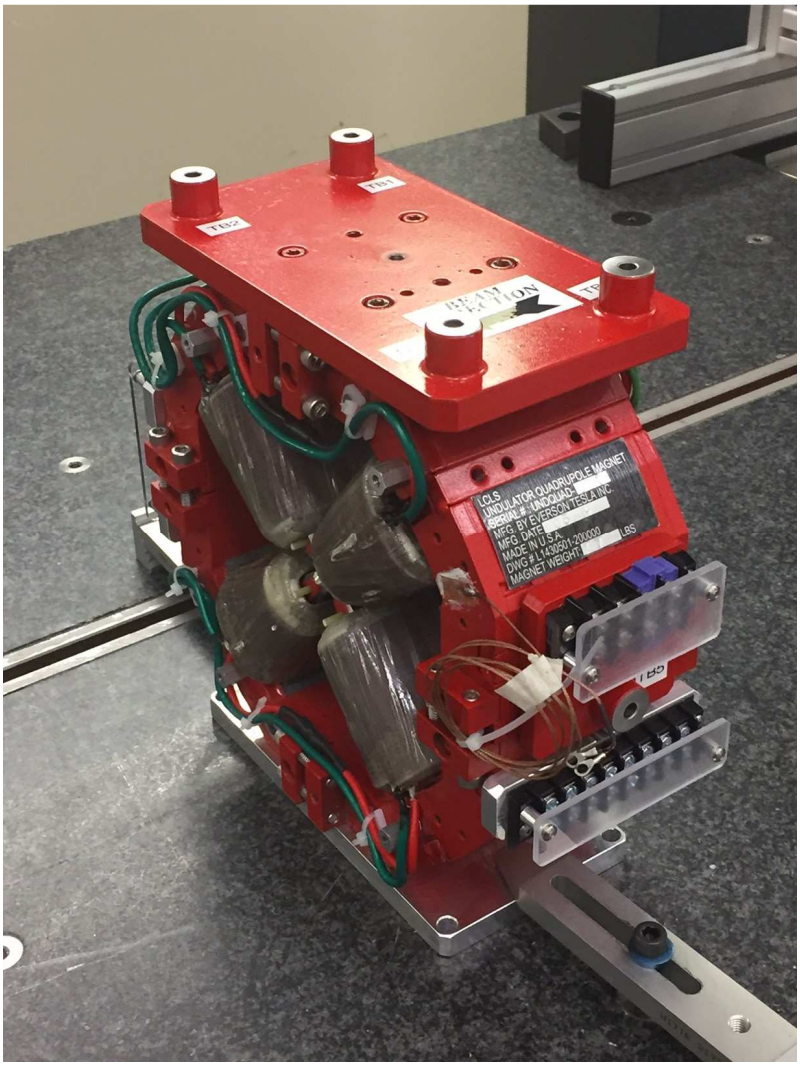
LCLS II Undulator Quadrupole Fiducialization Report



Inspector : K. Caban
Engineer : J. Amann
Drawing No. : SA-381-012-22
Barcode # : 4088
Mfg. S/N : 019

