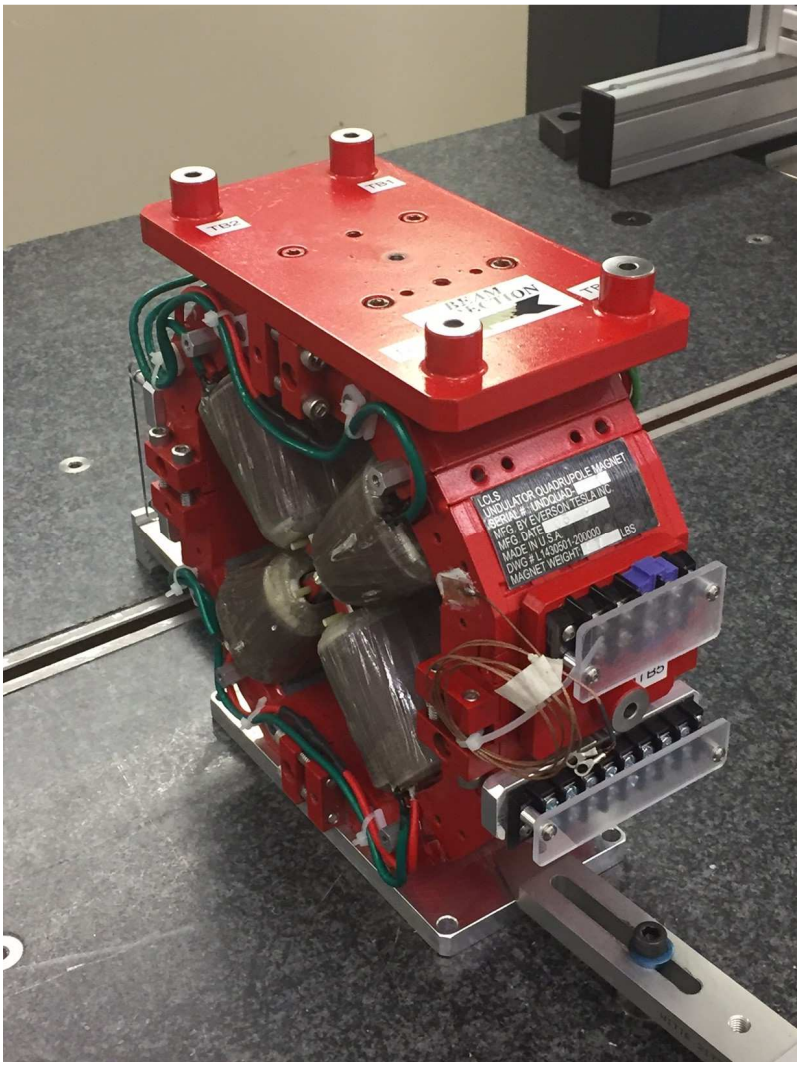
LCLS II Undulator Quadrupole Fiducialization Report



