

Accuracy of Rotation Measurement with the CADIAX® 4 System

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VieSID Summer School 2022
In honor of Prof. Rudolf Slavicek

INTRODUCTION

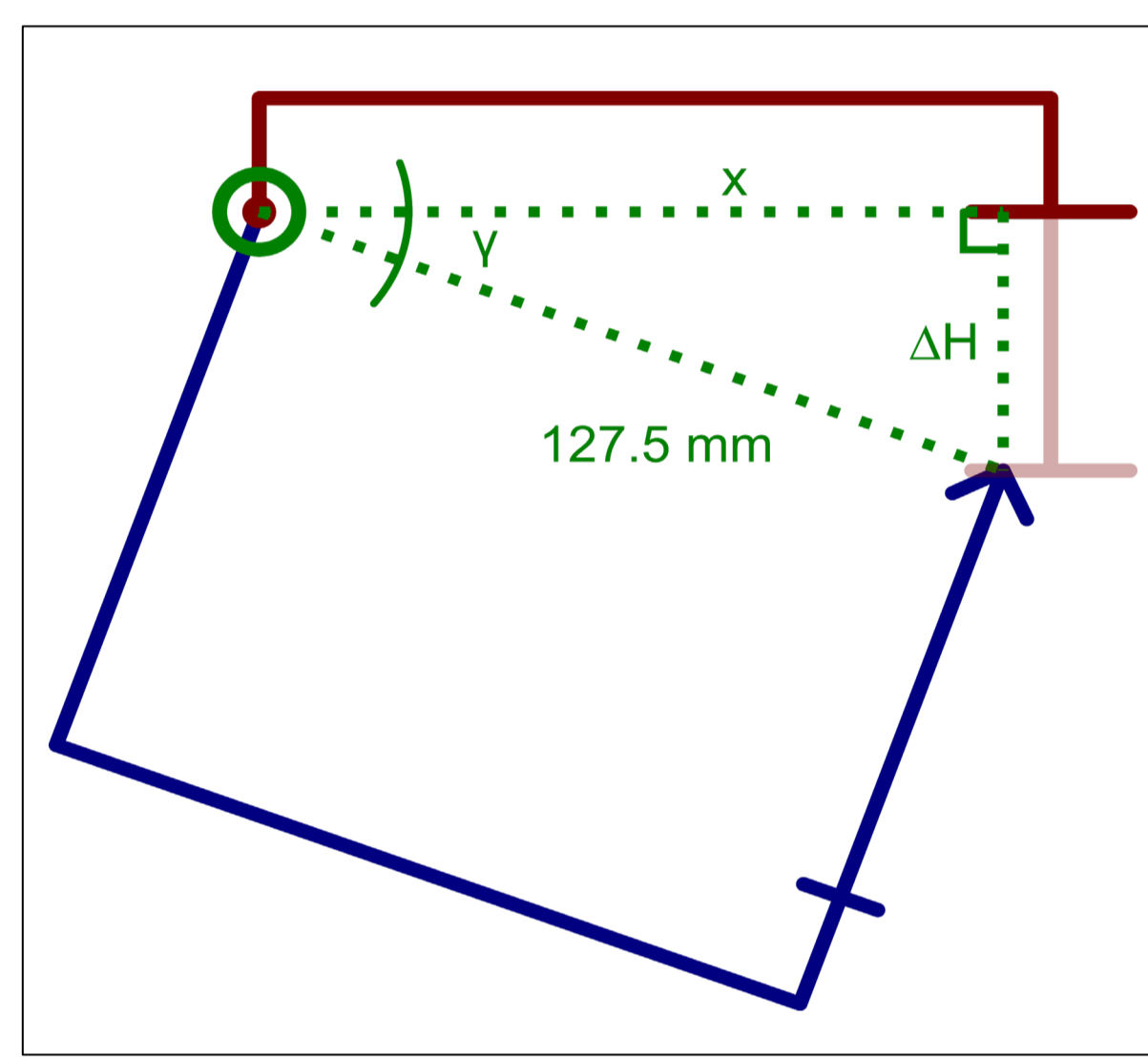
Accurate reproduction of patient's dental relation in the articulator is of crucial importance for the success of the dental treatment. The CADIAX 4 system is GAMMA's most advanced jaw-tracking device, capable of capturing the translational and rotational movement components of the lower jaw in 3D space. The rotational angle is relevant for the generation of translation/rotation plots and the accurate reproduction of the lower jaw movements in the virtual environment.

