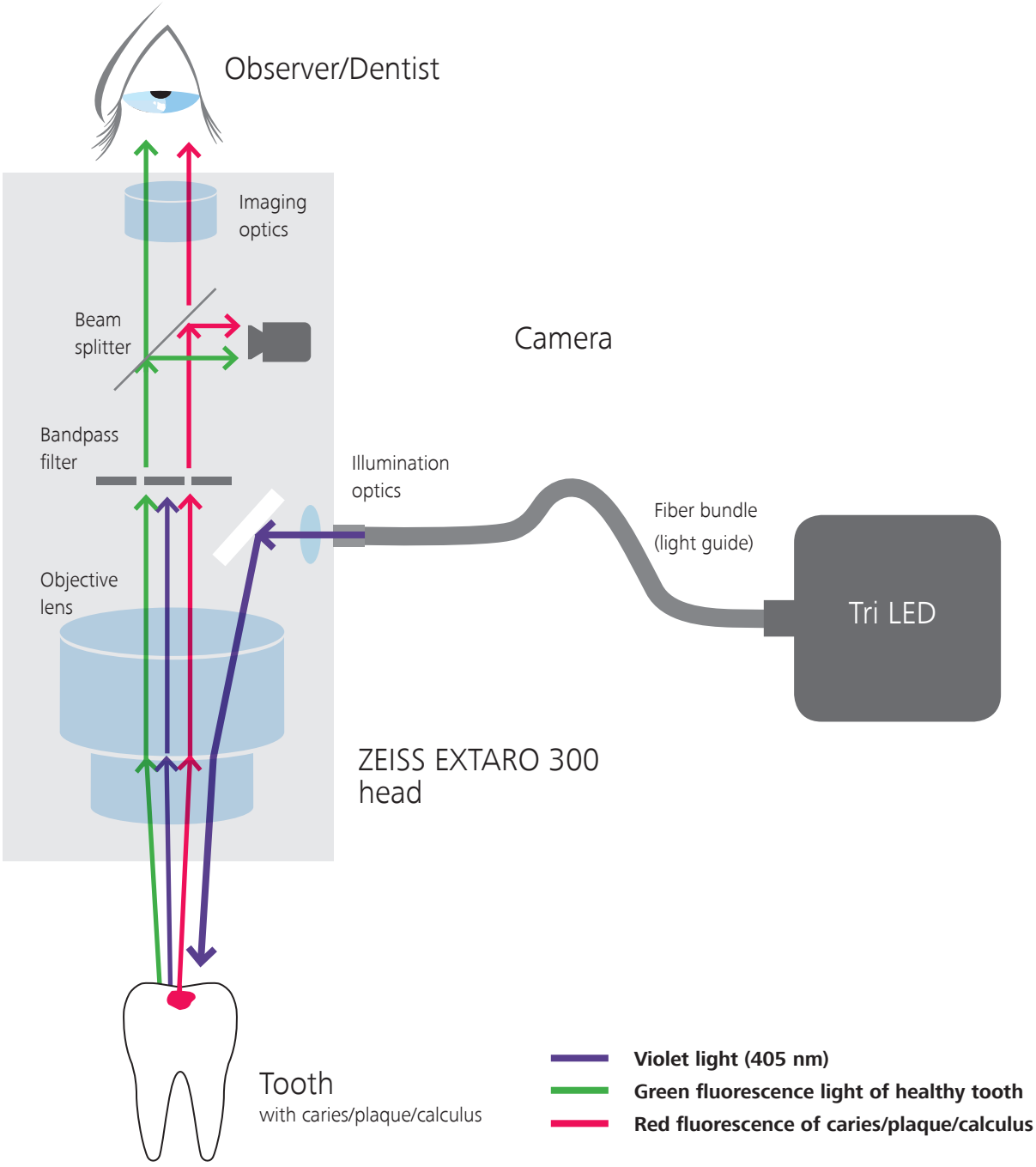
EXTARO® 300 from ZEISS

Working principle of Fluorescence Mode

Working principle

Schematics of Fluorescence Mode* of EXTARO® 300 from ZEISS



Graphic: Carl Zeiss Meditec AG

*Fluorescence Mode for caries detection, dental plaque and calculus detection is not available for sale in the US, requires 510(k) clearance by the U.S. FDA and may be subject to change. Not for sale in every market.

