Hall A Beam Line Status & Plans

For the GMn, GEn-RP, nTPE, WAPP Run Group

David Flay Feb 17, 2021







Outline

Introduction

- SBS Beam Parameter Overview
- The Hall A Beam Line

Subsystem Status & Tasks

- Upstream Components
- Downstream Components

Commissioning Plans

- Spectrometer B = 0
- Spectrometer $B \neq 0$
- Online Monitoring
- Task List at a Glance

Summary



Program Overview — From a Beam Perspective

Experiment	Beam Energy (GeV)	Beam Current (μA)	Max Lumi (cm ⁻² s ⁻¹)	P _{beam} (%)	Beam Diameter (mm)	Raster Size (mm x mm)	Target	Charge Norm. Uncertainty	Observable
GMn	3.74, 4.01, 5.99, 7.95, 9.91	30, 60	2.8 x 10 ³⁸	_	0.5	2 x 2 (sq.)	LD2 (15 cm)	_	σ_{unpol} ratios
nTPE	5.56	30	2.8 x 10 ³⁸	_	0.5	2 x 2 (sq.)	LD2 (15 cm)	_	R _{n/p} ratio
GEn-RP	5.56	30	2.7 x 10 ³⁸	80 ± 1.6	0.5	2 x 2 (sq.)	LD2 (15 cm)	_	P_{t},P_{ℓ}
WAPP	7.38	5	4.5 x 10 ³⁷ (6 x 10 ³⁷ w/Cu X ₀)	85 ± 1.7	0.5	2 x 2 (sq.)	LD2 (15 cm)		$\mathbf{K}_{LL},\mathbf{K}_{LS}$

Note:

• Luminosity calculated as (nucleons/cm²) x (electrons/sec)



Hall A Beam Line Components

Shield Wall Harp			
Quad Beam Position Monitor	⊕ ∃	MQA1C17 IPM1C18	BEAM LINE
Quad Vertical Corrector	•		shield Wall to Kaster
Harp Ouad + Franch Bench)	IHA1C18A	Dir
Harp	⊳ €	IHA1C18B	ec
Quad Beam Position Monitor	♣급-	MQR1C19 IPM1C20	tio
Quad Horizontal & Vertical Corrector (ORBIT LOCK)	* -	MQR1C20 MBC1C20H/V	n
Vacuum lon Pump Compton Dipole		VIP1C20A MCP1P01 (MVS1P01) (MMC1P01)	(MC1P01)
Beamline Vacuum Valve Vacuum Cold Gauge		VBV1P01A VCG1C20	
Horizontal Corrector Beamline Vacuum Valve Beam Loss Monitor	××*	MBT1P01H VBV1C20 ILM1P01	
vaccum ion Pump Vacuum Cold Gauge Compton Dipole	_	VIP1P01A VCG1P01A MCP1P02 (MVS1P02) (M	MC1D03)
		IPM1P02A	
		VBV1P02A	
Vacuum Ion Pump Laser Hut Elam Position Monitor []		VIP1P02B IPM1P02B	
	* *		
Beam Loss Choice Beam Incore Choice Beamline Vacuum Valve	*	IRUCE IFUS (INVESTEUS) (INVINCEFUS) ILM1P03 VRV1P03	
Beam Position Monitor Vacuum Ion Pump	-	IPM1P03A VIP1C20B	
Horizontal Corrector Vacuum Ion Pump Compton Electron Detector		MBT1P03H VIP1P03A	
Vacuum Cold Gauge Compton Dipole		VCG1P01A MCP1P04 (MVS1P04) (MMC1P04)	IMC1P04)
Compton Ion Chamber Beam Loss Monitor		SLD1P03 ILM1P04	
Beamline Vacuum Valve	- X -	VBV1H00	
Differential Pump	=ta	VDP1H00	
Vacuum Ion Pump Beam Current Monitor	₩ ²	VIP1H00 IBC1H00	
Beam Current Monitor (Unser)	<u> </u>	IBC1H00A	
vacuum Cold Gauge Harp		VCG1H00 IHA1H00	
Raster	[]	MRA1H00A & B, H/V	E. Forman 7 March 2014
Beamline Vacuum Valve		VBV1H00A	
Transport Ion Chamber	adatjov h	SLD1H00	HALL A
Vacuum Turbo Pump		VTP1H00	BEAM LINE
Beam Current Monitors	00	IBC1H01A, B, C	Kaster Area to Dump
	0		
Beamline Vacuum Valve Beam Position Monitor	X []	VBV1H01 IPM1H01	
Quad (SECONDARY)	*	MQK1H01	
Horizontal & Vertical Corrector		MAT1H01H/MBC1H01V	
moner rarget Moller Quad	•	MQM1H02	
Moller Quad Moller Ottad	◆◀	MQM1H02A MOO1H03	
Moller Quad	•	MQ01H03A	
Moller Dipole Moller Detector	•	MMA1H01	
Vertical Corrector Quad	← 🏶	MBD1H04V MQA1H04	Inverted
Beam Position Monitor Horizontal Corrector	₽급↑	IPM1H04 MBD1H04H	Girder
Beam Current Monitor/BPM		IPM1H04A+IBC1H04A	
Harp Beam Current Monitor/BPM		IHA1H04A IPM1H04+IBC1H04B	
Calorimeter Vocumentingho Bumon	30	IFY1H00	
Vacuum Cold Gauge		VCG1H04	
Beam Current Monitor/BPM		IPM1H04C+IBC1H04C	
Harp	- 🚝	IHA1H04B	
Beamline Vacuum Valve Taraet	x 语	VBV1H04B	
Target Ion Chamber		SLD1H05A	
Jeptum mugnet Beamline Vacuum Valve	X	VBV1H04C	
Vacuum ruso or man		VTP1H04A	
Lumi Ion Chamber Electron/Hadron Arm Q3 Beam Dump Viewer	GHV2ITAGE	SLD1H06 ITV1D00	
Electron/Hadron Arm Detectors	39%	Q	
Left/Right Dump Ion Chamber		SLD1H07/ SLD1H08	
High Power Beam Dump			E. Forman 7 March 2014



