SW Test Workshop
Semiconductor Wafer Test Workshop
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New Prober Interface Docking Evaluation

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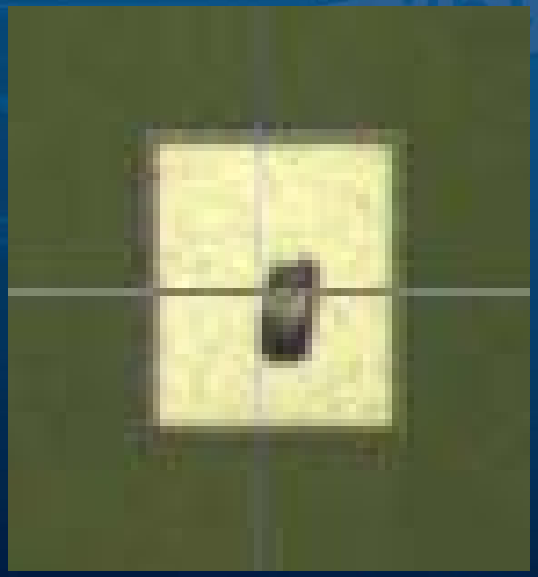
Overview

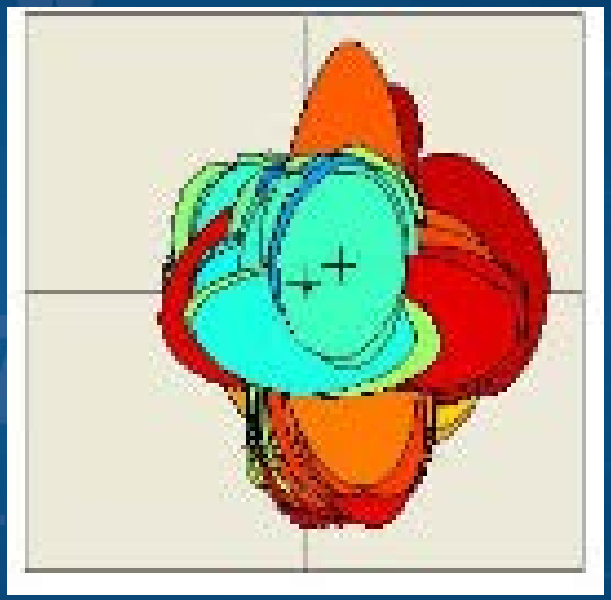
- **Objective**
- **Method**
  - Scrub mark size
  - Automated Visual Inspection
  - Thermal movement
  - Docking deflection
  - Auto-z
- **Design**
- **Design changes**
  - Materials
  - Stiffener modifications
  - Overhaul on the docking design
- **Manufacturability / Production**

Objective

- **Evaluate new probe interfaces to confirm that interface can support high multi-site designs for bumps and pads devices.**
  - Moving from 8DUT probe cards to 128DUT probe cards
- **Evaluating how the probe interface performs with large probe cards with 1,000 to 20,000 probes**
- **Probing temperatures of -40C to 140C**

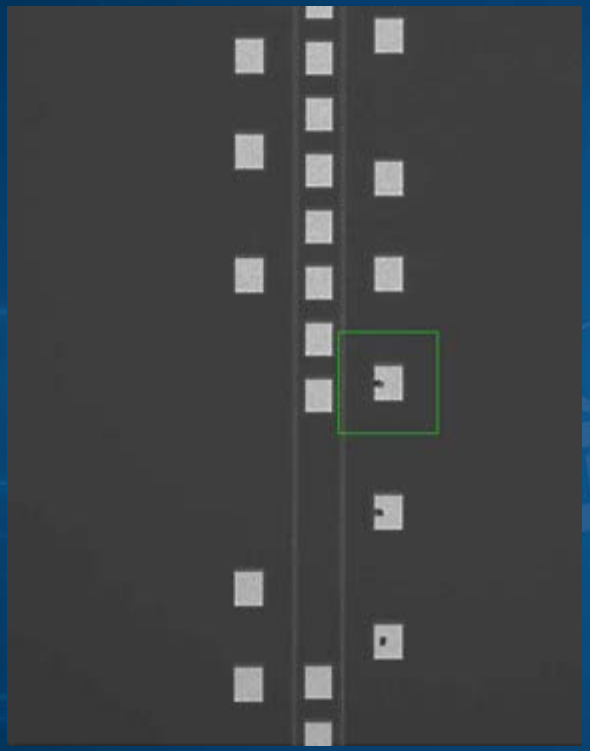
Method: Scrub Mark Size



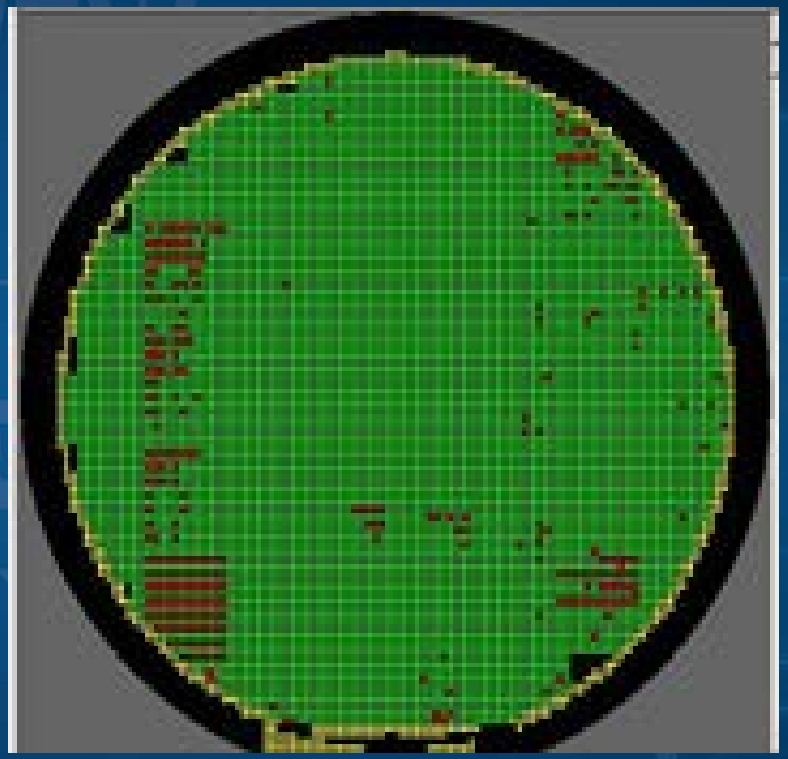


Super bond pad of the all the sites during probing. Scrub marks need to be within probe pad area

