BNL-105231-2014-TECH

Booster Technical Note No. 187;BNL-105231-2014-IR

LAYOUT OF BOOSTER RING VACUUM COMPONENTS

A. Arno

January 1991

Collider Accelerator Department

Brookhaven National Laboratory

U.S. Department of Energy

USDOE Office of Science (SC)

DISCLAIMER

LAYOUT OF BOOSTER RING VACUUM COMPONENTS

BOOSTER TECHNICAL NOTE
NO. 187

A. ARNO, E. EMMERICH, H.C. HSEUH and M. MAPES

JANUARY 2, 1991

ALTERNATING GRADIENT SYNCHROTRON DEPARTMENT
BROOKHAVEN NATIONAL LABORATORY
UPTON, NEW YORK 11973

LAYOUT OF BOOSTER RING VACUUM COMPONENTS

A. Arno, E. Emmerich, H.C. Hseuh and M. Mapes

Abstract

The purpose of this note is to serve as an information consolidator on the vacuum mechanical components, including chambers, flanges, pumps, gauges, valves... This information will help during the commissioning of the machine. We will update this note when all the components are installed and no major changes are expected.

Introduction

The Booster ring consists of 36 half cells and 12 quarter cells. To accommodate various beam components at short straight sections(at beginning of halfcells) and long straight sections(the missing dipole down stream of quarter cells), modifications to the standard chamber length and mating flanges are necessary. As it stands now, there are nine(9) types of halfcell chambers(named H1 to H9) and seven(7) types of quartercell chambers(named Q1 to Q7). The description and location of these chambers are given in the following sections. The ring vacuum system is isolable into seven(7) sectors with the all metal gate valves. The locations of pumps, gauges and roughing valves in each sector and are also summarized here.

Halfcell Chambers:

The standard halfcell chambers(H1), as shown schematically in Fig. 1, consists of dipole, quadrupole, PUE, sextupole, bellows and a tee for pump connection. In the modified ones, the short straight sections with missing tee are usually occupied by gate valves(H5), kickers(H5,H8), septum(H9) and RF cavities(H2). Other modifications to the halfcell chambers are mating flanges(H3,H7) and dipole chamber extensions(H4,H6). The standard flanges are 10" Conflat type. Conflat of 8", 14 1/4" O.D., and Marman flanges with similar knife edge are also used. The detail of these chambers are given as following

Type	Drawing# D36-M-	Flange U/S	Flange D/S	Tee	Length* (inch)	Comment/Location
H1	1485- 5	10"R	10"NR	Yes	164.988	A8,B5,B7,D2,D4,D5,D7,D8 E1,E2,E4,E5,E8,F1,F2,F5,F8
H2	1513- 5	10"NR	10"NR	No	156.488	A4,A7,B4,E7 (D/S of cavities)
H3	1485- 5	0"R	14"NR	Yes	165.247	B8,C8 (U/S of inj. kickers)
H4	1271- 4	10"R	10"NR	Yes	164.988	C5 (Y-dipole chamber for P inj.) also see H1 for assembly
H5	1512- 5	10"R	10"NR	No	156.488	A2,B2,F4
H6	1568- 5	10"R	10"NR	Yes	168.038	A1,B1,C2
H7	1749- 5	M**	10"NR	Yes	164.233	F7
H8	1546- 5	10"R	10"NR	No	156.252	C1,C7,D1 (w/ shorter bellows)
H9	2107- 5	14"R	10"NR	No	151.660	C4

*length given is cord length measured from flange center to flange center.
**F7 has special Tee, pump body and offset 9" Marman flange mating to septum flange.

Quartercell Chambers

There are seven(7) types of chambers out of the twelve quarter cells. They usually consist of chambers for quadrupole, PUE, sextupole, bellows and a tee. Similar to halfcell chambers, the variation in quartercell chambers are in the missing tees and the mating flanges. The chambers upstream of dump(D6) and extraction septum(F6) have ears to accommodate the larger sagitta required by the kicked beam; no PUEs are installed there.

Type	Drawing# D36-M-	Flange U/S	Flange D/S	Tee	Length* (inch)	Comment/Location
Q1	1603-5	10"R	8"NR	Yes	60.013	A6,E6 (U/S of Band 3 cavities)
Q2	2007-5	10"R	***	Yes	56.007	F6(U/S of Extraction Septum)
Q3	1604-5	10"R	10"R	No	51.887	C3
Q4	1609-5	10"R	10"R	Yes	60.387	B3,D3,E3,F3
Q5	2000-5	10"R	Evac	Yes	61.037	D6 (U/S of Beam Dump)
Q6	1606-5	10"R	10"NR	No	51.525	C6
Q7	1603-5	10"R	8"R	Yes	60.013	A3,B3 (U/S of Band 2 cavities)

***F6 quarter cell D/S has a special 13" Marman flange.

Beam Components

The name, locations and approximate length of various beam components are given below. All these beam components, with the exception of C1, C7, D1 inj. kickers and C6 stripper foil, occupy the long straight sections. The length given is from flange to flange excluding the additional bellowed spool pieces required upstream or downstream of the beam components.

