
The road towards all-spectrum femtosecond white laser

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The drive to construct ultrabroadband laser light sources is fueled by a great variety of basic science and high technology applications. For instance, a so-called four-high supercontinuum white laser with ultrabroad bandwidth, intense pulse energy and high peak power, high spectral flatness, and ultrashort pulse duration is highly helpful for simultaneously resolving multiple electronic transition and molecular vibration absorption bands and spectroscopic regimes of atoms, molecules, liquids, and solids at a high signal-to-noise ratio level. This will open up a new horizon of ultrafast laser spectroscopic science. In this talk, we will discuss our road in the past 10 years toward building a DUV-UV-Vis-NIR-MIR four-high white laser by deeply exploring the synergic action of third-order nonlinearity (3rd-NL) and second-order nonlinearity (2nd-NL) that is triggered by shining an intense femtosecond laser upon a cascaded nonlinear frequency conversion module comprising of a chirped periodically poled lithium niobate (CPPLN) superlattice crystal supporting 2nd-NL high-harmonic generation (HHG) and a gas, liquid, and solid medium with great 3rd-NL spectral broadening power. Using this original scheme we have realized an intense white laser with an ultraflat 200-5000 nm band width at 15 dB level, a 1.1 mJ per pulse, and pulse duration around 1 ps. We have built a single-pulse femtosecond laser spectrometer that enables simultaneous measurement of various atomic and molecular absorption spectra, which would open up a new avenue of high-speed spectrography.

Short Bio:



Zhi-Yuan Li is a professor in College of Physics and Optoelectronics, South China University of Technology, Guangzhou. Prof. Li's research interests include theory, experiment, and application of nanophotonics, nonlinear optics, laser technology, topological photonics, and quantum physics. With an H-index of 87, he is the author or coauthor of more than

500 peer-reviewed papers in physics, optics, chemistry, and materials science journals, which have been cited by more than 33,000 times. He serves now as a deputy editor of Acta Photonica Sinica.