

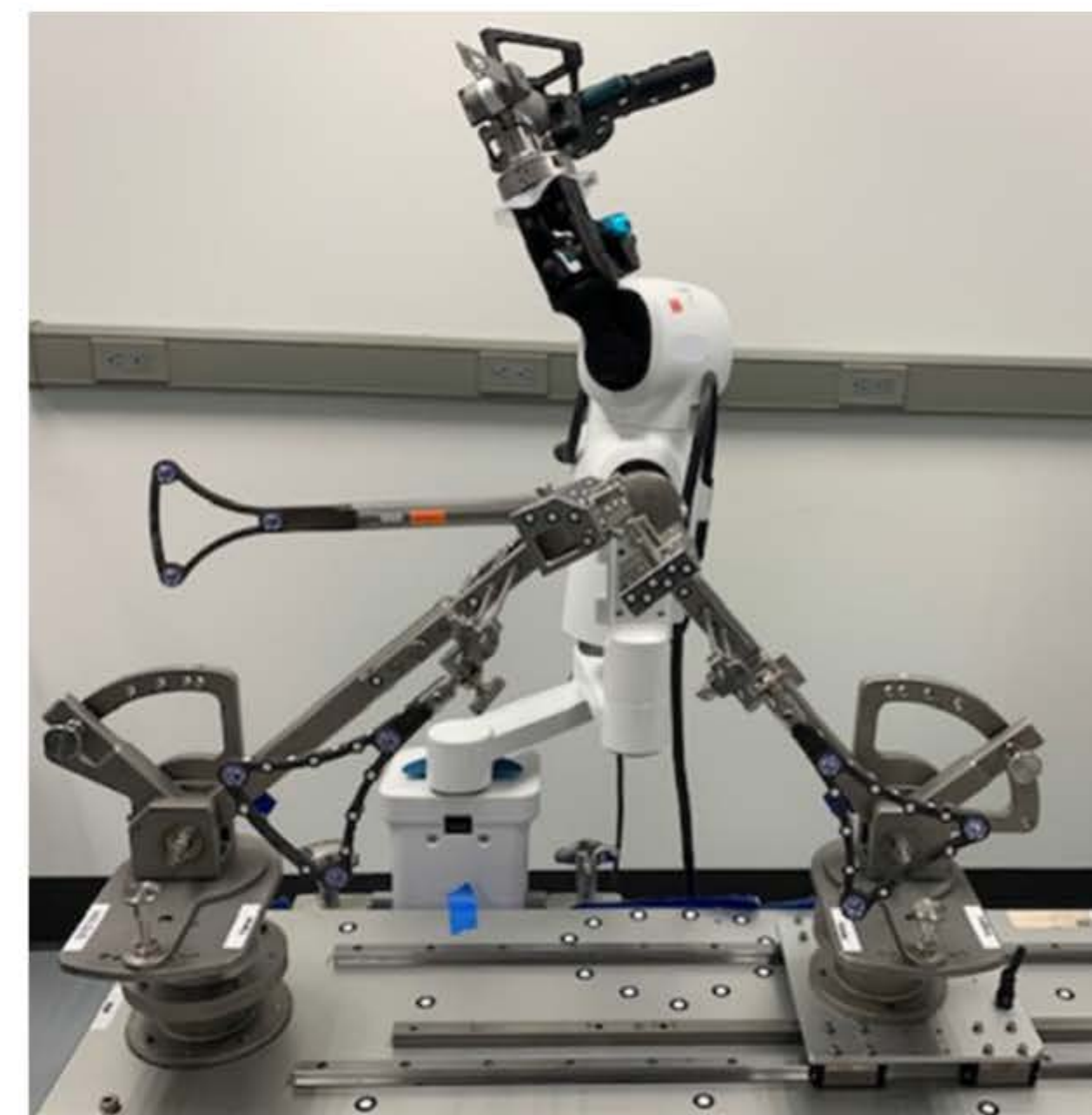
# Benchtop Positional Accuracy Assessment of the VELYS™ Robotic-Assisted Solution Using Digital Image Correlation

Authors: Kelly Mote<sup>1</sup>, Thomas Wesley McDowell IV<sup>1</sup>, Joseph Wyss<sup>1</sup>, Presenting Author: Kelly Mote

