# Rigid CARS endomicroscope with 2.2 mm diameter x 187 mm length, submicron resolution and 280 µm field of view for human brain imaging in cancer research in combination with a wide-field chip-on-the-tip endoscope

**Bernhard Messerschmidt*[a], Peyman Zirak[b], Gregor Matz[a], Sven Flaemig[a], Tobias Meyer[c], Michael Schmitt[c], Jürgen Popp[c], Ortrud Uckermann[d], Roberta Galli[d], Matthias Kirsch[d], Konrad Birkmeier[e], Andreas Brodschelm[e], Werner Göbel[f], and Andreas Zumbusch[b]**

**[a]GRINTECH GmbH, Schillerstraße 1, 07745 Jena, Germany;**
**[b]Department Chemie and Center for Applied Photonics, University of Konstanz, 78457 Konstanz, Germany**
**[c]Leibniz Institute of Photonic Technology, Albert-Einstein-Str. 9, 07745 Jena, Germany;**
**[d]Neurosurgery, University Hospital Carl Gustav Carus, Technische Universität Dresden, 01307 Dresden, Germany**
**[e]Toptica Photonics AG, Lochhamer Schlag 19, 82166 Graefelfing, Germany**
**[f]KARL STORZ SE & Co. KG, Dr.-Karl-Storz-Strasse 34, 78532 Tuttlingen, Germany;**
***Corresponding author: messerschmidt@grintech.de**

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Nonlinear optical endoscopy is an attractive technique for biomedical imaging since it promises access to high resolution clinical imaging in vivo. Among the various techniques used for endoscopic contrast generation, coherent anti-Stokes Raman scattering (CARS) is of special interest since it allows molecule specific imaging of unlabeled samples in living brain tissue. In this contribution, we describe the design, implementation, and experimental characterization of a rigid, compact CARS endoscope with a spatial resolution of 750 nm over a field of view of roughly 280 µm. Omission of the relay optics and use of a gradient index lens specifically designed for this application allows to realize these specifications in an endoscopic unit which is 2.2 mm wide over a length of 187 mm, making clinical applications during surgical interventions possible. Multimodal use of the endomicroscope is demonstrated with images of samples with neurosurgical relevance. The device is also combined with a wide-field chip-on-the-tip endoscope for navigation in a clinical setting.

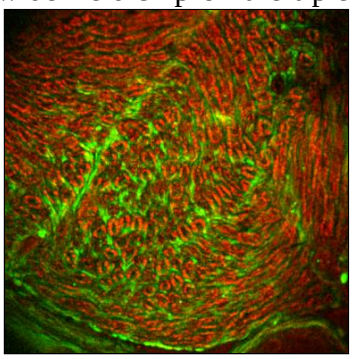

**Figure 1:** Human brain tissue imaged by multimodal non-linear endomicroscope: nerve fascicles with axon bundles, CARS – red, TPEF – green; Field of view is approx. 270 µm x 270 µm

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**References**

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