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Nuclear Analytical Chemistry at the cold neutron beam of MLZ

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The cold neutron beam at MLZ offers unique conditions for nuclear analytical chemistry. The analytical facility accommodates several instruments being under development or recently upgraded.

The focusing guide has been replaced with a truly-curved elliptical guide ensuring a more homogeneous beam with a smaller divergence and with coinciding focal points, which serves all instrumental setups much better. Upgraded spectrometers have been employed enabling better Compton suppression, improved timing for coincidence measurement together with list-mode acquisition. These features will be used in new dynamic in-beam activation analytical measurements.

Prompt Gamma Activation Analysis (PGAA) is a routine technique used since the reactor start. It exploits the advantages of the strong neutron beam with measuring small samples (with masses less than a mg), or activating them in the nearly parallel cold neutron beam with counting the activity in a dedicated low-background chamber. In-beam activation analysis (ibNAA) proved to be an important addition to PGAA. This technique will be further developed with many repeated irradiation and counting cycles using a transfer system to a low-background position on the top of the PGAA setup. The irradiation and counting times could be as short as 1 s, while the transfer times a few tenths of a second. With cyclic in-beam setup, several hard-to-measure elements, like F, Ag, Pb, even O-19 isotope become available with much better sensitivities.

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