Pushing Planarity Limits
Teradyne Precision Leveling System

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NXP   *Teradyne*   *Teradyne*

Why PLS is important?

1. Probe array sizes are increasing with parallelism
2. Numerous probe technologies with varying compliance (overtravel) restrictions
3. Correlation with probecard planarity profiles
4. Pad damage concern from multiple scrub marks
5. Pressure sensitive active circuitry under pad regions

Standard vs. UltraProbe Interface
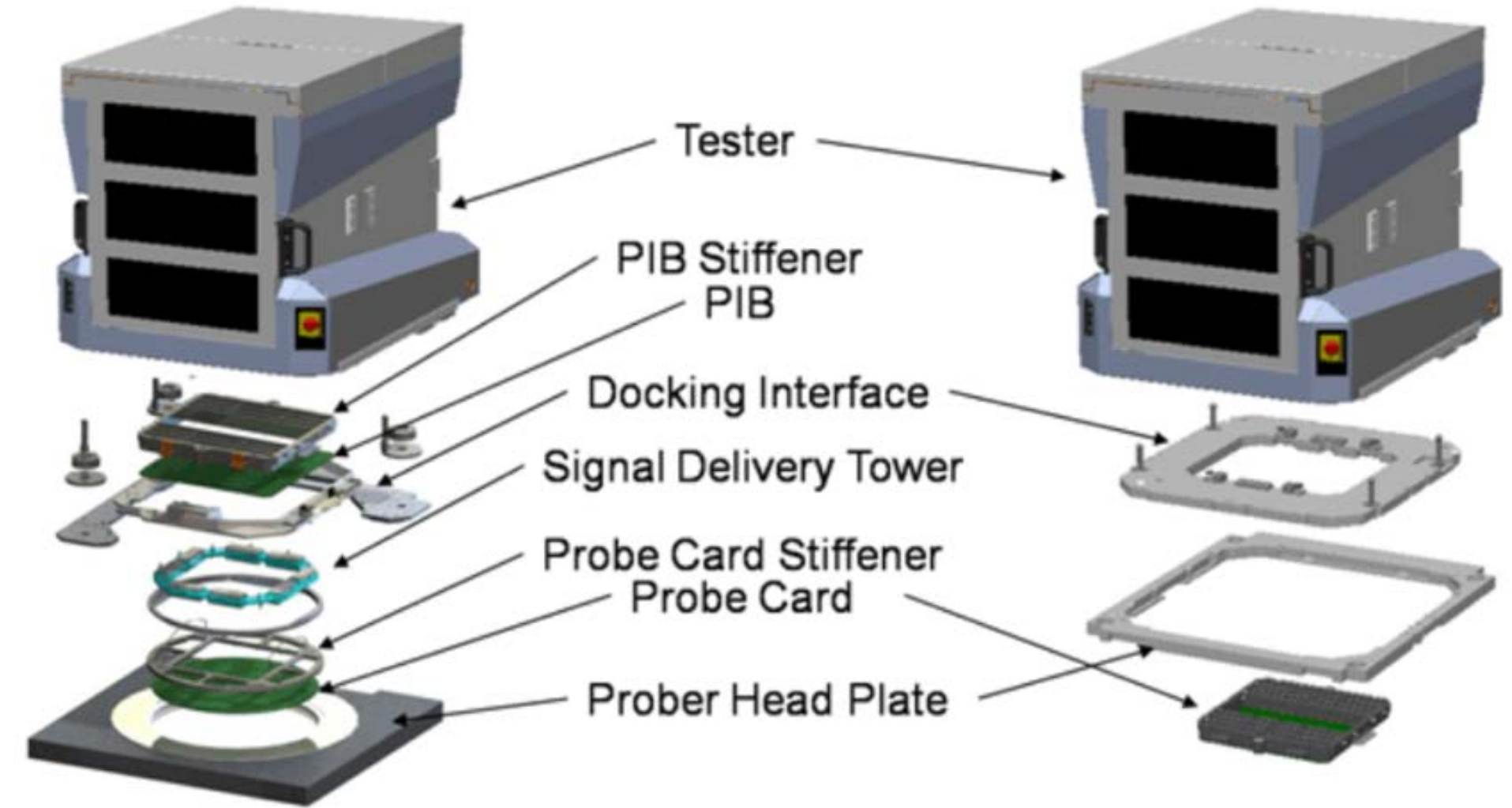
A test cell needs optimization when...

