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AMS of ^{36}Cl at the ETH Zurich 6 MV Tandem –the classical way

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Classical AMS measurements of ^{36}Cl require high ion energies to enable isobar separation of ^{36}S by nuclear separation techniques exploiting the different stopping power of S vs. Cl. The 6 MV Tandem accelerator at ETH Zurich was one of the first AMS systems being able to measure ^{36}Cl already several decades ago [Synal et al. NIM B 29 (1987) 146] and has been heavily used for ^{36}Cl measurements since then. A unique component of the AMS system was the Cs gun ion source, producing low ^{36}S background and very low cross talk. However, the overall efficiency of this setup was limited because only a fraction of the sample material was consumed during the measurement. Thus, for samples with low counting statistics (small samples or low ratios) the performance was not optimal, which motivated an upgrade.
Recently we rebuilt the low-energy side of the 6 MV Tandem accelerator with a new MICADAS-type ion source and an achromatic injector. After stripping in thin 2 µg/cm2 carbon foils at a terminal voltage of around 6 MV we achieve high ion energies of ˜45 MeV (7+ charge state), which is sufficient for isobar separation in a multi-anode gas ionization detector after additional ^{36}S-suppression by a 180° gas-filled magnet (GFM). The GFM is in use since 2008 and is described in a contribution in the proceedings of the AMS-14 conference [Vockenhuber et al. NIM B 455 (2019) 190]. High overall efficiency is reached because of high transmission though the accelerator (>20\%) and through the GFM (up to 70\%) while still measuring blank ratios in the 10^{-15} range and below.
We present here the upgraded AMS system and discuss background and performance for ^{36}Cl AMS measurements at the ETH Zurich 6 MV Tandem accelerator.

Student Submission

No

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