AIM

GAMMA wants to safeguard the work of the clinicians by guaranteeing high standards of its devices. The aim of this study was to test the accuracy of the rotation angle recorded by the CADIAX 4 measurement system.

MATERIALS AND METHODS

Figure 1: Given the known articulator dimensions, the expected angle of rotation γ for a ΔH opening at incisal pin was calculated.



Repeated measurements

Deviations from expected angle of rotation were measured by

2 operators, using

4 different CADIAX 4 systems, sampling at

2, 5, 10, 20, 30, and 40 mm opening from incisal pin, with

10 repetitions each, for a

480 total number of samplings.



Figure 2: Measurement setup with the articulator positioned upside down and the parallel gauge block placed on the incisal table. The articulator was opened at predetermined distances from incisal pin using calibrated parallel gauge blocks of known heights.

RESULTS

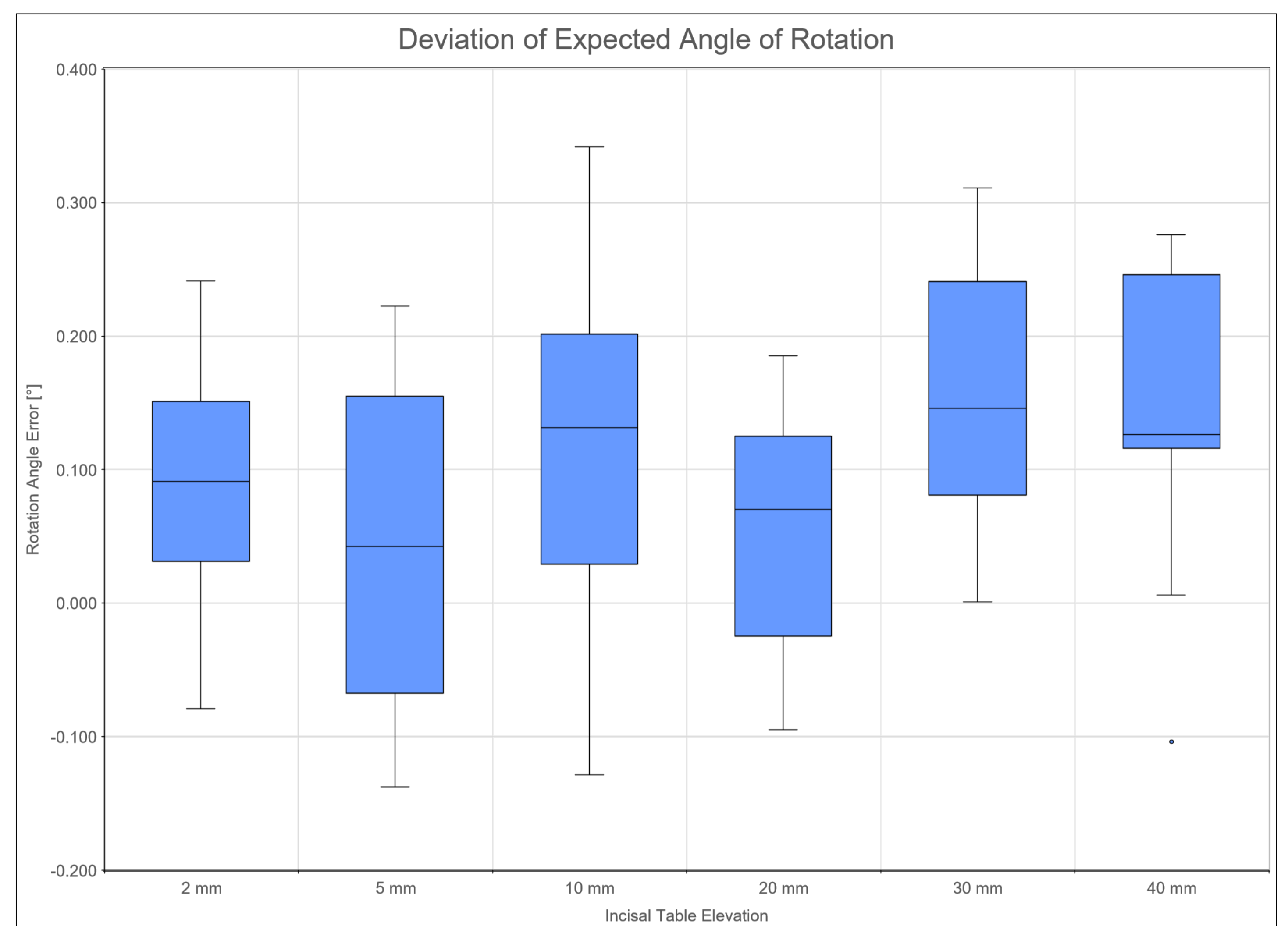


Figure 3: Box plot of the deviations of the rotation angle of the performed 480 samplings.