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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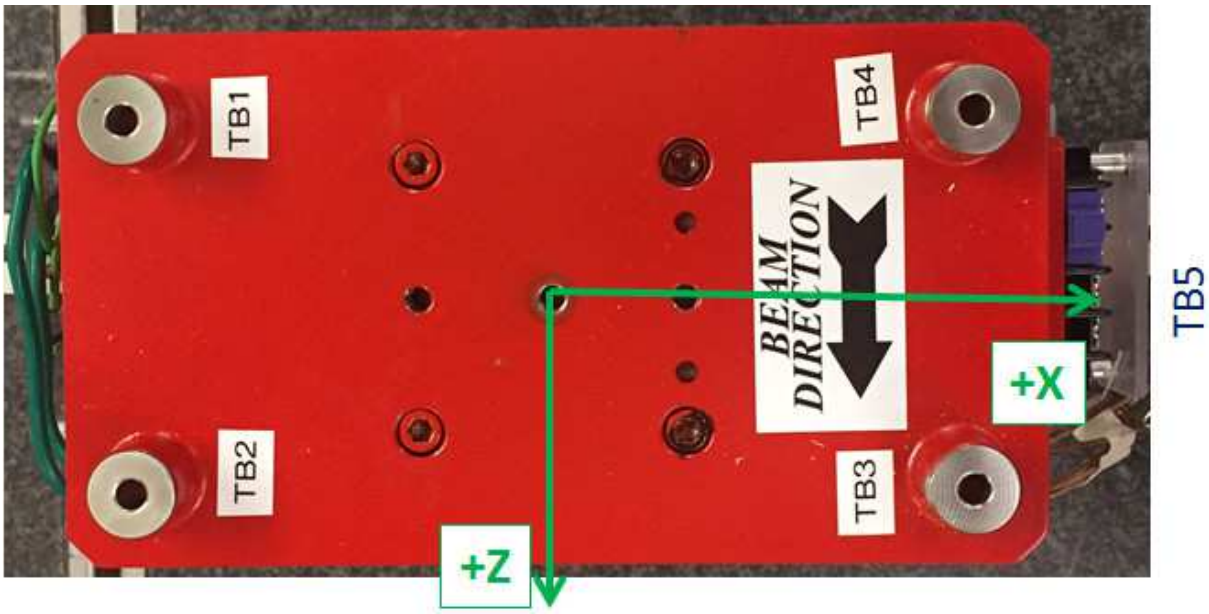
Tooling Ball Locations



Tooling Ball	X Coord.	Y Coord.	Z Coord.
TB 1	-3.37604	6.81106	-1.54065
TB 2	-3.37959	6.81025	1.45938
TB 3	3.36503	6.81795	1.46606
TB 4	3.36912	6.81883	-1.53730
TB 5	6.58805	0.13228	-0.03580
TB A	-3.37599	6.12393	-1.54068
TB B	-3.37996	6.12295	1.45933
TB C	3.36637	6.13071	1.46466
TB D	3.36999	6.13152	-1.53645
TB E	5.90117	0.13330	-0.03627

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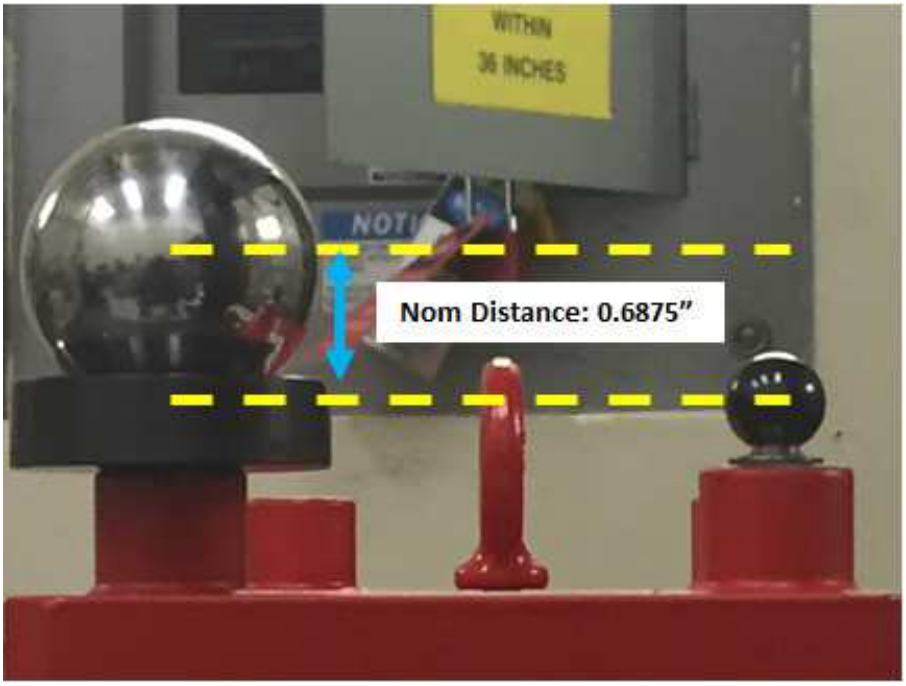
1" Tooling Ball to 5/16" Tooling Ball Difference