Affiliations: <sup>1</sup>DePuy Synthes Joint Reconstruction, Warsaw, IN

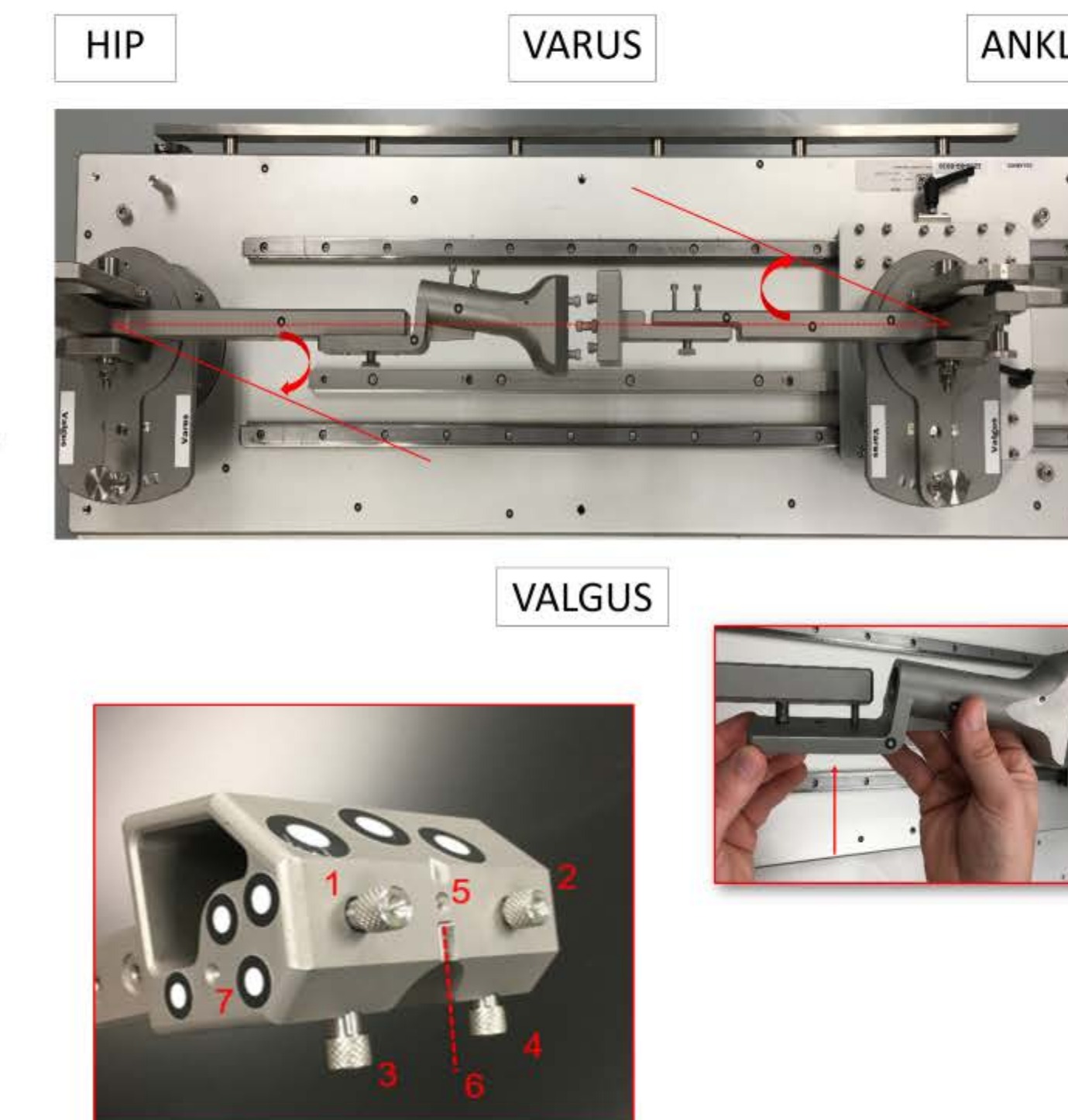
## 1. Introduction

- A benchtop assessment can rapidly characterize positional accuracy with reduced time, cost, and experienced personnel prior to cadaveric studies.
- It removes the user variability and landmark acquisition variability by pre-defining the landmark acquisition points and surgical plan based on bone model size.
- It can begin to evaluate the hypothesis that robotic-assisted surgery in Total Knee Arthroplasty (TKA) can potentially increase the surgical accuracy of TKA's compared to the conventional approach.



