

**Fiducials for BM1 Std. Vac. Chamber**

**BM1009**

Date:

4\18\02

Chamber:

BM1009

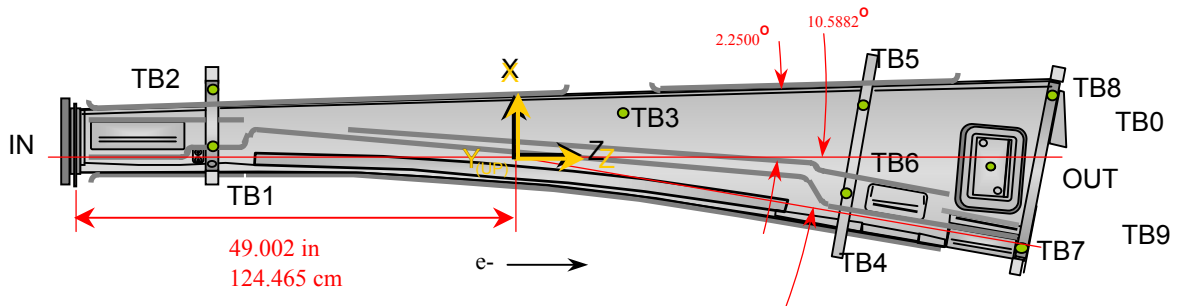
Operator(s):

F. Gaudreault

L. Griffin

Notes:

Z on Exit port not measured. Single support on final check measurements.



**Fiducial Coordinates for BM1 Standard Vacuum Chamber: (inches)**

Fiducial	Z	X	Y
TB1	-34.874	1.527	4.351
TB2	-34.823	8.407	4.375
TB3	11.000	4.155	2.342
TB4	34.550	-4.952	4.367
TB5	36.599	6.165	4.364
TB6	52.473	-1.892	2.298
TB7	55.681	-11.179	3.043
TB8	59.436	8.940	3.031
TB9 (V4)	74.659	-20.306	4.382
TB0 (V4)	76.955	-8.249	4.393

inches      inches      inches

Nominal Deltas For H3 Absorber (TB6)		
Z	X	Y
52.473	-1.902	2.301
52.493	-1.891	2.242
<b>-0.020</b>	<b>-0.011</b>	<b>0.059</b>

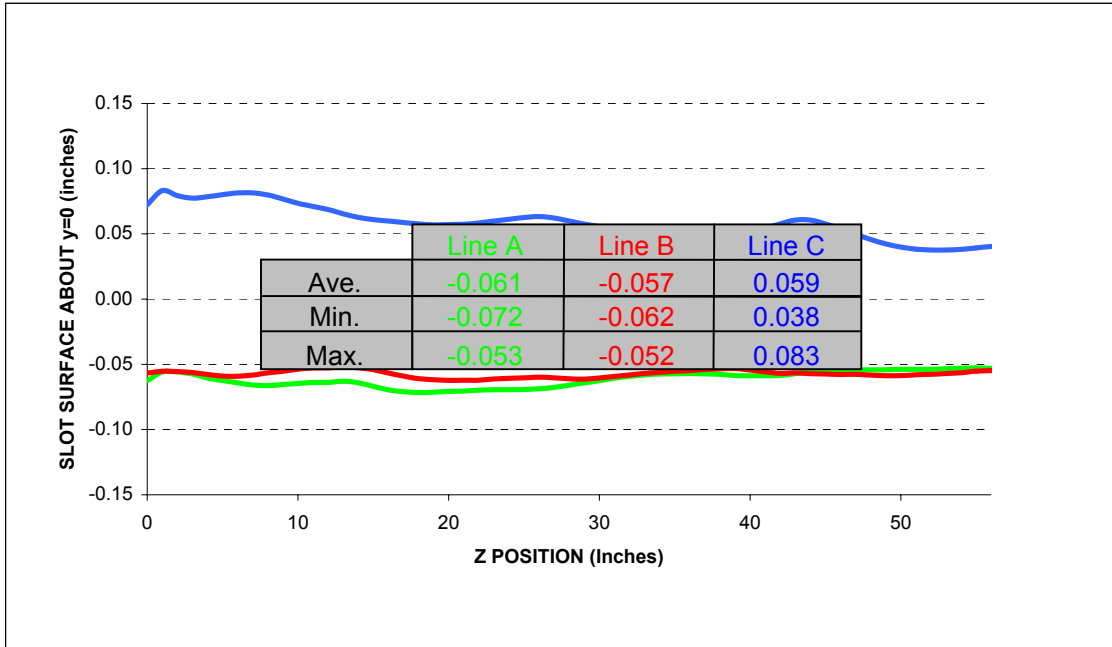
Source **V4 Step**

**Description:**

Fid. vals based on internal chamber datum. Source="V4 Step" indicates final data.

