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Development of a new target station for external electric field application at PLEPS

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The Pulsed Low Energy Positron System (PLEPS) at the intense positron source NEPOMUC at the MLZ in Munich allows to measure positron lifetime spectra using a mono-energetic positron beam of variable energy between 0.5-20 keV. PLEPS is a unique tool to investigate open volume defects in a large variety of material systems, e.g. in wide bad-gap semiconductors or in thin layer structured semiconductors and insulators.
Defect identification in semiconductors and insulting materials is a challenging task, as one encounters a wide variety of different defect types, often with very similar positron lifetimes.
To address this problem one possibility is to apply an external field to the sample and manipulate the positron diffusion after thermalization, thus driving the positrons to subtle structures i.e. thin layers, interfaces and internal surfaces. We present a newly designed target station which enables external field application and in situ measurement of voltages and currents during PALS measurements. With the three available power lines it is possible to apply voltages up to ±400V in different directions relativ to the sample surface and measure multiple electrical parameters at once.

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