

Fiducials for BM1 Std. Vac. Chamber

BM1012

Date:

4/4/02

Chamber:

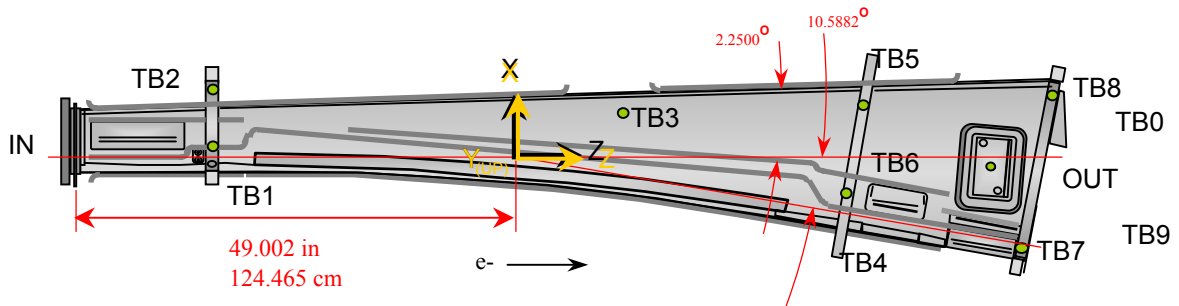
BM1012

Operator(s):

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H. Imfeld

Notes:

Z on Exit flange not measured.



Fiducial Coordinates for BM1 Standard Vacuum Chamber: (inches)

| Fiducial | Z | X | Y |
|----------|---------|---------|-------|
| TB1 | -34.867 | 1.498 | 4.374 |
| TB2 | -34.891 | 8.386 | 4.380 |
| TB3 | 11.002 | 4.128 | 2.314 |
| TB4 | 34.481 | -4.903 | 4.376 |
| TB5 | 36.578 | 6.279 | 4.346 |
| TB6 | 52.461 | -1.860 | 2.290 |
| TB7 | 55.649 | -11.162 | 3.063 |
| TB8 | 59.431 | 8.993 | 3.036 |
| TB9 (V4) | 74.669 | -20.277 | 4.389 |
| TB0 (V4) | 76.997 | -7.966 | 4.387 |

inches inches inches

| Nominal Deltas For H3 Absorber (TB6) | | |
|--------------------------------------|--------|-------|
| Z | X | Y |
| 52.467 | -1.879 | 2.268 |
| 52.493 | -1.891 | 2.242 |
| -0.026 | 0.012 | 0.026 |

