Call for Participation

2012 Work Programme

INTEGRATED TOKAMAK MODELLING TASK FORCE

Deadline for Responses: 16. Dec 2011

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This Call for Participation aims to implement the Integrated Tokamak Modelling Work Programme for 2012 under Task Agreements as foreseen in the new EFDA Art. 5

Introduction

At its 48th meeting in Strasbourg, France, 29 June 2011, the EFDA Steering Committee approved elements of the EFDA 2012 Work Programme, among which the programme on Integrated Tokamak Modelling programme (EFDA (11) 48/4.1.1). The ITM-TF Work Programme will be implemented through the Integrated Modelling Projects (IMPs), the ITER Scenario Modelling project (ISM) and the Infrastructure and Software Integration Project (ISIP).

IMPs have a dual responsibility, on one hand, developing and manifesting the physics foundations for Integrated Modelling in standalone packages targeting the code platform environment and on the other hand supporting the integration efforts towards scenario modelling tools and physics exploitation. ISIP is responsible for providing the technology backend and framework technology for the Task Force as a whole.

This programme is implemented on the basis of the EFDA Art. 5 provisions. The tasks will be defined following the present Call for Participation. The outcome of the Call is assessed by the ITM-TF leadership and the EFDA-CSU and implemented under the Task Agreements, listed in table 1. Following the assessment, it may be required to revise the scope and resources for specific tasks. New tasks could be also introduced at this stage to properly implement the ITM Work Programme.

Table 1: Summary of Task Agreements for the 2012 Work Programme

Task Agreement	**Activity**
WP12-ITM-AMNS	Atomic, Molecular, Nuclear and Surface Physics Data (*Task under Task Force Leadership*)
WP12-ITM-EDRG	Experimentalists and Diagnosticians Resource Group (*Task under Task Force Leadership*)
WP12-ITM-IMP12	MHD equilibrium, stability and disruptions
WP12-ITM-IMP3	Transport Code and Discharge Evolution
WP12-ITM-IMP4	Transport Processes and Micro stability
WP12-ITM-IMP5	Heating, Current Drive and Fast Particle Physics
WP12-ITM-ISIP	Infrastructure and Software Integration Project
WP12-ITM-ISM	ITER scenario modelling
WP12-ITM-TFL	TF leadership

Programmatic Background

Project Leadership

The ITM-TF Project leadership runs on a two–year appointment schedule. The current project leaders will reach end of term December 31 2011, except for the ISM coordinators which are appointed till May 2012. Hence an integral part of this call for participation (WP12-ITM-TFL) is the appointment of Project Leaders for two years and the renewal of ISM coordinators commitments till December 31 2013, pending the decision of the EFDA SC on the organization of ITM activities in 2013.

The appointed Project Leaders will take an active part in the establishment of Task Agreements and will be given the opportunity in negotiation with Associations to impact the final Task Agreements.

Priority Support

In 2012, the minimum total commitment from an individual to priority support activities should be 0.15 ppy. Lower commitment might be accepted on an exceptional basis for specific tasks.

The priority support is foreseen for well identified actions, including:

- **TF and project leadership (0.75 ppy for TF leader, 0.5 ppy for TF deputies, 0.25 ppy for project leaders and deputies)**
- **Tasks and activities considered to be on the critical path for ITM-TF to meet its mission, which are summarized in Table 2**

Table 2: Summary of Tasks under priority support for 2012

Task Agreement	Activities under Priority Support	Specific Tasks under Priority Support
WP12-ITM-AMNS	ACT1 partial ACT2	Coordination and Provision of AMNS data Further development, maintenance and documentation of modules to provide AMNS data to ITM-TF codes as well as support for the use of the modules
WP12-ITM-EDRG	ACT1 partial ACT2 ACT3 partial	Machine descriptions, data mappings and experimental data Coordination of plasma control activities and support to control integration in workflows Synthetic diagnostics integration
WP12-ITM-IMP12	ACT1 partial ACT3 partial	Integration of equilibrium and MHD modules into ITM Workflows and Maintenance of IMP12 codes

		Verification and Validation
WP12-ITM-IMP3	ACT1 ACT2 partial	Maintenance, continuing development, verification and validation of the ETS and other core components Implementation, integration, verification and validation of edge codes
WP12-ITM-IMP4	ACT1 partial ACT2 partial ACT3 partial ACT4	Cross verification of IMP4 turbulence codes on specified standard cases Kepler workflows and interfacing with HPC-FF and IFERC Cross verification of linear and neoclassical codes on specified standard cases Maintenance and standards-keeping of commonly used transport model modules
WP12-ITM-IMP5	ACT1 partial ACT2 ACT3	Creation, testing and benchmarking of Kepler Actors from Heating, Current Drive and Fast Particle Physics codes for use in ITM workflows. Integration of IMP5 modules in ITM workflows Development and integration of models for synergies between heating schemes and self-consistent coupling of IMP5 heating codes
WP12-ITM-ISIP	All (ACT1, ACT2, ACT3)	Support the users of the framework Maintain and upgrade the existing functionalities of the framework Identify and develop missing functionalities in the framework
WP12-ITM-ISM	ACT1	Support to the validation and physics application of the ETS and ITM tools

A significant part of the work of 2012 activities falling under Priority Support will be organised in coordinated working sessions and code camps.

A training on ITM tools will be offered in March 2012 and all who are not familiar with the latest version of the ITM tools are strongly encouraged to attend this event.

Table 3: ITM Trainings and Code Camps in 2012

ITM coordinated efforts	**Provisional dates**
ITM Tools Training	12-16 March
ETS/Integration Code Camp	19-30 March

Edge Code Camp	29 May - 8 June
ETS/Integration Code Camp	9-20 July
Edge Code Camp	15-26 October
ETS/Integration Code Camp	3-14 December

Attendance to the Code Camps planned for a Priority Support activity under a Physics Project is mandatory for the approval of Priority Support and the corresponding time duration should be accounted for in the committed manpower. Tentative Code Camp dates and duration are specified in Table 3 and the required participation at the project level. Use of the mobility agreement is foreseen in support to the exchange of scientists between the involved Associations, covering the participation in code camps and attendance at the TF meetings.

Documentation

A critical issue for ITM aim of supplying a transparent and long-lasting solver is the documentation, which necessarily enters as an integral part of the ITM code release (see Appendix A Phase IV). Documentation is mandatory for participants under priority support, in particular ITM members involved in the creation of Kepler modules and their integration into workflows are expected to provide the following documentation:

> **I. An end-user operational manual describing how the code or suite of codes is coupled with the tested workflows. The manual should also describe in detail which entries of the relevant CPOs are effectively used, and describe how to operate possible code switches, if any.**
>
> **II. A physics description document targeting a non-specialist end-user audience. The description should highlight strength and weaknesses of the model, possible limitations and identify, whenever possible, future model extensions.**

The ceiling of resources for activities under Priority Support is 625 kEuro.

Main programmatic priorities of the 2012 ITM Work Programme

The ITM-TF has reached by 2011 the capability of integrating modules building up complex physics workflows. In 2012, most of ITM activity will consist of coordinated TF wide efforts: the Integrated Modelling Projects activities will concentrate on moving to the verification and validation (V&V) of the integrated modules, the integration of new modules into ETS workflows and the promotion of their use in advanced applications, as detailed below. The integration of modules in the ETS has the ambition of developing an integrated ITM workflow with a level of physics description similar to that of software suits such as TRANSP, CRONOS, JINTRAC and ASTRA in mid-term.

The activities in the area of Integrated Tokamak Modelling in 2011 are moving from the

mainly development of simulation tools and integration activities to establishing complex workflows for physical applications at production level, as well as to providing support and maintenance both for the platform and infrastructure and to workflows integration. It is foreseen that the ITM-TF will realize by 2012 a number of "standard" workflows running under Kepler using the Universal Access Layer. The following taskforce-wide activities proposed in the 2012 ITM Call for Participation are integral parts of ITM-TF wide milestones on a two years scale. (EFDA_2012WP) Support of Associations to those Activities will contribute to the demonstration of ITM-TF tools capability and to the achievement of ITM-TF milestones. Associations are therefore encouraged to apply for the following coordinated activities as a whole, i.e. committing manpower for the complete set of tasks involved.

ITM-TF wide priority workflow development in 2012 and related project activities involved (Priority Support)

WF1: Exploitation of the equilibrium reconstruction and MHD stability chain
(*under supervision of IMP12 leadership*)

WP12-ITM-EDRG-ACT1

WP12-ITM-ISM-ACT1-T2: Exploitation of the equilibrium and MHD stability chain on at least one device

WP12-ITM-ISM-ACT1-T2: Application to the pedestal MHD analysis for JET and ASDEX-U Hybrid Scenarios
and its extensions:

WP12-ITM-IMP12-ACT1-T1: Equilibrium and MHD stability chain (incorporate RWM physics including elements of 3D tokamak wall)

WF2: ETS workflows including equilibrium modules, transport modules, impurities and pellets, heating and current drive modules from IMP5 including synergetic effects for ICRH, ECRH/ECCD, NBI
(*under supervision of IMP3 leadership*)

WP12-ITM-IMP3-ACT1-T2: Release of a number of standard Kepler workflows, including (but not limited to) workflows incorporating pellets, neutrals, impurities, heating and current drive modules, sawteeth, NTMs

WP12-ITM-IMP12-ACT1-T2: Integration equilibrium & MHD codes with the ETS

WP12-ITM-IMP4-ACT2: Kepler workflows and interfacing with HPC-FF and IFERC

WP12-ITM-IMP4-ACT4: Transport modules

WP12-ITM-IMP5-ACT1-T3: Workflows executing on HPC.

WP12-ITM-IMP5-ACT2: Integration of IMP5 modules in ITM workflows, development of "high level" H&CD modules for use in transport simulations, test and validation.

WP12-ITM-IMP5-ACT3: Development and integration of models for synergies between heating schemes and self-consistent coupling of IMP5 heating codes.

WF3: Core transport solver coupled with free boundary equilibrium
(*under supervision of IMP3 leadership*)

WP12-ITM-IMP12-ACT1-T3: Integration of free boundary equilibrium codes with the European Transport Solver

WP12-ITM-IMP3-ACT1-T3: A free boundary version of the ETS

WF4: Coupling of free boundary equilibrium codes with a feedback controller: develop a workflow coupling a free boundary equilibrium code with a plasma shape and position controller, able to simulate dynamic situations, like VDEs, where the actual equilibrium is lost.
(*under supervision of IMP12 leadership*)

WP12-ITM-EDRG-ACT2

WP12-ITM-IMP12-ACT1-T4: Coupling of free boundary equilibrium codes with a feedback controller

WF5: ETS workflow coupled with turbulence using High Performance Computers
(*under supervision of IMP3 leadership*)

WP12-ITM-IMP12-ACT1-T8
WP12-ITM-IMP4-ACT2
WP12-ITM-ISIP-ACT3-T1

WF6 : Workflow for NTMs stabilization via H&CD: develop a prototype workflow exhibiting feedback control of MHD modes, namely on NTMs based on H&CD
(*under supervision of IMP5 leadership*)

WP12-ITM-EDRG-ACT2
WP12-ITM-IMP12-ACT1-T5
WP12-ITM-IMP5-ACT2

WF7: Experimental data driven workflows
(*under supervision of TF leadership*)

WP12-ITM-EDRG-ACT1

WP12-ITM-IMP3-ACT1-T7: interpretive runs of the ETS where experimental data is imported to CPOs; the ITM profile maker is used to generate the "coreprof" CPO; either the IMP12 equilibrium chain is used to prepare the equilibrium or it is read from the experiment; IMP5 heating and current drive modules are used if necessary to calculate the sources (WP12-ITM-IMP5-ACT2); and the ETS is used to calculate the transport coefficients.

Relation to Experiments

The validation and exploitation of the above workflows will strongly imply collaboration with the official Contact Persons assigned to each device experimental device (see WP12-ITM-EDRG-ACT1) and ITER, in particular it is foreseen:

- **Consolidation of the Machine Description and Data Mappings (MD&DM) of all participating devices and ITER in view of covering all subsequent needs of test-bed data for V&V of ITM codes and workflows. It is anticipated that updates of the data mappings to comply with the current working version of the data structure (v4.09a), its future upgrades and corresponding planned installations will be needed.**

- **In collaboration with Diagnostic TG experts and EFDA ITER Physics Workprogramme for 2012-2013, bring further synthetic codes to the ITM and increase collaboration on workflow design for plasma control applications.**
- **In collaboration with ITER-IO and ITPA-IOS experts, develop ITER scenario modelling for current ramp down; real time model-based profile control; expansion of the operational domain of ITER hybrid scenario with q on-axis below one by controlling the sawtooth period.**

Additional V&V efforts will be pursued within the specific integrated modelling projects on the selected "testbed" shots identified in 2011 within the ITM-TF e.g. core and edge turbulence codes (IMP4), Heating and Current Drive codes (involving all the available H&CD codes in IMP5, in the fields of ECRH, LH, ICRH, and NBI). Benchmarking of the mature equilibrium and MHD stability modules against each other and validation against experimental data will be conducted.
To this end, an increasing number of exploitation projects with users from the participating experiments is solicited.

First physical exploitations of ETS workflows on experimental data, coordinated under ISM, is expected to involve all integrated modelling projects.

Interpretative and predictive modelling of scenarios for existing EU devices will be carried out by the ISM project as well as predictive modelling of ITER, JT60-SA (under input of the JT60 SA EFDA Work Programme implementation) and DEMO (under input of the PPPT EFDA Work Programme implementation) scenarios.

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. Furthermore, the ITM-TF will provide a collaborative software development environment, based on Gforge, to support the development of individual projects and at the same time ensure that Quality Assurance and traceability criteria for the ITM projects that adhered to.

Relation to HPC-FF, HLST and IFERC

It is worth noting that some of the above described ITM priority activities and workflows (i.e. WF2 and WF5 described above) will require the use of High Performance Computing systems. Namely WP12-ITM-IMP5-ACT1-T3 and WP12-ITM-IMP4-ACT2 explicitly foresee the application, respectively, of synergetic heating effects and of first-principle turbulence code workflows on both HPC-FF and -when available- IFERC-CSC. Operations on IFERC-CSC will require an allocation of CPU time to the ITM for development as well as software support from IFERC-CSC , pending the outcome of the corresponding Calls for Proposals. The HLST previously provided support to porting the ITM developed UAL, together with supporting libraries, to the HPC-FF, as well as to the interoperability between the ITM Gateway and HPC-FF. The HLST is also providing support for applications requiring different nested levels of parallelization (i.e. ADIOS). It is foreseen that this support should

continue and a similar effort would be required for applications of ITM tools on IFERC.