Tooling Ball	Nom Dist.	Actual Dist.
TB 1	0.6875 ± 0.001	0.68713
TB 2	0.6875 ± 0.001	0.6873
TB 3	0.6875 ± 0.001	0.68725
TB 4	0.6875 ± 0.001	0.68731
TB 5	0.6875 ± 0.001	0.68688

Dimensions in Inch

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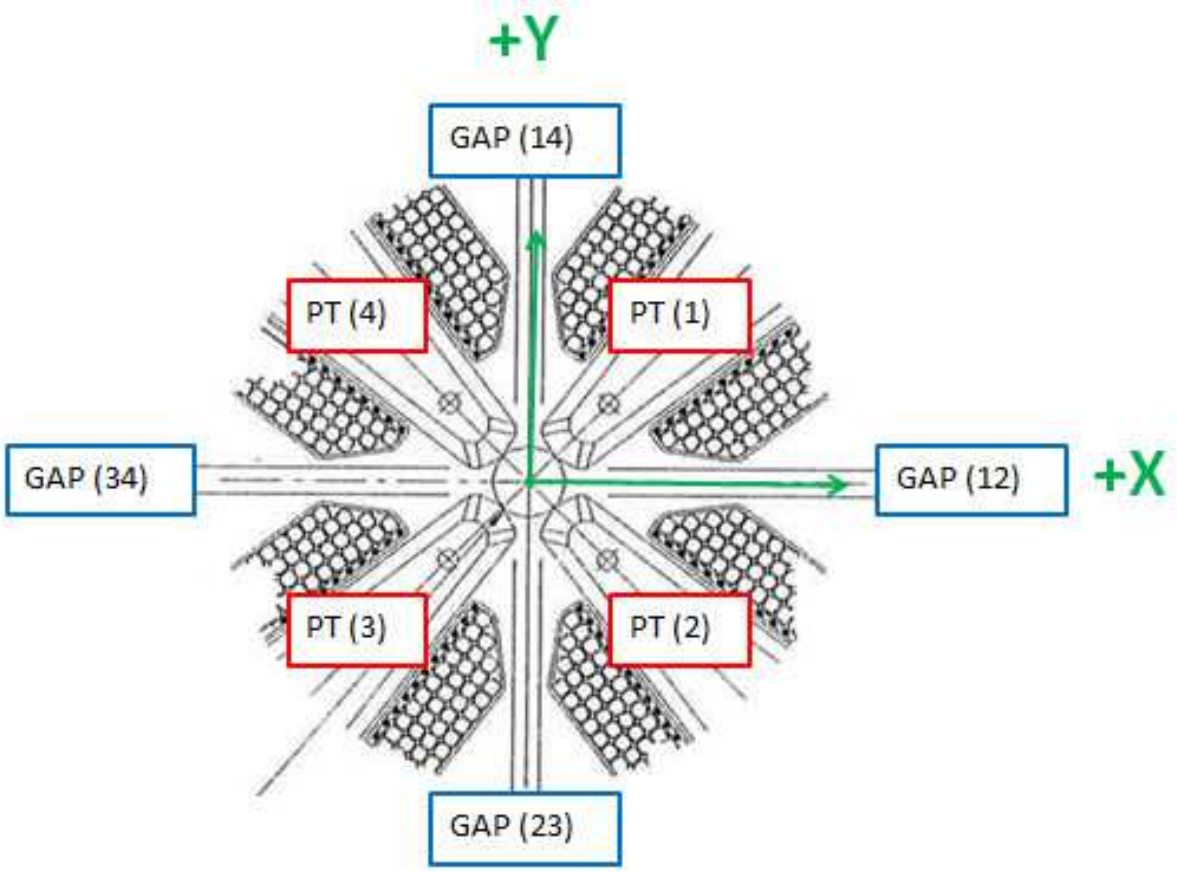
Pole Tip Gap Measurements



