



ID de la contribución : 898

Tipo : no especificado

Advancements in detector development and capture cross-section measurements at n_TOF for nuclear technology applications

martes, 19 de noviembre de 2024 16:44 (7)

The neutron time-of-flight facility n_TOF at CERN is dedicated to measuring neutron-induced reaction cross-sections of relevance to nuclear technologies, astrophysics, and other scientific applications. The facility uses a high-intensity neutron source, a large lead spallation target coupled with the CERN-PS 20 GeV/c proton beam, and features three experimental areas: Experimental Area 1 (EAR1), located approximately 185 meters horizontally from the spallation target; Experimental Area 2 (EAR2), positioned vertically around 20 meters from the target; and the newly established NEAR station, located about 3 meters from the target and currently in the commissioning phase.

Since the beginning of the n_TOF collaboration, CIEMAT has been engaged in capture measurements relevant to nuclear technologies. Over recent years, we have been focused on developing new detectors and conducting capture measurements for various isotopes.

In the area of detector development, the sTED detector was constructed and commissioned in 2023 at EAR2, initially with 9 modules. A planned upgrade of the sTED detector to 27 modules is scheduled for construction in 2025, which will significantly enhance the setup's efficiency. Additionally, a comprehensive validation of the C₆D₆ detectors used at n_TOF was completed last year, demonstrating that the new C₆D₆-Legnaro detectors exhibit a notably improved response. Consequently, further units of these detectors will be acquired to optimize measurement capabilities.

In recent years, several neutron capture cross-section measurements have been conducted in EAR1 using C₆D₆ detectors. These include studies on Tantalum, relevant for space nuclear reactors; ¹⁶⁷Er, considered as a burnable absorber for nuclear reactors; and ²³⁸U, a major component in light water reactors. The status of these measurements, along with the latest details of the data analysis, will be presented.

Abstract

The neutron time-of-flight facility n_TOF at CERN is dedicated to measuring neutron-induced reaction cross-sections of relevance to nuclear technologies, astrophysics, and other scientific applications. The facility uses a high-intensity neutron source, a large lead spallation target coupled with the CERN-PS 20 GeV/c proton beam, and features three experimental areas: Experimental Area 1 (EAR1), located approximately 185 meters horizontally from the spallation target; Experimental Area 2 (EAR2), positioned vertically around 20 meters from the target; and the newly established NEAR station, located about 3 meters from the target and currently in the commissioning phase.

Since the beginning of the n_TOF collaboration, CIEMAT has been engaged in capture measurements relevant to nuclear technologies. Over recent years, we have been focused on developing new detectors and conducting capture measurements for various isotopes.

In the area of detector development, the sTED detector was constructed and commissioned in 2023 at EAR2, initially with 9 modules. A planned upgrade of the sTED detector to 27 modules is scheduled for construction in 2025, which will significantly enhance the setup's efficiency. Additionally, a comprehensive validation of the C₆D₆ detectors used at n_TOF was completed last year, demonstrating that the new C₆D₆-Legnaro detectors exhibit a notably improved response. Consequently, further units of these detectors will be acquired

to optimize measurement capabilities.

In recent years, several neutron capture cross-section measurements have been conducted in EAR1 using C_6D_6 detectors. These include studies on Tantalum, relevant for space nuclear reactors; ^{167}Er , considered as a burnable absorber for nuclear reactors; and ^{238}U , a major component in light water reactors. The status of these measurements, along with the latest details of the data analysis, will be presented.

Primary author(s): ALCAYNE AICUA, Victor (CIEMAT (Spain)); CANO OTT, Daniel (CIEMAT); MARTÍNEZ PÉREZ, Trinitario (CIEMAT); MENDOZA, Emilio (CIEMAT); PÉREZ DE RADA FIOL, Alberto (CIEMAT); SANCHEZ CABALLERO, Adrian (CIEMAT); BALIBREA CORREA, Javier (Instituto de física corpuscular IFIC); CASANOVAS, Adrià (Universitat Politècnica de Catalunya); DOMINGO-PARDO, Cesar (IFIC (CSIC-University of Valencia)); GUERRERO, Carlos (Universidad de Sevilla); LERENDEGUI MARCO, Jorge (Instituto de Física Corpuscular); N_TOF COLLABORATION

Presenter(s): ALCAYNE AICUA, Victor (CIEMAT (Spain))

Clasificación de la sesión: Red FNUC (Red Temática de Física Nuclear)

Clasificación de temáticas: Red Temática de Física Nuclear (FNUC)