

Remote meeting February 6 2013



EFDA

EUROPEAN FUSION DEVELOPMENT AGREEMENT

Task Force

INTEGRATED TOKAMAK MODELLING

INTEGRATED SCENARIO MODELLING: organisation of modelling activities in 2013

Presented by I. VOITSEKHOVITCH and J. GARCIA

TF Leader : G. Falchetto
Deputies: R. Coelho, D. Coster
EFDA CSU Contact Person: D. Kalupin

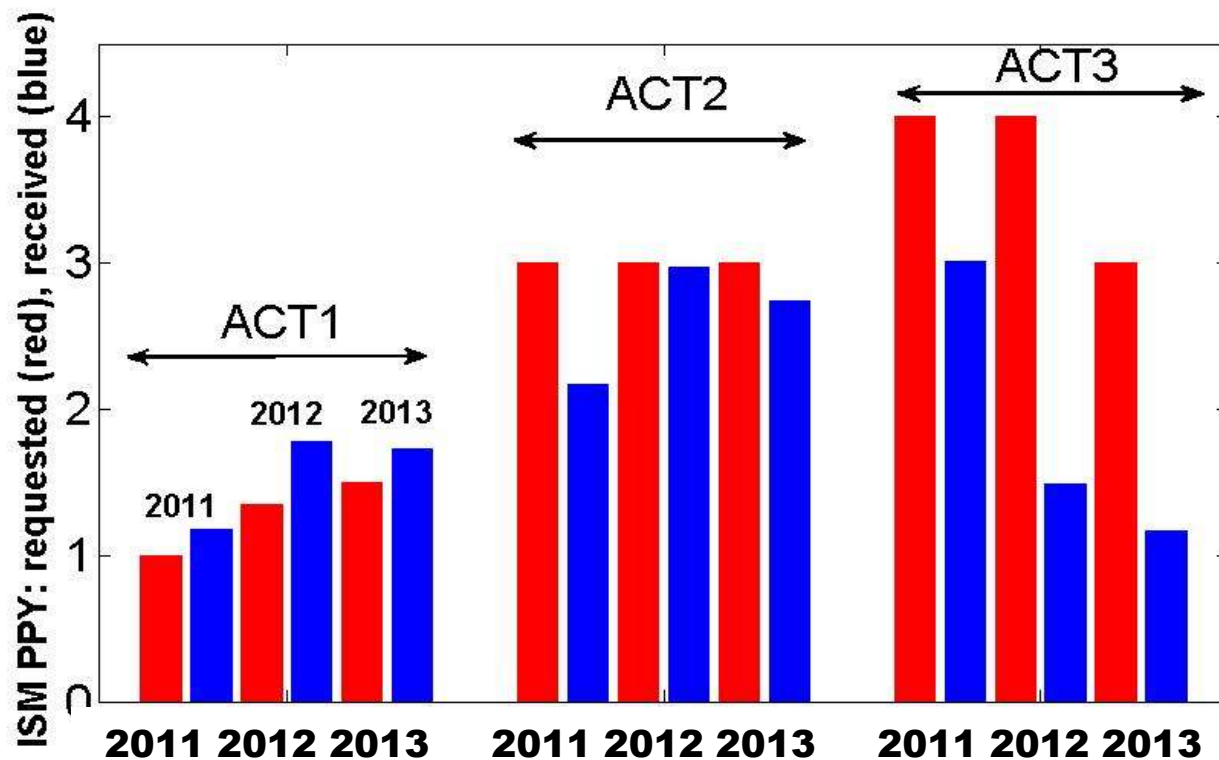
Agenda of this meeting

1. ISM 2013 (I. Voitsekhovitch, J. Garcia):

- Reply to ISM Call for Participation
- External collaborations (IO, IOS ITPA, JET)
- ISM working sessions, remote meetings, ITM code camps
- ISM mobility visits
- ISM contribution to conferences and meetings
- On-going publications
- Modelling tasks

2. JET hybrid pulses with ILW for ETS modelling: MHD, impurities, radiation, confinement (Yuri Baranov)

Reply to ISM Call for Participation 2013



2013: total 5.64 ppy

ACT1 (*Support to the validation and physics application of the ETS and ITM workflows*): 1.73 ppy

