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Formation of a micrometer positron beam at the Scanning Positron Microscope

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Positron annihilation lifetime spectroscopy (PALS) is a powerful tool for defect detection and characterization in 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 pulse width of 150 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 obtainable with laboratory positron sources, the SPM is currently transferred to the intense positron source NEPOMUC at the MLZ in Garching.

A sophisticated beam preparation, including multiple remoderation steps, is necessary to reach a lateral resolution in the micro-meter range. An essential component is the RF 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 SPM, which has been completely refurbished during the reactor shutdown. To ensure proper operation of SPM at NEPOMUC, stable amplitude, stable frequency and stable phase of the RF-signal are crucial. We report recent developments of the RF positron elevator, in particular a new frequency stabilization system.

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