

Neutron Optics and Shielding Group  
TG2 Summary  
MIRACLES Instrument

Review

Date  
9<sup>th</sup> October, 2017

2017 TG2 Round for ESS Instruments

Technical Reviewer:  
Phil Bentley

Input received from  
Douglas DiJulio  
Damian Martin Rodriguez (via ESS-  
0105247)

Preamble

This document is the review summary of the instrument's optical and shielding system preliminary design. Systems outside of this scope have not been considered, except where they significantly impact on optics and shielding.

**1. Executive Summary**

The reviewer considers that from the *perspective of optics and shielding systems* the concept of the design is sufficiently complete and mature. However, there are significant deficiencies in working practice and risk assessments.

**2. Proposal Grading**

The proposal is graded as a whole and by subcategory.











For each item, a grade is given for the preliminary system design *as it stands now* (column "NOSG status"),


"GREEN": All aspects of the criterion have been addressed satisfactorily to permit endorsement by the NOSG to the detailed design phase.

"ORANGE": Some aspects of the criterion have not been addressed satisfactorily. However, if additional information is supplied, NOSG endorsement of the instrument to the detailed design phase may be possible.

"RED": Some aspects of the criterion have not been addressed satisfactorily and there are reasons to doubt they can be achieved without changes. Currently it is not recommended to proceed.

Grades are indicated as traffic lights:  = green,  = orange,  = red.

Criterion	NOSG Status	Comments
Has adequate planning been done to move the project into Phase 2?		
Is the proposed budget consistent with the proposed scope?		
Does the preliminary design satisfy the requirements?		
Is the presented baseline technically sound?		
Has anything been forgotten or neglected?		Baseline design has not been uploaded to ESS repositories according to ESS-0059811.
In case where several In-kind partners are collaborating – are roles and responsibilities adequately defined and agreed?		
Have safety-related aspects in accordance with ESS-0043330 ref [6] been appropriately considered?		There are some questions about the shielding calculations below.
To what extent have appropriate connections been made with the critical project interfaces, such as software, data storage hardware and sample environment?	NA	
Has the instrument context been appropriately considered in terms of physical interfaces, such as bunker, beam extraction, ICS etc?		
To what extent have available engineering standards been implemented appropriately?		
Are the cost and duration estimates reasonable?		ESS-0105247 highlighted cost and performance opportunities; those factors should be verified to have been taken on board.

Criterion	NOSG Status	Comments
To what extent has the team planned appropriately for the risks, both technical and otherwise?		

### 3. Currently identified issues

#### Optics

Due to a shortage of available time and resources, no optics review of the final documentation was performed in October 2017. As such, the above “traffic lights” were presented in evaluation of the information as was able to be done within said boundary conditions. However, the team have had good and early contact with the optics expert this year, resulting in a review (ESS-0105247, 7<sup>th</sup> April 2017). We would expect the issues highlighted in that report to be resolved in order to satisfactorily pass TG2.

#### Shielding

They have tried to lose LOS within the bunker but found the best performance was to lose LOS within DO3, so they are trying to use as much of the bunker shielding as possible – this is positive.

They do not have shielding collimators within the bunker. Only B4C lining of guides and shielding of choppers. This is similar to other recent reports, and if ESS management requires safety-rated collimator blocks on all beam lines this would need to be added to the project.

They have done MCNP and analytical calculations. However, it's not always clear how these are used in combination, and it appears that they give different results. They claim MCNP calculations show that the neutron capture in the supermirror coating is minimal, but did a hand calculation which gave around 31 cm of steel. It's not clear how these fit together and we would like some additional clarification.

Conversion between steel and concrete thicknesses in general seems smaller than we would expect. For example, they have 30.6 cm steel or 60.5 cm concrete for their guide calculations, but the ratio seems on the small side.

### 4. Detailed/other comments

## **Addition During Meeting**