Range of deviations: -0.137° to $+0.342^\circ$

Average absolute deviation: 0.127° (\pm SD = 0.078°)

Maximum average deviation (at 30 mm and 40 mm opening):

0.158° (\pm SD = 0.092°) and 0.160° (\pm SD = 0.080°), respectively

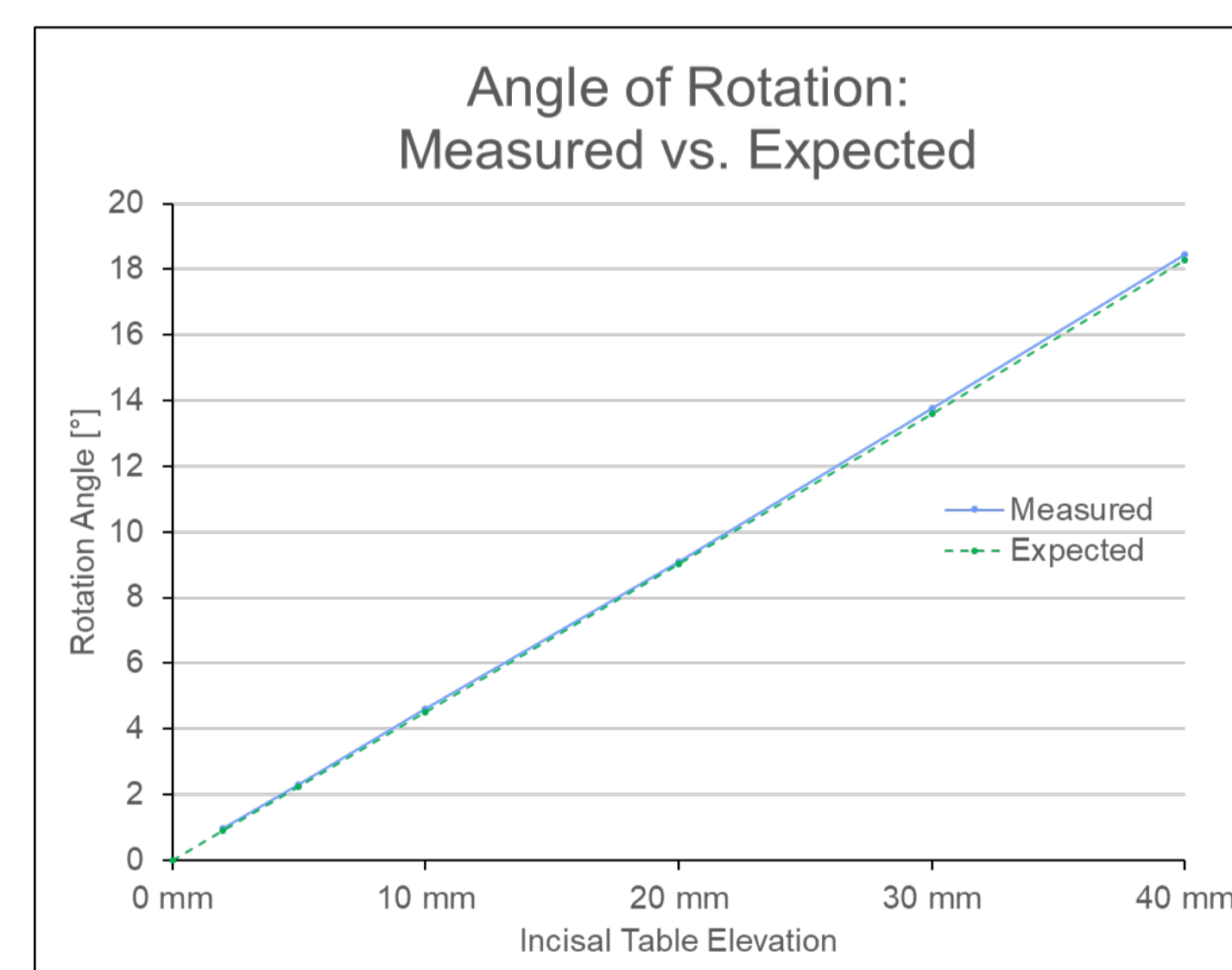
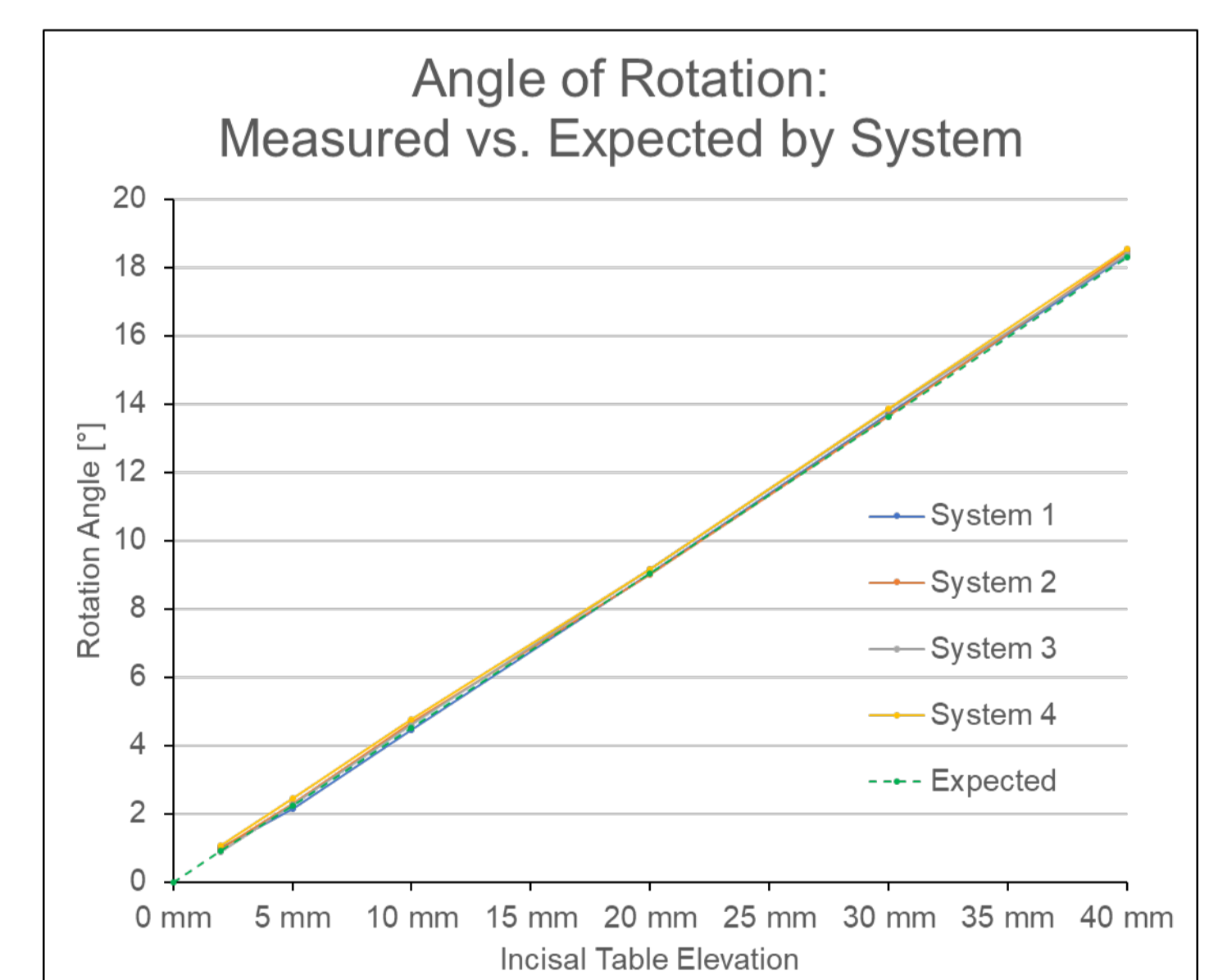


Figure 4: Average measured angle of rotation compared to the expected angle of rotation for each of the incisal table elevations.

Figure 5: Average deviations of rotation for each system, by incisal table elevation. No apparent effects of operator or device were observed on the deviation from the expected angle of rotation.



CONCLUSIONS

The average deviation from the expected angle of rotation measured with the CADIAX 4 system is small, and within the physiological changes in occlusal vertical height due to the buffering of the periodontal tissues.

The measurement deviations introduced by the CADIAX 4 system do not significantly affect the system output data, which can be therefore reliably interpreted for clinical purposes.