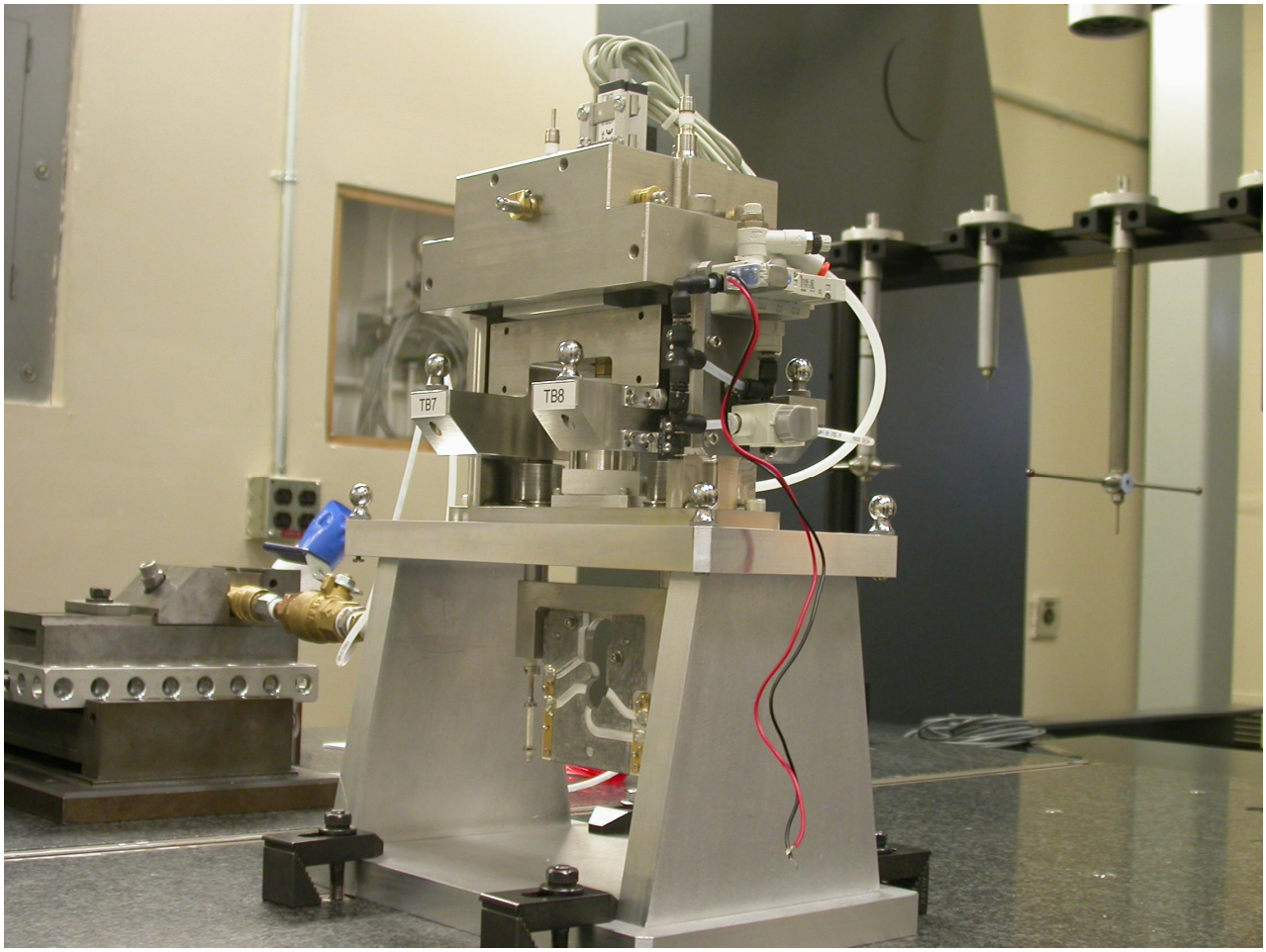
Linac Coherent Light Source

Stanford Linear Accelerator Center

Stanford Synchrotron Radiation Laboratory

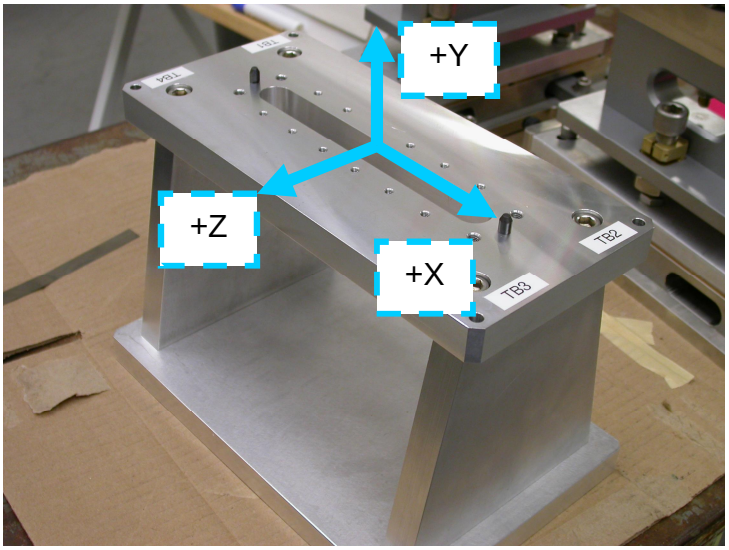
# LCLS BFW WIRECARD ASSY INSPECTION/FIDUCIAL REPORT




| | |
|---|---|
| Inspector: | Keith Caban |
| Responsible Engineer: | Don Schafer |
| Date: | Thursday, July 31, 2008 |
| Work Order/Charge No.: | 23800-1 |
| Serial Number: | BFW – 35 / VC – 35 / WC – 35 / BASE – 01 |
| Units of Measure: | Metric – Millimeters (mm.) |
| URL | http://www-group/met/Quality/FIDUCIAL%20REPORTS/LCLS%20BFW/BFW-35_VC-35_WC-35_BAS-01.pdf |