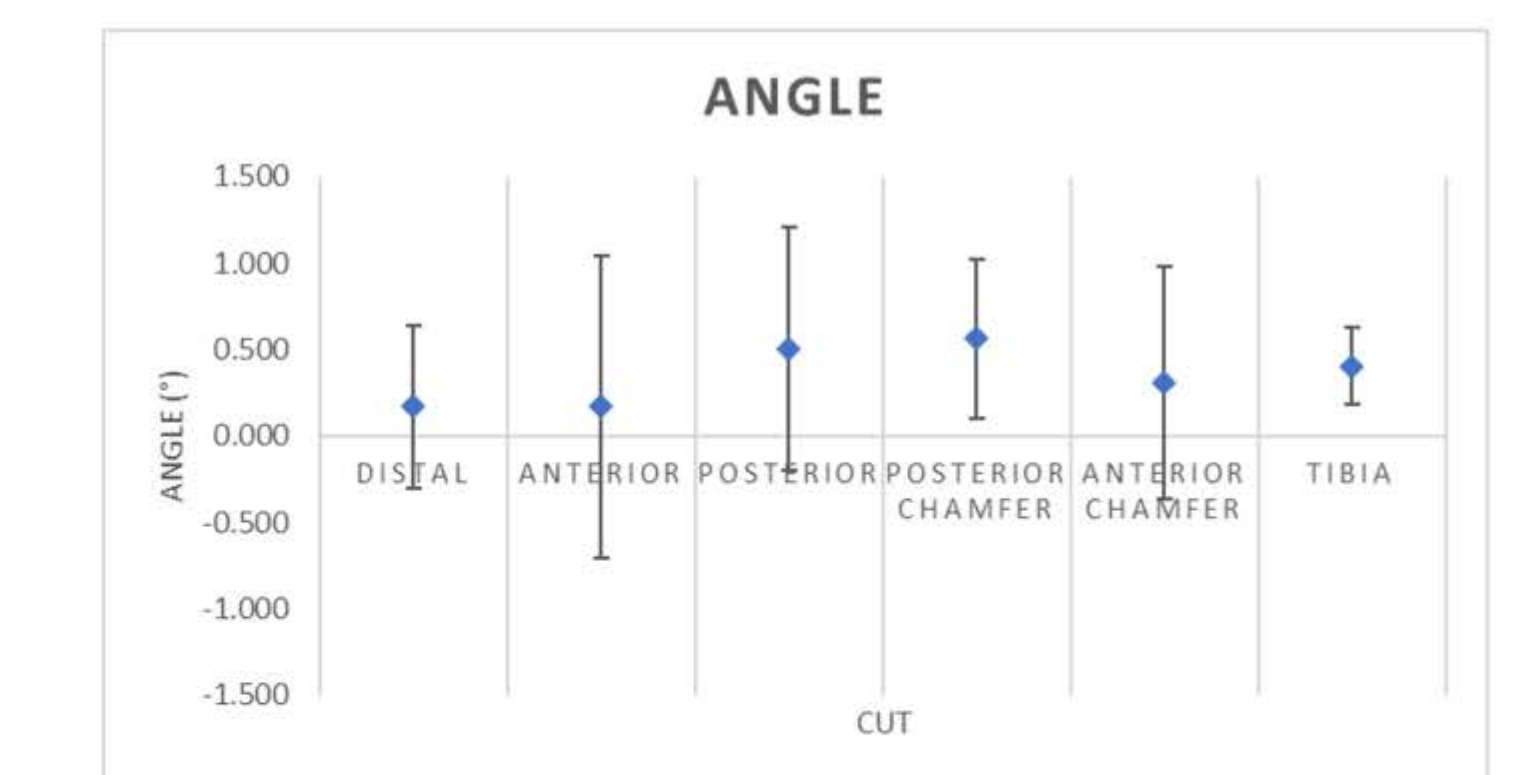
