

# **LCLS II 2Q4W Fiducialization Report**

## **S30XL Refurb Quadrupole MFD FILE: 38193-2**



Inspector : K. Caban  
Engineer : A. Ibrahimov  
Drawing No. : LCL0370-10763 R00  
Barcode # : L204254  
Mfg. S/N : QA03

## 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 0.150 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 and +Z points towards Terminal Bus End.

### 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.

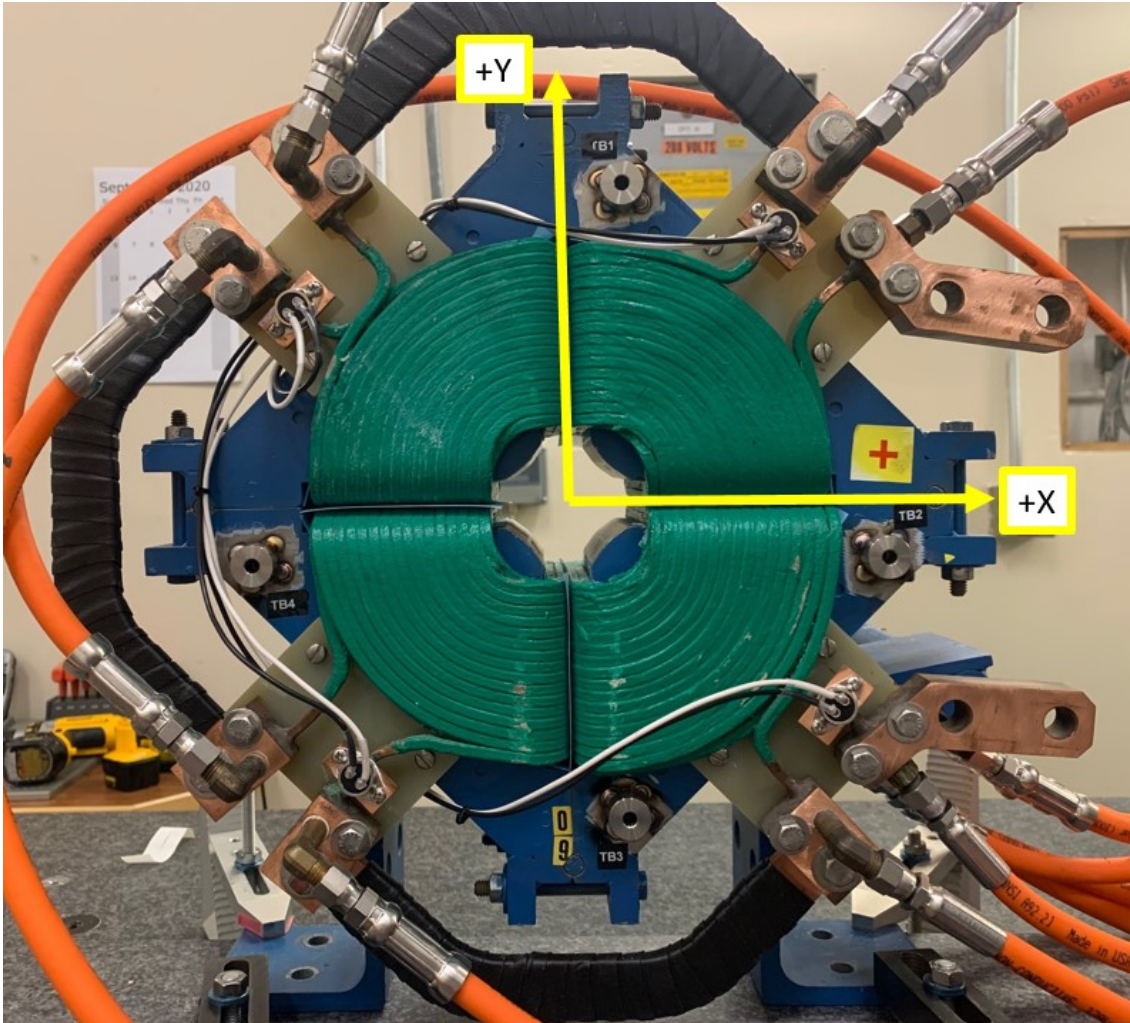
### Coordinate Origins

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. +Z points towards Terminal Bus End.