Inspector : K. Caban

Engineer : J. Amann

Drawing No. : SA-381-012-22

Barcode # : 4064

Mfg. S/N : 031

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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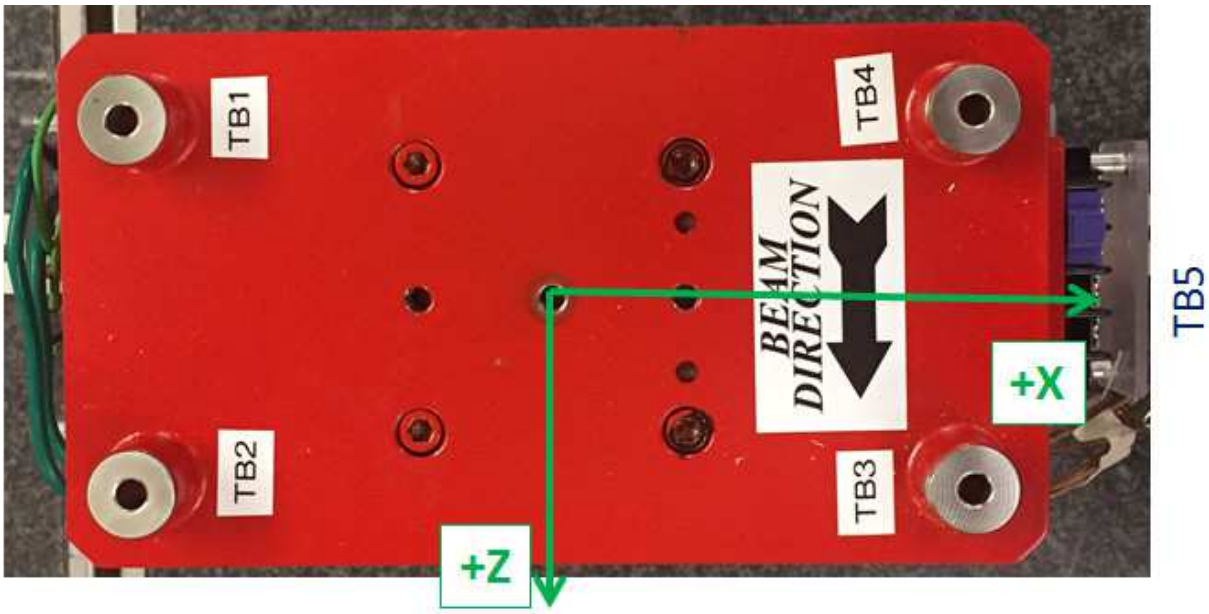
Tooling Ball Locations



Tooling Ball	X Coord.	Y Coord.	Z Coord.
TB 1	-3.37014	6.81668	-1.46407
TB 2	-3.36564	6.81964	1.53227
TB 3	3.38280	6.81256	1.52181
TB 4	3.37583	6.81675	-1.47909
TB 5	6.58602	0.12463	0.00953
TB A	-3.37096	6.12966	-1.46472
TB B	-3.36448	6.13178	1.53432
TB C	3.38184	6.12521	1.52134
TB D	3.37572	6.12923	-1.47811
TB E	5.89845	0.12670	0.01082

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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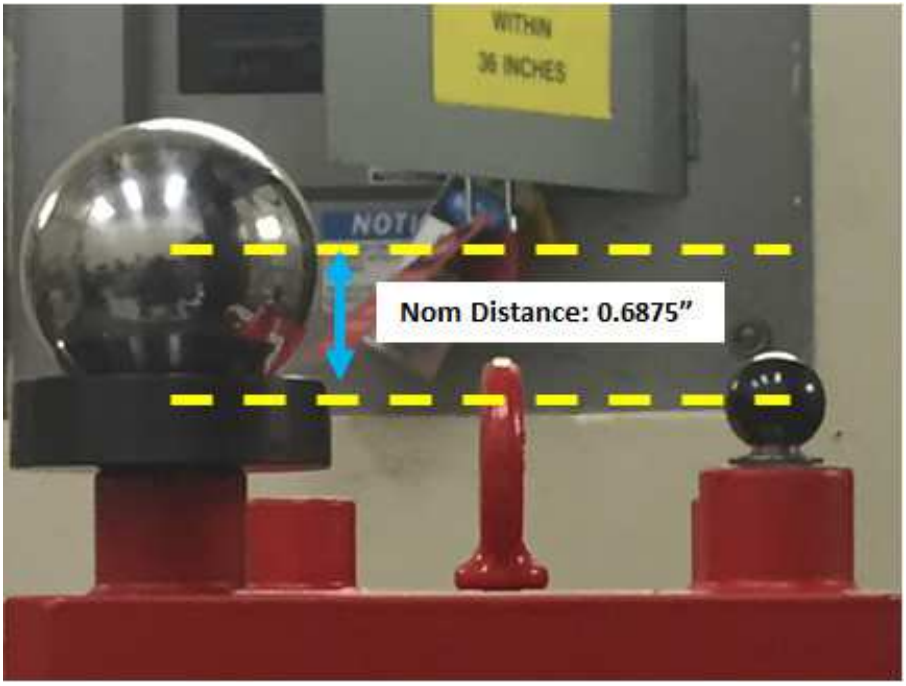
1" Tooling Ball to 5/16" Tooling Ball Difference



