



EFDA

EUROPEAN FUSION DEVELOPMENT AGREEMENT

Task Force  
INTEGRATED TOKAMAK MODELLING

*Remote meeting, 19 January 2011*

# **INTEGRATED SCENARIO MODELLING, Introduction meeting 19 January 2011**

**Presented by X LITAUDON & I  
VOITSEKOVITCH**

TF Leader : G. Falchetto  
Deputies: R. Coelho, D. Coster

EFDA CSU Contact Person: D. Kalupin



- **Introduction**
  - Meeting announcement
  - 2011 call for participation
  
- **F. Koechl CRONOS/JETTO benchmark on the JET hybrid pulse #77922**
  
- **A. Polevoi: Optimisation of Operational Space (OS) for Long-pulse Scenarios**

## Remote meeting

### **Regular remote meeting on Wednesday morning 10h30-12h00 CET (09h30-11h00 GMT) :**

- **Wednesday 19/01 10h30-12h00 CET**
- **(Wed 02 Feb postponed 09 Feb )**
- **Wed 09 Feb 10h30-12h00 CET**
  - Remote meeting devoted to "WP11-ITM-ISM-ACT1 Support Validation of the ETS “
  - I. Voitsekhovitch Report from the last ETS code camp
  - Discussion on EPS participation
- **Wed 16 Feb 10h30-12h00 CET**
- **Wed 02/ March 10h30-12h00 CET**
  - Preparation Working session

## **ISM Working session & related meeting**

- **First ISM working session date and place have been confirmed !**
  - 07 March - 11 March , at Cadarache
  - Joint session with IMP#3 "WP11-ITM-ISM-ACT1 Support Validation of the ETS “ + ITER modelling
  
- **Second ISM 04-08 July FOM ? tbc**
- **Third ISM Nov- Dec.**
- **ITPA-IOS : JET culham 11-15 April**
- **ITM general meeting 12-16 sept.**

## **ISM web page (Thanks to I VOITSEKOVITCH and C KONZ)**

- [https://www.efda-itm.eu/~wwwimp3/TEST/ITM/html/ism\\_meetings.html#s737](https://www.efda-itm.eu/~wwwimp3/TEST/ITM/html/ism_meetings.html#s737)
  
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## ISM (Integrated Scenario Modelling)

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## 2011 -Participation to conferences, Workshop , ITPA

- **EPS: Strasbourg du 27 juin au 1er juillet 2011 :**  
<http://www-fusion-magnetique.cea.fr/eps2011/index.html>
  - EPS Deadline abstract: 28 feb.
  - **ISM : send your proposal 14 feb**
  - **Invited talk: integrated modelling G. Giruzzi**
  - **Core/Edge ITER modelling (baseline) ? S. Wiesen**
  - **Condition for the sustainement of hybrid scenario (application to JET) : J. Garcia ?**
  - **JET / ASDEX hybrid transport modelling: J. Citrin ?**
  - **ITER Hybrid current ramp up: D. Hogeweyj**
  - **JET ramp-down modelling ?**
- **ITPA – IOS April**
  - **DIII-D modelling Irina Voitsekhovitch**
- **ITPA –Edge group**
  - **Core/Edge ITER modelling ? S. Wiesen**

## **JT-60SA modelling (Message from K. Lackner)**

➤ **« Two members of the EU JT60SA Physics Unit (Francesco Orsitto and Tommaso Bolzonella) will visit Japan from February 14-18, to discuss (among other) the topics**

- 1. JT60SA diagnostics**
- 2. scenario modelling**
- 3. similarity experiments on presently available devices ( AUG, DIIIID, JET)**
- 4. EU contribution to the next JT60SA research plan**
- 5. MHD active controls on AT scenarios**
- 6. Link of JT60SA to DEMO activities within the Broader Approach.**

**In particular the discussions on JT60SA diagnostics will aim at assessing their status and perspectives. We plan to hold the discussions on item 1, and 2, but also others if there is an interest, in the form of a video-conference and would like to invite interested colleagues within your TF/TG to participate in them. The VC will be held in during mornings (CET) »**



## **ITM/ISM Call 2011**

- **deadline to reply 21 Jan. (shifted by one week)**
- **Project leader meeting to analyse the response  
26 -28 jan at Garching**

## **2011- ISM activities: as defined in 2010**

- **Activity- 1: Support Validation of the ETS**
  - Under priority support
- **Activity-2 : Developing and validating plasma scenarios simulations for existing devices**
- **Activity-3 : Support to predictive scenario modelling for future devices (ITER , etc)**
- **General remarks: in addition to the working sessions, visits to work on specific ISM activities could be funded under EU mobility**

## Activity- 1

- **ASTRA, CRONOS, JETTO and TRANSP simulations for benchmarking of ETS modules:**
  - current diffusion with various models for bootstrap current and current conductivity,
  - density and temperature evolution with various transport models,
  - impurity evolution (SANCO runs)
  - Sharing of Fortran routines for transport models.
  
