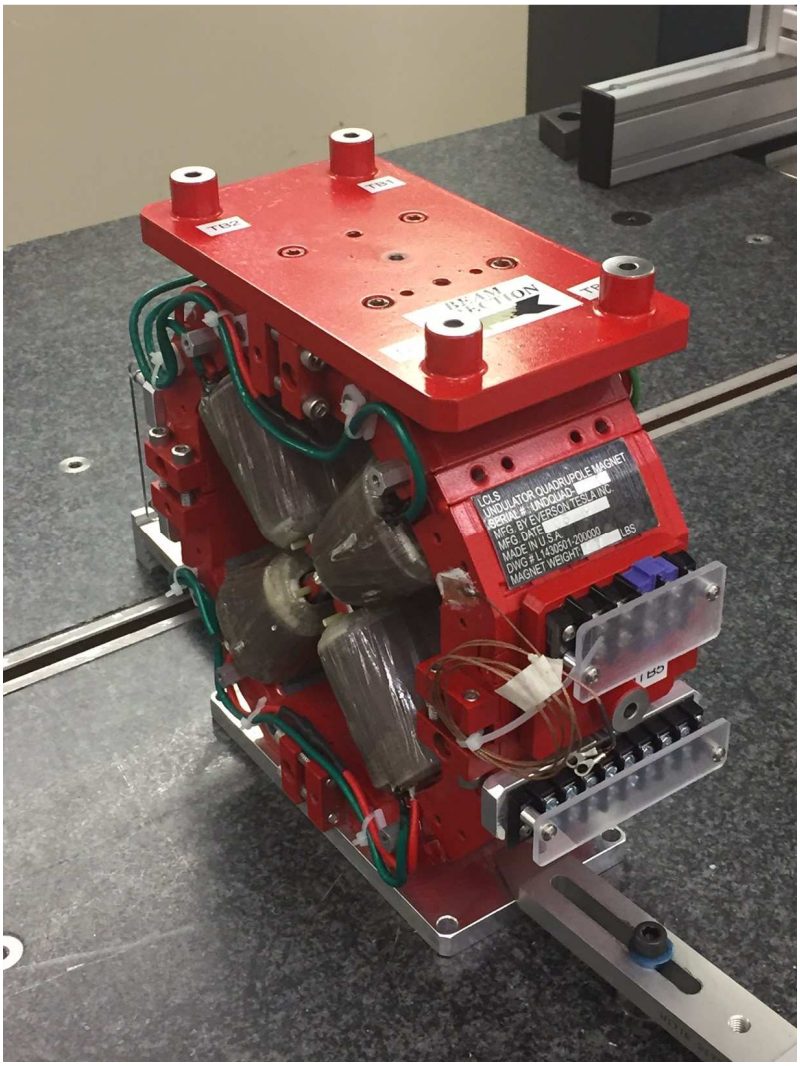
LCLS II Undulator Quadrupole Fiducialization Report



Inspector : K. Caban

Engineer : J. Amann

Drawing No. : SA-381-012-22

Barcode # : 4066

Mfg. S/N : 030

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.

