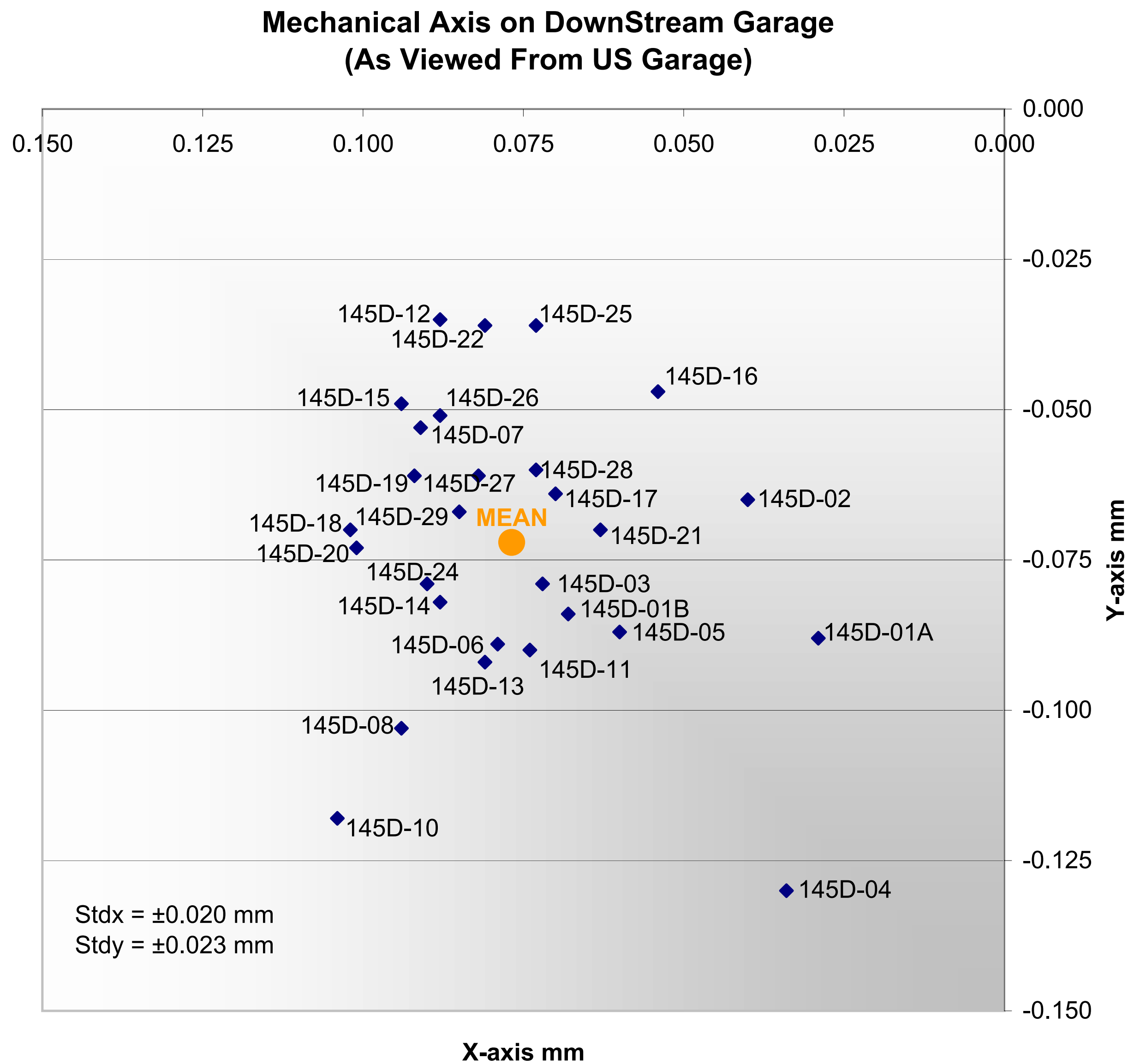
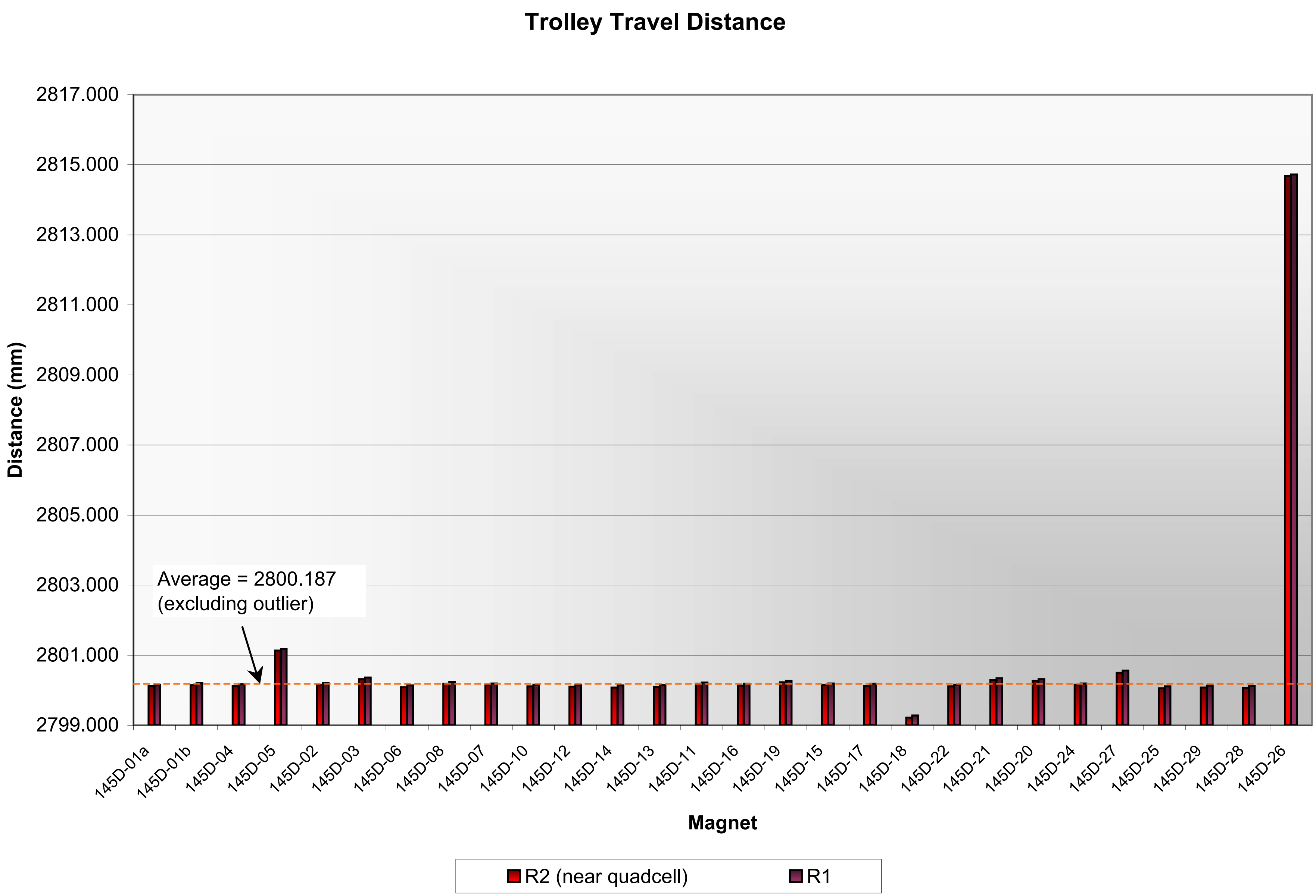