Method: Automated Visual Inspection



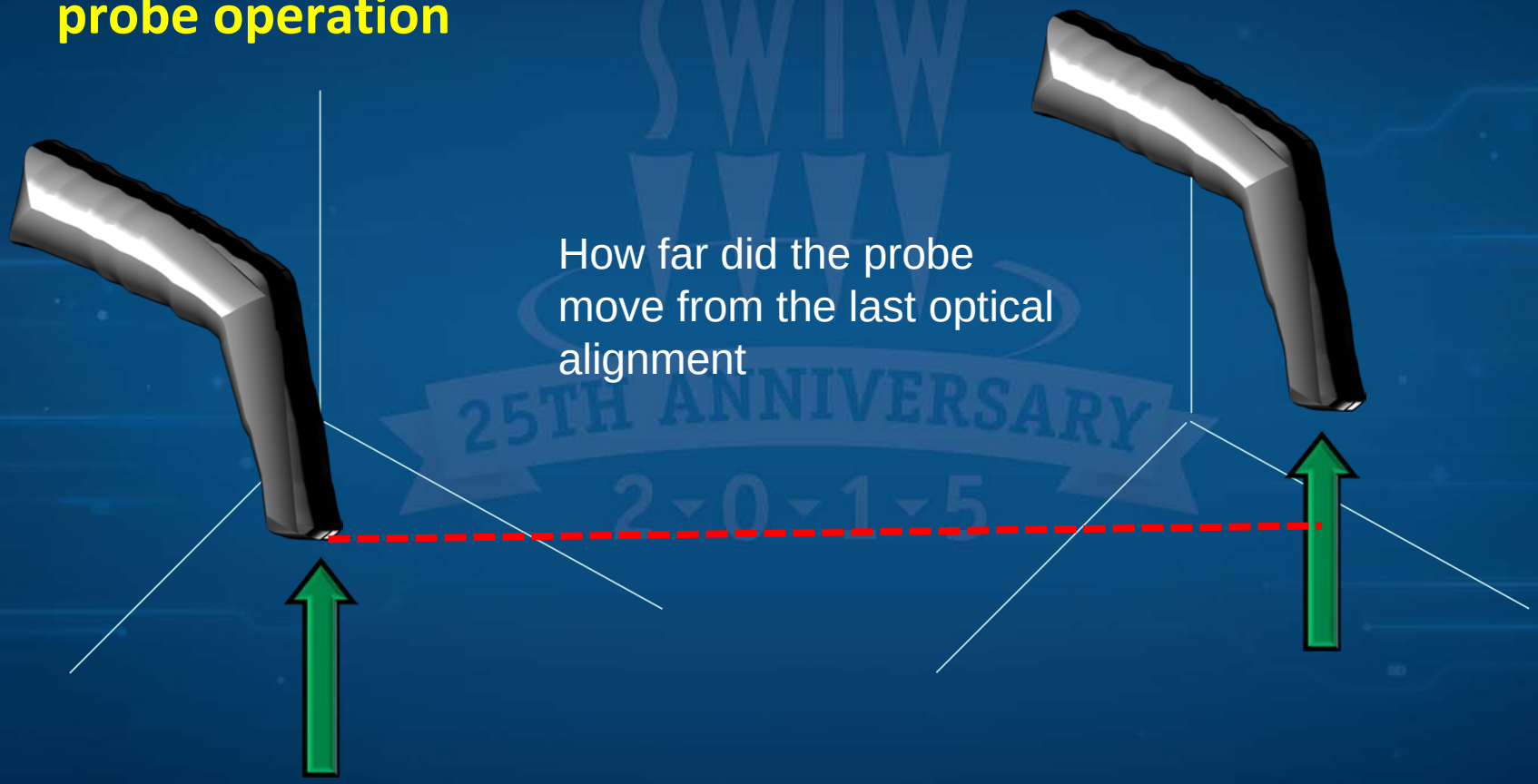
Misaligned Probes



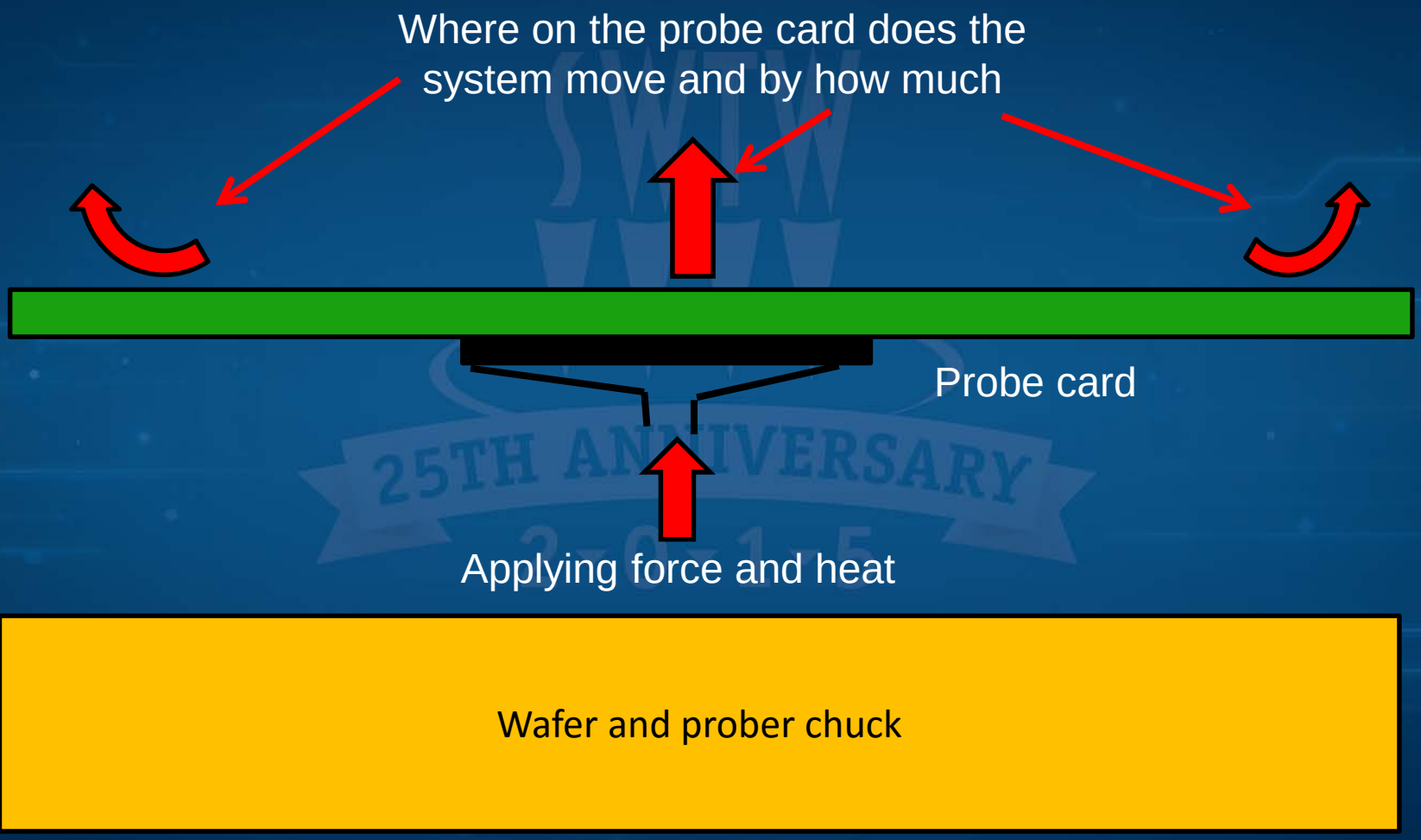
Wafer Map AVI loss

Method: Thermal Movement

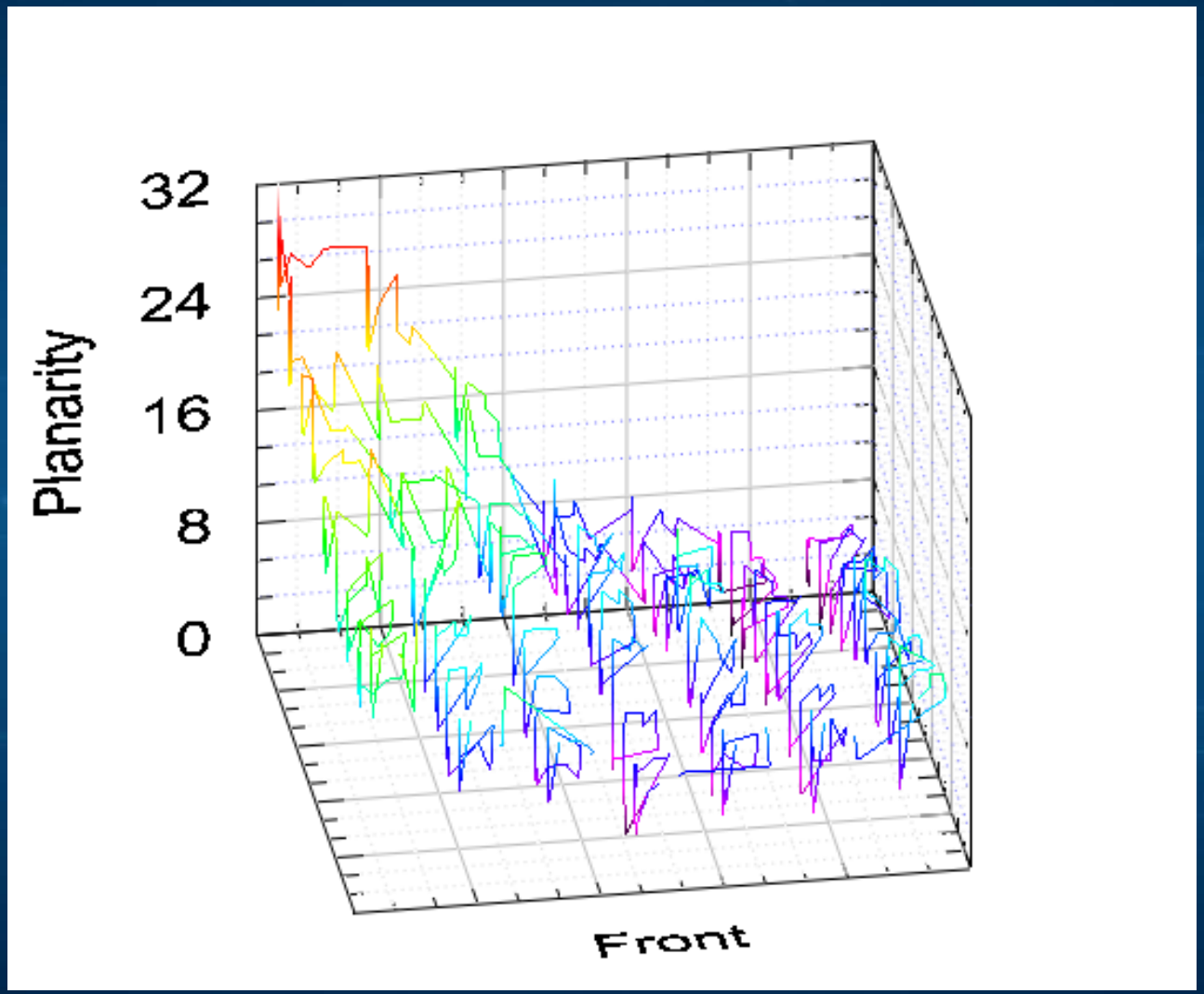
- **Looking at XYZ movement of the probes periodically during the probe operation**



