

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

**BM1013**

Date:

5/3/02

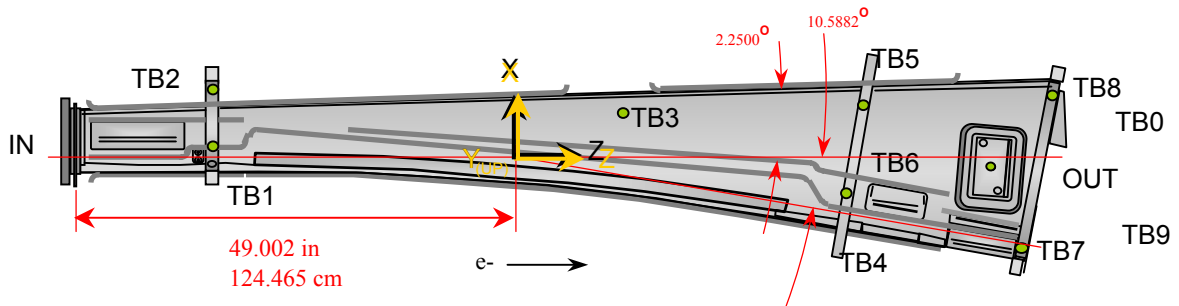
Chamber:

BM1013

Operator(s):

F. Gaudreault  
M. Rogers

Notes:



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

Fiducial	Z	X	Y
TB1	-34.807	1.535	4.394
TB2	-34.865	8.496	4.375
TB3	10.945	4.240	2.279
TB4	34.536	-4.899	4.312
TB5	36.610	6.272	4.310
TB6	52.451	-1.884	2.267
TB7	55.590	-11.207	3.052
TB8	59.446	8.975	3.034
TB9 (V4)	74.741	-20.267	4.409
TB0 (V4)	76.943	-8.211	4.421
	inches	inches	inches

Nominal Deltas For H3 Absorber (TB6)		
Z	X	Y
52.456	-1.891	2.340
52.493	-1.891	2.242
-0.038	0.000	0.098