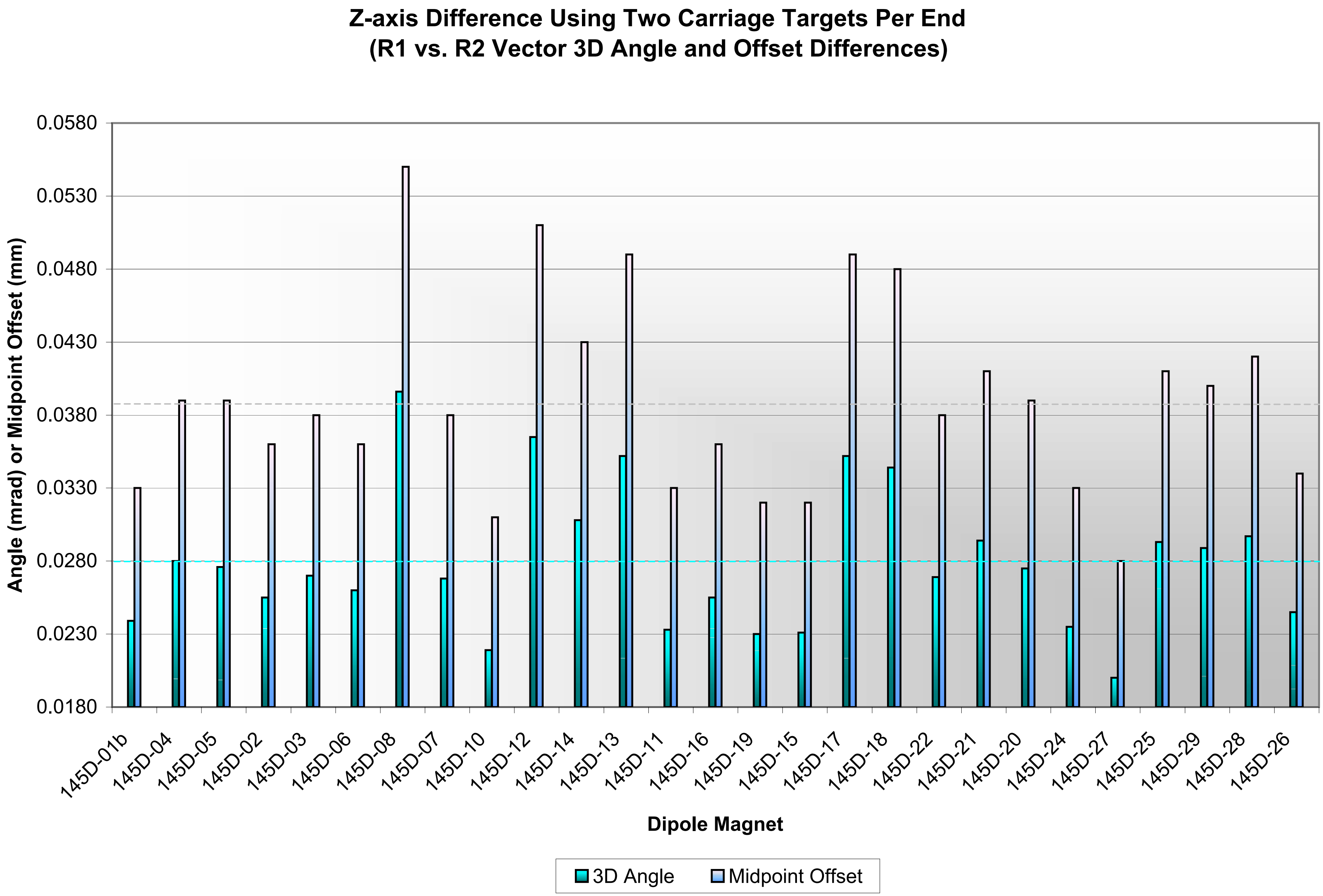

