

Comparing Intraoral Scanners Using Advanced Micro Computed Tomography

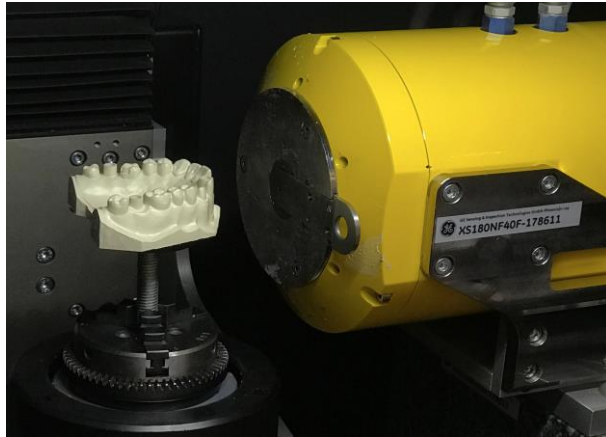


Figure 1: PEEK model on the rotation stage of the CT-system nanotom[®] m (Picture: M. Sacher).

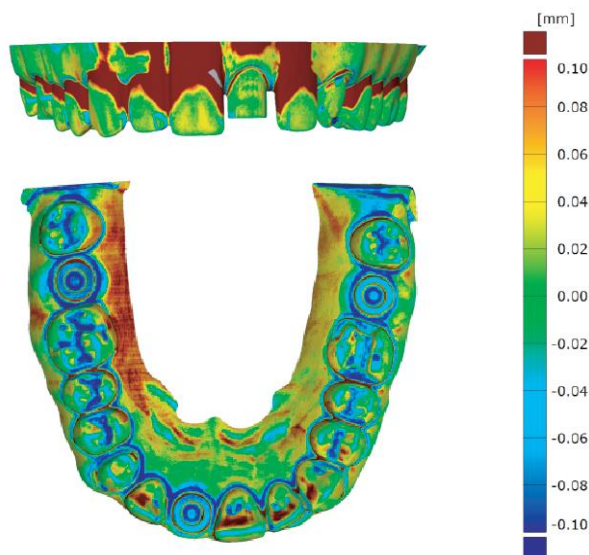


Figure 2: Three-dimensional representation of the deviations between the data of the intraoral scanner TRIOS 3[®] and the design (Picture: M. Sacher).

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Intraoral scanners play an increasingly important role in today's dental offices. The technology has become a valuable and economically reasonable alternative to conventional silicone impressions and plaster casts, which are still considered as the gold standard [1].

To determine the precision of a range of commercially available scanners, a clinically relevant polyetheretherketone (PEEK) model of a full arch upper jaw was designed and fabricated. This model was three-dimensionally visualized with an isotropic voxel length of $35\ \mu\text{m}$ using the nanotom[®] m (phoenix|x-ray, GE Sensing & Inspection Technologies GmbH, Wunstorf, Germany). These reference data were compared with multiple scans of the five commercially available systems, i.e. PlanScan[®] (Planmeca Oy, Helsinki, Finland), TRIOS[®] 3 (3shape, Copenhagen, Denmark), CS 3600 (Carestream, Atlanta, GA, USA), Medit i500 (Medit corp., Seongbuk-gu, South Korea) and 3M[™] True Definition Scanner (3M Espe, Rüslikon, Switzerland) [2].

Non-rigid registration of the scans with the reference tomography data demonstrated that the intraoral scanners can be grouped: The more precise instruments gave rise to deviations of $35\ \mu\text{m}$ (TRIOS[®] 3), $43\ \mu\text{m}$ (CS 3600) and $46\ \mu\text{m}$ (3M[™] True Definition Scanner) and the less precise systems yielded $93\ \mu\text{m}$ (Medit i500) and $97\ \mu\text{m}$ (Emerald[™]) [2]. This means that we can recommend all scanners for the preparation of reconstructions with two to three teeth, but only the one's of the first group for treating larger defects.

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References:

[1] C. Vögtlin, G. Schulz, K. Jäger, B. Müller: Physics in Medicine 1 (2016) 20-26.

[2] M. Sacher, G. Schulz, H. Deyhle, K. Jäger, B. Müller: Proceedings of SPIE 11113 (2019) 111131Q.