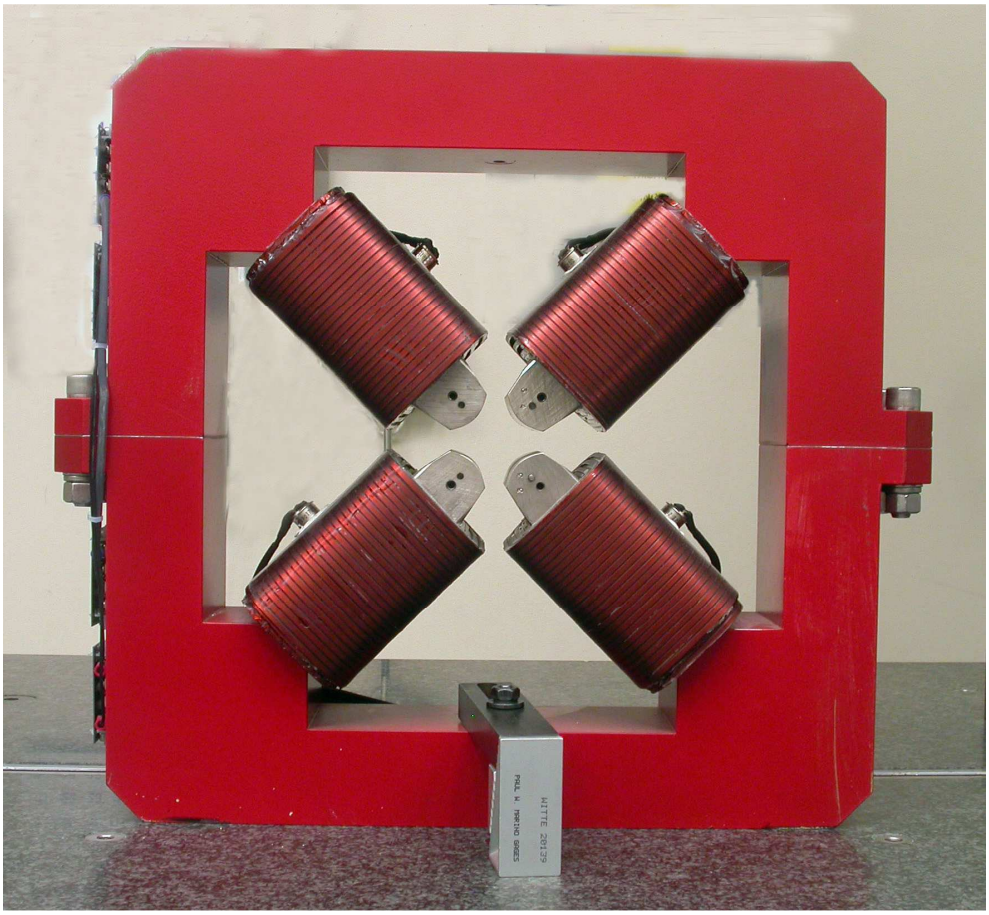
# LCLS II Magnet Fiducialization Report
# Injector Quadrupole 1.26Q3.5



Inspector : K. Caban

Engineer : J. Amann

Drawing No. : SA-380-309-12 R1

Barcode No.: 4002

Mfg. S/N : 009

# 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 the 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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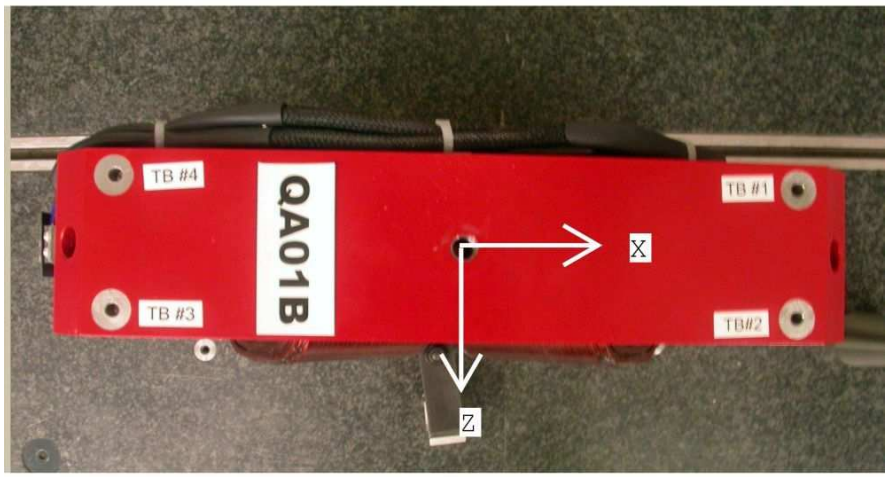
# Tooling Ball Locations




| Tooling Ball | X Coord. | Y Coord. | Z Coord. |
|---|---|---|---|
| TB 1 | 6.50299 | 8.87238 | -1.24948 |
| TB 2 | 6.50414 | 8.87209 | 1.25075 |
| TB 3 | -6.49596 | 8.88211 | 1.25118 |
| TB 4 | -6.49542 | 8.88238 | -1.24866 |
| TB A | 6.50248 | 8.18594 | -1.25000 |
| TB B | 6.50328 | 8.18566 | 1.25004 |
| TB C | -6.49664 | 8.19564 | 1.25054 |
| TB D | -6.49638 | 8.19585 | -1.24915 |