Hall A Beam Line Components

Beam Direction		E Forman 7March 2014 LINE to Dump	Further upstream: B (DF, transition from D.	eam energy measurements Higinbotham)
HALL A BEAM LINE Shield Wall to Raster	MCTP02) MCTP03)		Inverted Girder	
IHA1C17 MOA1C17 IPM1C18 MOA1C18 MOA1C18 MAC1C18V IHA1C18A MA1C18B MA1C18B MA1C18B MA1C128 MC1120 MBC1C20 MBC1C20 MBC1C20 MVP1C	VCG1C20 MBTTPDIH VBVT201 VIPTPDIA VCG1PD1A MCP1PD2 (MVS1PD2) (MMC1PD2) IPM1P02A VBV1P02A VIPTP02B IPM1P02B IPM1P02B IPM1P02B ILM1P02 MCTP03 (MVS1P03) (MMC1P03) ILM1P03 VIPT20B MBTP03A VIPT20B MBTP03A MBTP03A	MVS1P04) (n	VBV1H01 IPM1H01 MQK1H01 MQK1H01 MQM1H02A MQM1H02A MQ01H03A MQ01H03A MMA1H01 MMA1H04 MBD1H044 IPM1H04 MBD1H04H	IPM1H04A+IBC1H04A IHA1H04A IPM1H04+IBC1H04B IFY1H00 VCG1H04 IPM1H04C+IBC1H04C IPM1H04B IPM1H04B VBV1H04B VBV1H04B VBV1H04A VBV1H04C VTP1H04C VTP1H04C VTP1H06 SLD1H06 SLD1H06 SLD1H06
<mark>┟╞╺╶╺╤┍╤╺╤</mark>	× × × *		XX IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	
Shield Wall Harp Quad Beam Position Monitor Quad Vertical Corrector Harp Quad + French Bench Harp Quad Beam Position Monitor Quad Beam Position Monitor Quad Beam Position Monitor Quad Beam Position Monitor Compton Dipole Beamline Vacuum Valve Beamline Vacuum Valve	Vacuum Cold Gauge Horizontal Contro dave Beamline Vacuum Valve Beamline Vacuum Valve Vacuum Cold Gauge Compton Dipole Beam Position Monitor Vacuum Ion Pump Vacuum Valve Beamline Vacuum Valve Beam Loss Monitor Beam Loss Monitor Horizontal Corrector	oncurrent on the second of the second of the second of the	Beamline Vacuum Valve Beam Position Monitor Quad (SECONDARY) Horizontal & Vertical Corrector Moller Target Moller Quad Moller Quad Moller Quad Moller Quad Moller Dipole Moller Dipole	Beam Current Monitor/BPM Harp Beam Current Monitor/BPM Calorimeter Vacuum Turbo Pump Vacuum Turbo Pump Vacuum Turbo Pump Beam Current Monitor Harp Beam Current Monitor Harp Beam Current Monitor Harp Earter Madron Arm OI Vacuum Valve Flectron/Hadron Arm OI Vacuum Turbo Pump Electron/Hadron Arm O2 Lumi Ion Chamber Electron/Hadron Arm O2 Lumi Ion Chamber Electron/Hadron Arm O2 Lumi Ion Chamber Electron/Hadron Arm O3 Beam Dump Viewer Electron/Hadron Arm O3 Left/Right Dump Ion Chamber High Power Beam Dump
	Compton Polarimete (D. Gaskell)	BCN, Unser BCN, Macki Raster (D. Macki (B. Michaels)	Moller Polarimeter (S. Malace)	BPMs, HarpsIon Chambers(Accelerator)(Accelerator)
F		(D. W (B. MIL		