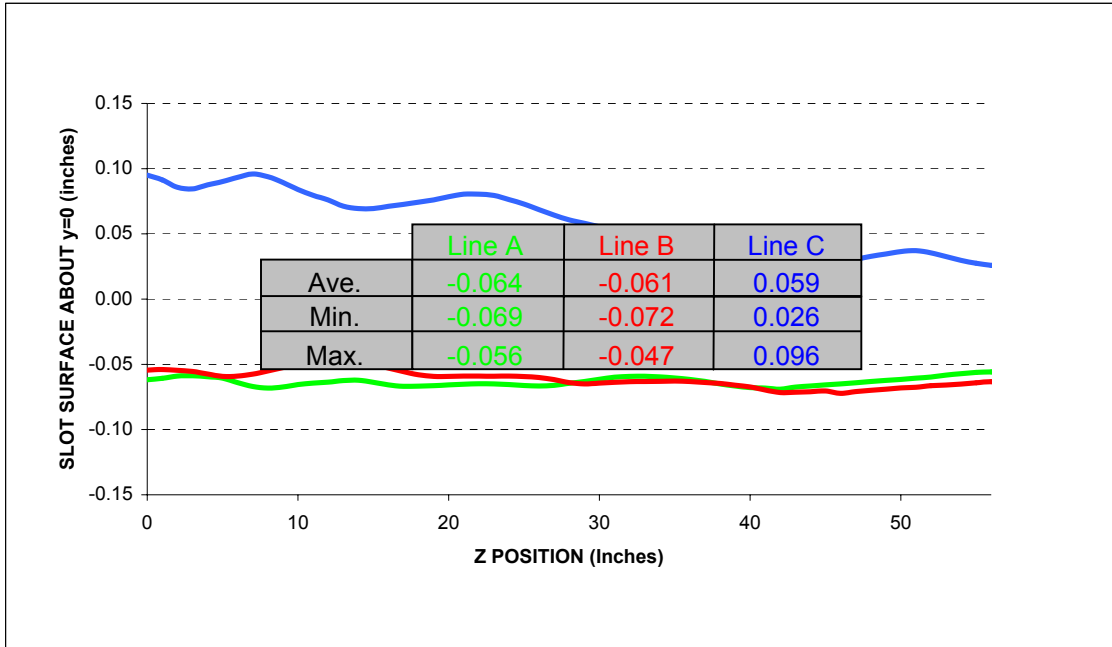
Source **V4 Step**

**Description:**

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

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

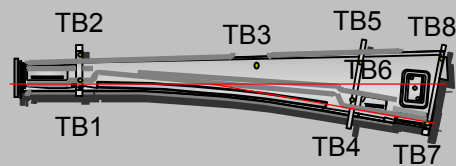
Slot Calibration	
Ideal	0.511
Meas.	0.136
Delta	-0.375



BM1013

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

Fiducial	Z	X	Y
TB1	-34.808	1.533	4.393
TB2	-34.869	8.498	4.359
TB3	10.947	4.255	2.332
TB4	34.537	-4.900	4.376
TB5	36.618	6.272	4.380
TB6	52.456	-1.891	2.340
TB7	55.595	-11.216	3.121
TB8	59.447	8.965	3.117
	inches	inches	inches

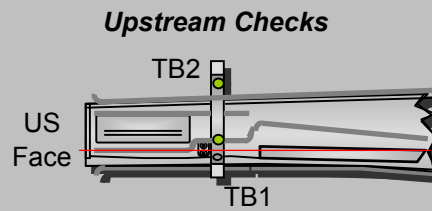


**Description:**

Fiducial values based on internal chamber datum.

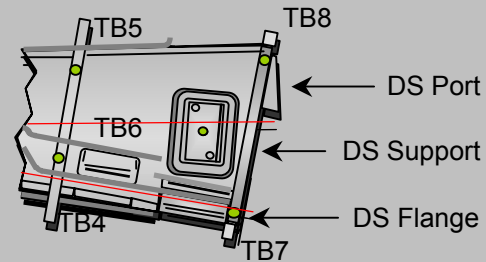
End Surface Attitudes for BM1 Std. Vac. Chamber

Upstream Face		
	yaw	pitch
Measured	2.8	-10.9
<b>Nominal</b>	<b>0.0</b>	<b>0.0</b>
<b>Difference</b>	<b>2.8</b>	<b>-10.9</b>
	mrad	mrad



Downstream Port		
	yaw	pitch
Measured	24.0	-5.3
<b>Nominal</b>	<b>25.3</b>	<b>0.0</b>
<b>Difference</b>	<b>-1.3</b>	<b>-5.3</b>

**Downstream Checks**



Downstream Support		
	yaw	pitch
Measured	-185.8	-7.7
<b>Nominal</b>	<b>-184.8</b>	<b>0.0</b>
<b>Difference</b>	<b>-1.0</b>	<b>-7.7</b>

Downstream Flange		
	yaw	pitch
Measured	-190.2	-9.9
<b>Nominal</b>	<b>-184.8</b>	<b>0.0</b>
<b>Difference</b>	<b>-5.4</b>	<b>-9.9</b>
	mrad	mrad

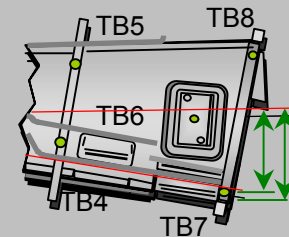
**Description:**

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

Datum Verification

DS Support	
	x
Measured	-11.907
<b>Nominal</b>	<b>-11.912</b>
<b>Diff.</b>	<b>0.006</b>
	inches

