

EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

Addendum to the ISOLDE and Neutron Time-of-Flight Committee

IS486: CRYSTAL FIELD INVESTIGATIONS OF RARE EARTH DOPED WIDE BAND GAP SEMICONDUCTORS

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Abstract

In order to test the new implantation chamber which has been built at Göttingen as part of IS486 4 shifts of collections are requested to test, calibrate and prepare for eventual online PAC measurements using ^{190}O . The other two isotopes are ^{172}Lu and ^{149}Gd , well-understood probes of semiconductors to understand crystal-field effects and which can be used to calibrate the new chamber better for online use.

Requested shifts (in total):

4 shifts



1. Motivation, experimental setup and technique (to be used in the addendum)

As part of IS486, a new solid state physics chamber has been designed and built which will be installed at the ISOLDE GLM branch this year (2014). This will replace the current old chamber.

The new chamber is currently being setup at the University of Göttingen and will be brought to ISOLDE this year. It provides a load-lock system for sample changing. This allows changing while the ion beam is simultaneously used in down-stream chambers thus maximizing beam time usage. The sample transport system provides easy access to the samples, improved radiation safety and positions samples precisely in the beam. The rotational axis can even be used to implant into tilted samples.

While the new implantation chamber allows for efficient collections even in numerous samples with adjustable tilt angles, the deceleration chamber makes it possible to do implantations at very low energies (i.e. close to the sample's surface) or with post-acceleration to up to 120 keV. The new online chamber completes the ensemble by providing the possibility of online TDPAC measurements during implantation into hot samples with good solid angle coverage and low gamma absorption between sample and detectors. Due to its modular design it also allows to do measurements involving externally magnetized samples.

This addendum requests 4 extra shifts for IS486 to be able to better test and calibrate the new chamber.

Technique: The main experimental technique is PAC, although the implantations will be used primarily – in this instance – to prepare the new implantation chamber for general implantations. Some test collections are also envisaged for online PAC experiments (albeit using relatively long-lived isotopes). Eventually it is expected that PAC using short-lived isotopes such ^{19}F (mother beam ^{19}O) will be a possibility at ISOLDE.

Motivation: Crystal field around rare earths in semiconductors.

Addendum

Future plans with all requested shifts (including available shifts):

(i) Envisaged measurements and requested isotopes

Calibration and testing of the new SSP chamber being finalised at Gottingen. Preparation for online PAC measurements using this new chamber.

(ii) Have these studies been performed in the meantime by another group?

No

(iii) Number of shifts (based on newest yields) required for each isotope

isotope	yield (/uC)	target - ion source	Shifts (8h)
172-Lu	5e7	Ta or other (RILIS if possible)	1
149-Gd	5e7	Ta or other (RILIS if possible)	1
19-O	1e6	UCx VADIS	2

Total shifts: 4