



# SP2

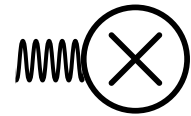
## SINGLE-SPHERE NEUTRON SPECTROMETER



Radically innovative and unique device



Spectrometric performance equivalent to a 6-unit BSS



Excellent photon rejection

Extended-range active neutron spectrometer

Portable device with built-in signal processing electronics

From thermal up to 10 GeV or up to 20 MeV (LITE)

Isotropic response (max  $\pm 2\%$  for neutron reference field of Am-Be source)

The single-sphere neutron spectrometer **SP2** is a unique device that allows to perform active neutron spectrometry measurements by employing a single instrument instead of the usual multi-sphere BSS.

**SP2** is characterized by the same high sensitivity and precision as BSS in determining the neutron flux over the entire energy range, while removing any reproducibility uncertainty. When employed with the on-line unfolding tool, **SP2** can also perform real time measurements.

**SP2** is equipped with 32 active  $^6\text{LiF}$ -covered Silicon neutron detectors installed over six concentric layers inside the moderating assembly, so that they reproduce the spectrometric performance of a six-sphere BSS. The signals are acquired by the built-in electronics and can be either analysed on-line by the built-in unfolding algorithm, or saved as raw data for off-line analysis.

**SP2** can be used in a great number of activities in scientific research: homeland security, cargo inspections, calibration laboratories, characterization of stray radiation fields for radiation protection purposes, periodical quality check of the neutron stray radiation field, all applications involving the need of a fast and precise measurement of the neutron spectrum.

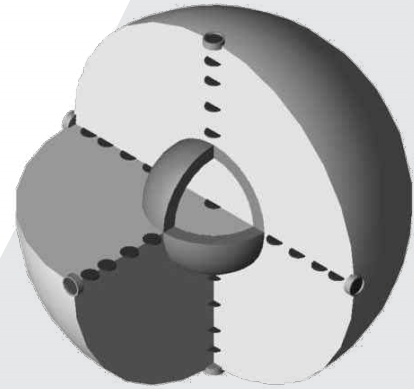
A **SP2 LITE** version is also available, featuring a lighter build and a narrower energy range, suitable for all the applications that do not require to detect neutrons with energy above 20 MeV.

The response function of the device, calculated via Monte Carlo simulations, is available for either on-line and off-line analysis. The response function and unfolding algorithm have been validated after thoroughly testing with reference radioactive sources.

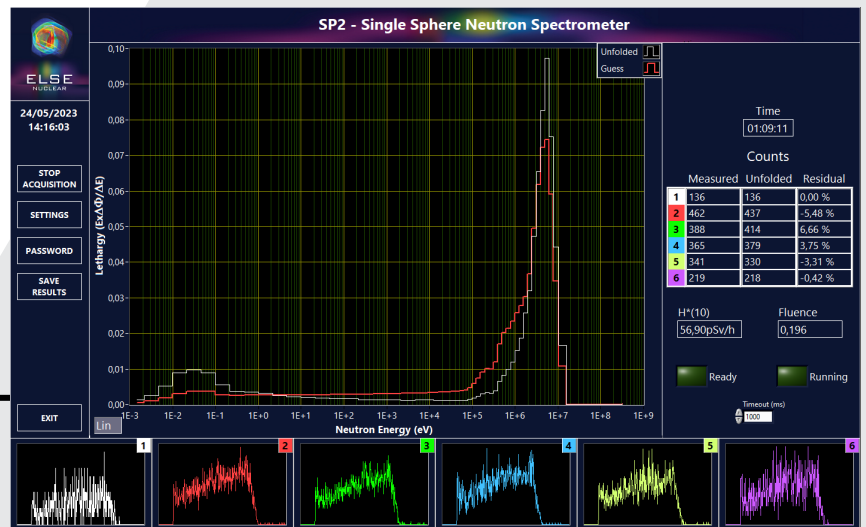
SP2 is the ideal device for performing active neutron spectrum measurements in every radiation environment, including mixed stray radiation fields, workplaces characterized by high gamma background and reference calibration laboratories.

## TECHNICAL SPECIFICATIONS

- Neutron typical sensitivity: approx. 0.3 cps/ $\mu$ Sv/h
- Gamma rejection: completely insensitive up to 50 mSv/h of gamma continuous background
- Moderating assembly diameter: 30 cm
- 32  $^6\text{LiF}$ -covered Silicon active neutron detectors
- Variation of the response with radiation angle of incidence: max  $\pm 2\%$  for  $^{241}\text{Am-Be}$  source
- Energy range:
  - from 0.025 eV to 10 GeV (standard version)
  - from 0.025 eV to 20 MeV (LITE version)
- Temperature range: from 0° to 40°C
- Humidity range: from 0 to 95%, non-condensing
- Weight: 25 kg; 23 kg (LITE version)
- Electrical operation: 50 Hz, 230 V  $\pm 10\%$
- Maximum counting rate:  $10^5$  cps for each acquisition channel
- Maximum  $H^*(10)$  per burst for use in pulsed fields: 1-5  $\mu$ Sv (depending on the neutron spectrum)



SP2 detectors distribution



SP2 software main panel

## OPTIONS

- Lighter version and narrower energy range (LITE version)

## ACCESSORIES AVAILABLE UPON REQUEST

- Unfolding code for automatic spectra and  $H^*(10)$  calculation
- Traceable calibration

Publications on international scientific journals:

- J.M. Gomez-Ros, R. Bedogni, M. Moraleda, A. Delgado, A. Romero and A. Esposito, A multi-detector neutron spectrometer with nearly isotropic response for environmental and workplace monitoring, *Nuclear Instruments and Methods in Physics Research Section A* 613 (2010) 127-133.
- J.M. Gomez-Ros, R. Bedogni, M. Moraleda, A. Esposito, A. Pola, M.V. Introini, G. Mazzitelli, L. Quintieri and B. Buonomo, Designing an extended energy range single-sphere multi-detector neutron spectrometer, *Nuclear Instruments and Methods in Physics Research Section A* 677 (2012) 4-9.

