

TTF/FLASH 9mA weekly meeting on 3 August 09

Participants

Gustavo Cancelo, Nicoleta Baboi, Shilun Pei, Ned Arnold, Toshi Masumoto, Wojciech Jalmuzna, Marius Grecki, John Carwardine, Sigi Schreiber, Nikolai Solyak, Xiaowei Dong

Agenda

- Progress report on ACC456 LLRF system preparations – W. Jalmuzna, M. Grecki
- Continue beam studies planning – J. Carwardine
- Proposal for cavity jitter studies – S. Pei

Important notes:

1. We are asking for people to draft detailed studies outlines for the main 9mA program topics within the next 2 weeks.
2. All other studies proposals are due August 10th – please submit to the FLASH beam request system.

Meeting notes

1. Progress report on ACC456 LLRF system preparations

Jarek Szewinski submitted a status report via email, which was presented by Wojciech Jalmuzna:

- We are testing our work with 3 SimconDSP boards in ACC456, and currently we use the same firmware as in ACC1. Finally we will need one "full feature" firmware (like the ACC1 firmware now) for the master board, and the other two slave boards will have "reduced features" - only input calibration (rot. matrixes) and data acquisition.
- Currently the server is handling 24 cavities: cavity probe signal calibration, generate the I&Q signals, calculate amplitude and phase calculation from I&Q, etc.
- Currently the signals are not working to the SimconDSP – suspicion is that either the timing is wrong or that signals were not connected back up after some unrelated testing. It is likely this can be easily fixed locally.
- The "main" location of the server has the base set of features needed for closing the feedback, like calculation for control tables (FF, SP, etc), setting various parameters.
- Olaf Hensler has added to the project support for accessing DOOCS DAQ system. It needs to be verified with the SimconDSP.
- Still to be done in the server:
 - Beam loading compensation (will be ported from the previous server and enhanced soon)
 - Klystron linearization (W. Cichalewski will be needed for that)
- Jarek and Wojtek plan to be on site at DESY from August 18th and will remain until the end of August. They will get everything ready for the pre-tests during the last week of August, including the final firmware, servers, etc.

Data is collected and processed by the SimconDSPs at 1MHz. Transfer rates from a single SimconDSP to the DOOCS server have been measured at 20Mbytes/sec. No timing tests have yet been done with the full 3-SimconDSP installation to determine how many RF waveforms can be pushed to the DAQ on each pulse.

In general, all the accelerator data is collected at 1MHz by the DAQ. This means that we will miss data from every third bunch when running at 3MHz rep rate. The only 3MHz data will come from a toroid mid-way through the accelerator that is being digitized by a test uTCA crate.

Is all the DAQ data bunch-synchronous when running at 3MHz bunch rate? We believe so, but it should be verified during start-up.

The Fermilab downconverters have reportedly arrived at DESY.

Mariusz reported that piezo controls for ACC3 and ACC5 would be installed during the intervention period. Controls for the ACC6 piezos are already available. Konrad Przygoda plans to be at DESY for the 9mA studies.

Mariusz proposed using beam energy instead of vector sum for adaptive feed-forward on ACC456. This would make an interesting study. If the measured energy could be used in the adaptive feed-forward algorithm, it could provide a way to compensate for errors or slopes in the energy profile that don't show up in the vector sum (eg from calibration errors or beam phase slippage). It also has the benefit that the energy data from the energy server implicitly contains information about the number of bunches and the bunch spacing.

2. Beam studies planning

A general outline for the two weeks of beam time is as follows:

Week 36 (Aug 31)

- Close tunnels ~Thursday to get an early start on turning on the machine and injector tune-up

Week 37 (Sept 7)

- First half of week: commissioning & tune-up, including
 - Machine setup, laser/gun setup for 3nC/3MHz
 - Diagnostics commissioning & calibration, ...
 - BLM calibration + commission and characterize new dump-line BLMS and bpms
 - Optics setup, bypass line dispersion correction, ...
- Second half of week
 - Attempt to re-establish 550+ bunches with 3mA transported
 - Begin studies to ramp up the power
- During night shifts: run stable beam at highest powers

Week 38 (Sept 14)

- First half of week: continue main 9mA program
 - Aim to meet 9mA goals, with the following priorities:
 - High beam current
 - Long pulses
 - Gradients close to quench
- Second half of week: plan secondary studies slots

- *During night shifts: run stable beam at highest powers*

We anticipate scheduling time during the second week for secondary beam studies, with the proviso that the main 9mA program takes precedence if need be. We should also have some 'stand-by' studies that can be done at short notice should time become available any time over the two week period.

Nicoleta requested 2 shifts for bpm and blm commissioning. In particular, we anticipate at least one study for setting up and characterizing the new dump-line blms.

Beam time will be needed to perform bunch length measurements with LOLA for the RF absorber studies. There is also a request to run with shorter bunches for the RF absorber studies. Additional time would be needed to set up the bunch compressors to provide these short bunches, which would likely be at 1nC/bunch rather than three.

By the beginning of KW37, Siggı plans to have the laser and gun operating at 3MHz with 3nC/bunch and 30 bunches per pulse.

A study proposal from Nikolai Solyak to run ACC456 at RF zero crossing was briefly discussed. A meeting will be scheduled later in the week between Nikolai, Siggı, and John to discuss details and feasibility.

We wish to assemble a list of data analyses that people will want to do during the studies. These will be used as guide to what tools and DAQ data collection to set up ahead of time. Gustavo will distribute brief descriptions of the analyses he anticipates doing during the studies. People are asked to add to the list accordingly.

Studies proposals are due August 10. Please submit through the FLASH beam request system for period KW37-38, here: http://tesla.desy.de/beam_request.html

Within two weeks, detailed studies outlines for the main 9mA study topics should be drafted and circulated for comment. Gustavo will draft a studies plan for Item 3 (LLRF feedback / beam energy stability). Tentatively, a draft will be discussed at next week's 9mA meeting.

Detailed outlines also need to be develop for other main studies topics, specifically

3. Operation with heavy beam loading
4. Gradients close to quench
5. RF power overhead
6. Studies to characterize and tune for low beam loss with heavy beam loading and long pulses

3. Proposal for cavity jitter and RF overhead studies

Shilun Pei gave a short presentation on his proposal to continue studies of cavity jitter vs detuning and cavity gradient. Shilun's slides are available from the meeting page on ilcagenda or from the FLASH beam requests page for KW37-38.

- Analysis of data from previous studies shows evidence of a parabolic relationship between jitter in the cavity field and the sum of cavity initial detuning and detuning at the end of the flattop. It indicates there is an optimum initial detuning that minimizes cavity jitter during the flattop. This optimum detuning value seems to be gradient dependent.
- The purpose of the study is to collect a more complete dataset to expand the range of detuning values and gradients.

- Much of the data can be collected in RF-only studies without beam.
- If possible, Shilun would like to collect similar data with beam loading up to the full 9mA data. It is not likely we would be able to run the LLRF open loop with high beam loading.

J. Carwardine