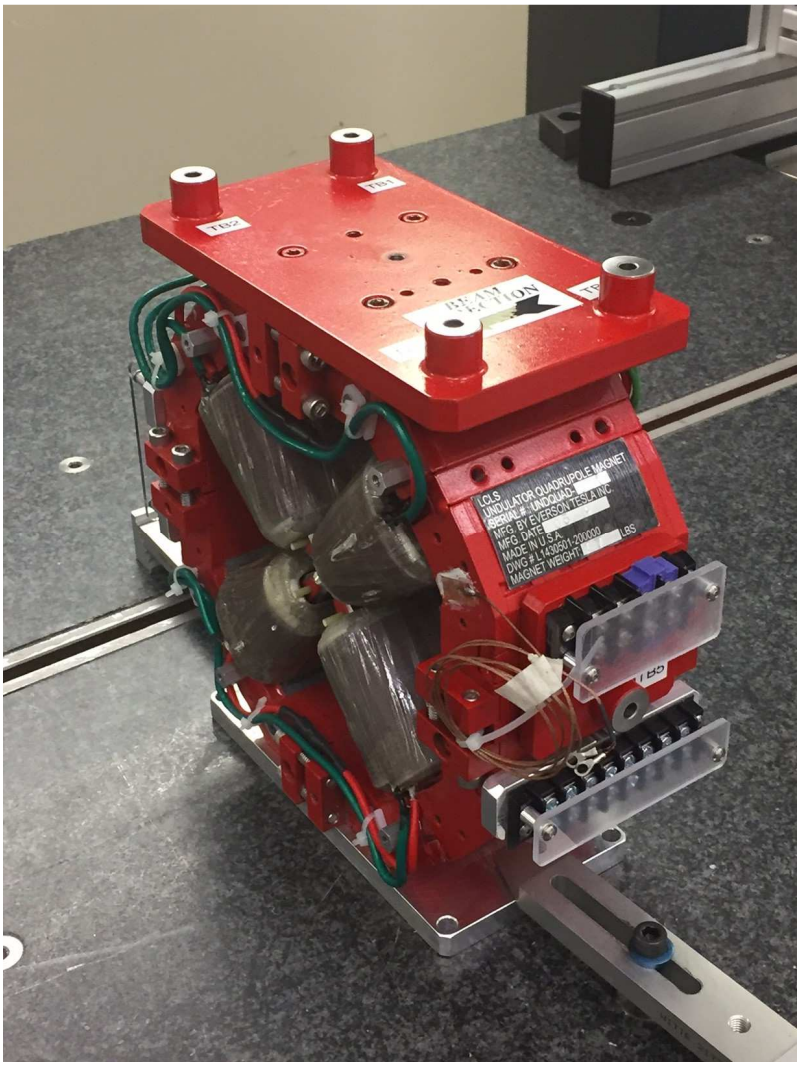
LCLS II Undulator Quadrupole Fiducialization Report



