March 17, 2022 REPORT | FEB 28 – MAR 25
DIRECTOR: TODD SATOGATA

Todd Satogata

Previous two weeks (Feb 28 – Mar 11)

- EIC Meetings (management, RF, crab, cooling, impedance, team, R&D, beam-beam)
- EIC BNL Meetings (Ferdinand and L2s, Design/R&D leadership)
- EIC TDR planning, chapter editor meetings
- EIC Update PSQ@EIC white paper second IR section (with R. Gamage)
- MGMT Meetings (Leadership/Dept Heads, CASA coffee)
- MGMT Proton radiotherapy FOA meet (Mar 2)
- MGMT Andrew Hutton term renewal emails
- ADMIN Reach out to SuperKEKB beam physics task force
- ODU Faculty meeting (Mar 1); Isurumali fall 2021 grade update
- ODU Nomination for Alumni 40 under 40 program
- SERVICE Update Snowmass education/outreach white paper
- VACATION Mar 4-7
- SICK Mar 11

Next two weeks (Mar 14 – Mar 25)

- EIC Meetings (management, RF, crab cooling, impedance team, R&D, beam-beam)
- EIC BNL Meetings (Ferdinand and L2s, Design/R&D leadership)
- EIC TCCB (Mar 22), HSR coordination (Mar 21), ERL scope (Mar 21)
- EIC Commissioning L2 transition planning (with Wolfram Fischer)
- EIC Start evaluating crab multipole time-domain simulations
- MGMT Meetings (Leadership/Dept Heads, CASA coffee, Andrei triweekly)
- MGMT CASA move planning, document control
- MGMT S&T Risk Matrix training (Mar 23)
- ADMIN Reach out to SuperKEKB beam physics task force
- SERVICE Finalize snowmass education/outreach white paper
- SERVICE JMU Madison Accelerator Lab program advisory committee (Mar 24)
- VACATION Mar 18

Alex Bogacz

Previous two weeks (Feb 28 – Mar 11)

- FFA@CEBAF collaborative work
- Preparing a joint FOA with BNL and Cornell
- VACATION
- Contributing to a Snowmass paper on '[The Physics Case for a Neutrino Factory]'

Next two weeks (Mar 14 – Mar 25)

- Mentoring Isurumali on arc optics design
- FFA@CEBAF collaborative work
- Finalizing a joint FOA with BNL and Cornell
- Preparing a talk on CEBAF energy upgrade for J-FUTURE workshop
- NuFact'22 SPC work

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Ryan Bodenstein

Previous two weeks (Feb 28 – Mar 11)

- Various OPS related meetings
- FFA@CEBAF collab work
    - Translation to BMAD: testing code from David Saga
    - Working on re-designing the spreaders for the 650 MeV injector
- Positron/FFA liaison work
    - Will be working on magnet reversal for positrons and linking positrons with 24 GeV
- Student Guidance
- LDRD work
- Hall C walkthrough training completed – scheduling for Hall D as well
- DEI meetings/training

Next two weeks (Mar 14 – Mar 25)

- Various OPS related meetings
- FFA@CEBAF collab work
    - Translation to BMAD: testing code from David Sagan
        - Almost done with ARCs, then will try linacs
    - Working on re-designing the spreaders for the 650 MeV injector
- Positron/FFA liaison work
- Student Guidance
    - Isurumali – guidance for arc optics, edits to papers, will write recommendation letter
    - Alex C – Getting lab laptop, general guidance and mentorship
- LDRD work
    - Met with Latifa for approval of student laptop and possible student travel to FFA22

Rui Li

Previous two weeks (Feb 28 – Mar 11)

- Going over some literatures about TCBI theory/simulation/measurement
- Playing with my TCBI simulation and get a better feel of the behaviors of the output data
- continue with TCBI data processing

Next two weeks (Mar 14 – Mar 25)

- Vacation 3/24 – 25th, 28th
- Served in the interview panel for the SRF dept. for their SSI hiring
- Made progress in unscrambling the coupling of bunch timing and coupled-bunch modes in the output data from the TCBI simulation
- Theoretical analysis of the eigenmodes for the TCBI simulation

Edy Nissen

Previous two weeks (Feb 28 – Mar 11)

- Attended required ops/bteam meetings
- Continued work on Hall D raster
- Attended Hall D beam line working group
- RCS working group and Beam-beam meetings
- Work done on Ghost collider
- NIM A paper was accepted for publication

