



 Dentsply
Sirona

Primescan® Intraoral Scanners

Study Overview



Clinical Research Validating Primescan® Technology

As digital workflows become integral to modern dentistry, clinical validation remains essential. This collection of peer-reviewed studies (2022–2025) presents robust evidence on the performance of Primescan technology, covering a broad spectrum of clinical indications.

The studies span both in-vitro and in-vivo settings and evaluate Primescan's performance in areas such as:

- **Restorative dentistry:** from single-unit crowns to complex prosthetic cases
- **Orthodontics:** capturing precise anatomical detail for digital planning
- **Implantology:** ensuring accuracy in implant positioning and fit
- **Prosthetics:** supporting full-arch and fixed partial denture workflows
- **User experience:** ease of use and scan efficiency
- **Comparison to traditional impressions:** demonstrating superior accuracy and patient comfort

Across these domains, Primescan consistently demonstrates high trueness and precision, supporting its use in complex cases. The scanner's ability to capture detailed anatomical data with excellent accuracy contributes to improved fit, reduced adjustments, and enhanced clinical outcomes.

Now Featuring: Primescan® 2

This collection also includes two recent studies on Primescan 2, which builds on the proven performance of its predecessor. These studies confirm further improvements in scan accuracy and workflow efficiency, reinforcing its role in delivering patient-centered care.

Transparency Note

This compilation represents a selected set of studies highlighting the clinical performance of Primescan and Primescan 2. While it provides valuable scientific insights, it does not encompass all available research on the technology. Additional studies exist in the broader scientific literature.

This document serves as a valuable resource for clinicians seeking data-driven insights into the performance of Primescan in real-world and research environments. It reflects Dentsply Sirona's ongoing commitment to advancing digital dentistry through clinically proven innovation.



Clinical Studies Categories

Study Focus

Icons representing the primary topic explored in each study.

	Depth		Multiple implant		Customer Satisfaction
	Accuracy		Scan body		User insights
	Speed		Scan pattern		The 3 Best
	Full arch		Excellent crown fit		
	Single implant		Patient comfort		

How to navigate this document:

This document has been designed with [interactive, clickable links](#) to help you navigate efficiently. Each study or page icon is clickable and takes you straight to the study summary.



Restorative

The following collection of scientific literature explores the use of intraoral scanning in restorative dentistry, featuring Primescan and benchmarking its performance against other prominent intraoral scanners.

	Study Name	Author/Date	Method Study	Summary of the Study Conclusions*	Category
1	Accuracy of various intraoral scanners in scanning post space preparation: An in vitro study	Abouseif et al., 2025	In-vitro	Primescan provided the greatest depth coverage, highest trueness and shortest scanning time. Medit i700 matched its accuracy with slightly reduced depth and longer scan times, while Omnicam and Carestream 3700 were more limited overall.	
2	Identification of optimal gingival displacement widths, finish line depths, and preparation designs for digitally scanned single crowns	Ciou et al., 2024	In-vitro	Clinically acceptable scans with both TRIOS and Primescan required ≥ 0.3 mm displacement width and ≤ 1.0 mm subgingival depth. Primescan with ≥ 0.4 mm displacement achieved high-quality subgingival scans, and round-shoulder preparations were most accurate.	
3	Complete-arch accuracy of seven intraoral scanners measured by the virtual-fit method	Borbola et al., 2024	In-vitro	Primescan delivers extremely low marginal gaps ($\sim 42\text{--}43$ μm) for complete-arch restorations, demonstrating top-tier trueness. While its precision ranks just below the absolute best (behind Medit i700, TRIOS 5, and Emerald S), its consistent performance without the need for additional cement spacing adjustments underscores its reliability.	
4	Effect of the scanner type on the marginal gap and internal fit of two monolithic CAD/CAM esthetic crown materials: An in vitro study	Farag et al., 2024	In-vitro	Although both scanning methods yielded clinically acceptable results, the combination of Primescan and MC XL produced excellent outcomes in terms of marginal and internal fit.	
5	How do different intraoral scanners and milling machines affect the fit and fatigue behavior of lithium disilicate and resin composite endocrowns?	Pilecco et al., 2024	In-vitro	The scanning performance of Primescan and TRIOS 3 on endodontically treated teeth was compared. Primescan provided more accurate adaptation in marginal and cervical-axial angle, while TRIOS 3 performed better in axio-occlusal angle adaptation. No substantial differences were observed between the scanners in the pulpal chamber area.	
6	Comparison of the measurement error of optical impressions obtained with four intraoral and one extra-oral dental scanners of post and core preparations	Dupagne et al., 2023	In-vitro	The results showed significant performance differences between scanners, influenced by the presence of adjacent teeth and scan depth. Based on these findings, the intraoral scanners evaluated in this study appear suitable for digitizing root canal preparations.	
7	Accuracy of four recent intraoral scanners with respect to two different ceramic surfaces	Yatmaz et al., 2023,	In-vitro	Overall, Primescan and TRIOS 4 achieved the highest trueness for both materials, with Primescan demonstrating the highest precision in each case. Material type did not affect trueness for any of the scanners but had a significant impact on precision for Omnicam and VivaScan.	