1. Setting up a test cell for the first time.
2. Changing instrumentation within the test head.
3. Changing the insert plate.
4. Physical movement of test cell equipment.
5. Changing the manipulator axes / counter-balance weights.
6. Production maintenance checks (varies by customer).
   a. Test head docking scenarios
   b. Product changes

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Precision Leveling System is a combination of tools - PLP and FLS

Precision Leveling Pucks

1. PLP provides repeatable docking with Teradyne's insert plate
   a. Universal upgrade kit for all existing Teradyne interfaces
   b. Quick & easy installation procedure
   c. PLP can be ordered with new insert plates
   d. Secondary benefit: 1 puck not engaged = docking issue

Fine Leveling System

1. FLS provides high accuracy in chuck co-planarity
   a. Applicable to both 12 slot and 24 slot tester platforms
   b. Applicable for prober models used with UltraPROBE
   c. Tool can be loaded 0º and 180º (no calibrating)
   d. Characteristics that emulate a probecard architecture
   e. Software calculator to aid in prober stage adjustments

Precision Leveling System

- FLS maintains proven concepts
- Leverages increased DUT parallelism
- Allows advanced probe compliances
- Optimal correlation to PC metrology
- Co-planarity Capability: **<20 microns** over active area (5.5" x 5.5")
- Reduces re-probing / pad damage