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Next two weeks (Mar 14 – Mar 25)

- Beam-beam working group meeting
- Will go through paperwork for NIM paper
- Will work on Fusion cross section design
- Will continue work on raster for Hall D
- Will attend Hall D beam line working group

Chris Tennant

Previous two weeks (Feb 28 – Mar 11)

- AI FOA: coordination meetings (project-wide, field emission, fault prediction), understanding results of binary classifier and planning next steps
- LD2202: working through UVA code to understand, configuring software workflow on my end
- R&D FOA Proposal: understand network design issues for robot communicating with operator control station
- RADSA2: tracking down changes in dataset distributions
- JLab training
- Setting up CEBAF tour (way more time than anticipated)
- Final preparations for talk at Robotics workshop

Next two weeks (Mar 14 – Mar 25)

- AI FOA: Coordination meetings (project-wide, field emission, fault prediction)
- LD2202: onboard new graduate student
- RADSA2: training model with additional (historical) data and testing on new data
- R&D FOA proposal: finalize budget, budget justification, final edits
- S&T training
- Tunnel walk-through training
- Watch robotics for inspection webinars
- Develop data visualizations (comparing a dataset from different times)
- Participate in, and give talk at, "Robotics Use in Accelerators, Targets, and Detectors" workshop

Lasitha Vidyaratne

Previous two weeks (Feb 28 – Mar 11)

- SRF cavity fault classification: Investigate the performance difference observed when used with data from different runs
    - Obtained baseline performance by training network with data from previous runs and applying to latest run
    - Transfer learning on classification layers investigated using a subset of current run data
    - Experiments on fine-tuning all layers with subsets of current run data
- AIFOA1 fault prediction: Explore/familiarize with scope mode data gathered from C100 cavities
    - Work with PhD student (Monibor) on analyzing the current model performance
        - Analysis on performance with different time windows
        - Improvements to the architecture
- Malachi SUF_SNS anomaly detection:
    - Hyperparameter optimization and architectural updates for the branched autoencoder model

- Updates to the encoder section by incorporating ResNet modules in place for Conv 1D
- Updated module based data weighting to include additional data from other modules
- Updated the K-fold CV scheme with Malachi's input to use maximum amount of training data through folds

- Malachi SUF_SNS anomaly detection
  - Incrementally adding data from new modules with data cleaning and preprocessing

Next two weeks (Mar 14 – Mar 25)

- SRF cavity fault classification: Investigate the performance difference observed when used with data from different runs
  - Transfer learning on classification layers investigated using a subset of current run data
  - Experiments on fine-tuning all layers with the same subsets of current run data
    - Results for fie-tuning show marginal performance improvements over transfer learning
- AIFOA1 fault prediction: Explore/familiarize with scope mode data gathered from C100 cavities
  - Work with PhD student (Monibor) on analyzing the current model performance
    - Focus on time window at 200ms before fault
      - Sufficient time to intervene
    - Experiment with small time windows: 100ms versus 300ms
    - Improvements to the architecture: Variational AE, hyperparameter optimization
- Malachi SUF_SNS anomaly detection
  - Incrementally adding data from new modules with data cleaning and preprocessing
    - Data from seven HVCM modules added to the training/testing set
    - Obtained new data recorded from additional HVCM modules from Oak Ridge SNS
- Malachi SUF_SNS anomaly detection
  - Hyperparameter optimization and architectural updates for the branched autoencoder model
    - Additional changes to layer wise feature map size, and latent vector size for accurate representation learning from multiple module data

Accelerator R & D - Yuhong Zhang

Yuhong Zhang

Previous two weeks (Feb 28 – Mar 11)

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Next two weeks (Mar 14 – Mar 25)

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Kirsten Deitrick

Previous two weeks (Feb 28 – Mar 11)

- Lower energy configuration for ERL with new injector beam
- Microbunching lattice conversion

- Research integrity policy working group headed by David Dean
- FFA cell lattice for FFA@CEBAF
- Meetings: CASA Coffee, JLab EIC, EIC Weekly, EIC Coffee, EIC Cooler Lattice, FFA@CEBAF, Research Integrity Policy

Next two weeks (Mar 14 – Mar 25)