- **Work has already started !!**
  - Euratom Mobility visit of Irena Ivanova-Stanik (Institute of Plasma Physics and Laser Microfusion, Warsaw, Poland) to CCFE to work with Paula Belo and Irina Voitsekovitch on benchmarking of impurity solver in ETS. The dates of this visit January 31 – February 4.
  
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# Activity- 1

<b>Title</b>	<b>Start date</b>	<b>End Date</b>	<b>Deliverable(s) (precise definition)</b>	<b>Dependent activities</b>
Benchmarking of NCLASS	01/01/11	30/06/11	ASTRA, CRONOS, JETTO simulations	IMP3-ACT1, IMP4-ACT3 (NCLASS in ETS)
Benchmarking of Sauter neoclassical model	01/01/11	30/06/11	TRANSP runs for selected parametric domain	IMP3-ACT1, IMP4-ACT3
Benchmarking/sharing of transport models	01/01/11	31/08/11	New transport model in ETS. ASTRA, CRONOS, JETTO, simulations	IMP3-ACT1
Benchmarking of ETS impurity solver	01/01/11	28/02/11	JETTO/SANCO runs: benchmarking of reaction rates and radiated power	IMP3-ACT1,2



## Activity 2

- **Interpretative and predictive modelling of hybrid scenario for existing EU devices:**
  - current ramps in hybrid scenario; validation of transport models
  - current diffusion during main heating phase, effect of impurities on sawtooth-free operation
  - first steps towards momentum transport in hybrid scenario: validation of existing transport models (GLF23, Weiland)
  - edge MHD stability analysis
- **Collaboration with T&C and IOS ITPA groups on current ramp-up simulations (e.g. DIID) and modelling of JET/JT-60U identity experiments**

## Activity 2

Title	Start date	End Date	Deliverable(s) (precise definition)	Dependent activities
Current profile diffusion in hybrid scenario	04.01. 2011	31.12. 2011	Current diffusion simulations including ramp up, main heating and ramp down phases.	
Modelling of plasma rotation in hybrid scenario	04.01. 2011	31.12. 2011	Test of existing models for plasma rotation: GLF23, Weiland models.	
Modelling of current ramp-down	04.01. 2011	31.12. 2011	Validated transport models on existing dedicated ITER ramp-down experiments	
Modelling of DIII-D current ramp up discharges	04.01. 2011	ITPA T&C meeting, 2011	Current diffusion simulations and transport modelling: test of transport models	data from ITPA database
Validation and benchmarking of SOUL 1-D	01.06. 2011	31.12. 2011	Validation and benchmarking of SOUL 1-D: SOUL 1-D and EDGE2D runs for JET plasmas	-

## Activity-3

- **Support to predictive modelling of hybrid scenario in future devices (ITER, JT60-SA)**
  - repeat previous ITER modelling with the revised ECRH antenna configuration, assess the effect of ECRH on q-profile evolution
  - study the pellet fuelling and effect of peaked density profile
  - modelling of the current ramps including free-boundary equilibrium,
  - scan the 0D operation space (Ti/Te, density, current, confinement factor etc )
  - develop model based control matrices for real time profile control
  - assess MHD stability
- **JT-60SA modelling**
  - Define operational space (0-D modelling)
- **Integrated edge and core modelling of H-mode scenario including impurity seeding for radiative divertor**



## Activity-3

Title	Start date	End Date	Deliverable(s) (precise definition)	Dependent activities
Hybrid scenario with revised ITER ECRH antenna configuration	04.01.2011	04.2011	scenario to be developed and passed for density modelling	ITER-IO provides the exact ECRH configuration
Hybrid scenario with revised ITER ECRH antenna and density modelling	04.01.2011	31.12.2011	scenario to be developed and passed for MHD analysis and impurity modelling	
Modelling of deep pellet fuelling in ITER hybrid regime	04.01.2011	31.12.2011	Assess the pellet penetration in ITER hybrid scenario	
Hybrid 0-D modelling	04.01.2011	31.12.2011	Estimation of operational space for hybrid scenario in future devices	
ITER hybrid current ramp-up and free boundary equilibria calculation	04.01.2011	31.12.2011	Optimised q-profile during ramp-up phase for Hybrid regime  Scenario operational space constrained from PF limits)	
MHD stability of hybrid scenario	04.01.2011	31.12.2011	Stable MHD domain	
hybrid real time q profile control	04.01.2011	31.12.2011	Model based matrices for profile control	
Integrated modelling of ITER H-mode scenario including impurities	04.01.2011	31.12.2011	Core-edge-SOL simulations: temperatures, density, current diffusion, impurity	
JT-60SA modelling	04.01.2011	31.12.2011	Define operational space (0-D modelling)	