Contribution ID: **542** Type: **Oral**

Managing ITER diagnostics and port plug engineering project risks

Thursday 8 June 2017 14:20 (20 minutes)

Risk management is a key part of any successful project. Projects like ITER with high technical challenges and complex integration vitally depend on risk management. This paper will describe the organization and management of risks within the ITER diagnostics and port plug engineering project design phase. A typical risk impacts design-phase cost and schedule due to the need for specific mitigation actions and additional design-by-analysis or design-by-prototype iterations. The paper will describe the management of five categories of design-phase engineering risks in the context of the Upper Wide Angle View (UWAVs) Visible and Infrared Camera diagnostic project. UWAVs is the largest US ITER diagnostic system and serves critical machine protection roles. The system provides a comprehensive view of the divertor and outer blanket wall for hot spot detection as well as visible inspection of these critical structures. The first type of design-phase risks are associated with the optimization and integration of the in-vacuum diagnostic port structures including balancing weight with shielding effectiveness, structural performance and diagnostic performance. As UWAVs is deployed in five upper port plugs there are some space-claim clashes to deal with despite strong IO CAD model controls. One mitigation approach for UWAVs is to share light collecting optics with another diagnostic. UWAVs proposal to share optics with the RFDA H-Alpha project will be discussed in this talk. The second risk category deals with the ITER operating environment and the need for radiation and magnetically hardened components. This is a critical risk category for UWAVs because the visible and IR cameras sit in high radiation areas. The UWAVs project approach to this risk will be discussed in this talk. Risks associated with design strategy and assumptions make up the third grouping. Strategy and assumptions are also the "risk" category that may lead to positive outcomes with cost savings and schedule acceleration. There are several examples of strategy from the UWAVs project. The major design strategy for UWAVs, also related to integration, is the decision by the US ITER project to have one UWAVs design for all five upper port deployments. The pros and cons of this strategy will be discussed in this talk. The fourth group deals with technology development through R&D and prototype activities. This is a key category because aspects of design are strongly linked to choices of technology. R&D and prototype work also helps to mitigate performance risks once the system is deployed. In the UWAVs project risks inherent in design strategy and technology development are partly associated with first mirror cleaning. The project has based the in-vacuum design on RF driven sputtering technology. A comprehensive mirror cleaning R&D and prototype program is underway in the US and several other DAs in order to handle this risk of design strategy based on new technology. Lastly risks associated with changing interfaces or requirements will also be discussed.

Eligible for student paper award?

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Session Classification: R.OP1: Diagnostics and Instrumentation II

Track Classification: Diagnostics and instrumentation