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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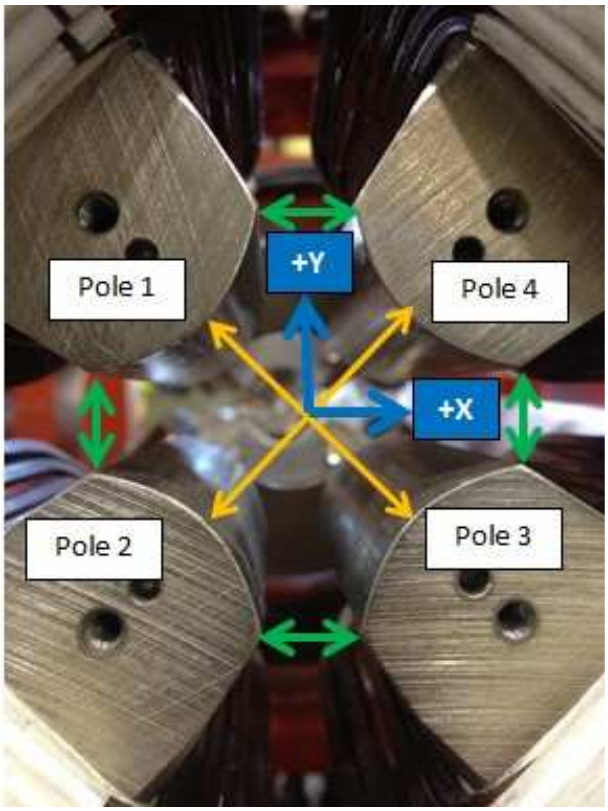
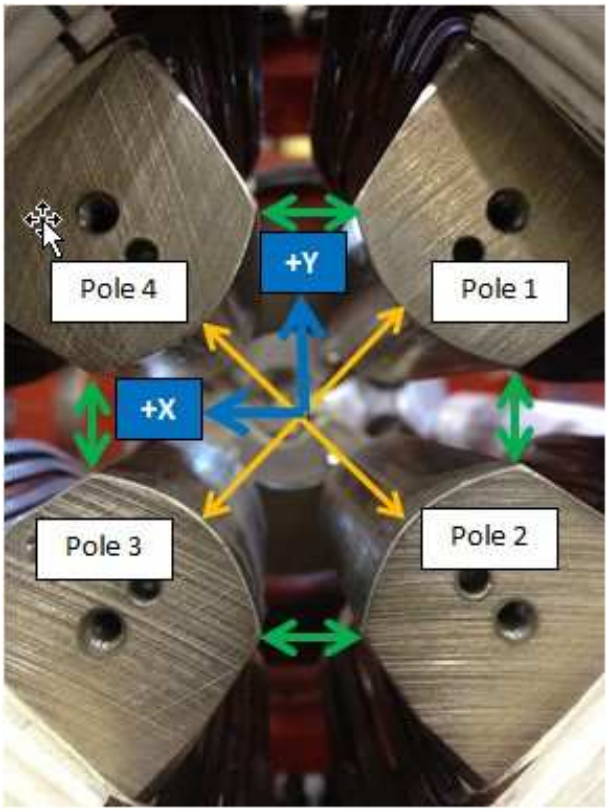
# Pole Tip Gap Measurements

### Pole Tips View from Downstream




### Pole Tips View from Upstream




| | Nominal Distance | Downstream Pole Ends | Upstream Pole Ends |
|---|---|---|---|
| Pole Tip Distance 1-3 | 1.260 | 1.26057 | 1.26099 |
| Pole Tip Distance 2-4 | 1.260 | 1.26036 | 1.26012 |
| Gap 1-2 | .422 | 0.41904 | 0.41962 |
| Gap 2-3 | .422 | 0.42448 | 0.42477 |
| Gap 3-4 | .422 | 0.42146 | 0.42187 |
| Gap 4-1 | .422 | 0.42077 | 0.42067 |