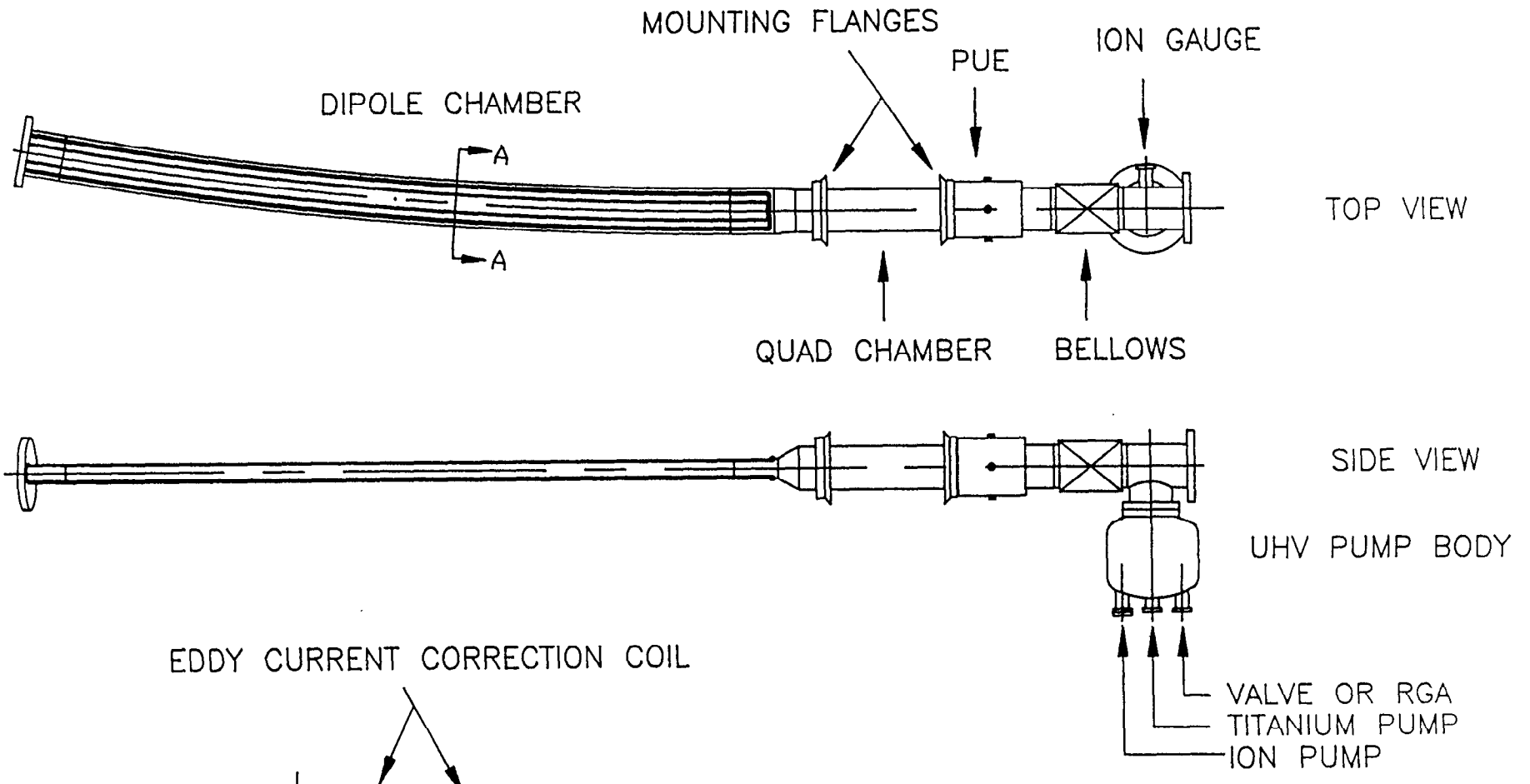
Name	Location	Approx. Length (inch)	Assy. Drawing# D36-M-
RF Cavity	A3,A6,B3,E6	114.0	0950-5
Inj. Kicker	C1,C3,C7,D1	8.76	1327-5
Inflector	C3	98.375	2322-5
Stripper Foil	C6	9.0	1350-5
Graphite Absorber	C6	15.5	1972-5/2006-5
Current Xmer	C6	30.0	1808-5/2006-5
Dump Kicker	D3	48.0	2298-5/2203-5
IPM	D3	47.75	2287-5
Dump	D6	52.0	2004-5
WCM	D6,E3	11.75	2335-5/2385-5
Tune Kicker	E3	23.625	2045-5/2385-5
Damper Kicker	E3	30.0	2488-5/2385-5
Damper PUEs	E3	30.0	2090-5/2385-5
Ext. Kicker	F3	108.15	2208-5/2740-5
Ext. Septum	F6	108.5	1263-5

Other Vacuum Equipments

The attached table gives the locations of valves, pumps and gauges. Each vacuum sector has one large ion pump(100 l/s), one Convectron tube, one RGA head, several small(20 l/s) ion pumps, titanium sublimation pumps and ion gauges. They are mounted off the "Tee" of the halfcell/quartercell chambers or on the beam component chambers.