Mechanical Axis on DownStream Garage
(As Viewed From US Garage)
0.150
0.125
0.100
0.075
0.050
0.025
0.000
0.000
-0.025
-0.050
-0.075
-0.100
-0.125
-0.150
Y-axis mm
X-axis mm
145D-12
145D-22
145D-25
145D-16
145D-15
145D-26
145D-07
145D-28
145D-19
145D-27
145D-17
145D-02
145D-18
145D-29
MEAN
145D-21
145D-20
145D-24
145D-03
145D-14
145D-01B
145D-05
145D-01A
145D-06
145D-11
145D-13
145D-08
145D-10
145D-04
Stdx = ±0.020 mm
Stdy = ±0.023 mm

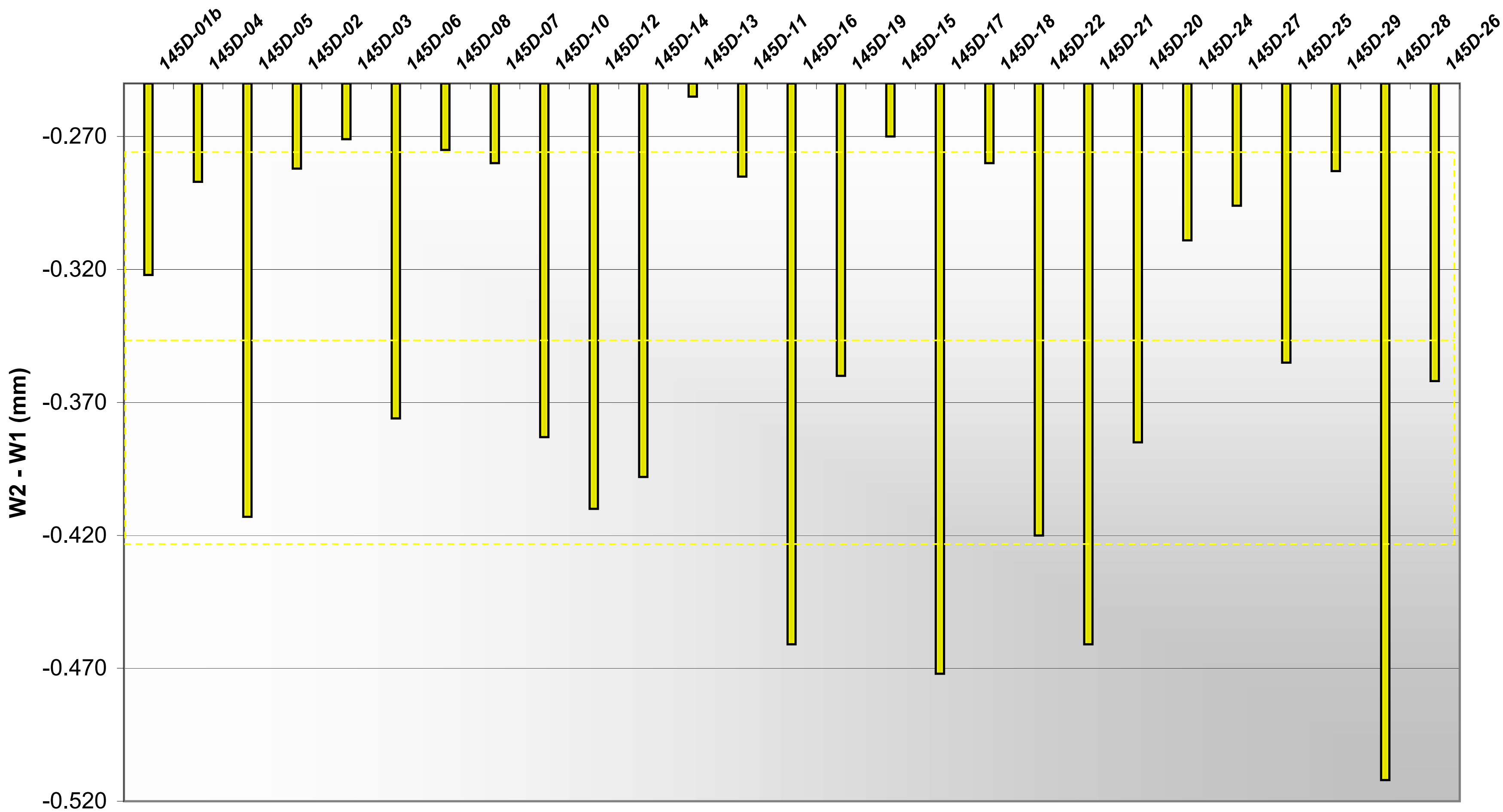


Trolley Travel Distance
Distance (mm)
2817.000
2815.000
2813.000
2811.000
2809.000
2807.000
2805.000
2803.000
2801.000
2799.000
Average = 2800.187
(excluding outlier)
145D-01a
145D-01b
145D-04
145D-05
145D-02
145D-03
145D-06
145D-08
145D-07
145D-10
145D-12
145D-14
145D-13
145D-11
145D-16
145D-19
145D-15
145D-17
145D-18
145D-22
145D-21
145D-20
145D-24
145D-27
145D-25
145D-29
145D-28
145D-26
Magnet
R2 (near quadcell)
R1



Z-axis Difference Using Two Carriage Targets Per End
(R1 vs. R2 Vector 3D Angle and Offset Differences)
Angle (mrad) or Midpoint Offset (mm)
0.0580
0.0530
0.0480
0.0430
0.0380
0.0330
0.0280
0.0230
0.0180
145D-01b
145D-04
145D-05
145D-02
145D-03
145D-06
145D-08
145D-07
145D-10
145D-12
145D-14
145D-13
145D-11
145D-16
145D-19
145D-15
145D-17
145D-18
145D-22
145D-21
145D-20
145D-24
145D-27
145D-25
145D-29
145D-28
145D-26
Dipole Magnet
3D Angle
Midpoint Offset

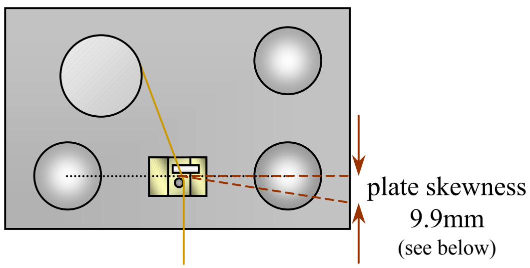
Wire Holder to Wire Holder Yaw



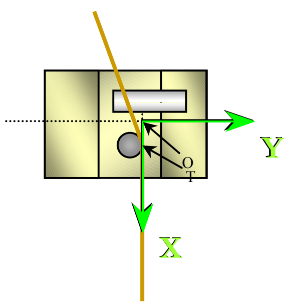
Dipole Magnet (with mean and std. dev)
Note: Yaw does not affect x-position of wire at these above values
(i.e. maximum above of ~0.415mm << 6.5mm shown on next page)