Dimensions in Inch

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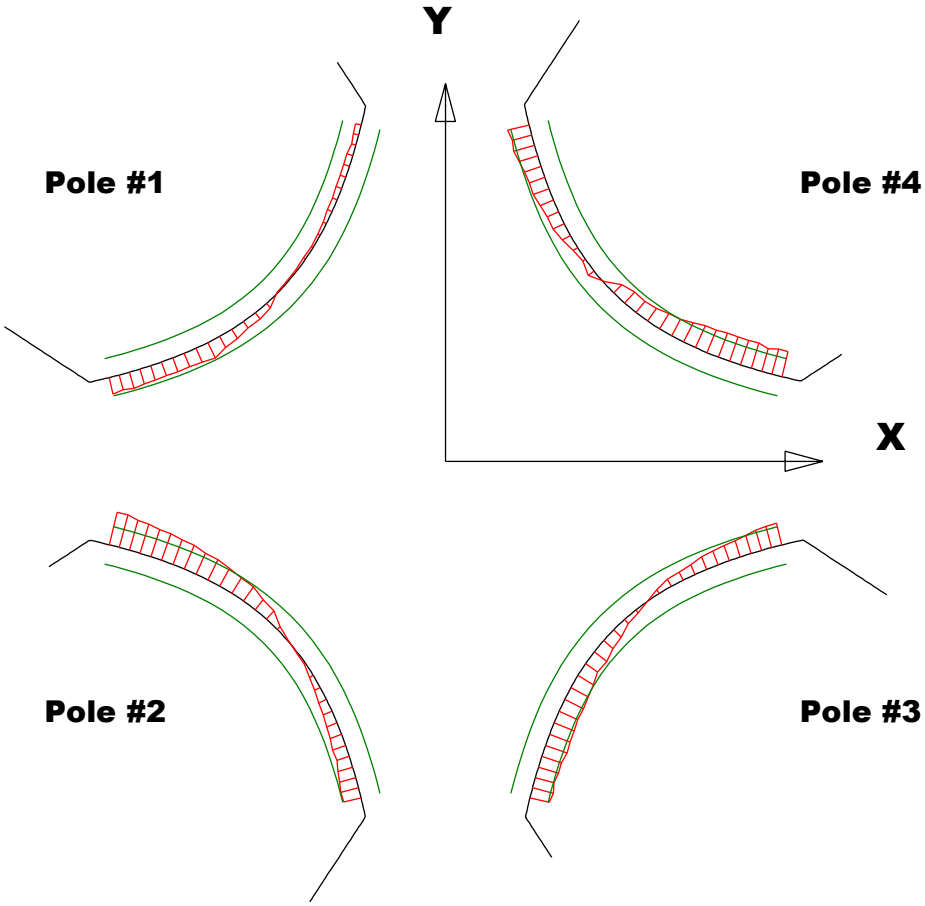
# Composite Best-fit of Pole Tips, Downstream




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. | -0.00033 | -0.00096 | -0.00121 | -0.00141 |
| Max. Dev. | 0.00091 | 0.00179 | 0.00119 | 0.00117 |

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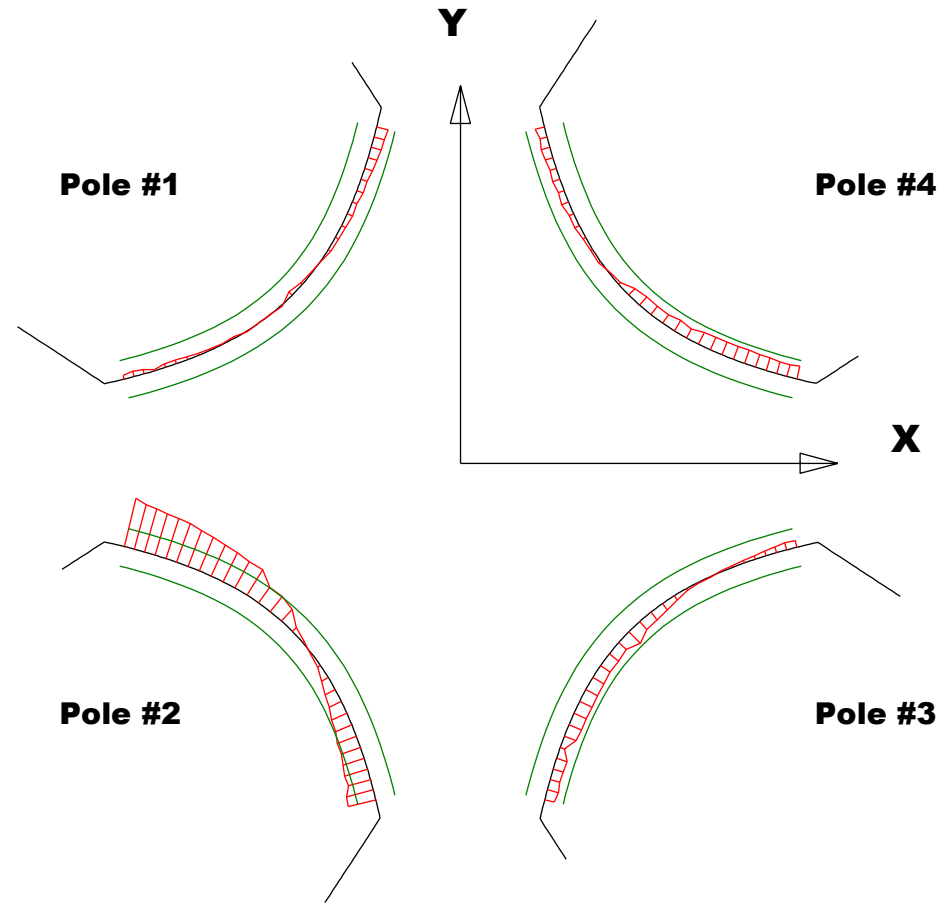
# Composite Best-fit of Pole Tips, Upstream