- Lower energy configuration for ERL with new injector beam
    - Longer linac version, more flexibility with initial beam parameters
- Microbunching lattice conversion
    - Continue resolving fringe field differences between elegant and bmad, use new lattice from Xelera
- Research integrity policy working group headed by David Dean
- FFA cell lattice for FFA@CEBAF
- S&T Matrix training
- Meetings: CASA Coffee, JLab EIC, EIC Weekly, EIC Coffee, Strong Hadron Cooling, EIC Cooler Lattice, FFA@CEBAF, Research Integrity Policy

Bhawin Dhital

Previous two weeks (Feb 28 – Mar 11)

- Was working on PRAB paper on dual energy storage ring cooler design.
- Was working on thesis writing

Next two weeks (Mar 14 – Mar 25)

- Will continue PRAB paper and thesis writing on a dual energy storage ring
- Further lattice optimization of the ring

Amy Sy

Previous two weeks (Feb 14 – Mar 11)

- Laser particulate counter: Initial tests with a translation stage and microscope glass slides. Particle "samples" provided by K. Jordan that feature < 100 micron specks in a ~0.5 mm vertical stripe on a glass slide. The translation stage has a maximum speed of 2.4 mm/s. Took background data with blank glass slides and translation across all four laser beam arrays. Took initial data using the particle slide and working on analyzing the initial data. OSP has indicated that the translation speed of 2.4 mm/s is likely too slow for the system to be able to resolve, due to the nature of the stabilization algorithms on the lasers. During initial testing, observed complete signal loss from one sensor - this sensor module and a second module has been sent back to the vendor for further testing to prevent similar issues in the future. Will meet with OSP and JLab colleagues to discuss the steps toward contract completion.
- Positrons: Working with the JLEIC universal spin rotator lattice as an initial starting point for the positron spin rotator design. Continued literature study on spin rotator theory. For the positron depolarization studies, looked back into past work on electron multiple scattering through thin targets (context in this case was isotope production in an ERL) for relevance. Will try to set up an injector tour with J. Grames for better familiarity with the proposed location of the degrader components.

Next two weeks (Mar 14 – Mar 25)

- Laser particulate counter: Discussions with internal JLab colleagues and OSP on technical objectives for contract completion. Working with J. Gubeli and Detector Group colleagues on opening up the test chamber to start conducting characterization studies of the detector, starting with reflective surface studies. Will relocate the test setup to lab space in the LERF for ease of testing in a more controlled environment. Will give an update on the laser particulate counter status at the Linac PIT meeting on 3/21.
- Positrons: Toured the injector beamline with J. Grames to start thinking about an LDRD proposal for sending degraded electron beams into CEBAF. The degrader components will likely be in the 5D beamline of the injector. Contributing 1-2 slides on a positron spin rotator concept to J. Grames' positron talk at the J-Future workshop.

Computational Physics - Yves Roblin

Yves Roblin

Previous two weeks (Feb 14 – Feb 25)

- Optics decks rework and review
  - Review for Troubleshooting guide and continuing work on ORFP rewrites
  - Positron source meetings
    - Mentoring student for positron simulations
  - FFA decks translation
- Learning BMAD
  - BMAD learning/work with D. Sagan on developing translator from ELEGANT to BMAD
  - 24 GeV CEBAF FFA discussions, in particular optimal linac gain and S/R redesigns
- BTEAM meetings and coordination
- Meetings on the possibility of adding spin rotators to CEBAF

Next two weeks (Feb 28 – Mar 11)

- Hall A target Alignment procedural development for He3 experiment
- BTEAM meetings and coordination
- Positron source meetings
- Training
- Edits to Springer book exercises section
- Preparing Zgoubi decks for CEBAF in order to look at spin diffusion in case of large momentum spread (FFA project and also positron beams)

Randi Gamage

Previous two weeks (Feb 28 – Mar 11)

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Next two weeks (Mar 14 – Mar 25)

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River Huang

Previous two weeks (Feb 28 – Mar 11)

- EIC Beam-Beam project: continuing adjusting the parameters of the crab cavities and studying the emittance growth rate, checking the dynamic status of HSR and the betatron tunes for different configurations.

Next two weeks (Mar 14 – Mar 25)

- Continue working on EIC Beam-Beam project

Isurumali Neththikumara

Previous two weeks (Feb 28 – Mar 11)

- Redo the rescaling of ARCs using OptiM, trying to suppress the horizontal beta peak at spreader section.
    - Estimate initial alpha_x value to suppress the peak
    - Since this did not affect much, reverse the lattice, and change the strengths of last 3 quads to suppress the peak & match with the initial values.
- Work on the NSGA optimization paper, read required materials.
- Completed ODH training.

