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Optical parametric vortex lasers

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Optical vortex carrys orbital angular momentum (OAM) and donut spatial profile owing to its helical wavefront and it has been widely investigated in a various applications, such as advanced optical manipulations, chiral microfabrications, super resolution microscopes and ultrahigh-speed optical telecommunications. The afore mentioned applications desire strongly wavelength and OAM- versatility in the optical vortex sources. In general, conventional phase elements for the optical vortex generation, designed for a specified lasing frequency, are ill-suited for tunable and high power laser sources. The direct generation of optical vortex modes from a laser cavity is alternative to produce high power optical vortex modes with high quality. A nonlinear frequency extension of optical vortex sources via second or third nonlinear process also provides us to achieve sufficient wavelength versatility in optical vortex sources. In this presentation, we detail the direct generation of optical vortex modes from solid-state laser and fiber laser systems. Also, we address optical parametric vortex lasers based on optical vortex pumped optical parametric laser oscillations in combination with difference frequency generation, which enables the development of ultrabroadband tunable optical vortex laser sources in the visible, near-infrared and mid-infrared regions. Further, we discuss the fractional vortex generation beam from an optical vortex parametric oscillator based on topological charge conservation.

Biography

Takashige Omatsu has completed his PhD in the year 1992 from the University of Tokyo. He is working as professor in the Chiba University. He has published more than 130 papers in journals and has been serving as an Editorial Board Member of Optics Express and Photonics Research. He is also currently working as a Director at Large, the Optical Society (OSA). He was elected as Japan Society of Applied Physics and OSA Fellow.

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