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Background from sample cryostat on three-axis spectrometer: can it be reduced?

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Background from sample cryostat on three-axis spectrometer: can it be reduced?

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Background from sample environment may be a relatively important issue in the measurements with small and low scattering samples on a three-axis spectrometer. It can be present in the form of sharp peaks as a function of nominal energy transfer E and scattering wave vector Q . The intensity of this parasitic intensity can be well comparable to the measured inelastic signal. The complex Q - E structure of such background stemming from sample environment such as cryostats arises largely due to multiple elastic scattering (diffraction) of the incident beam on the internal structure of a cryostat comprising several temperature screens and walls of vacuum vessels even if they are made as a rule from relatively low scattering aluminium alloys. We show at the thermal TAS-IN8 (ILL) that this parasitic scattering can be reduced by introducing neutron absorbers inside the cryostat, in the most internal volume, on the side opposed to the used scattering side. This will imply rotating the sample with the sample stick, independently of the static cryostat thus changing the “classical” mode of operation. In fact, such systems are already being routinely used at ILL with different sample environments such as cryomagnets, for instance. If combined with a single crystal alignment device Goniostick developed at ILL, the experimenters recuperate the full flexibility of the sample movements inherent to measurements on three-axis spectrometers - now with reduced background that stems from sample environment.

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