Precision Leveling Pucks

Hold-fast

Puck

637-953-01
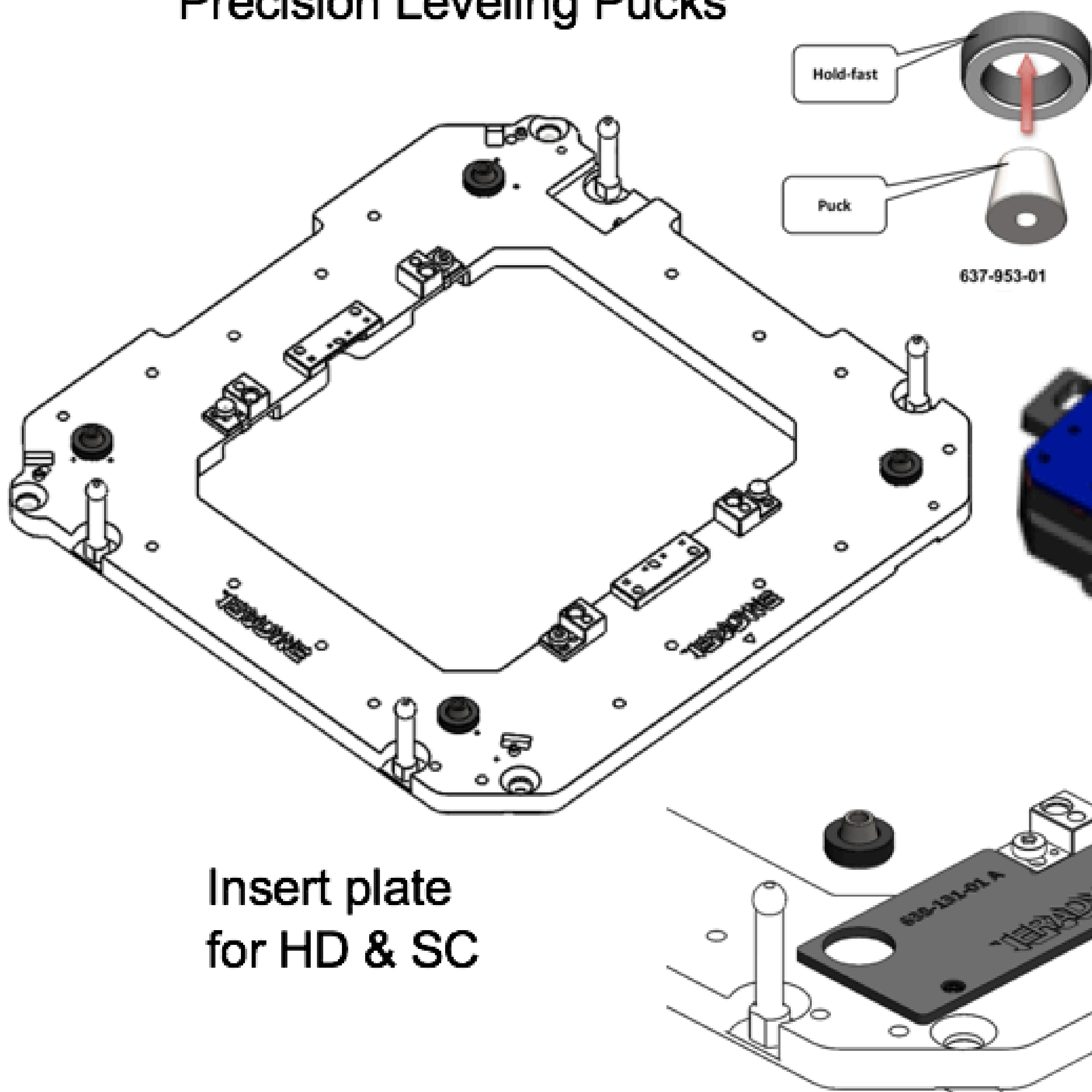
Insert plate
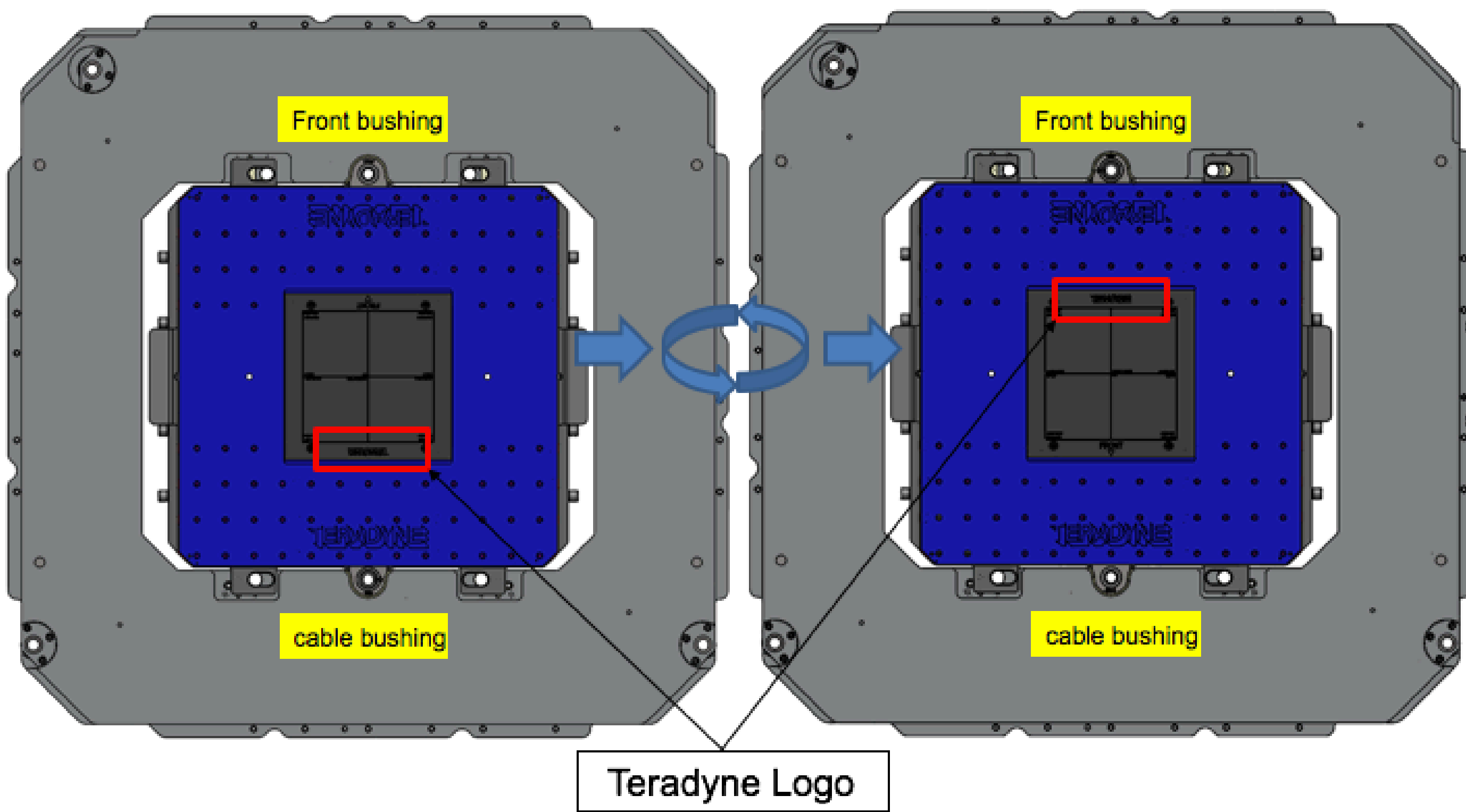for HD & SC

