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Micrometer positron beam at the Scanning Positron Microscope

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Positron annihilation lifetime spectroscopy (PALS) is a powerful tool in a wide range of material science. To investigate inhomogeneous defect distributions, e.g. close to fatigue cracks or dispersive alloy, with PALS a monochromatic pulsed positron beam of variable energy with a diameter in the range of 1 μm and a time resolution of 200 ps FWHM is needed.

To this aim, the Scanning Positron Microscope (SPM) was developed and built at the Universität der Bundeswehr. To overcome the limit of low count-rates the SPM was transferred to the intense positron source NEPOMUC at the MLZ in Garching. A sophisticated beam preparation, including multiple remoderation steps, is needed to reach a lateral resolution in the micro-meter range. An essential component of the interface is the positron elevator which compensates for the energy loss caused by the remoderation process without altering other important beam properties like time structure and brightness.

In this contribution, we will give an overview of the current status of the SPM, which has become a complete makeover during the reactor shutdown. In addition, the latest developments of the positron elevator and the newly developed frequency stabilization system are reported. To ensure proper operation of SPM at NEPOMUC, stable amplitude, stable frequency and stable phase of the RF-signal are crucial. Moreover, future applications of the SPM will be discussed.

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