

High-resolution bispectral imager at 1000 frames per second

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Abstract.

We describe a bispectral, 1000-frames per second imaging instrument working simultaneously in two spectral bands. These bands may be selected for a specific application; however, we implement a pair centered at 4.3 μm and 4.66 μm . Synchronization is accomplished by employing a single focal plane array. To demonstrate the performance of the bispectral imager, we apply it to the methane flame of a Bunsen burner in a near conjugate configuration with flame image length subtending at about 200 pixels. The instrument detects bispectral puffing at 2 Hz, pulsations, and bispectral radiation oscillations, first reported here in two spectral intervals. The period of oscillatory spectral components in two bands is the same, about 3 Hz for this flame, with delay of a quarter period between them, first reported here. With 1-ms integration time, we detect significant formation of turbulence and vortices, especially pronounced in the region where the flame transitions into a plume. We display bispectral ratioed images of flames in near-real time with either the laboratory or the field device.