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Introduction

The span of electromagnetic frequencies achieved by means of nonlinear optics covers more than 4 orders of magnitude: from vacuum UV to THz. And this is reflected by a remarkable variety of current achievements in nonlinear optics presented in this volume.

For example, in the realm of visible and UV generation, the invited paper [82400H] by Nomura et al. describes high-repetition rates for coherent quasi-CW 153nm vacuum UV light source. The narrowband pulses generated from an ytterbium-fiber laser system at a 33MHz repetition rate at the central wavelength of 1074 nm are frequency-converted by successive stages of LBO and KBBF crystals. The generated radiation at 153 nm has the shortest wavelength achieved through phase-matched frequency conversion processes in nonlinear optical crystals.

On the other end of the spectrum, in the invited paper [824007], Sheller et al. present their results on intracavity generation of continuous wave terahertz radiation. The terahertz source is based on difference frequency generation within a laser cavity. Combining the high-intracavity intensities of a dual-color vertical external cavity surface emitting laser (VECSEL) with the high-nonlinear coefficient of a periodically poled lithium niobate crystal enables the generation of milliwatt-level continuous wave broadly tunable terahertz radiation. As the frequency spacing between the two simultaneously oscillating laser lines can be adjusted freely, the entire range of the terahertz gap can be covered.

The invited paper [82400B] by Hirori et al. describes single-cycle terahertz pulses with amplitudes exceeding 1 MV/cm generated by optical rectification in $LiNbO_3$ with tilted-pump-pulse-front scheme, and application of these pulses to nonlinear optics. In particular, results of the study of nonlinear interactions of GaAs quantum wells with the intense THz pulses are presented.

The first results on optical parametric oscillation in orientation patterned GaAs (OP-GaAs) waveguides are presented in the invited paper [82400C] by Oron et al. The waveguides for parametric conversion have been fabricated by MOCVD growth on OP-GaAs templates. A monolithic OPO cavity was formed by dielectric facet coating. With the pump in the range 1.98-2.05 µm, the OPO tunability of 3 -5.2 µm was achieved with the OPO threshold around 6 Watts.

In the field of ultrafast nonlinear devices, the invited paper [82400P] by Minardia et al. describes latest achievements in light bullets. Three-dimensional light bullets (3D-LBs) are the most symmetric solitary waves, being nonlinear optical wavepackets propagating without diffraction and dispersion. Since their theoretical prediction, 3D-LBs have constituted a challenge in nonlinear science, due to the impossibility to avoid catastrophic collapse in conventional homogeneous nonlinear media. The authors have recently observed stable 3D-LBs in media with periodically modulated transverse refractive index profile.

A new approach for generating ultra-broadband mid-infrared frequency combs in the difficult-to-access mid-infrared spectral region was implemented in the paper by Leindecker et al. [82400X]. This technique is based on degenerate optical parametric oscillation, and efficiently transfers the desirable coherence properties of shorter wavelength mode-locked sources to the mid-infrared. With an ultrafast 2-micron Tm fiber laser as a pump and an OP-GaAs-based OPO system, the authors achieved octave-spanning output from 3 to 6 microns, with output powers over 30 mW.

In brief, the future of nonlinear optics looks bright. The volume describes great variety of new laser-based nonlinear optical sources as well as many applications.

Konstantin L. Vodopyanov