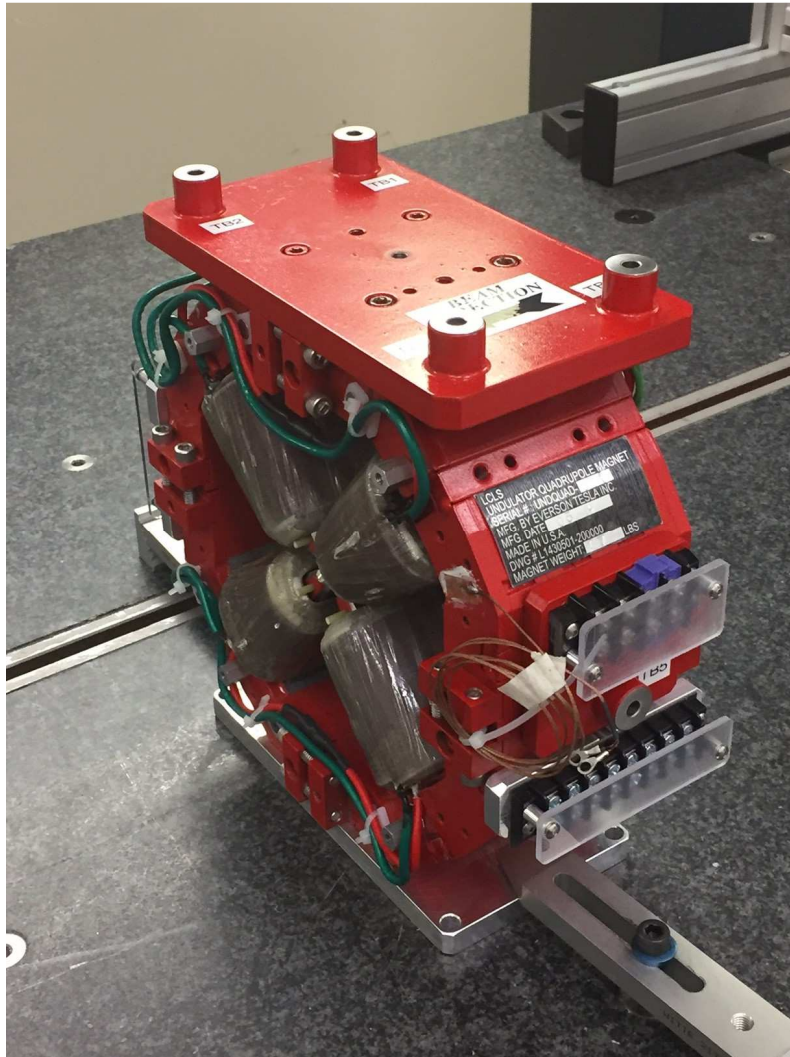


# LCLS II Undulator Quadrupole Fiducialization Report



Inspector : K. Caban  
Engineer : J. Amann  
Drawing No. : SA-381-012-22  
Barcode # : 4072  
Mfg. S/N : 007

## **Coordinate System Setup**

### **Spatial Alignment**

The Spatial Alignment of the magnet is created through a composite best-fit of the pole tips. Each pole tip scanned .150 inch inboard from the upstream magnet face and the downstream magnet face. A composite best-fit of the upstream poles and the downstream poles is made with the nominal pole tip shape and location. An axis is created through the two best-fit centerpoints. This axis is the spatial alignment of the magnet and defines the Z axis.

### **Planar Alignment**

The Planar Alignment of the magnet is created by averaging the rotations of the composite best-fits of the upstream pole tips and downstream pole tips. This direction defines the Y and X directions of the magnet.