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Fine Leveling System
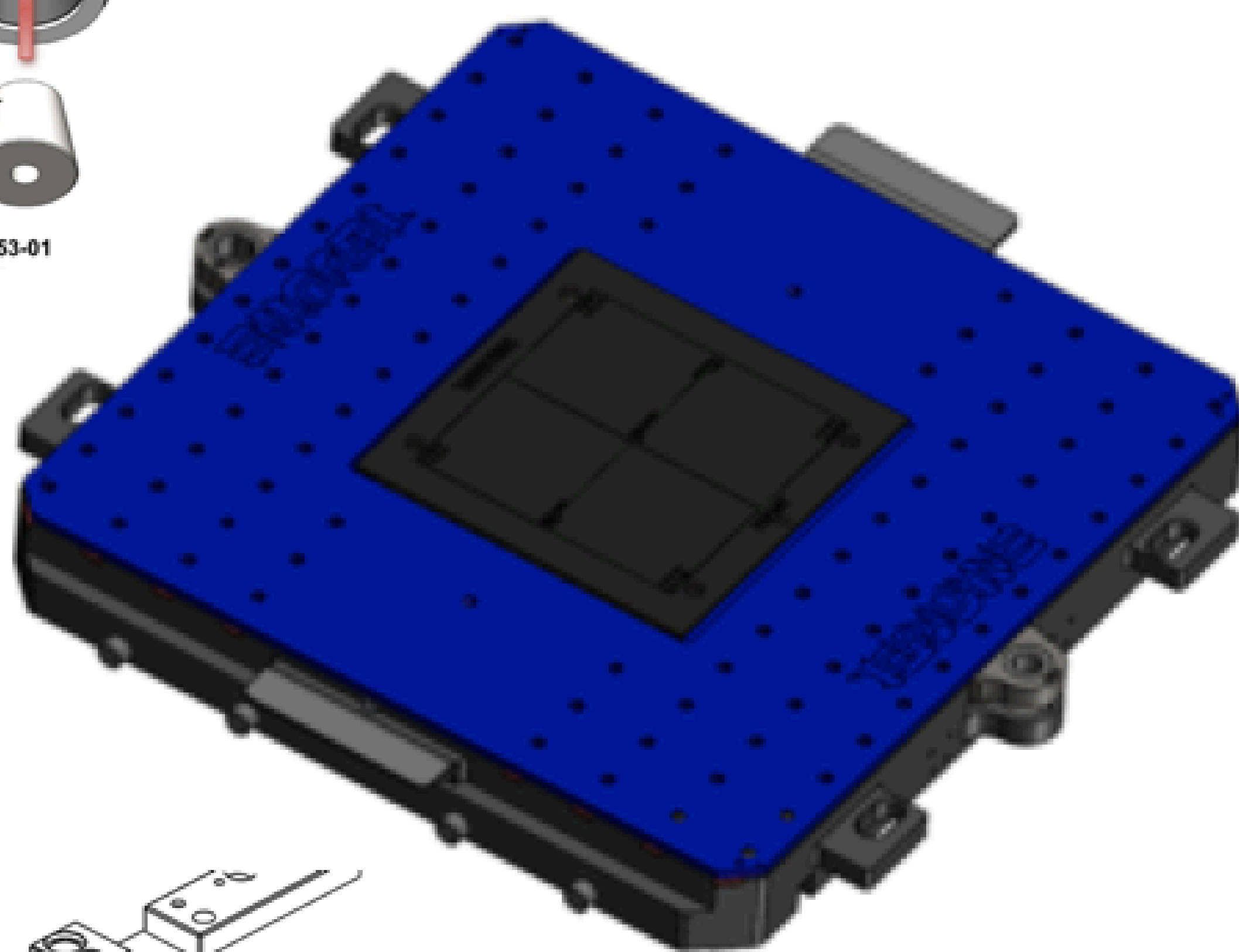
Smaller, symmetrical
tabs w/slots