Next two weeks (Mar 14 – Mar 25)

- Edit the IPAC paper draft
- Continue writing the paper on NSGA optimization
- Suppress the horizontal beta peaks in ARC5, 6,&7

Dennis Turner

Previous two weeks (Feb 28 – Mar 11)

- HLA
    - rayTrace
        - Tweaks to the data collector tool
        - Analyzer debug and improvements
- qsUtility
    - Finished making changes to account for counterwound solenoids
    - MatchingTool and multimatch tweaks
- QTSnyder
- Finished rewriting for RHEL7

- ced2elegant
    - Documentation updates

- Interview panel for new LLAPS hire
- AI FOA
    - Continued arichiver data collection and labeling
    - Continued model development
    - Read literature on anomaly detection with deep learning
    - Attended MLFlow training
- Explore modifying spreader optics to alllow for better orbit lock performance

- Attended Max's talks on LaTeX, etc
- Attended 0800, BTeam, AI FOA, PPB meetings
- Attend LCLS-II commissioning meeting

Next two weeks (Mar 14 – Mar 25)

- HLA
  - rayTrace
    - Read literature on SVD for noise reduction
    - Apply SVD for BPM noise reduction
    - Other improvements and tweaks
    - Documentation updates
  - ced2elegant bugfix for pass selection with -zone option
- Interview panel for new LLAPS hire
- Elegant2ced development; audit tools, etc
- AI FOA
  - Data labelling and model development
- LCLS-II
  - Attend commissioning meeting
  - Go over available training material
- Attended S&T Risk Matrix Training
- Attended SRF-RF Ops meeting
- Attended 0800, BTeam, CASA, AI FOA, PPB meetings
- Attend LCLS-II commissioning meeting

He Zhang

Previous two weeks (Feb 28 – Mar 11)

- Finish my part on quantum computing for snowmass white paper
- Drafting FOA proposal on particle-based simulation for eletron cooling
- Trying to make psJSPEC work together with BMAD
- RF fault data analysis ends

Next two weeks (Mar 14 – Mar 25)

- Finish FOA proposal
- Make a example of pyJSPEC carries out IBS rate calculation
- RF data analysis for Q value
- Write a note on how JSPEC carries out IBS rate calculation
- Continue writing the FMM paper
- Continue study BLonD and longitudinal dynamics

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Diagnostic Development - Kevin Jordan

Kevin Jordan

Previous two weeks (Feb 28 – Mar 11)

- Continued preparations for next weeks IBIC PC meeting. Sending our Faraday Cup nominations & proposing invited talks.
- Continued magnetron transmitter tests. Since Facilities did not get the chilled water updated I had Carroll Jones reduce the LERF LCW temperature to 78˚F, this should be above dew point so pipes won't sweat but can provide cooling for all of the planned magnetron work (2 transmitters & loads).
- Assisted in preparing for power outage to service power panels & breakers.. Turns out the 2,000 Amp clean power breaker had failed 'ON', it was removed & repaired to be re-installed on 2/8/22.
- Found all but one item on my property validation - that item was added to my list this year. It was on admin list meaning I did not ever have to locate it before. The last time I saw it was in the Arc lab.
- Had discussions with SRF & Facilities about future EIC cavity testing. The LERF has ample AC power & LCW available without modification - Facilities is looking at multiple $M to upgrade test lab facilities…
- Preparing for PD stint in two weeks, preparing slide shows (near daily) of "A Look Back in Time…"
- Walked tunnel with Joe inspecting diagnostics, in particular X-Ray damage to arc 7 SLMs.

Next two weeks (Mar 14 – Mar 25)

- Attended IBIC PC meeting
- Continued magnetron commissioning, getting ready to reconfigure waveguide for injection locking experiments
- Started draft proposal for 1497 MHz Vertical Slice Proposal

Joe Gubeli

Previous two weeks (Feb 28 – Mar 11)

- ARDDOT - Had a very nice week long vacation. Working on repairing the 3D printer. Replaced several parts that were recommended by the vendor. These included the material box feedthrough, two plastic feed tubes and the plastic material print tip. Those replacements did not fix the printing "voids". I then replaced the Onyx material and that also did not fix the issue. The last item that could cause this issue is the extruder. I order one yesterday. Everything I have replaced including the extruder are typical items that need to be replaced after a number of print jobs. The Onyx material (carbon imbedded nylon) we now use is much more abrasive then the pervious material nylon and caused the equipment to wear more quickly. Working on an experimental setup for the Laser Particle Counter (LPC) Project. This setup will allow us to characterize the LPC as a function of reflective surfaces and particle sizes. Working with the Diagnostics group to upgrade CEBAF diagnostics.

