

Mass measurements in the CR storage ring at FAIR

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The ILIMA measurements in the isochronous CR ring at FAIR

The ILIMA collaboration as a part of the NUSTAR programme aims at investigating Isomers and measure Lifetimes and MAsses in the storage rings of FAIR. In the first construction phase the CR storage ring without an electron cooler is foreseen. Instead it is designed to run an isochronous mode which can be used for IMS (isochronous mass spectrometry) either with time-of-flight (ToF) detectors or Schottky pick-ups. In another mode also fast stochastic cooling of up to 10^8 injected ions will be possible, good enough for creating a narrow beam from which decay products can be recorded on particle detector next to the beamline. The ILIMA experiment programme will be shown.

Compared to existing isochronous storage rings like ESR at GSI or CSRe at IMP Lanzhou the acceptance of the new ring should be orders of magnitude larger. This can be achieved by an increased acceptance in longitudinal and both transverse directions of beam phase space. However, this also means that a higher order correction scheme must be foreseen which will be explained in the presentation. These considerations are also valid for the smaller multi-reflection ToF mass spectrometers.

An advantage of the measurements with a large variety of ions in a storage ring is the coverage of larger areas of nuclides and a direct connection to calibration masses. But at fixed magnetic rigidity ions of different mass-to charge ratio (m/q) cannot all be equally isochronous. To overcome this problem two ToF detectors providing an additional velocity measurement shall be employed. The measurement procedure will be explained, it will increase the efficiency and accuracy of the measurements. For better efficiency of the detector itself a new enlarged detector design has been worked out.

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