Beam Polarimetry (for GEn-RP, WAPP)

Moller Polarimeter (Simona Malace)

- We have documented procedures for setting up the measurements
- Beam line will stay the same for this run group => the same beam setup procedure for PREX/CREX will be used
- Each beam energy needs a different Moller optics solution (to be determined via simulation). For each beam energy, must allocate 2 shifts: commissioning optics solution + time for one measurement

Compton Polarimeter (Dave Gaskell)

• Not needed or planned to be used for GEn-RP, WAPP



Beam Energy, Charge Monitors, Unser, Raster

Beam Energy (DF, transition from Doug)

- Last bend angle survey was 2018; scheduling a new one w/ Survey & Alignment (3-day effort)
- Each beam energy measurement takes 1 hr

BCMs, Unser (Dave Mack)

- Need to recover systems from parity experiments PREX/CREX
- Set up for beam currents relevant to GMn/GEn-RP/nTPE/WAPP (1—100 $\mu A)$
- Work estimate: 2 weeks @ half time

Raster (Bob Michaels)

- PREX/CREX ran with 1 XY pair; need to set up for XY XY configuration
- Estimate 2 weeks for installation and testing (Bill Gunning)



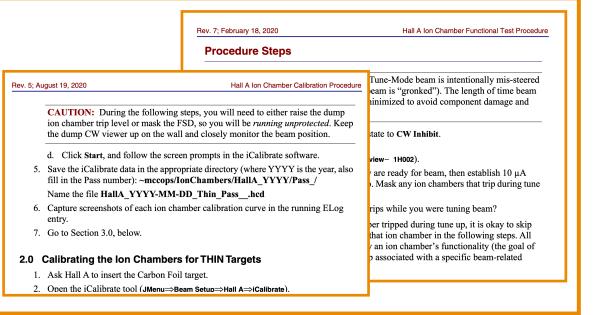
Beam Position Monitors, Harps, Ion Chambers

Beam Position Monitors, Harps

- Standard equipment maintained by Accelerator
- Checkout steps are included in standardized procedures
 - For Harps: Inject signal & check electronics, carriage motion; scan harps and identify wires that are faulty/need fixing
 - BPMs follow similar steps

Ion Chambers

- We will follow recently updated (2020) procedures
 - -<u>Calibration</u>
 - Functional Tests





Exit Beam Line Correctors

Why Corrector Magnets?

- SBS field (1.56 T-m) will have significant fringe field gradients
- Need to cancel gradients, optimize beam transport to dump
- Independent power for (beam) left and right coils => magnitude + gradient
 - Jay's calculations show powering DS corrector to 90% capacity in a 6/7 L/R ratio to simplify beam steering