Intellectual Property Rights Monitoring

IPR is managed according to the Gateway User Agreement.

A Right of access form (October 2009 version 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.

1. AMNS:

Task Agreement WP12-ITM-AMNS:

Atomic, Molecular, Nuclear and Surface Physics Data (Task under Task Force Leadership)

1.1 Introduction

The ITM has a broad need for data relating to atomic, molecular, nuclear and surface data (AMNS). In particular, AMNS data are needed in several of the ITM modelling projects. A consistent approach, taking into account the specific requirements of the ITM while maintaining the work aligned with other European efforts in this area, is therefore required. The AMNS activities have the following scope:

- **Coordination of the work in the four different sub areas (Atomic, Molecular, Nuclear and Surface).**
- **Supply of data not presently residing in easily accessible databases.**
- **Identify any Intellectual Property Rights (IPR) protection needs in view of a broader collaboration with ITER partners.**
- **Provide software for delivery of AMNS data to ITM-TF codes**

The AMNS data should include:	
Atomic Physics data	• Rate coefficients and cross sections for ionization, recombination, charge exchange, electron cooling etc. for elements: H, D, T, He, Be, C, O, N, Ne, Ar, Mo, Ni, Li, Si, B • Line radiation • Bundled charge state descriptions
Molecular Physics data	• H2, D2, T2, HD, HT, DT • Cw Hx Dy Tz
Surface data	• Sputtering/Reflection coefficients • Chemical sputtering • Mixed materials effects
Nuclear data	• Nuclear reactions for: D-D, D-T • Cross sections for diagnostics

The data will be needed by codes that have plasma temperatures/energies in the range of 0.1eV to 100 keV; for CX cross section data energies up to 5 MeV are wanted; the electron density should be between 1018 to 1022 m-3. The ITM has standardised on S.I. units but with temperatures in eV. There is a desire for cross-section data to be available as a function of angle as well as energy.

All AMNS data to used by the ITM-TF should bind to the following conditions: version control; accurate provenance and approval by experts when used for "production runs";

communication to ITM-TF codes via a standardised interface. The work on providing the AMNS data can be split into two parts:

(i) contact with different databases, including recommendation of the best data to be used/stamp of approval; transfer of appropriate data to the ITM-TF data repository;

(ii) development of modules that take AMNS data from the ITM-TF data repository and provide them in a standardized form to ITM-TF codes.

In 2012 the emphasis will be on adding more data (in particular, a complete set of surface data, atomic cross sections for key elements, and the start for molecular data) and implementing the AMNS interface in more codes.

1.2 Objectives

The purpose is to supply AMNS data to ITM codes including

- **a full set of rate coefficients for atomic processes**
- **a set of cross sections for atomic processes**
- **a full set of sputtering and reflection data for surface processes**
- **an initial set of data for molecular processes**
- **a full set of cross sections for the basic thermo-nuclear processes**

1.3 Work Description and Breakdown

Structure

Continuity – Activity relations

The connection between 2011 tasks and those planned for 2012 are given in the following table.

2011 Task	**Status in 2012**
WP11-ITM-AMNS-ACT1: Coordination of AMNS data	WP12-ITM-AMNS-ACT1: Coordination and Provision of AMNS data Continued in Priority Support
WP11-ITM-AMNS-ACT2: Continued development, maintenance and documentation	WP12-ITM-AMNS-ACT2: Further development, maintenance and documentation of modules to provide AMNS data to ITM-TF codes as well as support for the use of the modules Continued in Priority Support.

Work Breakdown

WP12-ITM-AMNS-ACT1

Coordination and Provision of AMNS data

Description

The following tasks are foreseen:

1. **coordination of data for Atomic data (0.25 PPY PS)**
2. **coordination of data for Molecular data (0.25 PPY PS)**
3. **coordination of data for Nuclear data (0.25 PPY PS)**
4. **coordination of data for Surface data (0.25 PPY PS)**
5. **the provision of AMNS data to the ITM (under BS, a maximum of 2 PPY)**

Implementation Method:

Priority and Baseline support

Requested manpower/skills:

- **Tasks 1-4 will be covered by Priority Support with indicative manpower of 0.25 ppy for each of the areas (atomic, molecular, nuclear, surface) Participation to at least two of the relevant code camps is required.**
- **Task 5 is under Baseline Support with total manpower required of 2 ppy.**

Existing Commitments: This is a continuation of the activity from 2011 and all who participated in 2011 are encouraged to reapply.

Code Camps or other coordinated efforts (preliminary)

Type of effort	Start date	Length (in weeks)	Expected outcome/relation to deliverable(s)
Code Camp	Mar	**2**	Integration of AMNS data for delivery to ITM codes.
Code Camp	May	**2**	Integration of AMNS data for delivery to ITM codes.
Code Camp	October	**2**	Integration of AMNS data for delivery to ITM codes.
Code Camp	Dec	**2**	Integration of AMNS data for delivery to ITM codes.

External connections / requirements

Requires connections and cooperation with external AMNS data bases (ADAS, HYDKIN etc.)

WP12-ITM-AMNS-ACT2

Further development, maintenance and documentation of modules to provide AMNS data to ITM-TF codes as well as support for the use of the modules

Description
The following tasks are foreseen:

1. **further development, maintenance and documentation of the user callable interface to the AMNS library (PS, 0.25 PPY)**

2. **support for the implementation of the AMNS interface in ITM codes (PS, 0.25 PPY)**

Implementation Method:

Priority support

Requested manpower/skills:

· **Task 1 will be covered by Priority Support with indicative manpower of 0.25 ppy**

· **Task 2 will be covered by Priority Support with indicative manpower required of 0.25 ppy.**

Participation to at least two of the relevant code camps is required.

Existing Commitments: This is a continuation of the activity from 2011 and all who participated in 2011 are encouraged to reapply.

Code Camps or other coordinated efforts (preliminary)

Type of effort	**Start date**	**Length (in weeks)**	**Expected outcome/relation to deliverable(s)**
Code Camp	Mar	**2**	Integration of AMNS modules for ITM codes.
Code Camp	May	**2**	Integration of AMNS modules for ITM codes.
Code Camp	October	**2**	Integration of AMNS modules for ITM codes.
Code Camp	Dec	**2**	Integration of AMNS modules for ITM codes.

External connections / requirements

Requires connections and cooperation with external AMNS data bases (ADAS, HYDKIN etc.)

JET related activities

not relevant

Resources

The Implementation of the AMNS work programme for 2012 is estimated to require a minimum of 2 Ppy under Baseline Support and 1.5 Ppy under Priority Support in order to be able to provide a minimum level of project fulfillment of the deliverables and milestones.

1.4 Scientific and Technical Reports

described at activity level

Milestones and Deliverables

Milestones:

Deliverables:

described at activity level

Activity	*Priority Support Deliverables*	*Due Date*
WP12-ITM-AMNS-ACT1	• Documentation of data transfers to the ITM-TF, including software used for this purpose, and other activities carried out for the task. • Documentation of modules used for taking data from external databases and to store them in the ITM database via the AMNS data structure.	31. Dec 2012
WP12-ITM-AMNS-ACT2	• Interface updates (T1). Updates to the AMNS interface modules as needed by new data and new capabilities; documentation of the updates • Implementation report (T2). Report of codes converted to use the AMNS interface	31. Dec 2012

2. EDRG:

Task Agreement WP12-ITM-EDRG:

Experimentalists and Diagnosticians Resource Group (Task under Task Force Leadership)

2.1 Introduction

The validation and consolidation of the simulation tools that the ITM-TF aims to provide for ITER and existing experiments requires a strong interaction with the experimentalists and diagnosticians fusion community. The former are promoted and coordinated by the Experimentalist and Diagnosticians Resource Group (EDRG). Acting as a contact point within the ITM towards the full range of experiments and some of the EFDA Topical Groups and Working Group initiatives, the EDRG group promotes the provision of a machine independent approach to modelling, to encompass realistic operational conditions and to facilitate verification and validation of the modelling codes. EDRG main action comprises the development of a comprehensive set of Machine Descriptions (MD) and Data Mappings (DM) to access both experimental and simulation databases, the coordination of the overall plasma control activities to be carried on within the ITM-TF in liaison with other EFDA initiatives, the support to the integration of control elements in TF-wide Kepler workflows, and the development and integration of synthetic diagnostic modules, covering as broad range of European fusion devices as possible.

Activities in 2012, in line with the EFDA 2012 Workprogramme, will address the revision and consolidation of the MD and DM of present devices and of ITER in view of covering all subsequent needs of testbed data for V&V of ITM codes and workflows. EDRG activities will also focus on the consolidation and further testing of the 3D visualization/defeaturing (automatic rasterization of the first wall domain to reduce unnecessary fine details of the original drawing) tool that is presently installed on the Gateway. Following the successful interfacing with the grid CPO structure and testing with ITM visualization tools carried out in 2011 for AsdexUpgrade, extension to other devices is foreseen. Development of new diagnostic CPOs and the integration of forward model based synthetic diagnostics that are in the interest of the IMPs is also called for. The testing of the 3D synthetic reflectometer effort led by the ERCC group (erc3d) will continue, with particular emphasis on the interfacing to turbulence codes.

2.2 Objectives

2.3 Work Description and Breakdown

Structure

Continuity – Activity relations

The connection between 2011 tasks and those planned for 2012 are given in the following table.

2011 Task	Status in 2012
WP11-ITM-EDRG-ACT1 Machine Descriptions, data mappings and experimental data.	Continued
WP11-ITM-EDRG-ACT2 Coordination of plasma control activities	Continued with new name and scope WP12-ITM-EDRG-ACT2 Coordination of plasma control activities and support to control integration in workflows
WP11-ITM-EDRG-ACT3 Synthetic diagnostics integration	Continued

Work Breakdown

WP12-ITM-EDRG-ACT1

Machine Descriptions, data mappings and experimental data
Description

1. Maintenance and support on the Machine descriptions and Data mapping for each of the participating devices (includes provision of STL files for the first wall).

2. Consolidation of H&CD elements, 2D vessel qualifying for discontinuous elements, pfsystems CPO and upcoming diagnostic CPOs as requested by the IMPs(e.g. *Strike point, Bremsstrahlung, LIDAR, neutral particle analyser, X-ray* diagnostics).

3. Support team to assist all V&V activities in the ITM-TF by delivering data mappings of "testbed" shots (coherent and reasonably complete set of plasma profiles of representative scenarios). *Priority will be given to devices for which V&V activity on given codes/workflows is agreed*.

4. Coordination of the local support to the verification and validation (V&V) activities agreed with the ITM Leadership to be carried on the experimental data of the affiliated laboratory, in collaboration with the relevant IMPs.

5. Whole device wall surface mesh for representative tokamak devices (e.g. JET, AUG) with different physics requirements (gas-tight *vs* ports), relevant for edge code boundary conditions.

Implementation Method:

Priority and Baseline support

Requested manpower/skills:

- **Experimentalists from each of the participating experiments are requested. Estimated 1.5pm per device (6pm) for MD and DM maintenance.**
- **For the support team providing the DM for the "testbed", experimentalists with experience in data validation and good understanding of the ITM datastructure are requested, 0.1ppy commitment per device is required. Minimal total manpower required is estimated to 0.4 ppy (under Priority Support)**
- **For the coordination of the overall effort and V&V roadmap agreement, a high level representative of the associated laboratory is called for (0.25 pm per device).**
- **Experts on the rasterization method used in ITM and the grid element structure; Experts on first wall meshing for RWM modelling (0.15 ppy estimate need, under Priority Support).Participation to Edge Code Camps (see Table 3 in introduction) is encouraged.**

Existing Commitments:

- **Representatives from TS, AUG, MAST, FTU committed during 2011. Renewal of commitments is expected.**
- **Commitments from IPP/TEKES on the whole chain of 3D defeaturing à storage in grid element with successful testing on AsdexUpgrade.**

Code Camps or other coordinated efforts (preliminary)

Type of effort	**Start date**	**Length (in weeks)**	**Expected outcome/relation to deliverable(s)**
Code Camp with IMP3-ACT2	tbd	**2**	Testing of defeatured 3D wall meshes on edge codes.

External connections / requirements

- **The ITM-TF activities on V&V targeting JET will require support staff to assist ITM-TF effort namely on the provision of validated experimental shot data building up a representative "testbed".**
- **Collaboration from ITER to provide support for upgrade/maintenance of the official machine description file is also encouraged in liaison with ISM activities.**
- **Drawing offices from participating experiments to provide CAD files of the device.**

WP12-ITM-EDRG-ACT2

Coordination of plasma control activities and support to control integration in workflows
Description

A coordinator for plasma control activities is requested, taking the responsibilities to:

1. Coordinate and stimulate the activities related to control within the ITM :

- **Plasma position&shape feedback control using at least CEDRES++ and CREATE-NL free-boundary equilibrium codes (IMP12-ACT1-T5)**

- **MHD plasma control (RWM and NTM) (IMP12-ACT1-T6)**
- **Control toolbox and Simulink integration via RT Workshop/C++ wrappers (ISIP-ACT2-T10)**
- **"Plant system" layout in Kepler with Plasma model, actuators and diagnostic elements (IMP3-ACT1-T9).**
- **Development of the ITER real time model-based profile control (ISM-ACT3-T3)**

1. **Provide an external connection to other EFDA related control activities and promote/coordinate the collaborative effort.**

Additionally, this ACT aims at providing the support and expertise for the development of control schemas to be used in the ITM Kepler workflows that require control (e.g. IMP12-ACT1-T6, IMP3-ACT1-T9).

Implementation Method:

Priority support

Requested manpower/skills:

Experts in plasma position/shape and MHD feedback control and in modelling of whole plasma evolution are requested (0.2 ppy).

Existing Commitments:

Continued task from 2011 where 0.1ppy were allocated.

Code Camps or other coordinated efforts (preliminary)

Type of effort	**Start date**	**Length (in weeks)**	**Expected outcome/relation to deliverable(s)**
WS+Code camp	July	**1**	Mid-term assessment of control activities status and roadmap evaluation. Stimulate contributions from WG and control experts.