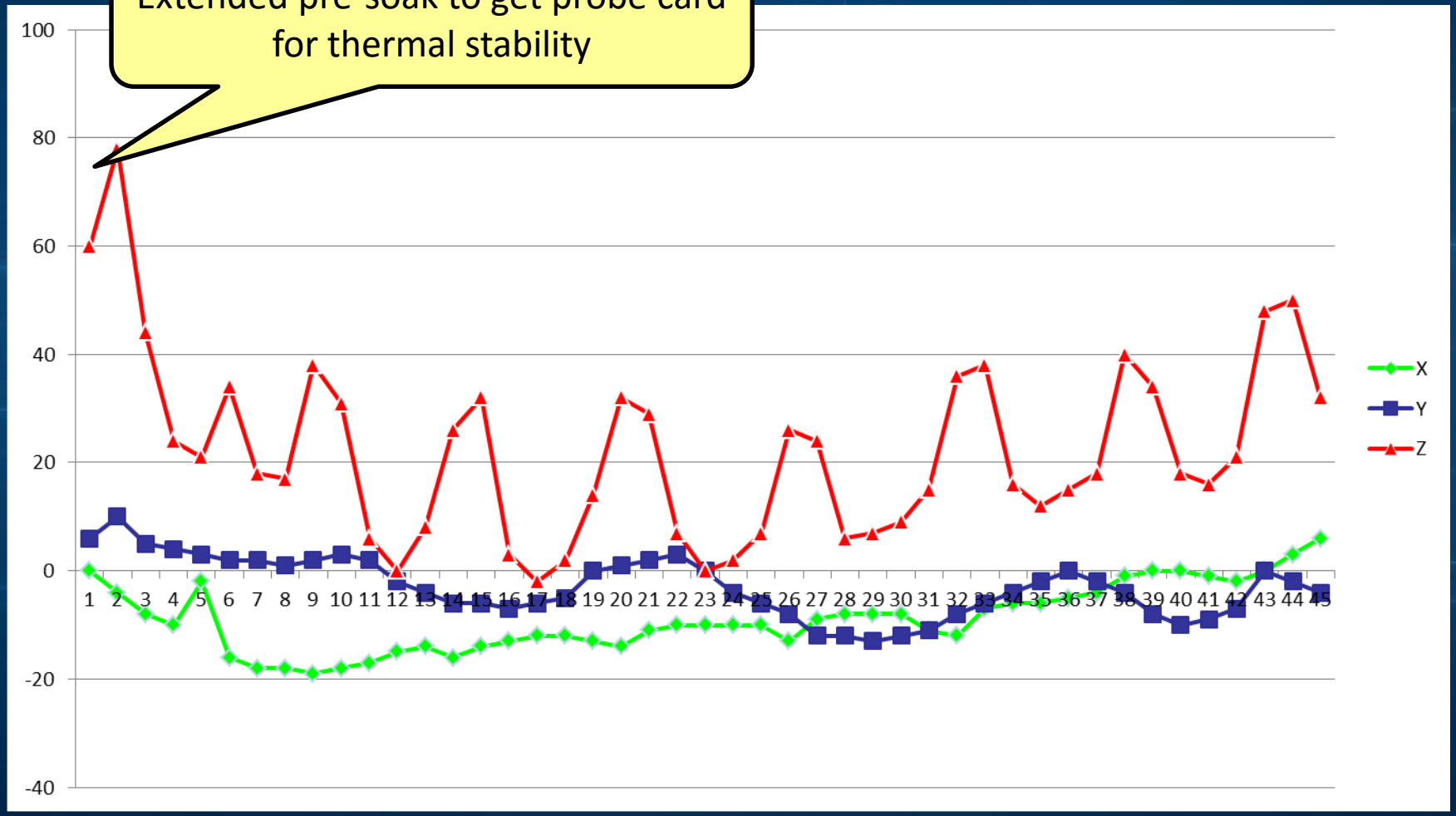
Method: Deflection



Method: Auto-Z

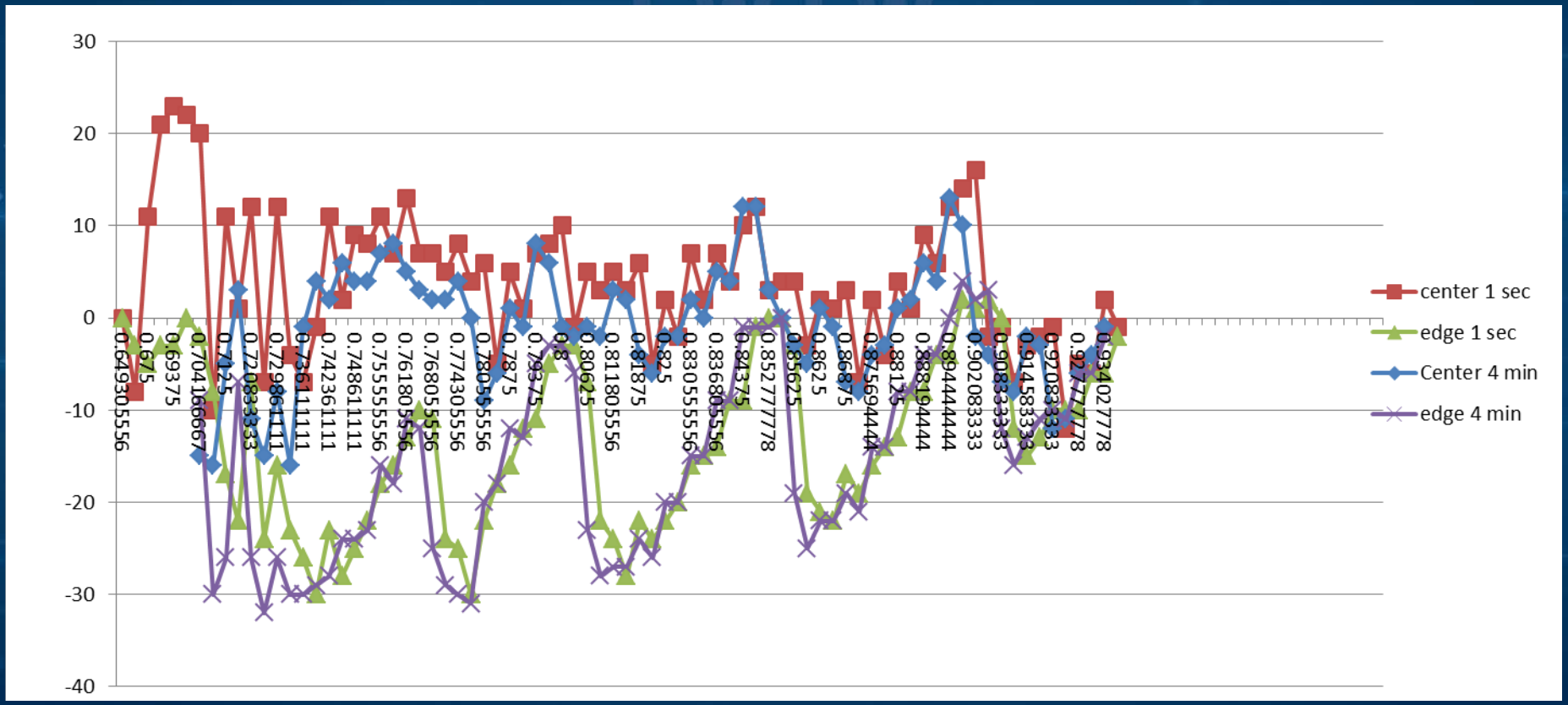


Baseline Thermal Movement

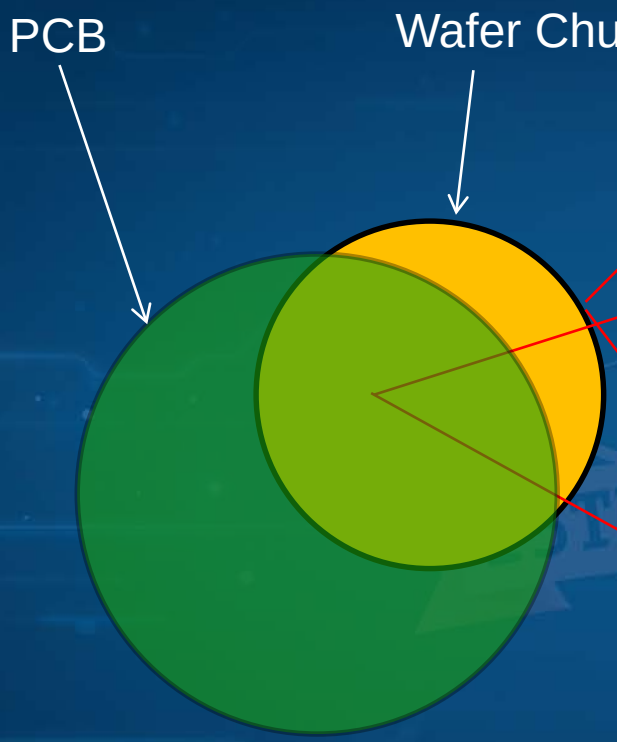


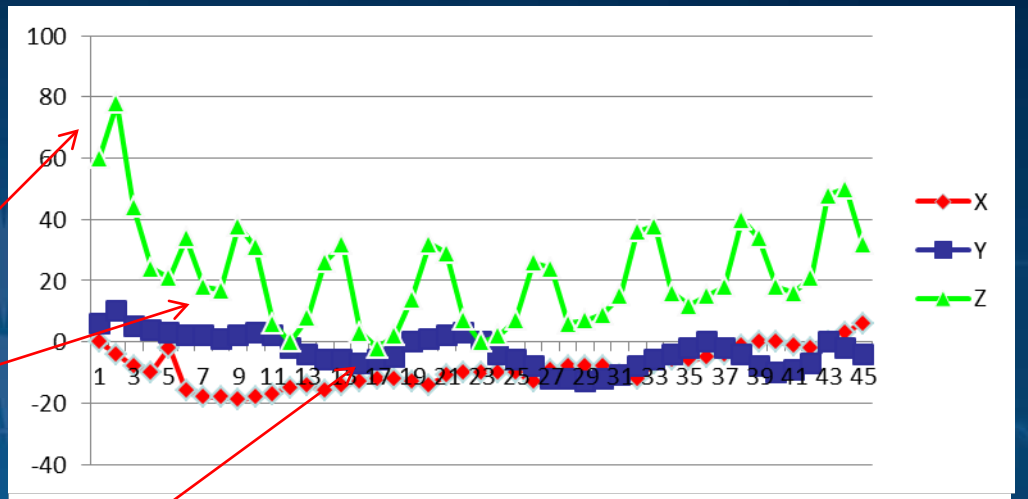
Base Line – Deflection at Temp

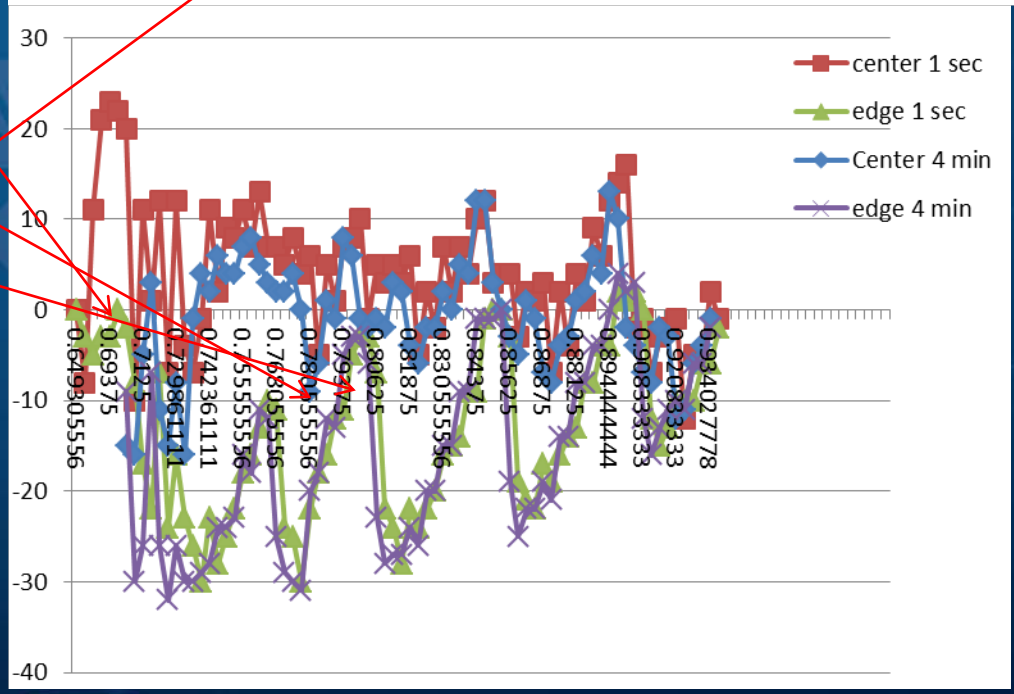
Measuring deflection at center and edge of the probe card



