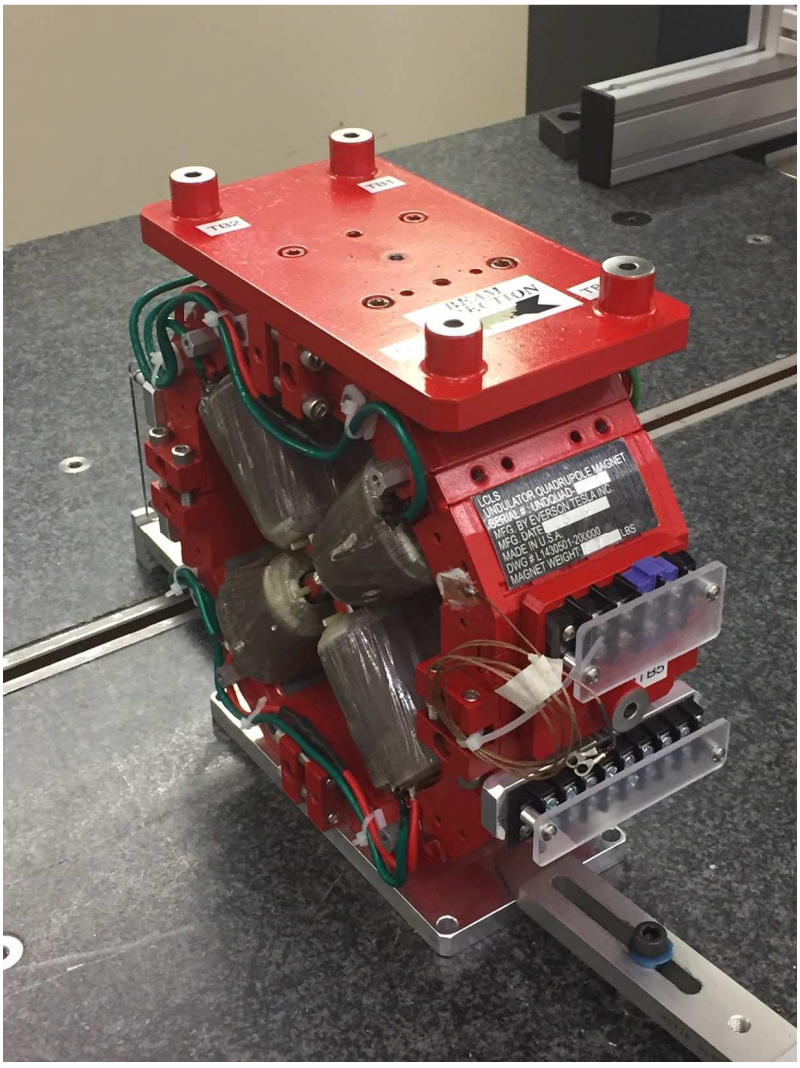
LCLS II Undulator Quadrupole Fiducialization Report



