LCLS II Quadrupole Fiducialization Report
1.51Q7.0 Quadrupole Magnet (Refurbish)

Inspector : K. Caban
Engineer : J. Amann
Drawing No. : SA-902-708-54
Barcode # : 4069
Mfg. S/N : 1.5Q7-4

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 0.367 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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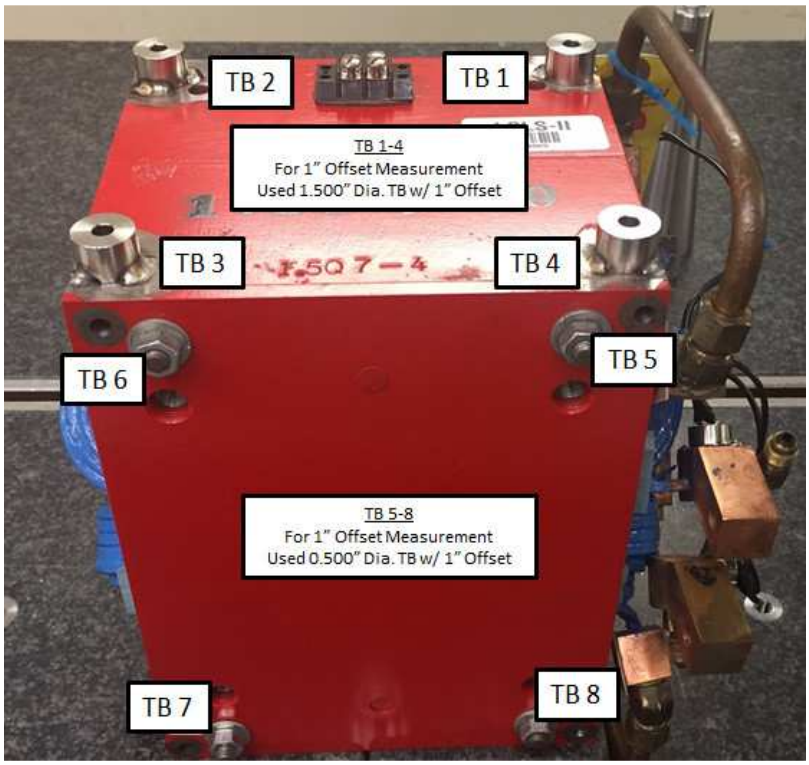
Tooling Ball Locations @ 1.000 in. Offset



Tooling Ball	X Coord.	Y Coord.	Z Coord.
TB 1	-2.4672	6.1164	-3.0413
TB 2	-2.4784	6.1166	3.0383
TB 3	2.4156	6.1238	3.0636
TB 4	2.4300	6.1205	-3.0660
TB 5	4.1321	4.2621	-3.2219
TB 6	4.1336	4.2367	3.1189
TB 7	4.1413	-4.3399	3.2045
TB 8	N/A	N/A	N/A

Dimensions in Inch

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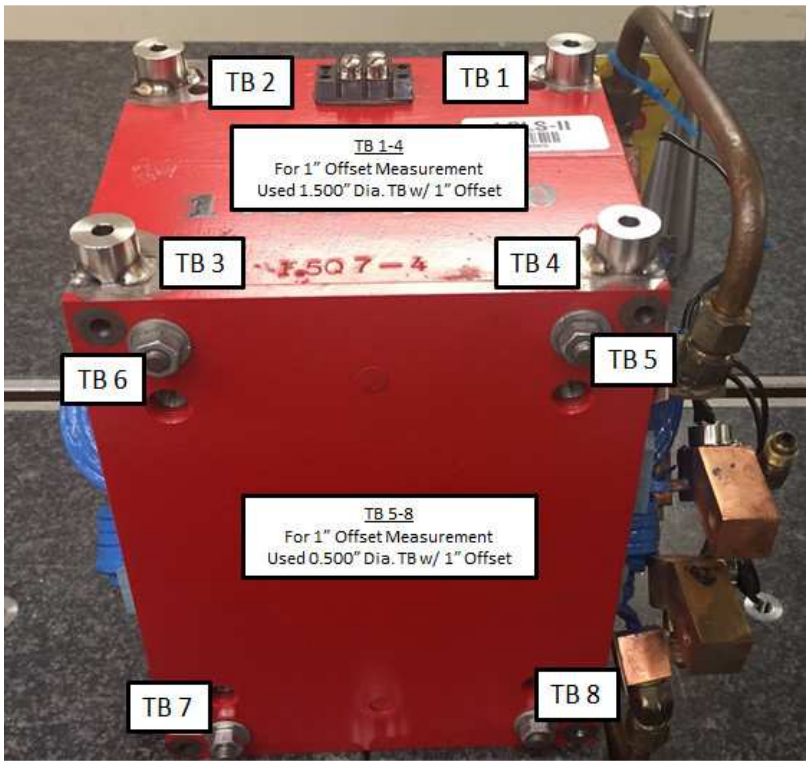
Tooling Ball Locations @ 0.3125 in. Offset



