LCLS Newsletter 13-MAR-2000

Project Management *Lowell Klaisner, Max Cornacchia*

LCLS Monday Management Meetings

The LCLS management holds videoconference meetings on Mondays every two weeks. The members of the management group are Ilan Ben-Zvi, Vinod Bharadwaj, Jym Clendenin, Max Cornacchia, Efim Gluskin, Lowell Klaisner, Ingolf Lindau, Dinh Nguyen, Heinz-Dieter Nuhn, Ewan Paterson, Claudio Pellegrini and Art Toor. The format of the meeting is as follows.

1 General management issues
2 System presentation
3 System presentation

The schedule for the management meetings and system presentations is

March 13, 2000	Injector	Linac
March 27, 2000	Parameters	X-Ray Optics
April 10, 2000	FEL Physics	Undulator
April 24, 2000	Experiments	Facilities

The system presentation includes discussion on the following aspects.

1 Status
2 Plans
3 Issues, Proposed Parameter Changes
4 Schedule for R&D work
5 Budget for R&D work
6 CDR, Text, Cost, Schedule

If you would like issues brought up at the management meetings please contact a member of the management group.

LCLS General Seminar

There will be a LCLS seminar on Monday, March 13, at 3:00 PM in the LOS (bldg. 137) 2nd floor conference room:

Agenda

LCLS news	Ewan Paterson
Report of the workshop on short bunch measurements	Theo Kotseroglou.
Additional Comments	Jym Clendenin, Paul Emma, Vinod Bharadwaj.
General Discussion.	

LCLS Travel

All travel initiated by SLAC personnel that is charged to the LCLS R&D accounts must be processed through the LCLS project office in SSRL prior to making a commitment to the travel arrangements.

Photoinjector R&D News *J. Clendenin*

erratum. The QEs at both LLNL and UCLA were reported incorrectly in the last Newsletter. The initial QE for the polycrystalline Cu cathode at LLNL was ~10^-6 while the initial QE for the single-crystal Cu cathode at UCLA was 4.5x10^-5.

GTF Status.

Shortly after recovering from the rod fracture of January 26th, the rods were found to be damaged at one end. This failure mode is much more common at the GTF than at ANL. To get going quickly, the rods have been replace, and also the flashlamps. The long-range plan is to configure the GTF laser as closely as possible to ANL, meaning curved cavity mirrors (GTF has been using flat mirrors) and increasing the rep rate from present 2.5 Hz to 5 Hz (ANL operates at 6 Hz). The curved mirrors will be ready in 2 weeks. When we install them, we will also replace the Kirge rods with the recently received Schott rods and also change to softer rod o-rings.

Meanwhile, a first measure of the QE for the present Cu cathode has been made. At a field value close to the nominal operating value, a QE of ~4×10^{5} was measured, i.e., for about 100 μJ at the cathode, we see ~0.8 nC at the Faraday Cup. The dark current looks reasonable. More-detailed studies are in progress.

An ion pump for the small volume behind the cathode has been installed but is still in bake. When valved in, this pump should significantly improve the vacuum in the half cell.

Linac *Vinod Bharadwaj*

There has been ongoing work on the LCLS lattice. We should have a draft version out soon. Mike Borland is tentatively planning to visit SLAC in the week of April 17-21 and we hope to check this lattice through the start-to-end simulation.

Ron Akre visited APS to look at RF issues in LEUTL. His comments are included here.

I met with several people at Argonne's APS. The main engineers responsible for the phase stability are Art Grelick and Terry Smith. During my visit we measured the precision of the phase measurement system for a single station to be about 0.2° @ 2856MHz and RF stability to be about 0.3° @ 2856MHz. Art is currently looking at lower phase noise oscillators to reduce the precision of the measurement to less than 0.1° @ 2856MHz.

In discussions with Glen Decker, Art Grelick, Ali Nassiri, Stan Pasky, and Geoffery Pile, about the phase stability of the accelerator structures due to temperature the following comments were made:

1. The water temperature at APS for the accelerator structures are held to about 0.05° F. Reference: IMPROVED TEMPERATURE REGULATION AND CORROSION PROTECTION OF APS LINAC RF COMPONENTS, M.White, R. Dortwegt, S. Pasky. 1999 PAC New York.

