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Formation of a micrometer positron beam at the Scanning Positron Microscope

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To investigate inhomogeneous defect distributions e.g. close to fatigue cracks or dispersive alloy with positron annihilation lifetime spectroscopy a pulsed positron beam with a diameter in the range of 1 μm and with a time resolution in the order of 250 ps is needed.

To this aim the Scanning Positron Microscope (SPM) was built at the Universität der Bundeswehr. To overcome the limit of low count-rates and corresponding exceedingly long measurement times the SPM is transferred to the intense positron source NEPOMUC at the MLZ in Garching. To connect the SPM to NEPOMUC a special interface has been constructed. It consists of a series of pulsing elements, a remoderation stage and a new positron elevator to change the potential energy of the pulsed positron beam.

The radio frequency positron elevator has been tested, which is the final step of the SPM interface. The elevator compensates the loss of potential energy, lost by the implantation of the positron remoderation processes. Since the elevation does not influence other beam parameters, the brightness and the time structure of the positron beam is conserved. This device allows also keeping both, the source and the sample, at the same electrical potential.

Primary author: Mr MITTENEDER, Johannes (Universität der Bundeswehr)

Co-authors: Dr DICKMANN, Marcel (Universität der Bundeswehr München); Dr EGGER, Werner (Universität der Bundeswehr München); Mr HELM, Ricardo (Universität der Bundeswehr); DOLLINGER, Günther; Dr KÖGEL, Gotfried (Universität der Bundeswehr München)

Presenter: Mr MITTENEDER, Johannes (Universität der Bundeswehr)

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