Tooling Ball	X Coord.	Y Coord.	Z Coord.
TB 1	-2.4644	5.4298	-3.0431
TB 2	-2.4754	5.4291	3.0380
TB 3	2.4188	5.4369	3.0652
TB 4	2.4293	5.4333	-3.0672
TB 5	3.4418	4.2730	-3.2242
TB 6	3.4438	4.2460	3.1223
TB 7	3.4530	-4.3442	3.2064
TB 8	N/A	N/A	N/A

Tooling Ball Locations are 5/16 inch above Tooling Ball Adapter Plane
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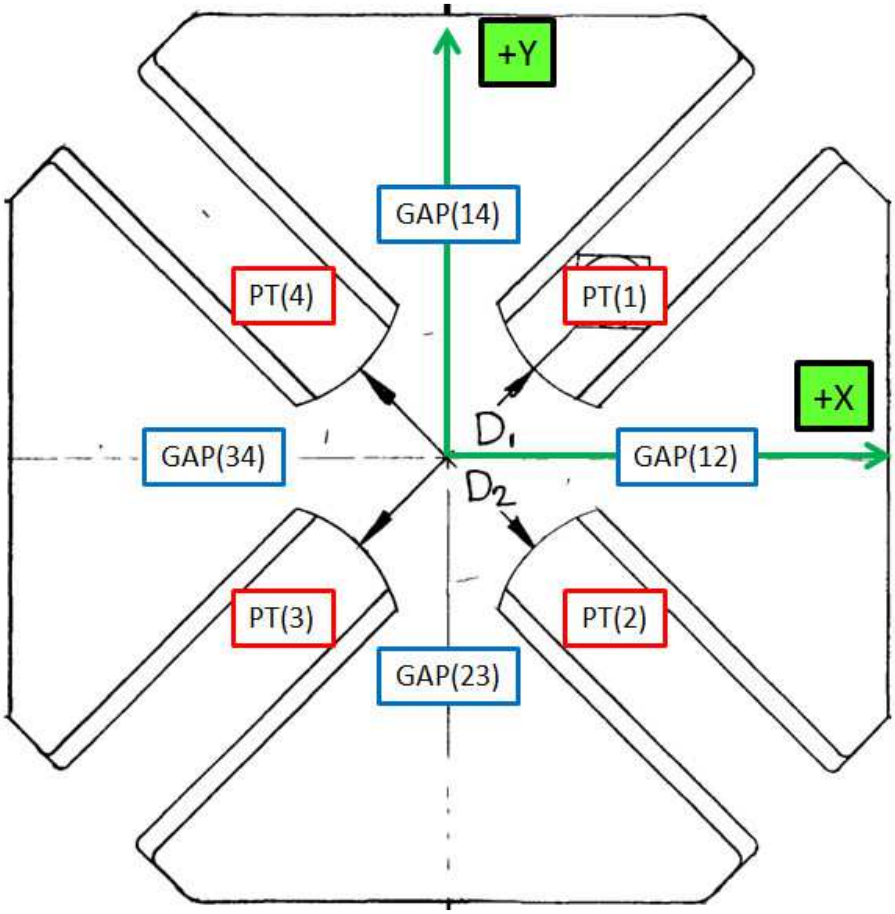
Pole Tip Gap Measurements