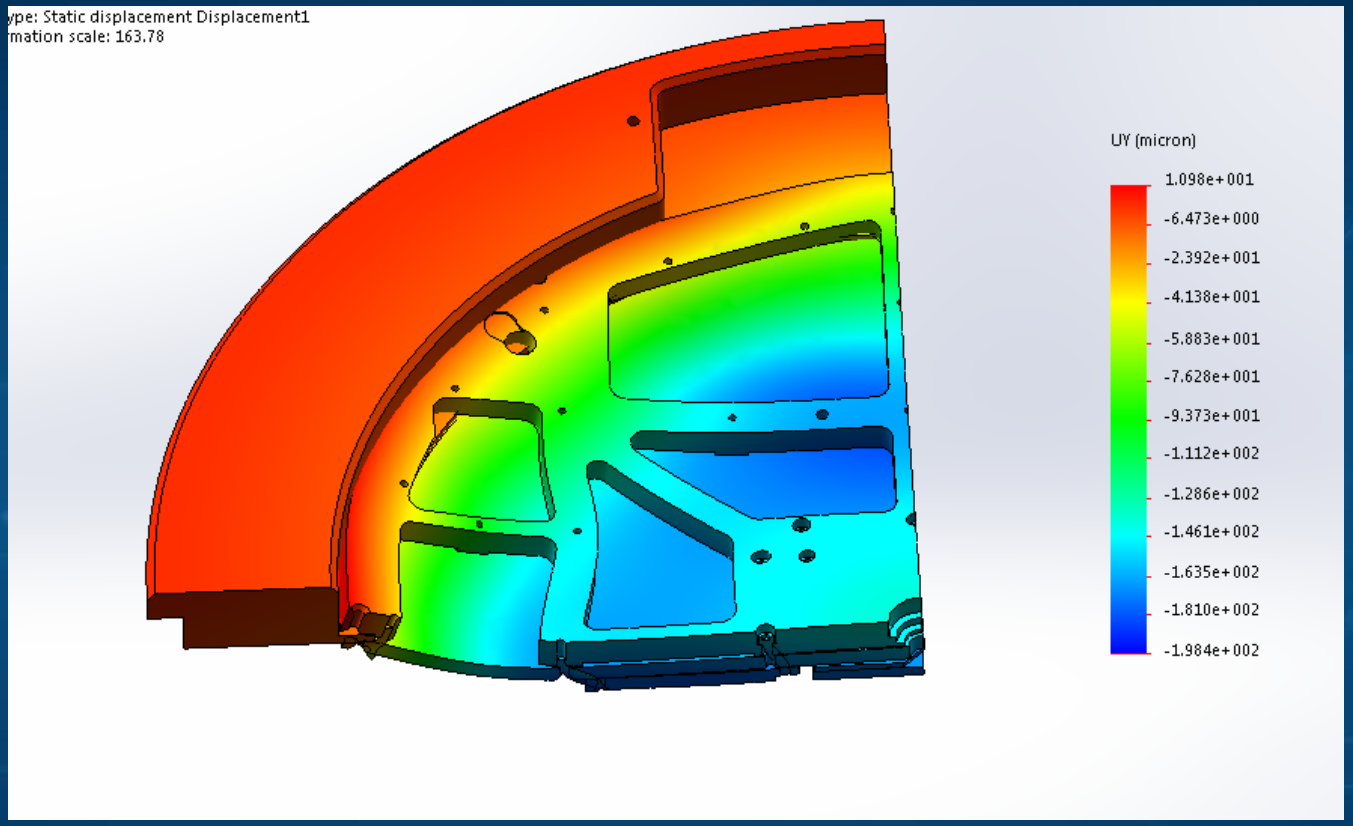
Probing Pattern





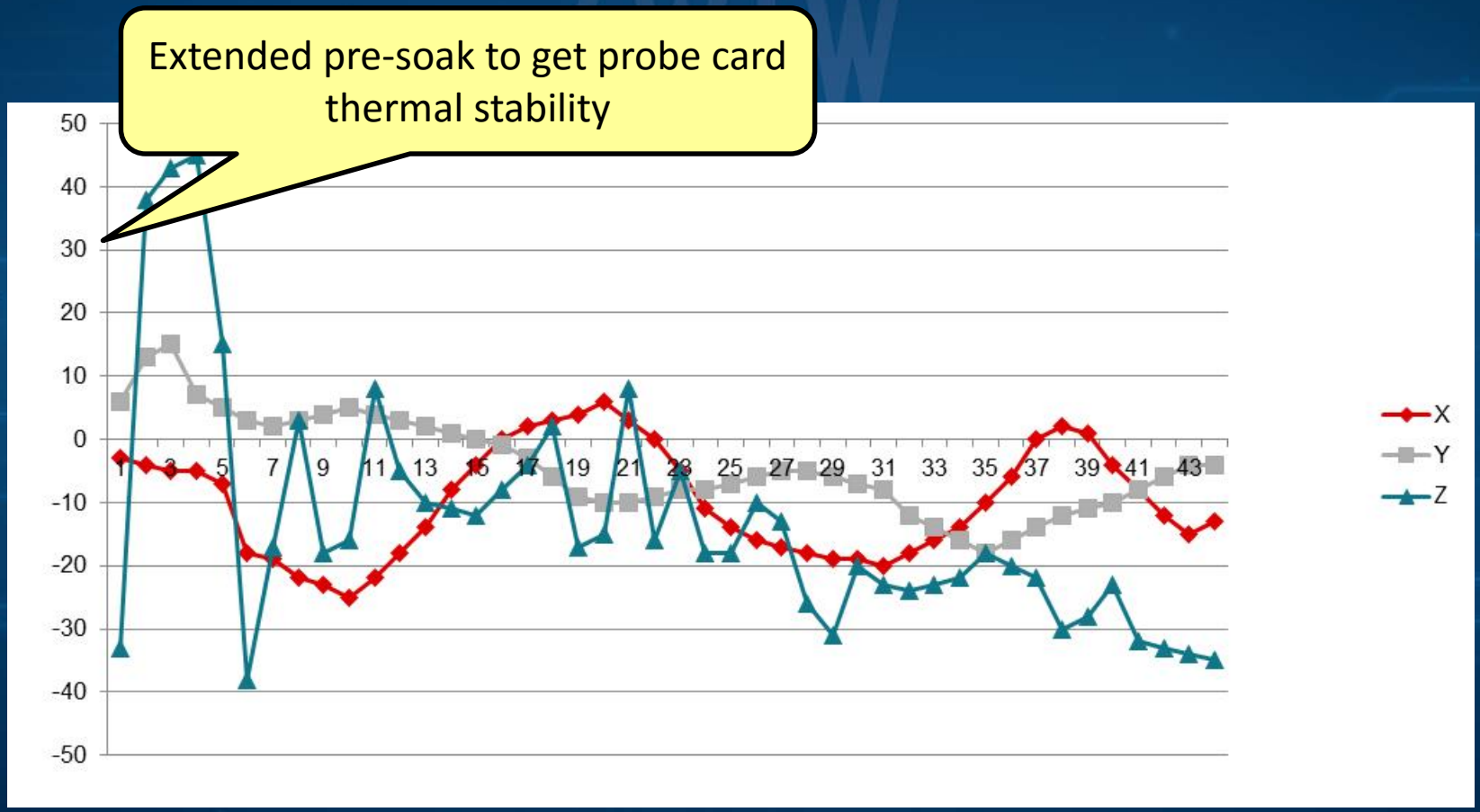


Baseline Modeling

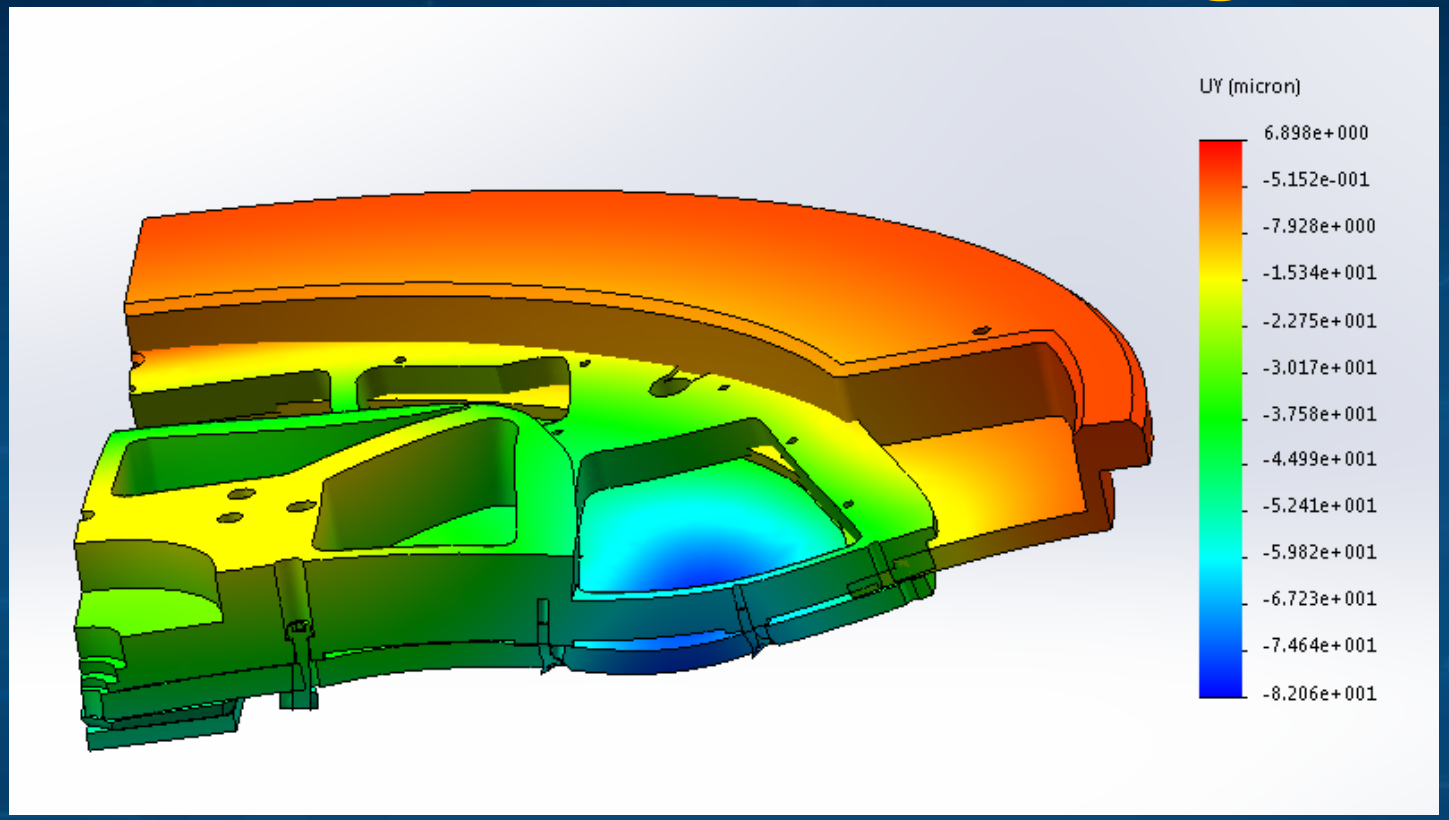


When the heat is applied to the edge of the docking hardware a large dome affect occurs due to temperature applied to the stiffener