ROTATION OF WIREHOLDER

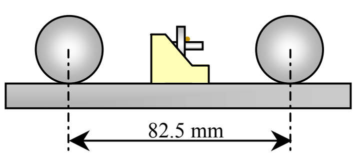
Top View of North Wire Holder

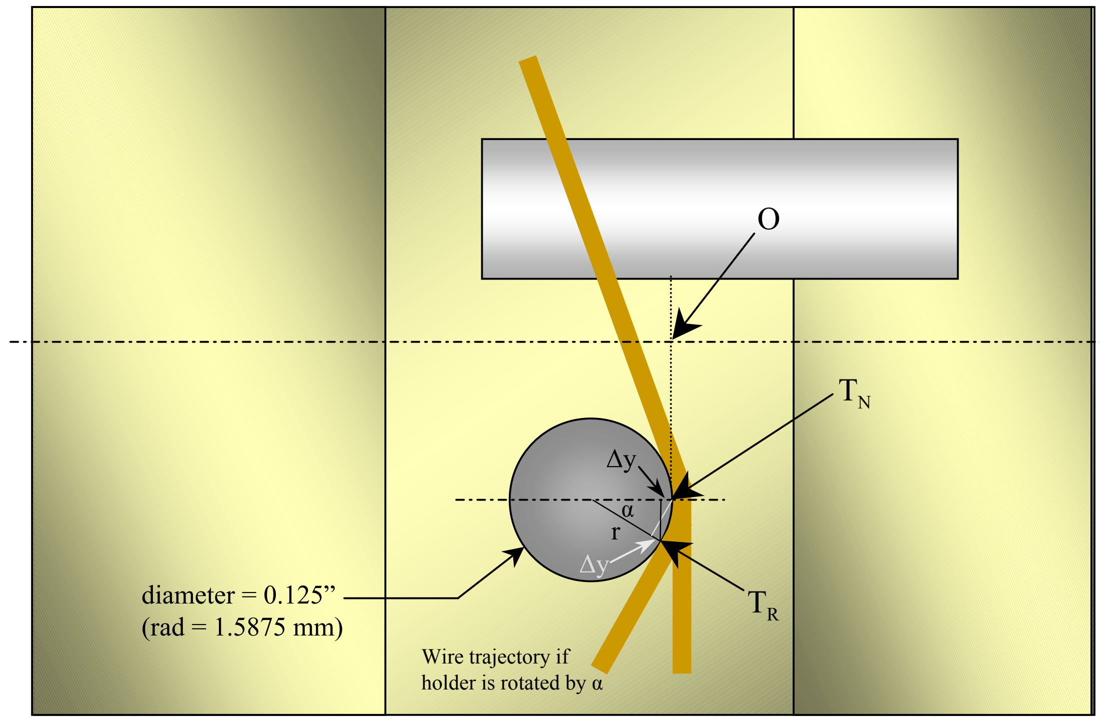


Detailed View of Local Axes



Side View of North Wire Holder





T_N = normal tangential point
T_R = rotated tangential point

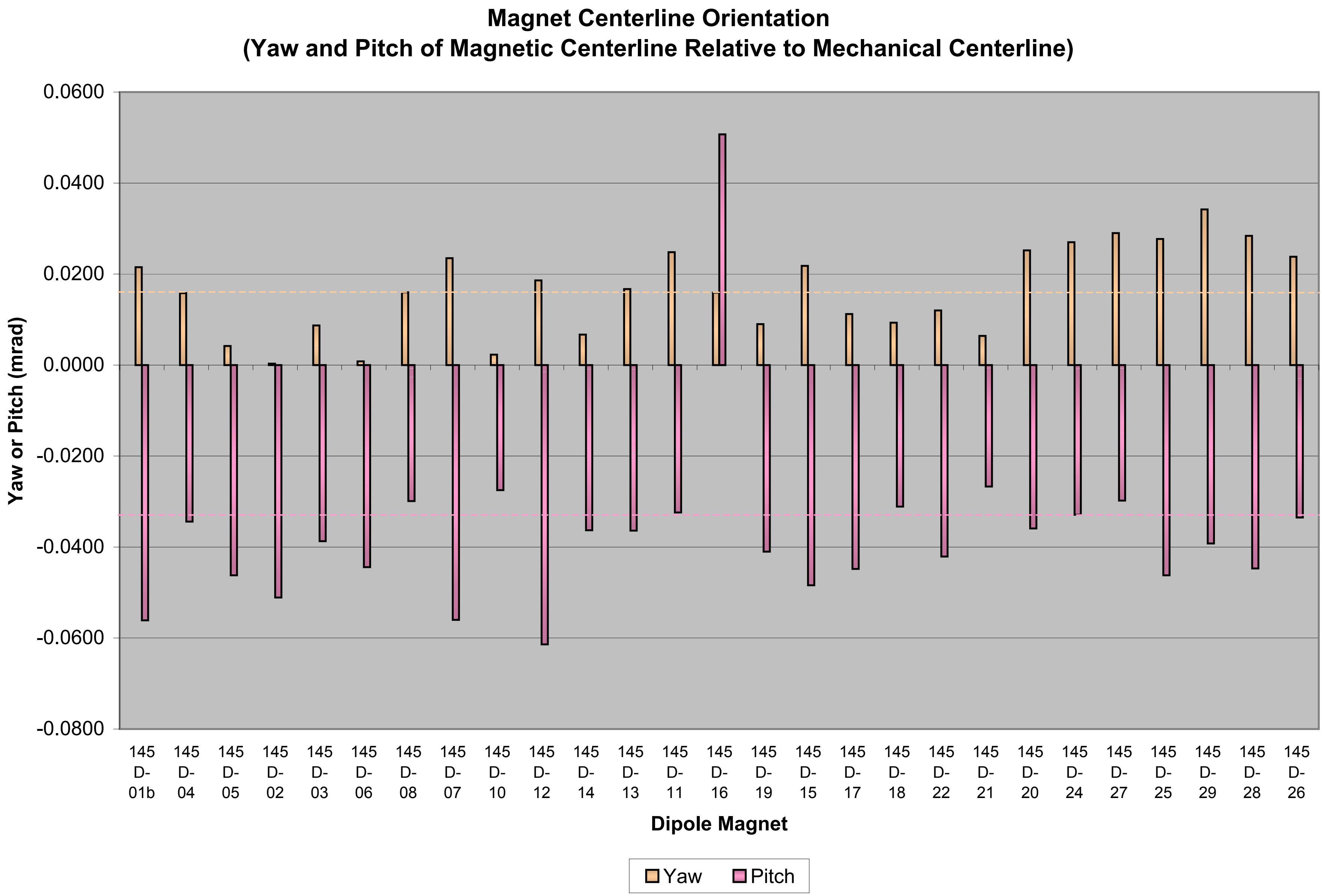
$$\cos\alpha = \frac{r - \Delta y}{r}$$

