



CM-P00044513

Abstract of ISOLDE-Proposal

MEASUREMENT OF β -DELAYED NEUTRON RESONANCES FROM $^{47-50}\text{Ar}$ AND ^{50}K DECAYS AND THEIR TRANSLATION INTO CROSS SECTIONS FOR THE INVERSE PROCESS OF $^{46-49}\text{K}$ and ^{49}Ca NEUTRON CAPTURE:

THE CORRELATED Ca AND Ti ISOTOPIIC ANOMALIES AND THE ASTROPHYSICAL $n\beta$ -PROCESS

W. Hillebrandt and F.K. Thielemann

MPI für Physik und Astrophysik, Garching/München, Fed.Rep. of Germany

K.-L. Kratz, H. Gabelmann, H. Ohm, A. Schröder and W. Ziegert

Inst. für Kernchemie, Univ. Mainz, Mainz, Fed.Rep. of Germany

The discovery of anomalies in isotopic abundances, e.g. Ca and Ti isotopes, in nature has initiated a wide range of investigations in nuclear astrophysics. However, all models using the standard Hauser-Feshbach formalism for average continuum neutron capture cross sections predict the isotope abundance ratio of e.g. $^{46}\text{Ca}/^{48}\text{Ca} > 1$, whereas the observed ratio is only about 0.02.

Recently, it has been suggested that neutron-rich Ca and Ti isotopes may be produced through a neutron capture/ β -decay ($n\beta$) process with strongly enhanced (n,γ) cross sections for ^{46}K and ^{49}Ca . From simple shell model considerations, there are reasons to question the validity of a statistical approach for these isotopes since they lie near closed shells and are expected to have small level densities resulting in larger neutron capture widths.

Since ^{46}K and ^{49}Ca are radioactive, their capture cross sections cannot be measured directly. However, they can be determined by the inverse reaction, i.e. β -delayed neutron emission from ^{47}Ar and ^{50}K , respectively. It therefore seems feasible to measure the delayed neutron spectra of the $^{47-50}\text{Ar}$ chain and ^{50}K in order to obtain the necessary parameters for the capture cross sections.

We suggest to first measure n -singles and $n\gamma$ -coincidence spectra (beam time requirement ca. 15 shifts), and for those cases where neutron peaks below 300 keV are observed we then intend to measure the low-energy regions with an energy resolution adequate to obtain the neutron widths by shape analysis (beam time requirement ca. 4 shifts per isotope, ^{50}K to start with and ^{47}Ar having highest priority).

We propose to carry out the measurements at the shielded position UR9. Detectors and data acquisition systems will be supplied by the Mainz-group.

ISOLDE-Proposal

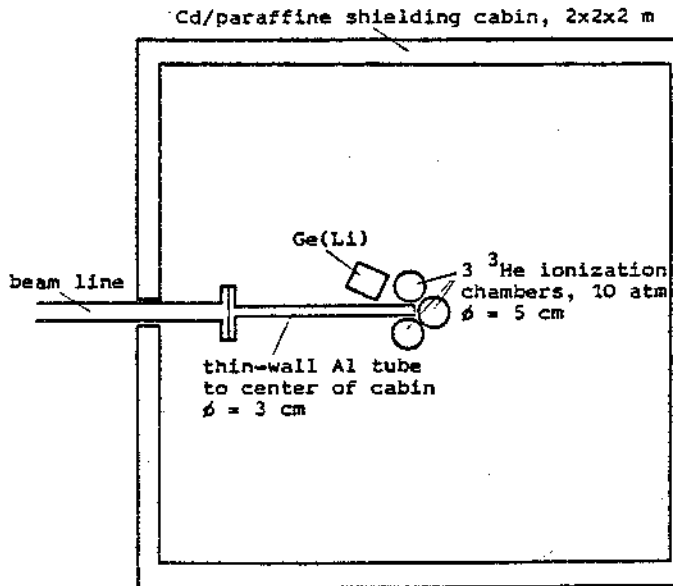
47- ^{50}Ar and ^{50}K Delayed Neutron Spectra; Ca/Ti Isotopic Anomalies and the Astrophysical $n\beta$ -Process

CERN/PSCC/82-20; PSCC/P55

Drawing of Experimental Set-up

ISOLDE, UR9

- 1) N-singles and $n\gamma$ -coincidence spectra using ^3He ionization chambers



Remove tape system and, if possible, also pump situated inside the shielding cabin.

- 2) N-singles and $n\gamma$ -coincidence spectra using high-resolution time-of-flight systems