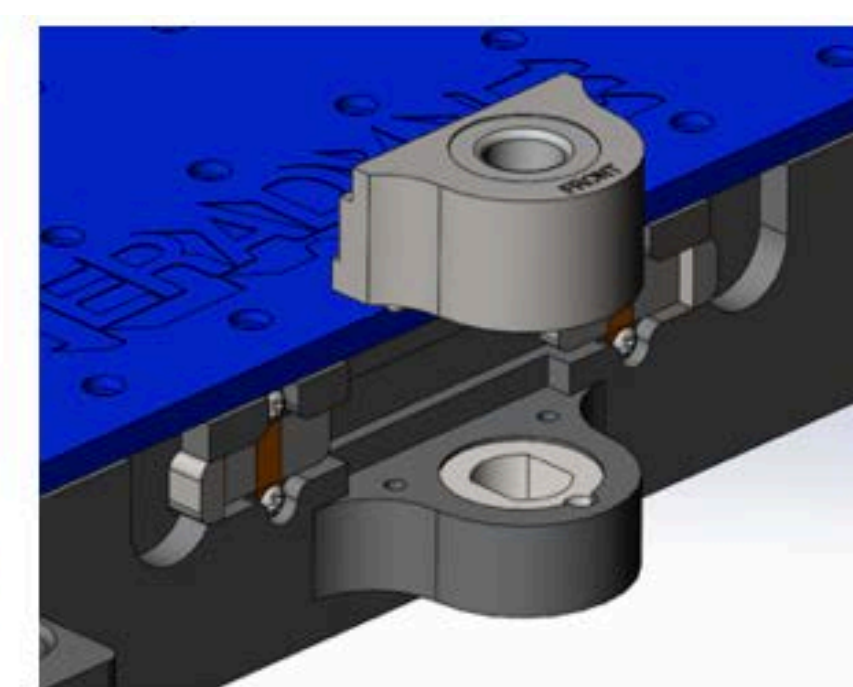**Upgrade kit shown. Pucks can be ordered on new systems**
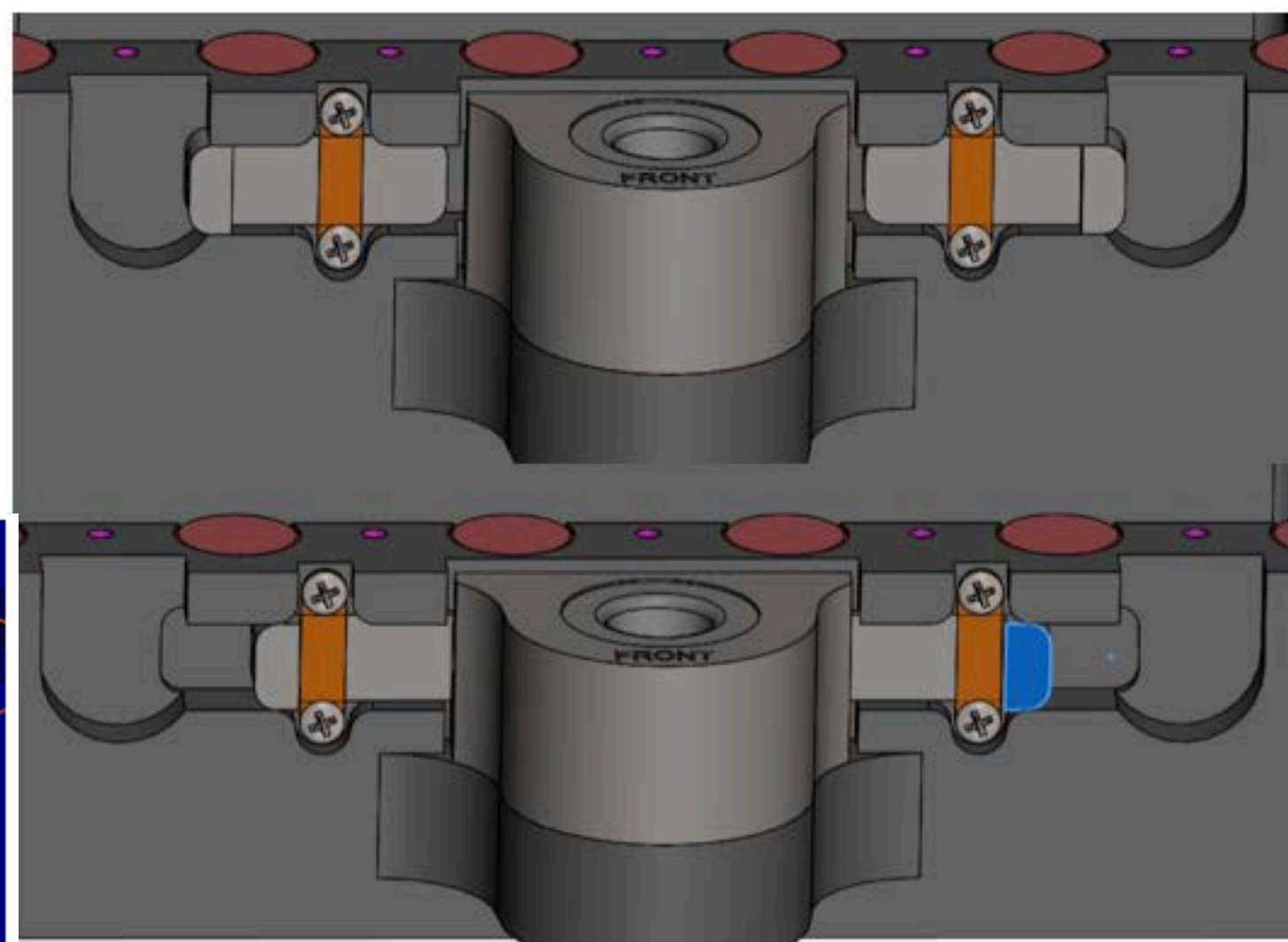
FLS and Insert Plate

