Contribution ID: **0** Type: **not specified**

C-SPEC- a cold time of flight spectrometer for the ESS

Tuesday, 20 June 2017 16:30 (1 minute)

The European Spallation Source (ESS), expected to be the world's most powerful neutron source, will begin operations in 2019. Among the endorsed instruments foreseen for day one instrumentation at ESS, is the cold time-of-flight spectrometer C-SPEC. C-SPEC is a joint proposal from the Technische Universität München, Germany, and the Laboratoire Léon Brillouin, Saclay, France. The high performance cold time-of-flight-spectrometer will serve multiple disciplines to address scientific questions from hard and soft matter research, life sciences, geosciences or magnetism. C-SPEC will address time dependent phenomena under realistic conditions. While current day spectroscopic experiments mainly probe the static state of a sample, neutron spectroscopy experiments that probe the time dependent behaviour, e.g. of electrolytes in an electric field, or laser excited light harvesting proteins, are still in an exploration stage, mainly due to the lack of flux at the instruments available today. C-SPEC benefits from the high brilliance of the ESS spallation source in addition to the use of a novel chopper implementation and as such will address scientific questions raised by probing time dependent phenonena.
The unique pulse structure of the ESS with its long pulse duration (2.86 ms) and a repetition rate of 14 Hz requires new concepts for the instrumentation to make optimum use of the available source time frame. With an instrument length of ~157 m, a wavelength range of $\lambda \leq 1.8$ Å can be probed within each ESS time period via rate–repetition mode. The energy resolution can be tuned in the range of $\Delta E/E$ = 6 - 1%, and C-SPEC will utilize cold neutrons in the range from λ = 2 - 20 Å with the focus on the cold part of the spectrum. The guide is optimised to enhance signal to noise and will be able to focus on samples ranging from several mm^2 to several cm^2 in area. The large detector area, with a radius of 3.5 m, 5 –140 degrees and 3.5 m in height, typical on a chopper spectrometer will be designed with optimal energy and Q resolution in mind while maintaining the highest signal to noise ratio. C-SPEC is in the preliminary engineering phase and we will present the current design layout and the expected performance

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Session Classification: Poster