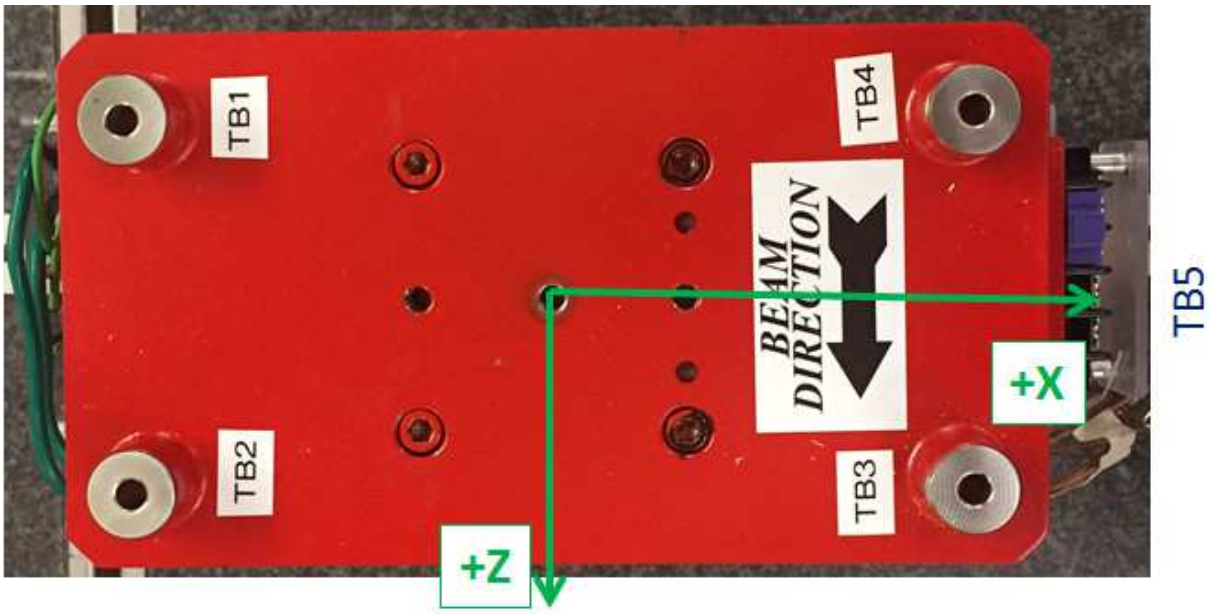
Coordinate Origins

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.

Barcode # : 4066

Mfg. S/N : 030

Tooling Ball Locations



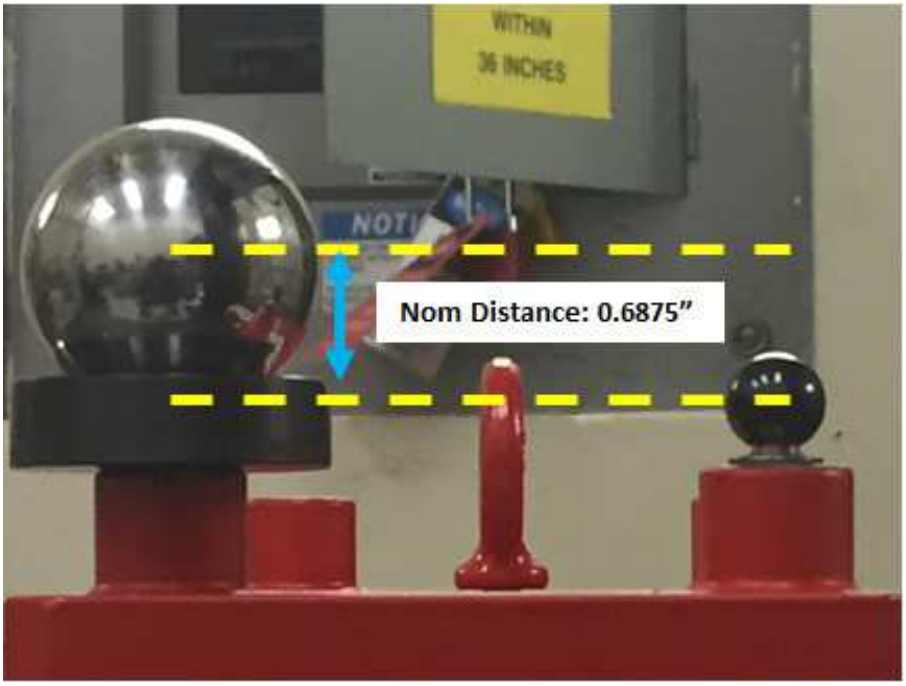
Tooling Ball	X Coord.	Y Coord.	Z Coord.
TB 1	-3.35529	6.81809	-1.51626
TB 2	-3.39004	6.81573	1.48364
TB 3	3.35349	6.81891	1.55638
TB 4	3.39144	6.81937	-1.44088
TB 5	6.59082	0.12745	0.03352
TB A	-3.35586	6.13049	-1.51727
TB B	-3.39122	6.12743	1.48162
TB C	3.35468	6.13076	1.55808
TB D	3.39001	6.13006	-1.44083
TB E	5.90191	0.12939	0.03150

