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| System Review of the ESS RF Cell  May 11 - 12, 2017 |
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| **Charge for the System Review** |
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Purpose of this review

The system review is meant to look at the RF cell including all supporting systems prior to the start of installation. The goal of the review is to ensure that the RF cell as a whole is a well thought out, consistent design that will meet its operating requirements. As such, it examines the final technical design of the integrated system with an emphasis on interfaces between components and subsystems and controls integration including local interlocks and links to the Machine protection System. It is not meant as a detailed design review of the individual components as that is dealt with during the subsystem PDRs and CDRs.

**Charge to the Committee**

The Review Committee is composed of the Chairman and members as identified in Appendix 2. This list also shows reviewers, who provide comments and review but are not on the formal committee and presenters.

The Review Committee is asked to:

1. REVIEW: Scrutinize and assess the deliverables listed in Appendix 1, presented through the material presented and discussions, at the System Review. Note that the presentations themselves are means of communication only, and it is the documentation which must be reviewed.

2. ANSWER: Answer each question listed in Appendix 3.

3. DECIDE: The Review Committee is to elaborate and deliver at the conclusion of this review, a clear recommendation to ESS about the ability of the RF cell including its associated systems to meet its requirements.

Suggested forms for the decision are:

* Approved, without qualifying comments or further actions.
* Approved, but with recommended actions and or clarifications.
* Not approved, but with recommended actions, for further inputs and activities, and a proposal for a follow-on review.

4. REPORT: The Review Committee is to document in a short report to be delivered as soon as possible after the System Review, its recommendation and any specific actions and other guidance for assisting planning and future success of the Work Unit in for its scope and deliverables.

If the System Review is “Approved but with recommended actions”, there shall be a summary list of requested actions defined .

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| Appendix 1  **Scope and Deliverables for Review** |
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Scope

The RF Cell under review is defined as:

* Modulators
* RF Sources (klystron, tetrode)
* RF Distribution System
* RF Interlock System
* Controls and connection to higher level accelerator control system
* Low Level RF Controls
* Phase Reference Line
* Cooling Water System
* Associated Racks, Cables and Cable Trays
* Preliminary Installation Plans

Deliverables for System Review - Information to be reviewed

The information identified below is to be described and communicated through presentation at the System Review, and the source information is to be available to reviewers for reference during the System Review.

The RF group and associated work packages should deliver to the Review Chairman for distribution to the Review Committee and other reviewers, an agreed subset of the following information for pre-review and comments no later than Five (5) working days prior to the Review.

1. Mechanical design at a sufficient detail to answer interface, performance, alignment and installation questions below.
2. Electrical design including: single line drawings, instrumentation lists, cable designs and connector pin outs, calibrations etc.
3. Integrated controls system design and documentation sufficient to answer charge questions.
4. Copies of reports of the previous applicable design reviews
5. System Verification Plan
6. Preliminary Installation Plan
7. Hazard analysis
8. Preliminary Work Safety Coordination Plan
9. Description of relevant MPS links and limits.
10. Results of relevant component and subsystem testing
11. RAMI report and list of needed spares for start of operation

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| Appendix 2  **Review Committee and other Reviewers, Presenters and Observers** |

The System Committee conducts this review of design with the authority of ACCSYS Project Leader, Mats Lindroos, and ESS Chief Executive Officer, John Womersley.

The Committee serves in an advisory capacity to:

* the ACCSYS WP 8 and WP16 Leaders, and
* the ACCSYS management team

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| Name | Organisation | Appointment for IRR |
| John Weisend II | ESS, ACCSYS Deputy Project Leader | Chairman of the Review Committee |
| Mats Lindroos | ESS, ACCSYS Project Leader | Review Committee member |
| Roland Garoby | ESS, Technical Director | Review Committee member |
| Duy Phan | ESS, ACCSYS Safety Group | Review Committee member |
| Kent Wigren | ESS, ACCSYS QA Engineer | Reviewer Committee member |
| Nick Grazis | ESS, Installation Manager | Review Committee member |
| Cecilia Maiano | ESS, Linac Group | Review Committee member |
| Frank Gerigk | CERN | Review Committee member |
| Fabien Rey | ESS, Alignment Group Leader | Reviewer |
| Enric Bargallo | ESS, RAMI | Reviewer |
| Hakan Danared | ESS, Deputy Division Head | Reviewer |
| Anders Sunesson | ESS, RF Group Leader | Presenter |
| Morten Jensen | ESS, WP8 Work Package Manager | Presenter |
| Yogi Rutambhara | ESS, RF Distribution Lead | Presenter |
| Anders Johansson | Lund University LLRF Lead | Presenter |
| Daniel Piso | ESS, Integrated Controls Systems | Presenter |
| Evangelia Vaena | ESS, Electrical Engineer | Presenter |
| Anton Lundmark | ESS, CW/IA leader | Presenter |
| Annika Nordt | ESS, ICS, MPS Leader | Presenter |
| Carlos Martins | ESS, RF Group | Presenter |

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| Appendix 3  **RF Cell System Review Charge Questions** |

1. Will the RF Cell function as a logical integrated system with optimized requirements
2. Will the system meet its technical specifications? Do we know how to verify this?
3. Are the interfaces between the various components and subsystems that compose this system completed defined in terms of: a) physical connection – location and type of mating flanges, location and type of power and cable connections, support stands etc. and b) physical parameters (flows, pressure, temperatures, current, voltage, data acquisition formats and rates etc.)
4. Have all interfaces between this system and other systems been completely defined and agreed. Are all the connections on the ESS site in place? This applies to physical connections, physical parameters (flows, pressure, temperatures, current, voltage, UPS requirements) and data exchange.
5. Has an integrated control system (both hardware and software) been developed and tested that permits control of the system, collection of data and integration of this system into accelerator operations?
6. Are all needed connections to the Machine Protection System defined and agreed to? Have all MPS trip and permit levels been agreed upon
7. Have all safety issues been defined and dealt with? Are additional separate safety reviews or inspections required?
8. Have all QA/QC plans been defined and implemented?
9. Will the system fit within its allocated space and can be transported there within the give transport path (height of doors, pass by other equipment) with the available transport means?
10. Are the alignment requirements agreed upon and can the system components be aligned within these requirements?
11. Is the preliminary installation plan for the system adequate? Have all tools, including cranes, movement devices, stands, alignment fixtures etc. been defined. Has the staff for this work been identified? Is the installation sequence consistent with the overall installation plan?
12. Has the reliability and maintainability of the system been optimized? Have all the spare parts required from the first day of operation been identified and procured?
13. Have all recommendations from component design reviews been addressed?