2. Holding the water temperature to 0.05°F would give a phase error in the accelerator of 0.21° at 2856 MHz which is close to spec. A phase error of 0.1° at 2856 MHz would correspond to a temperature error of 0.023°F which may be achievable.

LCLS Fast Beam Instrumentation Mini-workshop

This workshop was held at BNL on the 3rd and 4th of March. Approximately 25 people attended the workshop. Theo Kotseroglou and William Graves gave the two plenary talks and this was followed by 15 specific presentations on various bunch measurement techniques. Plenty of time was allowed for discussion of issues. A report on the workshop will be produced soon.

Undulator *Efim Gluskin (Liz Moog)*

The comparison between the triplet and FODO focusing options continues. For the FODO option, the break length has been optimized using simulations. The optimal break length was found to be 5 mm less than would have been expected for the perfectly phase-matched plane wave case. Some break lengths near the beginning of the undulator line were optimized separately. The differences of the 2nd, 4th, and 6th break lengths from the perfectly phase-matched plane wave case were found to be 45 mm, -40 mm, and -10 mm respectively. Now that the break lengths have been optimized, the sensitivities to quadrupole displacements will be simulated.

The magnetic design of the electromagnetic quadrupole is finished, and the specifications for a mechanical design are ready.

X-Ray Optics *Art Toor*

X-ray Source Testbed

It is extremely important that we have a x-ray source suitable to evaluate the x-ray optics and x-ray detector concepts that are being developed in our R&D activities. There are strong obvious advantages if this source is in the Bay Area. To this end, there are several schemes for producing ultra-short spontaneous radiation pulses in the parameter regime of the LCLS that have been recently proposed or are underway at SLAC. With varying degrees of required development, each scheme appears capable of attaining the desired parameter range of the LCLS x-ray optics R&D; including providing a longitudinal energy chirp in the bunch in excess of ~ 1%.

One scheme being investigated within the existing infrastructures of the SLAC linac and FFTB tunnel will attempt to compress the electron beam to an RMS length of ~100 microns using a downstream FFTB tunnel chicane as a compressor. If the compression succeeds there is sufficient space downstream of the chicane to install a 5-10 meter LCLS undulator prototype and in excess of fifty meters of free drift space to allow the installation and operation of a strong-focusing optic to support initial X-Ray Optics R&D experiments. Even though the compressed pulse would be ~3 times longer than the LCLS pulse, the optical slicing techniques being investigated by the X-Ray Optics group could be used to provide pulses substantially shorter than 200 fs.

VISA Report *Aaron Tremaine*

We slowly pumped down the system and the vacuum looks good. We are going to turn on the ion pumps tomorrow and should have vacuum ready by our next run day, March 17.

The BPMs and detectors need to be setup and will be done by the end of the weekend and will be ready by our next run.

After pumpdown, it was found that 5 out of the 7 pop-ins are now making contact with the undulator. We pumped on the system as slowly as we could to prevent movement which apparently didn't work (none were touching before pumpdown). A smaller design (in the vertical dimension) is needed and being worked on for implementation during the next shutdown.

The alignment lasers (800nm &566nm) were aligned as best as could be done. There is much instability in this system (vibrations, thermal drift, air currents, mirror pointing resolution) and the alignment lasers are only to within 100um of the magnetic axis. We are currently evaluating what needs to be done in order to attain the alignment lasers to be

within 20um of the magnetic axis. As long as the stability is good enough, guiding the e-beam to the alignment laser is possible, but will take more time than if it was within the 20ums.

The more sensitive cameras have arrived and we are working on a plan to implement them into the BPM system. These Cohus are bigger than the original Hitachis and there is not much room on the table so minor modifications will be needed. (We are using OTR.)

The redheading was been done for the transport for the radiation out the end of the undulator. We are waiting for the materials to enclose the transport to arrive. Once here, hopefully by the end of next week, we will finish the transport for the radiation out the end of the undulator to the FEL diagnostics room.