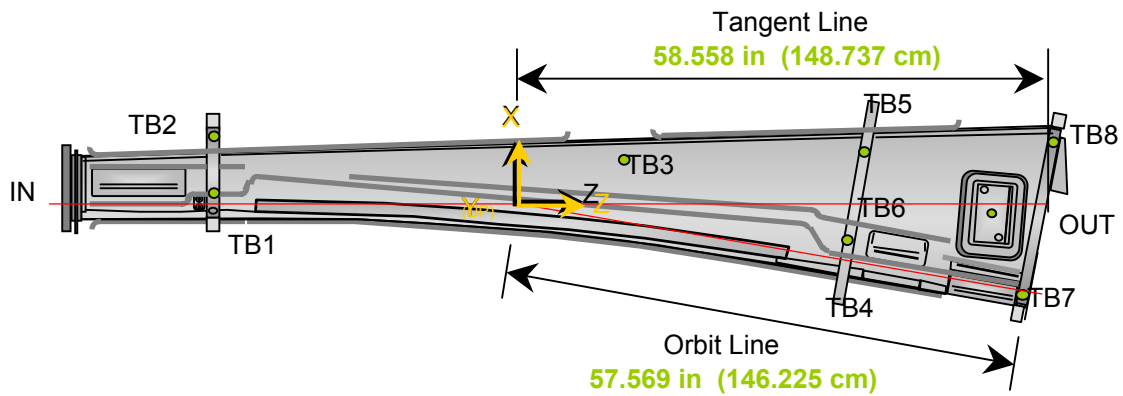
DS Flange	
	x
Measured	-11.951
<b>Nominal</b>	<b>-11.958</b>
<b>Diff.</b>	<b>0.007</b>
	inches



**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.

<u>BM1 Chamber Lengths</u>			Nominal Length
Tangent Line:	Length 58.553 inches	without SMR	58.558 <span style="background-color: green; color: white; padding: 2px;">OK</span>
Orbit Line:	Length 57.498 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	-34.804	1.539	4.396	0.003	0.006	0.004
TB2	-34.863	8.502	4.360	0.006	0.004	0.001
TB3	10.948	4.239	2.325	0.001	-0.016	-0.008
TB4	34.537	-4.902	4.374	0.000	-0.002	-0.002
TB5	36.613	6.267	4.379	-0.005	-0.005	-0.001
TB6						
TB7	55.596	-11.210	3.122	0.001	0.006	0.002
TB8	59.441	8.972	3.122	-0.006	0.007	0.005

inches          inches          inches

**DS Port Level Check**

OK ?        (YES or NO)

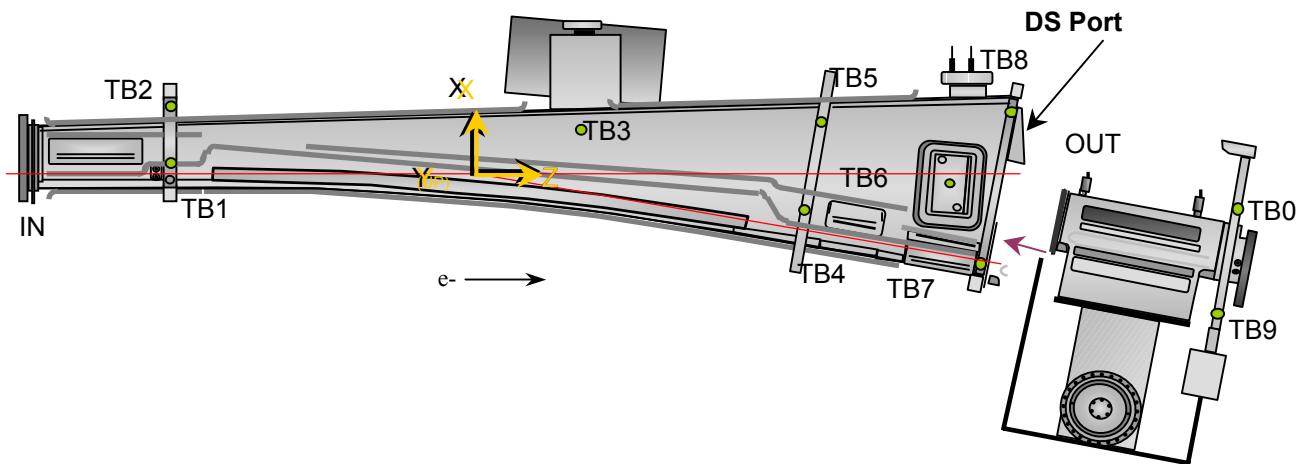
Level Status:    **UPDATE**

**US Flange Roll Check**

OK ?        (YES or NO)

