

Notes from 2019 SBS GMn-Gen-RP Preparedness Review, 8/4-5/19

Good to see full room, collaboration engaged.... nice talks - and a lot of productive activity!

GMn

Hall A Infrastructure, Installation, Magnets, Bunkers (Jessie)

- Evaluate if we need more welding outlets in Hall
- Need floor survey (to make flat for SBS floor plates) – will check between PREX2 and CREX
- Need to revisit BigBite/HRS-L running for GMn, plan to install BigBite after HRS-L running
- Estimates 4-6 weeks to remove PREX2/CREX, including radiation holds, also de-commission HRS-R, can bring equipment in while this is happening
- Survey and alignment – try not to have to iterate too much
- LCW will get early start between PREX2 and CREX
- Locate the roof shielding for the main electronics shield hut, verify here
- Need other shielding blocks (90+) too – make sure they're still available/located

Target (Dave M.)

- Standard target, no surprises anticipated, no showstoppers
- Assumes 4 x 15 cm cells, 50 microAmps
- One with and without radiator
- Will need to re-install and check out electronics that were taken out for PREX2/CREX, test controls
- Two months total for work in Hall, but has to start once pivot cleared – could take a month to be Rad Con cleared
- The rotated target chamber (and spectrometer) reduces available space and makes things more difficult
- There may be issues with cryo flex lines when both spectrometers are rotated back – cut HRS-R line?
- There may be issues for alignment access
- There may be issues for installation access – target and Hall A to plan together for how to work around new electronics huts, etc.
- Target adjustability in x (request from Yves, not necessary but could help)

Power (Joe)

- Has a plan for which power supply goes where, what we need
- Extra service for SBS magnet has been run, breaker panel installed
- Weldments will be powered via Berthas and welding panels in Hall, seems there enough of these – should check.verify
- More wall outlets needed – need to know how many final 60 days in advance
- 4 correctors, make sure how to power these
- Need to coordinate with accelerator for control of all magnets that can steer the beam

Design Status (Robin)

- Provided chart, looks in good shape (items on site or clear plan in place)

HRS Restoration (Bob)

- HRS-L only for HCal calibration
- Will have been apart after CREX, and will need all detectors (tracking and PID) back
- It will need the trigger, likely a new one
- VDCs will be there, as will Pb glass
- Gas Cerenkov and S2M scintillators need to come back
- Can't start until CREX completed
- Re-cabling of channels and cosmics – need to assign to someone in collaboration.
Bob requests few months of a student or postdoc
- Assumes Jack group does the detector moving

BigBite Support and Calo (Doug)

- BigBite sieve plate needs safety approval for motion mechanism.
- BigBite potential substitution of UVA/Italian GEMs??
- All but shower and preshower (and magnet) have changed
- GEM frame and BigBite frame exist – need Jessie to assemble together, but should be straightforward
- 243 Pb glass blocks
- Good handle on cable needs, seems to have all available (and correct length)
- Shower, preshower GRINCH in frame now, most electronics (other than GEMs) in weldment, plan to add GEMs August/September
- Might need some more HV cables

BigBite GEMs (Evaristo)

- Front GEMs for BigBite – what about Gen-RP?
- INFN and UVA GEM's, similar design and electronics same other than connector to FEC
- Same gas mixture/system
- Two sectors dropped out entirely, need to be replaced – should flush inert gas during standby periods/continuously when not running, looking at ultrasound cleaning
- INFN chambers running, efficiency testing with cosmics at JLab since 7/18, some look questionable - diagnosing, under investigation, need to fix/replace
- Cosmic tests of UVA chambers to begin
- Manpower – INFN, UVA, HU,... some JLab
- Test installation with frame/mock-up before trying with real chambers
- VME or optical fiber SSP mode, want the latter but have been using the former thus far, need to implement data reduction in SSP mode

- High rate only done by simulations, calibrated against x-ray source – have tests in Halls A,C to refer to – will be in report to be turned in for readiness response in ~days
- Hall C (and Hall A) test data needs to be analyzed – will put students/Latif(?) on it
- Adequate manpower?

