

RAMI analyses for the IFMIF-DONES facility

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The Demo Oriented Neutron Energy Source (DONES) plant design has been evolved from the 2013 IFMIF-EVEDA design. The current design activities are set in the frame of the EUROFUSION work programmes. Reliability, Availability, Maintainability and Inspectability (RAMI) analyses are part of these activities.

A target of 70% of operational availability was established for IFMIF-DONES facility design, which means, the facility is expected to be available for irradiation (i.e. beam on at full power) for 255.5 days per year. Such average operational availability requirement combined with the foreseen scheduled annual maintenance scheme (20 + 3 days) implies inherent availability requirement of 74.7% (i.e. ~75 %) for the DONES facility. Allocating such target for the whole plant to the single systems, the following system targets for inherent availability were defined: Accelerator Facility 87 %; Lithium Target Facility 94 %; Test Facility 96 %; Conventional Facilities 98 %; Central Control System 98 %. The compliance of the plant with these targets is analysed together with the design development.

Several sources of uncertainties still impact RAMI analyses for the facility. Some of them are related to the fact several systems are one of the kind and design is not yet sufficiently detailed.

Evaluations of reliability and availability parameters performed in the past for the different systems of IFMIF showed that the targets fixed for the availability requirements were not met. Nevertheless, a lot of design improvements that could contribute in matching with the fixed requirements were identified. With the development of DONES design such requests of improvements are pursued.

Particular attention is focused on the removal of several uncertainties still impacting RAMI analyses. Some of these are related to the fact several systems are one of the kind and design is not yet sufficiently detailed. For example, for the Lithium and Test systems, uncertainties are related to the lifetime of components, maintenance strategy, Li loop process boundary, fault tolerant approach, purification phases, system layout, auxiliaries and degraded operating mode assumptions. Experimental facilities are built or are under consideration to better define the different fields of application. On the same time the design is in progress in defining issue not yet treated.

Failure Mode and Effect Analysis (FMEA) and Reliability Block Diagram (RBD) analysis are the tools selected for the RAMI assessment. Some of the main outcomes of the RAMI studies will be presented at the Workshop. Moreover, a mention will also be made in the use of RAMI results, in defining components relevant to safety through a probabilistic approach.

Summary

Overview on RAMI studies for DONES-IFMIF facility. Particularly, availability targets for the different systems, sources of uncertainties on RAMI results, methodology applied for the studies and the use of probabilistic approach in defining safety relevant components are presented.

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