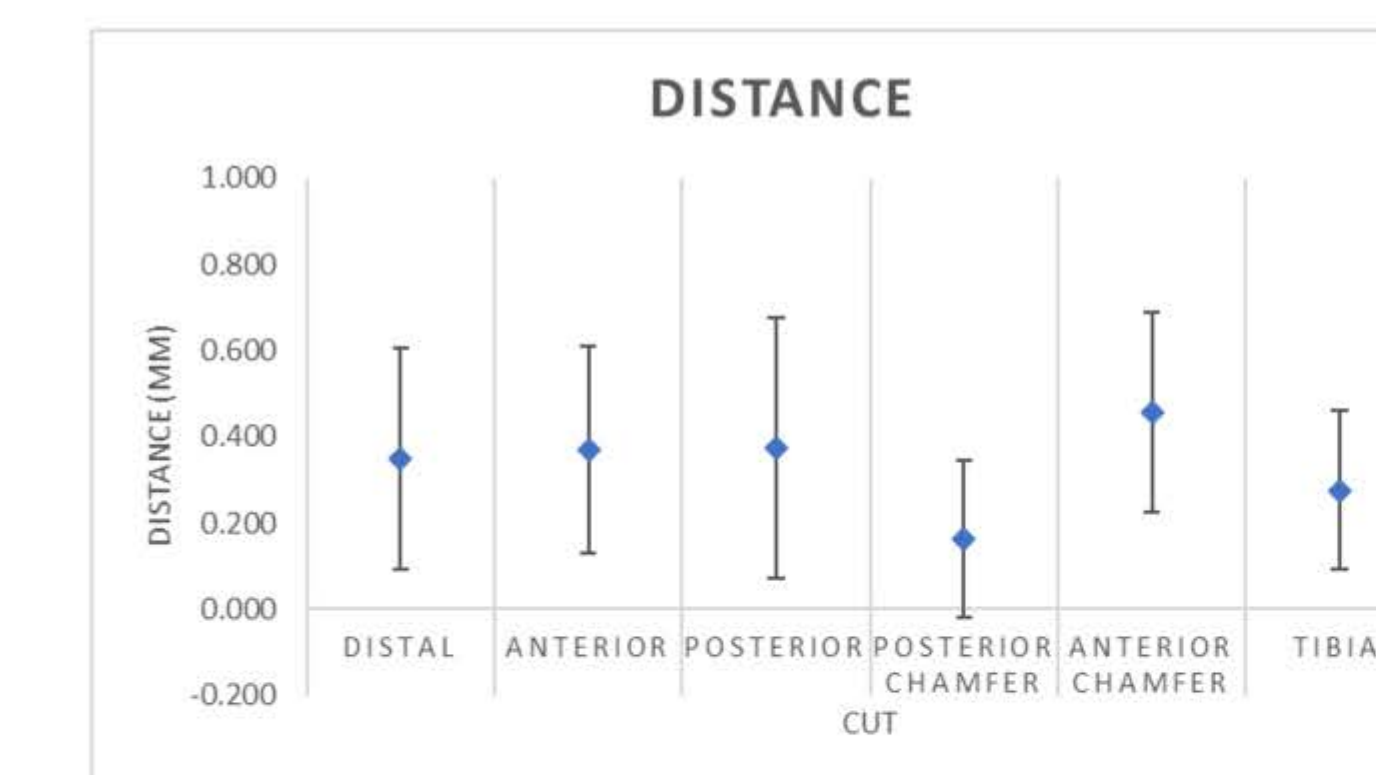
## 2. Methods: Test Bench