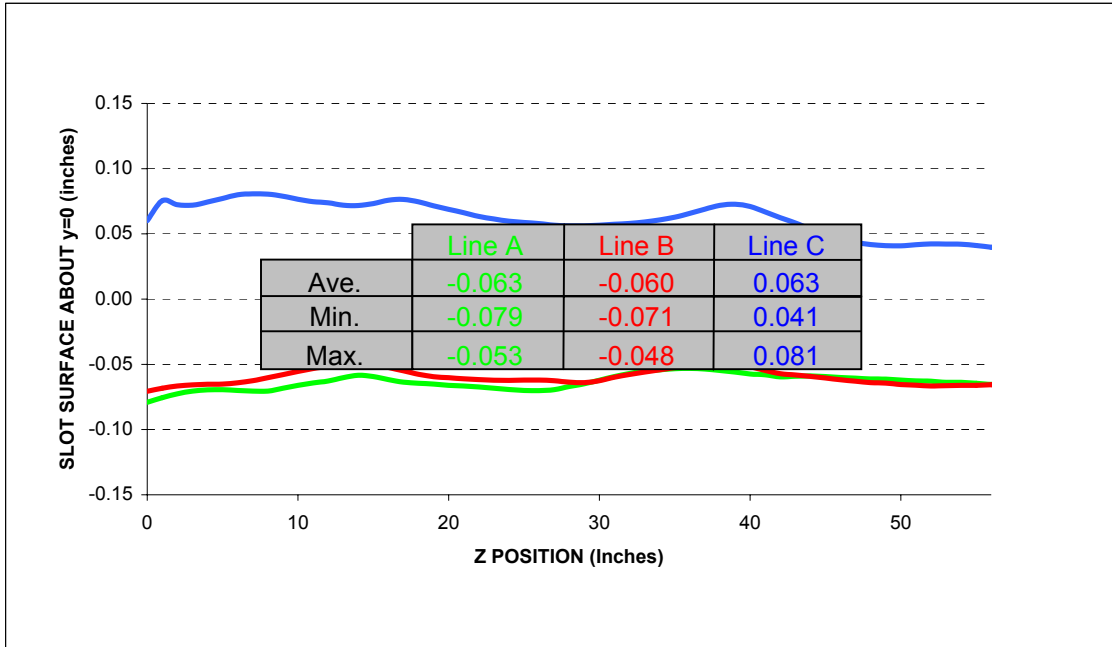
Source **V4 Step**

Description:

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

Fiducialization Step: (Traveler Step # 1380)

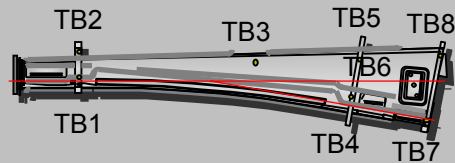
| Slot Calibration | |
|------------------|--------|
| Ideal | 0.511 |
| Meas. | 0.134 |
| Delta | -0.377 |



BM1012

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

| Fiducial | Z | X | Y |
|----------|---------|---------|--------|
| TB1 | -34.872 | 1.496 | 4.385 |
| TB2 | -34.907 | 8.387 | 4.381 |
| TB3 | 11.003 | 4.152 | 2.333 |
| TB4 | 34.485 | -4.903 | 4.375 |
| TB5 | 36.595 | 6.278 | 4.344 |
| TB6 | 52.467 | -1.879 | 2.268 |
| TB7 | 55.645 | -11.186 | 3.039 |
| TB8 | 59.444 | 8.966 | 3.005 |
| | inches | inches | inches |

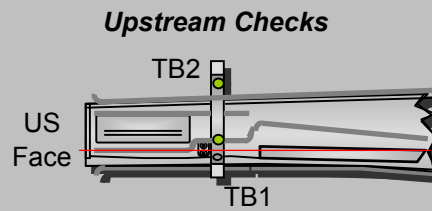


Description:

Fiducial values based on internal chamber datum.

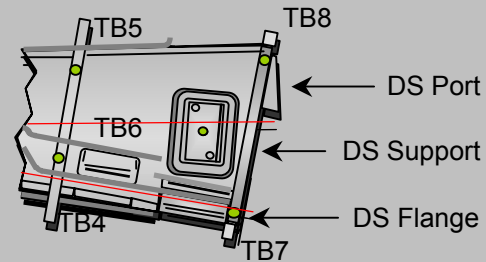
End Surface Attitudes for BM1 Std. Vac. Chamber

| Upstream Face | | |
|-------------------|------------|------------|
| | yaw | pitch |
| Measured | 2.1 | 3.5 |
| Nominal | 0.0 | 0.0 |
| Difference | 2.1 | 3.5 |
| | mrad | mrad |



| Downstream Port | | |
|-------------------|-------------|------------|
| | yaw | pitch |
| Measured | 26.1 | 5.0 |
| Nominal | 25.3 | 0.0 |
| Difference | 0.8 | 5.0 |

Downstream Checks



| Downstream Support | | |
|--------------------|---------------|------------|
| | yaw | pitch |
| Measured | -185.3 | 6.3 |
| Nominal | -184.8 | 0.0 |
| Difference | -0.5 | 6.3 |

| Downstream Flange | | |
|-------------------|---------------|------------|
| | yaw | pitch |
| Measured | -192.0 | 3.4 |
| Nominal | -184.8 | 0.0 |
| Difference | -7.2 | 3.4 |
| | mrad | mrad |

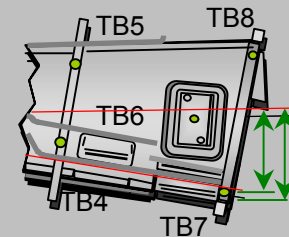
Description:

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

Datum Verification

| DS Support | |
|----------------|----------------|
| | x |
| Measured | -11.903 |
| Nominal | -11.912 |
| Diff. | 0.009 |
| | inches |

