Hall A Beam Line for SBS

SBS Collaboration Meeting July 14, 2020

David Flay









Hall A Beam Line

Shield Wall			HALLA
narp Quad) *	MQA1C17	BEAM LINE
beam Position Monitor Quad	-	IPM1C18 MQA1C18	Shield Wall to Raster
Vertical Corrector Harp	€	MBC1C18V IHA1C18A	Di
Quad + French Bench Harp		MQA1C18B IHA1C18B	ire
Quad	•	MQR1C19	cti
Beam Position Monitor Quad	: *	IPM1C20 MQR1C20	ion
Horizontal & Vertical Corrector (ORBIT LOCK)		MBC1C20H/V)
compton Dipole		MCP1P01 (MVS1P01) (M	4MC1P01)
Beamline Vacuum Valve Vacuum Cold Gauge	R	VBV1P01A VCG1C20	7
Horizontal Corrector Beamline Vacuum Valve Beam Loss Monitor	××	MBTTP01H VBV1C20 ILM1P01	
Vacuum Ion Pump Vacuum Cold Gauge	-	VIP1P01A VCG1P01A	
		MCP1P02 (MV51P02) (M	(MC1P02)
Beam Position Monitor	 		>
Vacuum Ion Pump		VIP1P02B	
Beam Position Monitor	*	IPM1P02B ILM1P02	
Compton Dipole		MCP1P03 (MVS1P03) (M	1MC1P03)
Beamline Sacuration Valve	K	ILM 1703 VBV1P03 IDM1P03 A	
Vacuum Ion Pump Horizontal Corrector		VIP1C20B MBT1P03H	
Vacuum Ion Pump Compton Electron Detector Vacuum Cold Gaune		VIP1P03A V/G1P01A	
Compton Dipole Compton Ion Chamber		MCP1P04 (MVS1P04) (M SLD1P03	1MC1P04)
Beam Loss Monitor		ILM1P04	
Beamline Vacuum Valve Differential Dumo	∑ =	VBV1H00	
Beam Current Monitor		IBC1H00	
Beam Current Monitor (Unser) Vacruum Cold Gauce	<u>;</u>	IBC1H00A	
Harp	1 700	IHA1H00	
Raster	-	MRA1H00A & B, H/V	E. Forman 7 March 2014
Beamline Vacuum Valve		VBV1H00A	
Transport lon Chamber	JOLTAGE	SLD1H00	HALL A
Vacuum Turbo Pump	нян	VTP1H00	BEAM LINE
	C		Raster Area to Dump
Beam Current Monitors	000	IBC1H01A, B, C	
Beamline Vacuum Valve	8	VBV1H01	
Beam Position Monitor		IPM1H01	
Quad (SECONDARY) Horizontal & Vertical Corrector	♦ ←	MQK1H01 MAT1H01H/MRC1H01V	
Moller Target	<u>)) (</u>		
Moller Quad	•	MQM1H02	
Moller Quad Moller Quad	•	MQ01H03	
Moller Quad Mollor Dirodo	*	MQ01H03A	
Moller Detector	••		
Vertical Corrector Quad	⊢ ♣	MBU1H04V MQA1H04	Inverted
Beam Position Monitor Horizontal Corrector	 †	IPM1H04 MBD1H04H	Girder
Beam Current Monitor/BPM		IPM1H04A+IBC1H04A	
Harp Beam Current Monitor/BPM		IHA1H04A IPM1H04+IBC1H04B	
Calorimeter	<mark>0</mark> 0	IFY1H00	
Vacuum Turbo Pump Vacuum Cold Gauge		VTP1H04 VCG1H04	
Beam Current Monitor/BPM Beam Distriction Monitor		IPM1H04C+IBC1H04C	
Beath Position monitor Harp		IP/04110440 IHA1H04B	
Beamline Vacuum Valve Taraet	8	VBV1H04B	
Target Ion Chamber		SLD1H05A	
septum Magnet Beamline Vacuum Valve	×	VBV1H04C	
Electron/Hadron Arm Q1 Vacuum Turbo Pump		VTP1H04A	
Lumi Ion Chamber Electron/Hadron Arm Q3	HIGH VOLTAGE	SLD1H06	
Beam Dump Viewer Electron/Hadron Arm Detectors		ITV1D00	
Left/Right Dump Ion Chamber		ci היוחה כו היוחה	
High Power Beam Dump			E. Forman 7 March 2014