**Fiducialization Step: (Traveler Step # 1380)**

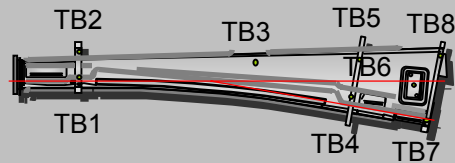
Slot Calibration	
Ideal	0.511
Meas.	0.134
Delta	-0.377



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**Step 1: Fiducial Coordinates for BM1 Std. Vac. Chamber**

Fiducial	Z	X	Y
TB1	-34.874	1.526	4.384
TB2	-34.828	8.408	4.376
TB3	10.997	4.169	2.352
TB4	34.549	-4.953	4.368
TB5	36.606	6.164	4.363
TB6	52.473	-1.902	2.301
TB7	55.680	-11.191	3.055
TB8	59.437	8.929	3.023
	inches	inches	inches

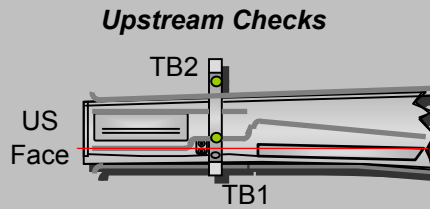


**Description:**

Fiducial values based on internal chamber datum.

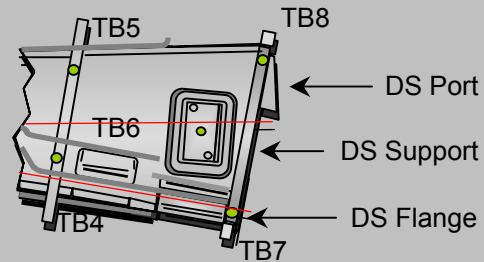
End Surface Attitudes for BM1 Std. Vac. Chamber

Upstream Face		
	yaw	pitch
Measured	1.7	-4.6
<b>Nominal</b>	<b>0.0</b>	<b>0.0</b>
<b>Difference</b>	<b>1.7</b>	<b>-4.6</b>
	mrad	mrad



Downstream Port		
	yaw	pitch
Measured	25.0	1.7
<b>Nominal</b>	<b>25.3</b>	<b>0.0</b>
<b>Difference</b>	<b>-0.3</b>	<b>1.7</b>

**Downstream Checks**



Downstream Support		
	yaw	pitch
Measured	-185.4	1.0
<b>Nominal</b>	<b>-184.8</b>	<b>0.0</b>
<b>Difference</b>	<b>-0.5</b>	<b>1.0</b>

Downstream Flange		
	yaw	pitch
Measured	-189.4	3.2
<b>Nominal</b>	<b>-184.8</b>	<b>0.0</b>
<b>Difference</b>	<b>-4.6</b>	<b>3.2</b>
	mrad	mrad

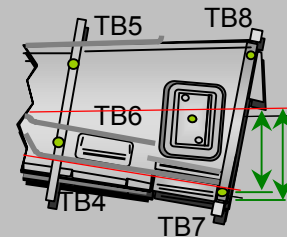
**Description:**

Orientation of the upstream and downstream surfaces compared to nominal values. Tol +/- 3 mrad

Datum Verification

DS Support	
	x
Measured	-11.889
<b>Nominal</b>	<b>-11.912</b>
<b>Diff.</b>	<b>0.023</b>
	inches

DS Flange	
	x
Measured	-11.932
<b>Nominal</b>	<b>-11.958</b>
<b>Diff.</b>	<b>0.026</b>
	inches

