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Development of a High-Sensitivity Wavefront Sensor for KALDERA

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At DESY, we are developing KALDERA, a high-repetition-rate laser system designed to enable active stabilization of laser-plasma acceleration through fast feedback systems. A critical step in this process is accurately measuring how variations in laser parameters affect the electron beam properties, with particular emphasis on the wavefront due to its significant influence on the acceleration process. However, commercially available wavefront sensors typically lack the sensitivity and acquisition rates required for our application. To address this limitation, we have developed a custom Shack-Hartmann wavefront sensor capable of measuring rapid wavefront variations with high precision. In this talk, we will review our design and implementation process, highlight development challenges, and present first measurements with the new sensor.

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