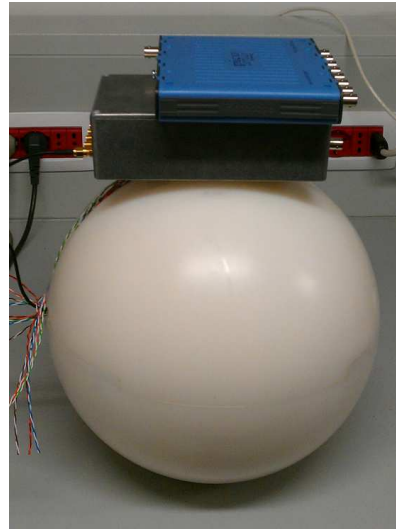


SINGLE SPHERE NEUTRON SPECTROMETER

SP2

MAIN FEATURES

- Radically innovative and unique device
- Extended-range active neutron spectrometer
- Portable device with built-in signal processing electronics
- Single sphere detector which provides a spectrometric performance equivalent to a six-sphere Bonner Sphere spectrometer
- Energy range from 0.025 eV to 20 MeV (optional extension up to 5 GeV)
- Isotropic response
- Excellent photon rejection (completely insensitive to photon fields up to 50 mSv/h)
- Typical sensitivity of 0.5 cps/ μ Sv/h



DESCRIPTION

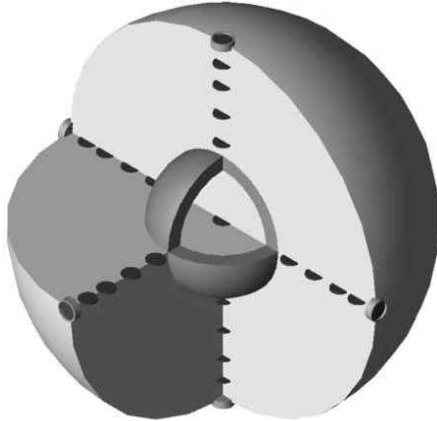
The **SINGLE SPHERE NEUTRON SPECTROMETER (SP2)** is a unique tool that allows performing active neutron spectrometry measurements by employing a single device instead of the usual multi-sphere Bonner spectrometers. Nevertheless, it is characterized by the same high sensitivity and precision in determining the neutron flux over the entire energy range. It reduces at minimum any reproducibility uncertainty and, when employed with the on-line unfolding tool, it can perform real time measurements.

The **SP2** core is constituted by 31 active ^6LiF -covered Silicon neutron detectors installed over six concentric layers in the moderating assembly, so that they reproduce the spectrometric performance of a six-sphere Bonner sphere spectrometer. The signals are acquired by the built-in electronics and can either be analysed on-line or transmitted for the analysis to an external device for off-line unfolding.

TECHNICAL SPECIFICATIONS

- Neutron sensitivity: approximately 0.5 cps/ μ Sv/h
- Gamma rejection: completely insensitive up to 50 mSv/h of gamma continuous background
- 30 cm moderating assembly
- 31 ^6LiF -covered Silicon active neutron detectors
- Variation of the response with the angle of incidence of the radiation: max $\pm 2\%$ for $^{241}\text{Am-Be}$ source
- Energy range: from thermal neutrons up to 20 MeV (5 GeV with optional Pb internal shell)
- Temperature range: from 0° to 40°C
- Humidity range: from 0 to 95%, non-condensing
- Total weight with optional Pb shell: approximately 20 kg
- 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 μ Sv (depending on the neutron spectrum)

The **SP2** is provided with its neutron response function, as a function of energy, calculated over the entire energy range. This has been validated via measurements performed with monochromatic neutron fields at different energies.



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.

OPTIONALS

- Supply of off-line or on-line (built-in) advance unfolding tools
- Training on unfolding tools for non-expert users
- Faraday cup for extremely noisy environments
- Internal lead shell for range extension up to 5 GeV
- Calibration certificate

APPLICATIONS

- Scientific research
- Homeland security
- Cargo inspection
- 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

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.
