

HUNTING THE S-PROCESS BRANCHING POINTS ^{147}Pm , ^{171}Tm AND ^{204}Tl AT CERN

C. Guerrero^{1,2}, C. Domingo-Pardo³, D. Schumann⁴, S. Heinitz⁴, U. Köster⁵ and The n_TOF Collaboration⁶

¹ *Universidad de Sevilla, Sevilla, Spain*

² *European Organization for Nuclear Research (CERN), Geneva, Switzerland*

³ *Instituto de Fisica Corpuscular IFIC-CSIC, Valencia, Spain*

⁴ *Paul Scherrer Institute (PSI), Villigen, Switzerland*

⁵ *Institut Laue-Langevin (ILL), Grenoble, France*

⁶ *www.cern.ch/nTOF*

Branching points along the s-process in stellar nucleosynthesis (see [1] and references therein) are key isotopes in which there is a competition between two processes: neutron capture (n,γ) and β -decay. This particularity makes the elemental abundances around these isotopes very sensitive to their half-life and (n,γ) cross section as well as to the neutron density and the temperature at the stellar scenario being considered. Therefore important information about the latter quantities can be inferred when one knows the corresponding (n,γ) cross sections. This is however difficult because such radioactive isotopes do not exist in nature and thus the material to perform accurate measurements is scarce. Indeed, the (n,γ) cross section of only two, ^{63}Ni [2,3] and ^{151}Sm [4], of the 21 most important branching points [1] have been measured by time-of-flight.

In order to improve significantly the situation we have launched a program to produce new samples of branching point isotopes and measure their capture cross section at the CERN n_TOF facility [5]. A significant amount of material ($\sim\text{mg}$) of ^{147}Pm , ^{171}Tm and ^{204}Tl (^{79}Se is also foreseen in the near future [6]) has been produced by irradiations of highly enriched precursors in the ILL high-flux reactor [7] and this material serves for preparing high purity samples at PSI [8]. The proposals for the experiments of their capture cross section [9] have already been accepted and the measurements are scheduled for fall 2014 and spring 2015.

We present the motivation for these measurements, report on the sample preparation and discuss the planned experiments.

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[3] M. Weigand et al., *PoS(NIC XII)184* (2013)

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[5] C. Guerrero et al., *Eur. Phys. J. A* 49:27 (2013)

[6] C. Domingo-Pardo and C. Guerrero et al., *CERN-INTC-2014-005* (2014)

[6] <https://www.ill.eu/>

[7] <http://www.psi.ch/lch/radwaste-analytics>

[8] C. Guerrero and C. Domingo-Pardo et al., *CERN-INTC-2014-003* (2014)