External connections / requirements

Evident synergies with EFDA Feedback Control WG and MHD-TG to integrate new control schemas and thus enrich the ITM-TF tool set that will be in use in Associations. Assistance from control experts in supporting the control dedicated ITM-TF tasks is essential.

WP12-ITM-EDRG-ACT3

Synthetic diagnostics integration

Description

Synthetic diagnostics play a crucial role in the validation of tokamak modelling codes. The ITM has identified both a 3D synthetic reflectometer suite and other general efforts building on forward modelling. There are therefore two activity lines

I – Forward modelling integration

1. Integration and validation on the ITM platform of synthetic diagnostics based on the forward modelling concept that are appropriate for physics code validation (present effort focus on neutron cameras, NPA and MSE).

II – Synthetic 3D reflectometer (within ERCC)

1. Deployment of working erc3d v1.1 code with basic features on Gforge.

2. Verification and validation of erc3d v1.1 code.

3. Development of (fully integrated) time-frame parellelized code version.

4. Development of spatial-region parallelized kernel module using ITM hardware configurations.

5. Integration of ITM turbulence CPO input with density field.

6. Implementation of mixed-scheme EM propagation.

7. Implementation of generalized antenna CPO input.

8. Continuing 2D benchmarking and cross benchmarking to 3D code.

Implementation Method:

Priority and Baseline support

Requested manpower/skills:

- **Expert modellers of diagnostics to integrate synthetic diagnostic (2pm per diagnostic). A minimal of 0.45ppy of Priority support is foreseen.**
- **The 3D full-wave reflectometry simulation code requires microwave reflectometry modellers and computer scientists specialized in parallel programming (1.4 ppy) but the task can be split up between different individuals to cover the necessary areas of expertise and deliverables. Priority support amounting to 0.5 ppy will be allocated to sub-activities 1,2 and 5.**
- **Participation at Working Sessions dedicated to synthetic diagnostics and/or edge/turbulence is mandatory.**

Existing Commitments:

0.2ppy for synthetic MSE requirement analysis. 0.35 for NPA and 0.33 for the neutron camera.

3D Reflectometer is a continued task from 2011 where 1.3ppy was allocated.

Code Camps or other coordinated efforts (preliminary)

Type of effort	**Start date**	**Length (in weeks)**	**Expected outcome/relation to deliverable(s)**
WS	tbd	**0.5**	Open forum to promote adaptation/integration of synthetic diagnostics from outside the ITM.
Code camp	tbd	**1**	Cross-project outreach on the use of the synthetic diagnostic codes on data from relevant IMPs.

External connections / requirements

Evident synergies should be promoted between the ITM-TF workprogramme implementation and the rest of the EFDA ITER Physics Workprogramme implementation for 2012-2013 regarding the synthetic diagnostics integration.

JET related activities

The EDRG group has direct interfacing with all fusion experiments involved in the ITM-TF effort, assisted by a task assigned to Contact Persons. Considering the level of maturity reached by a significant number of physics modules, on some cases in TF wide efforts, a special emphasis on high-quality validated experimental plasma profile data of representative scenarios ("testbed" shot database) is given in 2012.

Resources

The Implementation of the EDRG work programme for 2012 is estimated to require a minimum of 1. Ppy under Baseline support and 1.7 Ppy under Priority Support in order to be able to provide a minimum level of project fulfilment of the deliverables and milestones.

2.4 Scientific and Technical Reports

Milestones and Deliverables

Milestones:

Consolidation of the machine descriptions, data mappings and experimental data from the tokamak devices involved in the ITM-TF modelling activities, including ITER. Extend usage of the 3D visualization/defeaturing tool for tokamak wall surface to other devices. Integration of forward model synthetic diagnostics and further testing of the 3D synthetic reflectometer package.

Deliverables:

Specified at the activity level

Activity	*Priority Support Deliverables*	*Due Date*
WP12-ITM-EDRG-ACT1	• MD maintenance. Provide validated MD file for current and future ITM datastructure versions • DM maintenance. Provide validated DM file for current version and future ITM datastructure versions • DM for testbed data. Provide DM files for best fit data of plasma profiles to be used in test bed shot selection. • V&V roadmap. Report on V&V activities roadmap and support staff allocation. • Defeatured meshes. Defeatured first wall meshes of pending type for particular device.	31. Dec 2012
WP12-ITM-EDRG-ACT2	• Preliminary Progress Report on overall IMP activities + external connection + WS/code camp. • Final report on control activities • Implementation of Control elements on particular ITM workflows.	31. Dec 2012
WP12-ITM-EDRG-ACT3	Forward modelling integration: • Integration and validation of synthetic diagnostic modules, driven by IMP needs, in the ITM platform. Synthetic 3D reflectometer (within ERCC): • erc3d v1.1. deployment and testing • V&V of erc3d v1.1 • Time-frame code parallelization • Spatial parallelization withITM configuration • Turbulence integration with density field • Mixed-scheme EM propagation • Revision of generalized antenna CPO • 2D benchmarking and cross-benchmarking to 3D code.	31. Dec 2012

3. IMP12:

Task Agreement WP12-ITM-IMP12:

MHD equilibrium, stability and disruptions

3.1 Introduction

The IMP12 project aims at providing a comprehensive ITER relevant modelling capability covering essential areas in an MHD simulation chain starting from equilibrium reconstruction and advancing towards linear and non-linear MHD stability and plasma disruptions. The provision of free boundary equilibrium modules with added feedback control schemes is also targeted in view of the coupling to the ETS and application to further development for VDE/disruption capability, paving the path to a robust discharge simulator.

In 2012 the emphasis will be on

1. Workflow Integration and Maintenance of mature codes. Such effort clearly aims at assisting the cross-project interoperability involving IMP12 codes and leading up to devising jointly high level workflows. Both physics basis and workflow integration documentation is mandatory to pave the way to a future public release of the modules.

2. Development and Integration of standalone modules. This activity accommodates all IMP12 relevant modules that are entering the adaptation/integration stage and encompasses among others, 3D equilibrium codes, equilibrium solvers with plasma flow, RWMs, ELMs, error field modes, "ab initio" MHD codes (2D or 3D).

3. Verification & Validation, targeting certain "mature" codes, already at the integration stage, employing Kepler workflows, e.g. equilibrium.

Note the action WP11-ITM-IMP12-ACT4 of the 2011 work program, exploitation of mature workflows (equilibrium reconstruction and MHD stability chain) is now under ISM.

3.2 Objectives

To provide the ITM-TF with a comprehensive set of equilibrium, linear and non-linear MHD stability modelling tools and provision the fundamentals for a consistent free boundary equilibrium evolution, a backbone for a full discharge simulator, including plasma transport, feedback control and plasma disruption modelling and prediction.

3.3 Work Description and Breakdown

Structure

Continuity – Activity relations

The connection between 2011 tasks and those planned for 2012 are given in the following table.

2011 Task	Status in 2012
WP11-ITM-IMP12-ACT1: Integration, support and maintenance	WP12-ITM-IMP12-ACT1 Integration of equilibrium and MHD modules into ITM Workflows and Maintenance of IMP12 codes
WP11-ITM-IMP12-ACT2: Adaptation of IMP12 modules and standalone packages	WP12-ITM-IMP12-ACT2 Development and integration of standalone MHD modules and codes
WP11-ITM-IMP12-ACT3: Verification and validation of IMP12 codes	WP12-ITM-IMP12-ACT3 Verification and Validation
WP11-ITM-IMP12-ACT4: Exploitation of mature workflows: from equilibrium reconstruction to MHD stability analysis.	Will continue under WP11-ITM-ISM-ACT1

Work Breakdown

WP12-ITM-IMP12-ACT1

Integration of equilibrium and MHD modules into ITM Workflows and Maintenance of IMP12 codes

Description

The following tasks are regrouped under this activity, which is covered by Priority Support :

T1: Equilibrium and MHD stability chain

Scope of this task is to extend the equilibrium and stability chain to incorporate the physics of resistive wall modes, including elements of the 3D tokamak wall.

The specific task is to add to the chain the necessary functionalities to enable stability studies of advanced tokamak scenarios at high beta in presence of a resistive wall. The development of specific workflows allowing carrying out parametric studies will be highly desirable.

T2: Integration of MHD modules with the European Transport Solver

Scope of this task is to provide and maintain composite actors and interfacing workflows for the MHD modules already integrated with the ETS workflows, in particular for the sawteeth and NTM modules. The contributor(s) to this task shall liaise to IMP3-ACT1 to cooperate in the construction of demonstrative workflows able to simulate a plasma subject to NTMs and sawteeth and the effect of these MHD phenomena on transport.

T3: Integration of free boundary equilibrium codes with the European Transport Solver

This task is a continuation of 2011 ongoing work to produce, jointly with the contributors of IMP3-ACT1, a prototype workflow coupling ETS with at least one free boundary equilibrium code. Coordination of this task is done by the IMP3 leadership.. The contributor(s) to this

task shall provide expertise and manpower to adapt as necessary the existing free boundary equilibrium code(s) to achieve the above goal.

T4: Coupling of free boundary equilibrium codes with a feedback controller

The scope of this task is to develop a workflow coupling a free boundary equilibrium code with a plasma shape and position controller. The workflow should be able to simulate dynamic situations, like VDEs, where the actual equilibrium is lost. The contributor(s) to this task shall provide expertise and manpower to adapt as necessary the existing free boundary equilibrium code(s) and to integrate the basic control algorithms to achieve the above goal. TF wide coordination of control activities is done under EDRG-ACT2.

T5: MHD control workflow

The scope of this task is to develop a prototype workflow exhibiting feedback control of MHD modes, namely on NTMs and/or RWMs. Contributors to this task shall provide expertise and manpower in the above MHD phenomena to develop control schemes (using native Kepler actors/tools or dedicated schemes designed in Simulink in collaboration with EDRG-ACT2) of NTMs and RWMs based, respectively, on H&CD (in collaboration with IMP5-ACT2-T3) and external coils. TF wide coordination of control activities is done under EDRG-ACT2.

T6: Maintenance of codes belonging to the above workflows

This task covers maintenance work for existing IMP12 modules/actors requiring adaptation to the evolving ITM TF infrastructure

Implementation Method:

Priority and Baseline support

Requested manpower/skills:

- **Tasks T1-T6 will be covered by Priority Support with total indicative manpower of 2.5 ppy.**

Existing Commitments:
This is a continuation of the activity from 2011 and all who participated in 2011 are encouraged to reapply.

Code Camps or other coordinated efforts (preliminary)

Type of effort	**Start date**	**Length (in weeks)**	**Expected outcome/relation to deliverable(s)**
Code Camp	Mar	**2**	Development of new workflows and the incorporation of

			new modules
Code Camp	July	**2**	Development of new workflows and the incorporation of new modules
Code Camp	Dec	**2**	Development of new workflows and the incorporation of new modules

External connections / requirements

JET experimental data as identified by the validation task might be required.

WP12-ITM-IMP12-ACT2

Development and integration of standalone MHD modules and codes

Description

This activity concerns the adaptation of all the IMP12 codes, modules or packages still at a development stage up to the level of tested Kepler actor. In some cases, it involves continuation of WP11 work. It may include newly proposed work matching the TF remit.

This activity is under baseline support. That level obtained, the IMP12 codes will be eligible for Priority Support under IMP12-ACT1.

Examples of qualifying codes

- **Conventional equilibrium and MHD stability codes of interest to IMP12 and not yet integrated in the ITM platform.**
- **3D equilibrium codes.**
- **Equilibrium solvers with plasma flow.**
- **Modules for MHD processes RWMs, ELMs, error field modes, etc.**
- **“Ab initio” MHD codes (2D or 3D).**

The work breakdown in this activity foresees :

1. **Adaptation and integration of new codes in the above areas to the ITM infrastructure, porting on the Gateway and Gforge SVN, creation of a Kepler actor.**
2. **Adaptation of codes under development in the Associations during 2011 already ported to the Gateway, up to the stage of a tested Kepler actor.**

Code documentation should be generated in a quality compatible to a public release and the test procedures and test cases should be standardised.

Implementation Method:

Baseline support

Requested manpower/skills:

- **All these tasks are under Baseline Support with total manpower required of 2 ppy.**

Existing Commitments:
This is a continuation of the activity from 2011 and all who participated in 2011 are encouraged to reapply.

Code Camps or other coordinated efforts (preliminary)

Type of effort	Start date	Length (in weeks)	Expected outcome/relation to deliverable(s)
Code Camp	Mar	**1**	Training

External connections / requirements

JET experimental data as identified by the validation task might be required.

WP12-ITM-IMP12-ACT3

Verification and Validation
Description

Verification and validation (V&V) is an essential part of the ITM TF code release cycle. The scope of this activity is to carry out validation of IMP12 codes on the ITM platform, employing Kepler workflows. This is a cross-project activity targeting code developers as well as experimentalists to cooperate in the validation work.

The Task Force seeks commitments from the Associations to cover as a minimum the following tasks.

T1: Continued validation of the EQUAL equilibrium reconstruction code on JET data.

T2: Continued validation of the EQUAL equilibrium reconstruction code on Tore Supra data.

T3: Verification of equilibrium and MHD stability codes

Scope of this task is the verification of the ITM TF equilibrium and MHD stability codes by code-code comparison within the equilibrium and stability chain and assessment of code inter-operability. The specific task is to verify that the chain gives equivalent results upon swapping equilibrium codes (i.e.HELENA and CHEASE) and stability codes (i.e. ILSA and MARS) (collaboration/support to IMP5-ACT1 is envisaged regarding MARS benchmarking).

Upon reviewing the response to this Call for Participation, additional tasks may be included in this activity.

Implementation Method:

Priority support

Requested manpower/skills:

- **Tasks T1 and T2 will be covered by Priority Support with indicative manpower of 0.2 ppy per each task; Task T3 will be covered by Priority Support with indicative manpower of 0.5 ppy.**

  Participation to coordinated activities is encouraged.

Existing Commitments:
This is a continuation of the activity from 2011 and all who participated in 2011 are encouraged to reapply.

External connections / requirements

JET experimental data as identified by the validation task might be required.