Inspector : K. Caban

Engineer : J. Amann

Drawing No. : SA-381-012-22

Barcode # : 4082

Mfg. S/N : 013

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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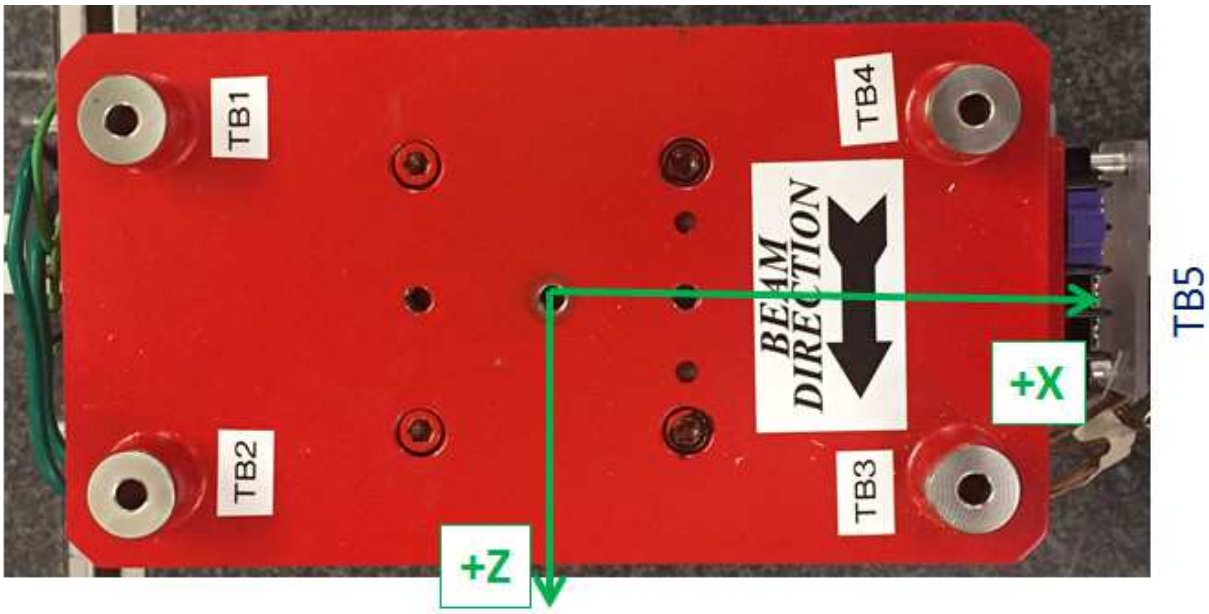
Tooling Ball Locations



Tooling Ball	X Coord.	Y Coord.	Z Coord.
TB 1	-3.36907	6.80963	-1.50023
TB 2	-3.38245	6.81035	1.49459
TB 3	3.36627	6.80708	1.52571
TB 4	3.38040	6.80571	-1.47456
TB 5	6.58901	0.12235	0.02005
TB A	-3.36823	6.12232	-1.50129
TB B	-3.38149	6.12257	1.49542
TB C	3.36788	6.11861	1.52501
TB D	3.38125	6.11772	-1.47390
TB E	5.90152	0.12468	0.02011

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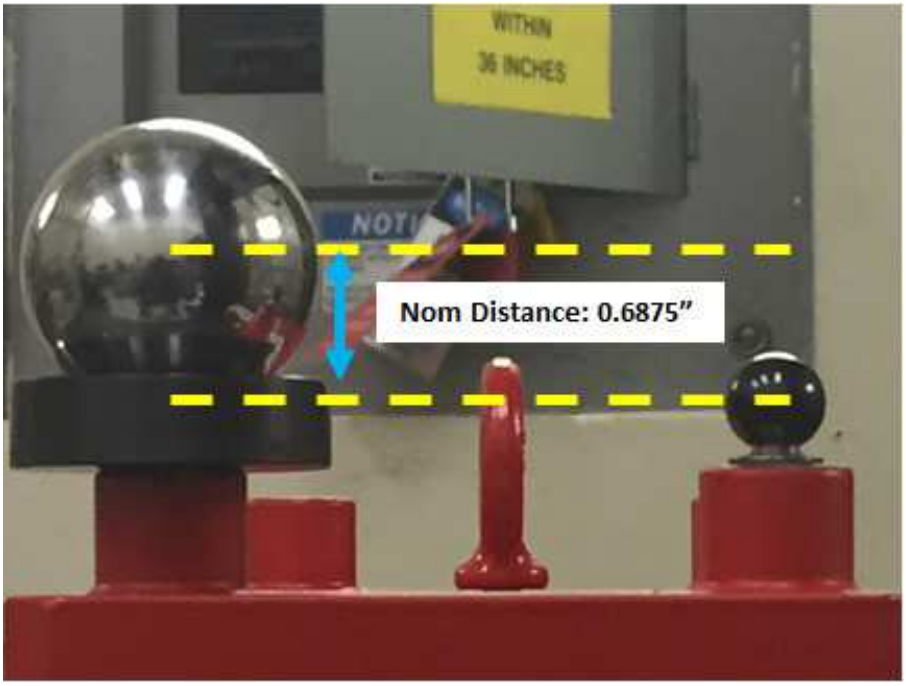
1" Tooling Ball to 5/16" Tooling Ball Difference