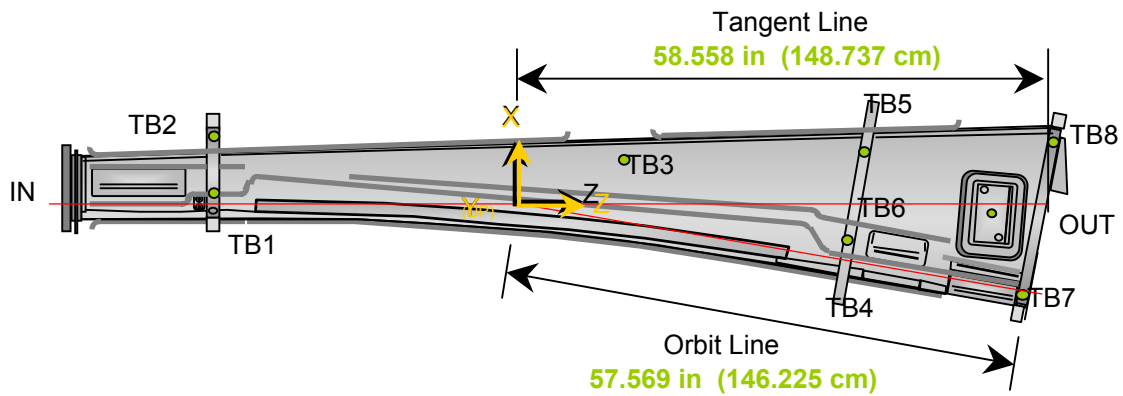


**Description:**

The x-distance from the center-line to the projection of the measured DS inside curve point on either of the DS surfaces. Tolerance values +/- 0.020 in.

BM1009  
Status

<u>BM1 Chamber Lengths</u>			Nominal Length
Tangent Line:	Length 58.565 inches	without SMR	58.558 <span style="background-color: green; color: white; padding: 2px;">OK</span>
Orbit Line:	Length 57.519 inches	without SMR	57.569 <span style="background-color: green; color: white; padding: 2px;">OK</span>
<p><b>Description:</b> Both lengths are to the faces of the weld flanges. Length tolerance +/- 0.125 in.</p>			



**V4 Step A: Survey and Check of BM1 Standard Vacuum Chamber Fiducials Before Attaching V4 and the Exit Port:**

**Step A-1: Remeasurement of Fiducial Coordinates for BM1 Std. Vac. Chamber**

Fiducial	Z	X	Y	del Z	del X	del Y
TB1	-34.876	1.525	4.383	-0.002	-0.001	-0.002
TB2	-34.826	8.408	4.377	0.003	0.001	0.001
TB3	10.997	4.151	2.348	0.000	-0.018	-0.004
TB4	34.549	-4.955	4.369	0.000	-0.002	0.001
TB5	36.595	6.166	4.362	-0.012	0.002	-0.001
TB6						
TB7	55.686	-11.175	3.041	0.005	0.017	-0.014
TB8	59.424	8.948	3.020	-0.014	0.019	-0.003
	inches	inches	inches	Compared to Step 1 Fiducial Coords.		

**DS Port Level Check**

OK ?  (YES or NO)

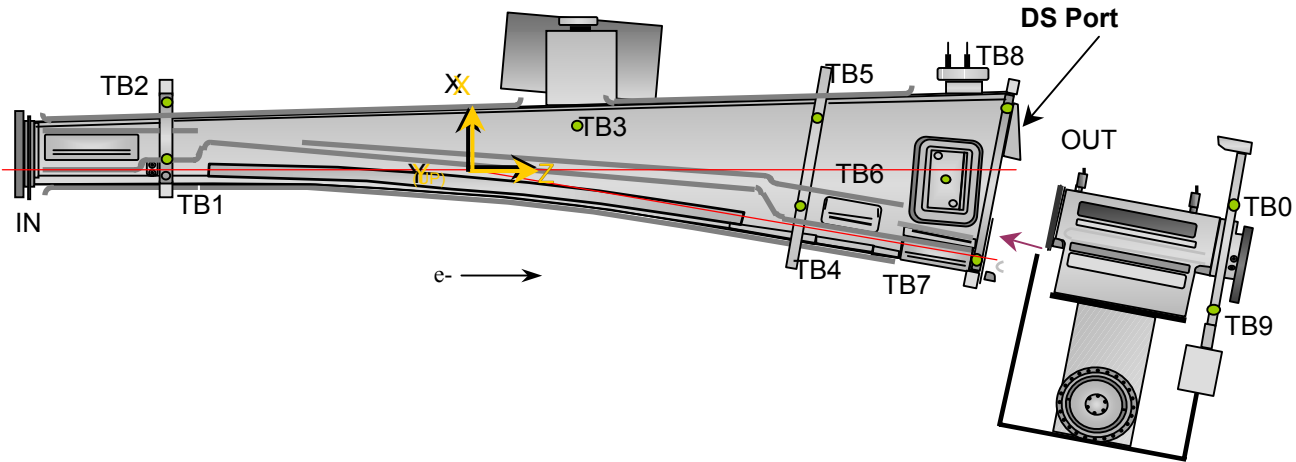
Level Status: OK

**US Flange Roll Check**

OK ?  (YES or NO)

