WIDELY TUNABLE FOURIER-TRANSFORM-LIMITED TERAHERTZ PULSES GENERATED BY OPTICAL FREQUENCY DIFFERENCE

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Fourier-transform-limited pulses of terahertz (THz) radiation ($\Delta\nu$ ~10 MHz, peak power up to ~50 μW) have been generated using (i) low-temperature-grown gallium arsenide (LTG-GaAs) photomixers with THz spiral antennas,[a,b] (ii) crystals of the highly nonlinear organic salt 4-N,N-dimethylamino-4′-N′-methyl stilbazolium tosylate (DAST).[c] Outputs from two narrowband ($\Delta\nu$ <1 MHz, λ ~800 nm) cw titanium-doped sapphire (Ti:Sa) ring lasers with a well-controlled frequency difference were shaped into pulses using acousto-optic modulators (AOM), coupled into an optical fiber, pulse amplified in Nd:YAG-pumped Ti:Sa crystals and used as optical sources to pump the THz emitters. The THz radiation can be scanned by scanning the frequency of one of the the Ti:Sa laser and keeping the frequency of the second locked. THz radiation up to 330 GHz was detected with a submillimeter-wave mixer and a spectrum analyzer. The bandwidth of the generated THz pulses was experimentally determined to be ~ 10 MHz. The absorption spectrum of a pure rotational transition of OCS at 304.0 GHz was detected. Using a specially cut DAST crystal, Fourier-transform-limited pulsed radiation over the whole THz region has been generated by difference frequency generation and detected with a 4.2 K germanium bolometer.

[a] E. Peytavit, G. Mouret, J.F. Lampin, S. Arscott, P. Masselin, L. Desplanque, O. Vanbésien, R. Bocquet, F. Mollot and D. Lippens, *IEE Proc.-Optoelectron.*, **149**, 82 (2002)

[b] E. Peytavit, S. Arscott, D. Lippens, G. Mouret, S. Matton, P. Masselin, R. Bocquet, J.F. Lampin, L. Desplanque and F. Mollot, *Appl. Phys. Lett.*, **81**, 1174 (2002)

[c] A. Schneider, M. Neis, M. Stillhart, B. Ruiz, R. U. A. Khan and P. Günter, *J. Opt. Soc. Am. B*, **23**, 1822 (2006)