

# INJECTOR QUICK REFERENCE DRAWING

## Rev 17 BETA

### Spring/Summer 2021 AIPINJ Phase I Gun -> Chopper

- DRAFT 5 (4/19)      IYG0I01 -> ITV0I01, ITV0I02 -> IYG0I02 (had YAG screened viewer position wrong). Updated A2 aperture to hole-size to 6mm.
- DRAFT 4 (3/29):      Changed ITV0I01->IYG0I01, ISL0I04->ISL0I04D to match CED. Updated 5D spur. Added Songsheet and AIPINJ Phase II clickable hyperlinks.
- DRAFT 3 (3/5):      Re-arranged VIP2I00,A,B,C to infer that only VIP2I00 is on the main beamline. Added E-field PVs for Wien filters. Added VIP4D00E marker.
- DRAFT 2 (2/19):      Removed VRVs -- not in the beam path. Corrected names for second Wien cross, prebuncher, and A3/A4 apertures.
- DRAFT 1 (2/12):      Updated Gun -> Choppers, AIPINJ Phase I, from 1/28 preliminary songsheet ACC0002845-0001.  
Added EPICS PVs and Songsheet names for RF elements  
Added chopper slit and central plug PVs

Pink = needs to be added

# INJECTOR QUICK REFERENCE DRAWING

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Bldg 53, Injector Service Building, Above-Ground Phones:

x6165 -- (3x+base) Cordless Phones

x5167 -- Outside PSS D1, in between D1 and D2, outside D2 (3 phones)

x6207 -- by tunnel entrance/  
1st R/S Box

Gun HV (kV)	<b>Electron</b> Momentum (MeV/c)	Relativistic Factor ( $\gamma$ )	Fraction of Speed of Light
100	0.335	1.196	0.548
130	0.387	1.254	0.604
200	0.494	1.391	0.695
300	0.630	1.587	0.777

**\* 2021 Physics Setting \***

GETTER PUMP VGP1I02

ION PUMP VIP1I02

x6208 -- both outside by camera and inside  
laser room (and by R/S box 2)

ION PUMP VIP1I03

GETTER PUMP VGP1I03

VERTICAL WIEN FILTER MWF1I04

ION PUMP VIP1I04

GETTER PUMP VGP1I04

(2/3) Rapid Access CARM RM100 P2  
Placement?