Next two weeks (Mar 14 – Mar 25)

- ARDDOT – Work on the LPC set and CEBAF diagnostics

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Michael Tiefenback

Previous two weeks (Feb 14 – Feb 25)

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Next two weeks (Feb 28 – Mar 11)

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CASA Fellows

LERF - Steve Benson

Previous two weeks (Feb 28 – Mar 11)

- Schedule third SPC meeting for Feb. 25th
- Organized and ran SPC meeting
- Reviewed FEL 2022 abstracts
- Developed input for LaTeX seminar
- Completed Radiation Safety training
- Worked on resolving property issues
- Presented strategy for resolution of ERL cryomodule design for Preble, Smith, and Willeke
- Continued looking over I&C needs for the cooler ERL

Next two weeks (Mar 14 – Mar 25)

- Develop personnel needs and definitions for the ERL program
- Update training for User Lab 4 users
- Rewrite and submit the LOSP for User Lab 4
- Finish up harmonic RF tech. note
- Go over SHC ERL schedule and update if possible
- Take S&T Risk Matrix training
- Attend Technical Control Board review of SHC move

Andrew Hutton

Previous two weeks (Feb 28 – Mar 11)

- SuperKEKB: I attended the virtual KEKB Accelerator Review Committee meeting. The luminosity is stalled and they have several working groups established with international experts who are trying to figure out why. There are still problems with an optics match in one of the injection lines; I requested and received the files and passed them to Todd.
- ERL Panel: I spent a lot of time to finish up the long report. I worked a lot with Max B. It is a long slog, really miserable work that just has to be done. Apparently, there is some slow progress on organizing the implementation plan; I am waiting for more details.
- Cryo Test: Next meeting was held on March 9 when we looked at some of the technical details. The cryogenic guys just want to modulate the cryostat heaters (no TF) and show that the swing heaters take up the slack. I would like the RF to be used so that we can show that the RF can also be stabilized. This may just be the zones equipped with the new RR low level controls, these will automatically find the resonance in the presence of modulated Lorentz forces.
- Ghost Collider: I had some interaction with Edy, but have not made much progress

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- VIN Hub: The war in Ukraine will have an impact on Transmutex, who had been working with a lab in Kharkiv and with Rosatom, the Russian nuclear power company. This may increase our chances of attracting them to Virginia.
- ALCC: I attended a meeting of the American Linear Collider Consortium. They have been documenting the need for a Higgs factory, separating the physics requirements from the ILC. A White paper was submitted to Snowmass (I did not sign it as I don't think I know enough about the physics).

Next two weeks (Mar 14 – Mar 25)

- ERL Panel: The long report is making headway, we are now planning to submit it to Physical Review Accelerators and Beams, which will accept long publications and has a reasonable impact factor. The Accelerator R&D Roadmap was published as a CERN Yellow Report (but has a green cover!), Kim is trying to work out how the JLab staff who worked on it can get credit. I had some back-and-forth with Dave Newbold, the Chair of the European lab Directors Group about speeding up the implementation plan. He replied "While you guys are pushing the gas, there are LDG members now pushing the brakes!" Not exactly encouraging! The LDG now needs to submit their suggestions to the CERN Scientific policy Committee for approval.
- VIN Hub: A lot of activity aimed at completing the proposal in time to be funded by the Commonwealth. Apparently, David Dean told them that the Jefferson Lab logo can be used and that he was happy to represent the lab on the proposal (he did not inform me of this). Before this, I had requested permission from Stuart, David and Andrei to work on the VIN Hub proposal, specifically the ADMIRE ADS test, but I have not heard back. I have looked around for commercial accelerators that might be suitable, including calculating the expected total neutron flux.
- Loida is making fantastic progress, she now has managed to link up her part of the SNIPP program with Lila's and is churning out results. I am sure this will be the "definitive" paper on the topic, so it should go to a refereed journal with a good impact rating. I need to research the options - I am not an expert on isotope publications!