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Development of an indirect spectrometer Mushroom

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Mushroom is a concept of an indirect neutron spectrometer with its secondary spectrometer based on a super flat-cone analyser made of highly oriented pyrolytic graphite with an array of position-sensitive detectors (PSD) below it. This combination of the analyser and PSD gives the complete information of the outgoing wave vectors from each detected point on the PSDs. The idea has been first presented by R. Bewley for a new spectrometer at the spallation source ISIS in the UK. We aim to adapt the Mushroom concept to the reactor source at FRM II, such that a much higher count rate can be reached than at a traditional triple-axis spectrometer (TAS). This is possible thanks to the special analyser in Mushroom covering a solid angle up to 2π steradian, while the value is ca. 0.001 steradian at a TAS. This allows an overview of the dispersion relation and/or diffuse scattering with only a few scans. We report on the theoretical calculations matching the resolution function of the secondary to the primary spectrometer using monochromatised neutrons from one of the neutron guides of FRM II. In addition, the first McStas simulations are presented showing predictions on the instrument performance.

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