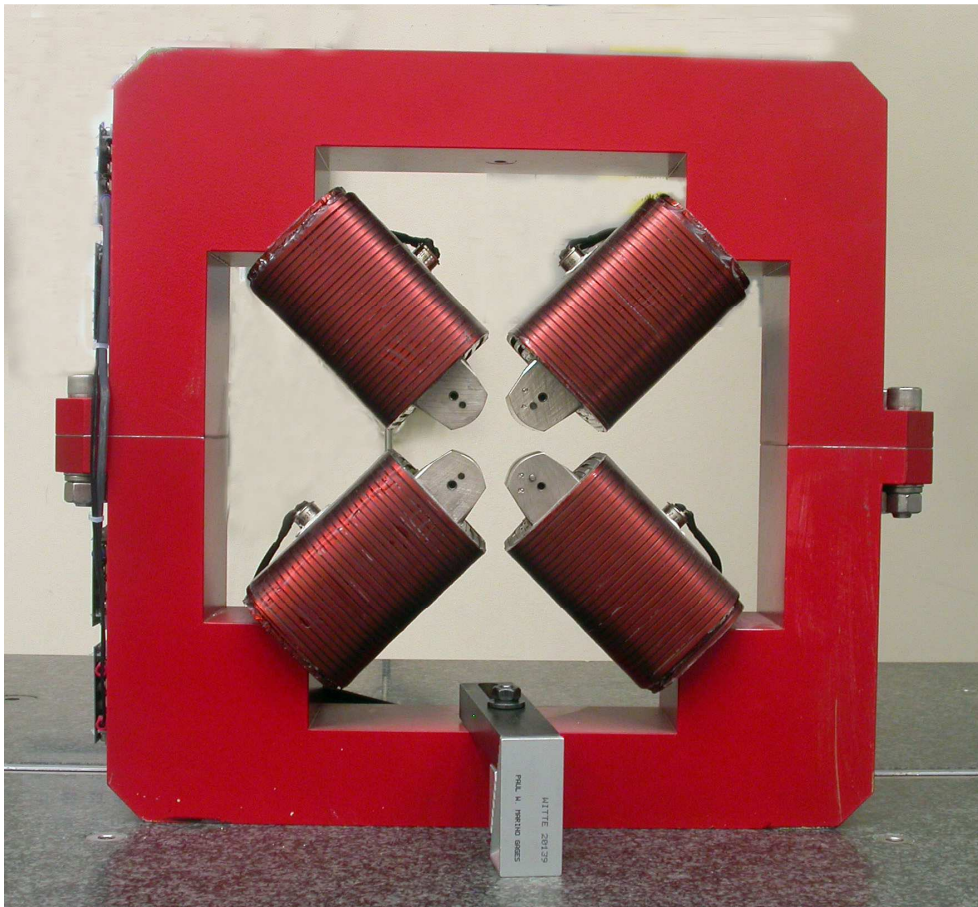


## LCLS II Injector Quadrupole Fiducialization Report



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## 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

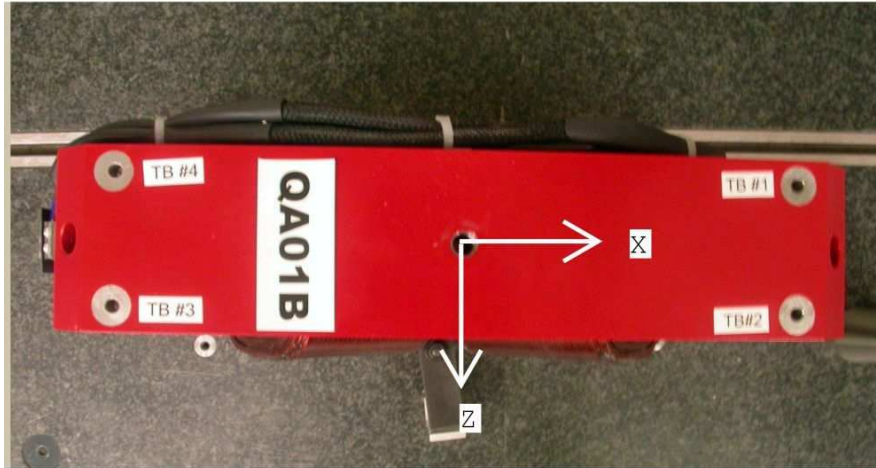
The Planar Alignment of the magnet is created by averaging the rotations of the composite best-fits of the upstream pole tips and downstream pole tips. This direction defines the Y and X directions of the magnet.