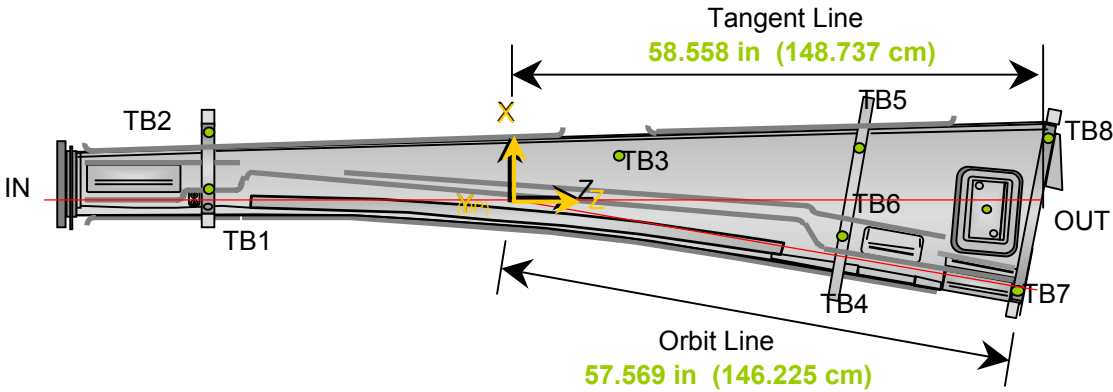
| DS Flange | |
|----------------|----------------|
| | x |
| Measured | -11.945 |
| Nominal | -11.958 |
| Diff. | 0.013 |
| | inches |



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 58.572 inches | without SMR | 58.558 OK |
| Orbit Line: | Length 57.497 inches | without SMR | 57.569 OK |
| <p>Description: 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 | -34.866 | 1.497 | 4.385 | 0.006 | 0.001 | 0.000 |
| TB2 | -34.890 | 8.385 | 4.381 | 0.017 | -0.002 | 0.000 |
| TB3 | 11.000 | 4.126 | 2.312 | -0.003 | -0.026 | -0.021 |
| TB4 | 34.481 | -4.904 | 4.375 | -0.004 | -0.001 | 0.000 |
| TB5 | 36.577 | 6.280 | 4.344 | -0.018 | 0.002 | 0.001 |
| TB6 | | | | | | |
| TB7 | 55.647 | -11.158 | 3.064 | 0.002 | 0.028 | 0.025 |
| TB8 | 59.423 | 8.994 | 3.038 | -0.020 | 0.028 | 0.032 |

inches inches inches

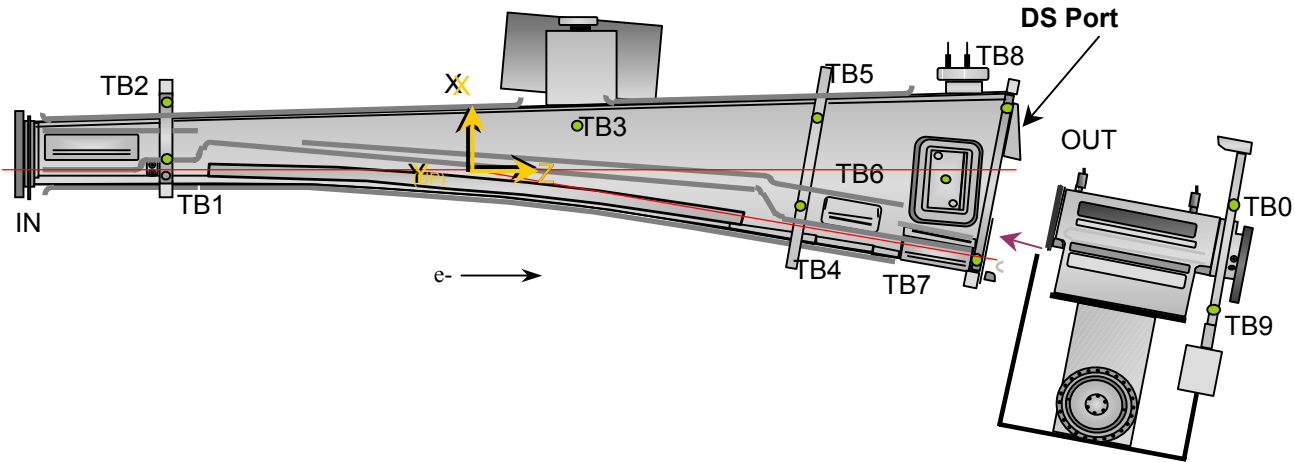
| DS Port Level Check | |
|---------------------|--|
| OK ? | <input type="text" value="Yes"/> (YES or NO) |