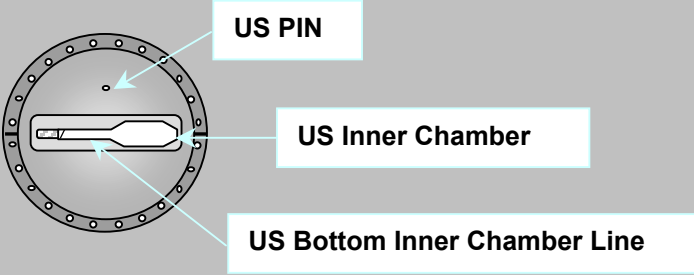
Roll Status: UPDATE

**Description:**  
Fid. vals based on internal chamber datum.



**V4 Step A:** Check of US Flange Prior to V4 Installation

**Step A-2: Pre-Installation Check of UpStream Flange Position**



The diagram shows a top-down view of a circular flange with a central rectangular chamber. A small dot is labeled 'US PIN'. The central chamber is labeled 'US Inner Chamber'. A horizontal line at the bottom of the inner chamber is labeled 'US Bottom Inner Chamber Line'.

US PIN	Z	X	Y
Measured	-50.878	1.871	2.261
Nominal	-51.000	1.836	2.282
Difference (inches)	0.122	0.035	-0.021

US Inner Chamber	Z	X	Y
Measured	-50.595	-1.375	-0.034
Nominal	-51.000	-1.404	0.000
Difference (inches)	0.405	0.029	-0.034

US Bottom Inner Chamber Line	ROLL	(FINAL)
Measured	-0.462	
Nominal	0.000	
Difference (mrads)	-0.462	

Roll Status **OK**

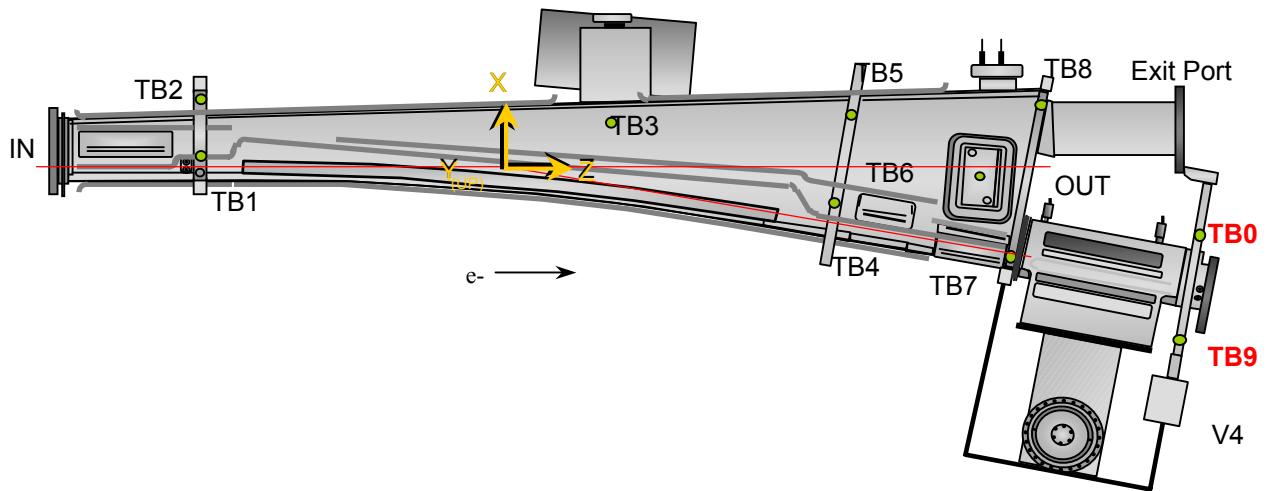
**Description:**  
 Measured vs. nominal values for US flange expressed in the PART coordinate system.  
 Fiducial values are updated (using those from Step A-1) if ROLL delta is not within 1 mrad.

**V4 Fiducialization Step: Survey of Fiducial Coordinates for BM1 Standard Vacuum Chamber with V4 and the Exit Port Attached:**

**Step Fid-1: Position of Added Tooling Balls TB9 and TB0**

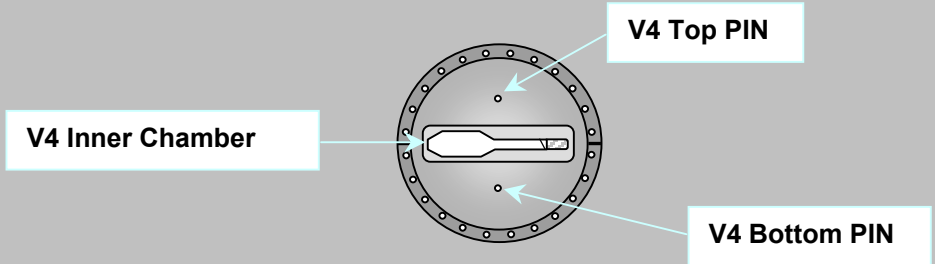
Fiducial	Z	X	Y
TB9 (V4)	74.645	-20.302	4.382
TB0 (V4)	76.929	-8.242	4.397
	inches	inches	inches

