

SLAC Main Control Center Upgrade

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Overview

- In the September 2008, SLAC Main Control was updated for LCLS operation
 - Layout of room changed
 - New countertops
 - New computer workstations
 - New overhead display monitors (and software)

Outline

- Building HVAC upgrade (2007)
- Change of experiment at SLAC (PEP-II to LCLS, April 2008)
- Constraints
 - Control room staffing
 - Room layout
 - Ergonomic considerations
 - Time and budget
- How we came up with a plan
- Implementation

Building HVAC upgrade

- Common complaints
 - Room too noisy (fans and building HVAC)
 - Lighting bad
 - Prefer indirect lighting to minimize monitor glare
 - Room often choked with people and felt “cave-like”

Building HVAC upgrade

- Raise ceiling 2 feet
- Install indirect lighting
 - 4 quadrants, each individually controlled, dimmable
- Upgrade HVAC system
 - Add user control of temperature in room by $\pm 3^\circ$
 - Programmable system; room temperature increases 5 degrees at night
- Done during one summer downtime

Before remodel



After ceiling, lighting and HVAC work



Change of Experiment(PEP-II to LCLS)

- Change of experiment at SLAC (PEP-II to LCLS)
- New software and new control system resulted in need for new computers and displays
- Early LCLS commissioning run gave us a preview of control room and workstation requirements

Control Room Staffing

- Continuous
 - 3 Accelerator Operators
 - 1 Operations Engineer (i.e. Crew chief)
- Day shift
 - 1-2 additional operations staff
 - 1-2 physicists
 - 1 Program Deputy
 - 1 or more controls staff

Control Room Staffing continued

- Accelerator physics studies / commissioning
 - Everyone from previous slide
 - More physicists
 - More controls people
- Design must accommodate both high and low occupancy periods

Control Room Layout

- Control room dated back to the 1970s
- Racks surrounded 80% of the room
- Removal of racks difficult due to existing cabling
- Decided not to remove any racks and work with existing room perimeter

Ergonomic Considerations

- neck strain due to overhead monitors (5)
- eye strain: distance, brightness of monitors, font sizes, display colors, room & local lighting (4)
- wrist discomfort, repetitive stress: keyboard & mouse placement, adjustability (4)
- table height adjustability, chair adjustability, and footrests (4)
- control of shared interactive displays/applications from any location (4)
- ability to move around between work stations easily, traffic flow (4)
- telephone accessibility (4)
- availability of desktop space, for writing, phones. (3)
- flexibility of workspaces, for varying number and types of personnel (3)
- placement & availability of knobs, Master Beam Control, etc. (3)
- air flow & room temperature (2)
- storage space for personal effects (1)
- sound or noise control (1)
- waste disposal (1)