## Coordinate System Setups

**Bench CSY (BENCH$CSY)**
(The only CSY in Both States of measurement - out and under vacuum)

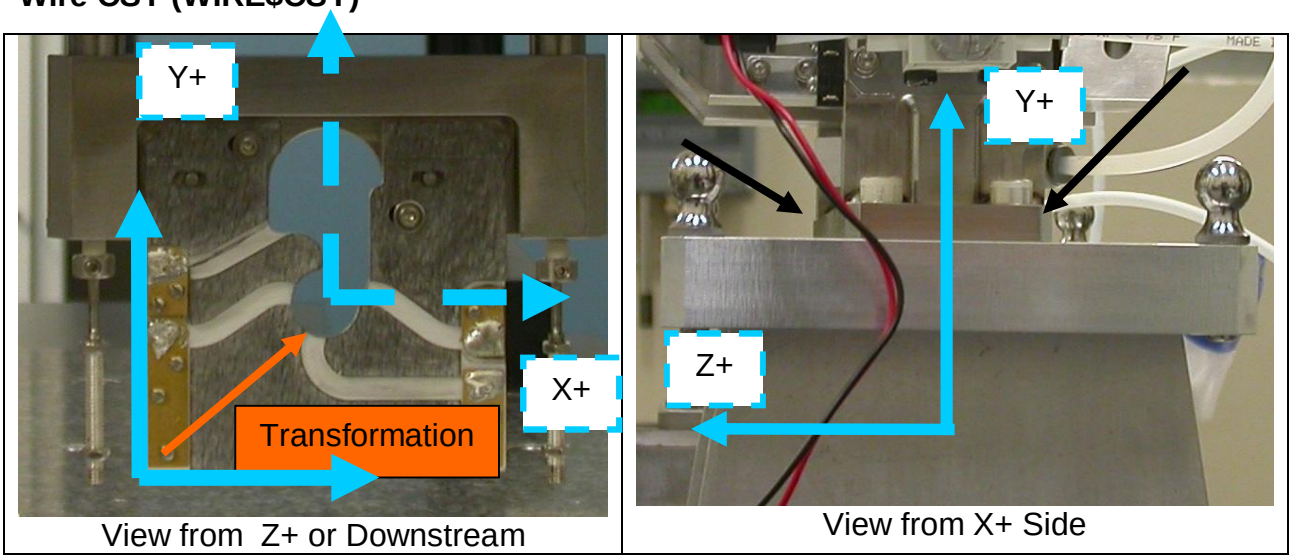



a) Plane measurement on top of Bench to set zero in Y and is the Spatial Alignment.
b) Measure Pin and Diamond Pin to get centers, create a line between the two center points and this sets zero in Z and is the Planar Alignment.
c) Take the symmetry point of the two pins this sets zero in X.

**Bench Tooling Ball CSY (BTB$CSY)**
a) Create a plane using Tooling Balls 1, 2, & 3
    a. This sets Zero in Y and is the spatial alignment
b) Create an axis/line using TB's 2 to 1 (+X)
    a. This is the planar alignment
c) TB 2 is a single point that sets zero in X, Y, Z.

**BFW Tooling Ball CSY (BFWTB$CSY)**
a) Create a plane using Tooling Balls 5, 6, & 7
    a. This sets Zero in Y and is the spatial alignment
b) Create an axis/line using TB's 6 to 5 (+X)
    a. This is the planar alignment
c) TB 6 is a single point that sets zero in X, Y, Z.

**Wire CSY (WIRE$CSY)**




a) Back Plane (-Z) Side sets Zero in Z and is the Spatial Alignment
b) Looking from +Z Side, Bottom of Card Sets Zero is the Planar Alignment
c) The Intersection of the Left Side of the Card and the Bottom, sets Zero in X & Y

**Wire offset from Edges per T. Nakashima's Optical Measurement**

| Wire | Wire Location | Wire Diameter |
|---|---|---|
| **Vertical Wire (X Location from Card)** | 39.6104 | 0.0364 |
| **Horizontal Wire (Y Location from Card)** | 37.0127 | 0.0386 |

**Support Stand CSY (BASE$CSY)**

a) A plane on Torque Fixture sets Zero in Y and is the Spatial Alignment
