

Call for Participation 2009 Work programme

INTEGRATED TOKAMAK MODELLING TASK FORCE

**Task under Task Force Leadership:
*Experimentalists and Diagnosticians
Resource Group (EDRG)***

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This Call for Participation aims to establish the EDRG work programme activity for 2009 under EFDA Art.5 Task Agreement format.

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Required Resources

The Implementation of the EDRG work programme for 2009 is estimated to require a minimum of 5 Ppy under Baseline support and 1.33 Ppy under Priority Support in order to be able to provide a minimum level of project fulfilment of the deliverables and milestones. The overall resources under priority support for the ITM Task Force are determined by the Work Programme, but the breakdown between projects within ITM is left to be optimised by the Task Force Leader in order to satisfy project requirements while taking into account the resources made available by Associations. Furthermore the resources under baseline support shown in the Work Programme are meant to be preliminary. For these reasons, the manpower requirements stated in the project descriptions should be viewed as indicative. Tasks are generally collaborative in character or form parts of a larger structure where timely delivery and coordination is of importance. Support and training on the ITM framework and tools will be available and time for the participation shall be allocated in addition to Task activities.

In the analysis of the answers to the Call, the ITM-TF will do its best to promote collaborative efforts between associations as well as between individuals in the different tasks. This is to provide internal peer review, quality of work and to develop a stronger sense of community ownership for the developed tools. However, and in order to reduce fragmentation and related administrative burden, if smaller tasks are shared between Associations, care should be taken that no individual's total contribution to a project becomes too small. It is suggested that, unless explicitly requested by an Association and/or technically justified, individual commitments per project should be of at least 3pm. This individual commitment could be shared between different tasks within the same project. Tasks and individual commitments aimed directly at the maintenance of software already installed in the ITM-TF platform are excluded from this requirement.

Priority Support

The tasks:

- **ITM-09-TFL2-EDRG-T3 Coordination of plasma control activities**
- **ITM-09-TFL2-EDRG-T5 Synthetic diagnostics – 3D reflectometry modelling framework**

are formed under priority support.

In addition, there are opportunities for work relating to implementation and development of data structures, support for development of code interfaces and integration into the KEPLER work flow platform under the INTEGRATION TEAM. The team will provide and train a set of experts from the different Modelling project to provide high level support and expertise on application development and code adaptation for the ITM as a whole.

Implementation

All software development is expected to be implemented on the ITM-TF gateway, www.efda-itm.eu, under the provisions of the Gateway User Agreement (attached). The latter was agreed to by the EFDA-SC in June 2008. The Gateway User Agreement details access and sharing mechanisms for the software developments within ITM-TF. Furthermore, the ITM-TF will provide a collaborative software development environment, based on Gforge, to support the development of individual programs and at the same time ensure that Quality Assurance and traceability criteria for the ITM project are adhered to.

Intellectual Property Rights Monitoring

In agreement with the EFDA-SC decision (June 2008), and as described in the Gateway User Agreement, the ITM-TF will monitor IPR relating to contributed codes. In particular, the ITM-TF will maintain a record of contributions made to any Software through collaborative Tasks within the ITM-TF. All such modifications remain fully available to the contributing Associate provided contributors are acknowledged though the principles stated in the ITM-TF license. A Rights of access form (attached) is required for all codes being contributed. For any given code, this document states the current list of contributors, the code's ITM-TF Responsible Officer and technical reference(s) that should be used in publications involving the code.

Overview: Experimentalist and diagnosticians resource group.