Baseline Docking Thermal Movement with Improved Step pattern

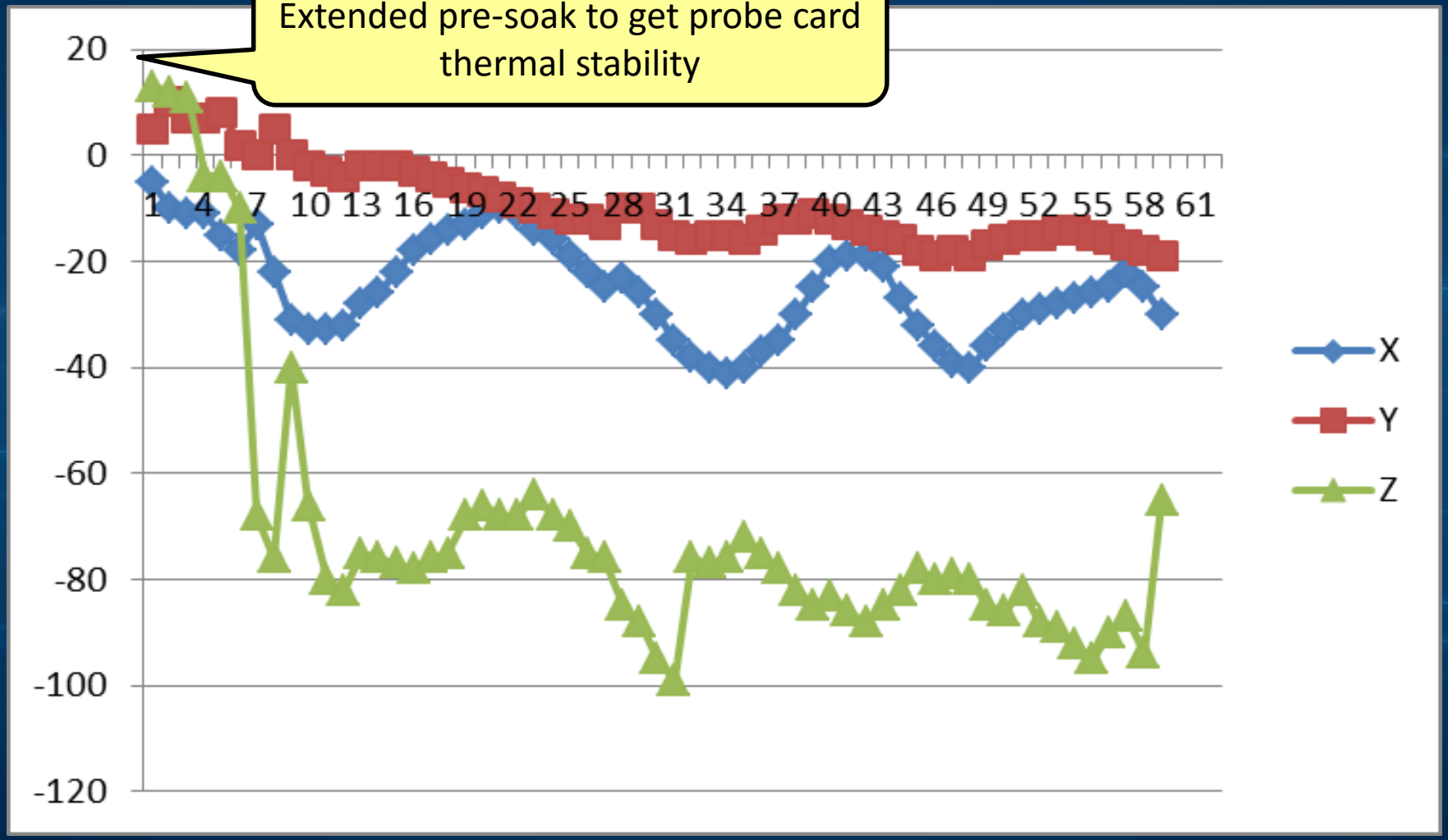


Stiffener B Modeling



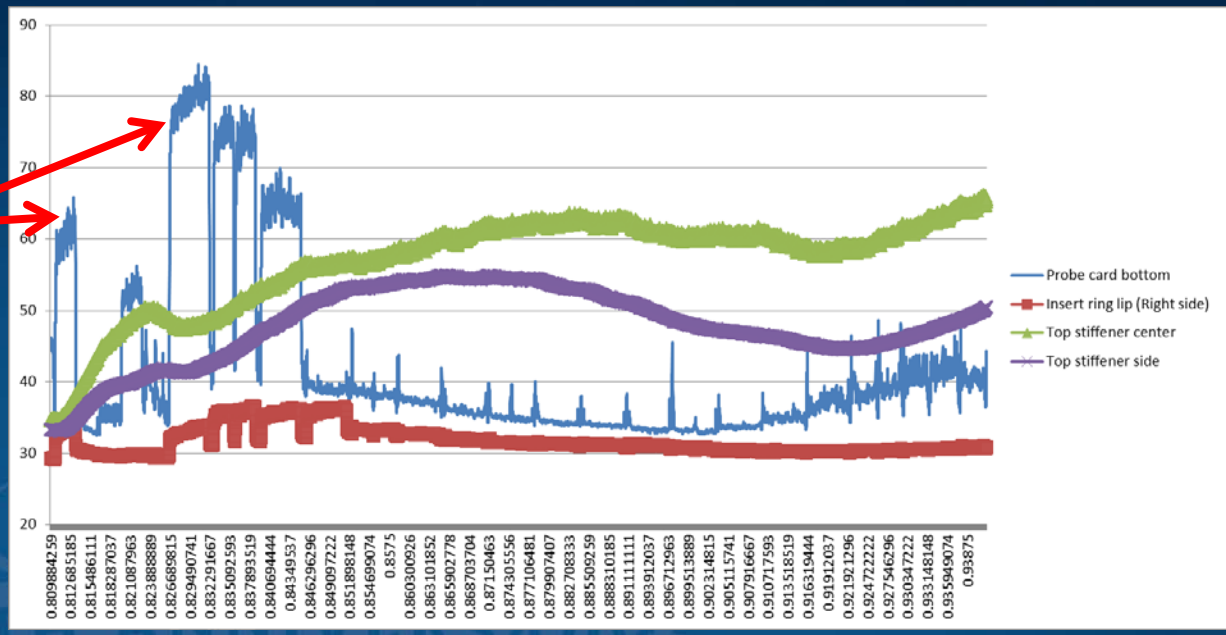
- Model Reproduces Domed Center Shape.
- Center Deflection is +64 um. Measured is ~70.

Stiffener Type B Thermal Movement

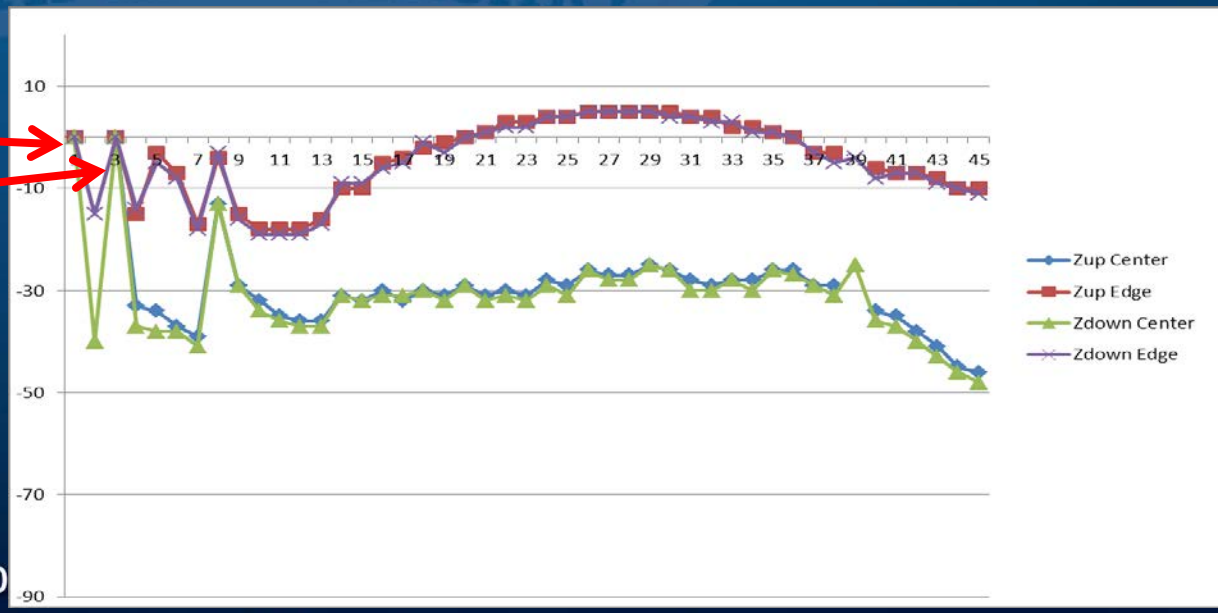


Stiffener Type B

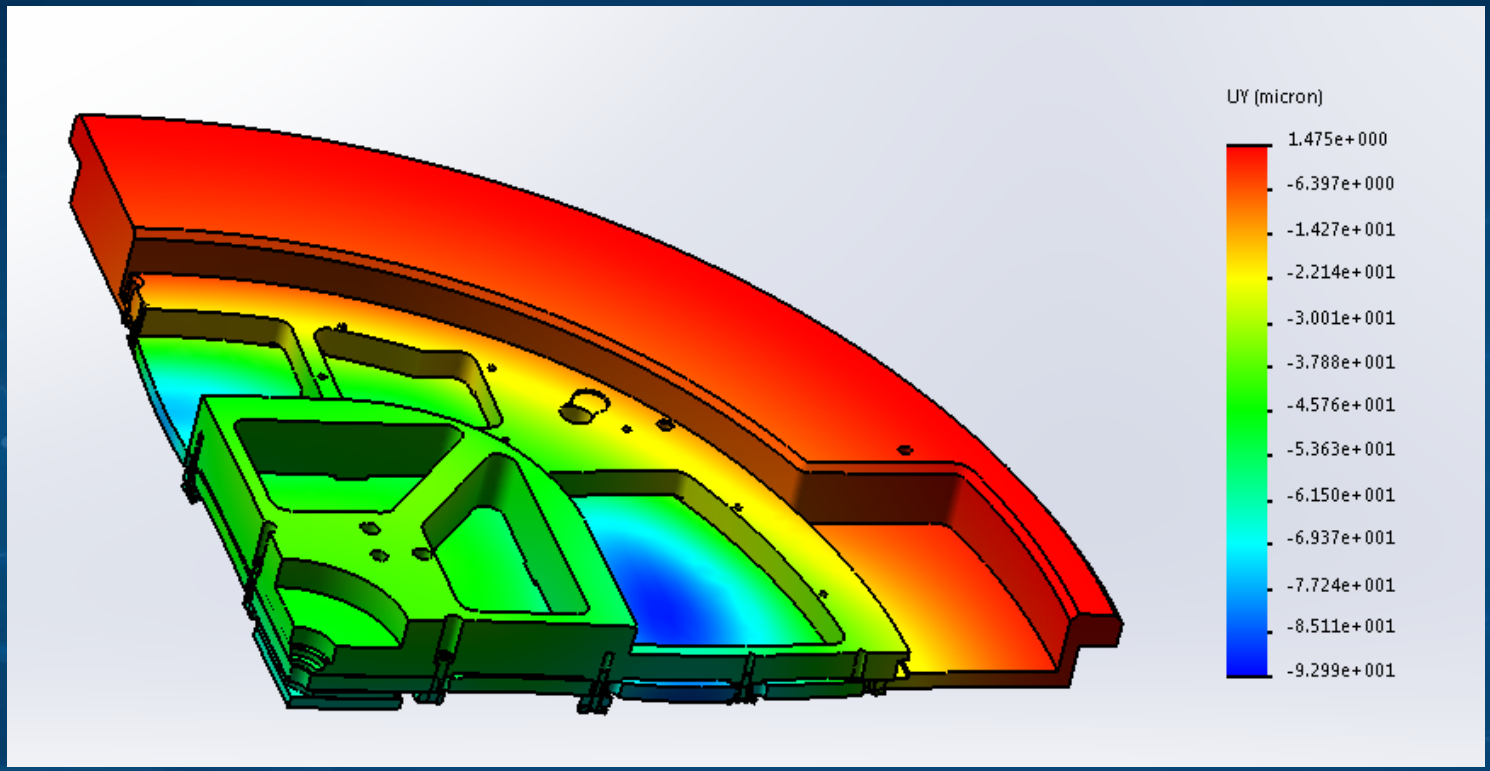
When the hot prober chuck is in contact with different areas on the probe card the temperature spikes



When the hot prober chuck is in contact with different areas on the probe card the deflection spikes matching with the temperature spikes