ACT2 (*Interpretative and predictive integrated scenario modelling on existing devices*) : 2.74 ppy

ACT3 (*Support to predictive scenario modelling for future devices (e.g. JT-60SA, ITER, DEMO)*): 1.17 ppy

Reply to CfP 2013: ISM participants

- **27 participants + Jonathan Citrin and Sara Moradi to join later on**
- **Warmest welcome to our new participants:** *Silvana Nowak, Olivier Sauter, Antoine Merle, Elina Militello Asp, Giuseppe Telesca*
- **ACT1 team:** *Vincent Basiuk, Yuri Baranov, João Bizarro, Emiliano Fable, Jorge Ferreira, António Figueiredo, Irena Ivanova-Stanik, Antoine Merle, Fernando Nabais, Filomena Nave, Silvana Nowak, Olivier Sauter, Pär Strand, Jakub Urban*
- **ACT2 team:** *Benedetta Baiocchi, Emilia Barbato, João Bizarro, Emiliano Fable, Jeronimo Garcia, Luca Garzotti, Dick Hogeweij, Irena Ivanova-Stanik, Florian Köchl, Xavier Litaudon, Elina Militello Asp, Didier Moreau, Paula Siren, Roman Stankiewicz, Giuseppe Telesca*
- **ACT3 team:** *Benedetta Baiocchi, Emilia Barbato, Tommaso Bolzonella, Emiliano Fable, Jeronimo Garcia, Dick Hogeweij, Irena Ivanova-Stanik, Florian Köchl, Xavier Litaudon, Roman Stankiewicz*

External collaborations:

➤ **IO:**

- *Sun-Hee Kim to replace Tom Casper from May 2013*
- *Alexei Polevoi*
- *Additional participation from ITER directorate staff members in the ISM activities/meetings for specific ITER scenario physics modelling issues (particle transport, fast particles, edge-core integration, ...)*

➤ **IOS ITPA group:** *George Sips (request on current ramp up simulations), particle transport – sensitivity studies*

➤ **JET:** *C and ITER-like wall discharges proposed by Emmanuel Joffrin*

ISM working sessions

- **1st ISM working session will take place 11-15 March at EFDA-Garching (joint with ITM CC)**
- **2nd working session: Cadarache, joint ISM - IO meeting on integrated modelling. Proposed dates: June 3-7**
- **3rd working session: end of October/November, JET / Frascati / Lisbon?**

Registered participants:

CEA:

Garcia Jeronimo (11 – 15 march 2013)
Baiocchi Benedetta (11 – 15 march 2013)
Litaudon Xavier (11 – 15 march 2013)
Basiuk Vincent (3 – 15 march 2013)

CCFE:

Voitsekhovitch Irina (11 – 15 march 2013)
Baranov Yuri (11 – 15 march 2013)

IST:

Ferreira Jorge (3 – 15 march 2013)
Figueiredo António (3 – 15 march 2013)
Nabais Fernando (3 – 15 march 2013)
Joao Bizarro (3 - 15 march 2013)

IPPLM:

Irena Ivanova-Stanik Irena (3 – 15 march 2013)
Stankiewicz Roman (3 – 15 march 2013)

ENEA:

Barbato Emilia (11-15 march, 2013)
Nowak Silvana (11-15 march 2013)

IPP-Garching:

Fable Emiliano (3-15 march 2013)

1st 2013 ISM WS

- **ETS training (1st week of CC): Yu. Baranov, A. Figueiredo, I. Ivanova-Stanik, R. Stankiewicz I. Voitsekhovitch**
- **Deadline for registration is **February 8**. The ITM CC webpage <http://www2.efda.org/cc2013-1/index.php> (username: itm, password: cc2013)**
- **Agenda will be drafted after the registration deadline.**

ITM Code Camps

- **March 4 – 15, IPP-Garching (2nd week is joint with ISM WS)**
- **April 15 – 26, CIEMAT, Madrid**
- **July 8 – 19 (after EPS), Helsinki**
- **September 9 – 20, Ljubljana**
- **Dates and place for the 5th CC is under discussion**