Inspector : K. Caban

Engineer : J. Amann

Drawing No. : SA-381-012-22

Barcode # : 4084

Mfg. S/N : 017

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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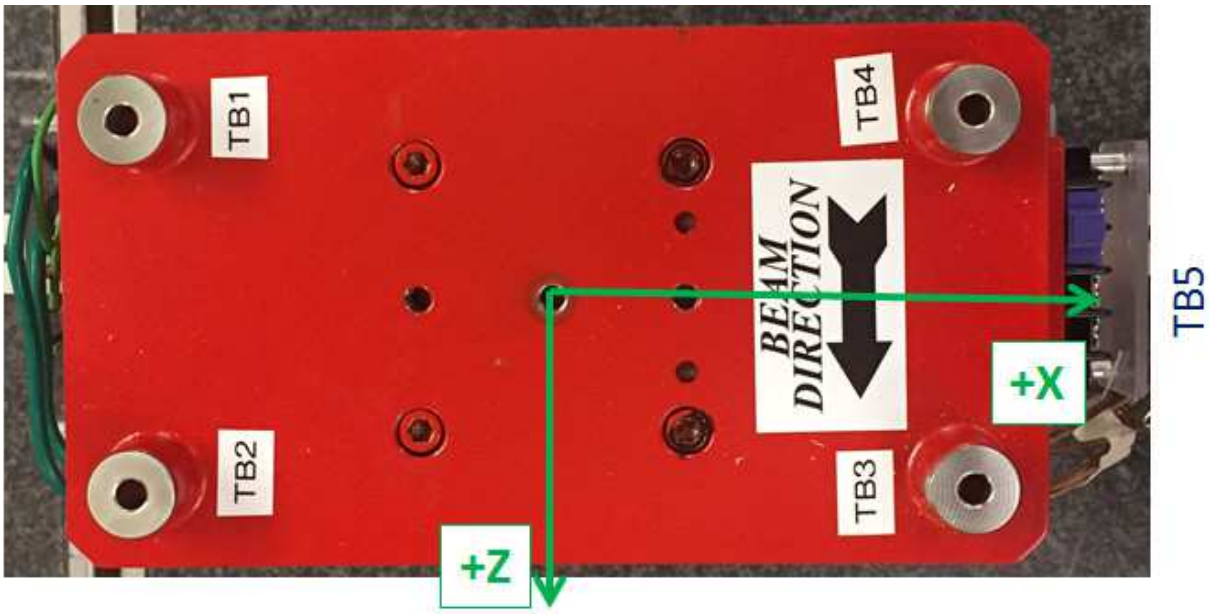
Tooling Ball Locations



Tooling Ball	X Coord.	Y Coord.	Z Coord.
TB 1	-3.36122	6.81457	-1.48547
TB 2	-3.37620	6.81374	1.51644
TB 3	3.37436	6.81747	1.54228
TB 4	3.38784	6.81466	-1.45407
TB 5	6.58944	0.12237	0.03600
TB A	-3.36056	6.12694	-1.48332
TB B	-3.37504	6.12690	1.51621
TB C	3.37336	6.12967	1.54500
TB D	3.38729	6.12778	-1.45500
TB E	5.90041	0.12527	0.03485

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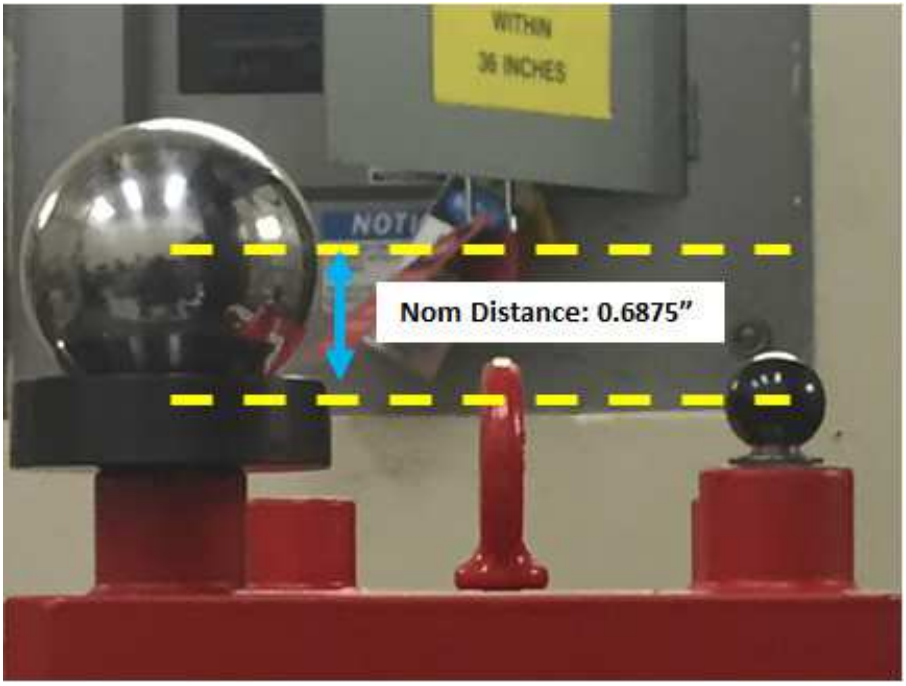
1" Tooling Ball to 5/16" Tooling Ball Difference