The consolidation of the validated suite of simulation tools that the ITM aims to provide for ITER and existing experiments requires a strong interaction with the experimentalists and diagnosticians fusion community. In order to provide a machine independent approach to modelling, to encompass realistic operational conditions and to facilitate verification and validation of the modelling codes, it is essential to pursue a comprehensive set of Machine descriptions, plasma control elements and

synthetic diagnostic modules, covering as broad range of European fusion devices as possible. The former are promoted by the Experimentalist and Diagnosticians Resource Group (EDRG), a contact point within the ITM towards the full range of experiments. The activities to be addressed are cast according to the following breakdown:

2008 Task		Status in 2009
<p>ITM-08-TFL-T2: Experimentalist and Diagnosticians Resource Group (EDRG)(*)</p> <p>(*)This was an implementation task in 2008.</p>	→	<p>ITM-09-TFL2-EDRG-T1: Contact Person in fusion experiments</p> <p>ITM-09-TFL2-EDRG-T2: Machine descriptions and data mappings</p> <p>ITM-09-TFL2-EDRG-T3: Coordination of plasma control activities [Priority Support]</p> <p>ITM-09-TFL-EDRG-T4: Diagnostic related activities</p> <p>ITM-09-TFL-EDRG-T5: Synthetic diagnostics – 3D reflectometry modelling framework [Priority Support]</p>

ITM-09-TFL2-EDRG-T1 Contact Person in fusion experiments

Implementation Scheme: Baseline Support

Description of the work:

For the success of a fully integrated simulation environment used for discharge studies, the establishment of a close collaboration with local responsible officers from each of the participating major European experiments is envisaged. The called contact person will provide the liaison between the affiliated laboratory and the ITM and will be in charge of:

- i) the coordination of the machine description (MD) and data mapping activities to be carried out in the affiliated laboratory by designated staff (see ITM-09-TFL2-EDRG-T2).
- ii) the proposal of verification and validation (V&V) activities to be carried on the experimental data of the affiliated laboratory, in collaboration with the relevant IMPs of ITM.

Deliverables:

- A report describing the proposed V&V activities to be carried out during 2009 by April 2009.
- A report on the machine description and data mapping coordination activity by Sept. 2009.

Manpower skills and needs:

Requested manpower/skills:

Close support representatives of each of the participating experiments are requested for this task.

Existing Commitments:

This is a new task and there are no existing commitments.

ITM-09-TFL2-EDRG-T2 Machine descriptions and data mappings

Implementation Scheme: Baseline Support

Description of work:

The machine descriptions are a key element in providing a device independent approach to integrated modelling. A fundamental step requires the extension of the machine descriptions, from participating experiments, beyond vessel and magnetic configurations and the associated data mapping. Completion of the present machine description aims at including:

- i) Heating and Current Drive systems.
- ii) Feedback plasma control elements (plasma position and shape controllers and actuators as well as active magnetic feedback systems for MHD control).
- iii) Comprehensive 3D description of the first wall, encompassing, among others, geometrical, chemical, thermal, electrical and mechanical properties and induced currents.

In association with the machine description assembly, the corresponding data mapping needs to be developed. This task links with relevant tasks to be carried out by other IMPs (ITM-09-ISIP-T7, ITM-09-IMP1-T6, ITM-09-IMP1-T2b, and ITM-09-IMP3-T4) and therefore expected to be carried out in coordination with the relevant IMPs.

Deliverables:

Development of extended set of machine descriptions and data mapping for each of the participating experiments by April 09.

Manpower skills and needs:

Requested manpower/skills:

Expert experimentalists in the relevant areas are requested to respond. An estimated 3 pm of dedicated work from each of the participating experiments during 2009 is expected. The task is suitable to be divided among different individuals and associations. Overall 30pm is foreseen.

Existing Commitments:

This task is partially continuing from ITM-08-TFL-T2 and had 4pm commitment. Contributors in 2008 are encouraged to express their ongoing interest.

ITM-09-TFL2-EDRG-T3 Coordination of plasma control activities

Implementation Scheme: Priority Support

Description of work:

An integrated suite of modelling tools targeting the simulation of a magnetically confined plasma discharge, in realistic free boundary equilibrium experimental conditions, requires the integration of plasma feedback control elements. Specifically, plasma position and shape feedback controllers and actuators as well as active magnetic feedback systems for MHD control are foreseen in the ITM platform. A control expert is therefore called to coordinate the activities related to control within the ITM (e.g. ITM-09-IMP1-T2, ITM-09-IMP2-T4), in liaison with both the relevant IMPs and the participating experiments. The coordination of the development of a KEPLER toolbox, implemented within the ITM and dedicated to control is also foreseen. This task assumes a high level of cooperation between the relevant IMPs in order to embed a comprehensive plasma control capability within the ITM tools (ITM-09-ISIP-T12). Interaction with the *MHD Topical Group* activities on Plasma Control is foreseen.