	Study Name	Author/Date	Method Study	Summary of the Study Conclusions*	Category
8	Trueness and Precision of Eight Intraoral Scanners with Different Finishing Line Designs: A Comparative In Vitro Study	Falih et al, 2022	In-vitro	Among the eight IOS tested, Medit i700 yielded the highest trueness across all finish-line designs, while Primescan and Medit i700 achieved the top precision rankings. Primescan and Heron 3 disc were the only scanners whose trueness did not differ significantly across the three finish-line designs.	
9	Beyond the surface: A comparative study of intraoral scanners in subgingival configuration scanning	Mourouzis et al., 2024	In-vitro	The accuracy of intraoral scanners decreases with increasing subgingival depth, with the magnitude of decrease varying between scanners. Across multiple depth levels, Primescan achieved results closest to the laboratory scanner, showing no significant difference at 0.5 mm and 1.5 mm, and outperforming other IOS at 4.0 mm.	
10	Digital mounting accuracy of 2 intraoral scanners with a single anterior or bilateral posterior occlusal scan: A three-dimensional analysis	Cha et al., 2023	In-vitro	Across most coordinate measurements, Primescan demonstrated higher intra-arch accuracy than TRIOS 3. The occlusal scan method influenced interarch accuracy at U1 and U2, which are located close to the coordinate origin. The scanner model influenced accuracy at U4 through U7, which lie farther from the origin.	

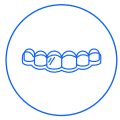


Implantology

This selection of scientific publications includes studies addressing various topics in dentistry, with a particular focus on implantology.

	Study Name	Author/Date	Method Study	Summary of the Study Conclusions*	Category
11	Scan accuracy of recently introduced wireless intraoral scanners in different fixed partial denture situations	Dönmez et al., 2025	In-vitro	Among the tested intraoral scanners, Primescan delivered the highest overall accuracy, followed closely by Primescan 2. Both scanners generally outperformed TRIOS 3 and TRIOS 5 in 3D distance and angular accuracy, while results for inter-implant distance varied depending on the model and scanner.	
12	Update on the Accuracy of Digital Implant Impressions in 2023: A Coordinate-Based Analysis	Schmidt et al., 2025	In-vitro	Primescan achieved statistically significantly better overall trueness than all other investigated intraoral scanners. All devices reliably transferred implant positions and demonstrated improved transfer performance; however, error accumulation still increased with longer scan-path lengths.	
13	Influence of Implant ScanBody Material and Intraoral Scanners on the Accuracy of Complete-Arch Digital Implant Impressions	Azevedo et al., 2024	In-vitro	Primescan remained stable across materials. TRIOS 4, Medit i700, and iTero 5D performed better with plasma-coated titanium scan bodies. Virtuo Vivo showed higher accuracy with polyether ether ketone (PEEK) scan bodies.	
14	Trueness of Intraoral Scanners in Different Scan Patterns for Full-Arch Digital Implant Impressions	Sezer et al., 2024	In-vitro	Primescan delivered superior trueness across all patterns, achieving its best performance with the zigzag technique; TRIOS 3 performed equally with Occlusal- Palatal-Buccal (OPB) and zigzag but showed greater deviation with circular scanning.	
15	Effect of intraoral scanner and fixed partial denture situation on the scan accuracy of multiple implants: An in vitro study	Donmez et al., 2023	In-vitro	In a majority of the comparisons, both scanners showed similar performance, while Primescan achieved significantly higher accuracy in a substantial number of cases.	
16	Influence of different scan body design features and intraoral scanners on the congruence between scan body meshes and library files: An in vitro study	Michelinakis et al., 2024	In-vitro	When evaluating all tested scan bodies, Primescan yielded mean absolute deviation that were significantly less than those measured with the other scanners.	
17	Effect of Different Intraoral Scanners on the Accuracy of Bite Registration in Edentulous Maxillary and Mandibular Arches	Rutkunas et al., 2024	In-vitro	Considering the constraints of this in vitro study, scanners differed significantly in digital bite registration accuracy for edentulous arches with four implants, and only Primescan achieved results within the 100 µm clinical acceptability threshold.	
18	Effect of splinting scan bodies on the trueness of complete arch digital implant scans with 5 different intraoral scanners	Azevedo et al., 2024	In-vitro	The trueness of complete-arch digital implant scans was comparable across the conventional, splinted, and artificial landmark techniques. The performance of Primescan remained consistently high across all scan techniques.	
19	Comparison between Conventional and Digital Impressions for Determining Axes and Distances of Three Implants in Straight and Curved Lines: An In Vitro Study	Ben-Izhack et al., 2024	In-vitro	In partially dentate situations, conventional impressions and intraoral digital scans yield reliable results for straight and curved implant arrangements but curved configurations cause greater deviations with conventional impressions than with digital scans.	