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## Tooling Ball Locations



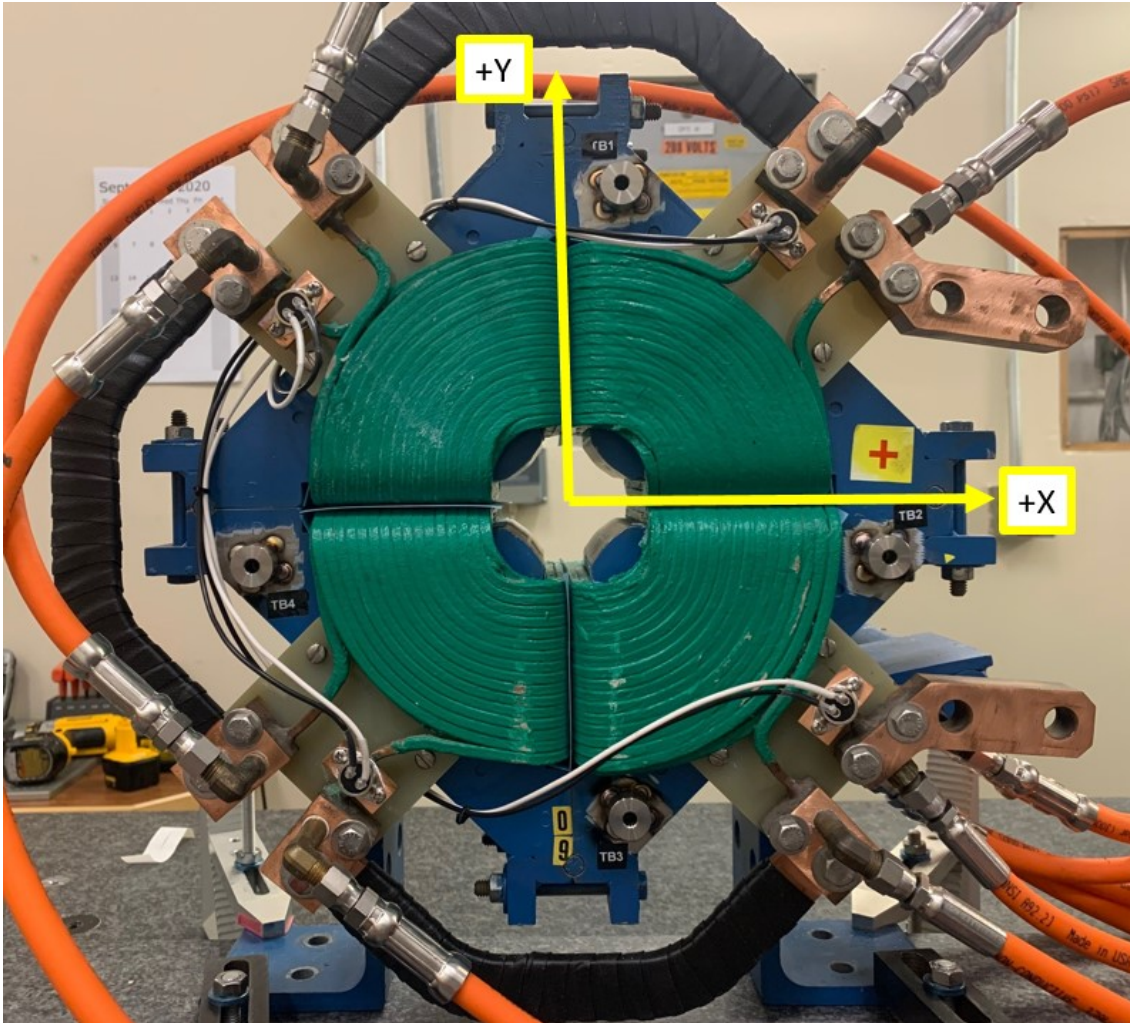
| Tooling Ball | X Coord. | Y Coord. | Z Coord. |
|--------------|----------|----------|----------|
| TB 1         | 0.9928   | 5.5058   | 3.4345   |
| TB 2         | 5.5214   | -0.9939  | 3.4368   |
| TB 3         | 1.0044   | -5.5008  | 3.4346   |
| TB 4         | -5.5211  | -1.0091  | 3.4374   |