Tooling Ball	Nom Dist.	Actual Dist.
TB 1	0.6875 ± 0.001	0.68731
TB 2	0.6875 ± 0.001	0.68777
TB 3	0.6875 ± 0.001	0.68847
TB 4	0.6875 ± 0.001	0.68799
TB 5	0.6875 ± 0.001	0.6875

Dimensions in Inch

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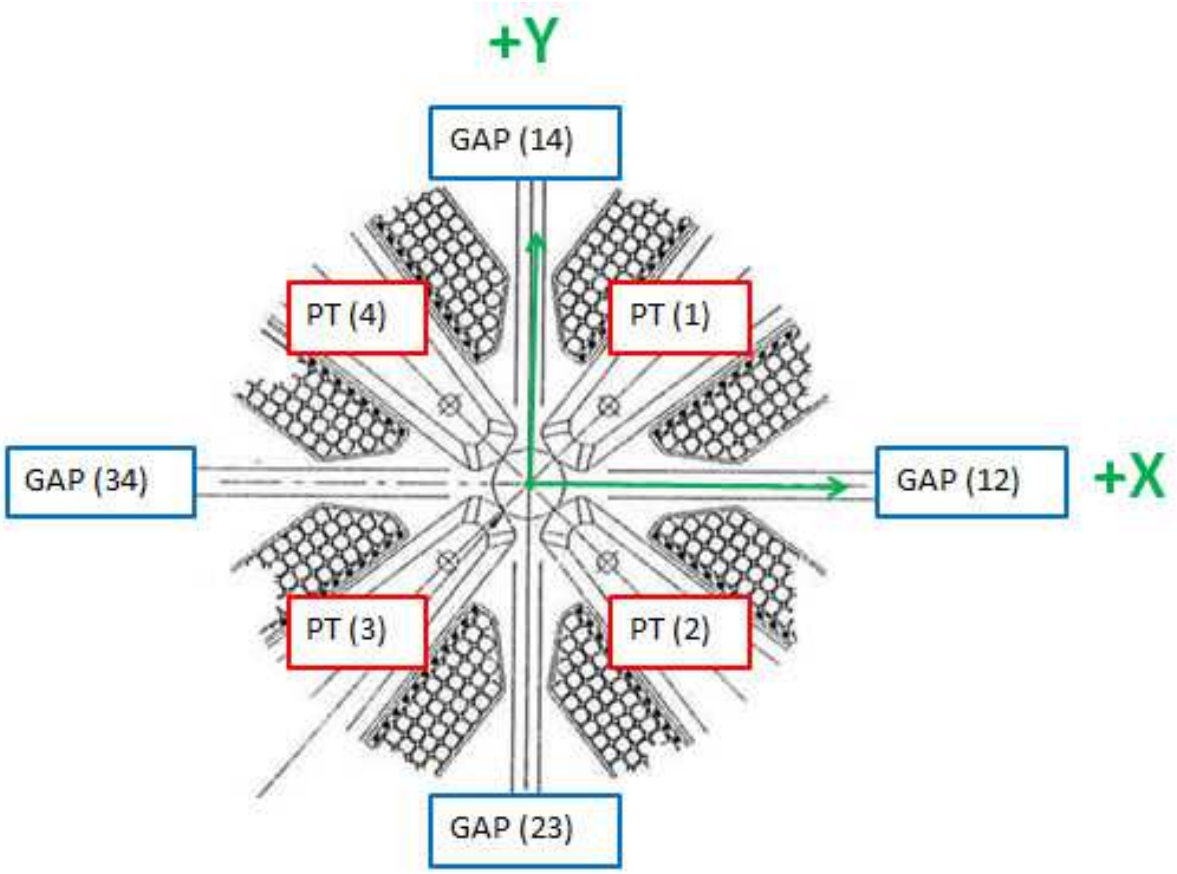
Pole Tip Gap Measurements



