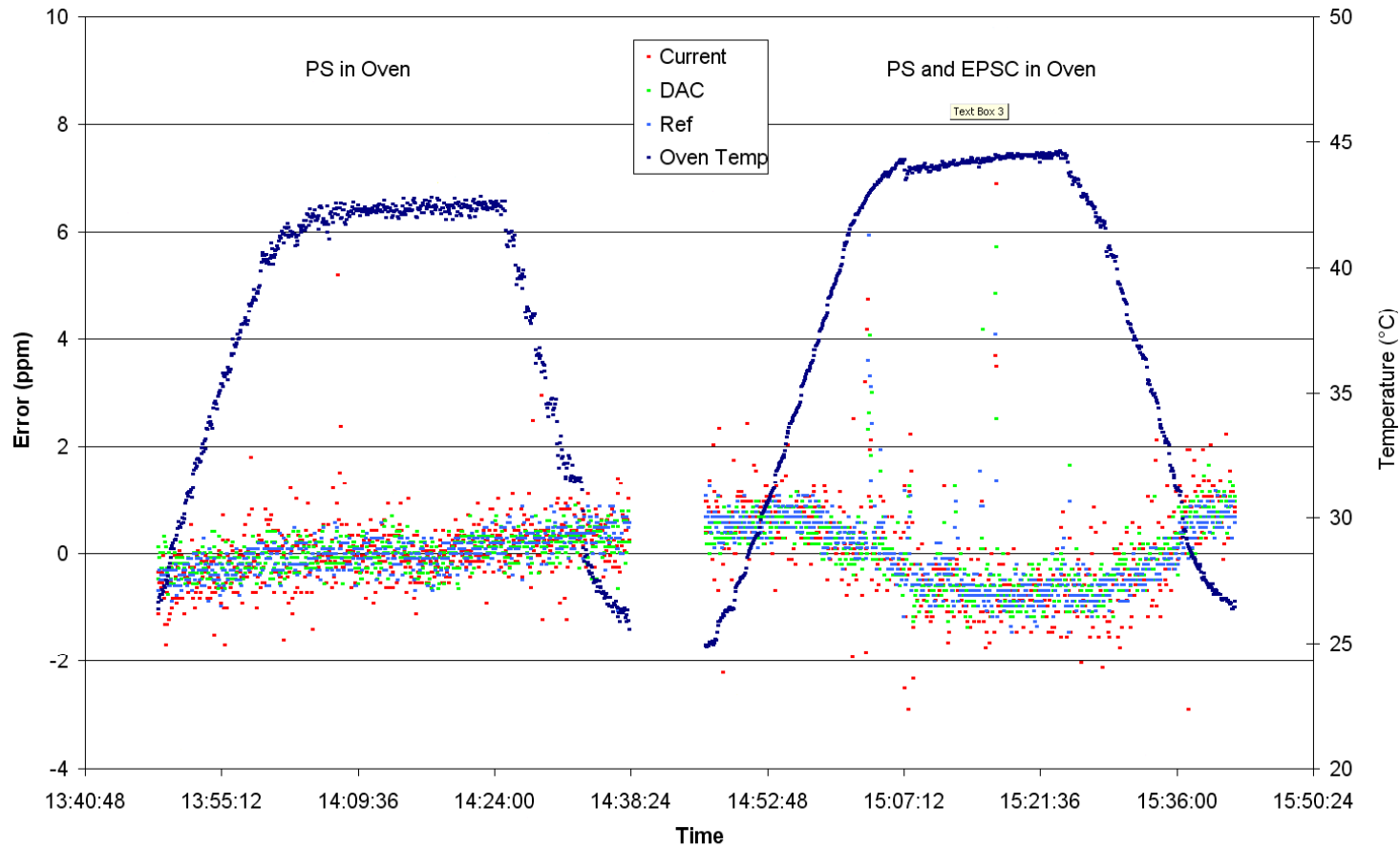


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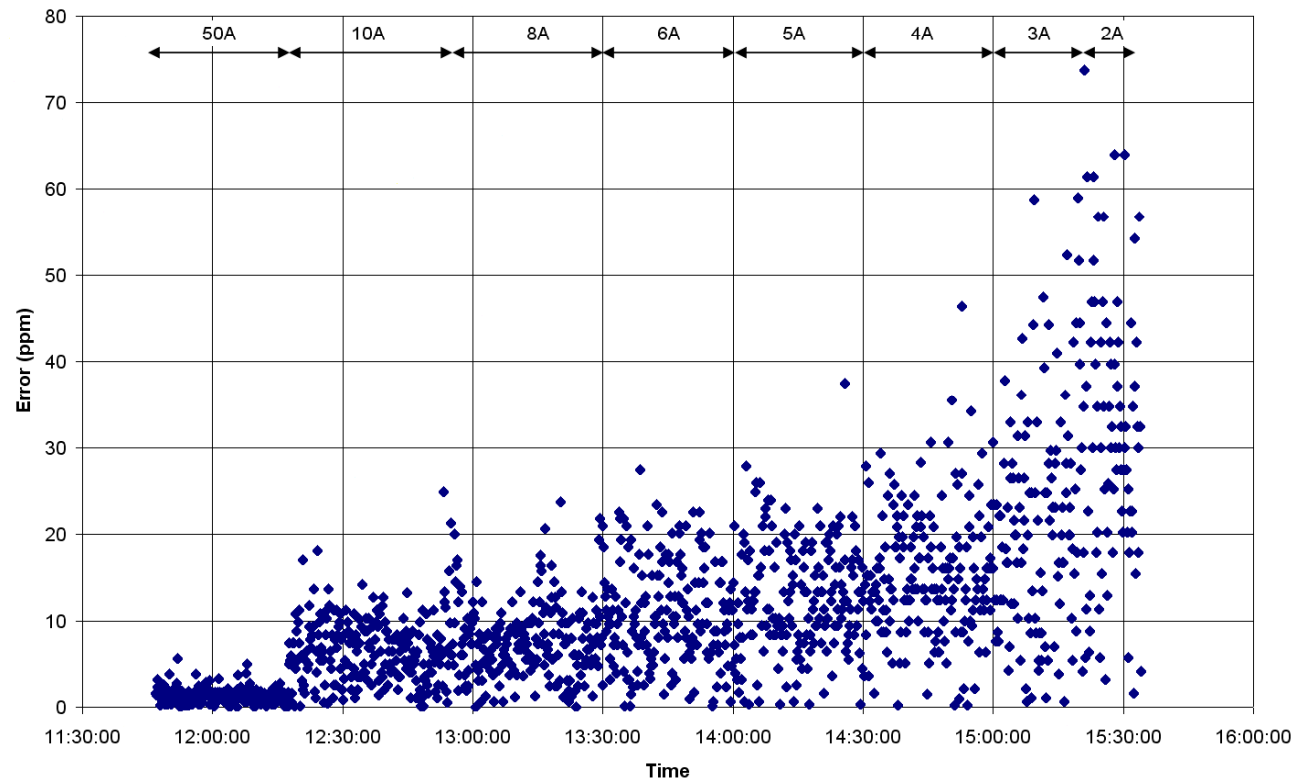


- Stability 200A system
 - < 10 ppm stability
 - Measured in an oven from 25°C to 45°C





- Stability 50A system
 - SF1 and SD0 need to run at ~8A with 100 ppm stability
 - Error is referenced to the operating current, not full scale
 - Testing showed < 80 ppm stability @ 2A





- EPICS Control System by Glen White
 - 1 PLC to control 6 bulk power supplies
 - 38 EPSCs to control 38 high availability power supplies
- Matlab GUI
 - Main Panel
 - 38 power supplies
 - PS Panel
 - Power Supply – on/off and current setpoint control
 - Bulk Power Supply – on/off control
 - Buttons for Expert Panel and Module Panel
 - Expert Panel
 - Diagnostic and Configuration Information
 - Module Panel
 - Status and current readback for individual modules
 - Enable/Disable Modules



ps control

PS Control

Close

| | | | | | | | | | | | | | | | | | | |
|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|---------|-----|-----|-----|-----|-----|-----|-----|-----|
| Off | Off | Off | Off | Off | Off | Off | Off | Off | Off | Off | Off | Off | Off | Off | Off | Off | Off | Off |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| Off | Off | Off | Off | Off | Off | Off | Off | Off | Off | Off | Off | Off | Off | Off | Off | Off | Off | Off |
| All On | | | | | | | | | | All Off | | | | | | | | |
| Off | Off | Off | Off | Off | Off | Off | Off | Off | Off | Off | Off | Off | Off | Off | Off | Off | Off | Off |
| 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 |
| 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 |
| Off | Off | Off | Off | Off | Off | Off | Off | Off | Off | Off | Off | Off | Off | Off | Off | Off | Off | Off |