Tooling Ball Locations are 1 inch above Tooling Ball Adapter Plane  
Dimensions in Inch

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## Tooling Ball Locations



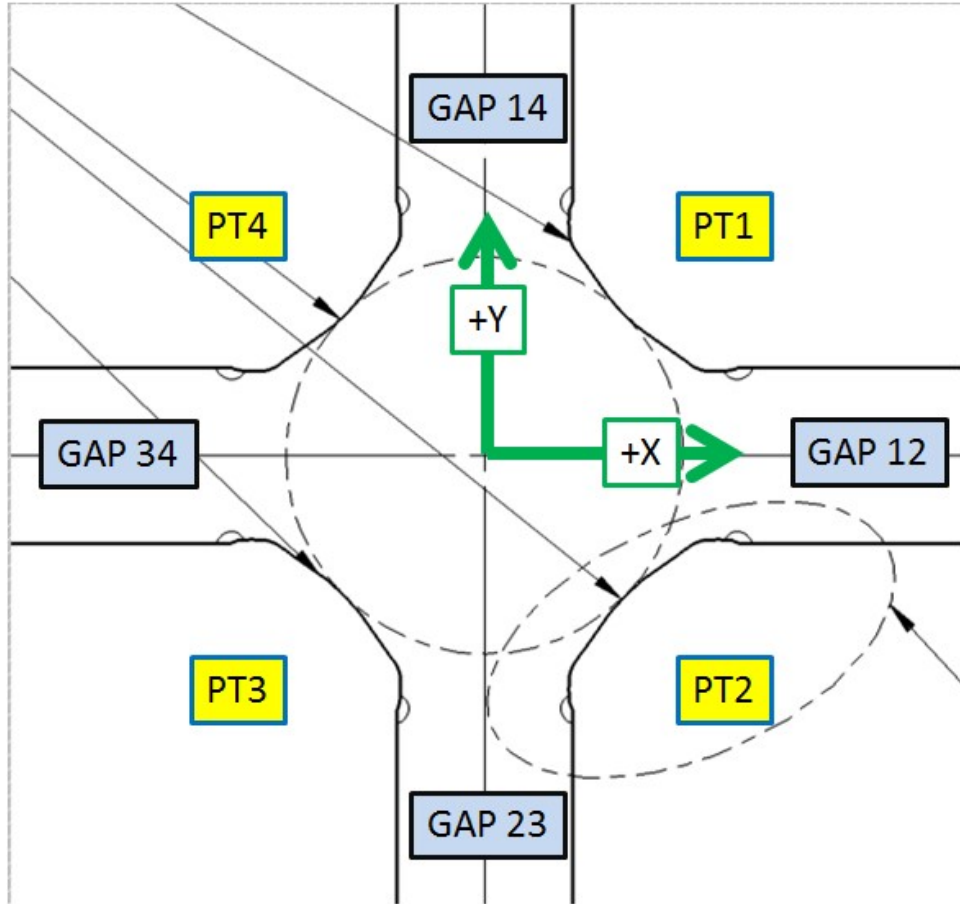
| Tooling Ball | X Coord. | Y Coord. | Z Coord. |
|--------------|----------|----------|----------|
| TB 1         | 0.9948   | 5.5033   | 2.7470   |
| TB 2         | 5.5230   | -0.9931  | 2.7493   |
| TB 3         | 1.0050   | -5.5010  | 2.7471   |
| TB 4         | -5.5181  | -1.0097  | 2.7499   |