	Nominal Distance	Downstream Pole End	Upstream Pole End
Pole Tip Distance 1-3	1.510± .001	1.51354	1.51148
Pole Tip Distance 2-4	1.510 ± .001	1.50991	1.51274
Gap 1-2	0.6154 ± .001	0.61461	0.61508
Gap 2-3	0.6154 ± .001	0.62451	0.62374
Gap 3-4	0.6154 ± .001	0.61171	0.61325
Gap 4-1	0.6154 ± .001	0.61811	0.61926

Dimensions in Inch

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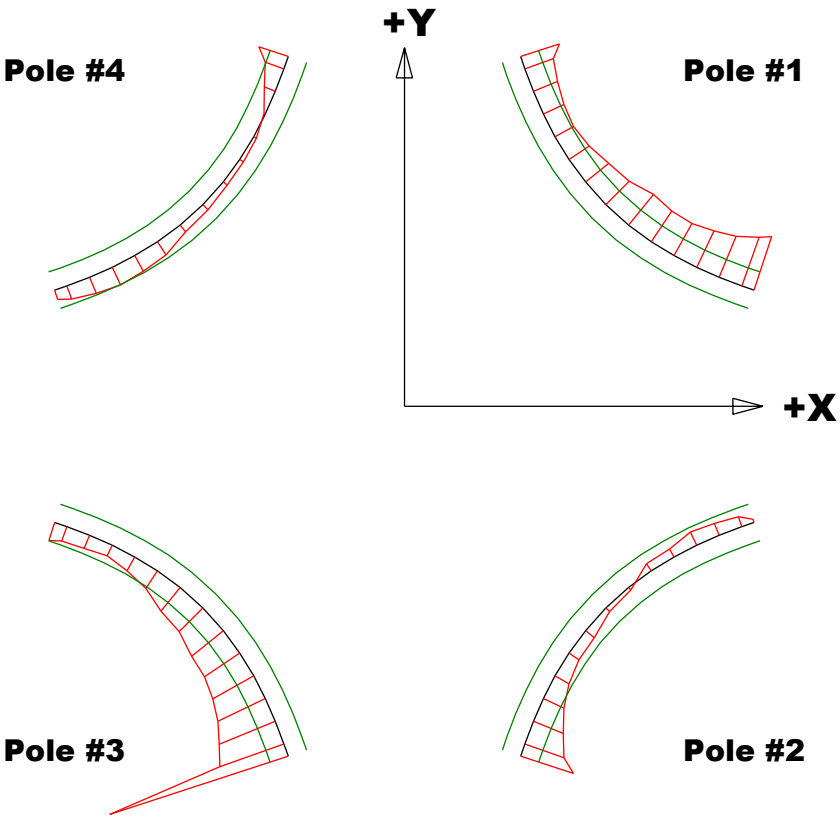
Composite Best-fit of Pole Tips, Downstream



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.	-0.00294	-0.00291	-0.00978	-0.00161
Max. Dev.	-0.0011	0.00077	-0.0006	0.00102