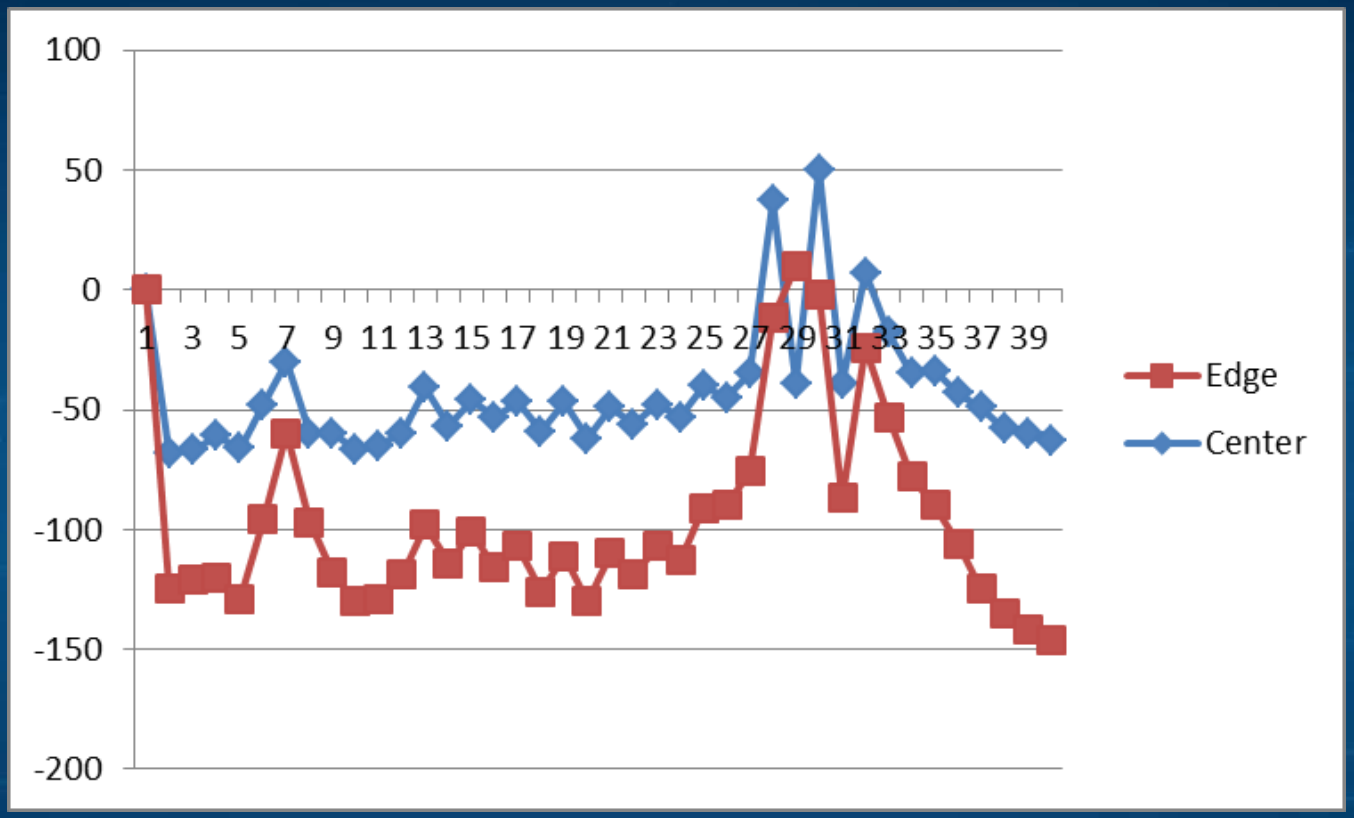


Stiffener Type C Modeling



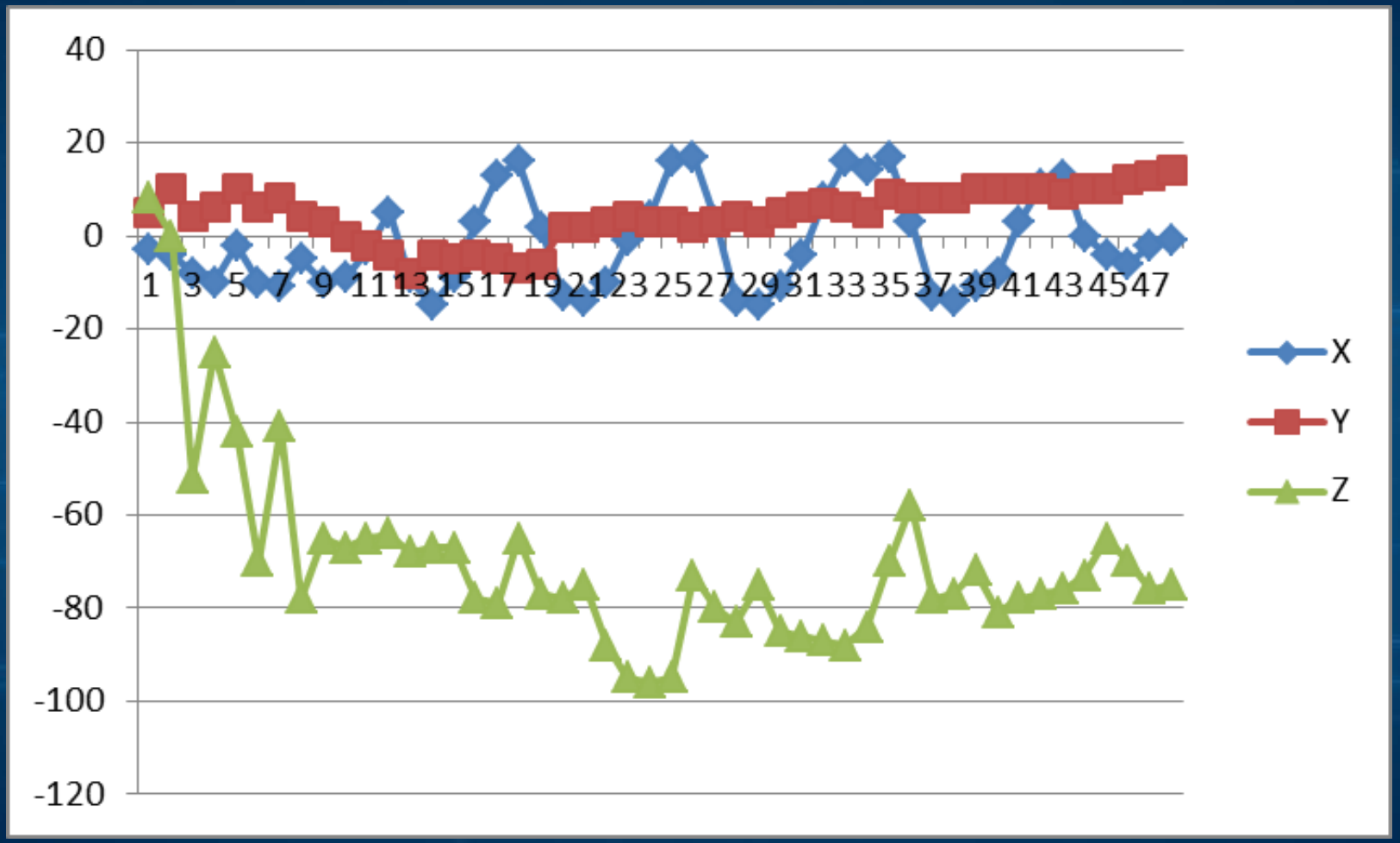
- Model Predicts Slightly Domed Center Shape.
- Center Deflection is +60 um.