ION PUMP VIP1I05

GETTER PUMP VGP1I05

HORIZONTAL WIEN FILTER MWF1I06

ION PUMP VIP1I06

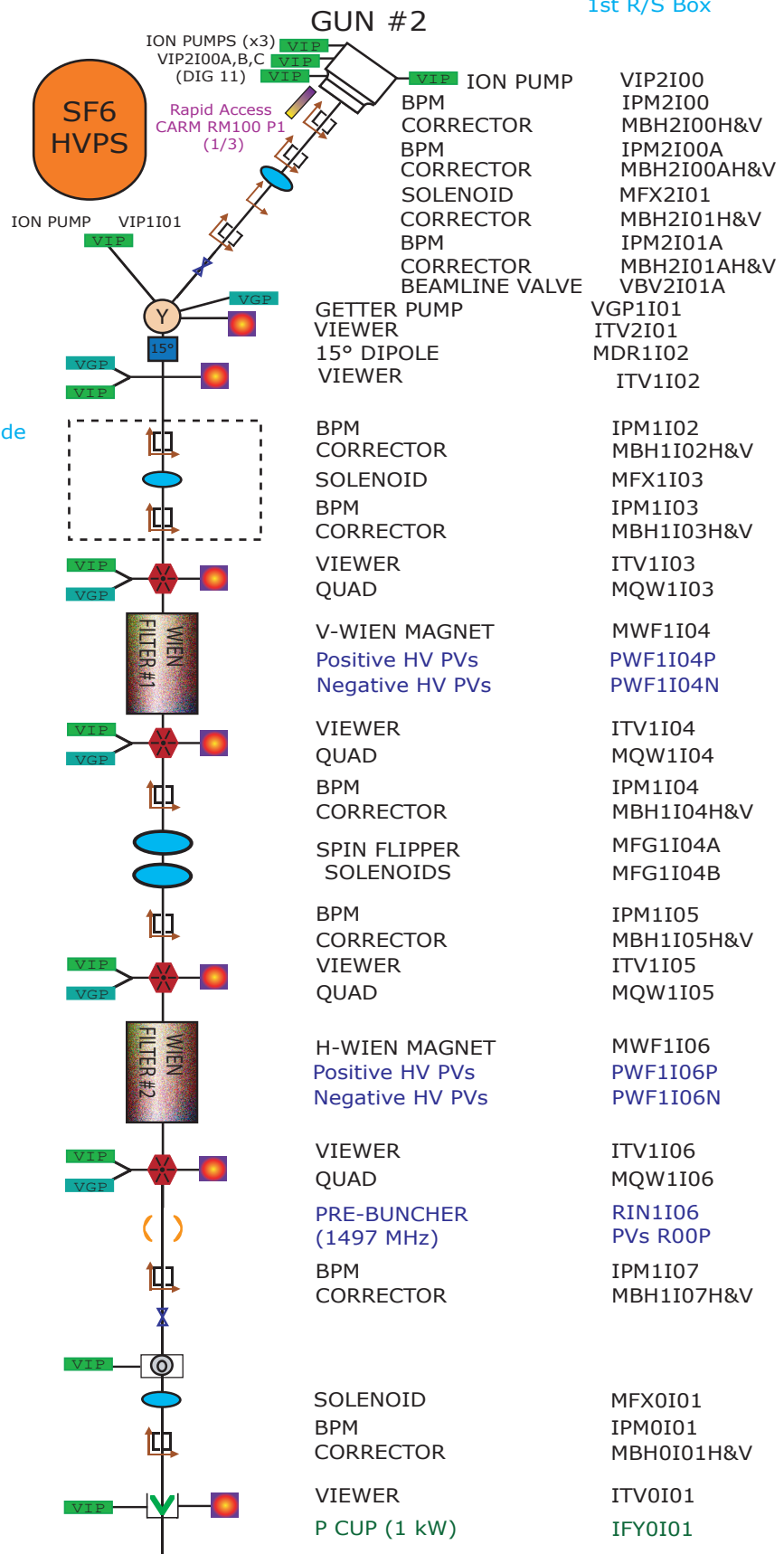
GETTER PUMP VGP1I06

BEAMLINE VALVE VBV1I07

DP CAN VDP0I00

ION PUMP VIP0I00

ION PUMP VIP0I01

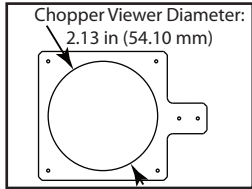


GETTER PUMP VGP0I01A  
ION PUMP VIP0I01A

BEAMLINE VALVE VBVOI02

ION PUMP VIP0I02  
GETTER PUMP VGP0I02

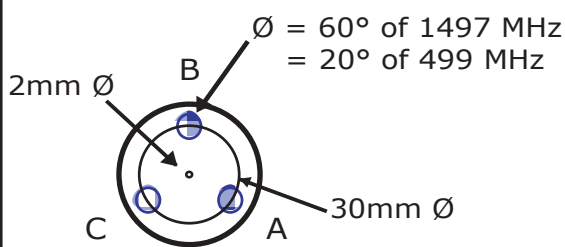
CHOPPER #1 RIH0I03  
(499 MHz) PVs X:R011 Y:R012



MASTER SLIT ISL0I04D  
SLIT A ISL0I04A  
SLIT B ISL0I04B  
SLIT C ISL0I04C  
VIEWER ITV0I04  
CENTRAL PLUG IDA0I04

CHOPPER #2 RIH0I04  
(499 MHz) PVs X:R013 Y:R014

### SLIT GEOMETRY



Downstream Electron View

### CAPTURE

RIA0I06  
PVs R023, R024

$T_{nom} = 500\text{keV } 0.86\text{c}$

BLM (MPS)

ILM0I07

### 1D SPECTROMETER

Bend angle =  $30^\circ = 0.523599$  radian

BEAMLINE VALVE VBV1D00  
SOLENOID (UNPOWERED) MFA1D00  
CORRECTOR MAD1D00 H&V  
HARP (UNPOWERED) IHA1D00  
VIEWER + ITV1D00  
ION PUMP VIP1D00 (DIG 3)  
500 keV Dump (1 kW) IDL1D00