	Nominal Distance	Downstream Pole End	Upstream Pole End
Pole Tip Distance 1-3	0.433 ± .002	0.43406	0.43412
Pole Tip Distance 2-4	0.433 ± .002	0.43531	0.43417
Gap 1-2	0.159 ± .002	0.15856	0.15907
Gap 2-3	0.159 ± .002	0.16052	0.15938
Gap 3-4	0.159 ± .002	0.16103	0.15694
Gap 4-1	0.159 ± .002	0.15952	0.16299

Dimensions in Inch

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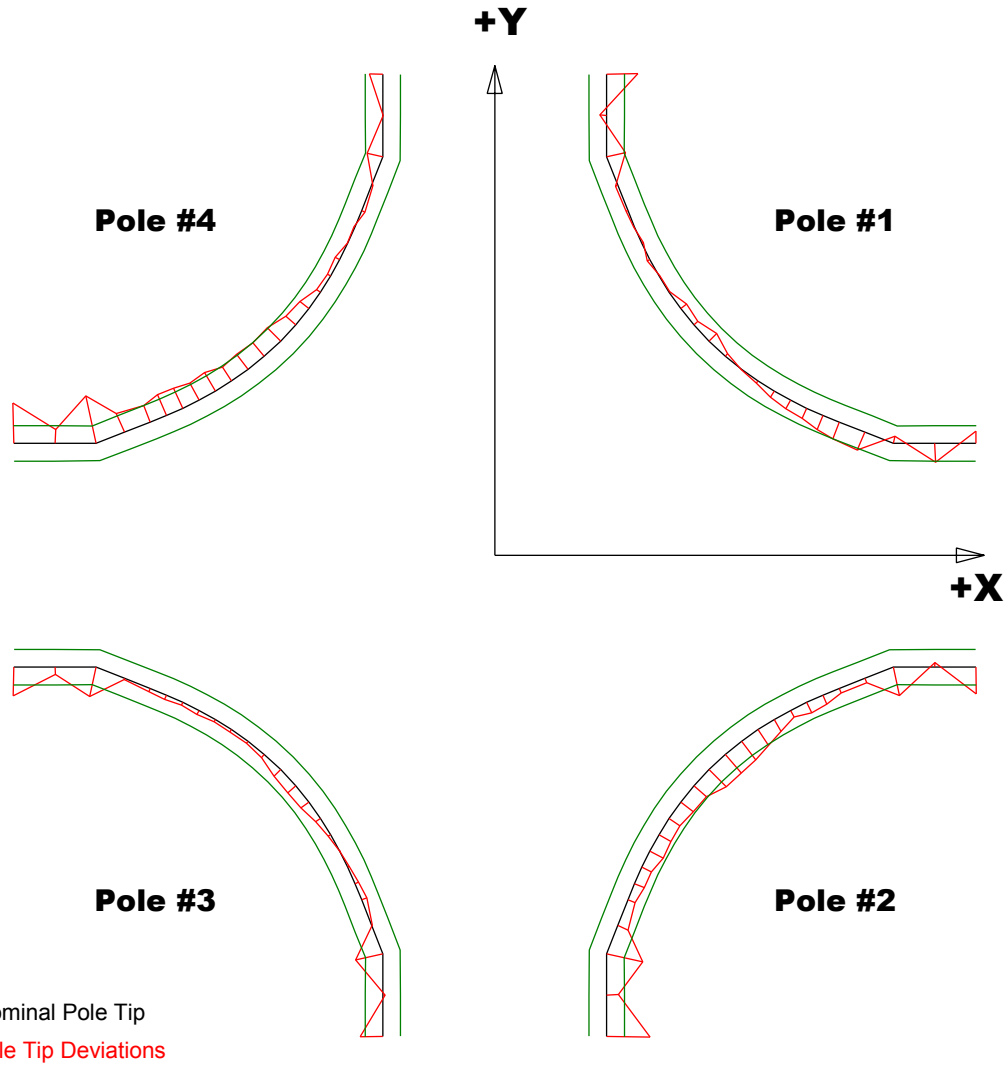
Composite Best-fit of Pole Tips, Downstream