Principle

The underlying principle of dental auto-fluorescence

The working principle of the Fluorescence Mode is based on the auto-fluorescent properties of the dental hard tooth tissue and Porphyrin. Under an excitation wavelength ranging from λ = 370 nm - 488 nm (violet - blue light) the tissue begins to fluoresce in a bright green color. Using an optical bandpass filter the residual excitation light is cut off to obtain a clear result, free of scattered and reflected excitation light. This insures that only green and red wavelengths reach the observer (Kühnisch, J., and R. Heinrich-Weltzien. "Quantitative Light-induced Fluorescence (QLF)-A Literature Review." International journal of computerized dentistry 7 (2004): 325-338).

When tooth tissue decays on the basis of bacterial demineralization, Porphyrin compounds are formed as a by product. Porphyrin has an absorption peak at λ = 405 nm resulting in a fluorescence mainly ranging from 600 nm - 700 nm, with peaks at 622-624 nm and 680-687 nm depending on the type of caries. As Porphyrin compounds can be found in matured dental plaque, calculus and caries lesions, the Fluorescence Mode of ZEISS EXTARO 300 makes these visible as a red fluorescence in contrast to the green fluorescing tooth tissue. (Van der Veen, M. H. "Detecting Short-Term Changes in the Activity of Caries Lesions with the Aid of New Technologies." Current Oral Health Reports 2.2 (2015): 102–109. PMC. Web. 8 Aug. 2017). This not only aids you in spotting carious lesions, but also enables you to save time during the caries excavation process. (Lennon, A. M., et al. "Efficiency of 4 caries excavation methods compared." Operative dentistry 31.5 (2006): 551-555.)

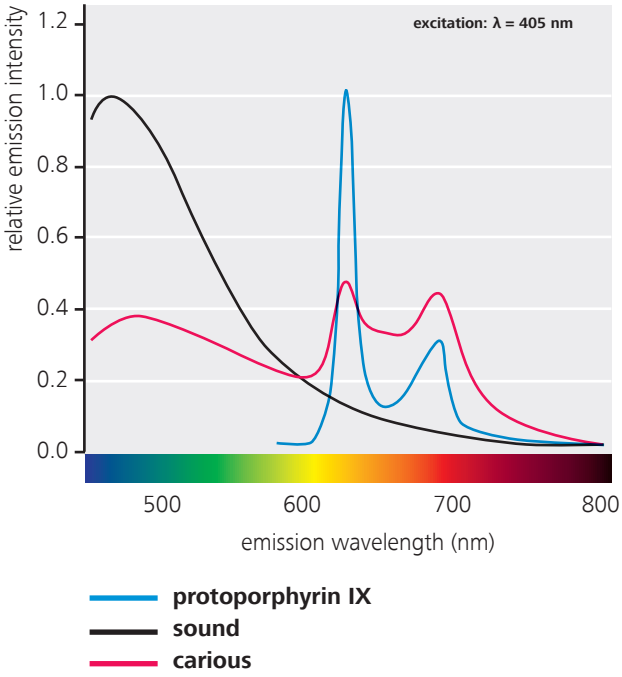


Figure based on:
Buchalla W, Lennon ÁM, Attin T: Comparative fluorescence spectroscopy of root caries lesions. Eur J Oral Sci; 112, 490-496 (2004)
Buchalla W, Attin T, Niedmann Y, Niedmann PD, Lennon ÁM: Porphyrins are the cause of red fluorescence of carious dentine: Verified by gradient reversed-phase HPLC. Caries Res; 42, 223 (2008)

Differences to Fluorescence-Aided Caries Excavation and Qualitative Light-induced Fluorescence methods

Well established methods like Fluorescence-Aided Caries Excavation (FACE) and Qualitative Light-induced Fluorescence (QLF) are based on the same working principle as the Fluorescence Mode of ZEISS EXTARO 300. Similar to FACE the detector of the fluorescence signal in ZEISS EXTARO 300 is the eye of the observer. The images aquired by the camera are for patient information and documentation purposes. In particular, there is no quantitative analysis of the images.

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