### 1/4 CRYOMODULE 0L02

PVs R027, R028  $T_{gain} = 5.75$  MeV

$T_{nom} = 6.3\text{MeV } 0.997\text{c}$

### EPICS control PV?

APERTURE  
CORRECTOR  
BPM  
CORRECTOR  
PSS KICKERS

VIEWER  
HARP

APERTURE  
CORRECTOR

SOLENOID  
ION PUMP

EARTH CORRECTING COIL  
CORRECTOR  
SOLENOID

VIEWER + ION PUMP  
SOLENOID (same power supply as MFD0I04)  
CORRECTOR

ION PUMP  
SOLENOID

EARTH CORRECTING COIL  
CORRECTOR / BPM

VIEWER + ION PUMP

BUNCHER  
(1497 MHz)

SOLENOID  
CORRECTOR  
VIEWER  
ION PUMP

FARADAY CUP #1 (1 kW)  
CORRECTOR

CAPTURE ION PUMPS (x4)

DIPOLE

VIEWER  
ION PUMP

APERTURE ( $\varnothing=6\text{mm}$ )

SOLENOID

CORRECTOR

BEAMLINE VALVE

DP CAN + ION PUMP

BPM

CORRECTOR

YAO CAVITY

APERTURE ( $\varnothing=6.5\text{mm}$ )

SKEW QUAD

BEAMLINE VALVE

ION PUMP

0L02 ION PUMP  
COLD CATHODE GAUGE  
BLM (MPS)  
BEAMLINE VALVE

IFY0IA1 ( $\varnothing=2,3,4$  mm)  
MHD0I01AH&V  
IPM0I01B  
MBH0I01BH&V  
SBK0I01  
IYG0I02  
IHA0I02

IFY0IA2 ( $\varnothing=4,6,8$  mm)  
MHD0I02H&V  
MFA0I03  
VIP0I03 (DIG 7)

MED0I03  
MBH0I03 H&V  
MFD0I04

ITV0I04 + VIP0I04 (DIG 2)

MFD0I04A

MBH0I04 H&V

VIP0I04A (DIG 7)  
MFA0I05

MEE0I05

MBH0I05H&V / IPM0I05

ITV0I05 + VIP0I05 (DIG 3)

RIB0I05 PVs R015

MFA0I06

MBH0I06H&V

ITV0I06

VIP0I06 (DIG 3)

IFY0I06

MAD0I06AH&V

VIP0I06A,C,D,E (DIG 3)

MBO0I06

ITV0I06A

VIP0I06B (DIG 3)

SFY0IA3

MFL0I07

MAD0I07H&V

VBV0I07

VDP0I07 + VIP0I07 (DIG 4)

