Control Room Requirements for LCLS

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The control room for LCLS will be shared with the Main Control Center (MCC) so that all accelerator operations are coordinated from a single, central location. LCLS shares the main linac with the high-energy physics program, which requires that all beam operation and access to the accelerator be coordinated.

The control room serves to provide a central location where the Engineering Operator In Charge (EOIC) and the operators on shift can monitor the state of the machine and respond accordingly. Computer monitors, control panels and telephones are distributed around the control room to facilitate this. The accelerator physicists and run coordinators who are involved in optimizing the machine performance also occupy the control room with the operators.

The present control room

The present control room occupies room 100 of building 5 (the MCC). The control room area has become defined by the oval-shaped enclosure formed by the equipment racks and a windowed partition wall with two entry doors. The control room is used at present to run the primary program, PEP II, and secondary programs for fixed target experiments, for example in the FFTB line. The typical occupancy of the control room is 1 EOIC, 3-4 operators on shift, a program deputy, a run coordinator from the high-energy physics program plus several PEP II accelerator physicists. The secondary program for FFTB typically adds two more people who use consoles in the remote corner of the control room. During PEP II Machine Development (MD) shifts the occupancy of the control room can rise to 15 persons, or more, and then there is not enough console space for the secondary beam program to operate. Two dedicated consoles are used for operators to control PPS (Personnel Protection System) access to the accelerator and beam line housings for maintenance or other purposes.

The present control room has a long history of evolution and has many shortcomings by today's building standards. The enclosure of equipment racks was originally designed to hold electronics modules, CRT Displays, push buttons and switches and the operator consoles (COW's). These functions have largely been superceded by computer screens and keyboards which are not well matched to the available shelf and table space. The ergonomics, lighting and cleanliness are also antiquated.

Future LCLS requirements

During LCLS commissioning and subsequent operation we can expect an additional equal number of people to occupy the control room as are currently present for PEP II operation. The LCLS operation involves the RF Photoinjector, the linac and bunch compressors, the BSY and Research Yard electron beam line, the undulator and the x-ray beam lines. Doubling the occupancy of the present control room is not possible as we have already reached the occupancy limit during PEP II MD's. Several scenarios can be considered to expand and reorganize the space in the existing control room area. These will be discussed at greater length before more extreme measures are considered such as building a new control center building and moving the entire operations to new premises.

Before discussing the different options it is necessary to list some of the other functions in the MCC building that houses the control room. Adjacent to the control room is a conference room (Room 110) heavily used by control room personnel. The front corner of the building houses a climatically controlled computer room (Room 112) for the accelerator control computers and network equipment. The computers have become more compact over the years relative to the available floor space. Behind the control room are more equipment racks which originally housed PDP11 computers which have since been removed and the space is now houses miscellaneous items such as interlock modules and cable TV distribution modules. The general area also contains photocopy machines and office supplies. An annex to the control room area has 8 small office rooms. The rear, non-climatized portion of the MCC building houses large power supplies for the end station beam lines and provides access to a kitchen and male and female toilets. The toilets are undersized and probably do not meet code requirements given even the present building occupancy.

Scenarios for expanding the present control room space involve moving, or removing, some of the equipment racks that partition off the present control room area. The degree to which racks are moved needs to be considered in terms of the invasiveness to the present accelerator operation program. Some of the racks contain wiring and cross connects essential to the machine interlock system, and the level of documentation for these systems is not very high. Relocating this wiring could only be done during an extended machine shutdown with an additional allowance for recommissioning time during the machine start up. Other racks have already had much of their equipment removed and contain nonessential wiring, so that these racks could be removed during machine operation, or at least on maintenance days.

Scenario 1
The least perturbative expansion can be made at the southern end of the control room near the front entrance. This is the area used by secondary programs at present, such as FFTB. The racks in this area do not appear to contain critical equipment or wiring. The racks from the door around to approximately the midpoint of the control room could be removed without a large interruption to machine operation. The floor space behind the racks is mainly a walkway and could be incorporated into the control room space, extending the control room out as far as the walls of the computer room. The small rack

housing the MPG micro could be relocated into the computer room. The control room would also extend as far as the wall to the copier room (Room 114). This room could become part of the control room and house printers, book shelves and sundry items used by operators such as radios and flashlights. The remaining horseshoe shape of racks would be left untouched for PEP II operation in this scenario.

Scenario 2
This expansion involves, in addition to the above, moving the racks at the northern end of the control room so that the room space could grow to encompass the sparsely used rack and floor area behind the present control room. The space could be prepared ahead of time to cause the least disruption to operations when the northern horseshoe area of racks is finally removed. One could conceivably leave just the eastern wall of racks in place since they house the beam containment modules and would cause the biggest interruption to the program if they were moved.

General requirements
A modern control room, such as the one at the APS shown in the accompanying photos, is uncluttered, clean and well-lit. The bench space is optimized for present day workstation computers with clear views to information monitors. The layout and furniture is ergonomic.

Schedule requirements

Commissioning of the LCLS RF photoinjector will begin in mid 2006, approximately 3 years from now. Usage of the control room will continue to grow after that as more of the linac is commissioned for LCLS operation. The planning, scheduling and costing of these changes to the control room should be started now.

Views of the modern APS control room at Argonne National Lab.

MCC Building 5, racks removed in scenario 1 and scenario 2