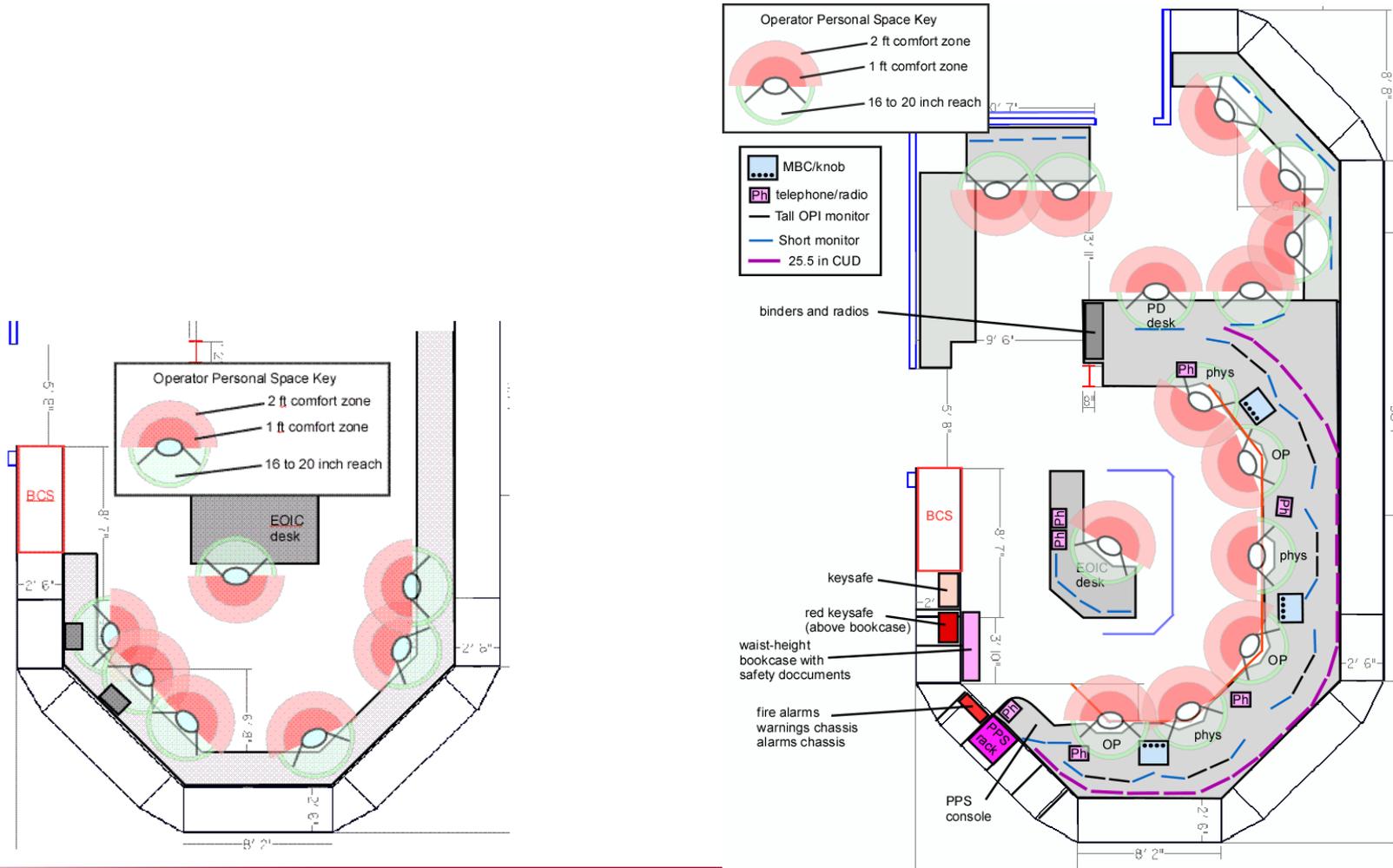
How we came up with a plan

- At the beginning of a 3 month downtime, ~6 interested group members formed a “control room redesign task force”
 - Met daily for first week to set requirements for new design
 - Met daily for second week to agree on a design and then presented it to the entire operations group for feedback
 - Third week created task list and split up the work. Met every other day to track progress. Wrote procurement request.