### 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	6.48566	8.88506	-1.25098
TB 2	6.48552	8.88491	1.24829
TB 3	-6.51502	8.86763	1.24954
TB 4	-6.51608	8.86555	-1.25054
TB A	6.48647	8.19605	-1.25093
TB B	6.48640	8.19707	1.24859
TB C	-6.51412	8.17932	1.24998
TB D	-6.51447	8.17735	-1.24955

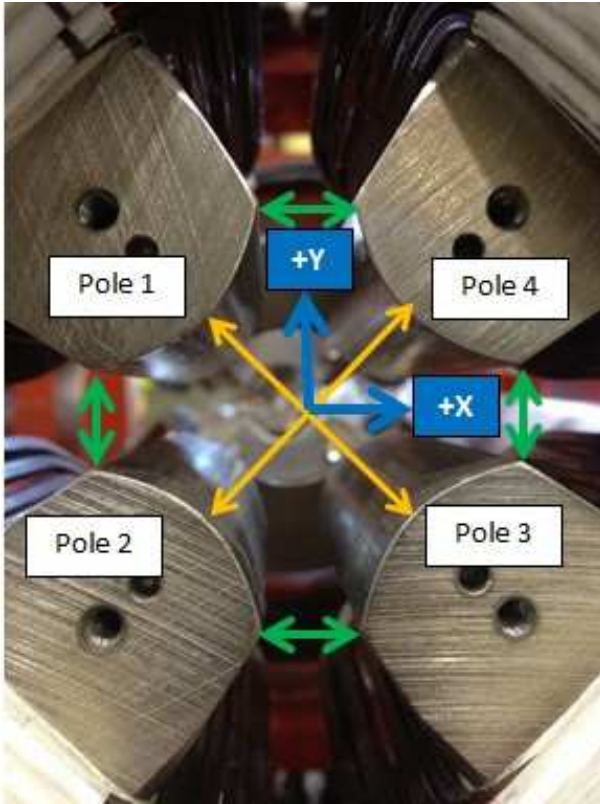
Tooling Ball Locations (1-4) are 1 inch above unpainted surface pads  
 Tooling Ball Locations (A-D) are 5/16 inch above unpainted surface pads

Dimensions in Inch

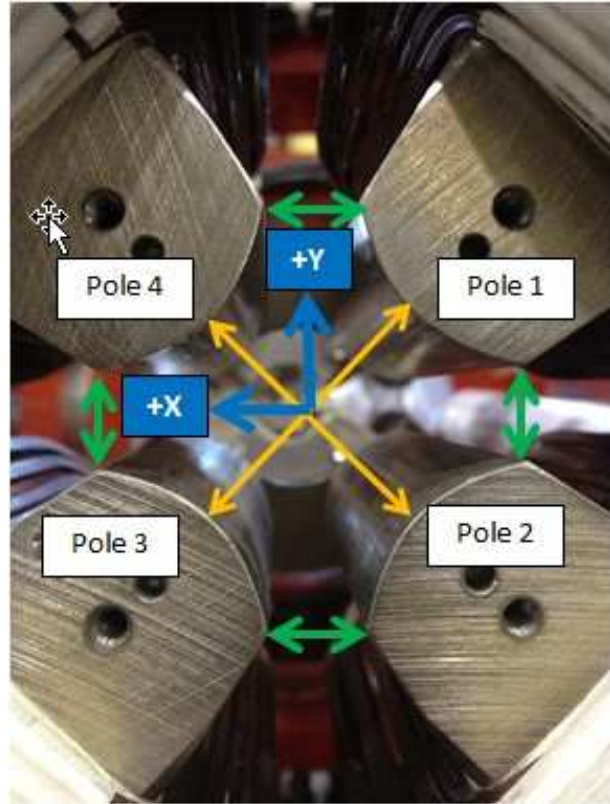
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## Pole Tip Gap Measurements