Tooling Ball	Nom Dist.	Actual Dist.
TB 1	0.6875 ± 0.001	0.68763
TB 2	0.6875 ± 0.001	0.68684
TB 3	0.6875 ± 0.001	0.6878
TB 4	0.6875 ± 0.001	0.68688
TB 5	0.6875 ± 0.001	0.68904

Dimensions in Inch

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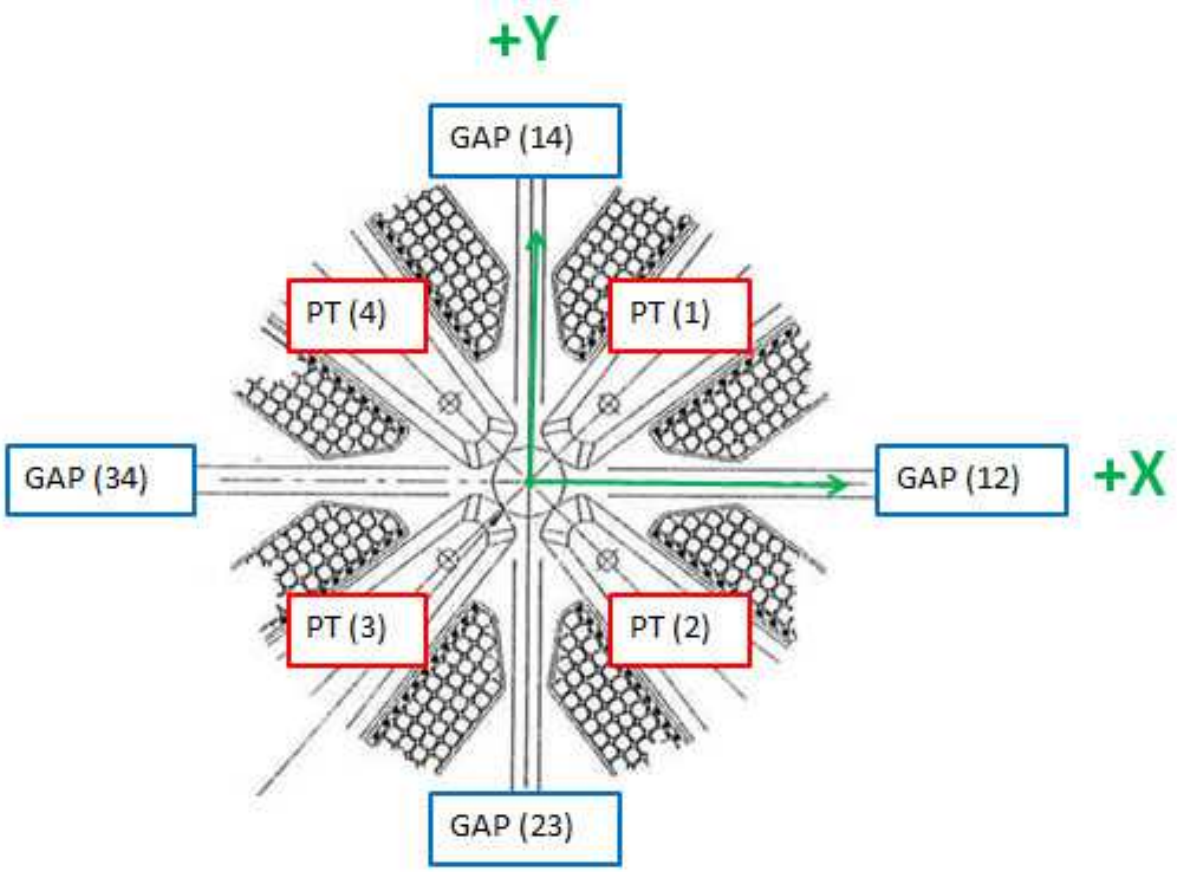
Pole Tip Gap Measurements