JET related activities

Resources

The Implementation of the IMP12 work programme for 2012 is estimated to require a minimum of 3 Ppy under Baseline support and 3.4 Ppy under Priority Support in order to be able to provide a minimum level of project fulfilment of the deliverables and milestones.

3.4 Scientific and Technical Reports

Milestones and Deliverables

Milestones:

Deliverables:

Defined at activity level

Activity	*Priority Support Deliverables*	*Due Date*
WP12-ITM-IMP12-ACT1	• T1 Equilibrium and MHD stability chain. Upgrade of the chain to	31. Dec 2012

	incorporate resistive wall mode physics with elements of a 3D wall. • T2 Integration of MHD modules with ETS. Provision of functioning actor to IMP3 and short report. • T3 Integration of a free boundary equilibrium code with ETS. Provision of functioning actor to IMP3 and short report. • T4 Coupling of free boundary equilibrium codes with a feedback controller. Provision of functioning actor to IMP3 and short report. • T5 MHD control workflow. Release of the workflow and report on the workflow • T6 Maintenance. Report on maintenance work carried out during the year (one brief report per participating code)	
WP12-ITM-IMP12-ACT2	• Code adaptation up to creation of a Kepler actor • Kepler actor and test workflow • Code documentation for developers and maintainers, and User documentation	31. Dec 2012
WP12-ITM-IMP12-ACT3	• validation of EQUAL codeon JET data. Report on validation conforming to the ITM validation procedure • validation of EQUAL codeon Tore Supra. Report on validation conforming to the ITM validation procedure. • Benchmarking of HELENA vs CHEASE within the MHD equilibrium and stability chain. Report on the benchmarking exercise • Benchmarking of ILSA vs MARS within the MHD equilibrium and stability chain. Report on the benchmarking exercise	31. Dec 2012

4. IMP3:

Task Agreement WP12-ITM-IMP3:

Transport Code and Discharge Evolution

4.1 Introduction

Integrated Modelling Project #3 on "Transport Code and Discharge Evolution" plays a central role in the Integrated Tokamak Modelling Task Force (ITM-TF): virtually all the other modelling projects will need information on the plasma state (densities, temperatures etc.) simulated by IMP3 modules; at the same time the calculation of these quantities is strongly dependent on input from IMP12 (equilibrium), IMP4 (transport coefficients) and IMP5 (sources).

In 2012 the emphasis will be on consolidating the achievements of 2011 (workflows including heating and current drive sources, modules providing transport coefficients) and extending the work to include

- **ETS coupled to free boundary equilibrium codes, and**
- **ETS coupled to edge codes.**

The continuing implementation of edge codes and the development of workflows using edge codes is planned.

Verification and Validation (V&V) of all components will also be an important part of the programme.

4.2 Objectives

The purpose is

- **To release a version of the ETS workflow incorporating a range of physics modules (fixed and free boundary equilibrium codes; NTMs; impurities; neutrals; various modules for calculating transport coefficients including direct coupling to turbulence codes; various heating and current drive modules including ECRH, ICRH and NBI)**
- **To develop workflows allowing for core-edge coupling, as well as a number of edge only workflows**

4.3 Work Description and Breakdown

Structure

Tasks from 2011 will be continued in 2012

Work Breakdown

WP12-ITM-IMP3-ACT1

Maintenance, continuing development, verification and validation of the ETS and other core components

Description

The following tasks are grouped under this activity, which is covered by Priority Support:

T1. Maintenance support for the ETS including the addition of new modules within the Kepler workflows [many of the new modules will come from other IMPs]

T2. Release of a number of standard Kepler workflows, including (but not limited to) workflows incorporating pellets, neutrals, impurities, heating and current drive modules, sawteeth, NTMs [in collaboration with other IMPs]

T3. A free boundary version of the ETS [in strong collaboration with IMP12-ACT1-T3]

T4. Verification of the ETS [in collaboration with ISM-ACT1]

T5. Validation of the ETS [in collaboration with ISM-ACT1 and other IMPs]

T6. Adaptation and maintenance of 0D codes in accordance with ITM module release cycle [in collaboration with ISM-ACT3-T6]

T7. Preparation of one or more interpretive runs of the ETS where experimental data is imported to CPOs; the ITM profile maker is used to generate the "coreprof" CPO; either the IMP12 equilibrium chain is used to prepare the equilibrium or it is read from the experiment; IMP5 heating and current drive modules are used if necessary to calculate the sources; and the ETS is used to calculate the transport coefficients.

T8. A version of the ETS workflow coupled with turbulence code [in strong collaboration with IMP4-ACT2]

T9. A Kepler workflow that, in addition to having a model for the plasma, makes provision for actuators and signals derived from synthetic diagnostics. This would then form the basis of future work involving the emulation of plasma control systems. [in collaboration with EDRG-ACT2]

Implementation Method:

Priority support

Requested manpower/skills:

- **All tasks will be covered by Priority Support with indicative total manpower of 4 ppy**

Existing Commitments:
This is a continuation of the activity from 2011 and all who participated in 2011 are encouraged to reapply.

Code Camps or other coordinated efforts (preliminary)

Type of effort	Start date	Length (in weeks)	Expected outcome/relation to deliverable(s)
Code Camp	Mar	**2**	Development of new workflows and the incorporation of new modules; ETS V&V ; edge-core workflows
Code Camp	July	**2**	Development of new workflows and the incorporation of new modules; ETS V&V ; edge-core workflows
Code Camp	Dec	**2**	Development of new workflows and the incorporation of new modules; ETS V&V ; edge-core workflows

External connections / requirements

JET experimental data as identified by the validation task might be required.

WP12-ITM-IMP3-ACT2

Implementation, integration, verification and validation of edge codes
Description

In light of the limited progress in the task area in 2011, many of the activities are continuations:

- **T1. Conversion of SOLPS-CARRE into a standalone ITM code with input and output to CPOs and XML for code specific parameters [0.25 ppy, PS]**
- **T2. Conversion of SOLPS-B2-b2mn into a Kepler module using XML for all code specific parameters, the AMNS routines for all A&S data, and the plasma state input and output via CPOs [0.5 ppy, PS]**
- **T3. Conversion of either EIRENE or SOLPS-EIRENE (or equivalent kinetic code) into a Kepler module using XML for all code specific parameters, the AMNS routines for all AM&S data, and the plasma/neutrals input and output via CPOs capable of being used for both the core and edge [0.5 ppy, PS]**
- **T4. Further development of edge-core coupled workflow(s) including verification and the start of validation [0.5 ppy, PS]**
- **T5. Implementation and release (including verification and validation) of a number of edge codes using CPOs (Phase V of "ITM modules release cycle") [~ 3 pm/code, BS]**

- **T6. Definition, implementation, verification and the start of validation of a number of edge only workflows using the edge codes [0.25 ppy, PS]**
- **T7. Further development of the Generalised Grid Description [0.25 ppy, PS]**

Implementation Method:

Priority and Baseline support

Requested manpower/skils:

People with expertise in edge codes, and in particular, authors of edge codes, are required for this task. People with an interest in the task with physics and/or computational expertise are also sought.

- **Indicative totals of staffing are given in the description of work**
- **A minimum commitment of 2.25 ppy of PS is anticipated**

Existing Commitments:
This is a continuation of the activity from 2011 and all who participated in 2011 are encouraged to reapply.

Code Camps or other coordinated efforts (preliminary)

Type of effort	**Start date**	**Length (in weeks)**	**Expected outcome/relation to deliverable(s)**
Code Camp	May	**2**	Edge code implementation; Core-edge coupling; edge code workfkows; edge code V&V
Code Camp	October	**2**	Edge code implementation; Core-edge coupling; edge code workfkows; edge code V&V

External connections / requirements

JET experimental data as identified by the validation task might be required. Coordination with EFDA-TF-PWI, ITPA-DIVSOL, ITER

JET related activities

Resources

The Implementation of the IMP3 work programme for 2012 is estimated to require a minimum of 1 Ppy under Baseline Support and 6.25 Ppy under Priority Support in order to be able to provide a minimum level of project fulfillment of the deliverables and milestones.

4.4 Scientific and Technical Reports

Milestones and Deliverables

Milestones:

Deliverables:

Activity	*Priority Support Deliverables*	*Due Date*
WP12-ITM-IMP3-ACT1	• T1. ETS Maintenance, Report on changes to ETS solver • T2. Release of Kepler workflows and report on workflows • T3. Free Boundary ETS, release as a workflow • T4. Verification reports • T5. Validation reports • T6. Functioning 0D codes with documentation integrated into the ITM Kepler environment and using the UAL • T7. Preparation of one or more interpretive runs using the ETS and other ITM tools. • T8. Release of workflows coupling the ETS to turbulence codes; report on the efforts. • T9. Release of workflows coupling the ETS to a basic Plant design with embedded control elements; report on the efforts.	31. Dec 2012
WP12-ITM-IMP3-ACT2	• T1. Conversion of SOLPS-CARRE into a standalone ITM code with input and output to CPOs and XML for code specific parameters • T2. Conversion of SOLPS-B2-b2mn into a Kepler module using XML for all code specific parameters, the AMNS routines for all A&S data, and the plasma state input and output via CPOs • T3. Conversion of either EIRENE or SOLPS-EIRENE (or equivalent code) into a Kepler module using XML for all code specific parameters, the AMNS routines for all AM&S data, and the plasma/neutrals input and output via CPOs capable of being used for both the core and edge • T4. Further development of edge-core coupled workflow(s) including verification and the start of validation • T5. Report on the implementation of the edge codes • T5. Report on the verification of the edge codes • T5. Report on the validation of the edge codes • T6. Release and Documentation of the implementation, testing, verification of workflows using multiple edge codes • T7. Report on the development of the Generalised Grid Description documenting enhancements	31. Dec 2012

5. IMP4:

Task Agreement WP12-ITM-IMP4:

Transport Processes and Micro stability

5.1 Introduction

Integrated Modelling Project 4 maintains responsibility for turbulence codes as well as modules for neoclassical and diffusivity-based transport models, linear instability codes, and computational fluctuation diagnostics within the Integrated Tokamak Modelling Task Force (ITM-TF).

In 2012 the emphasis will be on HPC (high performance computing) workflows, by which demanding, large-scale parallel computations can serve as elements in ITM workflows for modelling and validation exercises, moving toward comprehensive simulation of ITER-scale plasmas. Work on the HPC-FF platform will continue but we also aim to be ready for work on the IFERC platform as soon as it is available. Workflows with kinetic turbulence codes will require these resources.

We will continue with benchmarking efforts, both with new codes on the existing cases and with new and existing codes on new cases, specifically including a standard case with smooth edge-to-core profiles aiming to test electromagnetic codes with ion temperature gradient physics. Validation efforts using experimental/synthetic fluctuation diagnostics are expected to advance in tandem with availability of experimental fluctuation data (these are distinct from computational fluctuation diagnostics which are used to mathematically diagnose the codes).

5.2 Objectives

The purpose is as indicated above: development of necessary tools to enable modelling of ITER through first-principles based simulations. The workflows should be able to incorporate massively parallel turbulence codes along with simpler models as modules, in communication with a similar array of modules from the other projects. Standards-keeping is an integral part of this, to be implemented in the form of ongoing benchmarking.

5.3 Work Description and Breakdown

Structure

Continuity – Activity relations

The connection between 2011 tasks and those planned for 2012 are given in the following table.

2011 Task	Status in 2012

WP11-ITM-IMP4-ACT1 Cross verification of IMP4 turbulence codes on specified standard cases	WP12-ITM-IMP4-ACT1 Cross verification of IMP4 turbulence codes on specified standard cases
WP11-ITM-IMP4-ACT2 Kepler workflows and interfacing with HPC-FF	WP12-ITM-IMP4-ACT2 Kepler workflows and interfacing with HPC-FF and IFERC
WP11-ITM-IMP4-ACT3 Cross verification of linear and neoclassical codes on specified standard cases	WP12-ITM-IMP4-ACT3 Cross verification of linear and neoclassical codes on specified standard cases
WP11-ITM-IMP4-ACT4 Maintenance and standards-keeping of commonly used transport model modules	WP12-ITM-IMP4-ACT4 Maintenance and standards-keeping of commonly used transport model modules

Work Breakdown

WP12-ITM-IMP4-ACT1

Cross verification of IMP4 turbulence codes on specified standard cases
Description

This task is a continuation of WP11-ITM-IMP4-ACT1, within which the code developers involved in the cross-verification activity adapted their codes to ITM standards and ran the specified case (IMP4 shot 1) on HPC-FF in 2011. The obtained data should now undergo analysis and comparison and it is expected that the involved code developers participate in this activity (baseline support). In addition, a separate standard case appropriate to edge-to-core studies has been created (IMP4 shot 2), and codes expected to be used in edge studies should benchmark on this as well.

Fluid and kinetic simulations of standard ITER scenarios are also foreseen in 2012, as soon as the necessary input is provided via ISM (this will be created as IMP4 shot 3).

Priority support is foreseen for analysis and report generation.

This will be the main topic of the working session in May.

Implementation Method:

Priority and Baseline support

Requested manpower/skills:

Participants are expected to be code authors who individually maintain the Kepler actor version of their codes in addition to fulfilling the benchmarks

- **0.1-0.2 ppy per code developer (BS) and 1.0 ppy in total.**
- **0.2 ppy (PS) for organizing analysis including report generation**

Existing Commitments:
This is a continuation of the activity from 2011 and all who participated in 2011 are encouraged to reapply.

Code Camps or other coordinated efforts (preliminary)

Type of effort	**Start date**	**Length (in weeks)**	**Expected outcome/relation to deliverable(s)**
Code Camp	Mar	**2**	Workflow development and incorporation of new modules
Working session	May	**2**	Analysis of cross-verification data and report on outcome/ Internal component of work related to workflows

External connections / requirements

The description from ITER of a standard case mediated via ISM

WP12-ITM-IMP4-ACT2

Kepler workflows and interfacing with HPC-FF and IFERC
Description

From the start of 2012 it is expected that all IMP4 codes exist as Kepler actors and can run the IMP4 test workflow and have thus reached phase III (K) in ITM code status. The aim of this task is to evolve the individual codes at least one phase forward.

1. The workflow reads experimental data from the ITM database (requires profile/equilibrium data) and the actor extracts plasma parameters and geometry from the CPOs (IMP4 author prepares the code).