Restricting Δy to 20 μm gives α = 9.1°

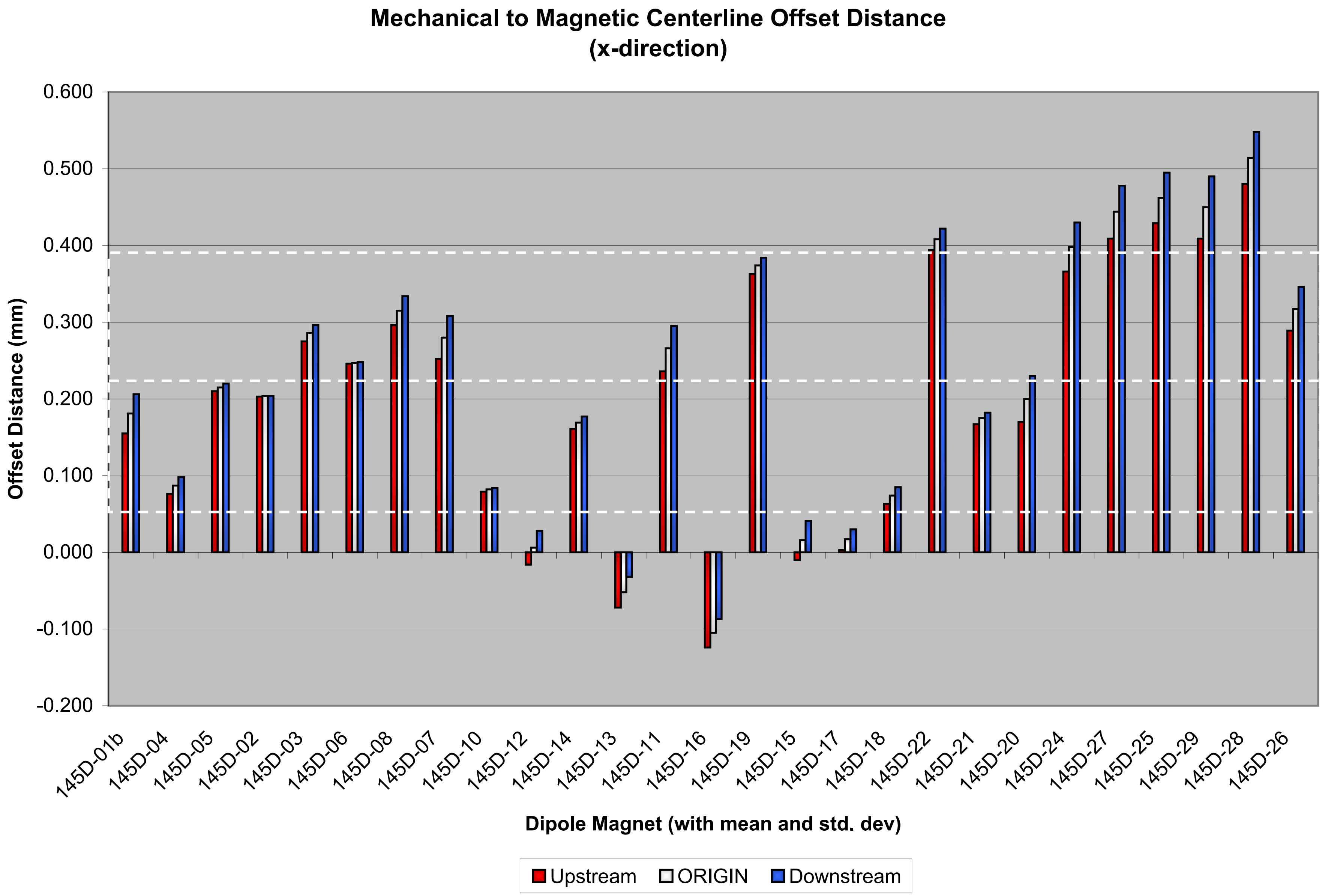
Assuming rotation about origin, plate skewness (ps) will be,

ps = 0.5 (dist TB1-TB2) sin α
= 6.5 mm

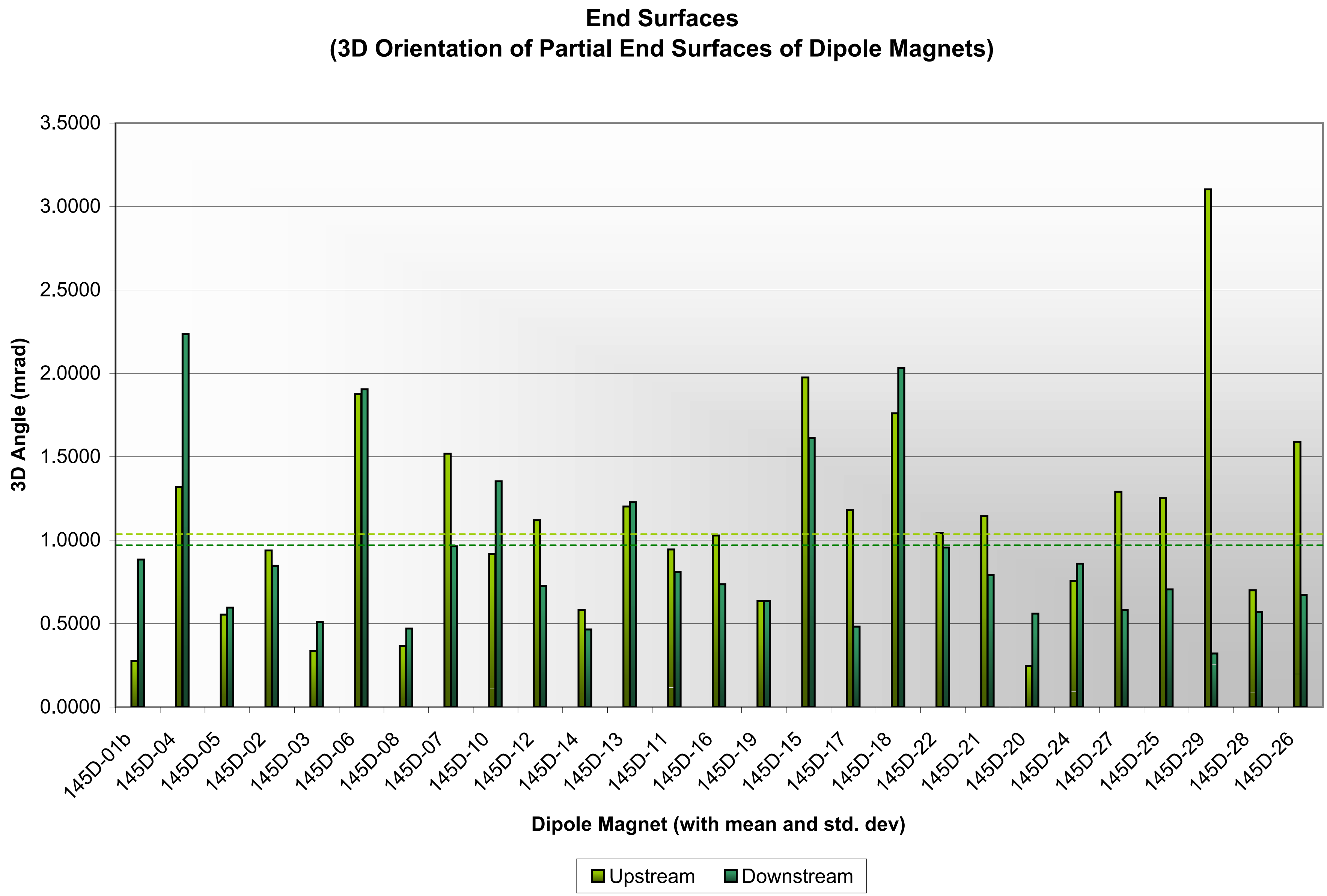
Note 1: ps = 9.9 mm at plate edge
Note 2: using wire centerline causes negligible difference in above solution