	Nominal Distance	Downstream Pole End	Upstream Pole End
Pole Tip Distance 1-3	0.433 ± .002	0.43432	0.43407
Pole Tip Distance 2-4	0.433 ± .002	0.4326	0.43379
Gap 1-2	0.159 ± .002	0.16089	0.16018
Gap 2-3	0.159 ± .002	0.16041	0.16021
Gap 3-4	0.159 ± .002	0.15848	0.16021
Gap 4-1	0.159 ± .002	0.15962	0.15877

Dimensions in Inch

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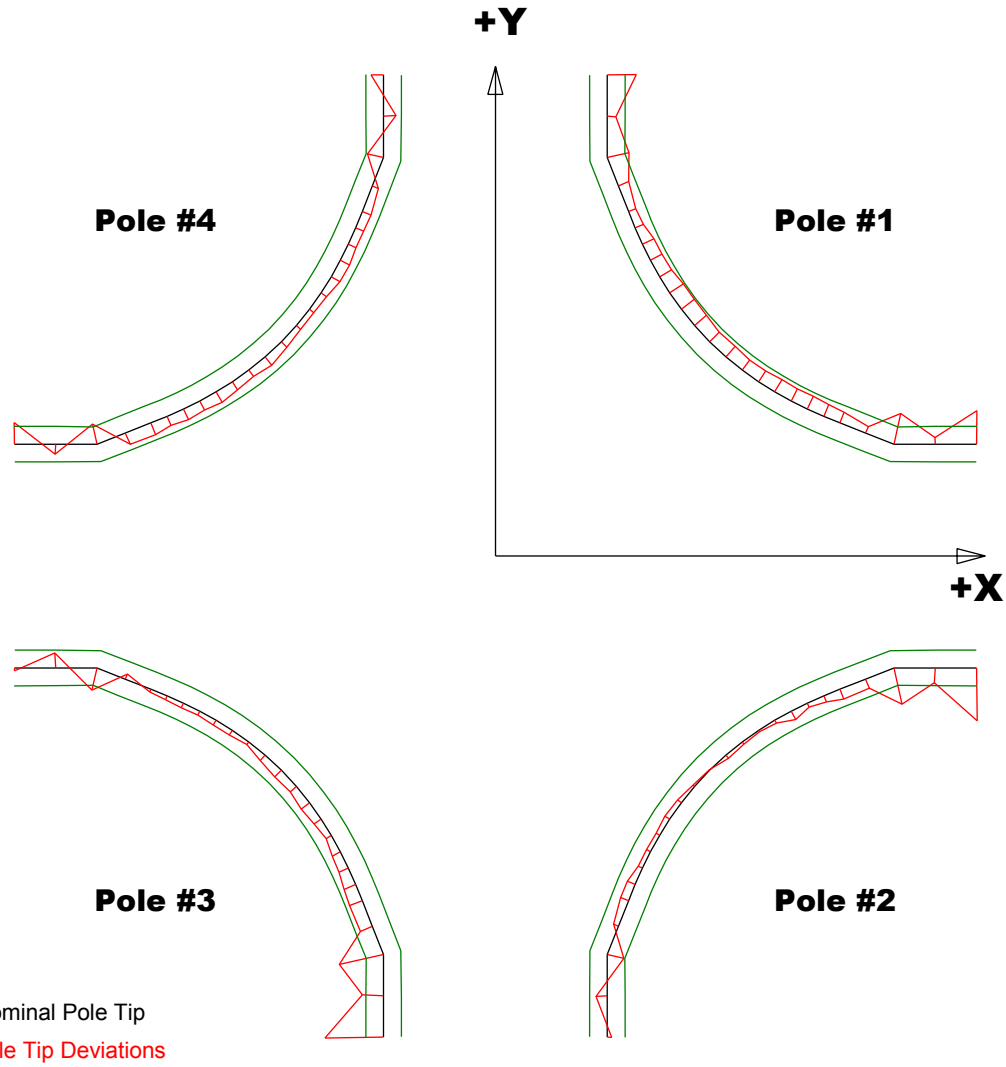
Composite Best-fit of Pole Tips, Downstream