	Nominal Distance	Downstream Pole End	Upstream Pole End
Pole Tip Distance 1-3	0.433 ± .002	0.4347	0.43685
Pole Tip Distance 2-4	0.433 ± .002	0.43259	0.43197
Gap 1-2	0.159 ± .002	0.16233	0.16176
Gap 2-3	0.159 ± .002	0.15848	0.15898
Gap 3-4	0.159 ± .002	0.15833	0.16034
Gap 4-1	0.159 ± .002	0.16111	0.1578

Dimensions in Inch

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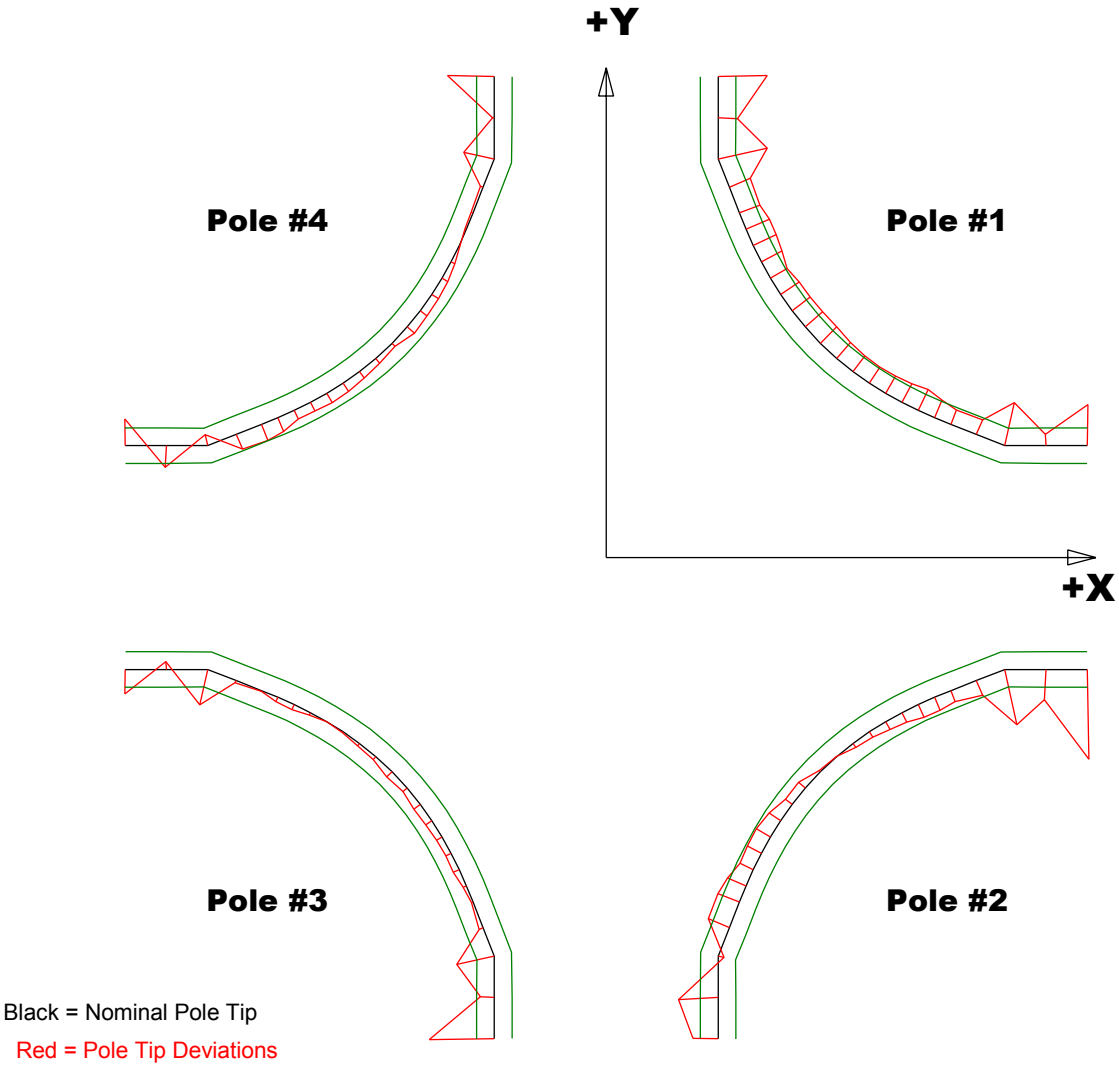
Composite Best-fit of Pole Tips, Downstream