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

Barcode # : 4066

Mfg. S/N : 030

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



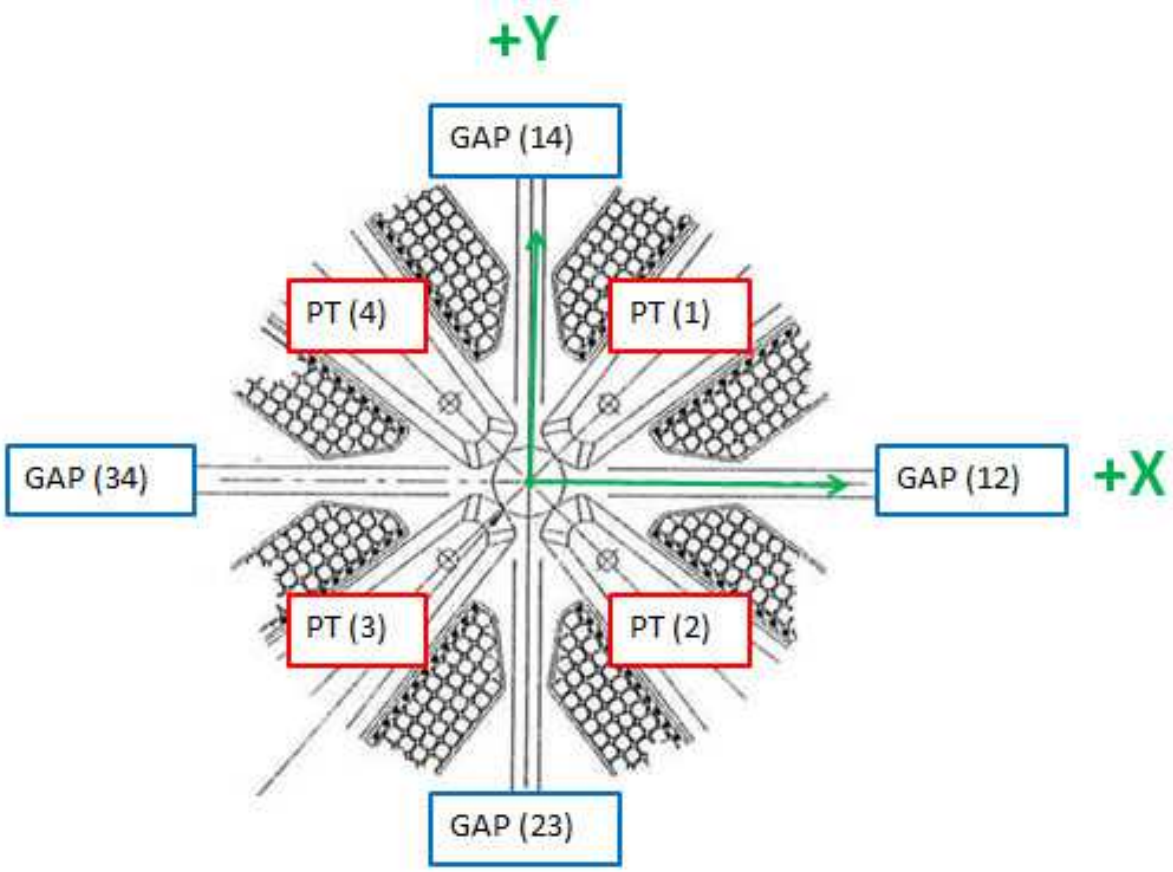
Tooling Ball	Nom Dist.	Actual Dist.
TB 1	0.6875 ± 0.001	0.6876
TB 2	0.6875 ± 0.001	0.6883
TB 3	0.6875 ± 0.001	0.68815
TB 4	0.6875 ± 0.001	0.68931
TB 5	0.6875 ± 0.001	0.68892