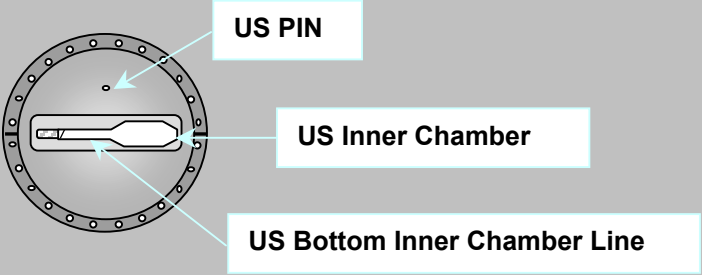
Roll Status:    **UPDATE**

*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	-50.880	1.852	2.315
Nominal	-51.000	1.836	2.282
Difference (inches)	0.120	0.016	0.033

US Inner Chamber	Z	X	Y
Measured	-50.563	-1.388	0.079
Nominal	-51.000	-1.404	0.000
Difference (inches)	0.437	0.016	0.079

US Bottom Inner Chamber Line	ROLL	(FINAL)
Measured	0.132	
Nominal	0.000	
Difference (mrads)	0.132	

Roll Status **OK**

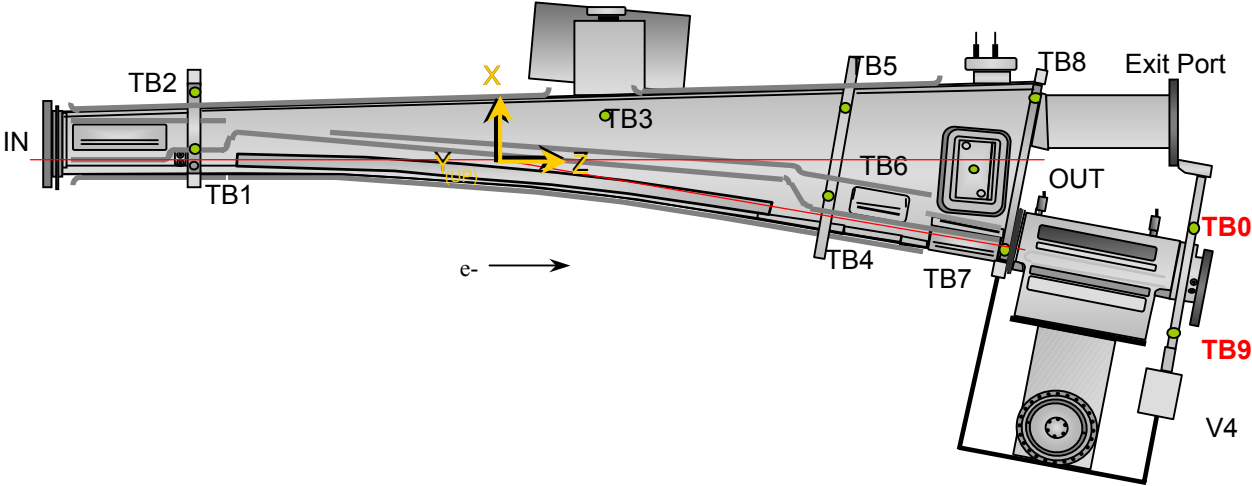
**Description:**  
 Measured vs. nominal values for US flange expressed in the PART coordinate system.  
 Fiducial values are updated (using those from Step A-1) if ROLL delta is not within 1 mrad.