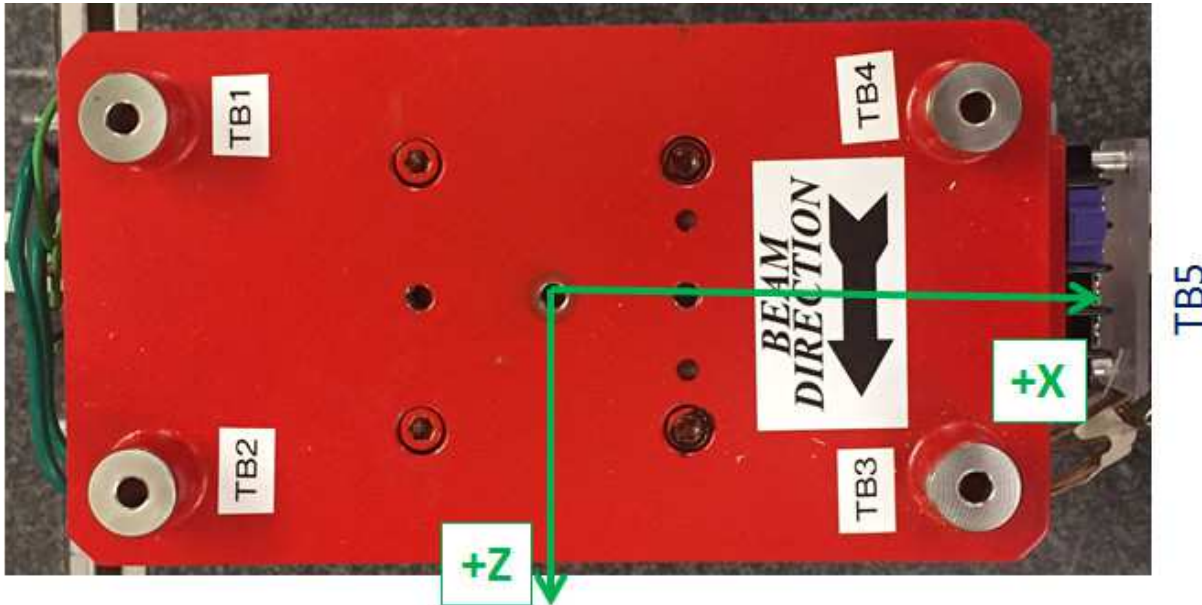
### **Coordinate Origins**

The origins of the magnet coordinate system are as follows. The XY origin lies on the axis of spatial alignment. The Z origin is the intersection of the mid-plane between the upstream and downstream magnet faces and the Z axis.

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## Tooling Ball Locations



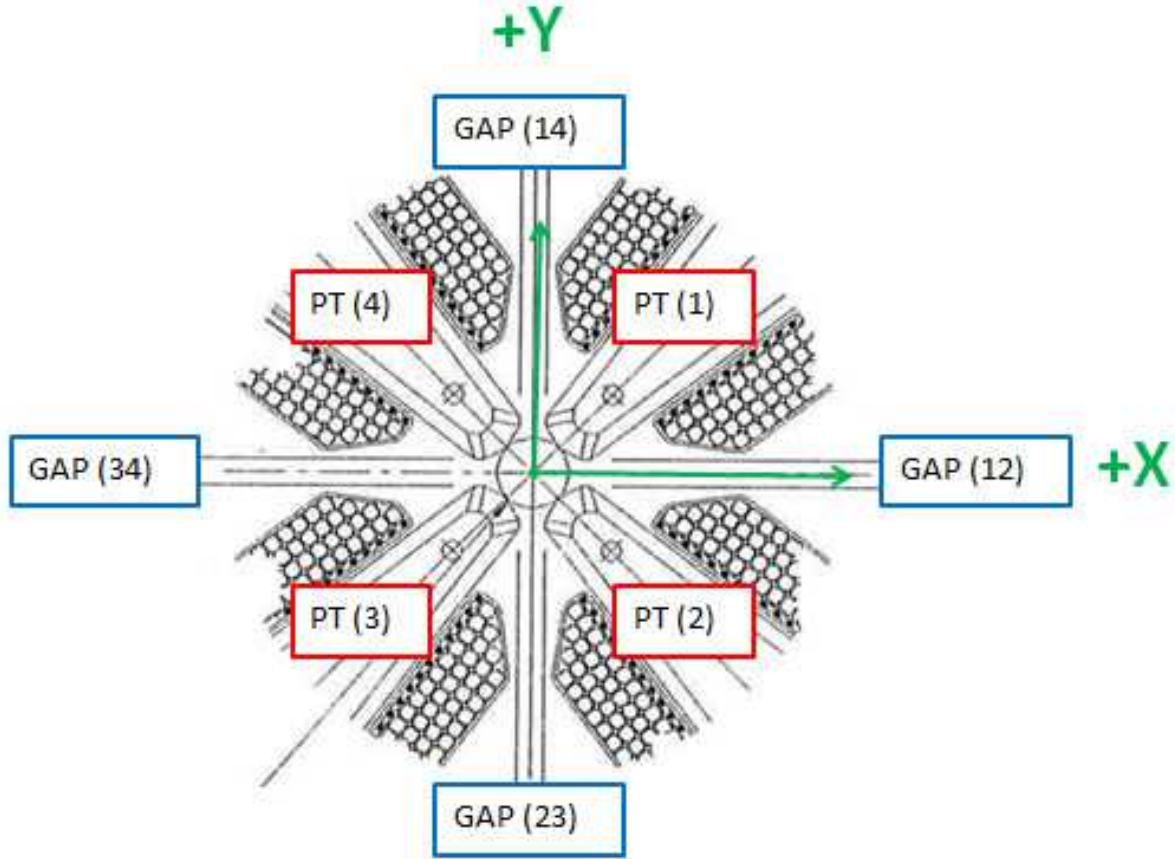
Tooling Ball	X Coord.	Y Coord.	Z Coord.
TB 1	-3.36978	6.81638	-1.48046
TB 2	-3.37848	6.81590	1.51828
TB 3	3.36913	6.81443	1.53631
TB 4	3.37679	6.81642	-1.46873
TB 5	6.58856	0.12432	0.02717
TB A	-3.37034	6.12916	-1.48092
TB B	-3.37916	6.12896	1.51869
TB C	3.36925	6.12716	1.53614
TB D	3.37705	6.12715	-1.46496
TB E	5.90125	0.12502	0.02655