Dimensions in Inch

Barcode # : 4066

Mfg. S/N : 030

Pole Tip Gap Measurements



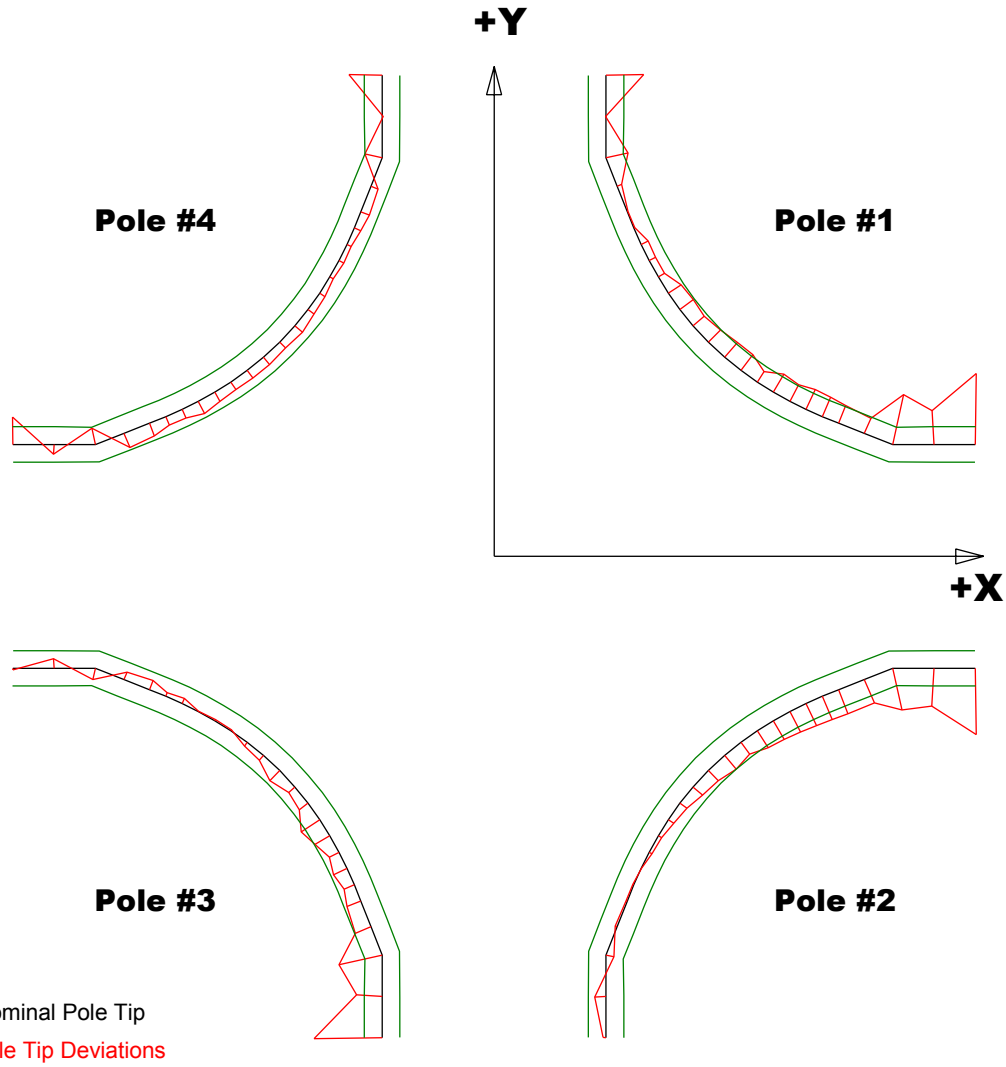
	Nominal Distance	Downstream Pole End	Upstream Pole End
Pole Tip Distance 1-3	0.433 ± .002	0.43475	0.43349
Pole Tip Distance 2-4	0.433 ± .002	0.43331	0.43296
Gap 1-2	0.159 ± .002	0.16371	0.15782
Gap 2-3	0.159 ± .002	0.16055	0.15961
Gap 3-4	0.159 ± .002	0.15849	0.16132
Gap 4-1	0.159 ± .002	0.1599	0.16089