b) The symmetry of the outer surfaces where "X" fine adjustments are sets zero in X.
c) A line where the Torque Fixture 2X Dowel pins sets zero in Z and is the Planar Alignment.

**Beamline CSY (BEAMLINE$CSY)**

a) Use the BENCH$CSY setup except use the Torque Fixture plate to set zero in Y and the Spatial Alignment, transform +258.67 in Y to replicate Theoretical Beamline Center
b) This coordinate system will tell us where the Wire Crosshairs are to a theoretical Beam Centerline.
c) The wires should be offset ~ -0.400 in X, -0.200 in Y.

**Statistical Data (mm.)**

***Out of Vacuum***

*10 Cycles (10 recordings)*

**Card Locations**

**CSY = BENCH$CSY**

| STATS | X-POS CARD | X-INTPT CARD | Y-INTPT CARD |
|---|---|---|---|
| **AVG.** | -0.02822 | -39.93728 | -95.29372 |
| **Range** | 0.00243 | 0.00209 | 0.00164 |
| **St. Dev.** | 0.00071 | 0.00065 | 0.00051 |

**Wire Location**

**CSY = BEAMLINE$CSY**

| Stats | X | Y |
|---|---|---|
| **AVG.** | -0.45175 | -0.16163 |
| **Range** | 0.00288 | 0.00108 |
| **St. Dev.** | 0.00086 | 0.00036 |
| **Nom.** | -0.40000 | -0.20000 |
| **RMS Tol** | 0.06500 | 0.03000 |

**Transformation WIRE$CSY TO BENCH$CSY**

| Stats | X | Y | Z | APA_PXPY | PA_PYPZ | PA_PXPZ |
|---|---|---|---|---|---|---|
| **AVG.** | -0.45175 | -58.16163 | -2.28115 | 0.19025 | 89.92843 | 89.97805 |
| **Range** | 0.00288 | 0.00108 | 0.00185 | 0.00086 | 0.00070 | 0.00060 |
| **St. Dev.** | 0.00086 | 0.00036 | 0.00069 | 0.00031 | 0.00021 | 0.00019 |
| **RMS Tol** | 0.06500 | 0.03000 | - | - | - | - |