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. | -0.0003 | -0.0015 | -0.00087 | -0.00075 |
| Max. Dev. | 0.00063 | 0.00264 | 0.00039 | 0.00051 |

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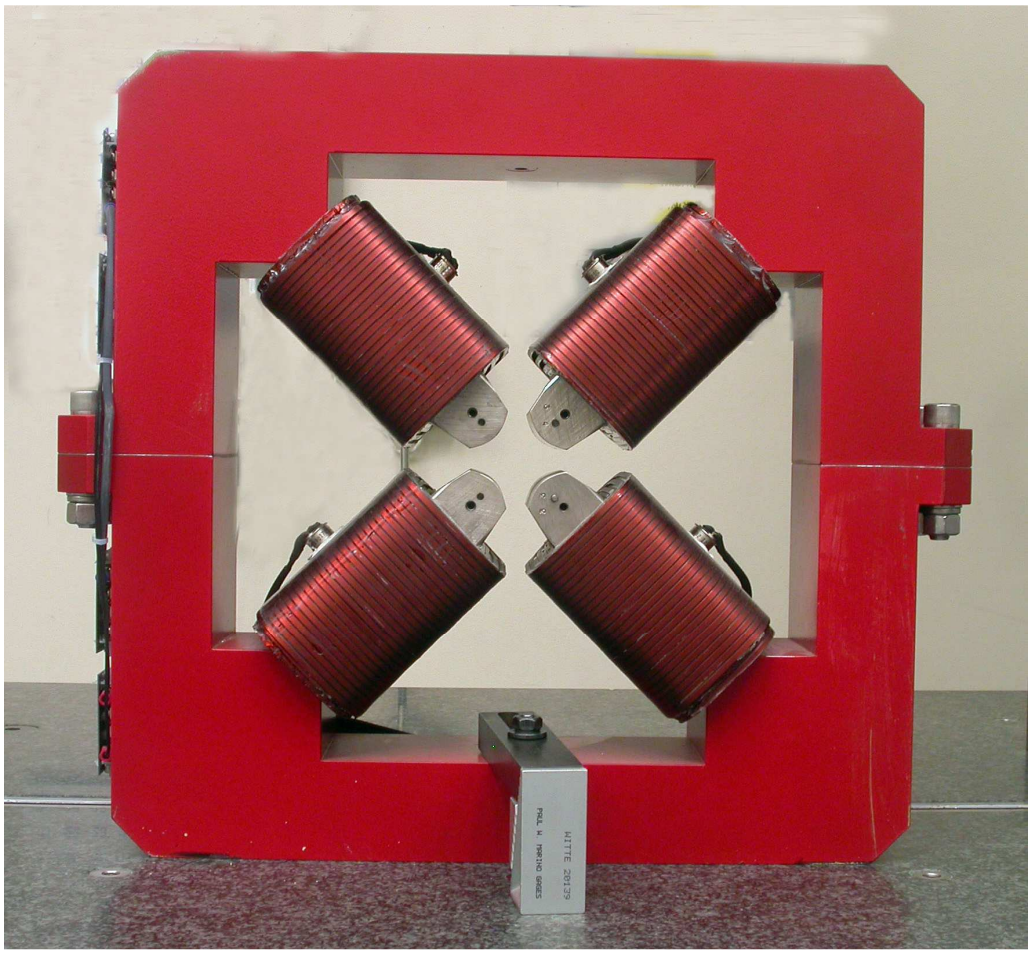
# Angle of the Composite Pole Tip Best-Fit In Relation to Tooling Ball Plane



Angle in Decimal Degrees ° = 0.04395

Angle in Milliradians = 0.76713

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