"Bulk" PS EPSC



ps panel

PS 1 **Power Off** **Bulk Pwr Off** **Close**

Current Control

Readback: **0.003** Ramp Time (A/s): **10**

Set: **0.000** **Ramp**

Store: **0.000** **Ramp** **Standardise**

Edit Standardisation

Reset Interlocks

Reset Controller

Bulk PS Fault Reset

Refresh Status

Aux. Panels

Module Panel

Expert Panel

Controller Status

13-Dec-2007 18:35:30: Module data not valid or fault detected- check module panel



ps expert

PS 1 Expert Panel

Close

Error Status

- Local Mode
- Mag. Interlock 0
- Mag. Interlock 1
- Mag. Interlock 2
- Mag. Interlock 3
- Reg. Xduct Status
- Aux. Xduct Status
- GND Current Fault
- Fault Latch Status
- Calibration Status
- Hardware Status
- Last reset code: 1
- Last turn OFF code: 0
- Self-test error code: 0
- Cal. error code: 0

Status Readback

- Reg. Xduct current: 0.003 A
- Aux. Xduct current: 0.000 A
- DAC current: -0.000 A
- Ripple current: 0.000 A
- Ground current: 0.000 A
- Output voltage: 0.000 V
- Controller temp: 97.000 degF
- Spare voltage: -0.000 V
- ADC offset: 2406
- ADC gain: -1345
- DAC offset: 43
- DAC gain: 0
- BULK PS output V: 0.000 V

Configuration Summary

| | |
|----------------------------------|--------------------------|
| Controller address: 192.168.1.98 | Xduct 1 V/I: 30 |
| Chassis type: 32 | Xduct 2 V/I: 30 |
| Serial #: PCD09375 | GND current V/I: 0 |
| Magnet ID: QD12X | PS voltage V/V: 3 |
| Firmware version: 11/20/07 | Reference Voltage (V): 7 |
| Calibration date: 06/12/07 | Dig. err. V limit (V): 1 |