Tooling Ball Locations are 5/16 inch above Tooling Ball Adapter Plane  
Dimensions in Inch

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## Pole Tip Gap Measurements



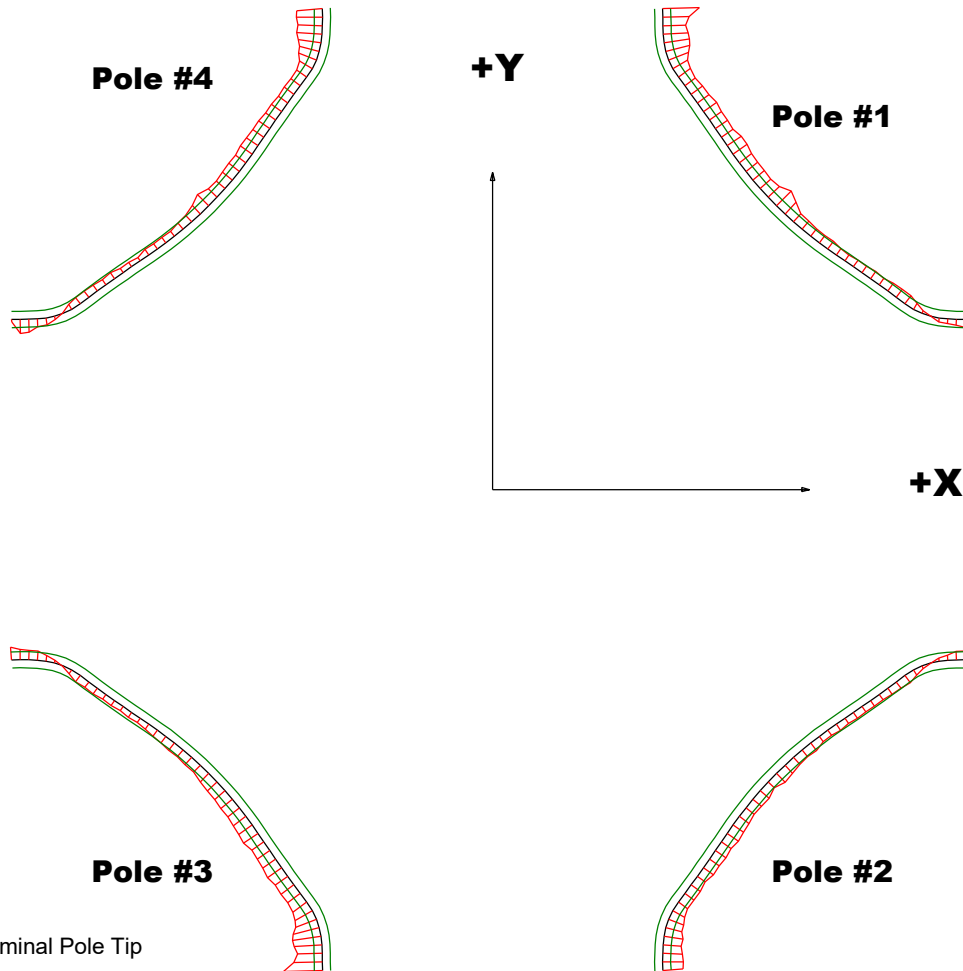
|                 | Nominal Distance | Downstream Pole End | Upstream Pole End |
|-----------------|------------------|---------------------|-------------------|
| PT Distance 1-3 | 2.026            | 2.0301              | 2.027             |
| PT Distance 2-4 | 2.026            | 2.0295              | 2.031             |
| Gap 1-2         | 0.8602           | 0.8544              | 0.853             |
| Gap 2-3         | 0.8602           | 0.8643              | 0.8664            |
| Gap 3-4         | 0.8602           | 0.8556              | 0.8545            |
| Gap 1-4         | 0.8602           | 0.8646              | 0.8655            |