IPM0I07

MBH0I07AH&V

ICV0I07

SFY0IA4

MQS0I07

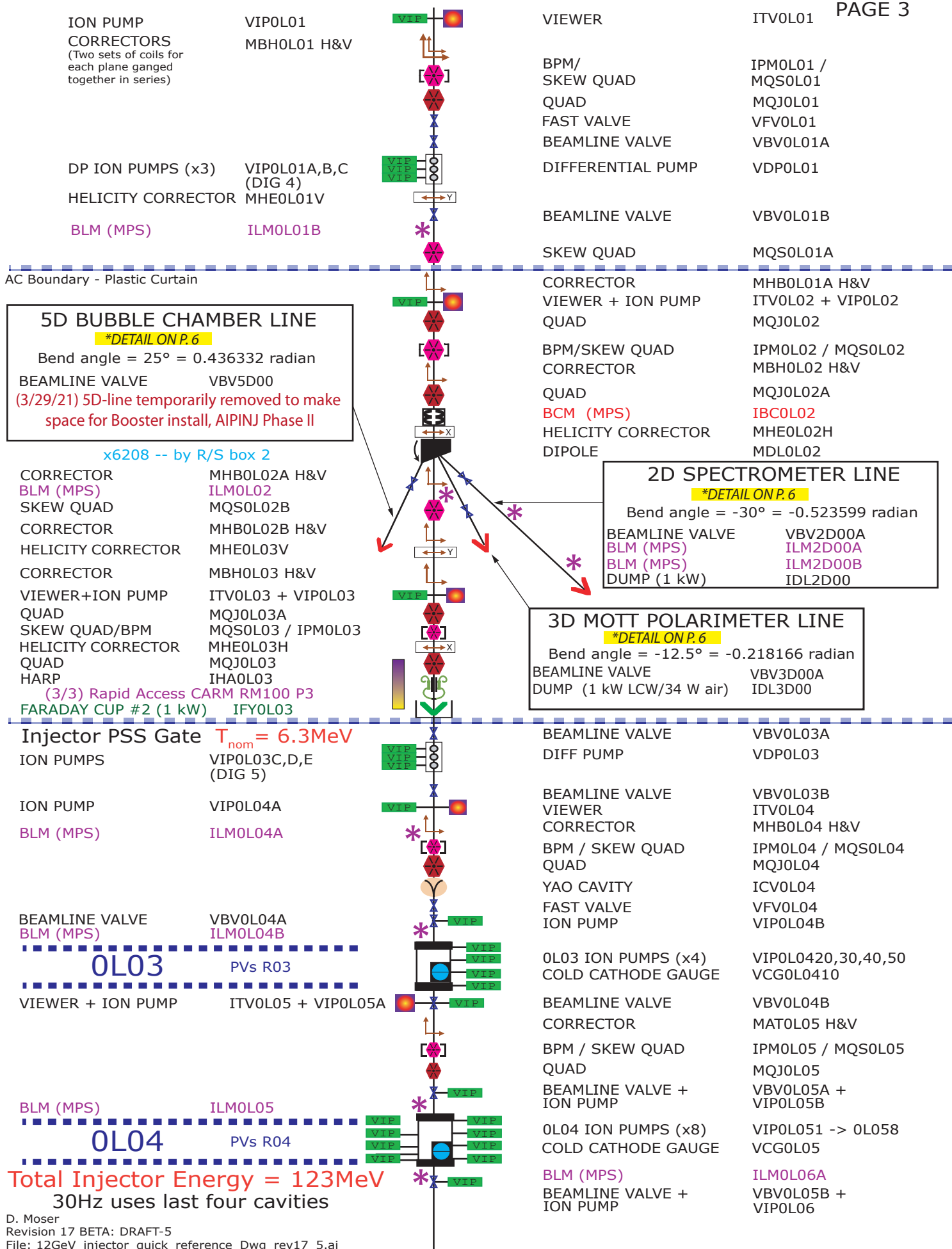
VBV0L00A

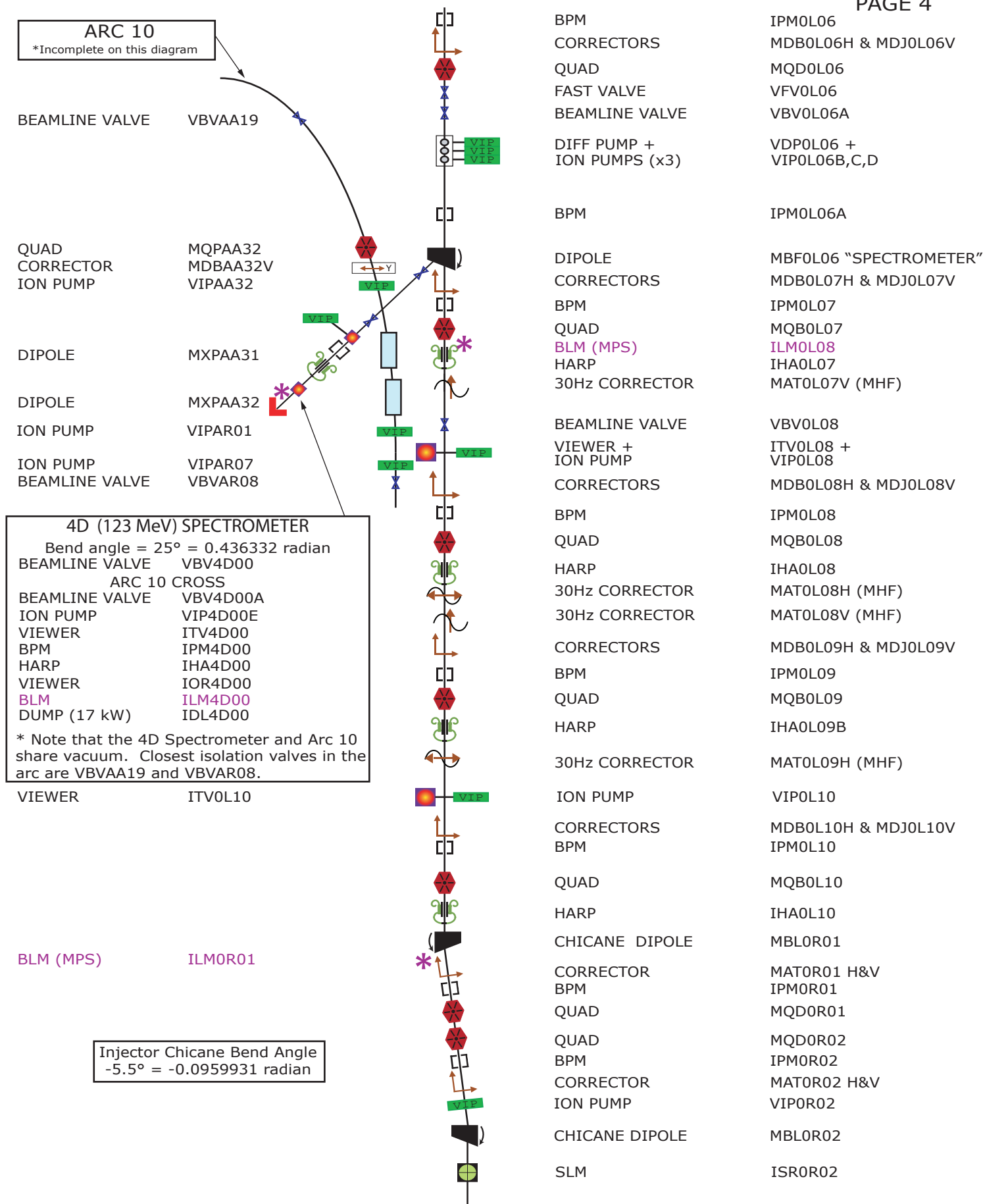
VIP0L00

VIP0L0020  
VCG0L0010

ILM0L01A

VBV0L00B





# WEST RECOMBINER / NORTH LINAC

\*Incomplete on this diagram

DIPOLE MZAAR03

DIPOLE MXT4R05

BLM (MPS) ILM0R08

DIPOLE MXR2R06

QUAD MQN1L00

BPM IPM1L00

CORRECTOR MBT1L00 H&V

CORRECTOR MBT1L01H

BPM IPM1L01

QUAD MQN1L01

CORRECTOR MCB1L01H

CORRECTOR MCB1L01AH

CORRECTOR MCA1L01H

DIFF. PUMPING STATION VDP1L01

VIEWER ITV1L02

BLM (MPS) ILM1L02

ION PUMP

BLM (MPS)

CORRECTOR

BPM

QUAD

ION PUMP

CORRECTOR

BPM

QUAD

BLM (MPS)

HARP

CORRECTOR

BPM

QUAD

VIEWER

ROUGHING VALVE

ION PUMP

CORRECTOR

BPM

QUAD

BLM (MPS, lead shielded)

CORRECTOR

BPM

QUAD

CHICANE DIPOLE

ION PUMP

CORRECTOR

CORRECTOR

BPM

QUAD

INSERTABLE DUMP (17 kW)

BCM (PSS)

BCM (MPS)

BLM (MPS)

CORRECTOR

BPM

QUAD

BEAMLINE VALVE + ION PUMP

CHICANE DIPOLE

SLM (UNPOWERED)

BEAMLINE VALVE