Tooling Ball Locations (1-5) are 1 inch above Tooling Ball Adapter Plane  
 Tooling Ball Locations (A-E) are 5/16 inch above Tooling Ball Adapter Plane  
 Dimensions in Inch

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## Pole Tip Gap Measurements



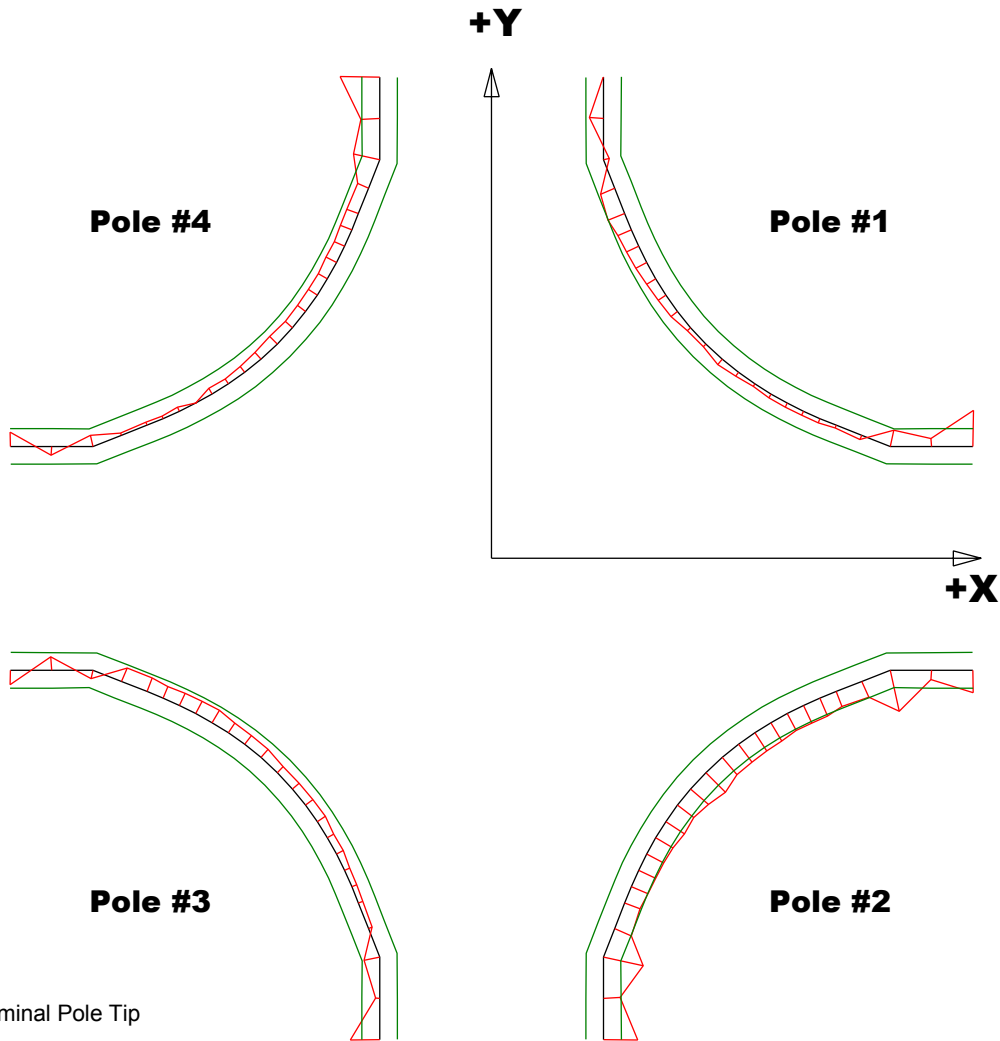
	Nominal Distance	Downstream Pole End	Upstream Pole End
Pole Tip Distance 1-3	0.433 ± .002	0.43231	0.43346
Pole Tip Distance 2-4	0.433 ± .002	0.43513	0.43308
Gap 1-2	0.159 ± .002	0.16076	0.15834
Gap 2-3	0.159 ± .002	0.1609	0.16032
Gap 3-4	0.159 ± .002	0.15862	0.15675
Gap 4-1	0.159 ± .002	0.1601	0.15974