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

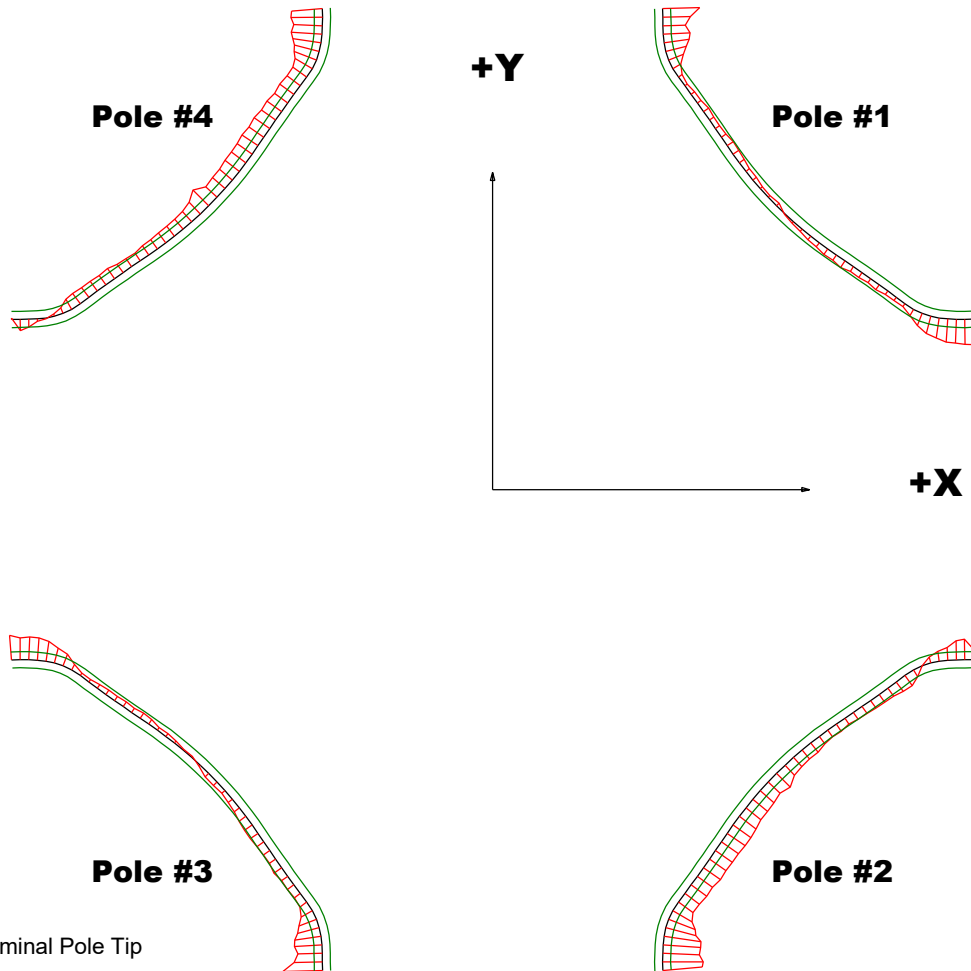
### Pole Tip Deviations

| Pole Tip  | #1      | #2      | #3      | #4      |
|-----------|---------|---------|---------|---------|
| Min. Dev. | -0.0046 | -0.0026 | -0.0049 | -0.0033 |
| Max. Dev. | 0.0012  | 0.0011  | 0.0016  | 0.0018  |

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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