Spare Consideration

A limited number of spare vacuum components are available, such as dipole chambers and bellows. The large number of chamber types prohibits us to make whole assemblies. The period for making up a particular chamber assembly is estimated to be more than two weeks assuming every components and facilities are available. We will publish a list of available spare components later.



CROSS SECTION A–A
DIPOLE VACUUM CHAMBER

AGS BOOSTER
TYPICAL HALFCELL VACUUM CHAMBER

TABLE I. LOCATION OF BOOSTER RING VACUUM COMPONENTS

SECTOR	A	B	C	CD	D	E	F
SECTOR VALVE							
VS	VS_A2	VS_B2	VS_C3	VS_C6	VS_D3	VS_E3	VS_F3
CONVECTRON GAUGE							
GTC	GTC_A6	GTC_B6	GTC_C3	GTC_C8	GTC_D3	GTC_E3	GTC_F3
ION GAUGE							
GI	GI_A3	GI_B3	GI_C3A	GI_C7	GI_D3B	GI_E3B	GI_F3B
	GI_A5	GI_B5	GI_C3B	GI_C8	GI_D4	GI_E4	GI_F5
	GI_A6	GI_B6	GI_C5	GI_D1	GI_D5	GI_E5	GI_F6
	GI_A8	GI_B7	GI_C6	GI_D2	GI_D6	GI_E6	GI_F7
	GI_B1	GI_B8		GI_D3A	GI_D7	GI_E8	GI_F8
		GI_C1			GI_D8	GI_F1	GI_A1
		GI_C2			GI_E1	GI_F2	
					GI_E2	GI_F3A	
					GI_E3A		
SPUTTER ION PUMP(PI = 20 l/s; PIL = 100 l/s)							
	PI_A3	PI_B3	PI_C3A	PI_C7	PIL_D3B	PIL_E3B	PIL_F3B
	PIL_A5A	PI_B5	PIL_C3B	PIL_D1	PI_D4	PI_E3C	PI_F3C
	PI_A5B	PI_B6A	PI_C5	PI_D2	PI_D5	PI_E4	PI_F5
	PI_A8	PIL_B6B	PI_C6A	PI_D3A	PI_D6	PI_E5	PI_F6
	PI_B1	PI_B7	PI_C6B		PI_D7	PI_E6	PI_F7
		PI_B8			PI_D8	PI_E8	PI_F8
		PI_C1			PI_E1	PI_F1	PI_A1
		PI_C2			PI_E2	PI_F2	
					PI_E3A	PI_F3A	
TITANIUM SUBLIMATION PUMP							
PTS	PTS_A3	PTS_B3	PTS_C3A	PTS_C7A	PTS_D3B	PTS_E3B	PTS_F3B
	PTS_A5	PTS_B5	PTS_C3B	PTS_C7B	PTS_D3C	PTS_E4	PTS_F3C
	PTS_A6	PTS_B6A	PTS_C3C	PTS_C8	PTS_D4	PTS_E5	PTS_F3D
	PTS_A8	PTS_B6B	PTS_C5	PTS_D1	PTS_D5	PTS_E6	PTS_F5
	PTS_B1	PTS_B7	PTS_C6A	PTS_D2	PTS_D6	PTS_E8	PTS_F6
		PTS_B8	PTS_C6B	PTS_D3A	PTS_D7	PTS_F1	PTS_F7
		PTS_C1A			PTS_D8	PTS_F2	PTS_F8
		PTS_C1B			PTS_E1	PTS_F3A	PTS_A1
		PTS_C2			PTS_E2		
					PTS_E3A		
RESIDUAL GAS ANALYZER HEAD							
RGA	RGA_A5	RGA_B6	RGA_C3	RGA_C8	RGA_D3	RGA_E3	RGA_F8
MANUAL ROUGHING VALVE							
VR	A3,A6	B3,B6	C3,C6	C7,D1	D3,E1	E3,F1	F3,A1
RS232 CABLE HOOKUP FOR TURBOPUMP GAUGE CONTROLLER							
TURBO	A6	B6	C3	D1	D3	E3	A1
RS422 CABLE HOOKUP FOR PLC CART							
PLC	A7	B7	C4	D2	D4	E5	A1