Laser Issues  CEBAF Spring Run, 2015

(poelker)

1. TEC controllers, powered in pulsed digital manner, introduce ~ 500 Hz amplitude noise on laser power.  Do we see this amplitude modulation on the e-beam?  Does this also introduce timing jitter?
2. Digital gain switching technique can introduce 180 degree phase shifts on the optical pulse trains.   Phase shifts happen regularly when gun HV trips OFF (i.e., emi pickup).   Sometimes phase shifts happen for other reasons (LLRF)?  Phase shifts originate at the commercial divide-by circuit which must look at a zero-crossing.  It doesn’t care which zero-crossing, but we care.
3. Shukui evaluated digital gain switching laser timing jitter/phase noise at our laser room.   Phase noise was ok, at least that is my recollection.  He can re-send his laser test summary, which I can’t find.
4. The 3-laser rf system was modified at our request.   5 W amps were removed.   Now we have low power rf (10 dBm) delivered to our lasers.  This signal gets amplified by a small rf amplifier inside John’s laser chassis.  Is this a good amp?  Or a noisy amp?  Because of this modification, we no longer have remote control of rf amplitude.?
5. At our request, Tomazc has provided us 998, 499 and 249.5 MHz RF.   Do we know how he does this?  Are phase shifts possible with his new rf system? Apparently, Yes.
6. We can move our laser pulses by 2nsec, this is fine at 499 MHz.    But at 249.5 MHz we need 4ns phase shift capability.   We have been swapping cables to reach the correct relative phase offsets between lasers.
7. Joe developed a good technique using the Mott to set relative phase difference between the A and D beams, but might not be adequate to set time of arrival at separators.?
8. Digital gain switching:  chopper scans revealed nice bunches down to 62 MHz.  The 31 MHz bunches were double-humped.
9. There were frequent BLM trips at 9S.  Were/are these trips laser related?  Trent Allison sent me images of frequency content on beam, from BLA system (don’t know which laser) – the beam looked clean.
10. The Hall A laser was deemed “bad” compared to Hall C laser, causing more trips than other lasers.?  What exactly was wrong with A laser compared to other lasers, per Reza?
11. Tune mode generators can be aligned to create a dark line visible on the spatial profile of laser beam.   We’ve seen this on the laser table, but never on the beam.   However, now we see it on the beam (a viewer image with dark line separating what seems like two e-beams)
12. In tune mode, there were multiple beams on sync light monitors, for all three lasers.?
13. Easy to damage IPG fiber amps at low rep rates, when peak power reaches ~ 1kW.  Three amps dead.
14. IPG amps also die when the input power is taken away.  Did we kill two amps this way?  When the new fibers were installed?   How to prevent this problem?  Does IPG introduce a safety feature?
15. The Mott requires 31 MHz bunches, and a 62 MHz trigger.   How best to satisfy comparatively straightforward CEBAF requirements at 499 and 249.5 MHz, and also the Mott + others at rep rates to 31 MHz?   I think we must expect one day for a hall to ask for 31 MHz beam.
16. Future laser system, what should it look like? based on all this stuff...
17. Plans A, B, C, D, ….. What are our options?, with pros/cons for each system, estimates for required level of work, procurement costs.   When to implement changes?