2. The actor submits the code to HPC-FF (later IFERC) via HPC2K and the results are collected on the Gateway in form of an HDF5 file containing the turbulence CPO and the coretransp CPO returned via Kepler (in cooperation with ISIP for the HPC2K development).

3. SOL-capable codes are validated against experimental Langmuir probe data (data from JET, ASDEX, or COMPASS, in cooperation with EDRG, and EFDA Physics actions concerning edge physics). This task is a continuation of 2011 Task. We are keen to obtain experimental profile/equilibrium data from any experiment and to obtain standard cases with the imprimatur of ITER IO/F4E.

Subtasks 2-3 are covered under Priority Support.

We expect that all IMP4 codes will evolve into level 1 and some codes will reach level 2.

During the Code Camps codes new in IMP4 will be given priority to catch up.

Implementation Method:

Priority and Baseline support

Requested manpower/skills:

minimum commitment required 1-2 Ppm (BS) for each code/author
Level 2-3 requires a 0.5 ppy under Priority Support (PS)
Participation in at least one of the two code camps is mandatory for PS.
HPC/MPP capability needed

Existing Commitments:
This is a continuation of the activity from 2011 and all who participated in 2011 are encouraged to reapply.

Code Camps or other coordinated efforts (preliminary)

Type of effort	**Start date**	**Length (in weeks)**	**Expected outcome/relation to deliverable(s)**
Code Camp	Mar	**2**	Development of new workflows and the incorporation of new modules
Code Camp	Oct	**2**	Integration with ITM-wide workflows with HPC-FF/IFERC in a major role

External connections / requirements

JET experimental data. Task 3 benefits from a collaboration with the EFDA Physics WP 2012-2013 where a proposal was submitted in A6.1.3

Close relation with HPC-FF/ Gateway interoperability working group

HLST grid computing, parallel I/O, and library expertise

WP12-ITM-IMP4-ACT3

Cross verification of linear and neoclassical codes on specified standard cases

Description

This activity is specific to neoclassical and linear codes, distinct from versions of turbulence codes. Authors of neoclassical codes who are also neoclassical theory experts are especially encouraged to apply. Linear codes will have to be able to translate their results into the coretransp CPO elements (flux/diff/vconv) for each transport channel (especially including the subdominant ones).

The work consists of establishment/maintenance of a Kepler actor version of the given code. Demonstration of performance on the benchmark case under Kepler is sufficient to enable use of the actor in ITM-wide workflows.

Developers responsible of codes used within ISM 2012 benchmark effort (ie. NCLASS and QualiKiZ) are especially encouraged to apply to IMP4-ACT3.

The activity is not limited to the benchmark and participants are encouraged to interact with ACT2.

Implementation Method:

Priority and Baseline support

Requested manpower/skills:

- **minimum 1 Ppm (BS) for each code/author**
- **Priority Support (PS) will be attributed for the participation of developers responsible for the codes used under ISM-ACT1-2 Participation in at least one of the two code camps is mandatory for PS**

Existing Commitments:
This is a recall of the same activity in WP2011

Code Camps or other coordinated efforts (preliminary)

Type of effort	**Start date**	**Length (in weeks)**	**Expected outcome/relation to deliverable(s)**
Code Camp	Mar	**2**	Development of new workflows and the incorporation of new modules
Code Camp	Oct	**2**	Integration with ITM-wide workflows
Working session	May	**2**	Analysis of cross-verification data and report on outcome/

			Internal component of work related to workflows

WP12-ITM-IMP4-ACT4

Maintenance and standards-keeping of commonly used transport model modules
Description

IMP4 is also charged with the maintenance of transport models which can be used in 1-D or 2-D/axisymmetric transport modelling (IMP3 codes and ITM-wide workflows). Several modules exist under the MODTRANSP Gforge project on the ITM-portal. We wish to have all of these "small modules" currently in use by ITM or ISM (and ITER in general) maintained under this activity. ITM standards of interoperability and V&V are required.

1. **Each module has to be incorporated into ITM as a subroutine taking CPOs as inputs and yielding the coretransp as output as in the case of other ITM codes.**
2. **Each module should be benchmarked against other IMP4 codes under IMP4-ACT1. The status of this is to be reported by any use of the module.**

Implementation Method:

Priority support

Requested manpower/skills:

1 ppm by each of two people familiar with the models

Code Camps or other coordinated efforts (preliminary)

Type of effort	**Start date**	**Length (in weeks)**	**Expected outcome/relation to deliverable(s)**
Code Camp	Mar	**2**	Development of new workflows and the incorporation of new modules
Code Camp	Oct	**2**	Integration with ITM-wide workflows
Code Camp	Dec	**2**	Integration with ITM-wide workflows

External connections / requirements

ITER (vetting of certain modules)

JET related activities

Resources

The implementation of the IMP4 work program for 2012 is estimated to require 3 Ppy under Baseline support and 1 Ppy under Priority Support in order to be able to provide a minimum level of project fulfillment of the deliverables and milestones.

5.4 Scientific and Technical Reports

Milestones and Deliverables

Milestones:

Deliverables:

Activity	*Priority Support Deliverables*	*Due Date*
WP12-ITM-IMP4-ACT1	Kepler actors capable of running the IMP4 cases on HPC-FF under HPC2K and ETS looping workflows	31. Dec 2012
WP12-ITM-IMP4-ACT2	• Kepler workflow for IMP4 code in phase IV • HPC2K actors working in looping workflows • A Kepler workflow comparing data from an IMP4 turbulence code and experimental Langmuir probe data	31. Dec 2012
WP12-ITM-IMP4-ACT3	• NCLASS (Actor, documentation of mode) • NEOART (Actor, documentation of mode) • Linear codes (Actor, documentation of mode)	31. Dec 2012
WP12-ITM-IMP4-ACT4	Actors, documentation of models	31. Dec 2012

6. IMP5:

Task Agreement WP12-ITM-IMP5:

Heating, Current Drive and Fast Particle Physics

6.1 Introduction

The aim of the Integrated Modelling Project #5 on "Heating, Current Drive and Fast Particle Physics" is to integrate codes simulating heating, current drive and fast particle effects into ITM. The areas to be covered include, ECRH, ICRH, NBI, LH, alpha particles and fast particle interaction with instabilities. The ultimate goal is to enable self-consistent simulation of heating and current drive in the presence of fast particle instabilities.

Following the same guidelines for this project as in previous years, we aim to incorporate both basic and advanced physics modules, thus providing both the capability to perform rough fast computations, as well as more detailed, but more expensive computations. The latter could e.g. include detailed computations of the distribution functions of electrons and ions during heating and current drive, ultimately incorporating non-linear effects of instabilities and their redistribution fast ions.

To this goal, the work in adaptation and integration to ITM of Heating and Current Drive modules has advanced further in 2011. The most significant progress of the project in 2011 consisted in providing an IMP5HCD composite actor that merges all heating schemes, and allows a compact and unique approach on how to couple an IMP5 Kepler actor in a generic ITM workflow. This effort will be continued in 2012 with the ambitious goal to have many representative Heating and Current Drive modules integrated in the ETS at the basic level as well as a few ones at a more sophisticated and advanced level.

In 2012 and onwards the completion of the adaptation, integration and assembly of dedicated workflows and V&V for all major codes in IMP5 is foreseen to continue. A stronger effort on integration activities in cross-project workflows is therefore due. The action plan for 2012 will focus on the following activities:

1. **Generation of Kepler actors, testing and benchmarking of H&CD and Fast Particles codes. Such effort clearly aims at provisioning the ITM with an even more significant set of codes in this field. The benchmark exercise will be performed within Kepler workflows, ensuring that codes addressing the same physics are using the same inputs and providing similar outputs within the same framework.**
2. **IMP5 Actor coupling to the ETS. This activity, supported by contributors from modules already Keplerized and foreseen ones, paves the way towards integrated modelling of H&CD plasma discharges under the ITM-TF platform. This activity will include also the development of dedicated workflows for strongly coupled modules, as e.g. wave solvers & Fokker-Planck solvers.**
3. **Self-consistent coupling of IMP5 codes and synergies effect. Implementation of models describing synergetic and self-consistent physics processes into H&CD codes will allow to describe more complex and realistic situations occurring in experiments dealing**

with more than one heating methods and address case of deviations from Maxwellian equilibrium.

4. **Code development of fast particle codes. This activity includes the development of various fast particle codes. In particular, the activity, already performed in previous years will continue in order to integrate these codes in the ITM for a realistic plasma operation scenario and investigate the nonlinear dynamics problems associated with fast ion transport and losses. Moreover, tools to calculate various local nuclear reactions and modelling fast particle redistribution during sawtooth events will be further developed.**

6.2 Objectives

The project will provide Kepler actors and test bench workflows covering the needs within the ETS for different source terms relating to heating and current drive. This includes codes dealing with Neutral Beam Injection, alpha particle, ICRF heating, LH current drive and EC heating and current drive. These modules should be documented and verified, and the validation process should be started.

6.3 Work Description and Breakdown

Structure

Continuity – Activity relations

The connection between 2011 tasks and those planned for 2012 are given in the following table.

2011 Task	**Status in 2012**
WP11-ITM-IMP5-ACT1 Adaptation of codes for codes for Heating, Current Drive and Fast Particle Physics for use with ITM tools	WP12-ITM-IMP5-ACT1 Creation, testing and benchmarking of Kepler Actors from Heating, Current Drive and Fast Particle Physics codes for use in ITM workflows.
WP11-ITM-IMP5-ACT2 Integration of IMP5 modules with the European transport Solver ETS	WP12-ITM-IMP5-ACT2 Integration of IMP5 modules in ITM workflows
WP11-ITM-IMP5-ACT3 Benchmarking and validation of codes	Merged in WP12-ITM-IMP5-ACT1
WP11-ITM-IMP5-ACT4 Development and integration of models for synergies between heating schemes and self-consistent coupling of IMP5 heating codes	WP12-ITM-IMP5-ACT3 Development and integration of models for synergies between heating schemes and self-consistent coupling of IMP5 heating codes
WP11-ITM-IMP5-ACT5 Code development and datastructure evaluation for global stability analyses of Alfvén Modes in realistic	Merged in WP12-ITM-IMP5-ACT4 Fast particle codes

geometries and in the presence of nonperturbative fast ion excitations	
WP11-ITM-IMP5-ACT6 Development/Porting of codes that calculate various local nuclear reaction rates	Merged in WP12-ITM-IMP5-ACT4 Fast particle codes

Work Breakdown

WP12-ITM-IMP5-ACT1

Creation, testing and benchmarking of Kepler Actors from Heating, Current Drive and Fast Particle Physics codes for use in ITM workflows.

Description

This activity concerns codes in the in the following areas:

- **NBI source codes**
- **Codes for source from nuclear reactions**
- **ICRF wave deposition codes**
- **LH and EC ray/beam tracing codes**
- **Fokker-Planck codes dealing with fast particles generated by NBI, nuclear reactions, ICRF, LH, EC or a combination of these.**
- **Codes for analysis of fast particle driven instabilities.**
- **Orbit tracing codes**
- **Codes for calculation of various local nuclear reaction rates**
- **Other codes needed for IMP5 as, e.g., antenna codes**
- **Mappers of IMP5 CPOs (e.g. codes for generating test particles from continuous source distribution in the distsource-CPO, or vice versa).**

In 2012 the work breakdown in this activity foresees :

1. **full integration to ITM, and generation of the Kepler actor of existing and under development codes in the above areas. Here the adaptation includes requirements needed for integration under WP12-ITM-IMP5-ACT2. This work will be carried out under either Baseline or Priority Support on the basis of the status of the code.**
2. **testing and benchmarking in ITM workflows of the Kepler actors at point 1. This work will be carried out under Priority Support. In addition, a validation activity will be possibly initiated.**
3. **adapting codes to interface with HPC-FF and IFERC via Kepler. Here the participation from codes capable of treating synergies between different heating schemes is particularly encouraged. This work will be carried out under Priority Support.**

Implementation Method:

Priority and Baseline support

Requested manpower/skills:

- **Subtasks 1, 2 will be covered by either Baseline or Priority Support depending on the status of the code**
- **Subtask 2 and 3 is under Priority Support**

The total manpower allocated for this activity is 2.5 ppy under Priority Support and 3 ppy under Baseline Support.

Existing Commitments:
This is a continuation of the activity from 2011 and all who participated in 2011 are encouraged to reapply.

Code Camps or other coordinated efforts (preliminary)

Type of effort	**Start date**	**Length (in weeks)**	**Expected outcome/relation to deliverable(s)**
Code Camp	Mar	**1**	Kepler actor creation, development of new workflows and incorporation of new modules
Code Camp	July	**1**	Kepler actor creation, development of new workflows and incorporation of new modules
Code Camp	November	**1**	Kepler actor creation, development of new workflows and incorporation of new modules

External connections / requirements

JET experimental data as identified by the validation task might be required, as well as experimental data from other machine

WP12-ITM-IMP5-ACT2

Integration of IMP5 modules in ITM workflows
Description

This activity concerns integration of IMP5 modules in the European Transport Solver (ETS) and in other ITM workflows like, e.g, in control workflows. All the modules listed in WP12-ITM-IMP5-ACT1 are eligible and encouraged to participate in this activity.

The work consists of four subtasks:

1. **Adaptation of Composite Actors for coupling IMP5 codes to the ETS. In addition adaptation to the new release of the data structure**

2. **Development of modules for workflow orchestration in weakly and strongly coupled regimes.**
3. **Adaptation and/or development of the composite actors in subtask 1. for integrated workflows suitable to cross-project integration effort, like, e.g., MHD mode control via H&CD (in collaboration with WP12-ITM-IMP12-ACT1 subtask T5).**
4. **Development IMP5 data structures and tools, e.g. libraries for mapping CPO data between coordinate.**

Implementation Method:

Priority support

Requested manpower/skills:

Code developers able to work in Kepler.

Tasks will be covered by Priority Support with indicative manpower of 1.2 ppy for the whole activity

Existing Commitments:
This is a continuation of the activity from 2011 and all who participated in 2011 are encouraged to reapply.
Many modules in WP11-ITM-IMP5-ACT1 providing sources in the field of ECRH&CD, ICRH, and NBI are now Kepler actors working in 4.09a, and are ready to be integrated in ETS. Involved contributors are invited to apply.