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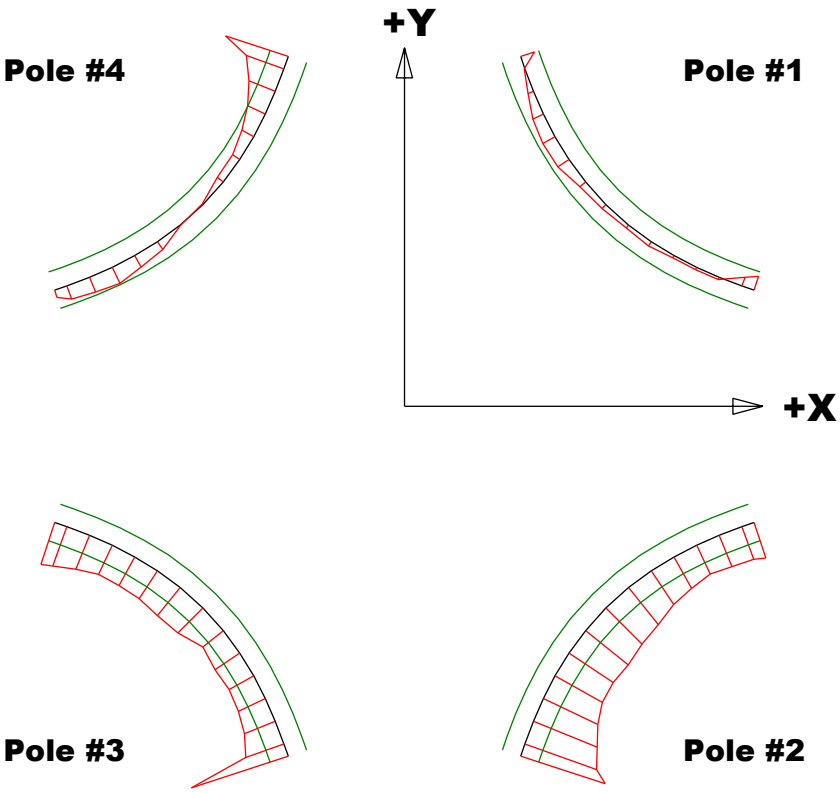
Composite Best-fit of Pole Tips, Upstream



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.	-0.00077	-0.00465	-0.00532	-0.00343
Max. Dev.	0.00073	-0.00166	-0.00136	0.00092

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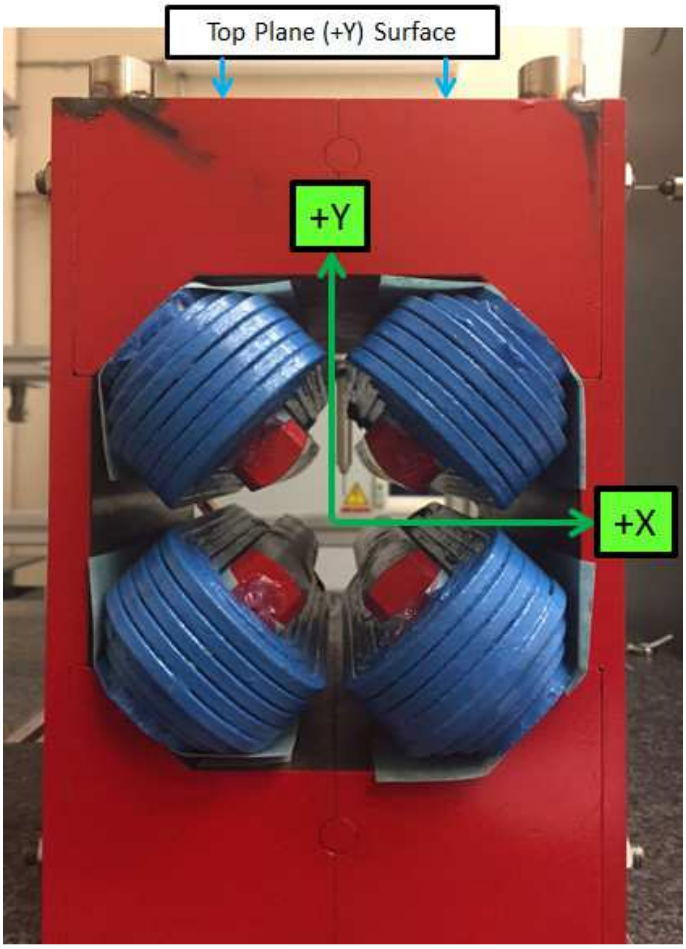
Angle of the Composite Pole Tip Best-Fit In Relation to Top (+Y Plane)



Angle in Decimal Degrees ° :-0.05090

Angle in Milliradians :-0.88835

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