	Study Name	Author/Date	Method Study	Summary of the Study Conclusions*	Category
20	Influence of Scanbody Design and Intraoral Scanner on the Trueness of Complete Arch Implant Digital Impressions: An In Vitro Study	Meneghetti et al., 2023	In-vitro	All tested scan bodies and intraoral scanners significantly affected 3D, angular, and linear deviations between implants. Primescan outperformed the other scanners in 3D accuracy.	
21	Scan accuracy and time efficiency of different implant supported fixed partial denture situations depending on the intraoral scanner and scanned area: An in vitro study	Dönmez et al., 2023	In-vitro	Both intraoral scanners delivered statistically comparable outcomes in many of the evaluated scenarios. However, Primescan demonstrated significantly better performance than TRIOS 3 in several aspects, including 3D trueness (particularly in anterior and posterior 3-unit models), 3D precision across all models, and overall time efficiency. TRIOS 3 achieved higher precision than Primescan in buccopalatal angular deviation when partial-arch scans were performed in the posterior 4-unit model.	 
22	Comparison of 3D accuracy of three different digital intraoral scanners in full-arch implant impressions	Akkal et al., 2023	In-vitro	Primescan showed the highest trueness among the tested scanners. Variation in implant angulation led to significant differences in scan accuracy.	
23	Effect of Different Intraoral Scanners and Scanbody Splinting on Accuracy of Scanning Implant-Supported Full Arch Fixed Prosthesis	Ashraf et al., 2023	In-vitro	While there was no statistically significant difference in accuracy compared to TRIOS 4, Primescan numerically demonstrated the highest values, whereas Medit i600 was significantly less accurate.	 
24	Predictability of intraoral scanner error for full-arch implant-supported rehabilitation	Zingari et al., 2023	In-vitro	While Primescan proved to be the most precise in capturing interimplant distances, its inclination angle assessments displayed a reproducible overestimation trend, characterized by a bimodal distribution.	
25	Accuracy of 14 intraoral scanners for the All-on-4 treatment concept: a comparative in vitro study	Kaya et al, 2022	In-vitro	Among the 14 intraoral scanners tested for the All-on-4 concept, Primescan showed the highest overall accuracy, while several scanners achieved strong results in either trueness or precision, and others demonstrated lower consistency and higher deviation.	
26	Accuracy of complete-arch implant digital scans: effect of scanning protocol, number of implants and scan body splinting	Denneulin et al, 2022	In-vitro	Measurements from both intraoral scanners showed linear and angular deviations that were well inside the thresholds regarded as acceptable in clinical practice.	
27	Effect of splinting scan bodies on trueness of complete-arch implant impression using different intraoral scanners: an in vitro study	Retana et al., 2023	In-vitro	Primescan achieved the best overall trueness among the evaluated intraoral scan, with Omnicam being the only device performing at a comparable statistical level. Connecting the scan bodies generally enhanced trueness for most scanner distance combinations.	