Level Status: **OK**

| US Flange Roll Check | |
|----------------------|---|
| OK ? | <input type="text" value="No"/> (YES or NO) |

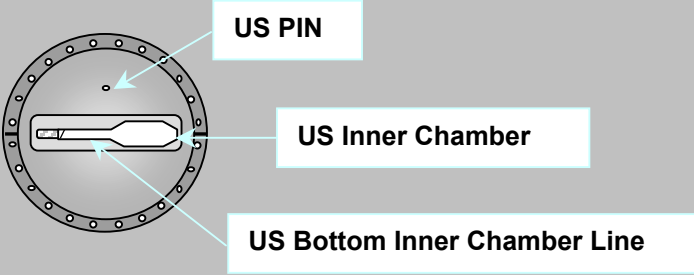
Roll Status: **UPDATE**

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 | -50.860 | 1.850 | 2.294 |
| Nominal | -51.000 | 1.836 | 2.282 |
| Difference (inches) | 0.140 | 0.014 | 0.012 |

| US Inner Chamber | Z | X | Y |
|---------------------|---------|--------|-------|
| Measured | -50.616 | -1.395 | 0.075 |
| Nominal | -51.000 | -1.404 | 0.000 |
| Difference (inches) | 0.384 | 0.009 | 0.075 |

| US Bottom Inner Chamber Line | ROLL | (FINAL) |
|------------------------------|-------|---------|
| Measured | 0.095 | |
| Nominal | 0.000 | |
| Difference (mrads) | 0.095 | |

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.

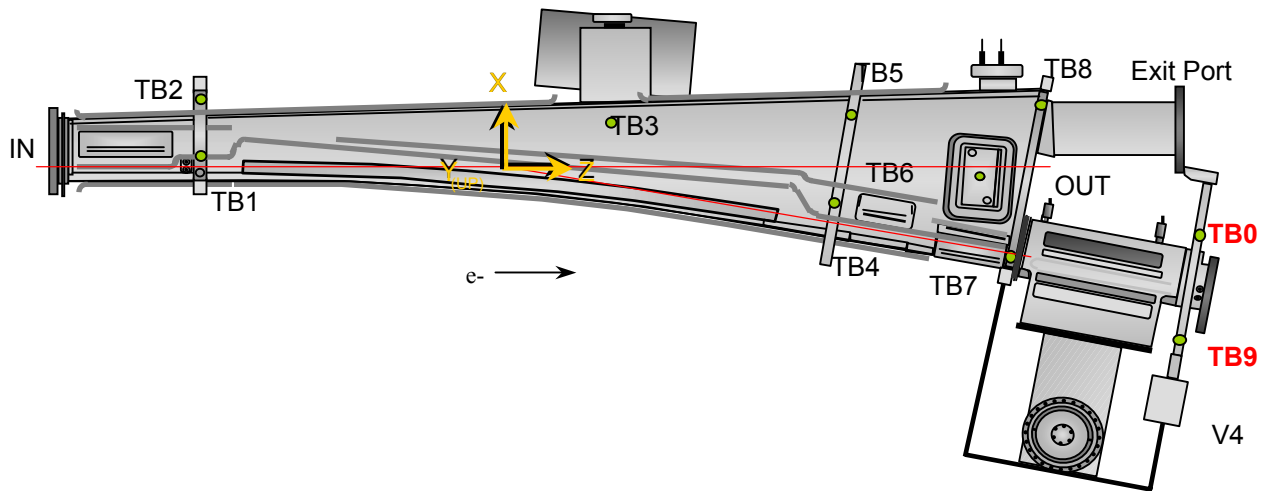
V4 Fiducialization Step: Survey of Fiducial Coordinates for BM1 Standard Vacuum Chamber with V4 and the Exit Port Attached:

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

| Fiducial | Z | X | Y |
|----------|--------|---------|--------|
| TB9 (V4) | 74.672 | -20.296 | 4.387 |
| TB0 (V4) | 77.011 | -7.987 | 4.390 |
| | inches | inches | inches |

