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Upgrade of the NEPOMUC remoderator

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The neutron-induced positron source Munich NEPOMUC provides a monochromatic positron beam of $> 10^9$ e+/s and ≈ 10 mm diameter FWHM. To create a small beam focus or sharp pulses of ≈ 100 ps the beam brightness needs to be enhanced by remoderation. This is achieved by focusing the beam magnetically on a tungsten single crystal W(100). Afterwards the beam exhibits an intensity of $> 3 \cdot 10^7$ e+/s and a diameter of < 2 mm FWHM.

However, we can further optimize the quality and increase the intensity of the remoderated beam by systematic tests of different remoderator materials and a precise positioning of the remoderator within the focus of the magnetic lens. Therefore, a new remoderation unit has been designed to allow a replacement of the remoderator crystal within several minutes. In addition, it will be possible to heat the crystal and to treat its surface with different gasses, e.g. atomic hydrogen. Moreover, in-situ cooling with liquid Helium will offer the opportunity to use noble gasses like Ne as remoderators.

After the upgrade we expect a higher remoderation efficiency and an increased brightness with higher beam intensity that is valuable for applications like the Coincidence Doppler-Broadening Spectrometer or the Scanning Positron Microscope. Moreover, a high intensity will further reduce the measurement time.

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