Dimensions in Inch

Barcode # : 4066

Mfg. S/N : 030

Composite Best-fit of Pole Tips, Downstream



Black = Nominal Pole Tip

Red = Pole Tip Deviations

Green = +/- .001 Tolerance

Dimensions in Inch

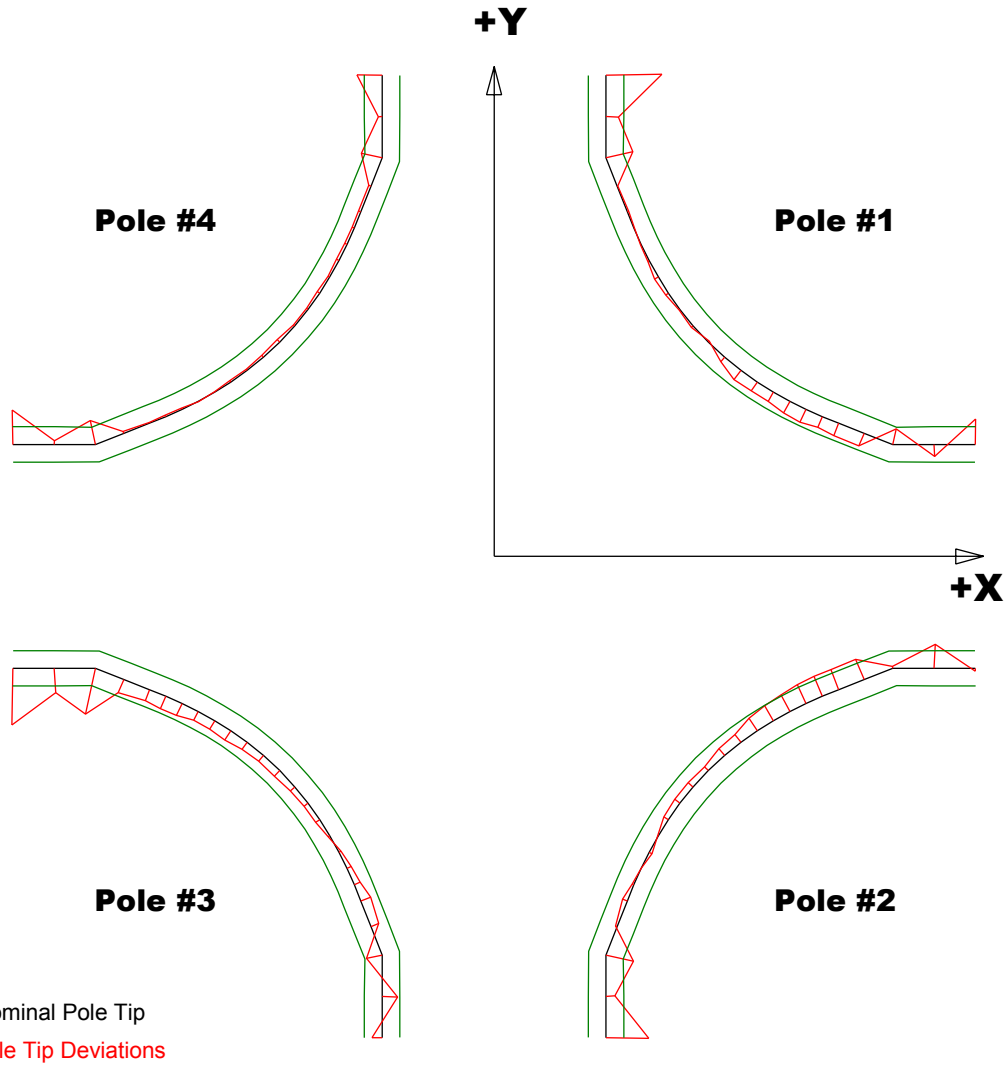
Pole Tip Deviations

Pole Tip	#1	#2	#3	#4
Min. Dev.	-0.004	-0.00372	-0.00383	-0.00187
Max. Dev.	0.00003	0.00064	0.00054	0.00088