YAO CAVITY

BLM (Diagnostic)

ION PUMPS

BEAMLINE VALVE

ION PUMP

CORRECTOR

BPM / SKEW QUAD

QUAD

FAST VALVE

BEAMLINE VALVE

VIP0R02A

ILM0R03

MAT0R03 H&V

IPM0R03

MQD0R03

VIP0R04

MAT0R04 H&V

IPM0R04

MQD0R04

ILM0R04

IHA0R05

MAT0R05 H&V

IPM0R05

MQD0R05

ITV0R05

VRV0R05

VIP0R06

MAT0R06 H&V

IPM0R06

MQD0R06

ILM0R06

MAT0R07 H&V

IPM0R07

MQD0R07

MBL0R03

VIP0R08

MAT0R08H

MBT0R08V

IPM0R08

MQD0R08

IDL0R08

SBC0R08

IBC0R08

ILM0R09

MAT0R09 H&V

IPM0R09

MQD0R09

VBV0R09 + VIP0R09

MBL0R04

ISR0R09

VBV1L00A

ICV1L01

ILM1L01

VIP1L01A,B,C

VBV1L01

VIP1L02

MAT1L02 H&V

IPM1L02 / MQS1L02

MQD1L02

VFV1L02

VBV1L02A

1L02

PVs R12

# 0L02 Injector Diagnostic and Experimental Spurs Detail

 $T_{nom} = 6.3\text{MeV}$ 

x6208 -- by R/S box 2

## 5D BUBBLE CHAMBER LINE

Bend angle =  $25^\circ = 0.436332$  radian

CORRECTOR	MBH5D00 H&V
BEAMLINE VALVE	VBV5D00
ION PUMP + VIEWER	VIP5D00 (DIG 8) + ITV5D00
QUAD	MQD5D00
CORRECTOR / BPM	MBH5D00A H&V / IPM5D00