**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**

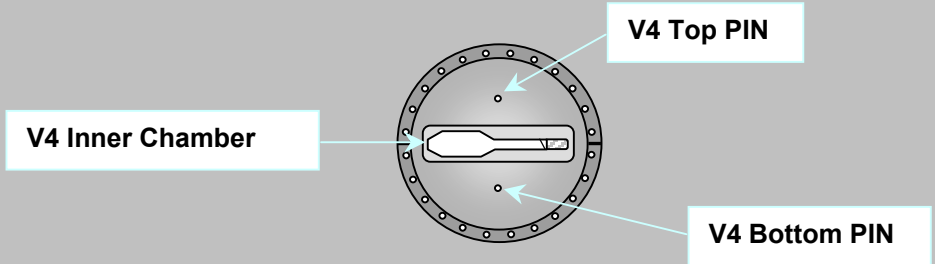
Fiducial	Z	X	Y
TB9 (V4)	74.722	-20.284	4.407
TB0 (V4)	76.952	-8.232	4.420
	inches	inches	inches

**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	80.207	0.003	2.282
Nominal	80.000	0.000	2.282
Difference (inches)	0.207	<b>0.003</b>	<b>0.000</b>

V4 Bottom PIN	Z	X	Y
Measured	80.167	0.008	-2.285
Nominal	80.000	0.000	-2.282
Difference (inches)	0.167	<b>0.008</b>	<b>-0.003</b>

V4 Inner Chamber	Z	X	Y
Measured	79.895	-1.395	0.054
Nominal	80.000	-1.404	0.000
Difference (inches)	-0.105	<b>0.009</b>	0.054

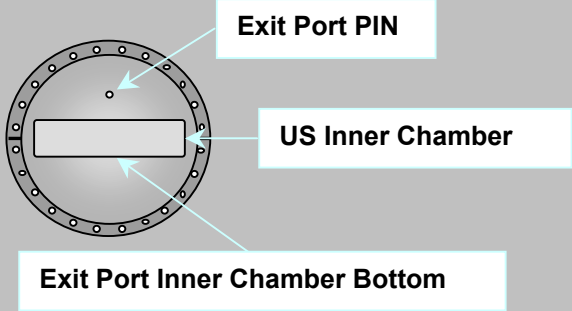
V4 Downstream Z Value	Z
Measured	80.724
Nominal	80.764
Difference (inches)	<b>-0.040</b>

**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**



The diagram shows a circular flange with a central rectangular chamber. Three callouts point to specific features: 'Exit Port PIN' at the top center, 'US Inner Chamber' on the right side, and 'Exit Port Inner Chamber Bottom' at the bottom center.

Exit Port PIN	Z	X	Y
Measured	75.314	4.149	2.295
Nominal	75.000	4.168	2.282
Difference (inches)	0.314	-0.019	0.013

Exit Port Inner Chamber Side	Z	X	Y
Measured	75.055	7.400	0.227
Nominal	75.000	7.418	0.000
Difference (inches)	0.055	-0.018	0.227

Exit Port Inner Chamber Bottom	Z	X	Y
Measured	74.903	4.130	-0.355
Nominal	75.000	0.000	-0.366
Difference (inches)	-0.097	4.130	0.011

Exit Port DS Z Value (PART Frame)	Z
Measured	75.824
Nominal	75.768
Difference (inches)	0.056

**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	-34.807	1.535	4.394	-0.002	-0.004	-0.003
TB2	-34.865	8.496	4.375	-0.001	-0.006	0.015
TB3	10.945	4.240	2.279	-0.002	0.002	-0.045
TB4	34.536	-4.899	4.312	-0.001	0.003	-0.062
TB5	36.610	6.272	4.310	-0.003	0.005	-0.069
TB6	52.451	-1.884	2.267			
TB7	55.590	-11.207	3.052	-0.005	0.003	-0.071
TB8	59.446	8.975	3.034	0.005	0.003	-0.088
TB9 (V4)	74.741	-20.267	4.409	0.019	0.017	0.001
TB0 (V4)	76.943	-8.211	4.421	-0.009	0.021	0.000
	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)