BigBite Hodoscope (Rachel)

- Detector assembled and nearly fully cabled
- HV and LV tested
- VME electronics on site, some in weldment – good summary chart
- Need slow controls
- LV supply also to go in GEM hut? Prefer 10m or less away, also needs shielding
- Develop plan to move CAEN to large electronics hut – radiation damage experience!
- Needs DAQ set up
- Need tech support for pressurized air in Hall, need for final setup
- Think about developing support so that we don't break light guide glue joints in the future
- Adequate manpower?

GRINCH (Todd)

- C48 is the plan now based on Hall C tests
- Door leak fixed
- Now installed and largely cabled in weldment
- Cables in place or identified to go to DAQ
- Standalone DAQ working in CODA, need to integrate with full BigBite DAQ
- VETROC/FPGA allows GRINCH to be part of PID trigger – not a necessity, but a strong like for SIDIS
- Adequate manpower

BigBite Electronics (Eric F.)

- List of all needs available, some small needs still but plan in place, most items installed
- Weldment layout available, most crates in place
- HV functional
- Not sure of GEM interface currently
- GEM slow controls
- Adequate manpower?

HCal Hardware (Scott)

- Pulser system installed, positional non-uniformity in light collection noticed, will try to rotate PMTs to optimal position (repeat note from last review)
- PMTs, bases being modified by CMU students, will need gain matching again
- Software – Juan Carlos

- 288 blocks/channels installed
- Adequate manpower?
- Air distribution system – need to install, not clear who will do this – need to coordinate
- Waiting for ~1,000 cables from DSG, have all parts
- HV system assembled in test lab, control system in place
- Do the patch panels exist? Splitters? All cables? Other electronics? – in list on slide
- Had cable/electronics inventory, still need to find some scalars, other items
- Slow controls need some development
- Still need to write online replay

DAQ and Trigger (Alex)

- Inventory of electronics, crates
- Looked at rates, readout type (Fastbus, etc.)
- 2KHz, ~300 MByte/sec (can do 500 Mbyte/s now)
- L1 trigger is BigBite shower + HCal sum
- HCal cluster (analog) sum is L2 trigger
- We are OK now for GMn, move router upgrade to next year
- Need full implementation of SSP GEM readout to 32 MPDs
- Trigger plan needs to be implemented, tested

Software (Andrew)

- Manpower an issue
 - Analysis code not production ready, not user friendly, no documentation
 - G4SBS, offline, digitization repositories available – some areas still a work in progress
 - Each detector has an identified software contact – many basic algorithms exist, but not all, and all need also to be ported into framework
 - Slow controls need work
 - Physics analysis needs work/ownership clearly identified
 - Subsystem groups should give information to software group regarding requested capabilities and features – document requested (see slide)
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GEN-RP

ERR (Brad)

- Mostly GEM performance related
- Topics seem to be addressed, draft response to ERR in final stage to be submitted this week

Runplan (Michael)

- Need to add electronics hut/shielding into considerations
- Need to add time to (de)install the shielding between BB and SBS for GEMs

Mechanical Design (Robin)

- Consider building cable run into (semi-)permanent walkway that will be needed to cross the parked HRS-R
- Develop a plan for installation/cabling polarimeter – heights! Do we need platforms, etc.? Fall protection on counterweight?
- Need final decision about INFN or UVA GEMs for frames
- Much still in design phase
- For access platforms, collaboration should provide feedback about who will need to use them
- Adequate manpower/time?
- Recount shielding blocks, make sure that we have them

SBS GEMs (Kondo)

- Uses all SBS GEM resources
- Modules partially tested, some fixes need to be done, haven't started cosmic tests at JLab yet, waiting for Bryan Moffit next week and also trigger scintillators/light guide fixes from Bogdan
- Some tracking work underway with PREX2 – no plots available yet, dependent on PREX2 running in particular mode(?), PREX2 data is lower rate
- Electronics needs known, mostly available
- Adequate manpower
- Two different HV systems (UVA and INFN), Brad to work on slow controls
- New, improved (U/V) chambers being produced to reduce technical risk, parallel work at UVA should not impact work at JLab
- Could turn down beam current if necessary, but don't anticipate this need
- Needs tracking development for new U/V geometry