QUAD	MQD5D01
CORRECTOR / BPM	MBH5D01 H&V / IPM5D01
VACUUM COLD GAUGE	VCG5D01
FARADAY CUP 1 (1 kW)	IFY0L01
PHOTON COLLIMATOR	IPC5D01
BUBBLE CHAMBER	ITG5D01
PHOTON DUMP	IDL5D01A

**5D-line temporarily removed to  
make space for Booster install,  
AIPINJ Phase II  
(3/29/21)**

IFY0L03  
FARADAY CUP 2 (1 kW)

CORRECTOR	MHB0L01A H&V
VIEWER + ION PUMP	ITV0L02 + VIP0L02
QUAD	MQJ0L02
BPM/SKEW QUAD	IPM0L02 / MQS0L02
CORRECTOR	MBH0L02 H&V
QUAD	MQJ0L02A
BCM (MPS)	IBC0L02M
HELICITY CORRECTOR	MHE0L02H
DIPOLE	MDL0L02

## 2D 5 MeV SPECTROMETER LINE

Bend angle =  $-30^\circ = -0.523599$  radian

BEAMLINE VALVE	VBV2D00A
BLM (MPS)	ILM2D00A
BPM	IPM2D00
HARP	IHA2D00
ION PUMP	VIP2D00A
VIEWER	ITV2D00
BLM (MPS)	ILM2D00B
DUMP (1 kW)	IDL2D00

## 3D MOTT POLARIMETER LINE

Bend angle =  $-12.5^\circ = -0.218166$  radian

CORRECTOR	MAD3D00 H&V
BEAMLINE VALVE	VBV3D00A
VIEWER+ION PUMP	ITV3D00 + VIP3D00A (DIG 12)
MOTT VIEWER	IFL3D00
TARGET LADDER	ITG3D00
ION PUMP	VIP3D00B (DIG 12)
DIPOLE	MDT3D01
DUMP (1 kW LCW/34 W air)	IDL3D00

Source Material Used: <https://misportal.jlab.org/jlabDocs/docDownload/85661>

12 GeV Song Sheets:	ACC-000-2845-001	rev. C
	ACC-000-2845-002	rev. 4
	ACC-000-2845-003	rev. 11
	ACC-000-2845-004	rev. 9
	ACC-000-2845-029	rev. 7

Revision Notes:

- 17: Updated Gun -> Choppers, AIPINJ Phase I, Spring 2021  
Added EPICS PVs and Songsheet names for RF elements, added chopper slit + central plug PVs
- 16: Added approximate locations of PSS Rapid Access CARMs. Differentiated symbols for helicity correctors vs 30Hz correctors. Updated BLM symbols and placement, cross-referencing [https://opswiki.acc.jlab.org/wiki/BLM\\_List](https://opswiki.acc.jlab.org/wiki/BLM_List). Added cryomodule Cold Cathode Gauges and Ion Pumps. Added site phones. Corrected/differentiated nominal-E vs E-gain from RF element.
- 15: Removed Gun #3 line and replaced with Cathode prep and storage chamber. Updated correctors in 2I-region.
- 14: Added drawing of viewer to P.2 by request (based on CEBAF DWG. No. 58432-C-0254 rev. A).
- 13: Corrected locations of the PSS and MPS BCM's  
Used [blue labels](#) for RF components
- 12: Added Brock Cavity (ICB0I01) between A1 and Wien #2 (per email from Marcy 7/1/15)
- 11: Corrected position of MBH0L03 H/V (moved upstream of ITV0L03)  
MQS0L02 and IPM0L02 are colinear, rather than in series  
corrected per elog 3316769 1/8/2015
- 10: Removed ICB1D00 (Brock Cavity) from 1D line  
Added VFFV0L01 fast valve  
Added detail page for 2D, 3D, and 5D lines (main drawing was too cluttered)  
Added bubble chamber components to 5D line  
Renamed 500 keV Spectrometer -> 1D Spectrometer  
Added bend angles for all spurs and the chicane  
Corrected various mistakes throughout