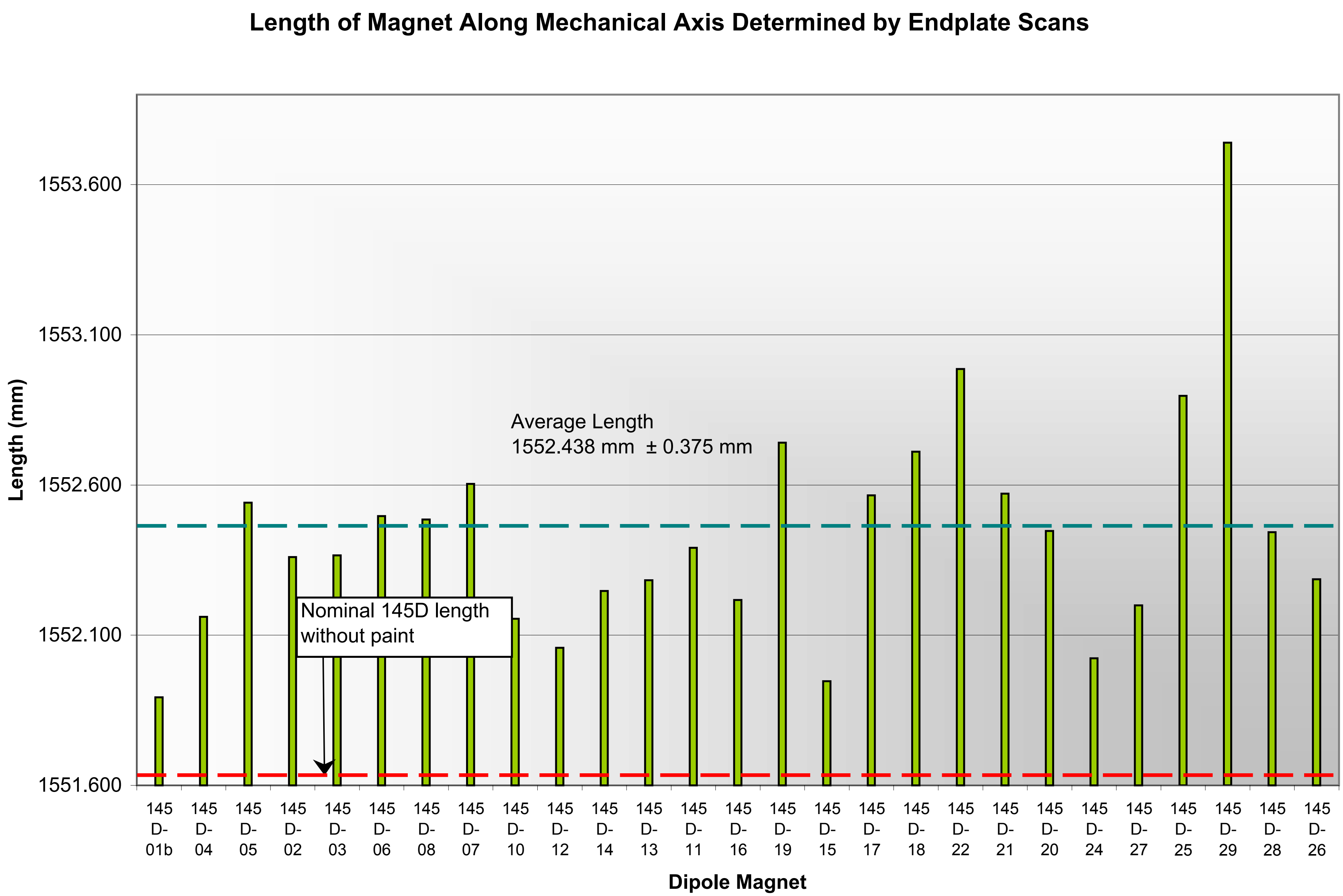
Magnet Centerline Orientation
(Yaw and Pitch of Magnetic Centerline Relative to Mechanical Centerline)
0.0600
0.0400
0.0200
0.0000
-0.0200
-0.0400
-0.0600
-0.0800
Yaw or Pitch (mrad)
145 D-01b
145 D-04
145 D-05
145 D-02
145 D-03
145 D-06
145 D-08
145 D-07
145 D-10
145 D-12
145 D-14
145 D-13
145 D-11
145 D-16
145 D-19
145 D-15
145 D-17
145 D-18
145 D-22
145 D-21
145 D-20
145 D-24
145 D-27
145 D-25
145 D-29
145 D-28
145 D-26
Dipole Magnet
Yaw
Pitch



