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Identification of spectroscopic signatures of biological tissues in exNIR spectral range

One of the central challenges in optical imaging of biological tissue is identification of the spectral signature and understanding the transport of photons through the tissue. Our laboratory is exploring the application of photons in the extended near infrared (exNIR) spectral range, an optical region from 950 to 1600 nm, to minimize the effects of scattering and increase the depth of tissue penetration. This region, also known as the second NIR window, is weakly dominated by absorption from water and lipids and is free from other endogenous chromophores, with virtually no autofluorescence. To demonstrate the applicability of the exNIR for bioimaging, we analyzed the optical properties of individual components and biological tissues using a home-built scanning imager featuring transmission geometry. Based on the differences in optical properties of tissues, we utilized ratiometric approaches to extract spectral characteristics from the acquired 3D “datacube”. The obtained images of an exNIR transmission through the phantoms, small animals, and plants revealed a variety of features that could be utilized in medicine and plant science.