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Measuring spatial-temporal couplings using modal multi-spectral wavefront reconstruction

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With the possibility of using high-power laser systems as drivers for particle acceleration, laser diagnostics becomes even more important in that field.

Knowledge of spatial-temporal couplings such as pulse-front tilt or curvature is important to determine the focused intensity of high-power lasers. Common techniques to determine these couplings are either qualitative or complex to set up. Here we present a simple method to measure low-order spatio-temporal couplings of a laser by measuring the spectrally resolved wavefront. To do so, we introduce different bandpass filters into an image of the laser's nearfield and subsequently measure the wavefront of the specific colour using a Shack-Hartmann sensor. Our technique is easy and cheap to implement in existing facilities and, based on our analysis, presents a reasonable trade-off between acquisition time and spatio-temporal resolution.

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