psModule_panel

PS 1

Enable All Modules Refresh Close

Module 1

ENABLED

Fault

Enable Disable

0 A

Module 2

ENABLED

Fault

Enable Disable

0 A

Module 3

ENABLED

Fault

Enable Disable

0.36585 A

Module 4

ENABLED

Fault

Enable Disable

0 A

Module 5

ENABLED

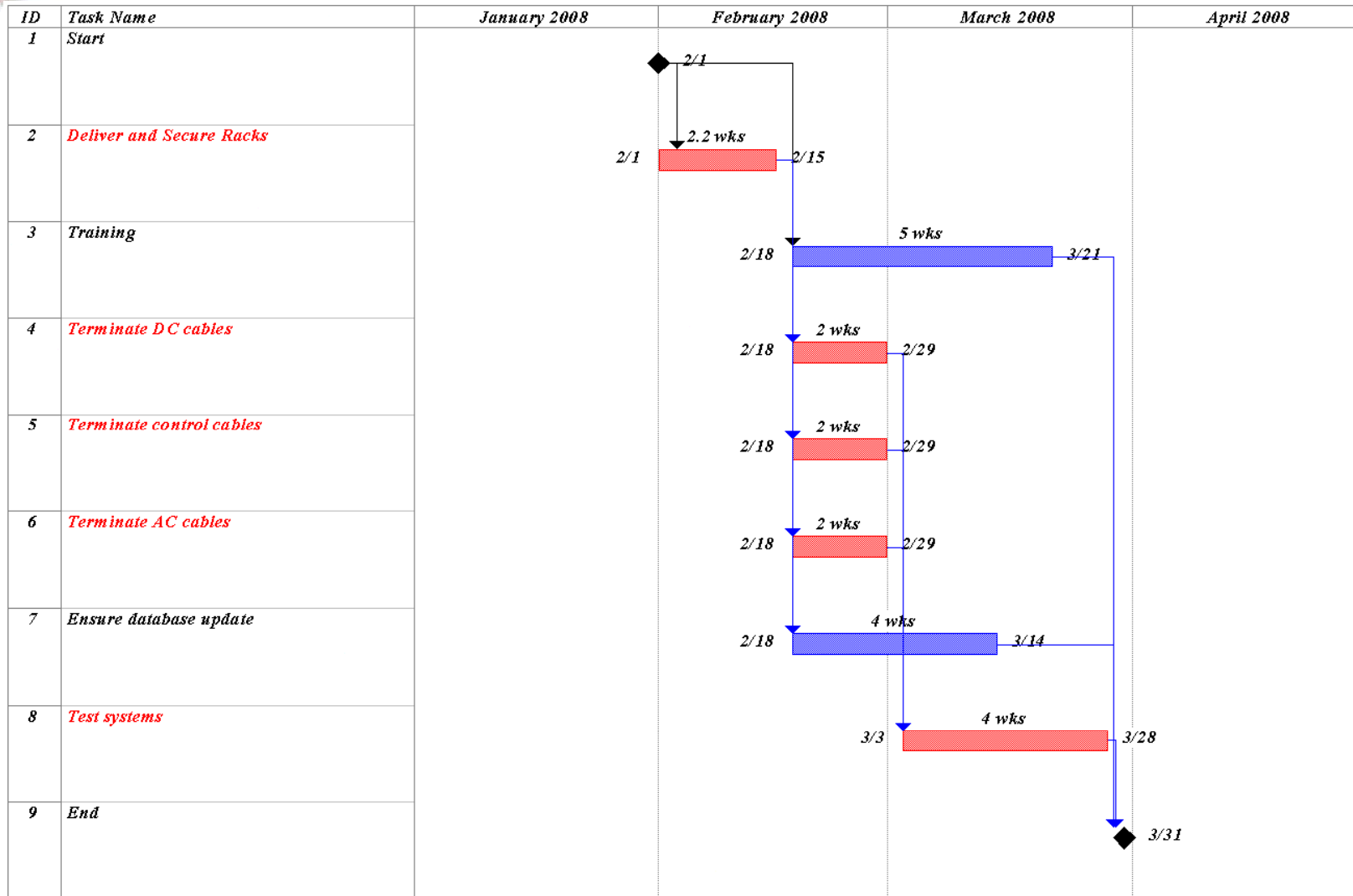
Fault

Enable Disable

0.12195 A



SLAC Phase 3 – Schedule





- Property Transfer to KEK
 - SLAC Technology Transfer Department is working on the paperwork to transfer the power supply systems to KEK.
 - MOU for the ATF International Collaboration
 - Write Annex that will allow “donation” of the power supply systems to the ATF Collaboration, subjecting DOE approval



- KEK commissioning schedule
 - Power supplies commissioned by April 2008
- SLAC will ship the power supplies at the beginning of February 2008
- SLAC will commission the power supplies from mid-February through March 2008 (6 weeks)



- Items needed from KEK during commissioning
 - AC service
 - 400VAC 3 Φ 240A with neutral and ground
 - 100VAC 1 Φ 20A (12 circuits)
 - DC magnet cables
 - 2 AWG for 50A Power Supply (\sim 40 mm²)
 - 4/0 AWG for all others (\sim 140 mm²)
 - Interlock Cables
 - Thermo-switch
 - Water flow-switch
 - Test Equipment and Tools
 - What is available and what do we need to bring?



- Test Equipment and Tools
 - Test Equipment
 - 6.5 digit voltmeter
 - Oscilloscope
 - Function generator
 - Loop Analyzer
 - Monitor, keyboard and mouse for the IOC
 - Tools
 - General Tools:
 - i.e. screwdrivers, wrenches, wire cutters, etc.
 - Crimpers and crimp lugs to terminate dc cables