Source Group Status

5/6/2019 (Poelker)

**CEBAF-related**

CEBAF (today):

Summer Shutdown #1 work includes:

* UVa pockel cell alignment in advance of PRex, Caryn Palatchi owns this job, appears to be going well. John, Joe and Shukui assisting.
* Shukui installed new preamp with PM fibers on Hall D laser for stability test, identified way to boost seed laser power delivered to amps using better fiber connectors
* Photocathode heat and reactivation
* Suitcase repaired, connected to gun, the intervening region was successfully baked
* New DBR installed, old DBR and old high polarization photocathodes removed (these photocathodes would not activate, dirty surface during bakeout with leak)
* Installed burst disk on SF6 tank, upstream of relief valve that had small leak, the fix appears to have worked, SF6 pressure stable for 10 days
* Added UHV supply to bias the anode
* Gabriel study beam from big mushroom, ask for 6 hours beam studies time?

Summer Shutdown #2 work includes:

* Move photocathodes to suitcase during bakeout
* Install new cathode electrode, the modified mushroom
* Rework the krypton line (remove RA valve, and VG valve, add rigid ¼” tube to new Kr tank, leak check)
* New HV feedthrough to anode
* Bake and krypton process the electrode to ~ 225kV
* Build and operate a little SF6 tank with conditioning resistor, so we avoid pumping out the HV tank
* Change out the fiber optic connections to increase power delivered to the amps
* Gabriel study beam?
* High current tests with anode biased, DBR photocathode?
* New PSS kicker?

Preparing for CEBAF 2020:

* Gabriel Palacios to model the Wien filter, and to recommend the modifications necessary for 200 keV beam. MIT Bates sent us an old Wien filter which we can modify and test before installation at CEBAF. We expect we will modify the way we apply voltage to the plates. New magnets? Build an 80/20 stand for this Wien, test it inside UITF.
* Working with Danny Machie to implement the new solenoid magnets that Jay recommends for improved parity quality. PR to follow soon.
* Working with Kazimi and injector group on the beamline region between the chopper and the QCM
* Need to finalize the baked beamline layout of the re-configured Two Wien Spin Flipper. Danny has a good first-pass layout but need girders, etc.,
* Need to model the new injector layout with a particle tracking code. Are the bpms in the right place, to permit accurate Helicity Correlated position asymmetry measurements?
* Need to list all the jobs related to removing old ¼CM and installing the new QCM: including removing ARC magnets, beampipe and stands, removing u-tubes and restabbing them, installing new girders, …… i.e., we need to spread the word this big job is coming and that service providers will have to support it

**UITF:** Pass the ARR, commission the waist-height beam line July, 2019, ERR for HDIce, beam through empty target by…..

To-do tasks include:

* Move from Construction to Commissioning to Operations
* Prepare for the ARR scheduled for June 26 – 28 (Pre-ops checklist, Beam Authorization tool, Operational Restrictions web page, HCO tool, UED complete, MPS with three zones, Commissioning Plan, MeV OSP, roof tile OSP, floating beam through QCM OSP)
* Formal Final Shielding Analysis – Vashek, sent to SCMB, waiting for approval
* Dress ion pump cables, cut to length?
* Brock bunch length monitor at MeV dump
* Yao bunchlength electronics
* SSA local on/off
* Characterize the buncher (Yan)
* Test the Brock polarimeter
* Build a chamber to install new photocathodes, pseudo-suitcase
* Build and operate a little SF6 tank with conditioning resistor, so we avoid pumping out the HV tank
* OSP for tile removal: add the tile movement procedure
	+ Need to implement all the fall protection that George Perry wants: stairs from cave1 to cave2, permanent railing at the top of the north stairs, barrier on the west side of cave2, catwalk(s) for HDIce that span the opening, some means to leave the roof from the north side, a horizontal lifeline to serve as tie off
* OSP for floating beam through the QCM, maybe just a revision of keV OSP?
* Float beam through QCM, calibrate the BCM (beam small enough for this?)
* MPS: implement the zoned approach, need the “good” valve chassis
* UED, validate it, BLMs added to UED with correct names
* Steering magnets for HDIce line, 3” pipe or switch to 2.5” pipe and use haimsons
* Third magnet rack (add the channel to elevate the rack)
* Another PSS rack for the PSS BCM stuff (add channel to elevate the rack)
* Valve chassis for MeV beamline, the global solution that permits three zones for MPS
	+ Will our valve actuators always look kluged up?
* Harps, install them, four more
* MeV beamline BPMs, fix one of them, map one of them on G-line
* MeV viewers and video signals
* Water flow through dumps and cups
* Raster magnets and electronics, functional
* Ask Eric for MeV quick view schematic
* pA BPMs, purchase in-line fiber modulator (Shukui)
* Go-No Go detector for HDIce, near apertures, add these as fsd nodes, ion chamber? We can use Decarad but won’t be formal FSD (no 5 MHz signal)
* Summarize MPS/FSDs, install them, test them
	+ Gun high voltage
	+ Dipole magnet at 15 degree bend
	+ Vertical chicane dipole (or is this PSS?)
	+ Go-No Go sensor near HDIce, at one or both apertures
	+ Vacuum interlock to valves
	+ Vacuum interlock to chopper rf power, buncher power?
	+ BLMs, need to put them on beamline
	+ QCM liquid level
	+ Water flow to buncher, chopper cavities
* Modifications to PSS?
	+ How does SSG want to interlock the vertical chicane dipole to PSS? What will it do?
	+ Third run/safe box
	+ Rack for PSS BCM electronics
* Clean up the caves and roof top, buy a vacuum cleaner
* Labels applied to everything?
* Replumb the GN2 manifolds
* Add lead in and on trenches Cave2, document this
* Add lead to the dumps
* Neil to build a barrier at helium vent
* Fall protection, George to sign-off on the tile removal OSP