Personnel

Accelerator

DF

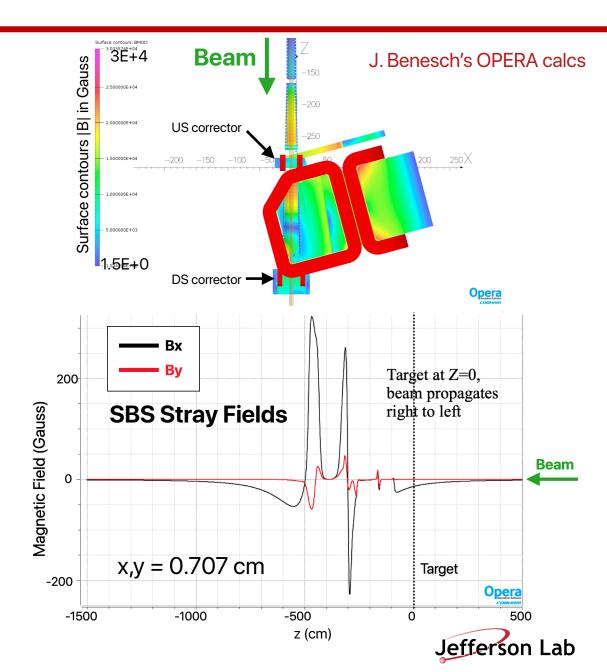
J. Butler & team

J. Segal & team

- Have full capacity of US corrector available

Rough Timeline & Tasks

- Estimate to install in April/May
- 12 days for:
 - Installation, survey, alignment
 - Connection of power, temperature sensors, LCW
- Must allocate time to power on the coils and test:
 - Power magnets
 - Measure field magnitude and direction
- CASA working on commissioning and operation plan w/beam



SBS Beam Line Commissioning (Spect. B = 0)

Step	Description	Beam Type	Raster	Target at Pivot	Duration Estimate (hrs)
Beam Centering	Directions on Wiki: Scan beam position in both x and y directions, and observe rates on rate monitor. Center beam on carbon hole according to rate monitor data	Tune	OFF	Carbon Hole	3–4
BPM Calibration	BPM checkout: record BPM data and perform HARP scans.	Tune	OFF	None (Dump diffuser)	2
Beam Delivery to Dump	Follow Ops procedures to send pulsed beam to beam dump.	Tune	OFF	None (Dump diffuser)	4
IC Calibrations and CW Test	<u>Perform Ion Chamber calibrations;</u> then send CW beam into the hall	Tune/CW	OFF	Target under IC calib None (CW)	1
Raster Checkout	Enable beam rastering and take data. Step up from minimal to full production size. <u>Coordination between MCC and Hall A</u>	CW	ON	None (Dump diffuser)	0.5
BCM Calibrations	Linearity tests and Unser calibration	CW	OFF	None (Dump diffuser)	1.5
Moller Polarimeter Checkout	Perform first measurements according to standard procedures	Tune/CW	OFF	None (Dump diffuser)	16



SBS Beam Line Commissioning (Spect. B ≠ 0)

Step	Description	Beam Type	BB/SBS Magnet Currents (A)	Raster	Target at Pivot	Duration Estimate (hrs)
Impact of BB, SBS Magnets + Corrector Magnets	Ramp BB and SBS magnets to nominal values for each kinematic point; observe how beam position changes at the dump. Accelerator drafting ops procedure.	Tune/CW	710/2000	ON	None (Dump diffuser)	TBD
Beam Alignment	Directions on Wiki: Scan beam position in both x and y directions, and observe rates on rate monitor. Center beam on carbon hole according to rate monitor data	Tune	710/2000	ON	Carbon Hole	3–4



Online Monitoring & DAQ Details

Monitoring Categories

- Shift checklist: Top-level (once per shift) check of nominal items, — Beam energy, current
- EPICS variables: Items to monitor on the ~hr time scale
- BPM, beam energy & dp/p, ion chambers
- Alarms: Items that need immediate attention as needed
 - Key BPMs, ICs
 - Three handlers: 1) for target; 2) for spectrometers/vacuum systems; 3) an improved version of the parity alarm handler for general use (Cameron Clarke, SBU)
 - Need to determine optimum setup/combination of these options

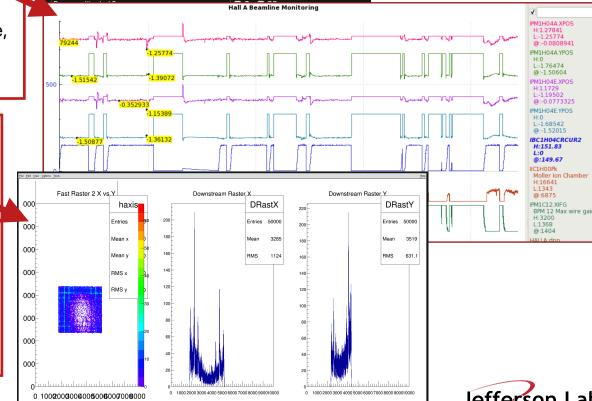
Raster Notes

 Raster spot++ usage will be similar to what it was for LHRS/RHRS (though no RHRS version now)