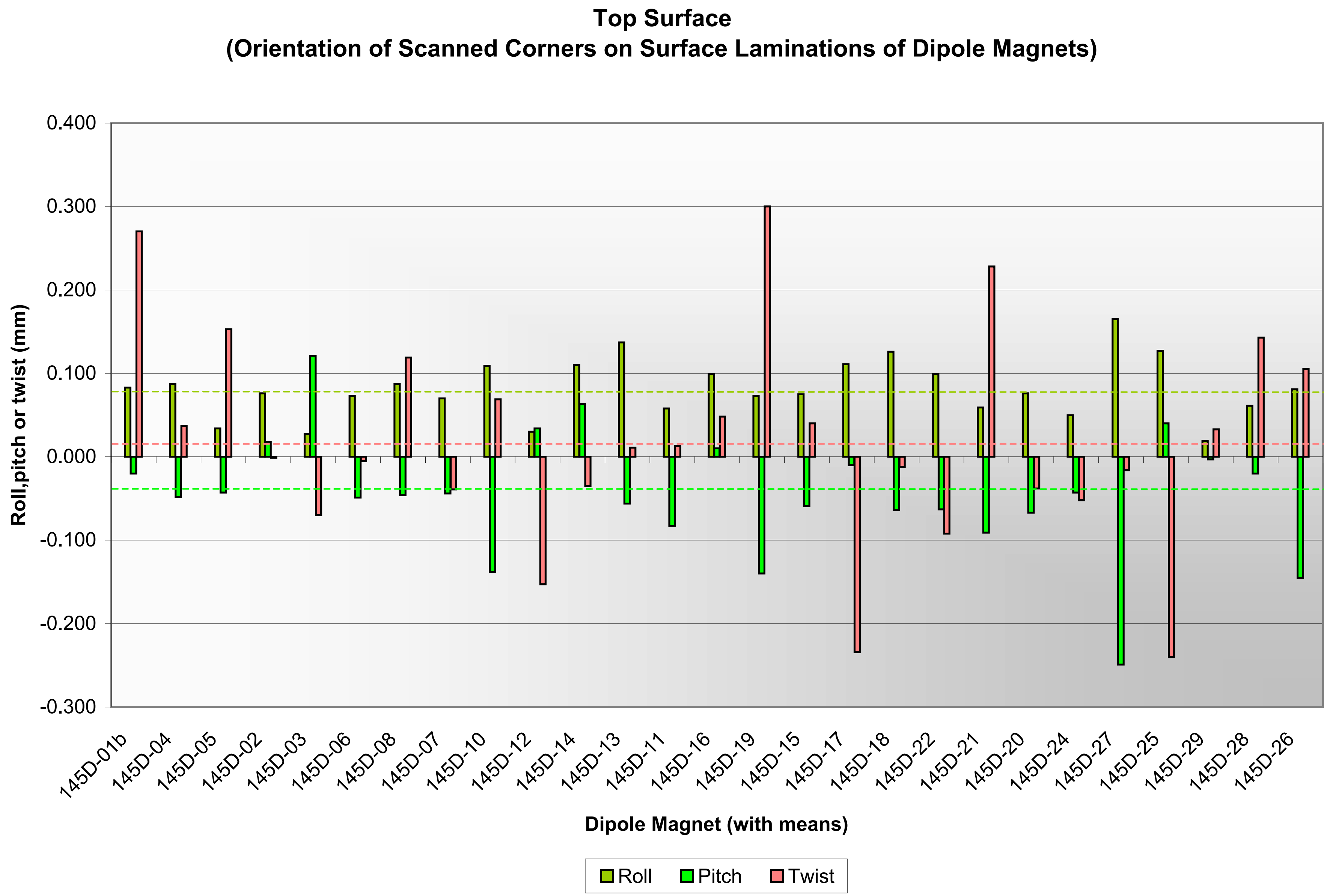
Mechanical to Magnetic Centerline Offset Distance
(x-direction)
0.600
0.500
0.400
0.300
0.200
0.100
0.000
-0.100
-0.200
Offset Distance (mm)
145D-01b
145D-04
145D-05
145D-02
145D-03
145D-06
145D-08
145D-07
145D-10
145D-12
145D-14
145D-13
145D-11
145D-16
145D-19
145D-15
145D-17
145D-18
145D-22
145D-21
145D-20
145D-24
145D-27
145D-25
145D-29
145D-28
145D-26
Dipole Magnet (with mean and std. dev)
Upstream
ORIGIN
Downstream