Tooling Ball	Nom Dist.	Actual Dist.
TB 1	0.6875 ± 0.001	0.68702
TB 2	0.6875 ± 0.001	0.68786
TB 3	0.6875 ± 0.001	0.68735
TB 4	0.6875 ± 0.001	0.68751
TB 5	0.6875 ± 0.001	0.68758

Dimensions in Inch

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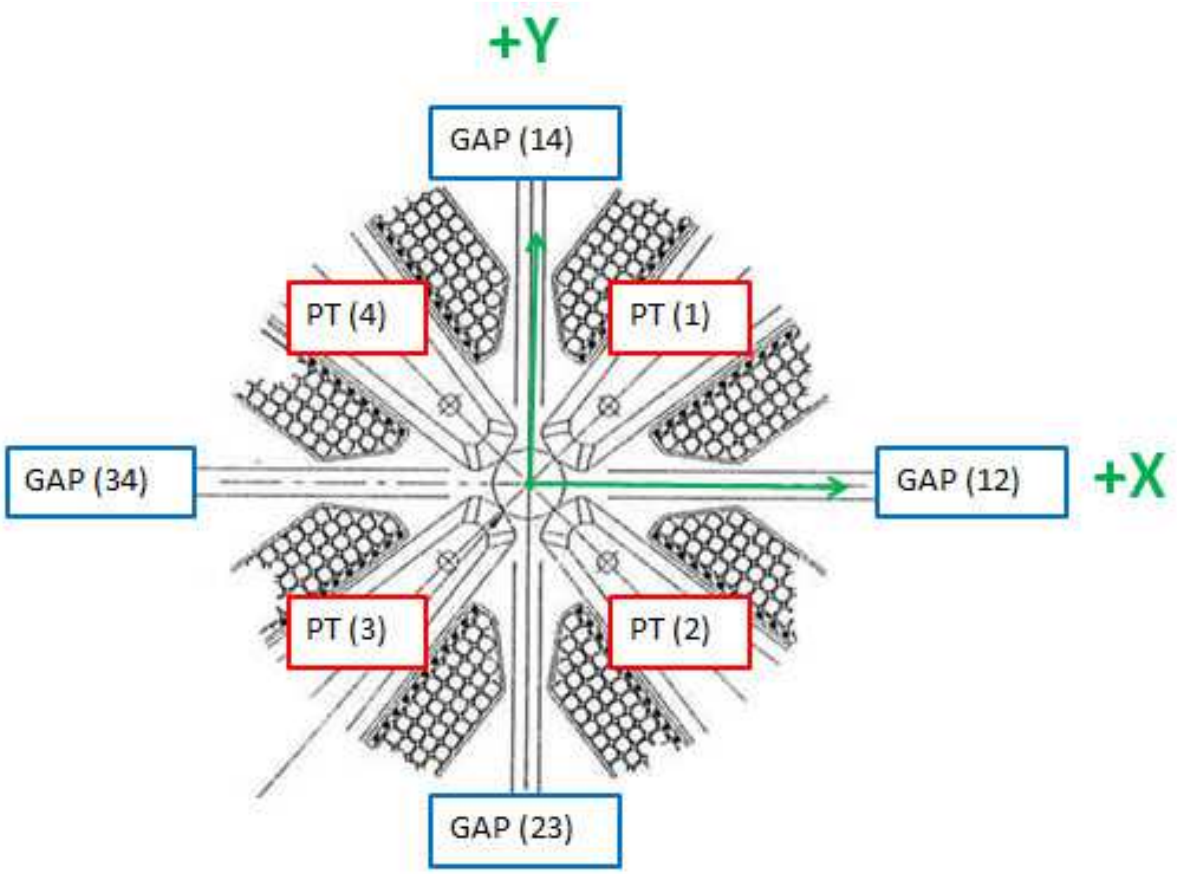
Pole Tip Gap Measurements