DAQ Readout

- Bob M: Considering reviving the LHRS readout of beam quantities
 - Signals are already in the LHRS for BPM, BCM, helicity, raster currents
 - If these data are redundant in the main SBS DAQ, instructions may be different (TBD)

_				
	Hall A Shift Checklist: Edit		Beam Current Ramp Protection is ON	ON Off
	Checklist opened 2/16/2021	Value	Beam 2C21A X/Y (mm)	
	Your Name		Beam 2H01 X/Y (mm)	
	Date		Collimator/Aperture position	
	Shift	🗖 Owl 🗖 Day 🗖 S	Beamline vacuum ok?	🕒 Yes 🔲 No
	Shift Leader		Fast raster pattern	Rectangular Circular
	Target operator			On Off
	3rd shifter		Fast Raster Setpoint [x, y]	
			Fast Raster Measured Currents (IxO3H, Ix04H, Iy03V,	
	Beam Energy [GeV]		IyO4V) [A]	
	Beam Current [uA]		Helicity reporting delay (No Delay, Windows)	
	Beam energy lock ON?	On Off	Alarm Handler Status (General)	 Running Visible Sound Works NOT silenced



At a Glance: Tasks & Time Estimates

Task	Personnel	Time Estimate
BEAM OFF		
BCM, Unser Prep	D. Mack	2 weeks (at half time)
BPM, Harp Checkout	Accelerator	(part of ops procedures)
Corrector Installation, Checkout	J. Butler & team, J. Segal & team, Accelerator, DF	2 weeks+
Raster Preparations	B. Gunning, B. Michaels	2 weeks
ARC Bend Angle Survey	Survey & Alignment	3 days
BEAM ON		
BB, SBS B = 0 Commissioning	Accelerator	13 hrs
BB, SBS B ≠ 0 Commissioning	Accelerator	TBD
Moller Setup and Measurement 🖈	S. Malace, Accelerator	16 hrs
Beam Energy Measurement	DF, transition from D. Higinbotham	1 hr

- Beam-off tasks being scheduled with Jessie
- ★ Note polarimetry tasks are only valid for GEn-RP and WAPP. Tasks are required for each beam energy



Summary

- We have our task list & personnel identified for beam off and beam on items
- Scheduling beam-off items with Jessie
 - Major item: Corrector installation & setup plan; working with AD to get procedures in place
- Have a beam line commissioning procedure with and without BB, SBS powered
- FSD list being updated to include BB, SBS magnets, correctors



Backup



- Fast Shutdown Lock list refined and checked this past run
 - Outcome of Beam Line Controls task force

FSD Card Name	CED Card Type	Interlocked Device Name	Device Description
FSD_1H01	FSD_FIBER		
		FSD_BD1H01	FSD Card
		FSD_BD1H02	FSD Card
		Hall A Fast Raster A	raster A power
		Hall A Fast Raster B	raster B power
		VBV1C20A	beamline vacuum valve
		DFHLAA Hall A Diffuser Card	dump diffuser plate motion controls
		FSD_BLMHLAA	FSD Card
		FSD_IONHA01	FSD Card
		FSD_IONHA02	FSD Card
		FSD_1H03	FSD Card
FSD_1H02	FSD_ELEC		
		PREX Target Motion	PREX target ladder motion
		9 Vacuum Devices:	monitors beamline valves and thermocouple gauges VBV1C20, VBV1H00, VBV1H0
			VBV1H00B, VBV1H04B, VBV1H04C, VBV1H04X, VTC1H04X, and VTC1H04D
		4 Vacuum Devices:	monitors beamline valves VBV1P01, VBV1P02, VBV1P03, and VBV1P04
		Septum Magnet	septum magnet power
		Hall A Aperture Waterflow	aperture water flow
		Hall A Diffuser Blower Status	dump diffuser blower fan
		Hall A Electron Detector	monitors compton electron detector position
		Hall A Moeller Target	monitors Moeller target motion
		PREX Target Water Flow	PREX target cooling water flow
		PREX Inlet Temperature	PREX target cooling water inlet temperature
FSD_1H03	FSD_ELEC		
		HVIONHA01 (HVCard6CH)	High voltage power supply for Hall A ion chambers
FSD_BLMHLAA	FSD_BLM		
		ILM1P01	beam loss monitor
		ILM1P02	beam loss monitor
		ILM1P03	beam loss monitor
		ILM1P04	beam loss monitor
FSD_IONHA01	FSD_ION		
		Moeller Target Ion Chamber	ion chamber
		Target Upstream Ion Chamber	ion chamber
		Target A Ion Chamber	ion chamber
		Dump Left Ion Chamber	ion chamber
		Dump Right Ion Chamber	ion chamber
FSD_IONHA02	FSD_ION		
		Compton Ion Chamber	ion chamber
		Target B Ion Chamber	ion chamber
FSD_BD1H01	FSD_FIBER		
		FSD_BD1H02	FSD Card
		FSD_BD1H03	FSD Card
FSD_BD1H02	FSD_ELEC		
		IBD1H05 Hall A H2 Alarm	Beam dump hydrogen sensor
FSD_BD1H03	FSD_ADC		
		IBD1H05 Hall A Water Flow	beam dump lcw flow
		IBD1H05 Hall A Differential Pressure	beam dump lcw differential pressure
		IBD1H05 Hall A Supply Pressure	beam dump lcw supply presure
		IBD1H05 Hall A Supply Temperature	beam dump lcw supply temperature



