A compact Raman Imaging System for Bladder Tissue Analysis

Eliana Cordero[*1], Iwan W. Schie[1], and Jürgen Popp[1,2]

[1]Leibniz Institute of Photonic Technology (IPHT), Albert-Einstein-Straße 9, Jena, Germany

[2]Institute of Physical Chemistry, Friedrich Schiller University Jena, Helmholtzweg 4, 07743 Jena, Germany

New modalities in detection and management of bladder tumours for early bladder cancer diagnosis still depend of invasive and time consuming procedures, such as the extraction of biopsies, following a pathological analysis of the samples [1,2]. There is a significant need for non-invasive and rapid methods for in vivo bladder cancer diagnostic. A large number of in vivo and in vitro experiments have demonstrated the ability of Raman spectroscopy to diagnose oncological diseases by providing label-free biochemical information from tissue samples [3-5]. Recent in vivo investigations have shown promising results, but were limited by long acquisition times and high auto-fluorescence backgrounds, due to the nature of the samples [6,7]. A more in-depth characterization of bladder biopsies is needed and new computational methods to preprocess and analyze the measured Raman signals are required [8].

Therefore, this work is aimed to develop a small and compactRaman fiber probe based imaging system to characterize large fresh bladder tissue biopsies. Moreover, we present a comprehensive study on the evaluation of background correction strategies for Raman spectra of highly fluorescent bladder tissues. We compare theoretically and experimentally an instrumental approach, i.e. shifted Excitation difference Raman spectroscopy (SERDS), with a computational approach, i.e. extended multiplicative scattering correction (EMSC), for background correction.

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