Code Camps or other coordinated efforts (preliminary)

Type of effort	Start date	Length (in weeks)	Expected outcome/relation to deliverable(s)
Code Camp	Mar	**1**	Coupling/integration of source modules in ETS
Code Camp	July	**1**	Coupling/integration of source modules in ETS
Code Camp	November	**1**	Coupling/integration of source modules in ETS

WP12-ITM-IMP5-ACT3

Development and integration of models for synergies between heating schemes and self-consistent coupling of IMP5 heating codes

Description

This activity is a continuation of WP11-ITM-IMP5-ACT4 and concerns the modeling of physics process involving synergies and self-consistent coupling between IMP5 codes. The main topics are:

1. **Synergies: Fokker-Planck modeling including both sources of beam ions and alpha particle and interactions with ICRF wave fields.**
2. **Synergies: Fokker-Planck modeling including interactions with EC, LH and ICRF wave fields.**
3. **Self-consistent quasilinear coupling of wave and kinetic plasma model by inclusion of a non-Maxwellian in the plasma susceptibility. This includes both the evaluation of the dielectric response from a general distribution function taken from the DISTIRIBUTION CPO and adaptation of wave codes to use this response. Note that clear documentation of the self-consistent model is mandatory.**

This activity should start from existing IMP5 codes.

Implementation Method:

Priority support

Requested manpower/skills:

Expertise on the physics processes involved in relevant synergies and self-consistent coupling processes. In particular in area of self-consistent quasilinear coupling of wave and kinetic plasma models. Code developers with experience in both the relevant IMP5 codes and in the ITM framework.

The manpower allocated for this activity under Priority Support is 0.8 ppy.

Existing Commitments:
This is a continuation of the activity from 2011 and all who participated in 2011 are encouraged to reapply.

WP12-ITM-IMP5-ACT4

Fast particle codes
Description

This task is partly a continuation of tasks WP11-ITM-IMP5-ACT5 and WP11-ITM-IMP5-ACT6. The main topics are:

1. Code development for global stability analyses of Alfvén Modes in realistic geometries and in the presence of nonperturbative fast ion excitations

2. Development of codes that calculate local nuclear reaction rates

3. Development of codes for the fast ion redistribution during sawtooth events

The codes developed under this activity should be ported to the ITM under WP12-ITM-IMP5-ACT1.

Implementation Method:

Baseline support

Requested manpower/skills:

The activity is expected to require 1.0 ppy under Baseline Support of dedicated work in total

Existing Commitments:

This is in part a continuation of task from 2011 (WP11-ITM-IMP5-ACT5/6) and all who participated in the task in 2011 are encouraged to reapply.

People working in this activity should apply also to WP12-ITM-IMP5-ACT1 to perform the ITM integration work.

JET related activities

Resources

The Implementation of the IMP5 work programme for 2012 is estimated to require a minimum of 3 Ppy under Baseline support and 4.5 Ppy under Priority Support in order to be able to provide a minimum level of project fulfillment of the deliverables and milestones.

6.4 Scientific and Technical Reports

Milestones and Deliverables

Milestones:

Deliverables:

Activity	*Priority Support Deliverables*	*Due Date*
WP12-ITM-IMP5-ACT1	• Release of Kepler actor compatible with the integration under WP12-	31. Dec 2012

	ITM-IMP5-ACT2. The actor should be available under svn on gforge • Benchmarking and validation of codes under ITM workflows. Detailed documentation of testing and benchmarking • Benchmarking of the energetic particle response of HYMAGYC with HMGC and analytical models in overlapping regimes of validity. • Benchmarking of the MHD module used in HYMAGYC (derived by the MARS code) with existing MHD solvers in IMP12 • Workflow that executes the code on HPC-FF and/or IFERC and documentation of the procedures for how to get from the source code on gforge to execution on HPC-FF and/or IFERC.	
WP12-ITM-IMP5-ACT2	• Release of IMP5 workflows • Module integration in ETS • Release of source code, test cases and actor all publically available under svn. • Providing ISIP with suggestions for changes to the IMP5 cpos (should always be done via the Project Leaders); provide generic tools operating on the IMP5 cpos. • Composite actor suitable for MHD modes stabilisation studies.	31. Dec 2012
WP12-ITM-IMP5-ACT3	• Kepler actor via the Gforge repositories. Always provide: source code, test cases and documentation under Gforge. • Deliver source code, documentation and test cases via Gforge. The aim should always be to provide a Kepler actor, but in case this in not available, a reasonable plan for how to turn the source code into a Kepler actor should be delivered.	31. Dec 2012
WP12-ITM-IMP5-ACT4	• Deliver module for nuclear reaction rates under SVN; including test cases and documentation • Deliver module for Alfvén modes under SVN; including test cases and documentation • Deliver module for fast ion redistribution under SVN; including test cases and documentation	31. Dec 2012

7. ISIP:

Task Agreement WP12-ITM-ISIP:

Infrastructure and Software Integration Project

7.1 Introduction

The Infrastructure and Software Integration Project (ISIP) develops and maintains the ITM-TF framework, a broadly accessible framework for integrated simulation of magnetic confinement fusion devices. The ITM-TF framework is a suitable environment for modellers and code developers to access input data (synthetic or experimental) and to allow dynamic creation of computational workflows. The framework targets various physical issues by coupling together different physics components (provided by the IMPs) in a fully flexible way, allowing addressing a wide range of user-defined fusion applications. The framework is intended to communicate with a wide spectrum of computer resources, including grid enabled resources (e.g., EGEE and DEISA architectures) local clusters, HPC (in particular HPC-FF) and single node machines.

The implementation of the 2012 work programme will be used to fulfil three main missions :

- **ACT1 Support the users of the framework (Hotline, documentation, tutorials)**
- **ACT2 Maintain and upgrade the existing functionalities of the framework**
- **ACT3 Identify and develop missing functionalities in the framework**

In 2012 the emphasis will be on i) performance optimization, ii) improving pause/restart mechanisms and iii) extending the distributed computing functionalities (HPC and GRID).

7.2 Objectives

The main ISIP purpose is to maintain - and upgrade when required - a stable and supported platform for ITM-TF modelling and exploitation needs, including the development of new functionalities and the support to Users.

7.3 Work Description and Breakdown

Structure

All activities are continuing from 2011

Work Breakdown

WP12-ITM-ISIP-ACT1

Support the users of the framework
Description

This activity consists in two tasks:

T1: Hotline, documentation and support of the ITM software on the gateway is formed under Priority Support with a ceiling of 4 pm.

T2: Tutorials on the ITM software is formed under Priority Support with a ceiling of 1 pm, covers various tutorials that can be given on ITM tools along the year (code camps, General meeting).

Implementation Method:

Priority support

Requested manpower/skills:

Requested manpower is indicated above in the Task description / Skills : Good knowledge of ITM/ISIP software. Participation in Code Camps is required and shall be included in the commitments to Task activities.

Existing Commitments:
T1 is covered significantly by the Core Programming Team, thus only 4 pm are open in this Call for Participation.

Code Camps or other coordinated efforts (preliminary)

Type of effort	**Start date**	**Length (in weeks)**	**Expected outcome/relation to deliverable(s)**
Code Camp	All ITM Codecamps	**5**	User support, Tutorials

WP12-ITM-ISIP-ACT2

Maintain and upgrade the existing functionalities of the framework
Description

This activity consists in twelve tasks:

- **T1: Maintenance and upgrades of the Kepler workflow tool is formed under Priority Support with a ceiling of 2 pm. The task consists in keeping contact with the Kepler core team in San Diego and updating the ITM-TF installation with new features developed by the Kepler team.**
- **T2: Simulation catalogue is formed under Priority Support with a ceiling of 3 pm. The main item in 2012 is the upgrade of the existing functionalities and querying interface from the feedback of the users.**

- **T3: Maintenance and upgrades of the Integrated Simulation Editor is formed under Priority Support with a ceiling of 6 pm. The main items in 2012 are the upgrade of the existing functionalities from the feedback of the users and in general improve the workflow preparation and monitoring features in ISE.**
- **T4: Data structure is formed under Priority Support with a ceiling of 2 pm. Continuous maintenance and upgrades of the data structure following the needs of the IMPs.**
- **T5: Universal Access Layer is formed under Priority Support with a ceiling of 7 pm. The main items in 2012 are the continuous profiling and performance optimization of the UAL for in-memory transfer and the deployment of the parallel I/O version developed in 2011.**
- **T6: Actor generator is formed under Priority Support with a ceiling of 5 pm. This includes the maintenance and upgrades of FC2K, the finalisation and merging into a single version of HPC2K (GRID/HPC tools) and WS2K (Web Service actor generator). Moreover FC2K should be augmented to generate also CPO-formatted Matlab script (wrapper) to be pasted into the native Kepler Matlab actor.**
- **T7: ITM Profile Maker is formed under Priority Support with a ceiling of 4 pm. It consists in upgrading the prototype developed in 2011 as more experimental data becomes available in the ITM-TF database.**
- **T8: Administration of the collaborative software is formed under Priority Support with a ceiling of 3 pm. This is the administration of the ITM-TF Portal, including Gforge, SVN, Jboss and documentation websites.**
- **T9: Maintenance and upgrades of experimental data import tool (Exp2ITM) is formed under Priority Support with a ceiling of 3 pm.**
- **T10: Maintenance and upgrades of the Control toolbox is formed under Priority Support with a ceiling of 2 pm.**
- **T11: Maintenance and upgrades of the advanced visualisation tools is formed under Priority Support with a ceiling of 3 pm.**
- **T12: Maintenance and upgrades of the "ITM shared" tools is formed under Priority Support with a ceiling of 3 pm. A number of tools has been developed in the past years to help physics programming in the ITM-TF (e.g. interpolation tools, CPO copy tools, …) and this toolset is now maintained by ISIP.**

Implementation Method:

Priority support

Requested manpower/skills:

The total manpower allocated for this activity is 4 ppy under Priority Support and 3 ppy under Baseline Support.

Code Camps or other coordinated efforts (preliminary)

Type of effort	Start date	Length (in weeks)	Expected outcome/relation to deliverable(s)
Working session	June	**1**	Review progress of the Tasks, coordination.

WP12-ITM-ISIP-ACT3

Identify and develop missing functionalities in the framework
Description

This activity consists in three tasks:

- **T1: Deploy strategies for HPC and GRID execution of components and workflows is formed under Priority Support with a ceiling of 6 pm. It includes the deployment of the procedures and tools prepared in past years for executing components of advanced physics workflows on HPC and GRID facilities. It includes also the evaluation of the proposed strategies and the design of new ones when needed depending on the Use Case. The task includes also the maintenance of GRID and HPC services (Unicore, …) on the Gateway and the consistent evolution of HPC2K.**
- **T2: Advanced workflow monitoring and Checkpoint/restart in workflows is formed under Priority Support with a ceiling of 5 pm. A first requirement capture has been done in 2011 and needs to be implemented in 2012.**
- **T3: CPO referencing in workflows is formed under Priority Support with a ceiling of 2 pm. This includes the maintenance and upgrades of UALinit and UALcollector actors with a closer connection to the simulation catalogue, in particular the implementation of the CPO referencing system.**
- **T4: Prepare local deployment of the ITM-TF infrastructure is formed under Priority Support with a ceiling of 4 pm. The deliverable is a packaged version of the ITM-TF platform independent of the Gateway in view of a possible local deployment in Associations.**

Implementation Method:

Priority support

Requested manpower/skills:
Requested manpower is indicated above in the Task description / Skills : Good knowledge of ITM/ISIP software

Code Camps or other coordinated efforts (preliminary)

Type of effort	Start date	Length (in weeks)	Expected outcome/relation to deliverable(s)
Working session	June	**1**	Review progress of the Tasks, coordination

JET related activities

Resources

Since ISIP provides the infrastructure for the ITM-TF programme, it is fully covered by Priority Support.

The Implementation of the ISIP work programme for 2012 is estimated to require 5,6 PPy under Priority Support in order to be able to provide a minimum level of fulfilment of the deliverables and milestones. Support participation in Code Camps shall be included in the commitments to Task activities.

7.4 Scientific and Technical Reports

Milestones and Deliverables

Milestones:

Deliverables:

Activity	*Priority Support Deliverables*	*Due Date*
WP12-ITM-ISIP-ACT1	• T1. Hotline, documentation • T2. Tutorials	31. Dec 2012
WP12-ITM-ISIP-ACT2	Maintenance and updates	31. Dec 2012
WP12-ITM-ISIP-ACT3	• T1. Implement demonstration workflows for various Use Cases. • T2. Implementation of workflow profiling and checkpoint/restart functionalities, including handling of the code-specific internal variables • T3. Capability of referencing CPOs in ITM data entries • T4. Packaged version of the ITM-TF platform independent of the Gateway in view of a possible local deployment in Associations	31. Dec 2012

8. ISM:

Task Agreement WP12-ITM-ISM:

ITER scenario modelling

8.1 Introduction

An increased need in integrated predictive modelling of plasma scenarios aimed at understanding the physics of fusion plasmas and optimisation of plasma performance in future experiments stimulates the development of the integrated modelling and analysis tools in Europe (JET suite of transport codes, EFDA-TF ITM and various efforts in the Associations (CRONOS, ASTRA, JETTO, etc.)), USA (Fusion Simulation Project) and Japan (Burning Plasma Simulation Initiative). The ITER Scenario Modelling (ISM) group within the ITM-TF coordinates the European efforts in developing interpretative and predictive modelling tools for operational scenarios in ITER and other new projects (e.g. JT-60SA), supports the validation of ITM tools and promotes and deploys these tools towards integrated scenario modelling. To reach these long term objectives, ISM is involved in scenario modelling of present day devices since the accuracy of predictive modelling of future operations strongly relies on the systematic validation of the integrated models.

The ISM activities in 2012 will be coordinated around three large topics:

- **Support to the validation and physics application of the ETS and ITM tools;**
- **Developing and validating plasma scenarios simulations for existing devices;**
- **Support to predictive scenario modelling for future devices (e.g. JT-60SA, ITER, DEMO)**

The physics issues addressed within these integrated modelling tasks will include current profile diffusion, physics of thermal transport and validation of existing transport models, particle transport and density peaking, plasma fuelling with pellets injection, momentum transport and effect of rotation on plasma confinement, plasma control issues, impurity transport and effect of impurities on plasma performance, integrated core-edge-SOL simulations, MHD stability analysis with existing tools.