**Description:**  
 Fid. vals after V4 and exit port attached.



**V4 Fiducialization Step: V4 Flange**

**Step Fid-2: Set Position of V4 Flange Position**



V4 Top PIN	Z	X	Y
Measured	80.200	0.001	2.282
Nominal	80.000	0.000	2.282
Difference (inches)	0.200	<b>0.001</b>	<b>0.000</b>

V4 Bottom PIN	Z	X	Y
Measured	80.189	0.006	-2.283
Nominal	80.000	0.000	-2.282
Difference (inches)	0.189	<b>0.006</b>	<b>-0.001</b>

V4 Inner Chamber	Z	X	Y
Measured	79.923	-1.406	0.041
Nominal	80.000	-1.404	0.000
Difference (inches)	-0.077	<b>-0.002</b>	0.041

V4 Downstream Z Value	Z
Measured	80.727
Nominal	80.764
Difference (inches)	<b>-0.037</b>

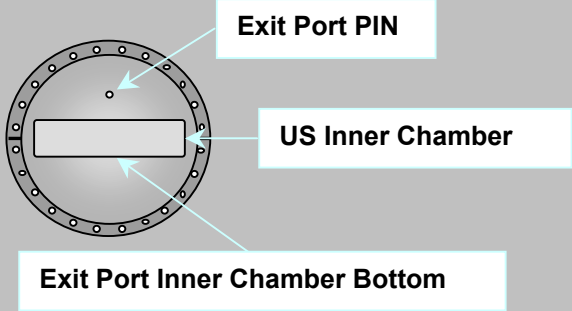
**Description:**

Measured vs. nominal values for V4 flange expressed in the V4 coordinate system.  
 Tol +/- 10mils except for the V4 Z-value. Values in **BOLD** or **RED** are most critical.

**V4 Fiducialization Step: Exit Port**

**Step Fid-3: Post-Installation Check of Exit Port Flange Position**

**Metrology Dept:**  
Measurements taken with single support on downstream end.



Exit Port PIN	Z	X	Y
Measured	75.328	4.155	2.332
Nominal	75.000	4.168	2.282
Difference (inches)	0.328	<b>-0.013</b>	<b>0.050</b>

Exit Port Inner Chamber Side	Z	X	Y
Measured	75.073	7.408	0.134
Nominal	75.000	7.418	0.000
Difference (inches)	0.073	<b>-0.010</b>	0.134

Exit Port Inner Chamber Bottom	Z	X	Y
Measured	74.970	4.167	-0.318
Nominal	75.000	0.000	-0.366
Difference (inches)	-0.030	4.167	<b>0.048</b>

Exit Port DS Z Value (PART Frame)	Z
Measured	
Nominal	75.768
Difference (inches)	-----

**Metrology Dept:**  
Did not measure flange face.

**Description:**  
Measured vs. nominal values for Exit Port flange expressed in the EXIT PORT coordinate system.  
Tol +/- 10mils except for the V4 Z-value. Values in **BOLD** or **RED** are most critical.

**V4 Final Step: Re-Survey of all Ten Fiducials**

Fiducial	Z	X	Y	del Z	del X	del Y
TB1	-34.874	1.527	4.351	0.002	0.001	-0.032
TB2	-34.823	8.407	4.375	0.003	-0.001	-0.002
TB3	11.000	4.155	2.342	0.003	0.004	-0.005
TB4	34.550	-4.952	4.367	0.002	0.003	-0.001
TB5	36.599	6.165	4.364	0.004	-0.001	0.001
TB6	52.473	-1.892	2.298			
TB7	55.681	-11.179	3.043	-0.005	-0.005	0.002
TB8	59.436	8.940	3.031	0.012	-0.008	0.011
TB9 (V4)	74.659	-20.306	4.382	0.013	-0.004	0.000
TB0 (V4)	76.955	-8.249	4.393	0.026	-0.007	-0.004
	inches	inches	inches			

**Description:**  
Final survey of BM1 standard vacuum chamber. (With V4 and exit port attached.)  
Note that all comparisons are relative to the most current fiducial values.  
(I.e. deltas are computed using values from Steps A-1 and Fid-1)

