iter
china eu india japan korea russia usa

Summary: Investigation of laser spectroscopic methods and applicability to ITER for Leak Localisation

1 Introduction

ITER will be the largest and most complex vacuum system yet to be built. Situated in Southern France, adjacent to the French CEA Cadarache site, the ITER facility covers approximately 190 hectares and is designed to study the fusion reaction between the hydrogen isotopes tritium and deuterium.
It is expected that water leaks from the Tokamak Cooling Water System (TCWS) Primary Heat Transfer Systems (PHTS) into the main vacuum vessel will result in a reduction of the availability of the ITER machine. Method(s) of leak localisation and repair must be developed to minimise machine down time caused by leaks from the PHTS.
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.

2 Scope

Under the scope of the contract the Contractor shall perform studies into laser spectroscopic methods and assess their applicability to ITER.
On the basis of work performed the Contractor shall identify a method of laser spectroscopy which could be developed / adapted to leak localisation on ITER.
The Contractor shall develop a concept design of the system for ITER and shall identify the steps required to bring the concept to an ITER demonstration.

2.1 Planned Approach

The following describes how the work envisaged in executing the project will be performed

2.1.1 Identification of applicable laser methods

The Contractor shall perform studies (literature, experience etc) into laser methods which may be applicable to ITER leak localisation.
Laser methods to be studied include, but shall not be limited to:

- Cavity Ring Down Spectroscopy (CRS)
- Laser absorption/emission
- Laser induced Fluorescence Spectroscopy (LIFS)
- Laser induced Breakdown Spectroscopy (LIBS)

2.1.2 Applicability to ITER

Of each of the laser methods identified the Contractor shall consider the applicability to ITER. In consideration of applicability the following at least shall be considered:

- Range
- Sensitivity
- Spatial resolution

2.1.3 Feasibility / Engineering Study

For the laser method(s) deemed to be most applicable to ITER the Contractor shall perform feasibility studies into realising the system for leak localisation on ITER. The study shall extend to integration with ITER systems and design changes to be made to integrate such systems. The Contractor shall identify the risks (in terms of system capability to localise leaks) associated with proposed systems.

2.1.4 Concept Design and Demonstration

The Contractor shall propose a concept design of a laser method for ITER leak localisation. The Contractor shall propose a plan of R&D, schedule and costs to bring the concept to an ITER demonstration. The execution of the R&D plan is outside the scope of this contract.

3 Schedule

Action	**Tentative date(s)**
Call for Pre-qualification	21 May 2010
Call for tender	28 June 2010
Tender submission	09 August 2010
Contract Award	End August 2010
Start of contract	September 2010
End of contract	September 2011

4 Experience

The potential tenderers should have proven experience in the following areas:

1) The Contractor and its personnel shall have adequate experience in laser spectroscopy.

2) Contractor’s access to experimental facilities for the demonstration of concepts is considered to be advantageous.