The main effort will be focused on the complete modelling of the various phases of the Hybrid Scenario from the current ramp-up, flat-top and ramp down operational phases (to a lesser extend, other operational scenarios will be addressed as well). The long term objective is to provide comprehensive modelling of ITER hybrid scenario evolving simultaneously current, momentum, thermal and particle transport in view of defining/optimising the operational space (sensitivity studies).

8.2 Objectives

The main objectives of the ISM group within ITM-TF are to provide support to:

- **interpretative and predictive integrated scenario modelling on existing EU experiments addressing the physics and operational issues**

- **scenario modelling activities to cover the preparation of operational scenario for ITER, JT60-SA, DEMO .**

8.3 Work Description and Breakdown

Structure

All activities are continuing from 2011

Work Breakdown

WP12-ITM-ISM-ACT1

Support to the validation and physics application of the ETS and ITM tools
Description

- **T1.The following tasks on support to the ETS validation are regrouped under this activity:**

a. Benchmarking of new modules coupled with ETS workflows (NCLASS, GLF23, Bohm-gyroBohm model for particle transport, ECCD and NBI heating) (in collaboration with EDRG, IMP3, IMP4-ACT4 and IMP5-ACT1). Provide ASTRA, CRONOS and JETTO simulations with NCLASS and GLF23 transport models, CRONOS run for comparison with ECR H&CD modules, ETS-TRANSP benchmarking of a heating and neutron yield.

b. Benchmarking of impurity transport for Be and W. ETS/impurity – SANCO simulations (in collaboration with AMNS and IMP3)

c. Benchmarking of core neutral module. Provide ASTRA and JETTO runs for benchmarking of neutral module for main species. SANCO runs for benchmarking the neutral module for impurity (in collaboration with IMP3)

d. Comparison of pellet module in ETS and JETTO. Provide JETTO run with pellet module (in collaboration with IMP3)

e. Benchmarking of ETS with multiple main ion species. Provide ASTRA simulations with multiple ion species (in collaboration with IMP3)

- **T2.ETS validation and application of ITM workflows for physics study:**

a. Effect of NTM on transport and confinement in Hybrid Scenarios. Application of ETS WF with the NTM module for JET and AUG discharges: estimation of island width and comparison with measurements, transport simulations (in collaboration with EDRG, IMP12, IMP3, IMP4-ACT4, IMP5-ACT2)

b. Exploitation of the Equilibrium and MHD stability chain in two or more experiments.

One specific application is the pedestal MHD analysis for JET and ASDEX-U Hybrid Scenarios. J-a stability diagram (in collaboration with EDRG, IMP12)

c. Current diffusion during the ohmic current ramp up on existing devices (JET, MAST). Interpretative simulations of the current diffusion for different collisionality levels and comparison to neoclassical prediction (in collaboration with EDRG, IMP12, IMP3, IMP4-ACT4)

d. Predictive (Te, Ti, current diffusion, NBI, etc.) modelling of Hybrid Scenarios (JET, ASDEX-U) and comparison to experimental data. Simulations with the Bohm-gyroBohm transport model, NCLASS and NBI heating module. Prediction for Te and Ti will be compared to measurements. (in collaboration with EDRG, IMP3, IMP4-ACT4, IMP5-ACT2)

- **T3.Provision of an ITER hybrid scenario for IMP4 codes (in collaboration with IMP4-ACT1 and EDRG-ACT1)**
- **T4.Provision of the ISM simulations and corresponding mapping tool for importing eqdsk/matlab simulation data to the ITM database (in collaboration with EDRG-ACT1).**

Implementation Method:

Baseline and Priority support

Requested manpower/skills:

ETS, ASTRA, CRONOS, JETTO, SANCO and TRANSP experts, Equilibrium, MHD stability, transport and H&CD experts.

The minimum anticipated commitment under Priority Support for ISM-ACT1 to be completed is: 0.5 ppy for T 1(a, c, d) and 0.75 ppy for T2(a, b, d); and 0.05ppy for each of T3 and T4.

Existing Commitments:
This is a continuation of the activity from 2011 and all who participated in 2011 are encouraged to reapply.

Code Camps or other coordinated efforts (preliminary)

Type of effort	**Start date**	**Length (in weeks)**	**Expected outcome/relation to deliverable(s)**
Code Camp	Mar	**1**	Benchmarking of the ETS simulations against ASTRA, CRONOS, JETTO, SANCO and TRANSP. First physics study with ETS WF (NTMs, current diffusion, pellets, …)
Code Camp	December	**1**	Finalisation of benchmarking exercises and physics studies,

			comparison to experimental data

External connections / requirements

Experimental data for limited JET, ASDEX-U and MAST discharges as identified by the validation task will be required.

WP12-ITM-ISM-ACT2

Interpretative and predictive integrated scenario modelling on existing devices
Description

1. **Modelling of density evolution self-consistently with current diffusion and temperatures, validation of first principle transport models (TGLF, QualiKiz). Modelling of limited number of JET and ASDEX-U discharges using GLF23, TGLF and Bohm-gyroBohm models. Stability analysis and transport modelling with QualiKiz code. Current ramp down modelling including the H to L transition**
2. **Comparison and modelling of JT-60U and JET plasmas in typical operational domains (signed Proposal Document Sheet EU11-02). Compare performance and characteristics of the JET and JT-60U plasmas. Predictive and interpretative simulations of the same discharges**
3. **Transport modelling of JET - ASDEX-U hybrid identity experiments**
4. **Current diffusion in hybrid discharges: JET, ASDEX-U and ITPA database.**
5. **Momentum transport in hybrid scenario: JET and ITPA database. Modelling of momentum transport in JET hybrid scenarios using the GLF23 and empirical models**

Implementation Method:

Baseline support

Requested manpower/skills:
transport experts, heating, current drive and fuelling experts, EU ITPA members of T&C and IOS group, EFDA Transport Topical group experts. All task are under Baseline Support with total manpower required of 3 ppy.

Existing Commitments:
collaboration within IEA Implementing Agreement for co-operation on tokamak programmes (JET and JT-60U). Existing commitments should be expanded to 2012

Code Camps or other coordinated efforts (preliminary)

Type of effort	Start date	Length (in weeks)	Expected outcome/relation to deliverable(s)
Code Camp	Mar	**1**	Review of activities since previous working session, update on ITER needs and coordination of the ISM activity with ITER need. Modelling work within the above specified tasks
Coordinated effort	June	**1**	Visits of EU modelers to JAEA. Modelling of JT-60U discharges.
Code Camp	July	**1**	Review of activities since previous working session, status of the EPS presentations and publications. Modelling work within the above specified tasks
Code Camp	December	**1**	Review of activities since previous working session, finalise modelling for publication, discuss the status of publications.

External connections / requirements

Expertise from EFDA Transport and MHD Topical groups is required. Limited and well-diagnosed JET, ASDEX-U, JT-60U and Tore Supra discharges will be modelled. Link with the T&C and IOS ITPA groups.

WP12-ITM-ISM-ACT3

Support to predictive scenario modelling for future devices (e.g. JT-60SA, ITER, DEMO)
Description

1. **Current diffusion and transport modeling for ITER hybrid current ramp down**
2. **Predictive density modeling with first principle models for ITER, density peaking effect.**
3. **Development of the ITER real time model-based profile control (in collaboration with EDRG-ACT2 and IMP3)**
4. **Expansion of the operational domain of ITER hybrid scenario with q on-axis below one by controlling the sawtooth period**
5. **1-D JT-60SA scenario modelling: implementation of the JT-60SA H&CD configuration (NBI, ECRH) in EU transport codes. Predictive scenario modelling with transport models validated in ACT2.**
6. **DEMO – 0D modelling using Kepler workflow [in collaboration with IMP3-ACT1-T6]**

Implementation Method:

Baseline support

Requested manpower/skills:
Expertise from EFDA Transport and MHD Topical groups is required. Link with the T&C and IOS ITPA groups, ITER IO, F4E and ITER EFDA Department for JT-60SA, PPPT

EFDA Department for DEMO modelling.
All ISM-ACT3 tasks are under Baseline Support with total manpower required of 5 ppy.

Existing Commitments:
This is a continuation of the activity from 2011 and all who participated in 2011 are encouraged to reapply.

Code Camps or other coordinated efforts (preliminary)

Type of effort	**Start date**	**Length (in weeks)**	**Expected outcome/relation to deliverable(s)**
Code Camp	Mar	**1**	Review of activities since previous working session, update on ITER needs and coordination of the ISM activity with ITER need. Modelling work within the above specified tasks
Code Camp	July	**1**	Review of activities since previous working session, update on ITER needs and coordination of the ISM activity with ITER need. Modelling work within the above specified tasks
Code Camp	December	**1**	Review of activities since previous working session, update on ITER needs and coordination of the ISM activity with ITER need. Modelling work within the above specified tasks

External connections / requirements

Interactions with EFDA Transport and MHD Topical groups, T&C and IOS ITPA groups, ITER IO, F4E, ITER and PPPT EFDA Departments

JET related activities

Resources

The Implementation of the ISM work programme for 2012 is estimated to require a minimum of 6 Ppy under Baseline support and 1.35 Ppy under Priority Support in order to be able to provide a minimum level of project fulfillment of the deliverables and milestones.

8.4 Scientific and Technical Reports

Milestones and Deliverables

Milestones:

Deliverables:

		Date
WP12-ITM-ISM-ACT1	• Thermal transport: benchmarking of new modules for transport coefficients and heating and current drive sources (report, data storred on the Gateway) • Particle transport: benchmarking of new modules for main species and impurity (report, data storred on the Gateway) • Effect of NTM on transport and confinement in Hybrid Scenarios (report, data storred on the Gateway) • Edge MHD analysis for Hybrid Scenarios (JET, ASDEX-U) (report, data storred on the Gateway) • Current diffusion during the ohmic current ramp up on existing devices (JET, MAST) (report, data storred on the Gateway) • Predictive (Te, Ti, current diffusion, NBI, etc.) modelling of Hybrid Scenarios (JET, ASDEX-U) and comparison to experimental data (report, data storred on the Gateway) • Provision of an ITER hybrid scenario for IMP4, steady state plasma profiles in ITER hybrid scenario to be provided (report, data storred on the Gateway) • Eqdsk/matlab mapping tool, Mapping tool to import eqdsk and matlab data files to the ITM database.	31. Dec 2012
WP12-ITM-ISM-ACT2	• Modelling of density evolution self-consistently with current diffusion and temperatures, validation of first principle transport models (TGLF, QualiKiz) (report, data storred on the Gateway) • Comparison and modelling of JT-60U and JET plasmas in typical operational domains (signed Proposal Document Sheet EU11-02) (report, data storred on the Gateway) • Current diffusion and transport modeling: (report, data storred on the Gateway)	31. Dec 2012
WP12-ITM-ISM-ACT3	Report on simulation results. Preparation of conference/journal publication. Data available on the GAteway	31. Dec 2012

9. TFL:

Task Agreement WP12-ITM-TFL:

TF leadership

9.1 Introduction

The ITM-TF is lead by a Task Force leader and two deputies. These are appointed by the EFDA-SC and report to the EFDA leader.

The ITM maintains in 2012 five projects, the Infrastructure and Software Integration project (ISIP) supporting the underlying technology of the modelling Platform and four physics related Integrated Modelling Projects covering equilibrium, MHD and disruptions (IMP#12), transport code and discharge evolution (IMP#3), turbulence, micro-instabilities, and neoclassical transport (IMP#4) and heating, current drive and fast Particles (IMP#5). In addition three tasks are coordinated under the Task Force Leadership, AMNS (Atomic, Molecular, Nuclear and Surface Physics Data), EDRG (Experimentalists and Diagnosticians Resource Group) and the project on ITER Scenario Modelling (ISM).

This call for participation foresees under WP11-ITM-TFL-PL the appointment of Project Leaders for two years. The ISM Task Coordinators are appointed till May 2012. Associations are asked to commit their staff for Project Leader positions until December 2013.

List of Task Force and Project Leaders at the end of 2011

WP11-ITM-TFL-TFL	CEA	Gloria FALCHETTO	gloria.falchetto@cea.fr
	IPFN	Rui Coelho	Rui.Coelho@ipfn.ist.utl.pt
	IPP	David Coster	David.Coster@ipp.mpg.de
WP11-ITM-TFL-PL-IMP12	CEA	Maurizio Ottaviani	maurizio.ottaviani@cea.fr
	ENEA-RFX	Roberto Paccagnella	roberto.paccagnella@igi.cnr.it
WP11-ITM-TFL-PL-IMP3	IPP	David Coster	David.Coster@ipp.mpg.de
	CEA	Vincent Basiuk	vincent.basiuk@cea.fr
	OAW	David Tskhakaya	David.Tskhakaya@uibk.ac.at
WP11-ITM-TFL-PL-IMP4	IPP	Bruce Scott	Bruce.Scott@ipp.mpg.de
	RISØ	Anders Henry Nielsen	ahnie@risoe.dtu.dk
WP11-ITM-TFL-PL-IMP5	ENEA_CNR	Daniela Farina	farina@ifp.cnr.it
	ENEA_Frascati	Gregorio Vlad	gregorio.vlad@enea.it
	VR	Thomas Johnson	thomas.johnson@ee.kth.se
WP11-ITM-TFL-PL-ISIP	CEA	Frédéric Imbeaux	frederic.imbeaux@cea.fr
	ENEA-RFX	Gabriele Manduchi	gabriele.manduchi@igi.cnr.it
WP11-ITM-TFL-PL-ISM	CEA	Xavier Litaudon	xavier.litaudon@cea.fr

	CCFE	Irina Voitsekhovitch	irina.voitsekhovitch@ccfe.ac.uk

9.2 Objectives

9.3 Work Description and Breakdown

Structure

This call for participation foresees under WP11-ITM-TFL-PL the appointment of Project Leaders for two years Since ISM Task Coordinators are appointed till May 2012, Associations committing that staff are asked for a prolongation of their commitment till December 2013.

