Exp 09042 Run Plan

Detection Systems:
- LASSA
- Neutron Walls
- Forward Array
- Miniball
- Proton Veto
- Downstream Scintillator

Primary measured quantities
- LASSA
  - Angle
  - Energy
  - dEnergy
- Neutron Walls
  - Angle
  - TOF
  - Energy
    - Fast
    - Total
- Forward Array
  - Energy
  - Time
- Miniball
  - Position (Element)
  - Energy
    - Fast
    - Slow
    - Tail
- Proton Veto
  - Time
  - Energy
  - Position (Element)
- Downstream Scintillator
  - rate

Equipment Monitoring
- EPICs
  - Collimator
  - Faraday Cup
  - Motherboard temp
  - Chamber vacuum
- Scalers
  - Element OR
  - CsI rates
  - Livetime
  - Consistency checks

Target Ladders

- Viewer, ^{124}Sn, blank
- Viewer, ^{112}Sn, blank
- Viewer, Natural Sn, CH_2

Trigger

- Primary Trigger: FA +MB Multiplicity
  - At least one hour of minimum bias
  - remaining runs with mult gate ~4-10
- For plastic target
  - Si trigger

Data U Setup

- Never run spectcl on spdaq19
- Run Control (u3pc3)
  - Readout
  - elog
  - EPICs readout
  - Scalers
  - Do not run spectcl on the run control machine
- System Control/Diagnostics
  - LASSA motherboard control
  - MB discriminators
  - High Voltage – controls MB, FA, PV, and DS
  - NW discriminator
  - NW fast gates
  - NW high voltage
  - FA discriminator
  - CsI shapers
  - CsI discriminator
  - Proton Veto shaper/discriminator
  - Scalers
  - EPICs
- SpecTcl – LASSA
  - Summary Spectra
  - hit pattern/mult/angles
  - PID
- SpecTcl – Neutron Walls & PV
  - Time
  - PID
  - position/angle
  - summary
  - PV 1D spectra
  - PV multiplicity
- SpecTcl – Miniball
  - Summary Spectra
  - multiplicity
  - FA summary

- SpecTcl – Forward Array
  - FA 1D spectra
  - FA multiplicity

Beam Tuning

- Before PDT
  - Train all new personnel on run control and SpecTcl
- Things in vault at beginning of SDT
  - Get Oscilloscope
  - Set trigger
  - Set shadowbar positions
  - Turn on pre-amps
- Things in Data-U
  - Start discriminators
    - CsI
    - MB
    - FA
    - PV
    - NW
  - Power up CsI
  - Check CsI discriminator signals
  - Start Control Software
    - MB HV – don't power yet
    - NW HV – don't power yet
    - motherboard control
  - EPICs
  - readout
  - Scalers

Beam Schedule

- Just before tuning:
  - Turn on CsI
- Tuning ~7 hrs
  - Dan works with Tom Ginter to tune beam. Light on, off, FA on, off.
  - Monitor FA and CsI
  - Monitor Scalars
  - Record target in/target out
  - Check NW, PV rates
- After tuning, preparing for debugging
  - place target
  - power silicon
  - power MB/FA/PV
- Debugging ~17 hrs
  - Debugging major tasks:
    - Check trigger logic/ data acquisition timing / no mismatched data
    - Check/set gains so signals fall within expected dynamic range
    - Set thresholds, both hardware and software
    - Check for missing channels
    - Check for expected relationships between data

- Task groups:
  - Trigger/timing:
    - Check trigger timing so FA + MB always makes a trigger
    - Check that fast clears never come if there is a trigger, and always come if there isn't
      - MB
      - FA
    - Check system busy vs element submasters – don't cut off subsystem early
    - CsI signal falls within ADC gate
    - FA signal falls within ADC gate
  - Neutron Walls
    - Check PSD
    - Check energy dynamic range – neutrons should stay inside range (single-sided PSD)
    - Check time sensitivity and dynamic range – find gamma peak and neutron bump
    - check for stale data – times should usually have fast signals and vice versa
    - set QDC thresholds to be above pedestal
    - Shadow bars are noticeable on neutron spectrum
    - Proton vetos shadow the expected parts of N walls
    - Plot energy vs time to find proton stopping line and check time resolution
  - LASSA
    - Confirm thresholds are working, not firing too fast
    - Check that each CsI is associated with expected Si pixels
    - Check that we can see PID for each CsI crystal
    - Check dynamic range against punch-throughs
      - Si full scale should be ~ 16MeV
      - CsI full range should be 400 MeV
      - Need to see proton punch-through
    - Check that missing channels correspond to expected ones
  - Miniball
    - Check that missing channels correspond to expected ones
    - Check discriminator settings
    - Check PID, and look for punch-throughs to check gains
      - Fast vs slow, slow vs tail
    - Check QDC thresholds
    - Check that we have time information
    - check for stale data – times should usually have fast signals and vice versa
  - FA/PV
    - For each, check that time and and energy fall within dynamic range
    - For each, check for stale data – times should usually have ADC signals and vice versa
    - For PV, check rate on forward vetoes to make sure the beam rate isn't swamping them

