**Requester**: Joe Grames, John Hansknecht

**Subject**: New high level application to configure 4-Laser and 4-LLRF frequencies

**Submitted date**: October 4, 2016

**Revision: 2 (October 12, 2016)**

**Requested date**: January 6, 2017

**Summary**: A new feature of 12 GeV Hall D operations requires any of the 4 beams to operate at either 499 or 249.5 MHz. To support this a new 4-laser system was installed the can operate at both repetition rates. To complete the project a new laser 4-LLRF is planned for installation during Winter 2016 SAD.

The purpose of this high level application is to provide a User interface to the ioc applications which control the output of the 4-laser (Frequency Division Controls, Mike Johnson) and 4-LLRF (TBD, Scott Higgins) hardware.

**New Channels to Read 4-Laser Division Controls**

This request is to grab four more items from the memory bank locations of the laser seed controller.  These are:

* Ask value for 500MHz seed bias:  \*ADR02{CR}   reply will be $A02XXXX{CR} where XXXX is the record value.
* Ask value for 500MHz pre-amp current:  \*ADR04{CR}   reply will be $A04XXXX{CR} where XXXX is the record value.
* Ask value for 250MHz seed bias: \*ADR10{CR}    reply will be $A10XXXX{CR} where XXXX is the record value.
* Ask value for 250MHz pre-amp current:  \*ADR12{CR}   reply will be $A12XXXX{CR} where XXXX is the record value.

It will suffice to read them every 10 seconds, and put them in the archiver.  They won't take up much archive space because they only change if we decide to adjust them manually, which is rare, like every 6 months.

**Setting Laser/LLRF Frequency**:

1. User Select laser (A,B,C,D) and Frequency (499,250) by pull-down menu
2. User press Go!
3. Record “old” values for logbook entry(Laser, Frequency, Seed Current Setpoint, PreAmp Current Setpoint, Seed Power Readback, PreAmp Power Readback, Seed Temperature Readback, Amplifer Power Setpoint, Amplifier Power Readback).
4. Set SCAM master mode to Beam Sync (make sure laser outputs are OFF)
5. Set selected laser amplifier OFF
6. Read laser amplifier emission is indeed OFF before continuing.
7. Set selected laser LLRF to desired frequency (might be a single button)
8. Read the LLRF frequency is indeed set before continuing.
9. Set nominal LLRF phase. Since each laser will have a nominal phase for 250 or 499 MHz there will be 8 values; they can be stored in a User configuration file.
10. Read the LLRF phase is indeed set before continuing.
11. Set selected laser to desired frequency. Each laser has a EPICS record for writing commands to the laser. If desired frequency is 499, issue the command \*A02{CR} to the laser seed controller. If desired frequency is 250, issue the command \*A04{CR}
12. Read the laser frequency is indeed set before continuing.
13. Read that seed and pre-amp power are within nominal 5% of nominal value before continuing (nominal values can be stored in a User configure file).
14. Set laser amplifier ON
15. Read laser amplifier emission is indeed ON
16. Set amplifier power to nominal value stored in User configuration file.
17. Read laser amplifier power output indeed matches set power.
18. Make a logbook entry showing initial (listed above) and final values of laser.