

Computational imaging with laser-generated light sources

Utsunomiya University, Japan

Kota Kumagai

Email: kumagai@a.utsunomiya-u.ac.jp

The fusion of imaging and computational processing has expanded the wavelength range that can be imaged. However, the ability to image a wide range of wavelengths, including non-visible light, with a single system is still a challenge due to limitations in the wavelengths that can be supported by devices, such as an illumination light source and an image sensor. In this research, femtosecond-laser-driven light sources on a water film have been applied for computational broadband imaging. The spatial position of the light source was controlled by beam deflection using a galvanometer scanner. The spatially selective generated light sources form a coded illumination pattern with a broadband wavelength including visible and non-visible region. Femtosecond laser-driven light sources function as ultra-broadband illumination light, including the non-visible region, depending on the excitation target and pulse energy. In particular, liquid-state targets such as water films can produce a broad emission spectrum that includes X-rays and terahertz waves in addition to the visible region. We have demonstrated X-ray and visible imaging by using the femtosecond-laser-driven light sources which was two-dimensionally generated on a water film. Furthermore, the imaging time was reduced while maintaining the number of pixels in the reconstructed image by using compressed sensing algorithms and coded illumination patterns.

Short Bio:



Kota Kumagai is an assistant professor in Center for Optical Research and Education (CORE) of Utsunomiya University since 2020. He received a Ph.D. in Engineering from Utsunomiya University with a President's Award in 2019 via JSPS Research Fellow DC1 and research inter at Swinburne University of Technology. From 2019 to 2020, he has worked for R&D Center of Sony Corporation. His research interest is an intersection of optics and information engineering, and recently, focused on volumetric display and computational imaging with femtosecond laser-matter interactions. He received a Good Design Award 2015 and a JSPS Ikushi Prize in 2018.