- Fast Shutdown Lock list refined and checked this past run
 - Outcome of Beam Line Controls task force

Raster

• Fast raster power supplies

FSD Card Name	CED Card Type	Interlocked Device Name	Device Description
FSD_1H01	FSD_FIBER		
		FSD_BD1H01	FSD Card
		FSD_BD1H02	FSD Card
		Hall A Fast Raster A	raster A power
		Hall A Fast Raster B	raster B power
		VBV1C20A	beamline vacuum valve
		DFHLAA Hall A Diffuser Card	dump diffuser plate motion controls
		FSD_BLMHLAA	FSD Card
		FSD_IONHA01	FSD Card
		FSD_IONHA02	FSD Card
		FSD_1H03	FSD Card
FSD_1H02	FSD_ELEC		
		PREX Target Motion	PREX target ladder motion
		9 Vacuum Devices:	monitors beamline valves and thermocouple gauges VBV1C20, VBV1H00, VBV1H00
			VBV1H00B, VBV1H04B, VBV1H04C, VBV1H04X, VTC1H04X, and VTC1H04D
		4 Vacuum Devices:	monitors beamline valves VBV1P01, VBV1P02, VBV1P03, and VBV1P04
		Septum Magnet	septum magnet power
		Hall A Aperture Waterflow	aperture water flow
		Hall A Diffuser Blower Status	dump diffuser blower fan
		Hall A Electron Detector	monitors compton electron detector position
		Hall A Moeller Target	monitors Moeller target motion
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		HVIONHA01 (HVCard6CH)	High voltage power supply for Hall A ion chambers
FSD_BLMHLAA	FSD_BLM		
		ILM1P01	beam loss monitor
		ILM1P02	beam loss monitor
		ILM1P03	beam loss monitor
		ILM1P04	beam loss monitor
FSD_IONHA01	FSD_ION		
		Moeller Target Ion Chamber	ion chamber
		Target Upstream Ion Chamber	ion chamber
		Target A Ion Chamber	ion chamber
		Dump Left Ion Chamber	ion chamber
		Dump Right Ion Chamber	ion chamber
FSD_IONHA02	FSD_ION		
		Compton Ion Chamber	ion chamber
		Target B Ion Chamber	ion chamber
FSD_BD1H01	FSD_FIBER		
		FSD_BD1H02	FSD Card
		FSD_BD1H03	FSD Card
FSD_BD1H02	FSD_ELEC		
		IBD1H05 Hall A H2 Alarm	Beam dump hydrogen sensor
FSD_BD1H03	FSD_ADC		
		IBD1H05 Hall A Water Flow	beam dump lcw flow
		IBD1H05 Hall A Differential Pressure	beam dump lcw differential pressure
		IBD1H05 Hall A Supply Pressure	beam dump lcw supply presure
		IBD1H05 Hall A Supply Temperature	beam dump lcw supply temperature



