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Detailed bench investigations and comparison of four low-light cameras

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Sensitive cameras are frequently operated to record low-light processes such as Beam Induced Fluorescence or optical transition radiation for transverse profile determination. We compared four cameras based on different principles: Firstly, we investigated an Image Intensifier equipped with a double MCP (producer ProxiVision); secondly, an electron-multiplied CCD (emCCD Teledyne Princeton Instruments ProEm+:512B); and, thirdly, sCMOS cameras (producer PCO.edge4.2bi and Teledyne Kinetix 22). LEDs generate light pulses within a wavelength range of 385 to 500 nm and a duration of 0.03 to 8 ms to vary the photon flux. Moreover, the spatial resolution is compared. The image intensifier is the most sensitive camera type and provides very low noise; however, the method provides only a limited spatial resolution. The investigated emCCD camera has a comparable sensitivity but provides a better spatial resolution. The sCMOS cameras provide a factor of about 5 to 10 lower sensitivity depending on wavelength. A quantitative comparison of signal-to-noise ratios and static fluctuations for several wavelengths will be presented.

Footnotes

Funding Agency

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Yes

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