Interlaboratory study of the ion source memory effect in ^{36}Cl accelerator mass spectrometry

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In 2011 the DREAMS (Dresden Accelerator Mass Spectrometry) facility [1] based on a HVE 6 MV Tandetron went operational. Since then constant effort was put into enabling routine measurements of long–lived radionuclides such as ^{10}Be, ^{26}Al and ^{41}Ca. In the case of ^{36}Cl the main focus was set on understanding and minimization of the ion source memory effect, which is the key issue for precise AMS–measurements of volatile elements like Cl and I [2, 3]. For this purpose, one of the two original HVE sources was mechanically modified. The new design has a more open geometry to improve the vacuum level and a modified target loading and positioning system, which allows exchanging the individual cathode aperture with each target.

To evaluate this improvement in comparison to other up–to–date ion sources, a small interlaboratory comparison had been initiated. The long–term memory effect in the four Cs sputter ion sources of VERA [3] (Vienna Environmental Research Accelerator, NEC ion source: MC-SNICS), ASTER [4] (Accélérateu pour les Sciences de la Terre, Environnement, Risques, modified HVE SO110) and DREAMS (original HVE and modified HVE ion source) [1] had been investigated by running samples of natural ^{35}Cl/^{37}Cl–ratio and samples containing highly enriched ^{35}Cl (^{35}Cl/^{37}Cl > 500).

Primary goals of the research are the time constants of the recovery from the contaminated sample ratio to the initial ratio of the sample and the level of the long term memory effect in the sources.

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