AT 0° POSITION

Front bushing

cable bushing

180° ROTATION

Front bushing

cable bushing

Teradyne Logo

Bushing Exchange Allows For Rotation On PC Loader Tray

Rotation achieved by
"Tool-less" bushing
exchange

Open state

FRONT

FRONT

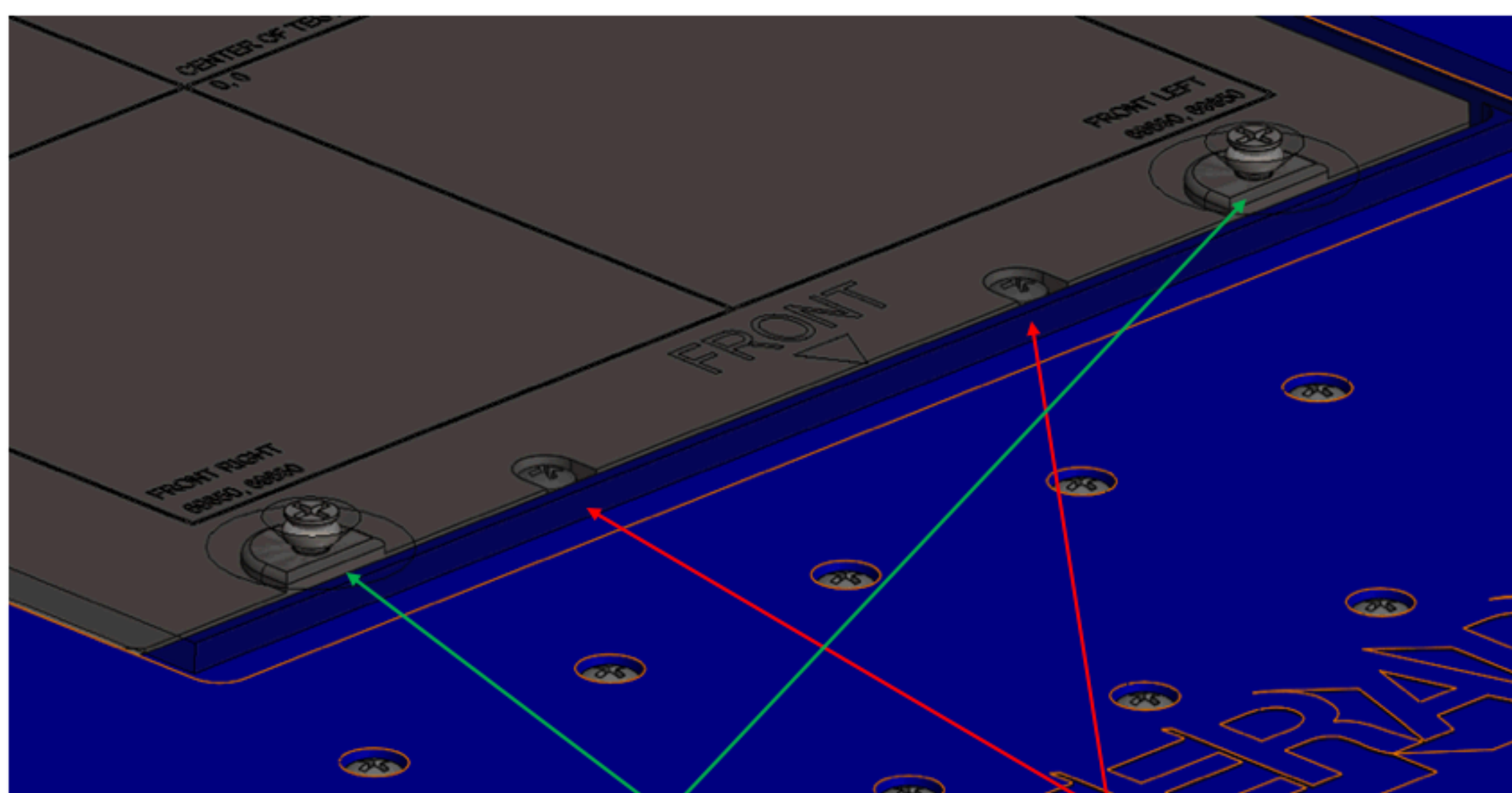Latched state

FLS Target Architecture

CENTER OF TILT

FRONT LEFT

FRONT

FRONT RIGHT

PCB mounted securely through Plate to PIB stiffener

Plate mounted securely to PIB stiffener under PCB

Emulates a probe card
No floating structures – reduces error budget

No tool calibrations required

FLS Calculator

Enter FLS Data at 0°

FLS Points	INPUT DATA (um)
Rear Left	-3
Rear Right	-19
Front Right	17
Front Left	5