	Nominal Distance	Downstream Pole End	Upstream Pole End
Pole Tip Distance 1-3	0.433 ± .002	0.43271	0.43199
Pole Tip Distance 2-4	0.433 ± .002	0.43186	0.43461
Gap 1-2	0.159 ± .002	0.15874	0.15999
Gap 2-3	0.159 ± .002	0.16029	0.16076
Gap 3-4	0.159 ± .002	0.1581	0.15932
Gap 4-1	0.159 ± .002	0.16033	0.15972

Dimensions in Inch

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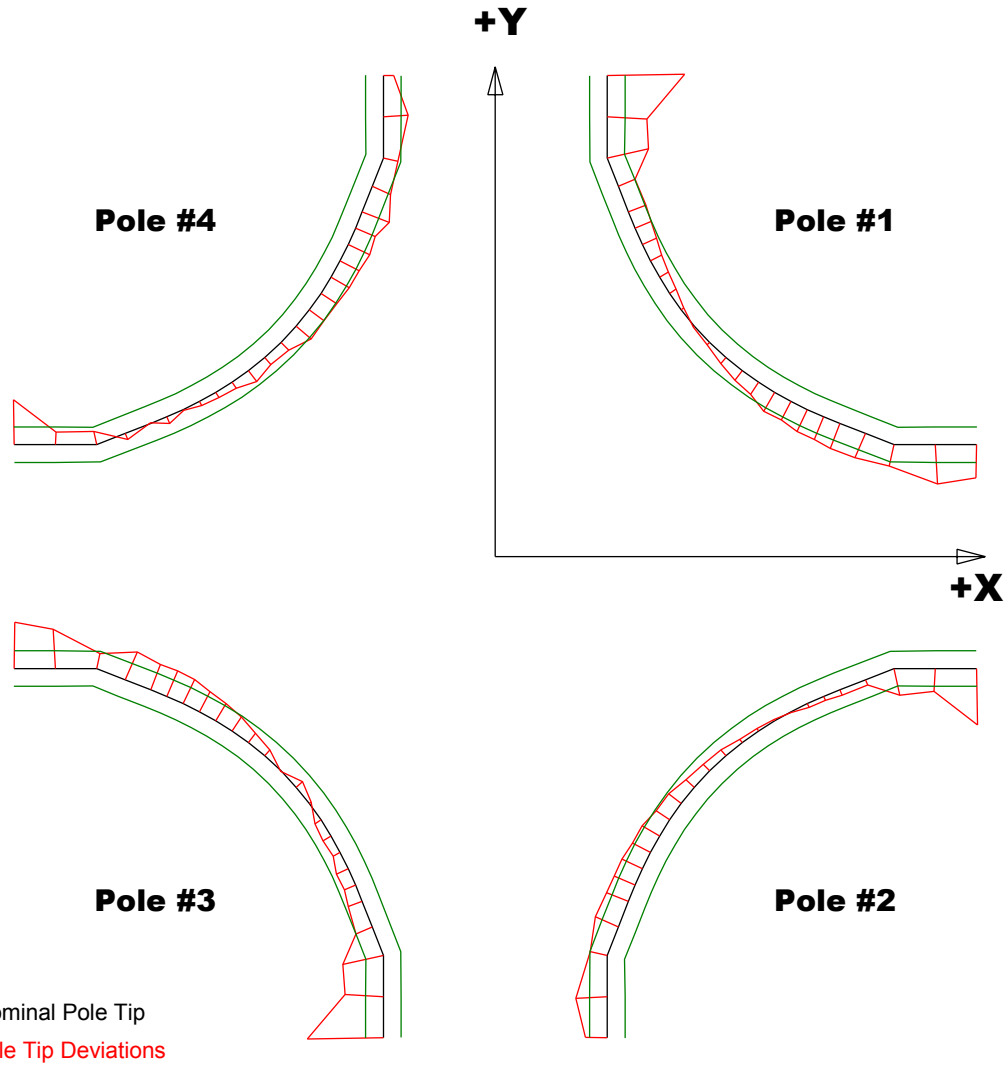
Composite Best-fit of Pole Tips, Downstream