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.	-0.00284	-0.00506	-0.00366	-0.00264
Max. Dev.	-0.00063	0.00224	0.00045	0.00123

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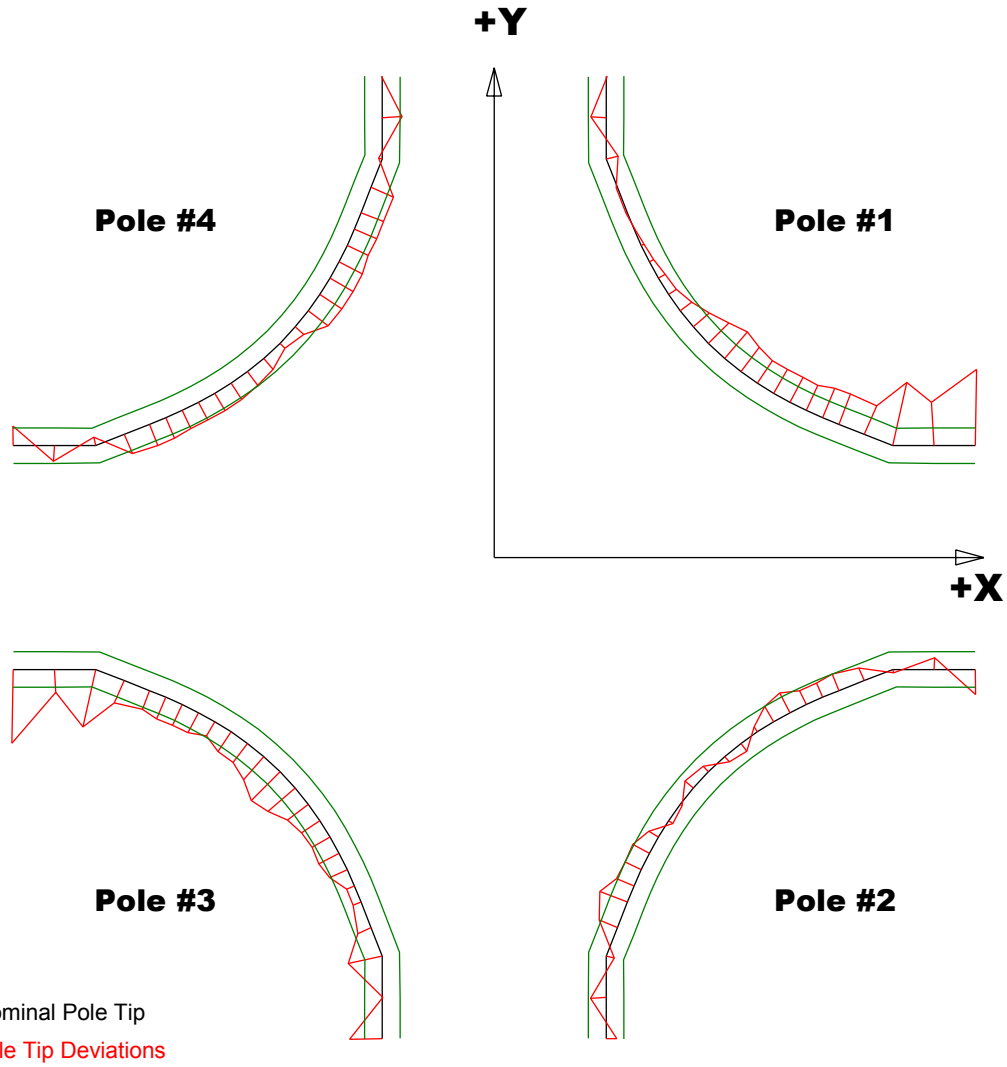
Composite Best-fit of Pole Tips, Upstream



