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PILGRIM, a future MR-ToF-MS at GANIL for mass measurement and separation on exotic beams.

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PILGRIM is a Multi-Reflection Time Of Flight Mass Spectrometer (MR-ToF-MS) currently under development at GANIL for the S3 collaboration (Super Separator Spectrometer) and dedicated to the study of very heavy and super heavy nuclei. MR-ToF-MS devices have been proven effective for isobaric separation (Resolving power over 10^5 [1]) and high precision mass measurement (mass error down to a few 10^{-7} [2]) within a few tens of milliseconds. These features make such a device extremely interesting for ensuring isobaric beam purity and mass measurement of very exotic, short lived nuclei. PILGRIM is to be set up in the future low energy branch of the S3-Spiral2 project and may also be used as a beam purifier in front of the double Penning trap PIPERADE at DESIR-Spiral2.

An electrostatic 90 degree quadrupole deflector is also currently on study and will be placed between a RFQ cooler-buncher (beam preparation) and PILGRIM. The study focuses on conserving the beam features and especially the Time-of-Flight spread of an ion bunch as it directly impacts the Resolving Power of a MR-ToF-MS device.

[1] R.N. Wolf et al., On-line separation of short lived nuclei by a multi-reflection time-of-flight device, Nuclear Instruments and Methods in Physics Research A 686, 82-90, 2012

[2] F.Wienholtz et al., Masses of exotic calcium isotopes pin down nuclear forces, Nature 498, 346-349, June 2013

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