Provisional dates for ISM remote meetings in 2013

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

- **20 February**
- **10 April**
- **24 April**
- **5 june**
- **19 June**
- **then EPS, Code Camp , vacations ...**
- **18 September**

ISM mobility visits to JET

- **J. Bizarro, February 4-8, to work on current ramp down, finalisation of the paper**
- **I. Ivanova-Stanik, February 18-22, ITER modelling with COREDIV**
- **S. Moradi, April 15-26, to work with L. Garzotti on GYRO simulations for JET hybrid scenarios**
- **ITM mobility visit of R. Coelho, J. Ferreira, A. Figueiredo and F. Nabais . February 6 - 20**

Conferences/meetings:

- **IOS ITPA, April 15-18, Cadarache**
 - **D. Hogeweij et al, (a) Current ramp up modelling for ITER hybrid scenario; (b) first results of the C-Be-W modelling (George Sips's request)**
 - **I. Voitsekhovitch et al, Particle transport: sensitivity studies**

- **7th IAEA TM on Steady State Operation of Magnetic Fusion Devices, 14-17 May 2013, Aix en Provence, France. Abstract deadline: 15th February 2013 (JET abstract deadline 1st February 2013), poster deadline 1st May 2013, paper with Referee deadline 25th April 2013**
 - **J. Garcia / J. Citrin et al, poster on the modelling of ITER hybrid scenario**

- **20th Topical Conference on Radio Frequency Power in Plasmas, 25th June 2013 - 28th June 2013, Sorrento, Italy. Abstract deadline: 5th April 2013**

Conferences/meetings:

- **40th EPS conference on Plasma Physics, 1st July 2013 - 5th July 2013, Espoo, Finland. Abstract deadline: 23rd February 2013 (JET deadline 9th February 2013), poster and oral before 15th June 2013, paper without Referee before 2nd June 2013**
 - **A. Figueiredo et al, Modelling of JET discharges with ETS code**
 - **E. Barbato et al, LHCD modelling of JET discharges**
 - **I. Ivanova-Stanik et al, Modelling of impurity transport with ETS**

- **PLASMA-2013 International Conference on Research and Applications of Plasmas, 2nd September 2013 - 6th September 2013 Warsaw, Poland. Abstract deadline: 17th March 2013**

Conferences/meetings:

- **H-mode and ITB workshop, October 2013, Japan**
 - **Dick Hogeweij et al Modelling of current ramp up / down**
 - **Jeronimo Garcia et al Comparison of JET/JT60U shots**

Publications

- **J. Bizarro et al, Modelling the Ohmic L-mode ramp-down phase of JET hybrid pulses using Bohm-gyro-Bohm transport (Nucl. Fusion)**
- **L. Garzotti, S. Moradi et al, paper on particle transport in HS based on Luca's EPS 2012 paper**
- **I. Voitsekhovitch et al, paper on self-consistent modelling of hybrid scenarios with GLF23 model**
- **J. Garcia Current diffusion of JET hybrid scenario with C wall (Nucl. Fusion)**
- **J. Garcia Comparison of JET/JT60U shots. Extrapolation to JT60SA**
- **S. Wiesen, F. Köchl et al, Integrated ITER scenario modelling and density evolution prospects**
- **F. Köchl et al, paper on ELM mitigation in progress**
- **G. M. D. Hogeweij et al, paper on the experiments and modelling of the ITER-like RU/RD on JET is planned**

ISM-CfP 2013 the main effort will be focused on

- **systematic use of the ETS workflows for:**
 - reproducing the ITER scenarios developed with the existing integrated modelling codes (CRONOS, ASTRA, JETTO) and
 - complementing those studies with the calculation of edge MHD stability and core turbulence if corresponding WFs are available
- **modelling of physics issues relevant towards the extrapolation of the scenarios with a metallic walls to ITER, using existing codes and the ITM workflows**
 - e.g. such as impurity transport, coupled core and edge transport, edge stability, vertical stability.
 - requires to validate the integrated modelling against experimental data from European tokamaks.