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.	-0.00429	-0.00141	-0.00414	-0.00111
Max. Dev.	0.00086	0.00166	0.00003	0.00151

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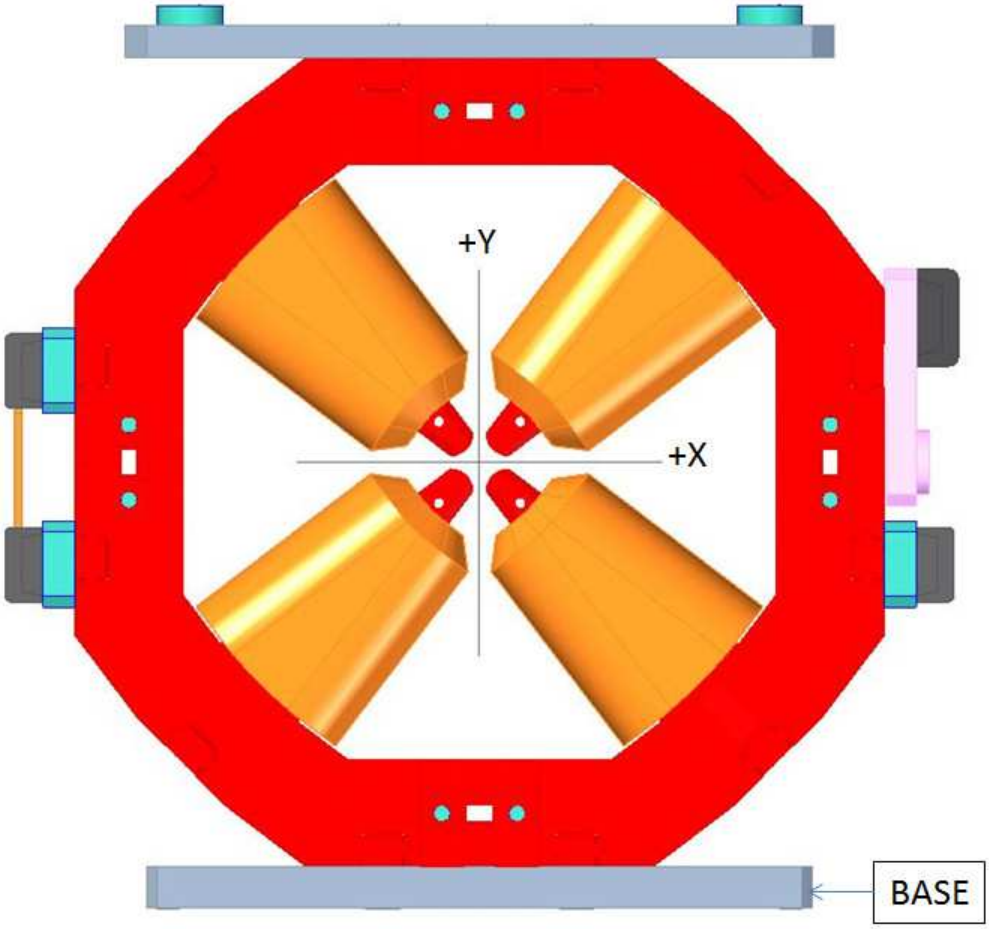
Angle of the Composite Pole Tip Best-Fit In Relation to Base



Angle in Decimal Degrees ° :0.04612

Angle in Milliradians :0.80486

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