Proton Recoil Detectors (Brad)

- Active analyzer ready to be shipped to JLab
- Scintillator hodoscope needs some glue joint repairs, evaluation of fringe fields
- Adequate manpower
- Most everything identified and available
- Need plan for (de)installing analyzers quickly, incorporate into changeover planning

Tracking Software (Eric F.)

- Not just Gen-RP, gave general talk
- TreeSearch algorithm – will it work with U/V tracking?
- Digitization with full background not done yet in simulation for GEp? Or for U/V
- New clustering algorithm developed, ADC and time correlation look better at high rate
- Nothing shown comparing simulation to data
- Online analysis may be slow at the currently-achieved ~3Hz within POD – might also need a lot of CPUs for offline, can't write this all to tape – need development to suppress noise at hardware level, need testing

- Evaluate where software time is spent, in reality will have variations, there may be options to fitting if it's taking time
- Some confidence that the simulations can predict true rates (within 5%), but didn't show this benchmarking
- Could leverage information from calorimeter (and maybe Cerenkov) earlier on in tracking process

GEM DAQ (Alexandre)

- Showed correlations GEM and VDCs from PREX
- MPDs, fibers, in place, plan for all components
- SSP zero suppression to facilitate data reduction anticipated
- Needs manpower (postdoc requested)
- Full system test (with SSPs) planned for end of 2019

Gas (Jack)

- Will be a pressure system – working with Whit as Design Authority
- INFN cited high humidity and no gas flowing as a possible reason for INFN GEM damage, should strongly consider flowing nitrogen to GEMs in test areas now
- Have all that we need to blend AR-CO₂, 5 Ar, 3 CO₂
- Do we need to change filters?
- Own some of material for this – have pressure regulators, fittings, valves, mass flow controllers, buffer tank,...
- Working with DSG, settled on nylon tubing, manual rotameters, cameras to keep on eye on mass flow meters
- Gas “shed” plans going through facilities, out for bids
- Can the need for ~30 bottles/month be sustained, suggest work in advance with supplier

CDet (NOT discussed this time – notes below are from 2018 preparedness review)

- Detector, frame exist
- Will test assemble and cable one plane in the Hall (will need crane support)
- CNU not supplying any cabling, connectors, nuts, bolts, etc...
- Need engineering support, current CAD model not correct, hanging and connecting needs engineering work – and some purchases
- Will need Jessie's group to help trial assembly
- Assumes JLab DAQ support, can provide some student help
- Need to purchase all cabling, HV and signal, also NINO power supplies – Todd cautioned that the power and length may need to be more than we're planning (or shorter cable runs), voltage drop is non-trivial – *need to pin down how close these need to be!*
- Keep NINO power supplies away from (NINO) signal converters

DO! [List from 2018 review, not addressed above or on other list]

- One person should take over making a cable map for the installation in the Hall – how many huts/constraints
- Same for weldment plan for electronics hut(s)
- Also full cable inventory?
- Electronic modules too
- A/C DAQ group should meet and come up with an integrated plan for all of this DAQ work, both testing and in the Hall eventually – just GMn
- Also come up with timeline from now to GEp to TDIS, staged purchasing/capability upgrades – what is needed/most useful when?
 - Coordinate with computing center to make sure they know our plans/needs and we know their anticipated availability
- Determine cable lengths/LV drop for NINO power supplies – where to put repeater?
- Need backup plan in case RadCon won't let Hall A team modify the existing beamline
- Add to list of work for Robin's group
 - BigBite small hut for GEM's plus more (NINO supplies)
 - BigBite weldment modifications, or new?
 - New platforms around pivot?
 - Review CDET support with Peter, need new frame
- Need to get new quote for gas pad/temporary structure