

APPLICATION

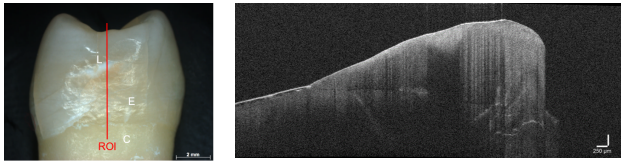


Photo of a Tooth (left) and OCT Profile Scan (right) Along the Region of Interest (ROI) Depicted in the Photograph*

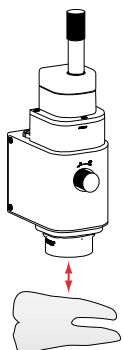
The ease of use and non-invasive nature of OCT has led to various applications in dentistry, including but not limited to:

- ◆ Diagnosis, Restoration, and Monitoring of Various Lesions and Defects¹⁻⁶
- ◆ Assessment of Restorations and Restoration Imperfections⁷⁻⁸
- ◆ Examination of Gingiva⁹

QUICK FACTS

- ◆ Thorlabs OCT systems are not medical equipment.
- ◆ OCT uses infrared light with very low intensities (laser class 1M).
- ◆ Long wavelengths such as 1300 nm penetrate up to 2.5 mm into teeth.
- ◆ *In vivo* imaging is possible. It is recommended to stabilize the head for a stable focus position.
- ◆ OCT can image into teeth, gum, and some cavity fillings and crowns.
- ◆ The Speckle Variance mode highlights blood vessels in gum (included in the software).
- ◆ Degree of Polarization Uniformity (DOPU) OCT reduces strong reflections and may also give additional information.

TYPICAL SETUP



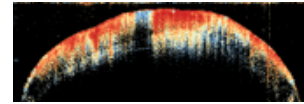
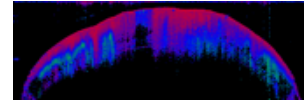
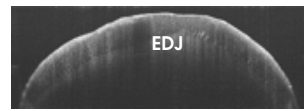
In a typical setup, the tooth is placed under the scanner. A line (for profiles) or an area (for volumes) is drawn and subsequently scanned.

A translation stage may be used to locate areas of interest during a live scan.

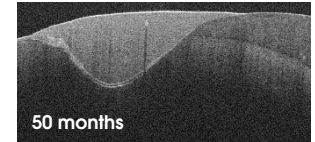
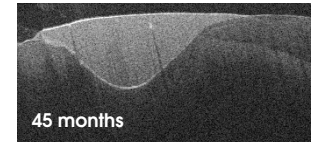
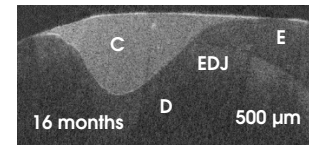


The red line in this image represents the region observed in the Example Images section.*

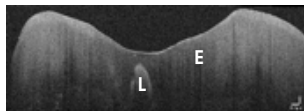
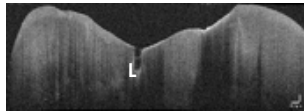
EXAMPLE IMAGES



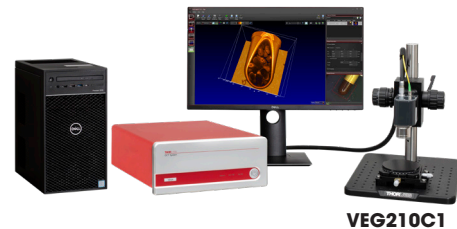
Above: OCT intensity (top), retardation (center), and DOPU (bottom) of a tooth with carious lesions. The DOPU is noticeably lower at the carious lesion.*



Above: Within 50 months a gap forms between composite (C) and dentin (D). The enamel (E) and enamel-dentin junction (EDJ) are also labeled. Left: Carious lesions (L) can be detected at the surface (top) and under healthy enamel (E).*



RECOMMENDED ITEMS



Choice of OCT System:

- ◆ **TEL221C1**: For High-Resolution Imaging
- ◆ **VEG210C1**: For Deep Imaging
- ◆ **TEL221PSC1****: For Polarization-Sensitive Imaging

Useful Accessories:

- ◆ Larger Depth of Focus (for Telesto systems): **OCT-LK4 & OCT-RA4**

**Resolution and depth of the TEL221PSC1 are the same as for the TEL221C1.

Interested? Email OCT@thorlabs.com for more information.

PUBLICATIONS

- 1) H. Schneider, K.-J. Park, M. Häfer, C. Rüger, G. Schmatz, F. Krause, J. Schmidt, D. Ziebolz, R. Haak, *Appl. Sci.*, **7** (5), 472, 2017
- 2) R. Haak, P. Schmidt, K.-J. Park, M. Häfer, F. Krause, D. Ziebolz, H. Schneider, *J. Dent.*, **76**, 46, 2018
- 3) K.-J. Park, H. Schneider, R. Haak, *J. Biomed. Opt.*, **18** (7), 076018, 2013
- 4) L.O. Fernandes, C.C.B. de O. Mota, H.O. Oliveira, J.K. Neves, L.M. Santiago, A.S.L. Gomes, *J. Biophotonics* **12** (2), e201800209, 2019
- 5) A.G. Türk, M. Sabuncu, S. Ünal, B. Önal, M. Ulusoy, *J. Appl. Oral Sci.*, **24** (4), 383, 2016
- 6) H. Schneider, K.-J. Park, C. Rüger, D. Ziebolz, F. Krause, R. Haak, *J. Dent.*, **60**, 94, 2017
- 7) S. Lee, K. Son, J. Park, J. Lee, S.H. Kang, R.E. Wijesinghe, P. Kim, J.H. Hwang, S. Park, B.-J. Yun, M. Jeon, K.-B. Lee, J. Kim, *IEEE Access*, **7**, 6209, 2019
- 8) M.-R. Seidemann, R. Haak, C. Olms, *Z. Zahnärztl. Implantol.*, **33** (3), 202, 2017
- 9) N.M. Le, S. Song, H. Zhou, J. Xu, Y. Li, C.-E. Sung, A. Sadr, K.-H. Chung, H.M. Subhash, L. Kilpatrick, R.K. Wang, *J. Biophotonics* **11** (12), e201800242, 2018

* Images Courtesy of H. Schneider, University Medical Center Leipzig, Germany