Orthodontics

This collection of scientific publications focuses on the use of intraoral scanning in orthodontics, highlighting clinical applications, workflow efficiencies, and comparisons between digital and conventional methods.

	Study Name	Author/Date	Method Study	Summary of the Study Conclusions*	Category
28	What to Prefer in Patients with Multibracket Appliances? Digital vs. Conventional Full-Arch Impressions—A Reference Aid-Based In Vivo Study	Bock et al., 2023	In-vitro	In orthodontic patients with multibracket appliances, digital full-arch impressions with intraoral scanners matched or exceeded the transfer accuracy of conventional alginate impressions for every measured parameter except the longest distance and required significantly less time for both impression taking and model preparation.	 
29	The transfer accuracy of digital and conventional full-arch impressions influenced by fixed orthodontic appliances: a reference aid-based in vitro study	Schlenz et al., 2022	In-vitro	Intraoral scanners showed higher transfer accuracy than conventional alginate impressions in the presence of fixed orthodontic appliances, whereas conventional impressions showed the highest accuracy without fixed orthodontic appliances. All intraoral scanners were overall faster than the combined process of conventional alginate impression and conventional plaster model casting.	 



Dentures

This collection of scientific publications focuses on the role of intraoral scanning in the fabrication of dentures, highlighting clinical workflow and accuracy.

	Study Name	Author/Date	Method Study	Summary of the Study Conclusions*	Category
30	Scan accuracy of recently introduced wireless intraoral scanners in different fixed partial denture situations	Dönmez et al., 2025	In-vitro	Among the tested intraoral scanners, Primescan delivered the highest overall accuracy, followed closely by Primescan 2. Both scanners generally outperformed TRIOS 3 and TRIOS 5 in 3D distance and angular accuracy, while results for inter-implant distance varied depending on the model and scanner.	
31	Impact of the Superimposition Reference Area on Intraoral Scanning Accuracy in a Partially Dentate Maxilla	Negm et al., 2024	In-vitro	The accuracy of the scans was significantly impacted by the area used for superimposition. Primescan led in trueness and precision for palatal and edentulous regions, TRIOS 3 excelled in distal-extension trueness, and Emerald in tooth precision.	
32	Evaluation and Comparison of the Accuracy of Three Intraoral Scanners for Replicating a Complete Denture	Le Texier et al., 2024	In-vitro	The outcome of this study indicates that the choice of intraoral scanner plays a crucial role in the digital reproduction of removable complete dentures (RCD). Among the evaluated devices, Primescan delivered the most accurate results for both upper and lower removable complete denture (RCD).	
33	Effect of Different Intraoral Scanners and Scanbody Splinting on Accuracy of Scanning Implant-Supported Full Arch Fixed Prosthesis	Ashraf et al., 2023	In-vitro	While there was no statistically significant difference in accuracy compared to TRIOS 4, Primescan numerically demonstrated the highest values, whereas Medit i600 was significantly less accurate.	
34	Effect of intraoral scanner and fixed partial denture situation on the scan accuracy of multiple implants: An in vitro study	Dönmez et al., 2023	In-vitro	In a majority of the comparisons, both scanners showed similar performance, while Primescan achieved significantly higher accuracy in a substantial number of cases.	
35	Feasibility of using an intraoral scanner for a complete arch digital scan, part 2: A comparison of scan strategies	Son et al., 2023	In-vitro	Across the six intraoral scanners tested, scan strategy, scanner type, and tooth position influenced trueness, with improvements in clinically acceptable range observed only for some devices when using the second scan strategy.	



Comparison of digital to traditional impression

This selection of scientific publications explores the use of Primescan for digital impressions, with a particular focus on how it compares to conventional impression techniques.