I&C tasks

* MeV BPMs
* MeV viewers
* MeV harps
* MeV ion pumps
* MeV valves
* MeV cups and dumps

DC Power

* MeV magnets, on the beamline and wired up
* 3rd magnet rack

RF group tasks

* Yao cavity electronics
* SSA on/off via epics

Phil, Bubba, Marcy tasks

* Two large-bore BPMs on elevated beamline need attention: characterize and re-install the BPM now at G-line, install new feedthrough on one BPM
* Install the apertures and crosses (waiting on parts)
* Install the dif pump can
* Water and compressed air to all things
* Bake some of the beamline
* Stack lead around dumps
* Stack lead in MeV trenches, and on top of trenches
* Dress ion pump cables, replace long ones with short ones where possible

Shukui

* Nufocus modulator, in line fiber…

OPS Software

* MPS
* UED updates
* Software for all things MeV
* Brock scope#2 (need to buy scope and plugin)
* Beam Authorization Tool
* Hot Checkout Tool

HDIce task list

* Replace 3” pipe with 2.5” pipe, so we can add haimsons to beamline, magnets we have on hand? Or bring over steering magnets from LERF
* Build the apertures, with motorized bellows actuators like the chopper master slit, use radmon to detect beam loss and incorporate this as fsd
* Add NEG dif pump can with ion pump with pump out port to the beamline between last valve and HDIce
* Raster magnets on beamline: Omar and Gunning and William Wei, Phil and Gary to provide the mounting shelf
* pA BPMs, modulate current at kHz frequency with tune mode generator, make another flange mount? Or maybe we purchased two already
* Catwalk
* Solenoid dump: finish design and build it (big job)
* Thread the vent pipes out of Cave2, in accordance with RadCon wishes

**GTS:** Transition from photogun studies to thermionic gun studies. Install the rf-pulsed thermionic gun being constructed by sbir-partner Xelera, make magnetized beam with it, finish Mark’s thesis work. Promised arrival in “two weeks”.

* RF-pulsed thermionic gun: Mark’s thesis. Make 65 mA magnetized beam with 500 MHz rf-structure. Measure drift emittance, and temporal characteristics.
* Brock and company return, study TE011 cavity response to magnetized beam from tgun
* Carlos, Joe and Riad are working to summarize emittance measurements taken previously….
* Yan and Mamun to evaluate the different photocathodes used during LDRD using surface science tools: composition and thickness (if possible)
* Josh to look for light coming from hydrogen ion trap created by gun solenoid, biased anode, and beamline solenoid
* Sajini, model what the gun and beamline and laser pulse should look like for nC tests part2: new electrodes? Optimum laser pulse length, can we create nsec long laser pulses? Gun voltage 400kV, can we get there?
* Rework our GTS lasers: Verdi + gain-switched fiber system moved to little table next to beamline (incorporate into PSS), big BNL laser moved to hutch
* Start building HV test stand for big inverted insulator (dummy ball). Design a shed, weld onto ball. Modify receptacle, design SF6 port and mating connection for receptacle into insulator. Electrostatic model the test stand? Yes, probably a good idea
* Re-plumb to SF6 plumbing to move SF6 into the bag inside the vault, get rid of the bag outside the vault
* Finish the papers that summarize LDRD project: 300kV gun, photocathode studies that include 28mA run, 532 nm gain-switched diode laser and amp, magnetized beam low bunch charge, magnetized beam at high bunch charge, TE011 magnetometer cavity?