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Raster

• Fast raster power supplies

Beam polarimetry

- Moller & Compton ion chambers
- Moller target motion

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		Hall A Fast Raster B	raster B power
		VBV1C20A	beamline vacuum valve
		DFHLAA Hall A Diffuser Card	dump diffuser plate motion controls
		FSD BLMHLAA	FSD Card
		FSD_IONHA01	FSD Card
		FSD_IONHA02	FSD Card
		FSD_1H03	FSD Card
FSD_1H02	FSD_ELEC	100_1100	
100_1102	100_000	PREX Target Motion	PREX target ladder motion
		9 Vacuum Devices:	monitors beamline valves and thermocouple gauges VBV1C20, VBV1H00, VBV1H00,
			VBV1H00B, VBV1H04B, VBV1H04C, VBV1H04X, VTC1H04X, and VTC1H04D
		4 Vacuum Devices:	monitors beamline valves VBV1P01, VBV1P02, VBV1P03, and VBV1P04
		Septum Magnet	septum magnet power
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		ILM1P02	beam loss monitor
		ILM1P03	beam loss monitor
		ILM1P04	beam loss monitor
FSD_IONHA0	FSD_ION		
		Moeller Target Ion Chamber	ion chamber
		Target Upstream Ion Chamber	ion chamber
		Target A Ion Chamber	ion chamber
		Dump Left Ion Chamber	ion chamber
		Dump Right Ion Chamber	ion chamber
FSD IONHA02	FSD_ION		
		Compton Ion Chamber	ion chamber
		Target B Ion Chamber	ion chamber
FSD_BD1H01	FSD_FIBER		
bbinoi	TOD_TODER	FSD BD1H02	FSD Card
		FSD_BD1H02	FSD Card
FSD BD1H02	FSD ELEC	130_001103	
	ISD_ELEC	IBD1H05 Hall A H2 Alarm	Room dump hydrogen sensor
			Beam dump hydrogen sensor
FSD_BD1H03	FSD_ADC		hanna duma lau flau
		IBD1H05 Hall A Water Flow	beam dump lcw flow
		IBD1H05 Hall A Differential Pressure	beam dump lcw differential pressure
		IBD1H05 Hall A Supply Pressure	beam dump lcw supply presure
		IBD1H05 Hall A Supply Temperature	beam dump lcw supply temperature



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 - Outcome of Beam Line Controls task force

Raster

• Fast raster power supplies

Beam polarimetry

- Moller & Compton ion chambers
- Moller target motion

Target — to be adapted to SBS, under preparation

- Ladder motion
- Auxiliary systems

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FSD_1H01	FSD_FIBER		
		FSD_BD1H01	FSD Card
		FSD_BD1H02	FSD Card
		Hall A Fast Raster A	raster A power
		Hall A Fast Raster B	raster B power
		VBV1C20A	beamline vacuum valve
		DFHLAA Hall A Diffuser Card	dump diffuser plate motion controls
		FSD_BLMHLAA	FSD Card
		FSD_IONHA01	FSD Card
		FSD_IONHA02	FSD Card
		FSD_1H03	FSD Card
FSD_1H02	FSD_ELEC		
		PREX Target Motion	PREX target ladder motion
		9 Vacuum Devices:	monitors beamline valves and thermocouple gauges VBV1C20, VBV1H00, VBV1H0
			VBV1H00B, VBV1H04B, VBV1H04C, VBV1H04X, VTC1H04X, and VTC1H04D
		4 Vacuum Devices:	monitors beamline valves VBV1P01, VBV1P02, VBV1P03, and VBV1P04
		Septum Magnet	septum magnet power
		Hall A Aperture Waterflow	aperture water flow
		Hall A Diffuser Blower Status	dump diffuser blower fan
		Hall A Electron Detector	monitors compton electron detector position
		Hall A Moeller Target	monitors Moeller target motion
		PREX Target Water Flow	PREX target cooling water flow
		PREX Inlet Temperature	PREX target cooling water now
FSD_1H03	FSD_ELEC		
	FSD_ELEC	HVIONHA01 (HVCard6CH)	Llink voltage nover events for Hell A ion showhare
FSD_F_MHLAA	FSP_JLM	HVIONHAUI (HVCardbCH)	High voltage power supply for Hall A ion chambers
	FSF_BLIVI	U.M.1.DO.1	beam loss monitor
		ILM1P01 ILM1P02	
			beam loss monitor
		ILM1P03	beam loss monitor
		ILM1P04	beam loss monitor
FSD_IC_HA01	FSD_ION		
		Moeller Target Ion Chamber	ion chamber
·		Target Upstream Ion Chamber	ion chamber
		Target A lon Chamber	ion chamber
		Dump Left Ion Chamber	ion chamber
		Dump Right Ion Chamber	ion chamber
FSD_IONHA02	FSD_ION		
		Compton Ion Chamber	ion chamber
		Target B Ion Chamber	ion chamber
FSD_BD1H01	FSD_FIBER		
		FSD_BD1H02	FSD Card
		FSD_BD1H03	FSD Card
FSD_BD1H02	FSD_ELEC		
		IBD1H05 Hall A H2 Alarm	Beam dump hydrogen sensor
FSD_BD1H03	FSD_ADC		
		IBD1H05 Hall A Water Flow	beam dump lcw flow
		IBD1H05 Hall A Differential Pressure	beam dump lcw differential pressure
		IBD1H05 Hall A Supply Pressure	beam dump lcw supply presure
		IBD1H05 Hall A Supply Temperature	beam dump lcw supply temperature