**Transformation WIRE$CSY to BFWTB$CSY**

| Stats | X | Y | Z | APA_PXPY | PA_PYPZ | PA_PXPZ |
|---|---|---|---|---|---|---|
| **AVG.** | 93.39463 | -160.45806 | 35.68550 | 0.11685 | 89.87504 | 90.05300 |
| **Range** | 0.00353 | 0.00224 | 0.00472 | 0.00067 | 0.00160 | 0.00087 |
| **St. Dev.** | 0.00101 | 0.00064 | 0.00158 | 0.00024 | 0.00058 | 0.00032 |
| **RMS Tol** | 0.06500 | 0.03000 | - | - | - | - |

***Under Vacuum***
*10 Cycles (10 recordings)*
**TB 5-8 Locations**
**CSY = BENCH$CSY**

| TB 5 | X | Y | Z |
|---|---|---|---|
| **AVG.** | 94.74878 | 102.41031 | -38.05076 |
| **Range** | 0.01387 | 0.01963 | 0.08295 |
| **St. Dev.** | 0.00498 | 0.00682 | 0.02920 |
| **RMS Tol** | 0.06500 | 0.03000 | - |

| TB 6 | X | Y | Z |
|---|---|---|---|
| **AVG.** | -94.09099 | 102.24746 | -37.67278 |
| **Range** | 0.01324 | 0.00725 | 0.01696 |
| **St. Dev.** | 0.00473 | 0.00291 | 0.00665 |
| **RMS Tol** | 0.06500 | 0.03000 | - |

| TB 7 | X | Y | Z |
|---|---|---|---|
| **AVG.** | -50.76989 | 102.19398 | 68.05610 |
| **Range** | 0.04166 | 0.02013 | 0.00589 |
| **St. Dev.** | 0.01487 | 0.00731 | 0.00180 |
| **RMS Tol** | 0.06500 | 0.03000 | - |

| TB 8 | X | Y | Z |
|---|---|---|---|
| **AVG.** | 51.76830 | 102.27916 | 67.86615 |
| **Range** | 0.04146 | 0.00737 | 0.05984 |
| **St. Dev.** | 0.01490 | 0.00255 | 0.02119 |
| **RMS Tol** | 0.06500 | 0.03000 | - |

**Wire Location**

**CSY = BEAMLINE$CSY**

| Stats | X | Y |
|---|---|---|
| **AVG.** | -0.49408 | -0.24157 |
| **Range** | 0.01610 | 0.00255 |
| **St. Dev.** | 0.00614 | 0.00077 |
| **Nom.** | -0.40000 | -0.20000 |
| **RMS Tol** | 0.06500 | 0.03000 |

**Transformation WIRE$CSY TO BENCH$CSY**

| Stats | X | Y | Z | APA_PXPY | PA_PYPZ | PA_PXPZ |
|---|---|---|---|---|---|---|
| AVG. | -0.48817 | -58.16121 | -2.31172 | 0.16636 | 89.92376 | 89.93835 |
| Range | 0.01611 | 0.00256 | 0.00557 | 0.00781 | 0.01085 | 0.03032 |
| St. Dev. | 0.00614 | 0.00077 | 0.00177 | 0.00290 | 0.00365 | 0.01086 |
| RMS Tol | 0.06500 | 0.03000 | - | - | - | - |

**Locations of ¼-20 Jo-Plugs Cylinders Intersected into Plane projected 12.7mm away from surface replicating a ½" (12.7mm) offset to center of Tooling Ball.**

**CSY = BEAMLINE$CSY**

| INTPT | X | Y | Z |
|---|---|---|---|
| 1 | -27.02567 | 227.43341 | 68.27202 |
| 2 | 26.98383 | 227.43782 | 68.25629 |
| 3 | 79.77405 | 179.96531 | -68.73934 |
| 4 | -79.93210 | 180.03912 | -68.68991 |