UITF Meeting Minutes 8_18_2014

The meeting discussion focused on RF requirements for the new beamline.

Invitees: Tom Powers and Curt Hovater, Rick Nelson invited but no-show

Began meeting with Geoff suggesting we complete an optics model of the beamline, pick a code. Something to tell us predicted energy spread at HDIce, beam size at target and everywhere else, emittance, etc.

RF devices include:

Laser, Buncher, Choppers, 1/4CM

Laser is relatively easy, 1497 MHz RF control module. Likely live inside laser room, but could also live above Cave, however laser room might be better choice since it is temperature regulated space, could make pulse train more stable.

Buncher: three options. Use the old 1497 MHz buncher and electronics at FEL, use the new 750 MHz buncher destined for the FEL injector upgrade, make a new one. Tom Powers says we will know by Fall 2015 if an FEL buncher is available for us, which will be a big cost savings for us. The old buncher operates with a klystron and requires ~ 1 kW of power with 320kV input beam and mA current.

¼ CM: Tom predicts considerable microphonics at Test Lab, out to 50 Hz. Microphonics are bad because it will require more power to obtain desired energy gain. Discussed need to know HDIce specs on energy jitter and stability, showed him the wiki table. 0.5% energy stability is no problem. Different from energy spread, which is more demanding. Energy spread is not the RF guys' problem. Will need stub tuners to provide efficient coupling.

Choppers: need 4 amplifiers, 500W each. And water skid to maintain constant temp, and resonant frequency with RF ON and OFF. Copy Joe Gubeli's design.

RF trips, could steer beam onto HDIce target. How to prevent? Add an aperture to take the beam?

Fast valves? NO

We talked about 60 Hz and need to provide orbit feedback. But beam current is so small, how to see the beam and apply feedback?

SEE BPMs upstream of ¼ CM should work, we imagine extracting ~ couple microamps and using the chopper slit to reduce current to HDIce level, ~ 1nA

Downstream of ¼ CM we will have two nA cavity BPMs. Need to talk with Trent and John Musson about noise floor. At really low current, it takes a long time to measure position and amplitude (integration time).

The big problem: there will be 1497 MHz RF radiated everywhere, screaming from klystrons and waveguides, and this will introduce significant noise. Cavity BPM electronics can be near the devices, and shielded.

3 GHz cavity BPMs gets around the problem of 1497 MHz radiation, but very expensive.

Could test our cavity bpm electronics at CEBAF between now and when we need them at Test Cave, to determine noise floor, and integration time, important for feedback.

Joe Grames suggested we intermittently insert cup upstream of HDIce and run Tune Mode at 8uA, to find beam, apply feedback, the back to low current CW, pull cup. Do this in automated way every ~ 10 mimutes?

Apertures can be installed, with x-ray detectors, steer to minimize scraping.

Run beam at 31 MHz to make higher peak current, to get above noise floor?

RF parts list, don't forget these when estimating costs:

Klystrons (x3) and power supplies

10 kW electrical power feeding these three racks with power supplies and klystrons

RF waveguides ($100/ft, check building 31, might have enough)

Stub tuners

Control modules (x6), old ones would be fine

Interface to MPS, e.g., trip RF power when certain things happen…

VME crates (x2, maybe 3)

500 W chopper amplifiers (x4), 30k$ per amp

Water heaters and feedback electronics to maintain choppers and buncher at constant temp, to stay resonant at 1497 MHz

Will invite Trent and John to next Big Picture meeting