Deliverables:

- Provide a report on the existing or newly developed feedback controller(s) schemes for plasma position, shape and MHD control on participating experiments by April 2009.
- Coordinate the overall plasma control ITM activities in view of a comprehensive integration of control modules in the ITM platform.

Manpower skills and needs:

Requested manpower/skills:

Experts in plasma position/shape and MHD feedback control and in modelling of plasma evolution are requested (4pm).

Existing Commitments:

This is a new task and there are no existing commitments.

ITM-09-TFL2-EDRG-T4 Diagnostic related activities

Implementation Scheme: Baseline Support

Description of work:

This task addresses the activities that are directly related to diagnostics. These play an essential role on the overall code V&V activities to be carried out in ITM, building on diagnostic CPOs and synthetic diagnostic modules. At present, Magnetic, MSE and general line integrated diagnostic CPOs have been developed and a 3D reflectometry full wave modelling framework has been identified and being pursued (ITM-09-TFL2-EDRG-T5). Therefore, a comprehensive set of CPOs characterizing diagnostic data needs to be developed to provide the necessary coverage of future V&V activities needs. In particular, *LIDAR and Thomson scattering, ECE, charge exchange, neutral particle analyser, X-ray and fusion product diagnostics* are requested. The opportunity for the synthesation of the former diagnostics or for the adaptation of existing software packages to the ITM platform will be explored. A joint effort deriving out of expert diagnosticians from the participating experiments, in liaison with the ITM-ITF, is expected. This task might benefit from collaboration with the Diagnostics topical group.

Deliverables:

- A report describing further needs and opportunities for synthetic diagnostics within the ITM by April 2009
- Definition of new diagnostic CPOs and revision of the present set by June 09.
- Adaptation of existing (if any) synthetic diagnostic software packages to the ITM framework throughout 2009 and a plan for activities for the 2010 work programme by September 2009.

Manpower skills and needs:

Requested manpower/skills:

Expert diagnosticians from each of the participating experiments in the relevant areas are requested to respond. Estimated 3pm of dedicated work per participating experiment is expected for the CPO definitions and code adaptation, evenly divided between the diagnostics involved. Overall 30pm is foreseen. The task is suitable to be divided among different individuals and associations.

Existing Commitments:

This is a new task and there are no existing commitments.

ITM-09-TFL2-EDRG-T5 Synthetic diagnostics – 3D reflectometry modelling framework

Implementation Scheme: Priority Support

Description of the work:

Following a first evaluation of the needs and opportunities for bringing synthetic diagnostic modelling into the ITM suite of tools, a 3D reflectometry full wave modelling framework has been identified and prioritised, aiming at the creation of suite of optimized joint European reflectometry simulation codes, with the prime objective being a modularized 3D full-wave code using best schemes and code parallelization techniques. This will draw upon the current ERCC (European Reflectometry Code Consortium) activity of benchmarking existing 2D full-wave codes using synthetic fluctuation input data. Operating within the ITM and Diagnostics topical group framework will assist in subsequent coupling of codes to turbulence simulation codes and aid in diagnostic development as well as help to promote fundamental physics studies.

Deliverables:

- Algorithm prototyping, particularly the development of mixed solution schemes, for the 3D full-wave reflectometry simulation code by December 09.

Manpower skills and needs:

Requested manpower/skills:

The 3D full-wave reflectometry simulation code requires a computer scientist specialized in parallel programming (1 ppy). The task can be split up between different individuals to cover the necessary areas of expertise.

Existing Commitments:

This is a new task and there are no existing commitments.