- Fast Shutdown Lock list refined and checked this past run
 - Outcome of Beam Line Controls task force

Raster

• Fast raster power supplies

Beam polarimetry

- Moller & Compton ion chambers
- Moller target motion

Target — to be adapted to SBS, under preparation

- Ladder motion
- Auxiliary systems

Beam Exit — to be adapted to SBS, under preparation

- Diffuser monitors, BLMs, LCW monitors
- Need to add SBS magnet, correctors

FSD Card Name	CED Card Type	Interlocked Device Name	Device Description
FSD_1H01	FSD_FIBER		
		FSD_BD1H01	FSD Card
		FSD_BD1H02	FSD Card
		Hall A Fast Raster A	raster A power
		Hall A Fast Raster B	raster B power
		VBV1C20A	beamline vacuum valve
		DFHLAA Hall A Diffuser Card	dump diffuser plate motion controls
		FSD_BLMHLAA	FSD Card
		FSD_IONHA01	FSD Card
		FSD_IONHA02	FSD Card
		FSD_1H03	FSD Card
FSD_1H02	FSD ELEC		
		PREX Target Motion	PREX target ladder motion
		9 Vacuum Devices:	monitors beamline valves and thermocouple gauges VBV1C20, VBV1H00, VBV1H00
			VBV1H00B, VBV1H04B, VBV1H04C, VBV1H04X, VTC1H04X, and VTC1H04D
		4 Vacuum Devices:	monitors beamline valves VBV1P01, VBV1P02, VBV1P03, and VBV1P04
		Septum Magnet	septum magnet power
		Hall A Aperture Waterflow	aperture water flow
		Hall A Diffuser Blower Status	dump diffuser blower fan
		Hall A Electron Detector	monitors compton electron detector position
		Hall A Moeller Target	monitors Moeller target motion
		PREX Target Water Flow	PREX target cooling water flow
		PREX Inlet Temperature	PREX target cooling water inlet temperature
FSD_1H03	FSD_ELEC		
		HVIONHA01 (HVCard6CH)	High voltage power supply for Hall A ion chambers
FSD_BLMH_AA	FSD_BLM		
		ILM1P01	beam loss monitor
		ILM1P02	beam loss monitor
		ILM1P03	beam loss monitor
		ILM1P04	beam loss monitor
FST IONHA01	FSD ION		
		Moeller Target Ion Chamber	ion chamber
		Target Upstream Ion Chamber	ion chamber
		Target A Ion Chamber	ion chamber
		Dump Left Ion Chamber	ion chamber
		Dump Right Ion Chamber	ion chamber
FSD_ION# .02	FSD IO		
		Compton Ion Chamber	ion chamber
		Target B Ion Chamber	ion chamber
FSD_BD1H01	FSD_FIBER		
		FSD_BD1H02	FSD Card
		FSD_BD1H03	FSD Card
FSD BD1H02	FSD ELEC		
		IBD1H05 Hall A H2 Alarm	Beam dump hydrogen sensor
FSD_BD1H03	FSD_ADC		
		IBD1H05 Hall A Water Flow	beam dump lcw flow
		IBD1H05 Hall A Differential Pressure	beam dump icw how
		IBD1H05 Hall A Supply Pressure	beam dump icw supply presure
		IBD1H05 Hall A Supply Fressure	beam dump icw supply presure
		ibutinos nali A supply remperature	beam dump it w supply temperature