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.	-0.00189	-0.00297	-0.0033	-0.00122
Max. Dev.	-0.00038	0.00064	0.00084	0.00072

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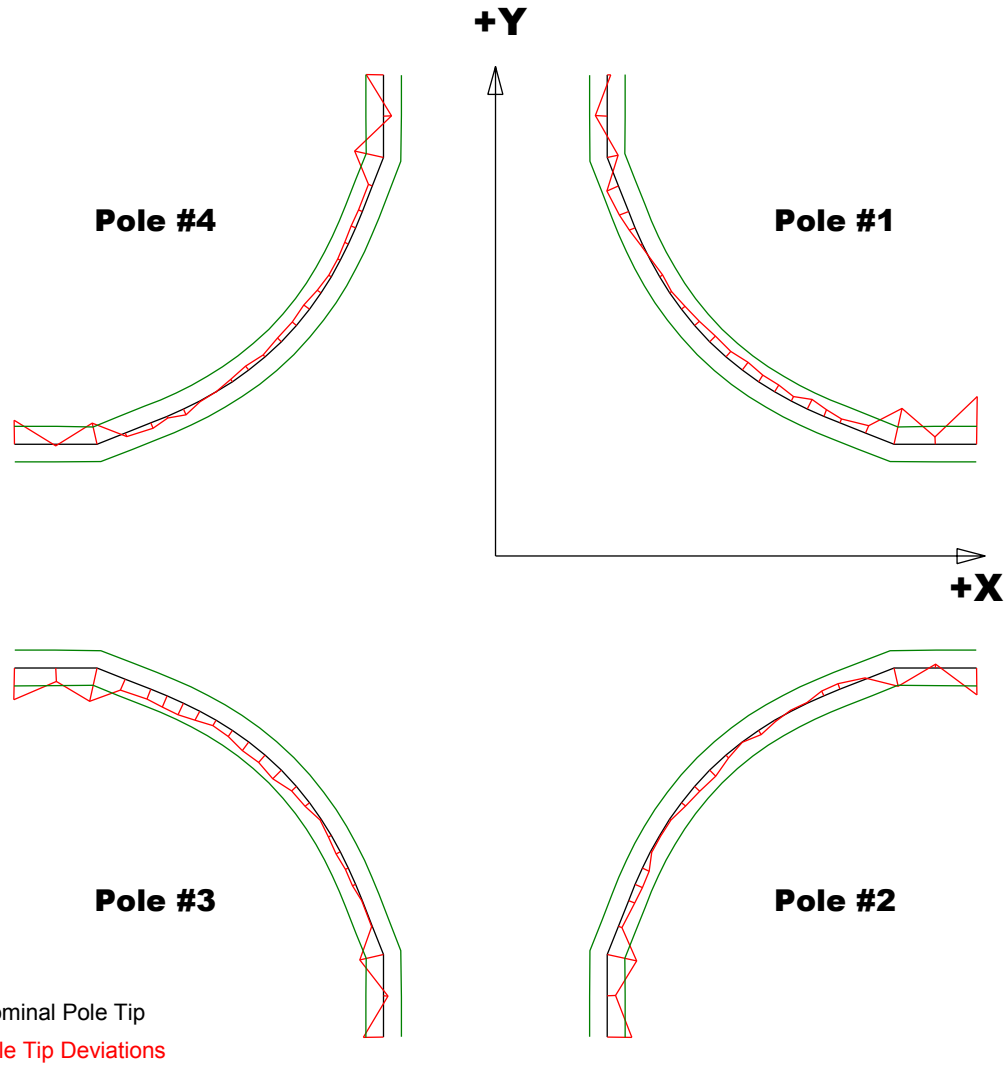
Composite Best-fit of Pole Tips, Upstream