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.	-0.00435	-0.00318	-0.00429	-0.00253
Max. Dev.	0.00222	0.00177	0.00261	0.00163

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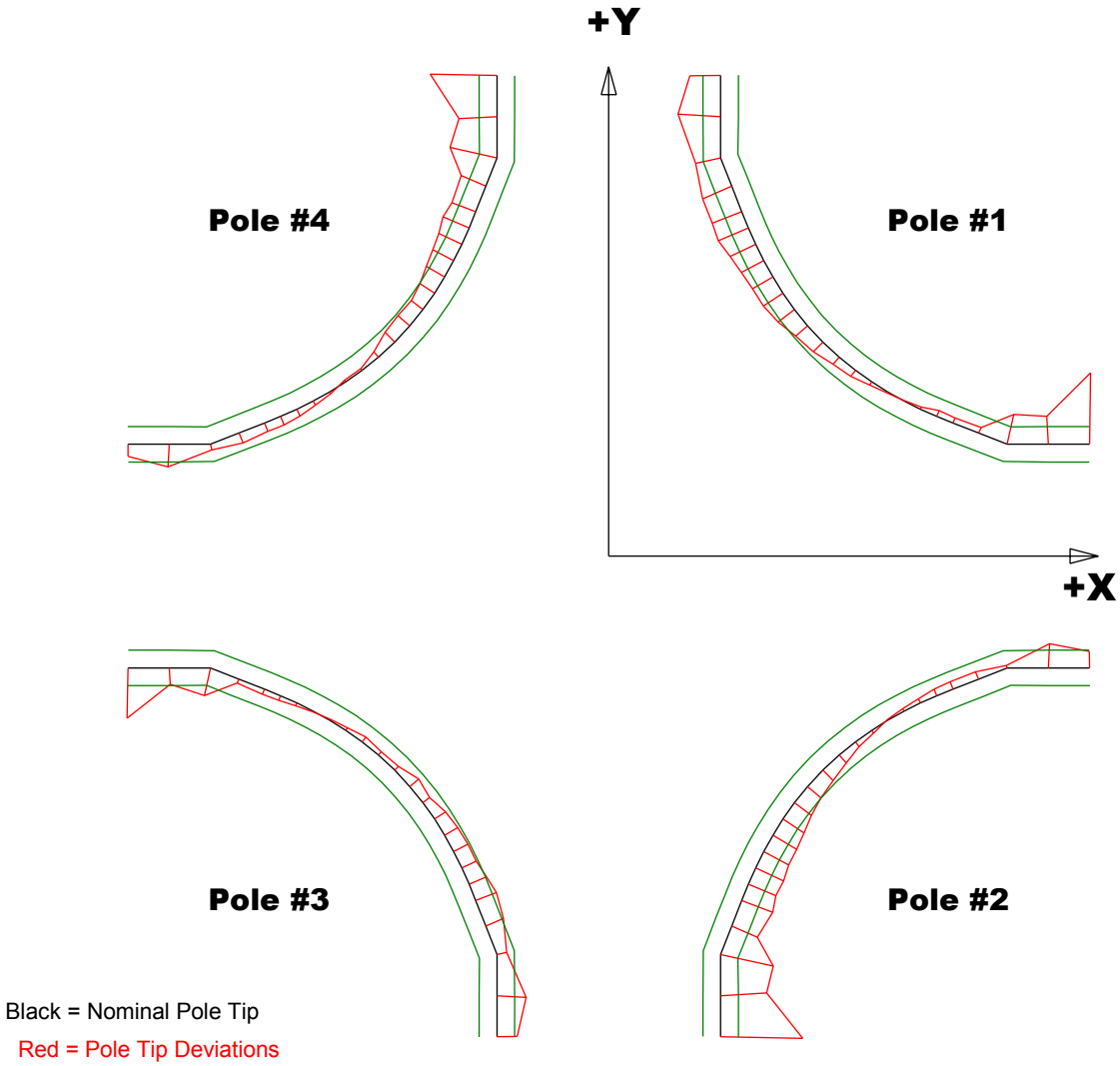
Composite Best-fit of Pole Tips, Upstream



