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Update on VESPA, the vibrational neutron spectrometer at the ESS

We present an update on the design of VESPA, the neutron vibrational spectrometer of the European Spallation Source (ESS). VESPA is a broad-band indirect-geometry spectrometer designed to measure molecular vibrations and address a wide range of research areas highly relevant to society and industry, such as renewable energies or catalysis. The large neutron flux of the ESS will enable VESPA to routinely perform in-situ experiments and measure novel materials that are only available in limited quantities.

VESPA will give access in a single ESS pulse to an extended energy transfer range, 0–1000 meV. It will provide a large neutron flux in the low energy region, < 85 meV, and in the so-called “fingerprint region” of the spectra, 60–220 meV. This is achieved by the combination of a direct view of the ESS thermal moderator, partial view of the cold moderator, and the presence of a supermirror guide with elliptic profile and with high m -values, $m = 3\text{--}5$. Three high-speed double disc choppers in optically blind configuration will allow to divide the long ESS pulse into three subframes and to flexibly control the primary spectrometer energy resolution contribution from 0.5% to 2.5% of the incident energy, thus allowing to trade neutron flux for resolution depending on the scientific requirements.

The secondary spectrometer of VESPA is constituted of 16 spectroscopy modules and 4 diffraction banks in backscattering and equatorial positions. Each spectroscopy module is constituted of a focusing analyzer made of highly oriented pyrolytic graphite crystals, a cryo-cooled beryllium filter, and an array of high-pressure ^3He position sensitive detectors. The design of the spectroscopy module has recently been updated to further increase the solid angle coverage up to 7.0 sr.

Session

Instrumentation

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