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.	-0.00268	-0.00168	-0.00191	-0.00166
Max. Dev.	0.00071	0.00033	0.00024	0.00045

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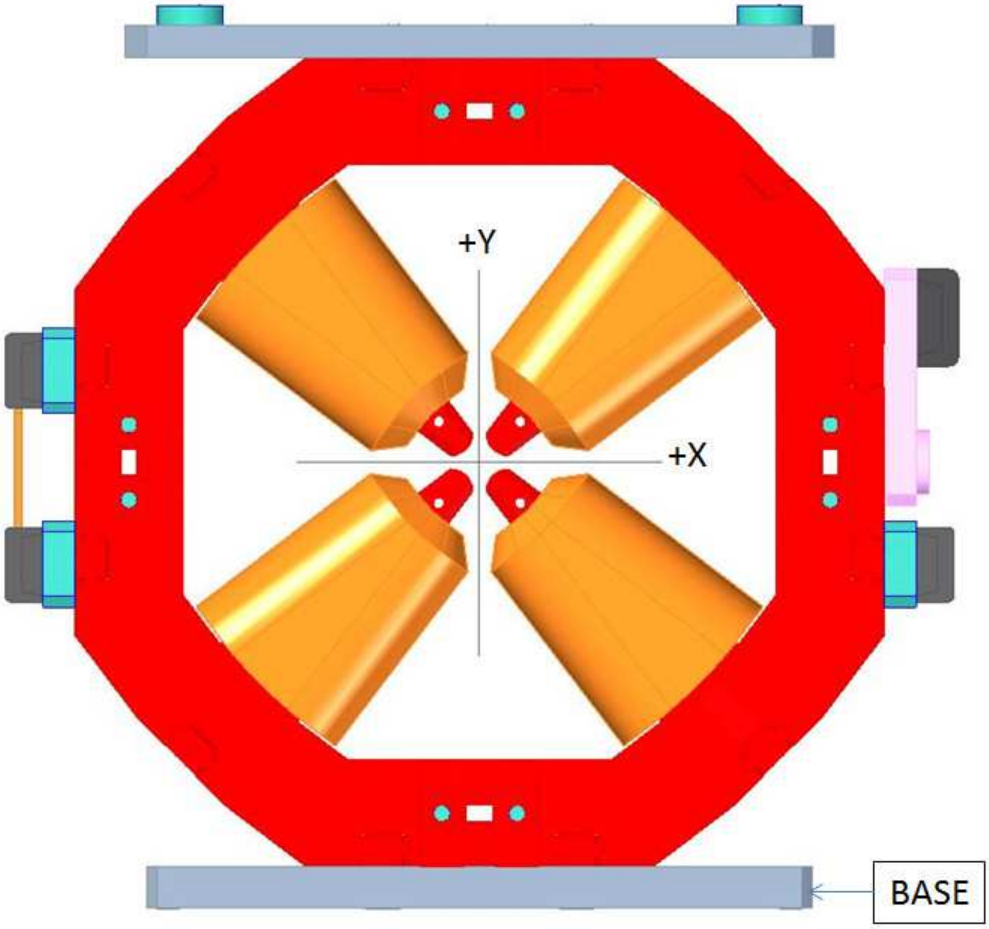
Angle of the Composite Pole Tip Best-Fit In Relation to Base



Angle in Decimal Degrees ° :-0.07410

Angle in Milliradians :-1.29329

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