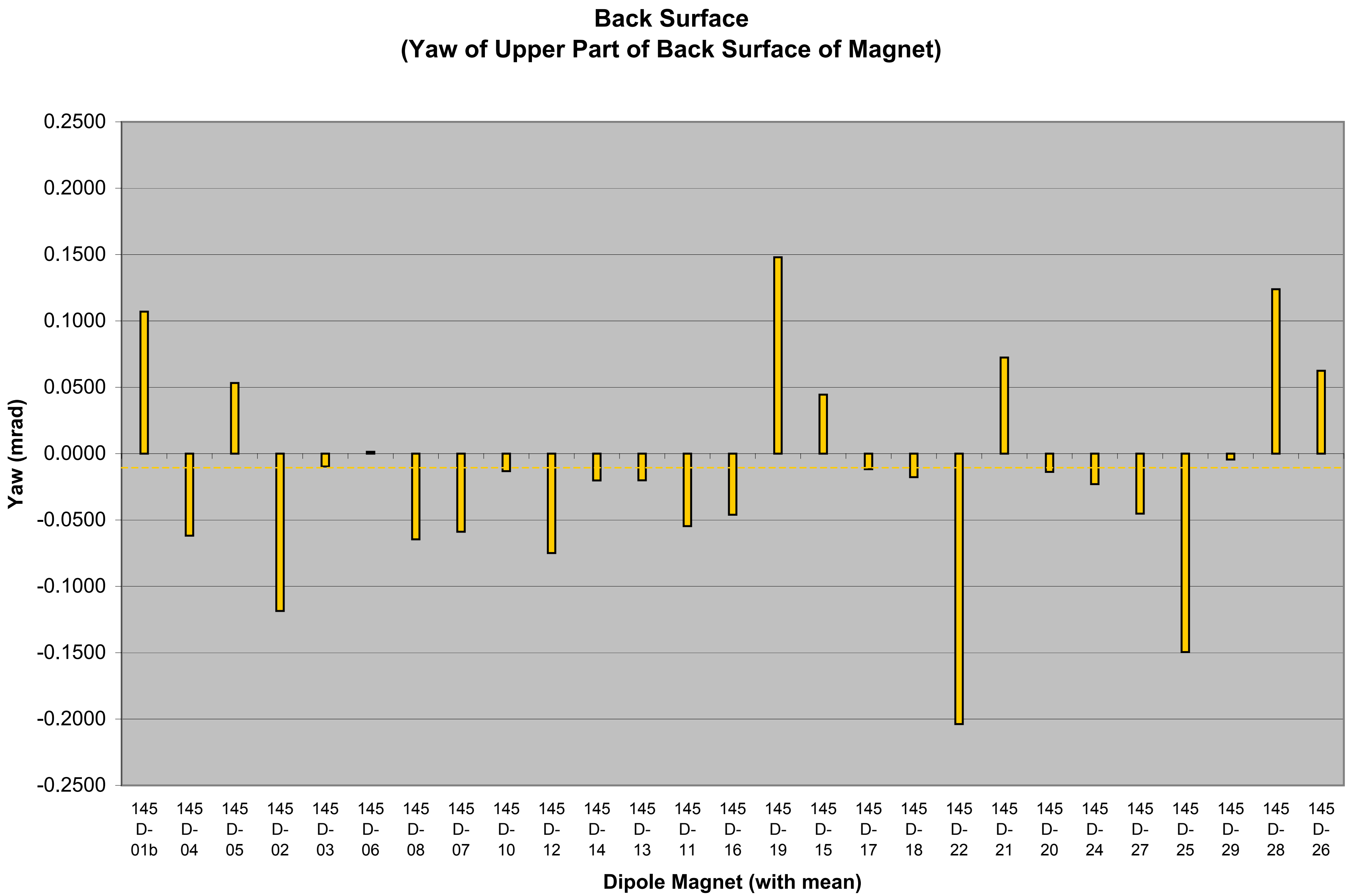


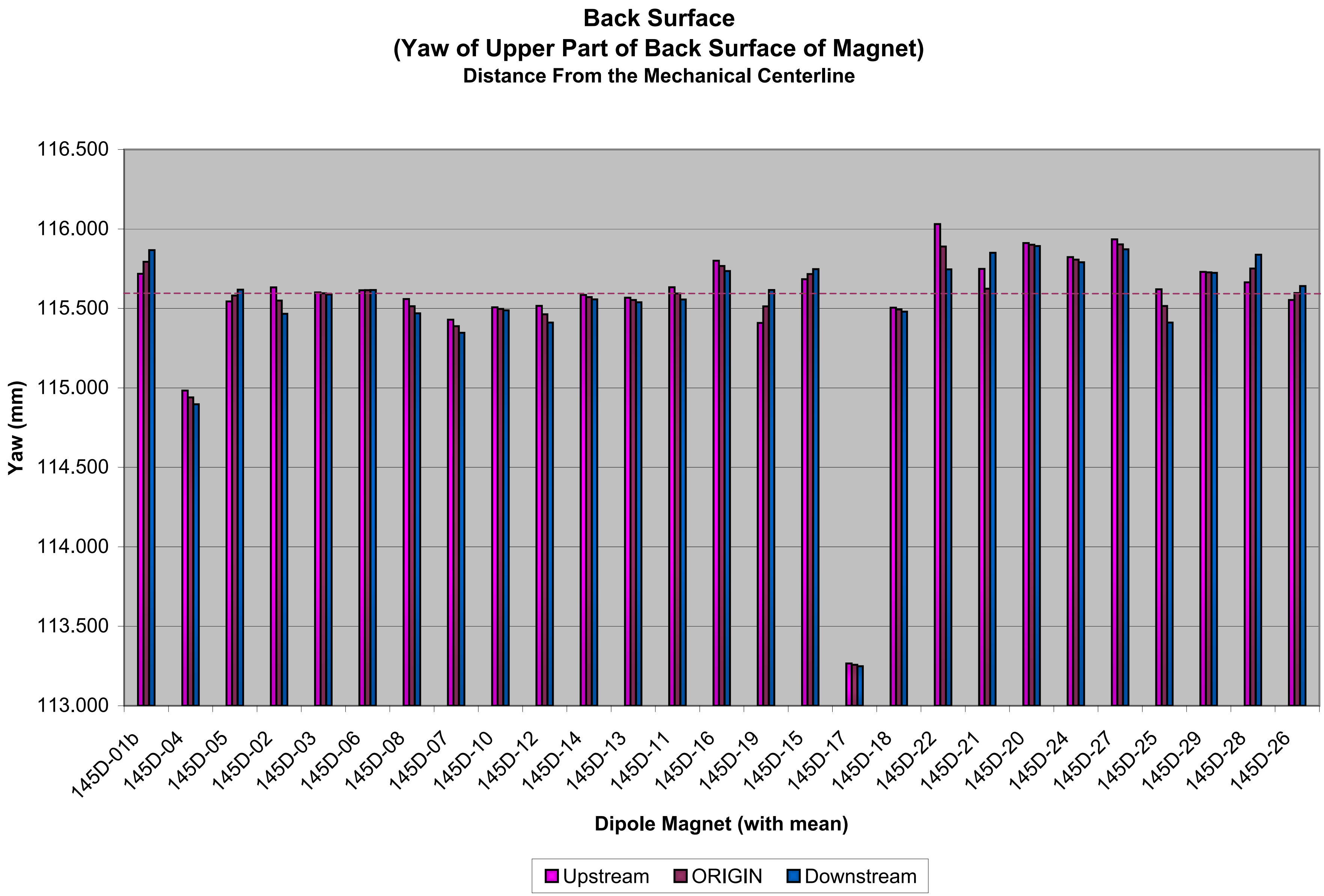
End Surfaces
(3D Orientation of Partial End Surfaces of Dipole Magnets)
3D Angle (mrad)
3.5000
3.0000
2.5000
2.0000
1.5000
1.0000
0.5000
0.0000
145D-01b
145D-04
145D-05
145D-02
145D-03
145D-06
145D-08
145D-07
145D-10
145D-12
145D-14
145D-13
145D-11
145D-16
145D-19
145D-15
145D-17
145D-18
145D-22
145D-21
145D-20
145D-24
145D-27
145D-25
145D-29
145D-28
145D-26
Dipole Magnet (with mean and std. dev)
Upstream
Downstream



Length of Magnet Along Mechanical Axis Determined by Endplate Scans
Length (mm)
1553.600
1553.100
1552.600
1552.100
1551.600
Average Length
1552.438 mm ± 0.375 mm
Nominal 145D length without paint
145 D-01b
145 D-04
145 D-05
145 D-02
145 D-03
145 D-06
145 D-08
145 D-07
145 D-10
145 D-12
145 D-14
145 D-13
145 D-11
145 D-16
145 D-19
145 D-15
145 D-17
145 D-18
145 D-22
145 D-21
145 D-20
145 D-24
145 D-27
145 D-25
145 D-29
145 D-28
145 D-26
Dipole Magnet


Top Surface
(Orientation of Scanned Corners on Surface Laminations of Dipole Magnets)
0.400
0.300
0.200
0.100
0.000
-0.100
-0.200
-0.300
Roll,pitch or twist (mm)
145D-01b
145D-04
145D-05
145D-02
145D-03
145D-06
145D-08
145D-07
145D-10
145D-12
145D-14
145D-13
145D-11
145D-16
145D-19
145D-15
145D-17
145D-18
145D-22
145D-21
145D-20
145D-24
145D-27
145D-25
145D-29
145D-28
145D-26
Dipole Magnet (with means)
Roll
Pitch
Twist


Back Surface
(Yaw of Upper Part of Back Surface of Magnet)
0.2500
0.2000
0.1500
0.1000
0.0500
0.0000
-0.0500
-0.1000
-0.1500
-0.2000
-0.2500
Yaw (mrad)
145 D-01b
145 D-04
145 D-05
145 D-02
145 D-03
145 D-06
145 D-08
145 D-07
145 D-10
145 D-12
145 D-14
145 D-13
145 D-11
145 D-16
145 D-19
145 D-15
145 D-17
145 D-18
145 D-22
145 D-21
145 D-20
145 D-24
145 D-27
145 D-25
145 D-29
145 D-28
145 D-26
Dipole Magnet (with mean)


Back Surface
(Yaw of Upper Part of Back Surface of Magnet)
Distance From the Mechanical Centerline
Yaw (mm)
116.500
116.000
115.500
115.000
114.500
114.000
113.500
113.000
145D-01b
145D-04
145D-05
145D-02
145D-03
145D-06
145D-08
145D-07
145D-10
145D-12
145D-14
145D-13
145D-11
145D-16
145D-19
145D-15
145D-17
145D-18
145D-22
145D-21
145D-20
145D-24
145D-27
145D-25
145D-29
145D-28
145D-26
Dipole Magnet (with mean)
Upstream
ORIGIN
Downstream