Hall A Beam Line

Beam Direction		l am t D. Hig	aking over items in <mark>b</mark> jinbotham	l ue + beam	n energy from
HALL BEAM L Shield Wall to	(MMC1P02) (MMC1P03) (MMC1P04)	HALL BEAM Raster Area t	V Inverted Girder		
IHA1C17 MQA1C17 MQA1C18 MQA1C18 MQA1C18 MAQA1C18 IHA1C18 MQA1C18 MQA1C18 IHA1C18 MQR1C19 MQR1C20 MC120	MCP1P02 (MVS1P02) IPM1P02A VBV1P02A VBV1P02B VB1P02B IPM1P02B VB1P02B VB1P02B VB1P02B VB1P02B VB1P02B VB1P02B VB1P02B VB1P02B ILM1P03 MCP1P03 VB1P03A VB1P03A VB1P03A VB1P03A VD1P00A VDP1H00 VDP1H00	VIP1H00 IBC1H00A IBC1H00A VCG1H00 IHA1H00A & B, H/V VBV1H00A & B, H/V VBV1H00A SLD1H00A VTP1H00 IBC1H01A, B, C	MQK11H01 MQK11H01 MQM1H02A MQM1H02A MQ01H03A MQ01H03A MMA1H01 MMA1H04 MMA1H04 MMD1H04H IPM1H04 MBD1H04H IPM1H04A IPM1H04A	IPM1H04+IBC1H048 IFY1H00 VTP1H04 VCG1H04 IPM1H04C+IBC1H046 IPM1H04D IHA1H04B IHA1H04B IHA1H04B	 SLD1H05A VBV1H04C VTP1H04A SLD1H06 SLD1H07 SLD1H08
<u></u>			┇╺╴╤ <mark>╔╔</mark> ╺┼╦╼╶ <mark>╖╔┊╞╶╶</mark>	<mark>⊟8<mark>⊕∎∎</mark>⊒8⊒∌≥</mark>	
Shield Wall Harp Quad Beam Position Monitor Quad Vertical Corrector 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 Vacuum Ion Pump Vacuum Cold Gauge	Compton Dipole Beam Position Monitor Beamline Vacuum Valve Vacuum Ion Pump Laser Hut Beam Loss Monitor Compton Dipole Beam Loss Monitor Beam Loss Monitor Vacuum Ion Pump Horizontal Corrector Vacuum Ion Pump Horizontal Corrector Vacuum Ion Pump Compton Dipole Compton Ion Chamber Beam Loss Monitor Beam Loss Monitor	Vacuum Ion Pump Beam Current Monitor Beam Current Monitor (Unser) Vacuum Cold Gauge Harp Raster Raster Beamline Vacuum Valve Beam Current Monitors Beamline Vacuum Valve	Cuant Poston monuto Quad (SECNDARY) Horizontal & Vertical Corrector Moller Target Moller Quad Moller Quad Moller Quad Moller Quad Moller Quad Moller Dipole Moller Dipole	Beam Current Monitor/BPM Calorimeter Vacuum Turbo Pump Vacuum Cold Gauge Beam Current Monitor/BPM Beam Position Monitor Harp Beamline Vacuum Valve	Target Target Ion Chamber Septum Magnet Beamline Vacuum Valve Electron/Hadron Arm Q1 Vacuum Turbo Pump Flectron/Hadron Arm Q2 Lumi Ion Chamber Electron/Hadron Arm Q3 Beam Dump Viewer Beam Dump Viewer Electron/Hadron Arm Detectors Left/Right Dump Ion Chamber High Power Beam Dump
Cor	n pton Polarimeter B ((D. Gaskell)	CM, Unser, Raster	Moller Polarimeter (S. Malace)	BPMs	lon Chambers interlocks & safety



SBS Program Overview — From a Beam Perspective

- High-luminosity up to ~10³⁹ cm⁻²/s
- Charge normalization largely cancels in observables
- Raster size driven by high-current operation

EXP	Beam Energy (GeV)	Beam Current (μA)	Max Luminosity (cm ⁻² /s)	Beam Polarization (%)	Beam Pol. Uncertainty (%)	Beam Diameter (mm)	Raster Size (mm x mm)	Target	Charge Normalization Uncertainty	Observable
GMn	4.4, 6.6, 8.8	30, 60	2.8 x 10 ³⁸	_	_	0.5	4 x 4	LD2 (15 cm)	_	σ_{unpol} ratios
GEn-RP	4.4	30	1.4 x 10 ³⁸	80	5	0.5	4 x 4	LD2 (15 cm)	_	P_t,P_ℓ
GEn(2)	4.4, 6.6, 8.8	60	6.6 x 10 ³⁶	85	5	0.5	4 x 4	Polarized ³ He (60 cm)	_	Double-spin asymmetries (QE)
GEp(5)	4.4, 11	75	7.5 x 10 ³⁸	85	5	0.5	4 x 4	LH2 (30 cm)		P_t, P_ℓ



SBS Downstream Beam Line

- Forward angles of SBS dipole (48D48)
 => exit beam line goes through cut in 48D48 yoke
 - 4 major configurations
- Need to shield exit beam path from stray field lines
 - Magnetic shielding
 - Corrector magnets
 - Both items in storage
- Will need to commission the correctors once installed
 - Power to nominal current
 - Verify field strength
 - Can we test before installation in hall?

Configuration	Experiment		
BL01	GEp		
BL02	GEn		
BL03, BL04	GMn		





Beam Line Protection Working Group

- Bi-weekly meetings since mid-June with Accelerator & Ops
- Goal is to improve beam line controls to protect targets & infrastructure
 - Improve communication between MCC & experimental Hall(s)
 - Streamline interlock systems and ion chamber calibration procedures

Dave Meekins (Physics, Chair) Keith Welch (RadCon) Jerry Kowal (EESSAF) Jay Benesch (OPS) Mike Tiefenback (CASA) Todd Satogata (CASA) Yves Roblin (CASA) Paul Vasilauskis (OPSMCC) John Musson (EESICS) Gary Croke (OPSSFT) Brian Freeman (OPSMCC) Javier Gomez (Physics) David Flay (Physics)



Summary

- Taking over for Doug on many beam line systems
 - -BCM, Unser, BPM, raster
 - Beam energy measurements
- Will be involved with corrector magnet commissioning
- Involved with working group to improve beam line controls

