

## INSTALLATION LEAK TESTING AND STATUS OF ITER LEAK LOCALISATION R&D

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The integrity of ITER vacuum systems is crucial to the operation of the machine and it is planned to perform installation leak testing of 100 % of boundaries to vacuum. In this paper the design of the thermal shield and blanket systems are discussed with particular reference to features included in the design to facilitate installation leak testing. The methodologies for the installation leak testing of the thermal shield and blanket systems are also given and leak mitigation strategies, including the requirements for redundancy and segregation of system components, are reviewed.

Operational water leaks into the main vacuum vessel and helium leaks into the cryostat are expected to account for a significant loss of operational availability if timely localisation and repair of the leak cannot be performed. The design of the ITER in-vessel systems are such that localisation of a leak must be performed with sub-centimeter resolution to ensure that the leaking component is identified and the risk of removing a leak tight component in proximity is reduced as, in many cases, access to the leaking component will require the removal of several other components which may be supplied with water, or cryogenics, from the same loop.

Due to the complexity of the machine, and the progression to an active environment, traditional methods of leak localisation may not be applicable to ITER. Personnel access to facilitate in-situ leak testing will be at best limited and during the active phase of the project severely restricted. Hence a challenge for ITER is to develop methods of leak localisation capable of operation in the ITER environment, with a minimum of human intervention and loss of machine availability, capable of sub-centimeter spatial resolution.

To solve the challenge of leak localisation a three year program of research and development has been initiated, the aim of which is to identify and subsequently develop concept leak localisation techniques to an ITER relevant demonstration. In this paper the type and magnitude of operational leaks critical to ITER are described and the current status of the Leak Localisation R&D program is given. A synopsis of results of studies previously performed on the subject of ITER leak localisation is also provided herein.

**Topic:** Vessel / In-vessel Engineering and Remote Handling

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