Detector System TG2 Review
NMX Instrument

Date

11 June 2017 TG2 Review (22.06.2017).

Reviewers:

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Introduction

This document is the review of the Tollgate 2 document of the detector systems technology for the proposed instrument "NMX".

1. Executive Summary

The reviewers looked from the perspective of detector technologies at the Tollgate 2 documents. The level of detail with which the detector system is discussed in the submitted documents is sufficient. Since Detector technology fulfilling the NMX requirements of a time resolved detector with good efficiency and excellent position resolution is currently not available, the ESS Detector Group is performing research and development activities to provide such a detector. Since the technology is performing well, with most engineering challenges overcome, there is only a medium risk that the detector technology does not meet the requirements, we grade this proposal "green.

The reviewers consider that from the perspective of detector system technologies the preliminary design is sufficiently complete and mature. With regard to the detection efficiency, in case of insufficient detector performance, there is an upgrade option using enriched 157 Gd converters that would increase detection efficiency by more than a factor of two. NMX is well advanced and mature, early procurement of the detectors is thus critical, following the end of the BrightnESS project. This is especially true since the mounting of the detectors on the robotic detector positioners requires special efforts with regard to integration and commissioning. For the detector backend, two options exist for NMX. Either the RD51 SRS system can be used, or the ESS standardized interface. If the standardized interface is used, there will work to integrate the RD51 frontend.
A full scale demonstrator for this detector is presently under construction.

General Comments:

- **Maturity:** The detector requirements are presented in a clear and understandable fashion.

- **Compatibility**: The plan is compatible with ESS standards, if executed as expected.

- **Feasibility:** The overall system performance requirements presented in the concept are beyond of the presently available state of the art. However, the present state of the development is well advanced, and key performance requirements have been demonstrated. Some key numbers like the signal-to-background ratio though have to be measured with a prototype to get a realistic picture.

- **Risks:** The main risk is that the detector performance does not meet expectations. This risk is being mitigated by an extensive prototyping, testing and demonstration campaign.

- **Budget:** Testing campaigns side-by-side with the state-of-the-art detectors at an existing similar instrument must be performed, and are planned this year.
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- **Schedule:** The schedule is feasible, but keeping it depends on the successful

production and test of the BrightnESS demonstrator.

Communication: The instrument team have communicated effectively with the ESS Detector Group. We strongly encourage to continue with the good collaborative work.

Comments on the TG2 documents:

ConOps:

- Clear and concise description of the instrument operations.

System requirement specifications:

- 13.6.4.1: With 1.8 A – 10 A, the wavelength range seems to be extended now towards longer wavelength. It should be clarified to which wavelength the efficiency requirements refer to.

Work package specifications:

- Page 14: The schedule foresees to start procurement and manufacturing of the detector in spring 2018, which seems too early. The preparations for manufacturing and procurement may start at this point. The start of the manufacturing will depend on the measurement results obtained with the BrightnESS demonstrator. The BrigthnESS demonstrator will be available at the end of the BrightnESS grant in August 2018. The expected completion date is realistic.

Preliminary System Design:

- Page 15: The intensity of the fast neutron and gamma background and its influence on the detector still has to studied in detail.