	Study Name	Author/Date	Method Study	Summary of the Study Conclusions*	Category
36	Accuracy Analysis of Digital Models from Intraoral Scanners and 3D-Printed Casts in Children and Teenagers	Serrano-Velasco et al., 2024	In-vitro	Although minor differences are present, digital and 3D-printed models from intraoral scans perform similarly to conventional plaster models in terms of reliability.	
37	Comparison between Conventional and Digital Impressions for Determining Axes and Distances of Three Implants in Straight and Curved Lines: An In Vitro Study	Ben-Izhack et al., 2024	In-vitro	In partially dentate situations, conventional impressions and intraoral digital scans yield reliable results for straight and curved implant arrangements but curved configurations cause greater deviations with conventional impressions than with digital scans	
38	Comparative Analysis of the Comfort of Children and Adolescents in Digital and Conventional Full-Arch Impression Methods: A Crossover Randomized Trial	Serrano-Velasco et al., 2024	In-vitro	Primescan delivered the highest patient comfort, followed by iTero, with conventional alginate impressions rated lowest in comfort in children and adolescents.	
39	What to Prefer in Patients with Multibracket Appliances? Digital vs. Conventional Full-Arch Impressions—A Reference Aid-Based In Vivo Study	Bock et al., 2023	In-vitro	In orthodontic patients with multibracket appliances, digital full-arch impressions with intraoral scanners matched or exceeded the transfer accuracy of conventional alginate impressions for every measured parameter except the longest distance and required significantly less time for both impression taking and model preparation.	
40	The transfer accuracy of digital and conventional full-arch impressions influenced by fixed orthodontic appliances: a reference aid-based in vitro study	Schlenz et al., 2022	In-vitro	Intraoral scanners showed higher transfer accuracy than conventional alginate impressions in the presence of fixed orthodontic appliances, whereas conventional impressions showed the highest accuracy without fixed orthodontic appliances. All intraoral scanners were overall faster than the combined process of conventional alginate impression and conventional plaster model casting.	
41	Accuracy of current intraoral scanning systems for full-arch impressions: An in vitro study	Buhl et al., 2025	In-vitro	Conventional impressions achieved significantly higher accuracy than all IOS; all IOS stayed <100 µm. Among IOS, Primescan was significantly better than the others, followed by Primescan 2, which was comparable to Aoralscan 3 in trueness. The three metrics were highly correlated, supporting their interchangeable use.	
42	Clinical study on the accuracy of wireless intraoral scanners for digital full arch impressions of dentate arches	MA Schlenz et al., 2025	In-vitro	In this study, Primescan 2 and Primescan AC showed no statistically significant differences in accuracy compared with the conventional impression on pooled distances.	



User experience

These scientific publications explore the user experience of intraoral scanning, highlighting clinician and patient perspectives, ease of use, learning curves, and workflow integration across different scanner systems.

	Study Name	Author/Date	Method Study	Summary of the Study Conclusions*	Category
43	User Experience of Intraoral Scanners in Dentistry: Transnational Questionnaire Study	Al-Hassiny et al., 2023	Survey Study	While Primescan proved to be the most precise in capturing interimplant distances, its inclination angle assessments displayed a reproducible overestimation trend, characterized by a bimodal distribution.	
44	Scan accuracy and time efficiency of different implant supported fixed partial denture situations depending on the intraoral scanner and scanned area: An in vitro study	Dönmez et al., 2023	In-vitro	Both intraoral scanners delivered statistically comparable outcomes in many of the evaluated scenarios. However, Primescan demonstrated significantly better performance than TRIOS 3 in several aspects, including 3D trueness (particularly in anterior and posterior 3-unit models), 3D precision across all models, and overall time efficiency. TRIOS 3 achieved higher precision than Primescan in buccopalatal angular deviation when partial-arch scans were performed in the posterior 4-unit model.	



*The study summaries presented herein are abbreviated interpretations intended exclusively for informational and educational use. They should not be interpreted as product performance claims. Full study details can be found in the publications listed at the bottom of each summary page.

About Dentsply Sirona

Dentsply Sirona is the world's largest diversified manufacturer of professional dental products and technologies, with over a century of innovation and service to the dental industry and patients worldwide. Dentsply Sirona develops, manufactures, and markets a comprehensive solutions offering including dental and oral health products as well as other consumable medical devices under a strong portfolio of world-class brands.

Dentsply Sirona's innovative products provide, high-quality, effective and connected solutions to advance patient care and deliver better and safer dental care. Dentsply Sirona's headquarters is located in Charlotte, North Carolina. The Company's shares are listed in the United States on Nasdaq under the symbol XRAY.

Visit www.dentsplysirona.com for more information about Dentsply Sirona and its products.