Input 4 Z-values from 0 degrees

Enter FLS Data after Rotating 180°

FLS Points	INPUT DATA (um)	Delta(um)
Rear Left (0° Front Right)	16	-1
Rear Right (0° Front Left)	5	0
Front Right (0° Rear Left)	-3	0
Front Left (0° Rear Right)	-18	1

Input 4 Z-values from 180 degrees

FLS Range	2

Head State Adjustments (reference)

FLS Points	Move (um)
Rear Left	1
Rear Right	0
Front Right	0
Front Left	-1

Upward	Upwards Towards Test head
Downward	Downward Into Prober

Z-Movement Ref.

Turn	Z (um)
"1/128"	5
"1/64"	9
"1/32"	18
"1/16"	36
"1/8"	73
"1/4"	145

FLS Range
2

Visual Reference

Rear Left Target 1		Rear Right Target 2
-1		0

| Front Left Target 4		Front Right Target 3
1		0

Adjustment Instructions:
1. Start with front corner largest value from zero. Try to achieve left /right symmetry.
2. Next, adjust both front corners equally to match rear.
3. Avoid adjusting rear (hinge area).
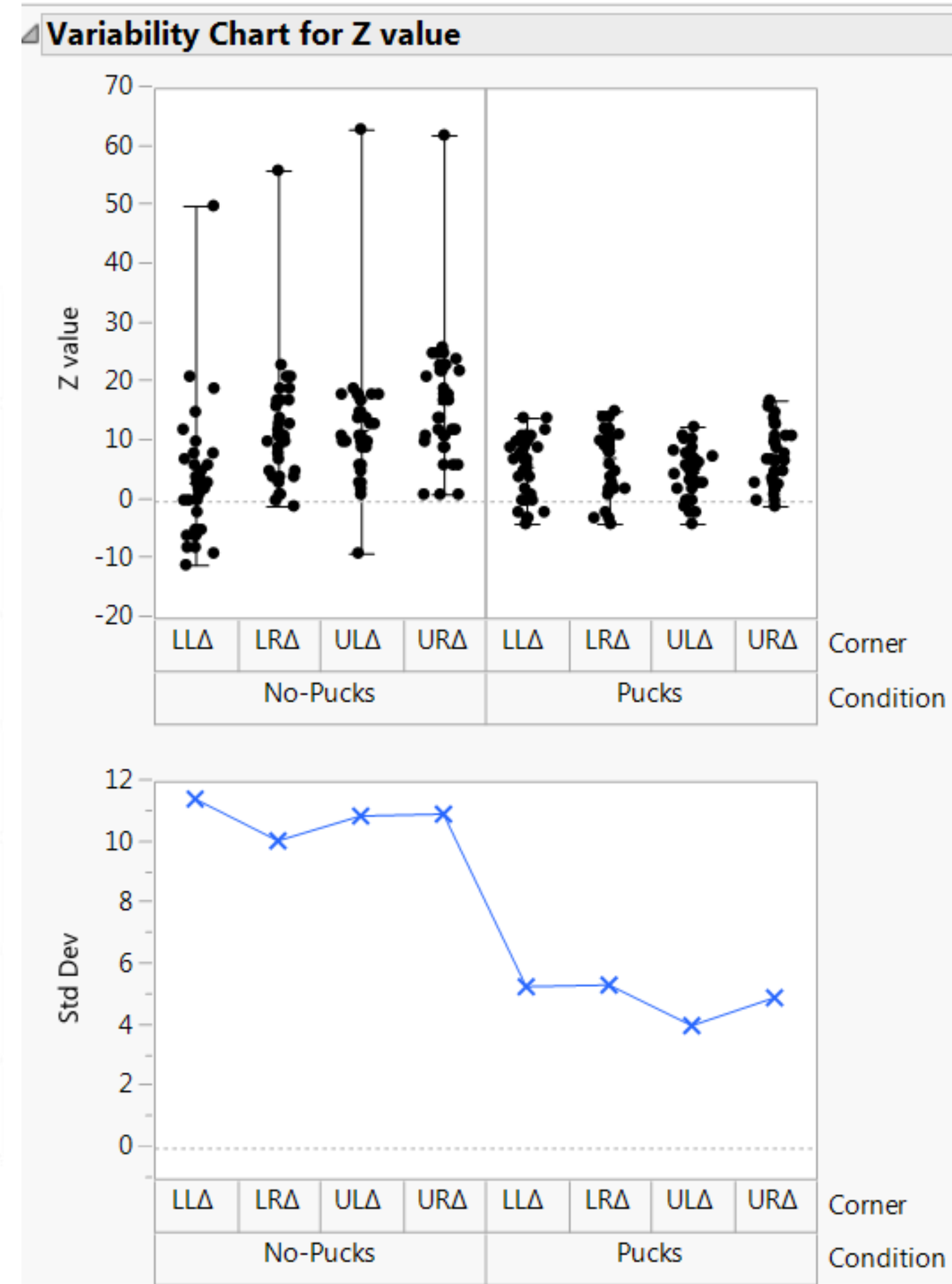4. Only make small adjustment in rear for left / right symmetry.