Photocathodes:

* Max Herbert: lifetime tests bulk GaAs activated with Lithium
* Summer student: make alkali antimonide photocathodes with antimony wafer substrate
* Coax samples from YQ, evaluate them in miniMott
* Get an MBE machine? Make our own high polarization photocathodes

Lasers and Optics:

* Work with Raytum and UVa to build low voltage pockels cells for CEBAF
* Replace the modelocked master oscillator at LERF with gain-switched laser
* Improve CEBAF lasers
* Install BNL laser inside GTS hutch
* Build the regenerative amplifier for nC bunch generation at GTS?
* Evaluate the laser that QPeak is building (532 nm, 780 nm, and 1064 nm)?

Vacuum:

* demonstrate -13 Torr vacuum!!! Marcy has great vacuum in cryopump test stand (low -12 Torr), now turn ON the cryopump (need the chiller fixed)
* Design, model the vacuum of the JLIEC interaction region
* Test black vacuum chambers with Xelera: outgassing and light absorption
* Summer student: hydrogen outgassing rates for tubes heated using induction heater, pump down curves to evaluate efficacy of getting rid of water vapor

500 kV photogun for JLIEC, LERF and UITF

Black Photogun: A photogun with internal components coated with AlTiNi would appear black, which could improve lifetime by absorbing ambient light. And the coating could reduce vacuum outgassing, providing lower base pressure.

Build a true 500 kV dc high voltage photogun using the large inverted insulators purchased by the FEL years ago. Apply voltage to cathode using plastic R350 receptacle with intervening region filled with SF6. This gun could drive the LERF, with alkali-antimonide photocathodes.

**Papers**

1. Marcy: little vacuum cans, ultimate pressure measurements, submitted JVST
2. 5 MeV Mott paper: Joe, Marcy, Riad, Daniel, Charlie…getting close
3. Carlos writing 300 kV inverted gun paper – building confidence in our emittance summary, plus section describing the optical characteristics of our cathode electrode and shed
4. Shukui: paper describing green-light laser that uses gain switched master oscillator and fiber amplifiers: high power data from LERF work with components of Advanced Drive Laser?
5. Yan write the photocathode paper, 28 mA result
6. Mamun and Riad: magnetized beam from a dc high voltage photogun
7. Nanostructure photocathode, submitted to Nature Photonics
8. mA lifetime studies with supporting material from IBSimu
9. Wei Lui paper, monte carlo simulation, photoemission from thin GaAs (waiting for CKS)

All of CIS obligations:

* CEBAF full energy upgrade: 200kV gun, 200 kV Two Wien Spin Flipper, new QCM
* CEBAF parity program: assist UVa with fast polarization flipper, fast helicity quad magnets, new chopper?, Moeller liaison,
* JLEIC: gun development, vacuum modeling
* Isotope project at LERF: gun and drive laser
* HDIce: Andy wants 5 months of beam! Who will operate UITF for that?
* Students: Yan Wang, Sajini, Mark Steffani, Gabriel Palacios, Josh Yoskowitz
* Fay needs a laser for nanostructured photocathode
* Summer students
* SBIR Partners:
	+ QPeak 532, 780 and 1064 nm laser
	+ Electrodynamic non-invasive polarimeter and magnetometer
	+ ~~Electrodynamic harmonic arbitrary waveform generator, fast kicker, energy booster~~
	+ Raytum polarization controller
	+ Xelera rf-pulsed thermionic gun
	+ Xelera and Euclid “black gun”
* LDRD magnetized beam: write it all up, we owe Stuart many papers
* LDRD EDM experiment
* Charlie Sinclair
* Tim Gay? Optical polarimeter?
* Eric Voutier/Hugh Montgomery ILC PEPPo
* Quantum Computing solicitation: PEPPo work revisited
* BNL (Thomas Tsang, Erdong)?
* Darmstadt Max Herbert
* Grigory Eremeev, test the coated ¼ CM
* Gigi, waste-water treatment

Conferences:

* IPAC19, Shukui and Sajini
* Marcy IVC in July,
* Phil and Marcy have abstracts in for AVS in October/November