Work Breakdown

WP12-ITM-TFL-PL

Project Leadership

The Task Force on Integrated Tokamak modelling (ITM-TF) is mainly organized in Projects, covering specific physics modelling and addressing critical physics/technology issues and activities covering specific code development, integration and V&V efforts. The latter will generally comprise joint efforts of theoreticians, experimentalists and engineers. Each project is coordinated by a Project Leader and one or two deputies leaders coordinating some specific tasks. Project Leaders will be selected on the basis of their scientific competence and of the scientific support which can be provided by their Association. The Project leaders are responsible for the day to day management of their projects and report to the Task Force leader.

- **WP12-ITM-TFL-PL-ISIP: Coordination of ISIP – Infrastructure and Software Integration**
- **WP12-ITM-TFL-PL-IMP12: Coordination of IMP12 – Equilibrium, MHD and disruptions**
- **WP12-ITM-TFL-PL-IMP3: Coordination of IMP3 - Transport Code and Discharge Evolution**
- **WP12-ITM-TFL-PL-IMP4: Coordination of IMP4 - Transport Processes and Microturbulence**
- **WP12-ITM-TFL-PL-IMP5: Coordination of IMP5 – Heating, Current Drive and Fast Particles**

WP12-ITM-TFL-TFL

Task Force Leadership

The TF leadership is providing the Scientific Leadership of the Integrated Modelling TF. They will ensure that the overall EFDA Work Plan and Work Programme objectives are adequately translated into specific / detailed scientific and technical objectives. Furthermore, they shall make sure that the work within the TF on development, validation and application of computational models, including their integration, is consistent with the objectives and that they are met. The TF leader can also propose activities within international collaborations and implement approved activities. The Integrated Modelling TF Leader shall report to the EFDA Leader through the Head of the ITER Physics Department.

Resources

- **0.75 ppy of Priority support is foreseen for the Task Force Leader**
- **0.5 ppy of Priority support is foreseen for the Task Force Leader Deputy**
- **0.25 ppy of Priority support is foreseen for the Project Leader / Project Leader Deputy / ISM Task Coordinator / ISM Task Coordinator Deputy**

9.4 Scientific and Technical Reports

Milestones and Deliverables

Milestones:

Deliverables:

Activity	*Priority Support Deliverables*	*Due Date*
WP12-ITM-TFL-TFL	Task Force leadership is an ongoing activity and the main concern is to lead the project towards a successful and timely implementation of the work programme. The Task Force leaders have reporting obligations to the EFDA Leader through the Head of the ITER Physics Department: • Lead and organize the overall ITM –TF activities • Monitor progress in the TF and seek to secure the needed resources • Assist the EFDA Leadership in the definition of the annual Work Programme • Provide Annual report of ITM activities • Support the EFDA Leader on International Collaborations and outreach activities. The project leader will be supported by one or more deputy project leaders. The exact division of responsibilities between the project leader and his or her deputies within the project will be decided by the Project leader. The project leader maintains all responsibilities for the project towards the Task Force.	31. Dec 2012
WP12-ITM-TFL-PL	• Document describing the activities in the project during the incoming year – including timelines. Maintained and published on the IM-TF website • Bi-monthly progress reports detailing progress in all tasks and status towards all deliverables – submitted to TF leadership, discussed in monthly PL meetings and published on ITM-TF portal • A summary of the project activities and achievements during the year in a format suitable for inclusion in the annual progress report.	31. Dec 2012

Appendix: Gateway User Agreement

ITM SOFTWARE POLICIES AND GATEWAY USER AGREEMENT

Background and General information

The Integrated Tokamak Modelling Task Force (ITM-TF) is a Task Force defined under the European Fusion Development Agreement (EFDA). It has the long term aim of developing a validated suite of simulation codes for ITER exploitation and the remit extends to the benchmarking on existing devices.

The working format for the ITM-TF is collaborative activities between individual and Associations aimed towards the creation of a common simulation framework for fusion plasmas. Software within the ITM-TF is either original software developed fully within the ITM-TF or software contributed by the EFDA Associates and adapted to the ITM-TF framework, through ITM-TF. We take the ITM-TF framework to collectively mean the contributed and developed software together with compiled databases of experimental and simulation data.

ITM-TF undertakes to provide a record of the software being contributed to the ITM-TF in a registry and it will track the contributions made to the software within the ITM-TF activities. The initial data entry for the contributed software is provided by the Contributing Associate through information detailed in a separate Grant of Software Access agreement which also should appoint a Responsible Officer for the Software.

The ITM Gateway is a joint resource for contributors to the ITM-TF work programme and users of software developed within the framework of ITM-TF. The purpose of the Gateway is to provide a common development environment and access to contributed software. In addition, the Gateway should act as a user access point to relevant simulation and experimental data as well as the entry point to a wider range of computing resources. Only activities which are consistent with the ITM-TF Terms of reference can be supported on the ITM Gateway. The Gateway hosts the ITM-TF software repositories. Access to the repositories is structured according to the status of the software and the role of the users as described in the section on Quality Assurance.

All activities on the ITM Gateway need to be performed within one of the Integrated Modelling Projects (IMPs) or the Infrastructure and Software Integration Project (ISIP) or in collaboration with other EFDA entities.

The ITM GATEWAY USER BOARD (GUB) supports the development and maintenance of the contributed software and monitors the activities on the ITM Gateway. It consists of at least one representative from the TF leadership and one representative appointed by each of the Projects (IMPs and ISIP) and represents the unique management body and the main point of contact to users of the ITM Gateway. It grants access to the Gateway, to software releases and repositories, and the relevant data and data access tools based on the status of the user.

Two levels of Gateway user status are possible:

Active developers are individuals or groups of individuals contributing to an ITM Task formalized under a Task Agreement (TA) between their HRU and the EFDA Leader. These Tasks form the core of ITM work programme and are organized within the ITM project structure and coordinated by the

Project Leaders. Active developers are formal project members or collaborators agreed by the ITM task force leader and have access to the **project software development repositories** and the **ITM public release repository**. The appointment of active developers in a given task for development on a specific code should be agreed by the code responsible officer and the corresponding project leader.

Active users are individuals or groups of individuals that are not directly involved in the development of the ITM software suite but are actively using the ITM-TF tools for physics studies. This category of users will in general be supported though collaboration with the different Topical Groups, European Experiments or on an individual basis through work proposals supported by the GUB. This category of users has access to the ITM public release repository only. In general only binary versions of contributed software are available to this category of users. Exception to this rule can be granted by the ITM Gateway User Board in agreement with the Responsible Officer for the respective software.

Access rights to the ITM gateway may be revoked if a user is found to be in breach of the terms of the user agreement as set out in this document.

EFDA ITM-TF Software License Agreement

This ITM-TF Software License Agreement for ITM-TF Software (“License”) is an agreement between the undersigning party (“Licensee”) and the ITM-TF for the use of the ITM-TF Software (the "Software"), as defined below. If the undersigning party is obtaining access to the software for personal use, this agreement applies to and binds the undersigning party personally. If the undersigning party is obtaining access to the software as part of its work for an organization, this agreement applies to and binds such organization. In such a case the undersigning person must expressly declare that he/she acts on behalf and in the interest of the organisation.

The Software in this respect is any software contributed to the ITM-TF by an EFDA Associate through issuing of a Grant of Access form or any software developed solely within the ITM-TF in support of its work programme. The ITM-TF Software is thus constituted by the ITM-TF software repositories.

License

This software has been contributed by an EFDA Associate within the framework of the EFDA Taskforce on Integrated Tokamak Modelling (ITM-TF). The software has either been developed directly within the ITM-TF work programme or the EFDA Associates have granted the ITM-TF right of managing and distributing the Software on their behalf under this ITM Software Licence Agreement

1. ITM-TF allows the undersigning party to use the ITM-TF computer software residing in ITM-TF managed software repositories provided that this software will be used exclusively for non-commercial research purposes.

2. The undersigning party agrees not to transfer the software to third parties and not to grant sublicenses. If the undersigning party receives a request for such transfer it should be referred to the ITM Gateway User Board that will decide on appropriate action in consultation with the involved Associates and EFDA.

3. The undersigning party agrees, to use the software only for peaceful purposes and to avoid using the software for military purposes or any other purpose falling under the provisions for non-proliferation.

4. Except as specified in this license, all express or implied conditions, representations, and warranties including, without limitation, any implied warranty of fitness for a particular purpose, correctness of the mathematical and physical model, or error freeness of the numerical scheme, as well as non-infringement of copyrights, or arising from a course of dealing, usage, or trade practice, are hereby excluded to the extent allowed by applicable law. The undersigning party will notify ITM-TF if it discovers that the software contains any error or infringes any copyright.

5. Within the limits of the license granted to him, the undersigning party is required to make any modifications and improvements of the contributed software available to the ITM-TF under the same conditions.

6. The undersigning party agrees to acknowledge the name of the software, the author(s), the Associate(s), the ITM-TF, and cite the relevant technical reference(s) for the software package in any publication reporting results obtained with the aid of it. Any extensive support from an ITM-TF member to the undersigning party implies that the published work will include that ITM-TF member(s) as co-author.

7. Transfer of the software will involve no costs for EFDA ITM-TF.

ITM-TF SOFTWARE IS PROVIDED ON AN "AS IS" BASIS AND ANY EXPRESSED OR IMPLIED WARRANTIES (INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY, NON-INFRINGEMENT AND FITNESS FOR A PARTICULAR PURPOSE) ARE DISCLAIMED. IN NO EVENT SHALL THE EFDA ASSOCIATES INVOLVED INT THE ITM-TF BE LIABLE FOR ANY DIRECT, INDIRECT, INCIDENTAL, SPECIAL, EXEMPLARY, OR CONSEQUENTIAL DAMAGES (INCLUDING, BUT NOT LIMITED TO, PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION) HOWEVER CAUSED AND ON ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS ITM-TF SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE.

Access to Source Code Repositories and basic Quality Assurance

ITM-TF is creating a collaborative research and software development environment for integrated modelling of ITER, DEMO and the current experimental devices. This requires joint adaptation and development of a range of software tools of different origins. It is foreseen that different levels of maturity will be exhibited during the lifetime of a code within the ITM-TF and a **layered set of access rights,** has been defined to reflect this:

Access to software is based on the ITM-TF project structure where

- Read access is granted for all active developers within a Task to all **source code development repositories** needed within the Task. Write access should be granted to the appointed Responsible Officer (RO) for each software code. Or, if so has been agreed between the ROs for the different software codes involved in the Task to a single person taking the coordinating responsibility for the software integrity in the Task. All active developers have write access to some parts of the relevant tree structure (development thread) so they can easily exchange files amongst themselves, make modifications and merge the versions

- Read access is granted for all active developers within a Project for all **Release Candidates** of the different software packages within a Project. A Release Candidate is a software or software component that is considered stable and fully adapted to the ITM-TF data structures and is currently being tested under the ITM-TF V&V procedures. Release Candidates are proposed by the Responsible Officers to the corresponding Project leader. Write access for Release Candidates is granted to Responsible officers OR the person taking the coordinating responsibility for the software integrity in the originating task. For each new version of the Release Candidate a renewed endorsement by the Project leader is needed.

- All ITM users have access to the public repositories. Public releases are proposed jointly by the Responsible Officer for each software and the corresponding Project leader to the ITM Gateway User Board. Only software that is deemed appropriate under ITM-TF V&V procedures can be proposed for Public Release. Write access for Public Releases is granted to Responsible officers OR the person taking the coordinating responsibility for the software integrity in the originating Task. For each new release of the software a renewed endorsement of the Gateway User Board is needed.

Any request falling outside of the above presented access hierarchy should be forwarded the ITM Gateway User Board. A permanent transfer of responsibility to the ITM-TF for software is possible through a separate written agreement between the involved HRU and the ITM-TF.

If a conflict arises in relation to software access or releases the first route for resolution is the ITM Gateway User Board. If that route fails to resolve the issue the TF Leader will move the complaint to the attention of the involved HRUs and the EFDA leader for further consideration.

ITM Publication Review Procedure

All activities in the ITM-TF are based on collaborative work involving, in most cases, several Associates providing resources and staffing to the ITM-TF through EFDA. The EFDA Publication Rules approved by the EFDA Steering Committee therefore apply to these activities.

Any manuscript intended for circulation outside the Task Force which is based on ITM related work has to be cleared by the Task Force Leader.

In line with the EFDA Publication Rules, the following procedure applies:

1. All proposed publications, conference contributions and abstracts need to be endorsed by the Project Leader(s) under whose project(s) the main part of the work to be reported was carried out. The manuscripts, abstracts, presentations and posters must then be submitted to the TF leadership at least 14 days prior to submission deadline for review.

2. The submitting author needs to have cleared any internal review and publication authorization required by his Association by the date of seeking review by the TF leadership. In the case of a manuscript or contribution deemed important to the ITM-TF where the author fails to clear an internal review or obtain travel authorization, the ITM-TF reserves the right to take appropriate measures to secure the publication or presentation of the material through other means.

3. No manuscript should be submitted without TF leadership approval. The submitting author should be prepared to iterate the manuscript until consensus has been reached. The TF leader communicates the final approval and submits the manuscript to EFDA for archiving.

4. EFDA leader can act as adjudicator on TF leader final decision if so requested by submitting Associate.

As a user (**active developer** or **user**) of the ITM Gateway I declare that

- I will abide by any software licenses covering contributed ITM gateway software tools. I have reviewed the general ITM software license as given here and agree to its contents. I am aware that for some software tools additional requirements may apply if so explicitly stated.
- In case I contribute software to the repository, I will take necessary measures in order to inform –other active developers or users as well as end users on any limitation of use due in particular to existing third parties' rights on the contributed software. I will also inform of the parts of software falling under Open Source Licenses.
- I agree to the ITM publications procedures for any work intended for dissemination outside of the ITM which depend in whole or in part on the use of the ITM gateway or any ITM software tool.
- I will not install or run any software on the ITM Gateway which cannot be directly attributed to my role as an **active developer** or **user**.
- I understand that User access to the Gateway is granted through individual accounts that cannot be transferred or shared.

Date and Place:

.....

Project (s)[ISIP or IMP#]

Associate

Name:

Signature:

.....

Full address:

e-mail:

phone:

fax:

For Non-EFDA collaborators only:

duly representative person of sponsoring Associate or organisation[1]

Name:

Organisation:

Signature:

[1]Members not directly employed by an Associate can be formal collaborators ITM and/or users of the Gateway. A co-signature is then required by a recognized official of the sponsoring party, usually an Associate, or as per collaborative agreement of the organization with ITM-TF and EFDA