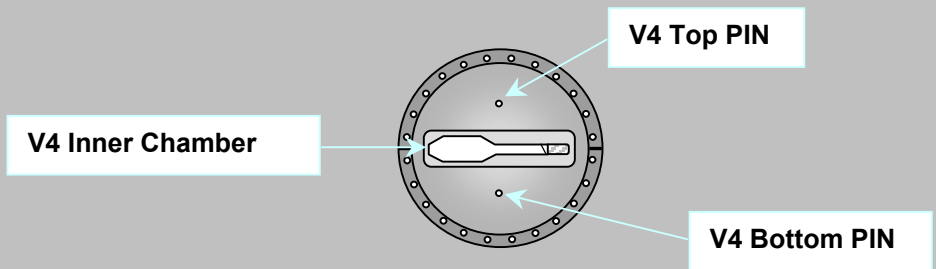
Description:

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 | 80.202 | 0.006 | 2.283 |
| Nominal | 80.000 | 0.000 | 2.282 |
| Difference (inches) | 0.202 | 0.006 | 0.001 |

| V4 Bottom PIN | Z | X | Y |
|---------------------|--------|--------------|---------------|
| Measured | 80.181 | 0.007 | -2.283 |
| Nominal | 80.000 | 0.000 | -2.282 |
| Difference (inches) | 0.181 | 0.007 | -0.001 |

| V4 Inner Chamber | Z | X | Y |
|---------------------|--------|--------------|-------|
| Measured | 79.908 | -1.400 | 0.023 |
| Nominal | 80.000 | -1.404 | 0.000 |
| Difference (inches) | -0.092 | 0.004 | 0.023 |

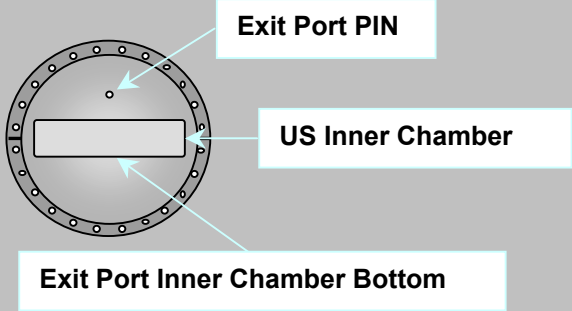
| V4 Downstream Z Value | Z |
|-----------------------|---------------|
| Measured | 80.726 |
| Nominal | 80.764 |
| Difference (inches) | -0.038 |

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



| Exit Port PIN | Z | X | Y |
|---------------------|--------|--------------|---------------|
| Measured | 75.306 | 4.230 | 2.252 |
| Nominal | 75.000 | 4.168 | 2.282 |
| Difference (inches) | 0.306 | 0.062 | -0.031 |

| Exit Port Inner Chamber Side | Z | X | Y |
|------------------------------|--------|--------------|-------|
| Measured | 75.056 | 7.479 | 0.148 |
| Nominal | 75.000 | 7.418 | 0.000 |
| Difference (inches) | 0.056 | 0.061 | 0.148 |

| Exit Port Inner Chamber Bottom | Z | X | Y |
|--------------------------------|--------|-------|---------------|
| Measured | 74.913 | 4.137 | -0.398 |
| Nominal | 75.000 | 0.000 | -0.366 |
| Difference (inches) | -0.087 | 4.137 | -0.032 |

| 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 | -34.867 | 1.498 | 4.374 | 0.000 | 0.001 | -0.012 |
| TB2 | -34.891 | 8.386 | 4.380 | -0.001 | 0.001 | -0.001 |
| TB3 | 11.002 | 4.128 | 2.314 | 0.002 | 0.001 | 0.002 |
| TB4 | 34.481 | -4.903 | 4.376 | 0.000 | 0.001 | 0.001 |
| TB5 | 36.578 | 6.279 | 4.346 | 0.002 | 0.000 | 0.002 |
| TB6 | 52.461 | -1.860 | 2.290 | | | |
| TB7 | 55.649 | -11.162 | 3.063 | 0.003 | -0.003 | -0.001 |
| TB8 | 59.431 | 8.993 | 3.036 | 0.008 | -0.001 | -0.001 |
| TB9 (V4) | 74.669 | -20.277 | 4.389 | -0.004 | 0.019 | 0.002 |
| TB0 (V4) | 76.997 | -7.966 | 4.387 | -0.014 | 0.020 | -0.003 |
| | 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)