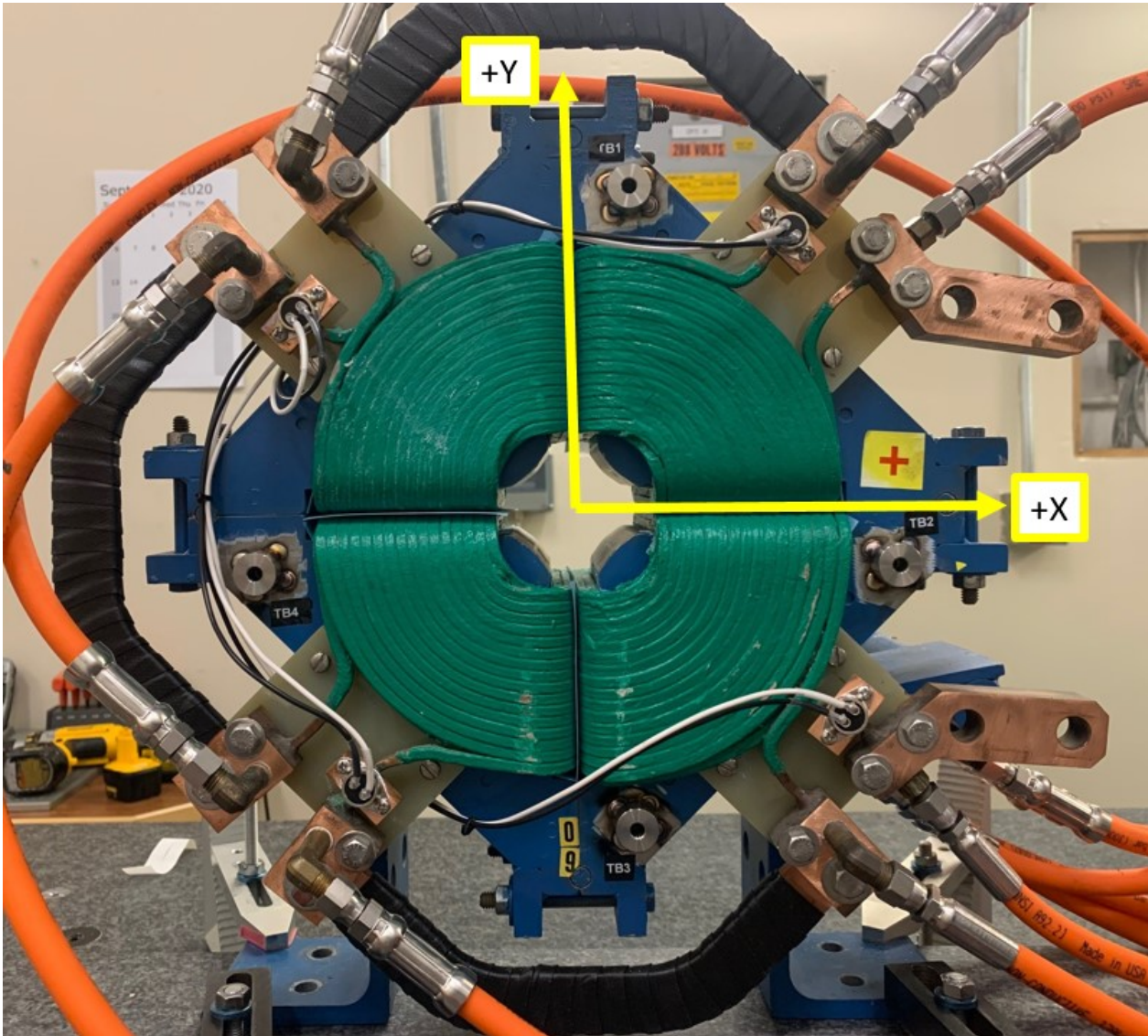
### Pole Tip Deviations

| Pole Tip  | #1      | #2      | #3      | #4      |
|-----------|---------|---------|---------|---------|
| Min. Dev. | -0.0046 | -0.0051 | -0.0049 | -0.0039 |
| Max. Dev. | 0.0032  | 0.0025  | 0.0031  | 0.0014  |

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## Angle of the Composite Pole Tip Best-Fit



in Decimal Degrees ° : -0.09839

Angle in Milliradians : -1.71725

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