Dimensions in Inch

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## Composite Best-fit of Pole Tips, Downstream



Black = Nominal Pole Tip  
 Red = Pole Tip Deviations  
 Green = +/- .001 Tolerance

Dimensions in Inch

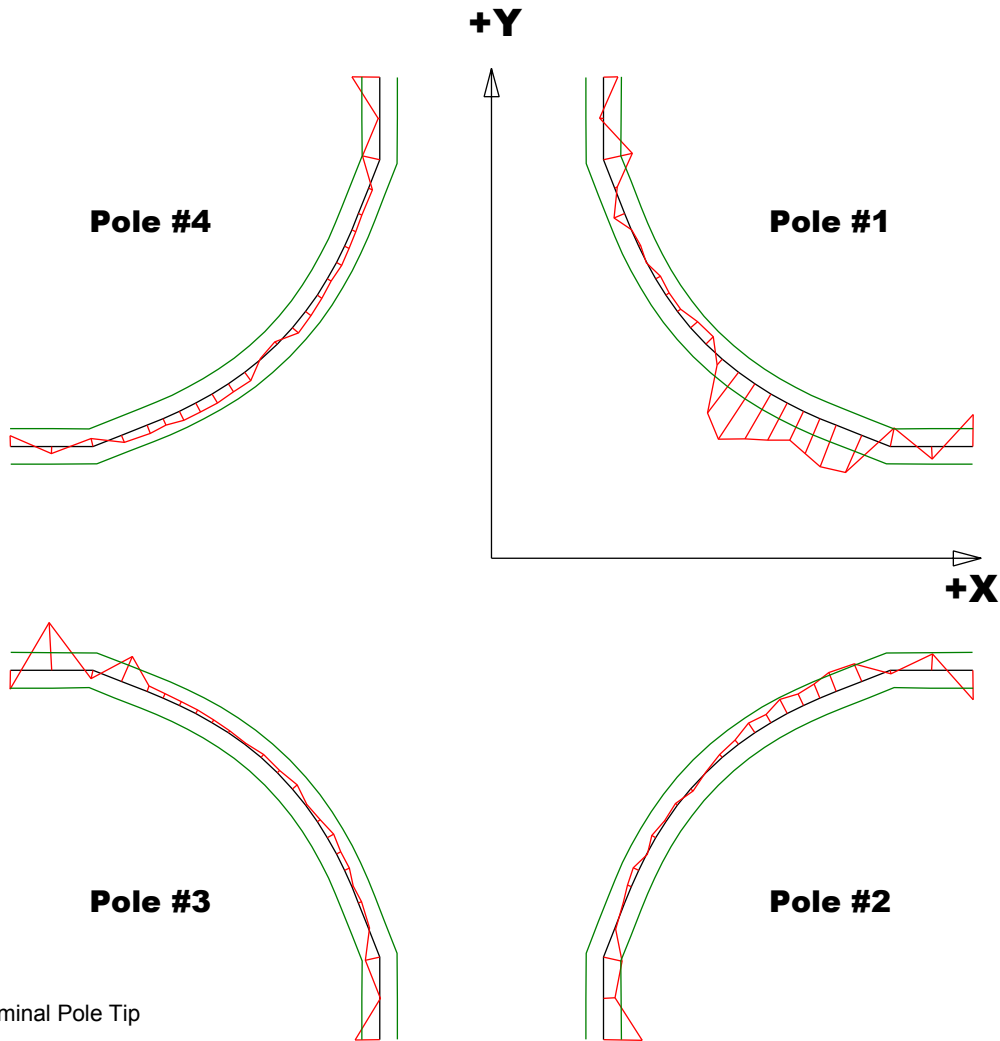
### Pole Tip Deviations

Pole Tip	#1	#2	#3	#4
Min. Dev.	-0.00203	-0.00236	-0.00164	-0.00223
Max. Dev.	0.00101	-0.00052	0.00082	0.0005

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## Composite Best-fit of Pole Tips, Upstream