Stiffener Type C Deflection

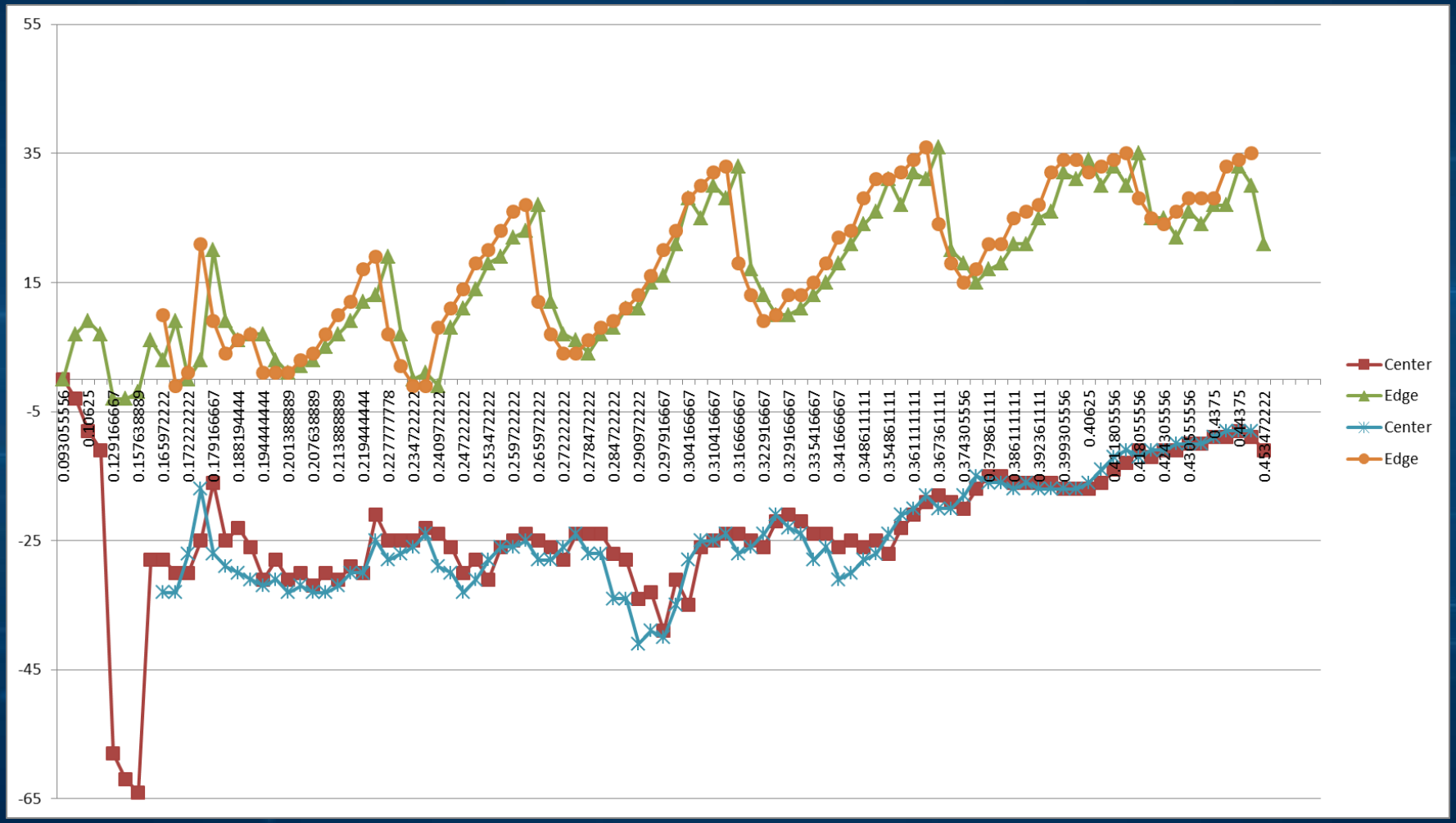


Deflection on stiffener type C showed the tendency to drift during probing

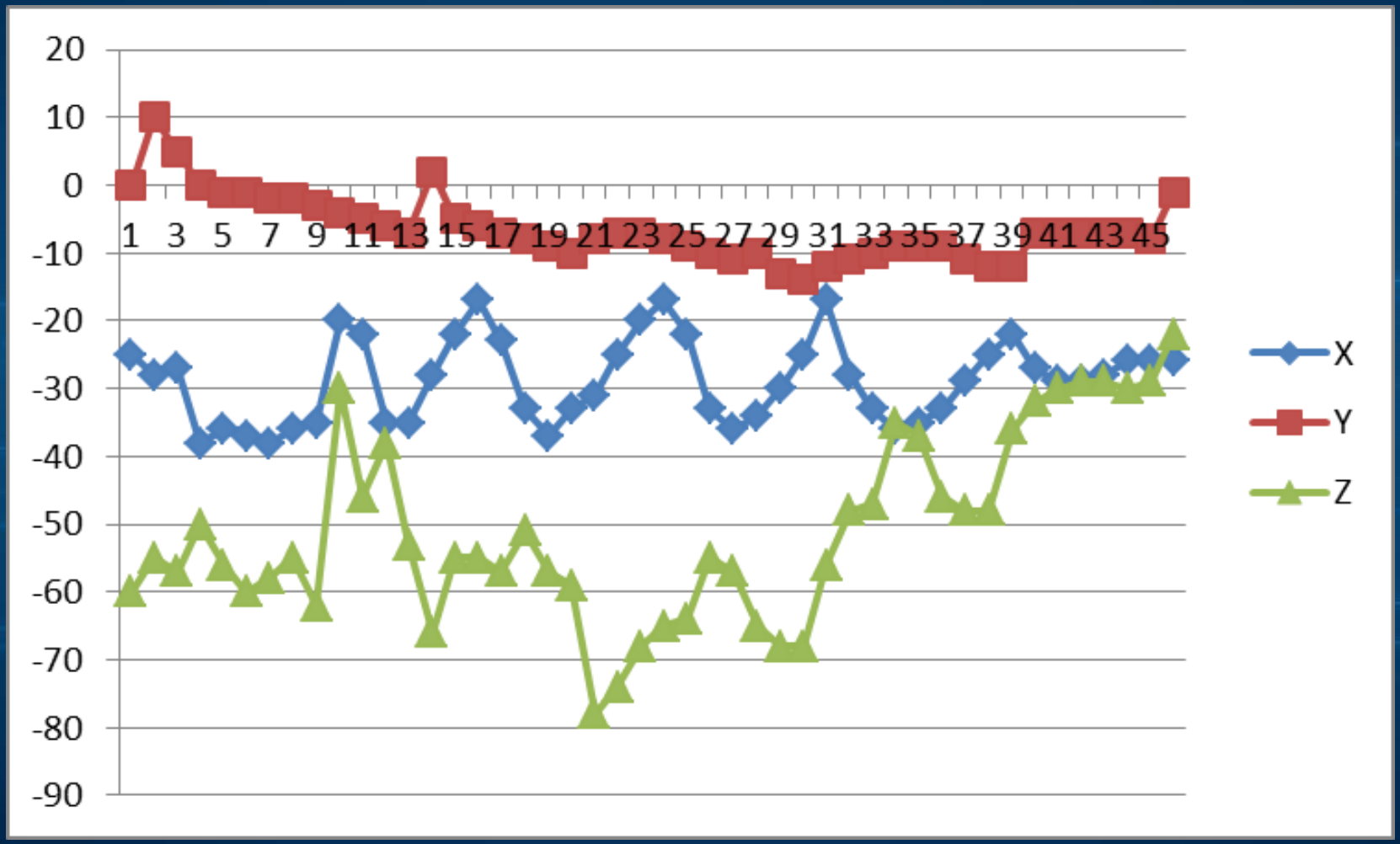
Stiffener Type C Thermal Movement



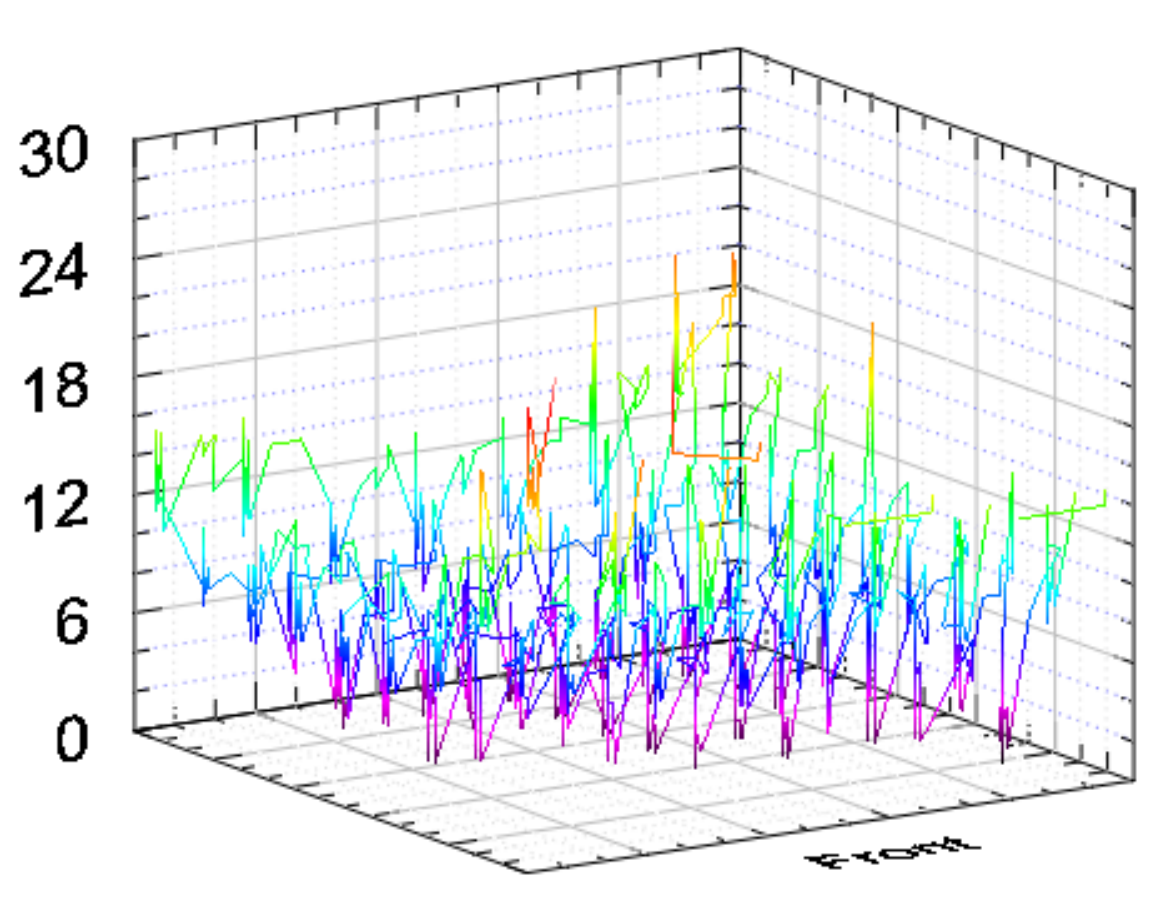
Stiffener Type C Deflection With Hardware Modification



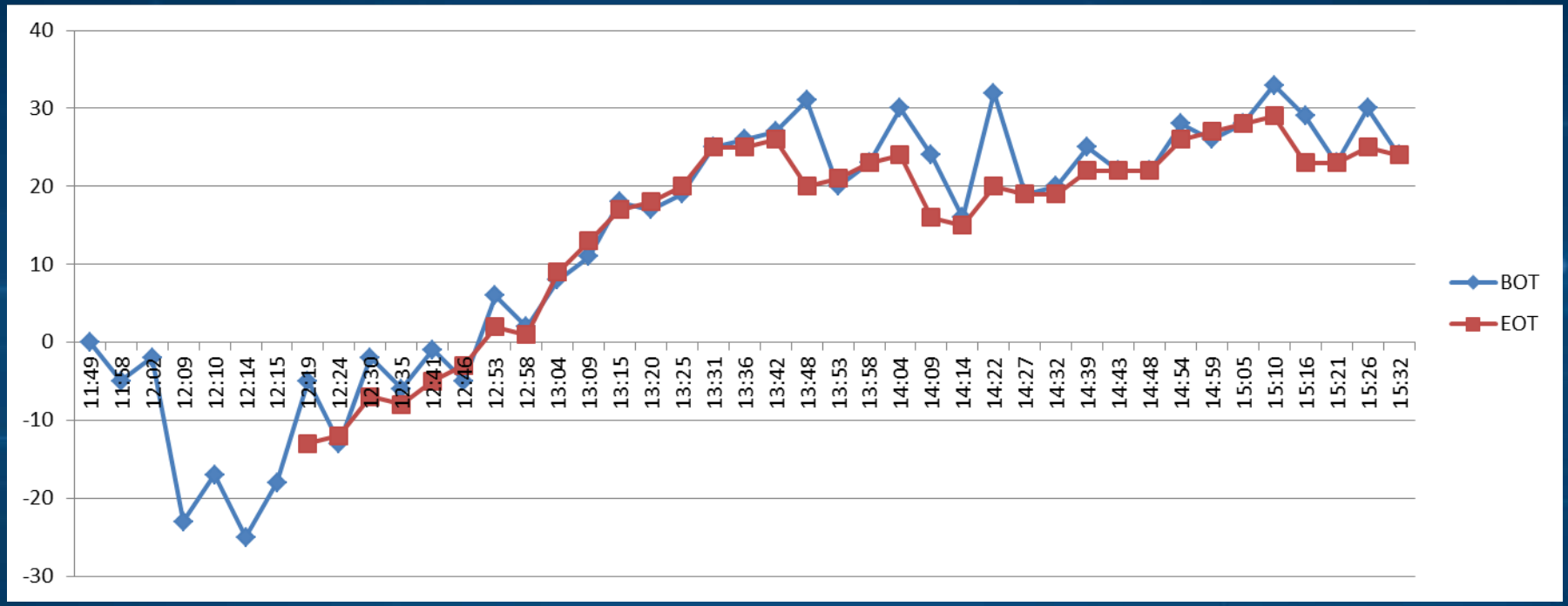
Stiffener Type C Thermal Movement With Hardware Modification