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.	-0.00176	-0.00244	-0.00168	-0.00273
Max. Dev.	0.0011	0.00025	0.00032	0.00021

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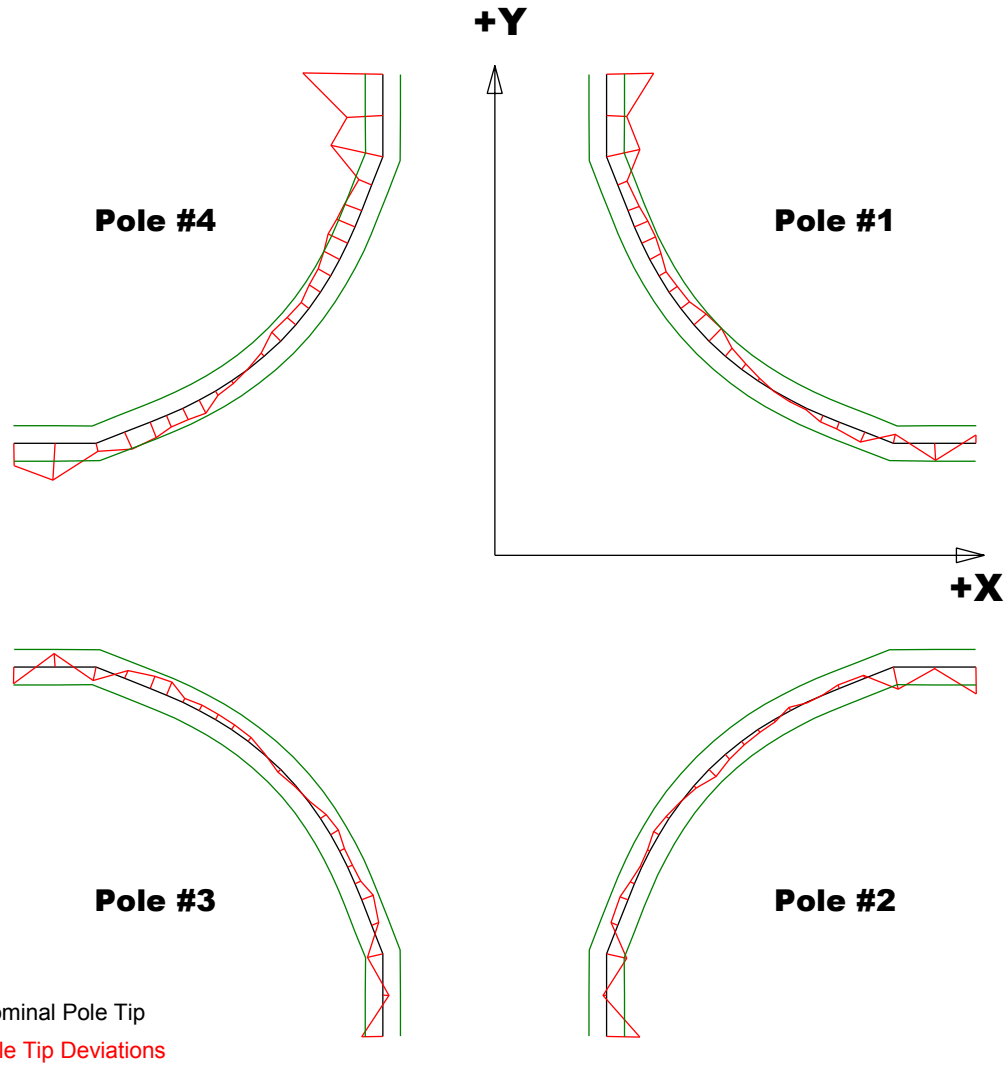
Composite Best-fit of Pole Tips, Upstream