Black = Nominal Pole Tip  
 Red = Pole Tip Deviations  
 Green = +/- .001 Tolerance

Dimensions in Inch

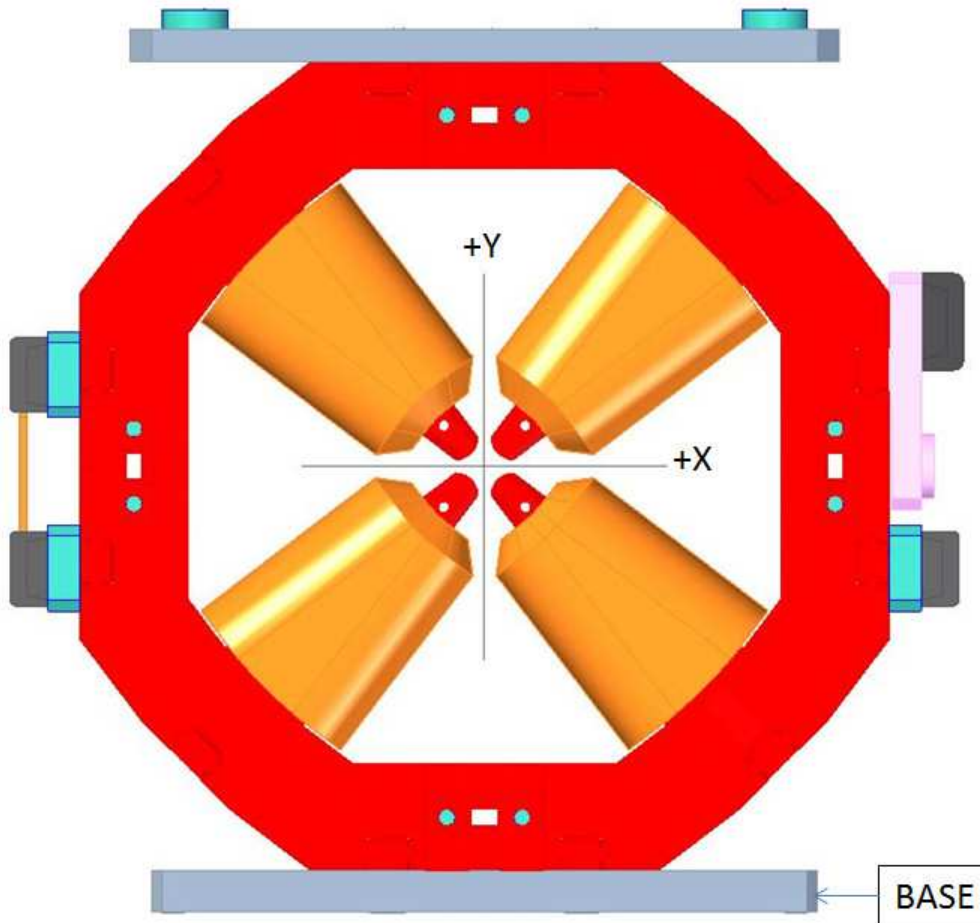
### Pole Tip Deviations

Pole Tip	#1	#2	#3	#4
Min. Dev.	-0.00179	-0.00218	-0.00138	-0.00156
Max. Dev.	0.00372	0.00115	0.00268	0.00059

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## Angle of the Composite Pole Tip Best-Fit In Relation to Base



Angle in Decimal Degrees ° :0.01230

Angle in Milliradians :0.21473

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