Barcode # : 4066

Mfg. S/N : 030

Composite Best-fit of Pole Tips, Upstream



Black = Nominal Pole Tip
Red = Pole Tip Deviations
Green = +/- .001 Tolerance

Dimensions in Inch

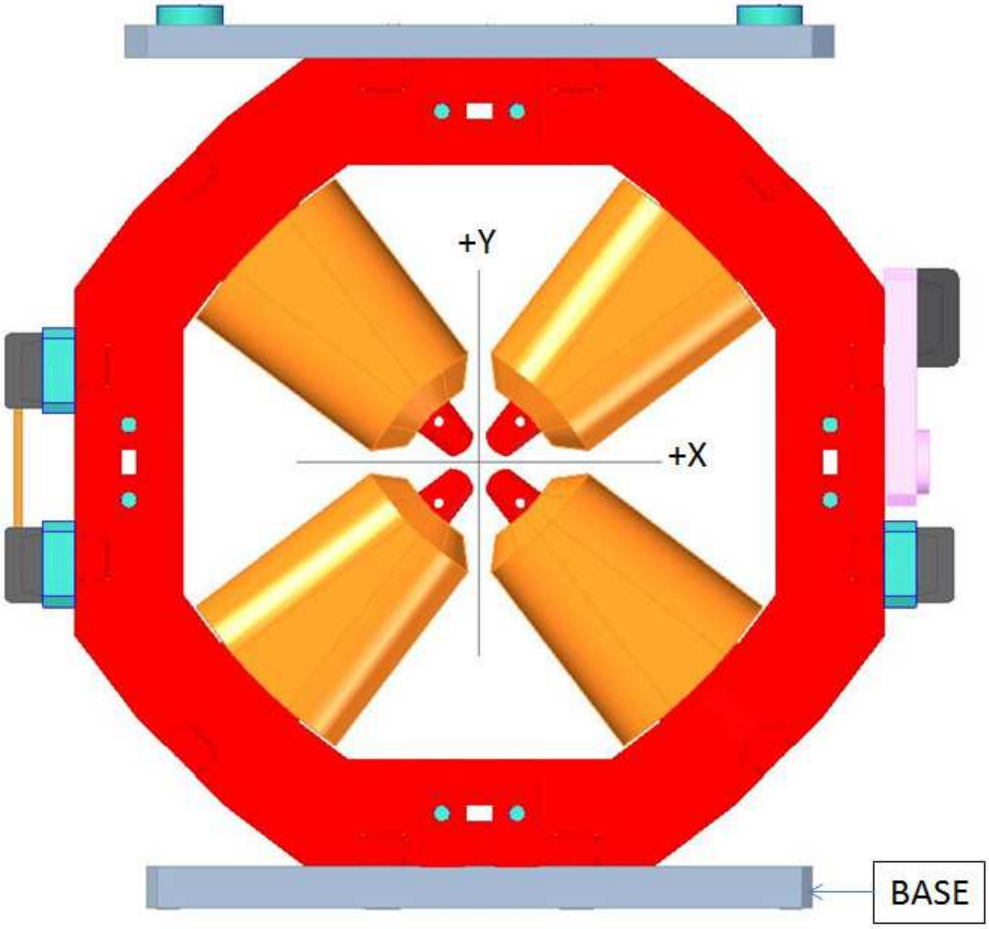
Pole Tip Deviations

Pole Tip	#1	#2	#3	#4
Min. Dev.	-0.00314	-0.00241	-0.00319	-0.00195
Max. Dev.	0.0008	0.00136	0.00088	0.00003

Barcode # : 4066

Mfg. S/N : 030

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



Angle in Decimal Degrees ° :-0.02716

Angle in Milliradians :-0.47404

Barcode # : 4066

Mfg. S/N : 030