

Fig. 1 Intelligent THz metrology

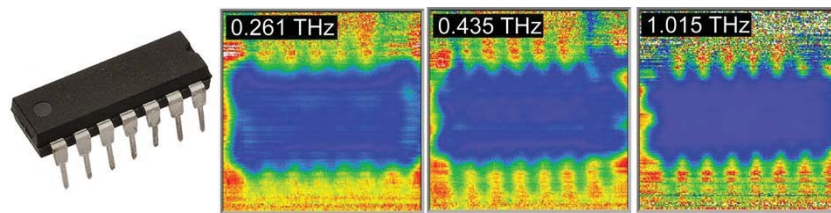


Fig. 2 THz spectral Imaging of semiconductor IC package

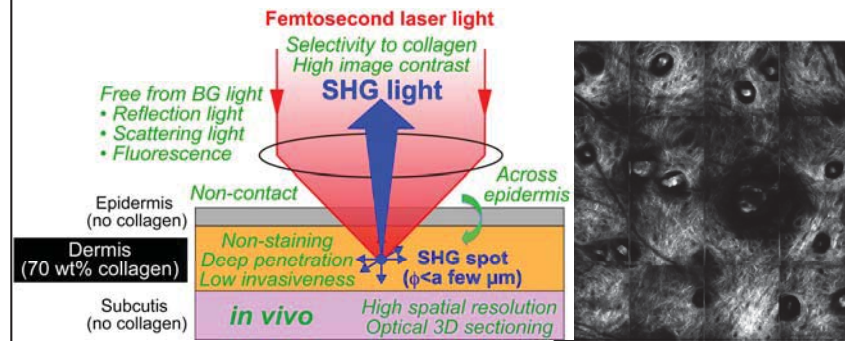


Fig. 3 Collagen-sensitive SHG microscopy Fig. 4 Human facial skin

Content:

【Intelligent THz metrology】

THz wave, lying between optical and electrical waves, has attracted attentions as a new tool for non-destructive inspection, sensing, and other applications because of free-space propagation, good penetration, coherent beam, and imaging and spectroscopy available as shown in Fig. 1. However, the long image acquisition time has hampered its use for practical applications. We successfully reduced the image acquisition time by using 2D spatio-temporal imaging, asynchronous optical sampling, or THz comb (see Fig. 2).

【Nonlinear optical microscopy】

Second-harmonic-generation (SHG) light functions as an effective nonlinear optical probe that shows high selectivity and good image contrast to collagen molecules as well as high spatial resolution, optical three-dimensional (3D) sectioning, minimal invasiveness, deep penetration, the absence of interference from background light, and *in vivo* measurement without additional staining as shown in Fig. 3. We applied SHG microscopy to *in vivo* visualization of collagen fibers in skin and other tissues, as shown in Fig. 4.

Keywords: THz wave, SHG microscopy,
frequency comb, laser control

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