Design Type S Auto-z

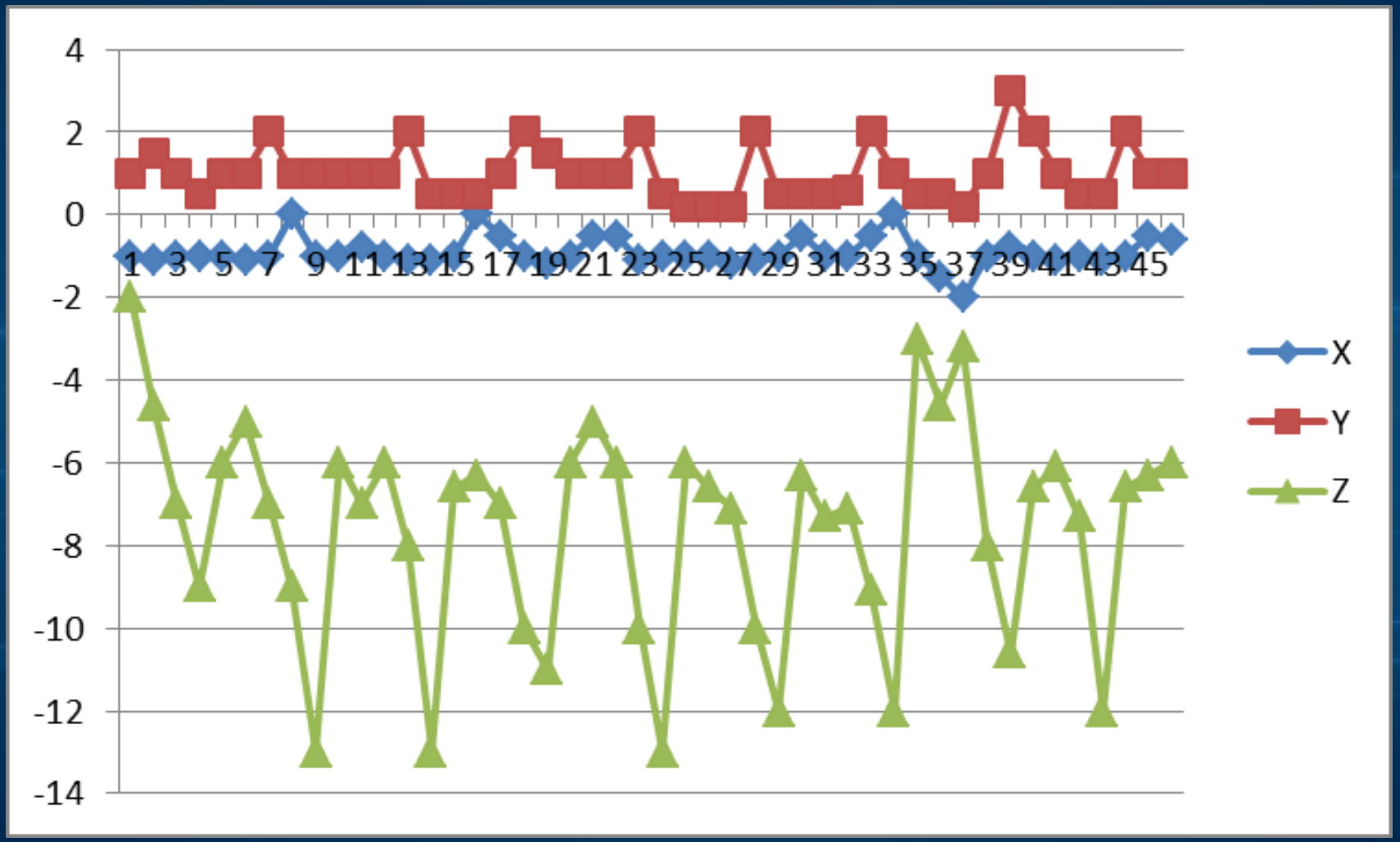


Design Type S Deflection



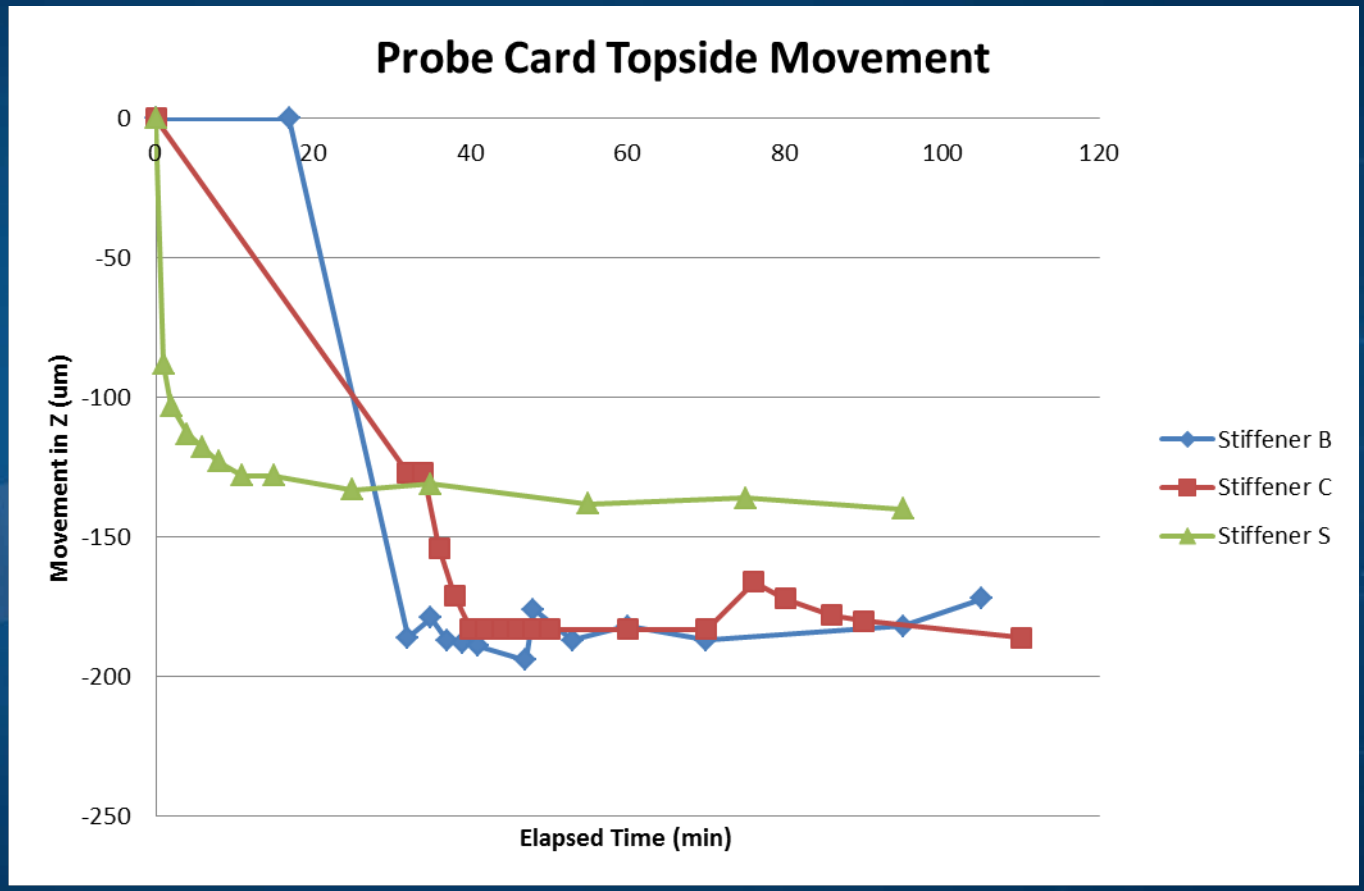
Deflection of design type S does not have any large movements

Design Type S Thermal movement

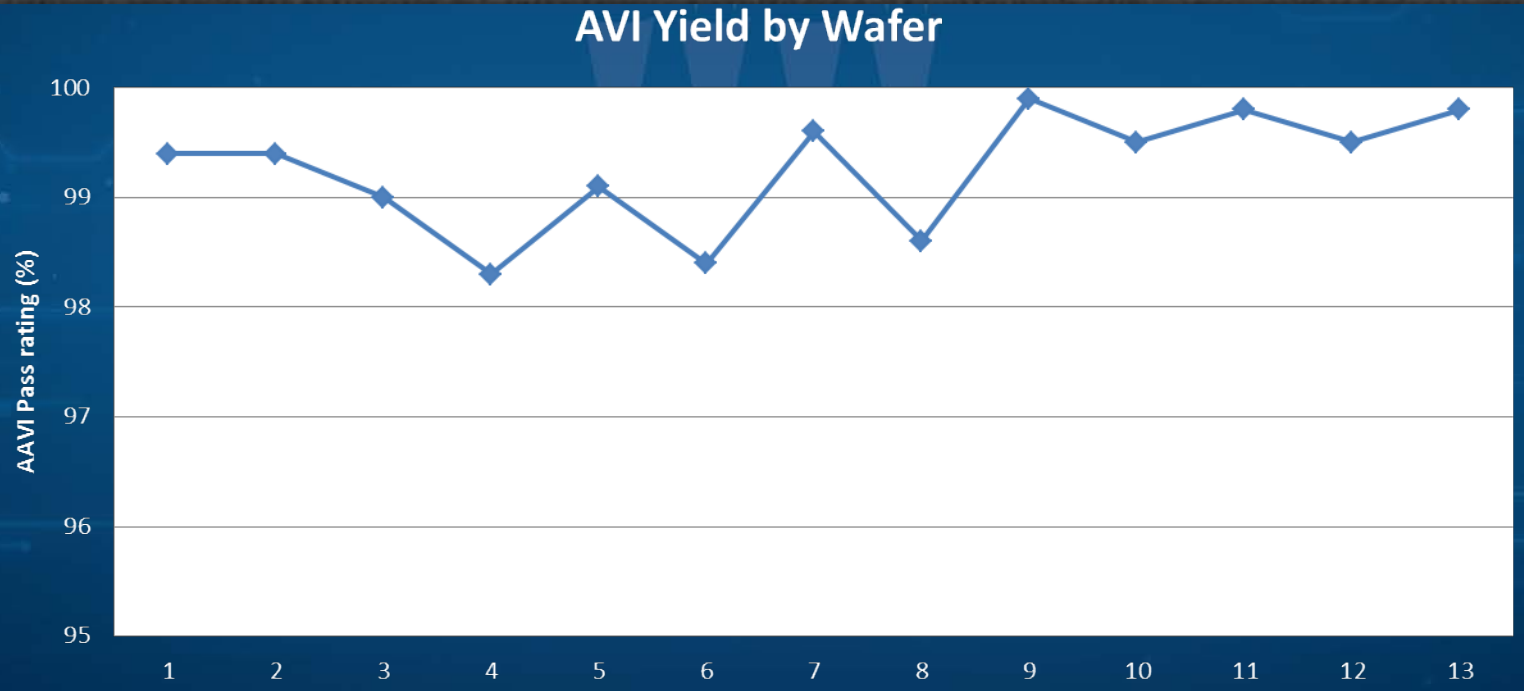


Deflection Movement

Stiffener S Design Z drop happens immediately not requiring any temp soaking



Design Type S AVI Results



Conclusion

- Measuring the correct features on a probe card are important to evaluate production performance.
- Using the correct stiffener material is critical to controlling probe card performance .
- Docking and stiffener design will have impacts on how the card reacts at all temperatures.

Acknowledgments

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