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.	-0.00264	-0.00186	-0.00119	-0.00451
Max. Dev.	0.00094	0.00047	0.00079	0.00208

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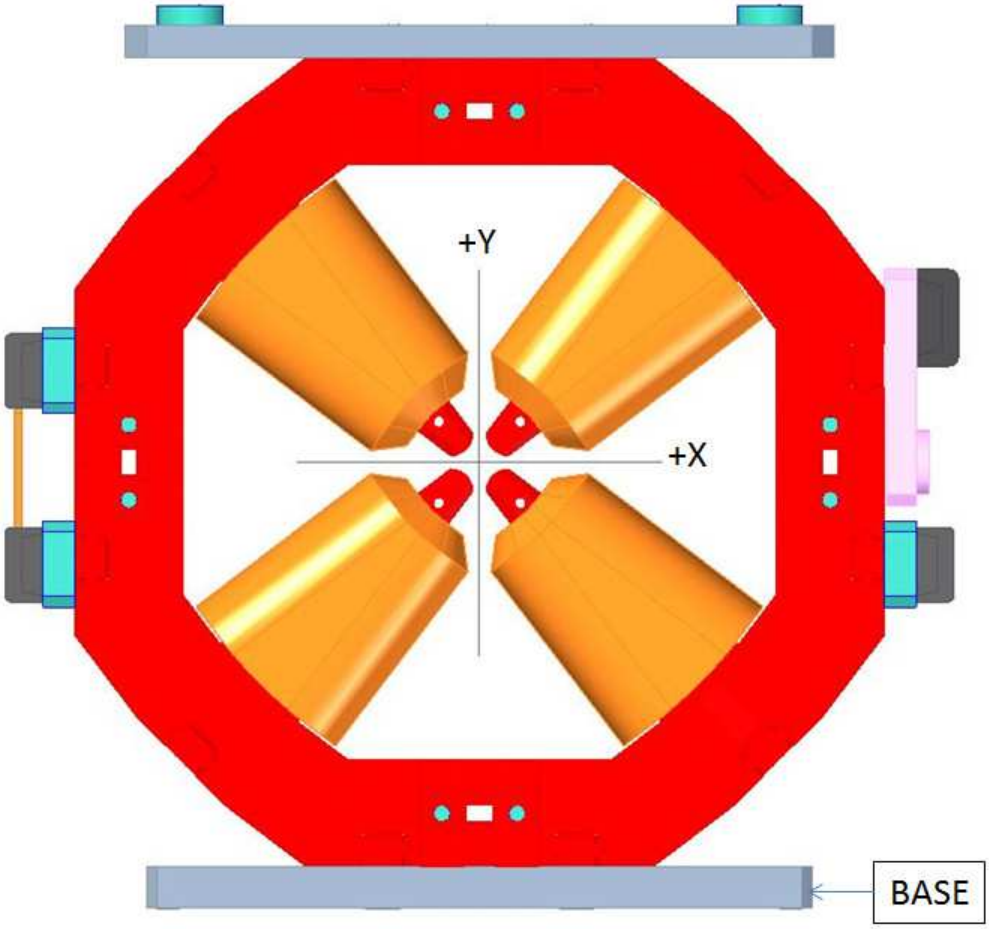
Angle of the Composite Pole Tip Best-Fit In Relation to Base



Angle in Decimal Degrees ° :-0.05231

Angle in Milliradians :-0.91297

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