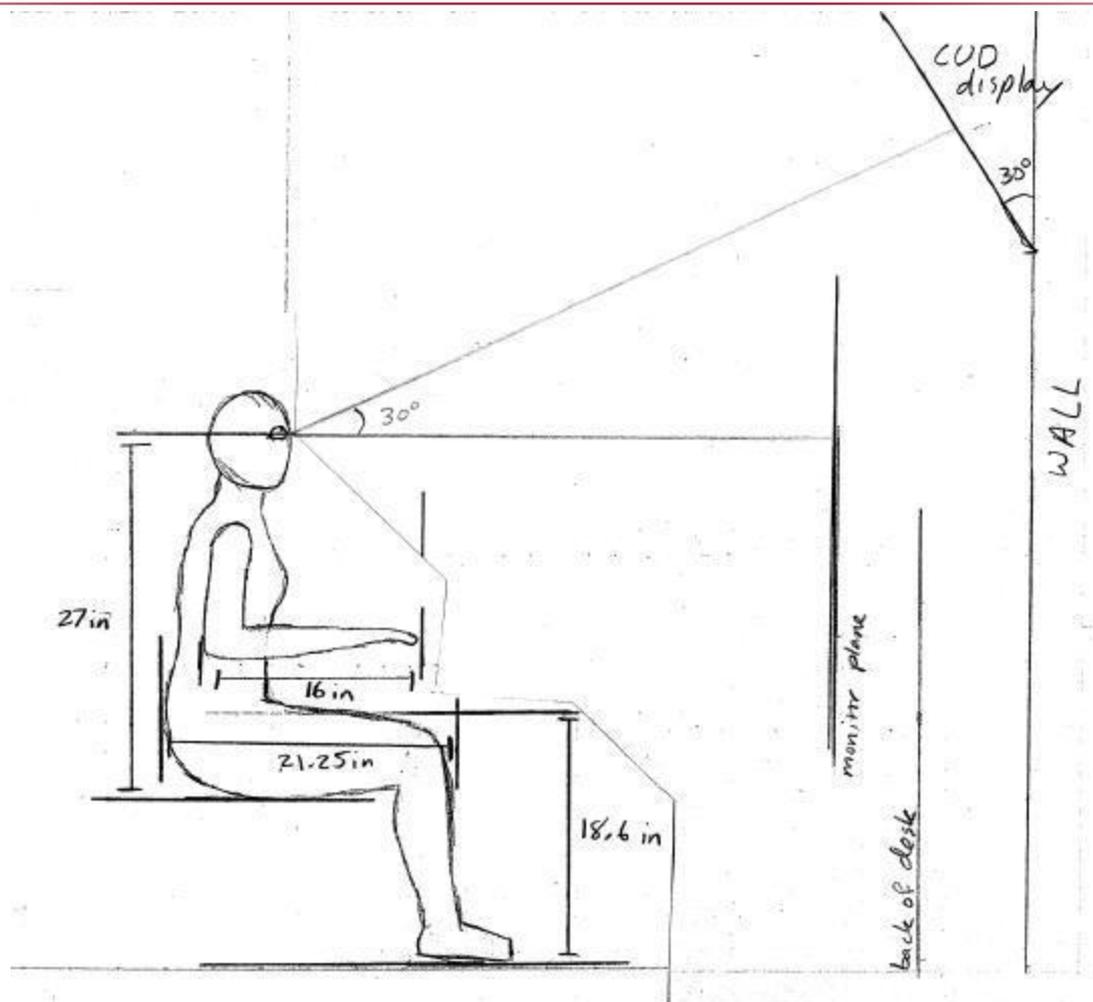
Timeline and budget

- Three month window to make changes
- Furniture takes time to order or build
- Equipment in racks difficult to move
- Budget a concern, so implementation must be done in phases

Console Redesign (before and after)