Setting up device file or manual measurements:
Start in Rear Left location, continue clockwise.

Production Data

Test Cell Docking

Test Cell Co-Planarity

Before Pucks / Z Plane range by run / After Pucks
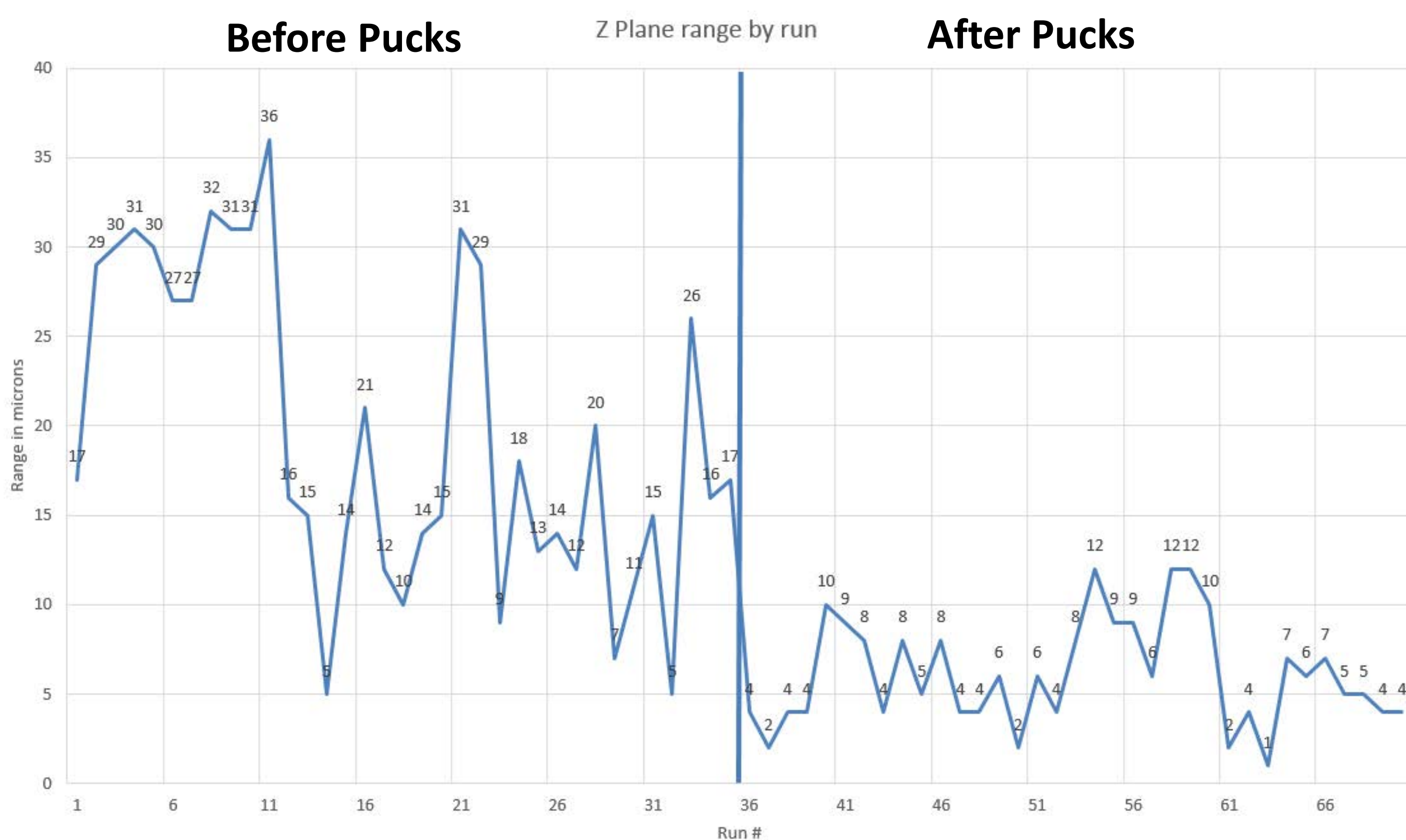
FLS Target Acquisition Repeatability