**Pole Tips looking Downstream**



**Pole Tips looking Upstream**

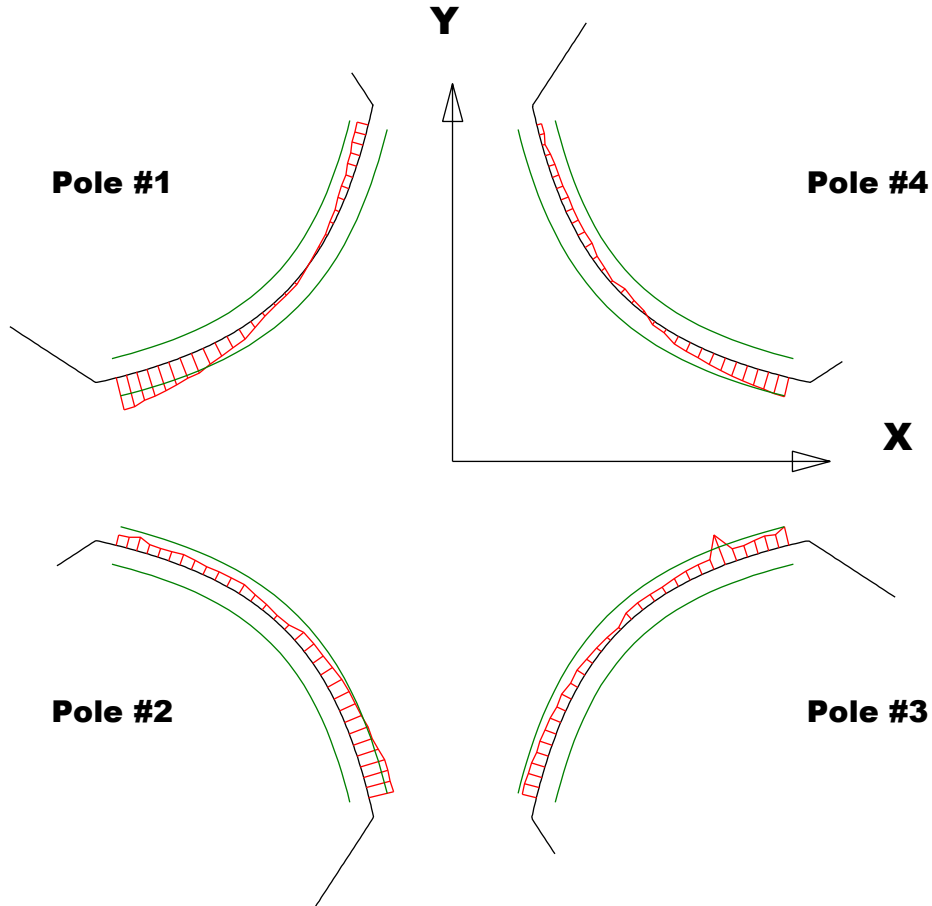


	Nominal Distance	Downstream Pole Ends	Upstream Pole Ends
Pole Tip Distance 1-3	1.260	1.25968	1.26107
Pole Tip Distance 2-4	1.260	1.25993	1.26093
Gap 1-2	.422	0.41898	0.42033
Gap 2-3	.422	0.4204	0.42251
Gap 3-4	.422	0.42038	0.42099
Gap 4-1	.422	0.42326	0.42265

Dimensions in Inch

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**Beamline Name: First Article**

# Composite Best-fit of Pole Tips, Downstream



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

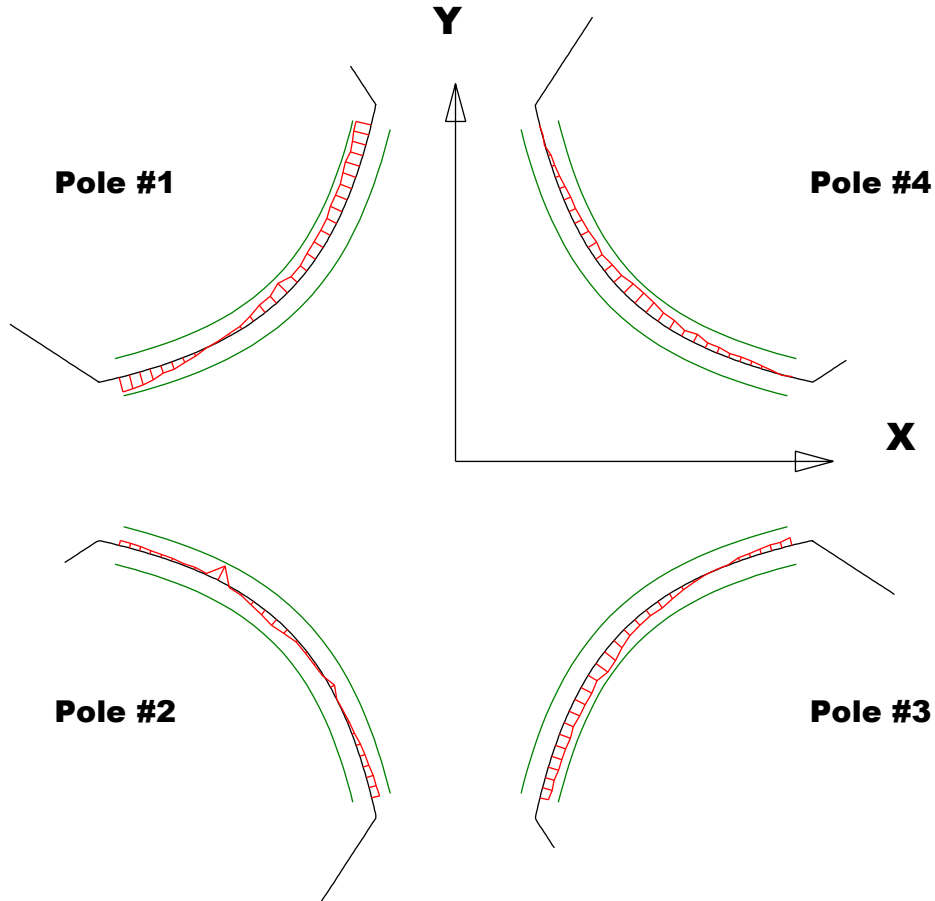
Dimensions in Inch

## Pole Tip Deviations

Pole Tip	#1	#2	#3	#4
Min. Dev.	-0.00062	0.00028	0.00016	-0.00044
Max. Dev.	0.00176	0.00135	0.00168	0.00105

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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.	-0.00083	-0.00041	-0.00077	-0.00072
Max. Dev.	0.0008	0.00083	0.00043	0.00003

**Barcode # : 4000**

**Beamline Name: First Article**