Desk and overhead display height



After countertops removed



After new countertops installed



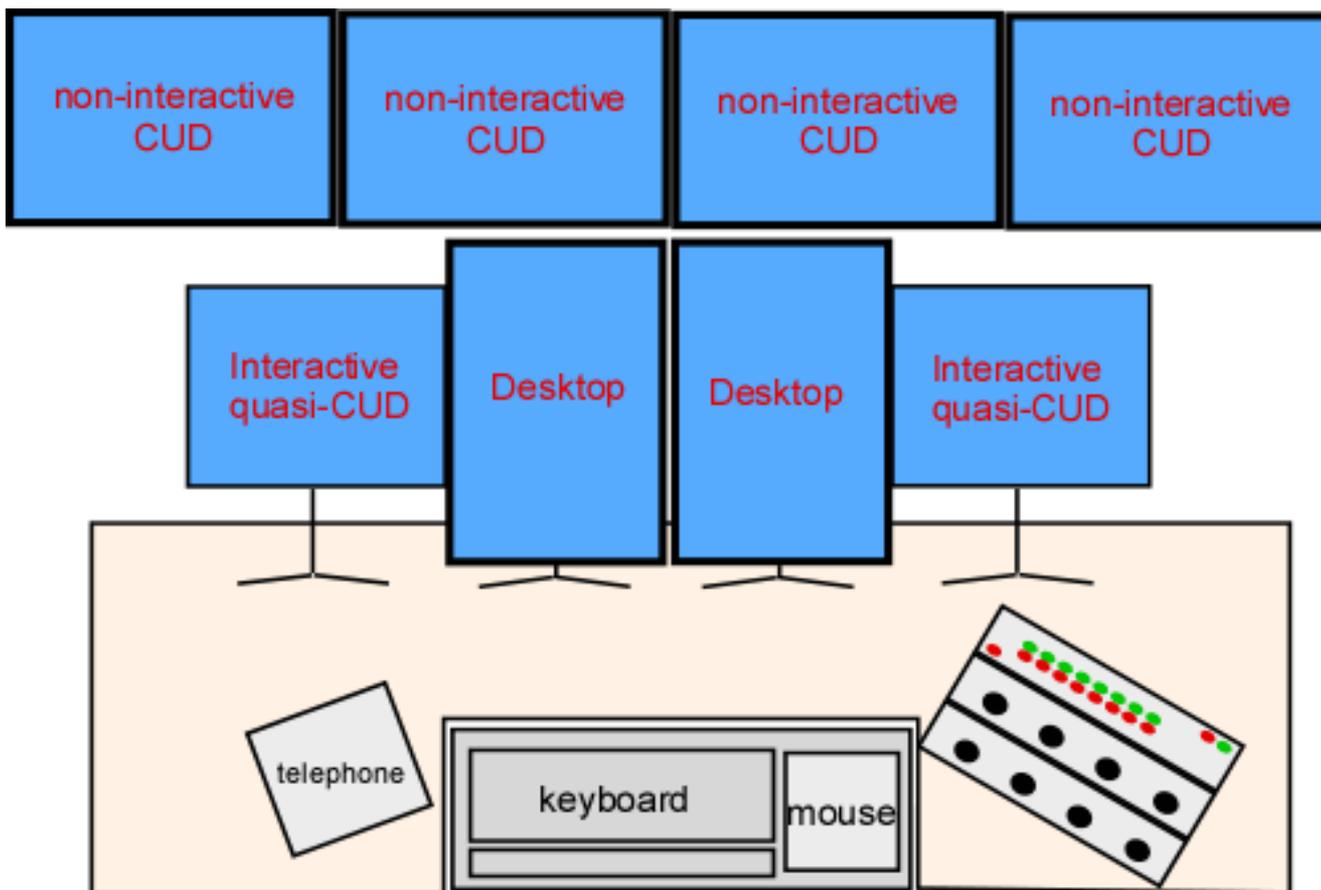
Present day



Workstation considerations

- Each workstation needs
 - 1 keyboard/mouse and multiline telephone
 - At least two 24” monitors for desktop applications
 - 4-6 extra displays within easy view that show information about the accelerator (we call these “CUDs”)
 - Access to custom-built hardware accelerator “master beam control”