        - Check that discriminator thresholds are high enough not to trigger on noise
        - Check that QDC thresholds are above pedestal
        - Note any missing channels
- Run Order
    - 124Sn 120MeV/A
    - 124Sn 50 MeV/A
    - 112Sn 120 MeV/A
    - 112Sn 50 MeV/A
    - 16O calibration run

- Beam on Target
    - <1GB runs ~1hr

- Shadowbar changes for each beam combination
    - start at corners ~12hrs
    - opposite corners ~12 hrs
    - center ~12hrs
    - no shadow bar ~12 hrs

- normalization run with downstream scintillator for each beam combination

- Pulsing
    - 1 Hz signal into Si EF at nearly full scale range
    - 1 Hz signal into CsI at nearly full scale range

- End of Experiment Calibrations
    - Neutron wall time
    - MB time
    - FA time
    - Silicon front pulser ramps
    - Silicon back pulser ramps
    - CsI pulser ramps
    - Si alpha source
    - Neutron laser position
    - roaming arm position measurements

Shift Duties

- For Everyone
    - Please arrive at least 15 minutes prior to the beginning of your shift
    - Please be prepared to stay late if needed
    - Bring a laptop if you have one
    - Try to learn as much as you can about what others are doing during the experiment while focusing on your own tasks
    - DO NOT MAKE CHANGES TO SPECTCL SOURCE CODE WITHOUT TALKING TO SHIFT LEADER
    - Have fun! As nuclear experimentalists, beam time is what we live for.

- Shift Leaders
  - Notify operator of the shift change
  - Obtain experimental status from previous shift leader
    - run number
    - beam
    - target
    - shadowbar positions
    - problems or potential problems
    - changes since last shift
    - things to do over next 8 hrs
  - Ensure that everyone is monitoring their stations and the shift goes smoothly
  - Fix any problems that arise
  - Dan – bring donuts, attend 8 am meeting, and short meeting

- Run Control
  - This is the most important position! If the system hangs up or we lose beam, you will be the first to know and need to notify the shift leader
  - Note any changes, problems, issues in elog and physical logbook
  - At beginning of shift
    - make elog note of shift change
    - get status from previous run control person
  - Things to do every run (once an hour)
    - Fill out elog at beginning of each run
    - Fill out run sheet at beginning of each run
  - Things to monitor during runs
    - Chamber pressure
    - motherboard temp
    - motherboard regulator voltage
    - run size (should be less than 1gb)
    - scaler rates
      - discriminator rates
      - data trigger rate and live time
  - Things to do every few runs (2-3 times per shift)
    - print barney
    - fill out bias sheet for LASSA
    - EPICS
  - Things to check whenever someone goes into vault
    - Note whatever they change
    - Specifically keep track of changes in patch panels
    - Periodically check chiller water level

- LASSA/CsI/ASICS SpecTcl
  - The following spectra should be attached online, monitored for problems and cleared at the beginning of every run

what to monitor	def file	win file
CsI summary	LASSA/CsI/CsI_summary.tcl	LASSA/CsI/csi_sum.win
hit pattern, angles, CsI multiplicity	LASSA/hit_angle_mult.tcl	LASSA/hit_angle_mult.win
ASICS summary	LASSA/silicon/asic_summary.tcl	LASSA/silicon/asic_sum.win
PID	LASSA/PID/PID_rawcsi_calE.tcl	LASSA/PID/raw_csi_calE.win
PID only if CsI has a calibration	LASSA/PID/PID_cal.tcl	LASSA/PID/PID_cal.win

  - You are encouraged to make your own spectra to look at things you may find interesting. Attach to previous runs. Any def-files or win-files made should be saved in your own folder labeled with your name. Any files saved in the general directories will be deleted at midnight. You may find your own laptop useful for this.
  - You may be asked to create certain spectra, again these should be saved in your own folder unless the shift leader says it's ok to store it in the general directories. Attach to previous runs. You may find your own laptop useful for this.

- MB/FA SpecTcl
  - The following spectra should be attached online, monitored for problems and cleared at the beginning of every run

what to monitor	def file	win file
FA sum	FA/sum_1d_adc_tdc.tcl	FA/sum.win
FA tdc vs adc	FA/tdc_v_adc.tcl	FA/tdc_vs_adc.win
MB sum	miniball/miniball_sum.tcl	miniball/ring_sum.win
MB monitor	miniball/monitor.tcl	miniball/monitor.win

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- Neutron/PV SpecTcl
  - The following spectra should be attached online, monitored for problems and cleared at the beginning of every run

what to monitor	def file	win file
summary	Neutron/sum.tcl	Neutron/summaries.win
PSD	Neutron/gm_PID.tcl	Neutron/gm_PID.win
timing	Neutron/amtdc.tcl	Neutron/amtdc.win
position	Neutron/ang_xy.tcl	Neutron/ang_xy.win
PV	proton_veto/adc_tdc_mult.tcl	proton_veto/adc_tdc_mult.win

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