

**BEAM REQUEST justification: Document CERN-INTC-2016-004 (INTC-P-454) in the series  
Proposal**

*Study of molybdenum oxide by means of Perturbed Angular Correlations and Mössbauer spectroscopy*

8 hours of proton request = 1 shift

-  $^{111m}\text{Cd}$  - 4 shifts

The 2D  $\text{MoO}_x$  samples are very difficult to handle. A big amount of samples and more implantation time is needed for measuring each temperature. This request deals with the fact that  $^{111m}\text{Cd}$  has 48 min half-life. From our experience, 4 hours of beam time were needed to achieve one measurement point. We would like to measure 8 different temperatures (32 hours of beam time).

Every measurement takes about 3 - 4 useful hours without receiving protons. Then new samples from the same batch are re-implanted.

The annealing for removal of implantation defects is performed and a new measurement can start as a function of, e.g., temperature.

There will be 6 PAC machines, five with 6 detectors and one with 4 detectors. This means that we can implant and prepare simultaneous 2 - 3 samples, every couple of hours keeping optimized use of PAC spectrometers and beam time.

We cannot conceive enough data taking with less number hours of access to beam time. The optimum way to run such "tens of minutes" half-life isotopes on off-line experiments, is to share beam time with other users of the same target prolonging beam time for several days where we add our shifts to other's shifts.

Off-line experiments are needed due to the necessary annealing steps and measurements performed under a variety of atmospheres (air,  $\text{O}_2$ , Ar from RT to high temperatures and vacuum - low temperatures).

- 2 shifts were requested for  $^{117}\text{Cd}$ ,  $^{115}\text{Cd}$  and  $^{111}\text{In}$ .

These are hour- and days - lived isotopes. Several samples can be collected during relative short time implantation and then measured offline for several hours and days.

- 2 shifts are requested for  $^{57}\text{Mn}$  and  $^{119}\text{In}$ , which are very short lived (minute) Mössbauer isotopes. Experiments need to be done on-line at the ISOLDE beam line. The beam intensities are strong enough to collect several data points within a limited use of beam time.

- 1 shift is requested for  $^{151}\text{Gd}$  and  $^{166}\text{Ho}$ . These are day-months- half-life isotopes. Samples can be collected off-line, then measured for several days and months.