Virtual skin biopsy enabled by ultrafast fiber source tunable between 1.15 and 1.35 µm

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Harmonic generation microscopy (HGM) is important for *in vivo* imaging (e.g., virtual skin biopsy [1]) because it is label-free and of low photo-damage/-bleaching compared with fluorescence microscopy. Ultrafast sources covering the transmission window in the range of 1.1-1.35 µm [2] are desired for HGM because both the excitation and the emitted second-/third-harmonic generation (SHG/THG) experience less water absorption in the biological tissue. Recently we demonstrated a new fiber-optic method—self-phase modulation enabled spectral selection (SESS)—to generate wavelength widely tunable pulses for nonlinear optical microscopy [3,4]. In this submission, we implement an Er-fiber laser based SESS source covering 1.15-1.35 µm with up to >10-nJ pulse energy and ~100-fs pulse duration, and investigate the optimal excitation wavelength for HGM in *ex vivo* human skin tissue (Fig. 1).

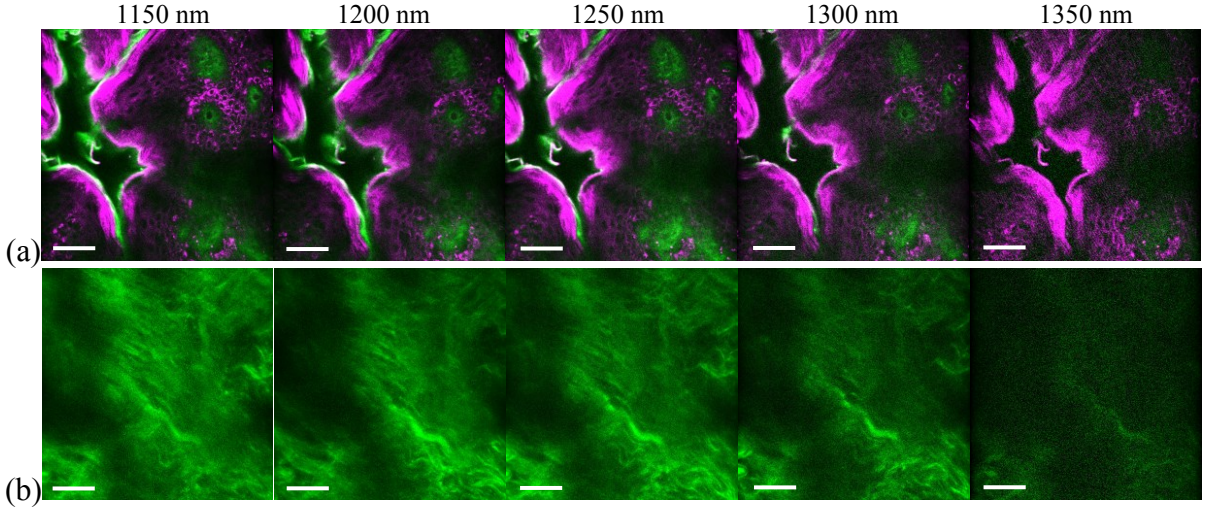

Figure 1. HGM imaging of *ex vivo* human skin excited by different wavelength at different penetration depth. (a) Stratum spinosum in epidermis at 50-µm depth. (b) Collagen fiber in dermis at 150-µm depth. SHG is colored in green and THG in magenta. Scale bar: 50 µm.

References

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