

## REFERENCE NEUTRON SPECTRA IRRADIATION FACILITIES

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**Abstract.** *The reference neutron spectra irradiation facility represents useful experimental tools for reference measurements, measurement unit preservation, and international intercomparisons. Such experimental facilities have been developed also in the frame of R&D programs of the Institute for Nuclear Research. These are the thermal flux cavity, the  $\Sigma\Sigma$  reference spectrum system and the TRIGA-ACPR central dry channel. The last one, even if it is not recognized as reference spectrum, it may be used for some experiments, the neutron spectrum being reproducible and having a well characterized neutron field. The paper presents considerations about the reference neutron spectra, a constructive and functional description of the irradiation facilities, and computation and measurement results. At this moment formalities are being made in order to recognize the thermal flux cavity as national standard of the thermal neutron flux density unit.*

**Keywords:** irradiation facility, neutron spectrum, thermal neutron flux

### 1. Introduction

The nuclear energy development required the knowledge about the neutron characteristics of nuclear reactors, both for control and safety purposes, and also for calibrating the apparatus working in neutron fields. Different facilities producing reproducible neutron fields, with different characteristics, have been developed for neutron measurement standardization. The neutron metrology cannot be contrived without standards preserving the neutron flux density unit. This amount shall be consistent with the internationally recognized reference systems.

Different existing experimental facilities that generate neutron fields with different spectral characteristics are reported in the literature. AIEA recommends a set of reference neutron spectra, published in the IRDF 2002<sup>1</sup> library.

The neutron metrology is a R&D activity to create the methodology, infrastructure and legal framework for neutron flux density and derived measures measurements. Standard neutron sources and facilities generating standard neutron fields based on nuclear reactors or accelerators were created. The scope is to cover the energies and intensity ranges useful for calibration and the metrological testing of apparatus working in neutron fields, to improve the measurements precision refining the experimental and computational methods, to preserve the measurement units and to allow it's transmittal to other standards.

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