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.	-0.00403	-0.00463	-0.00283	-0.00377
Max. Dev.	0.0024	0.00137	0.00165	0.00127

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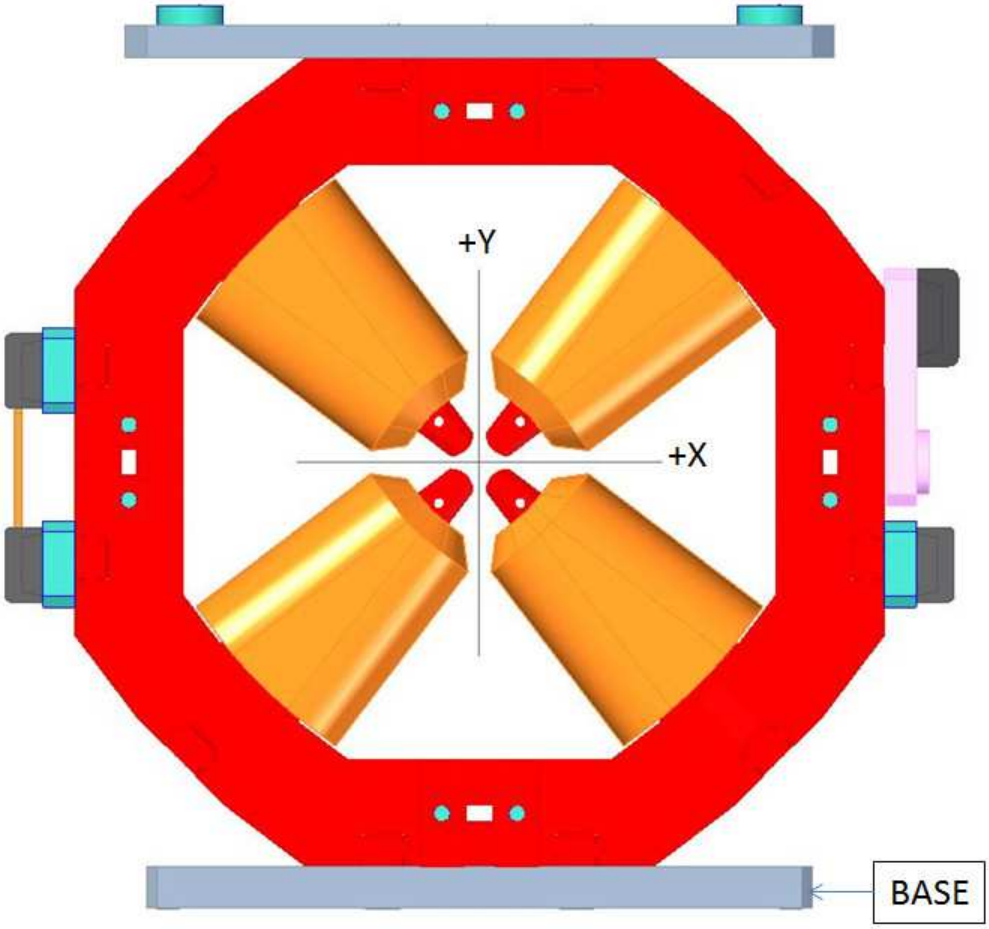
Angle of the Composite Pole Tip Best-Fit In Relation to Base



Angle in Decimal Degrees ° :0.00789

Angle in Milliradians :0.13768

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