Workstation picture



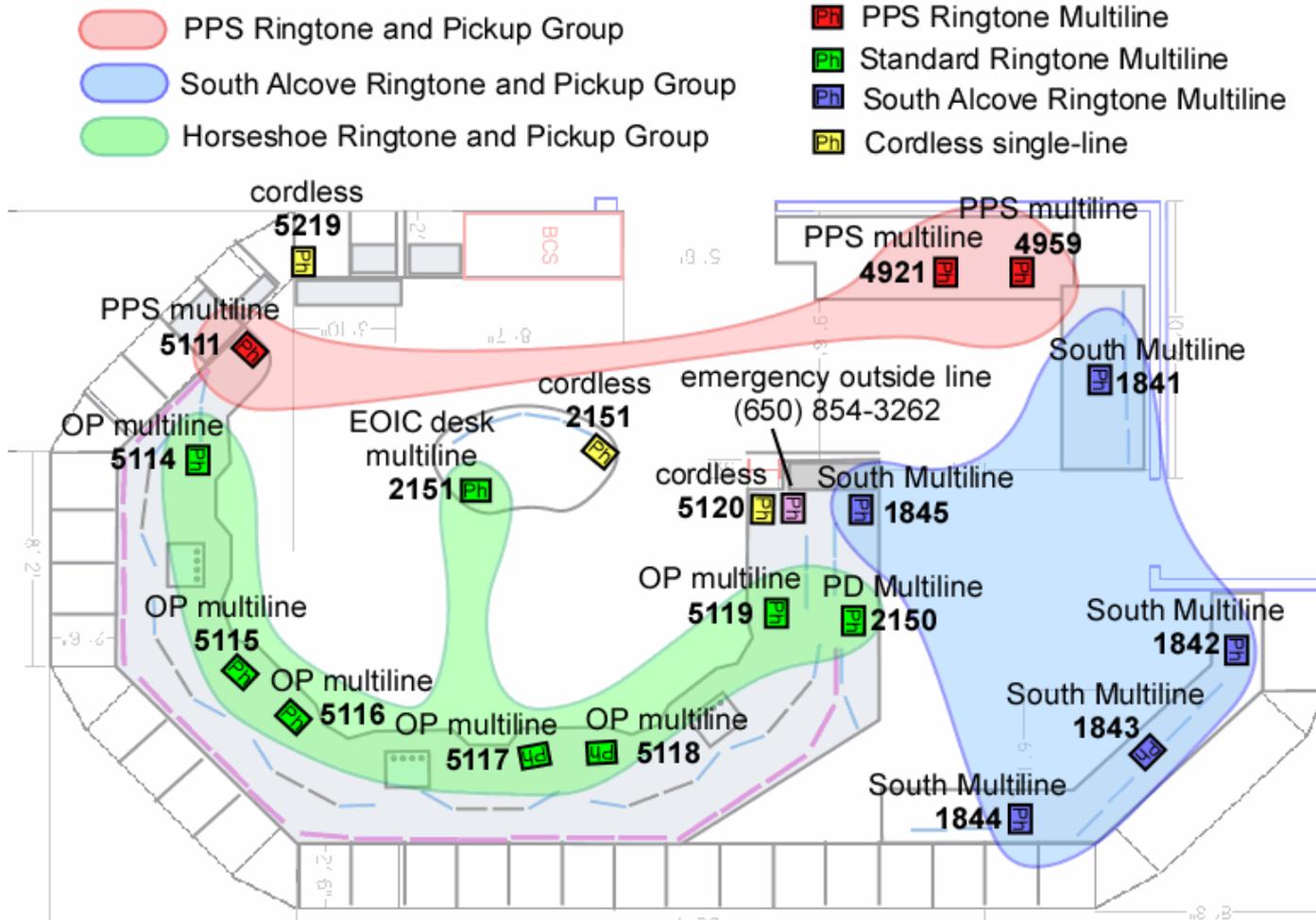
Overhead display considerations

- Operators came up with a set of standards for overhead displays
 - High contrast, font size > 36
 - Fill a 24” monitor in landscape mode
 - Launched and controlled remotely from any workstation in room
 - Printed remotely

Overhead display considerations

- Operators created several overhead displays themselves using EPICS to replace old displays

Telephone layout



Budget

- Countertops and center desk: \$15,000
- Workstation computers
 - Linux workstations: 8 x \$5,000
 - Monitors: 4 x \$600
- Lower overhead displays
 - Monitors: 12 x \$350
 - SunRay workstations: 6 x \$400
- Upper overhead displays:
 - Monitors: 6 x \$1500
 - SunRay workstations: 3 x \$400

Budget continued

- Keyboard tray arms: 7 x \$300
- Sunray server: 2 x \$5,000
- Total: ~\$90,000 not including operator labor or building HVAC work

Thank you