- The Accuracy Test Bench is an anatomical mechanical representation of a single leg and developed with gauged femur and tibia bone models defining the anatomical landmark locations (pre-operative) and respective cut planes (post-operative) using removable bone pins.
- One trial was conducted for 5 VELYS™ Robotic-Assisted Solution systems.
  - Bone model machined to fit a size 5 ATTUNE® Knee implant
  - Bench Configuration: 90° Flexion and 0° Varus/Valgus
  - 5 Femoral Resections: Distal, Anterior, Posterior, Posterior Chamfer and Anterior Chamfer
  - 1 Tibial Resection



## 3. Results

- Overall pooled\* linear positional accuracy of 0.33 +/- 0.25 mm.
- Overall pooled\* angular positional accuracy of 0.37 +/- 0.61°.



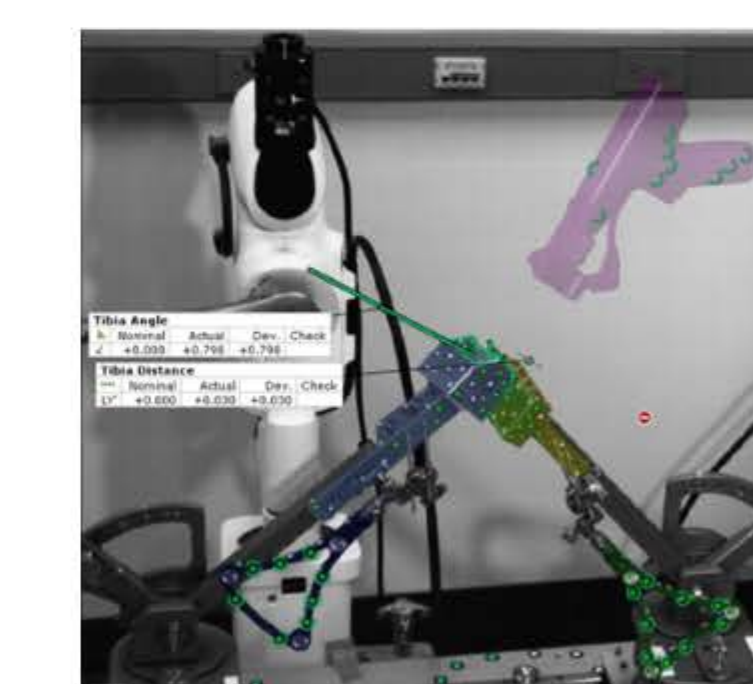
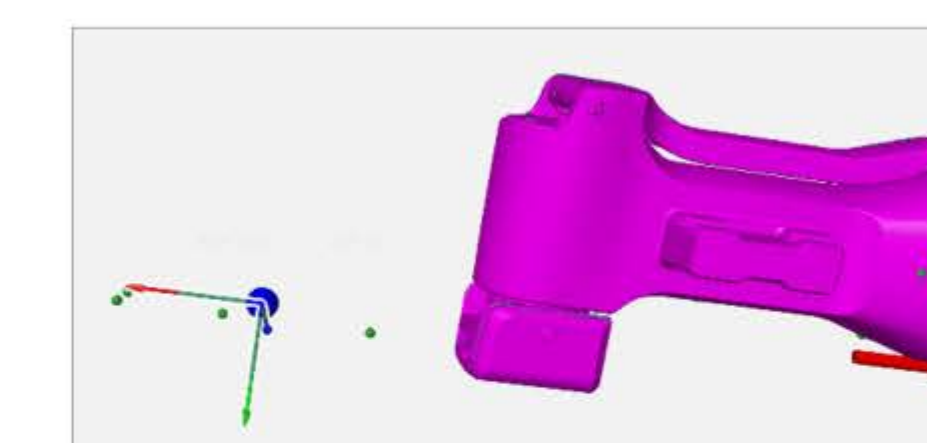
\*Where pooled denotes the combination of all systems and bone models

## 4. Discussion

- Predefining the landmark acquisition and surgical plan by bone model size allows for direct evaluation of the system accuracy without introducing user variability.
- The results show that in a benchtop setting, the VELYS™ Robotic-Assisted Solution was able to produce a mean positional linear and angular accuracy within 1mm and 1°, respectively
- In the future, the Accuracy Test Bench can test a wide range of orientations and implant sizes.
- Additional studies can analyze the landmark acquisition accuracy and evaluation of anatomical alignment.

## 2. Methods: Test Method

- Landmark acquisitions were taken 90° Flexion and 0° Varus/Valgus to compute the surgical plan.
- An optical measurement system tracked the position of the saw blade of the surgical system to theoretical cut planes created on the bone models on the test bench.
  - Tracking markers were placed on the bone models and the saw handpiece and scanned using the optical measurement system and associated software.
- The linear deviations were then measured from the saw blade plane to the bone model plane and the angular deviation was measured between the normal of the saw blade plane and the bone model cut plane.



## 5. Significance

- A customizable benchtop can perform a positional accuracy assessment of a robotic-assisted TKA system at normal and extreme limits of the system and aid as a pre-assessment to cadaveric studies.
- Early benchtop analysis of the VELYS™ Robotic-Assisted Solution has shown a high level of linear positional and angular positional accuracy.

*All products may not be available and/or approved or cleared by all global regulatory authorities. Please contact your sales representative for questions regarding regional product availability and indications. Please refer to the instructions for use for a complete list of indications, contraindications, warnings and precautions*