WP13-ITM-ISM-ACT1 : Support to the validation and physics application of the ETS and ITM workflows

T1. Benchmarking of new modules integrated within ETS workflows, following the ETS development (in collaboration with EDRG, IMP3, IMP4-ACT4 and IMP5-ACT1):

V. Basiuk (benchmarking of the models in ETS_C)

I. Ivanova-Stanik, P. Belo, F. Nave (Ni radiation)

F. Nave, I. Ivanova-Stanik (neutral module)

P. Strand, J. Bizarro, E. Fable (theory-based transport models)

WP13-ITM-ISM-ACT1 : Support to the validation and physics application of the ETS and ITM workflows

T2. ETS validation and application of ITM workflows to physics studies:

a. Modelling of ITER scenarios with ETS workflows, based on the existing scenario developed with CRONOS, JETTO and ASTRA (in collaboration with IMP12, IMP3, IMP4 and IMP5) (V. Basiuk, J. Garcia, ...)

b. Effect of NTM on transport and confinement in Hybrid Scenarios, estimation of island width. (JET, ASDEX-Upgrade or ITER discharges (in collaboration with IMP12-ACT1, IMP3-ACT1) (S. Nowak, O. Sauter, A. Merle, V. Basiuk, D. Kalupin)

c. Core impurity transport and radiation in JET (C & ILW) and ASDEX-Upgrade (W wall) (in collaboration with IMP3-ACT1) (I. Ivanova-Stanik, Yu. Baranov, J. Ferreira, D. Kalupin)

d. Self-consistent (T_e , T_i , n_e , j) predictive modelling for JET plasmas with the ETS – increase of the database, particle transport (A. Figueiredo, J. Ferreira, D. Kalupin, V. Basiuk, X. Litaudon)

e. Equilibrium and MHD stability simulations (task continuation) (F. Nabais, J. Urban, ...)

WP13-ITM-ISM-ACT2: Interpretative and predictive integrated scenario modelling on existing devices

- 1. Modelling of density evolution self-consistently with current diffusion and temperatures, validation of first principle transport models (TGLF, QualiKiz). Current ramp down modelling including the H to L transition.**
- 2. Comparison and modelling of JT-60U and JET plasmas in typical operational domains.**
- 3. Comparison of current diffusion, transport and confinement in JET C and ILW discharges.**
- 4. Impurity transport in JET ILW discharges, effect of impurity on plasma confinement.**
- 5. Pedestal-SOL modelling for JET ILW discharges**

WP13-ITM-ISM-ACT2: Interpretative and predictive integrated scenario modelling on existing devices

When working with the JET data proposed to ISM for the model validation:

- **discharges selected for ISM should be previously agreed by the TF leader and SC**
- **in case of publication please follow the JET rules and involve SC as co-authors if the data have not been published**

WP13-ITM-ISM-ACT2: Interpretative and predictive integrated scenario modelling on existing devices

➤ Request for ASDEX-Upgrade data for:

- NTMs (ACT1)**
- impurity (ACT1 & 2)**
- current ramp up (ACT2)**
- current ramp down (ACT2)**
- ...**

ACT-2 tasks and people

Task	Responsible
<p>WP13-ITM-ISM-ACT2-01/Belgium_ERM-KMS</p> <p>Simulation with the self-consistent COREDIV code of JET and JT-60U plasmas in different scenarios with special emphasis on impurity transport issues.</p>	<p>Giuseppe TELESCA</p>
<p>WP13-ITM-ISM-ACT2-01/CCFE</p> <p>Development and validation of plasma scenarios simulations for existing devices. Dr Elina Militello Asp will contribute in particular to the validation of first principle transport models</p>	<p>Elina Militello Asp, Luca Garzotti</p>
<p>WP13-ITM-ISM-ACT2-01/CEA</p> <p>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 JT60U plasmas. Predictive and Interpretative simulations of the same discharges</p>	<p>J. Garcia, B. Baiocchi, D. Moreau</p>
<p>WP13-ITM-ISM-ACT2-01/ENEA_Frascati</p> <p>Interpretative and predictive modeling of JET discharges in the presence of LHCD by ASTRA and JETTO. Study the effect of LHCD on the q profile.</p>	<p>E. Barbato</p>
<p>WP13-ITM-ISM-ACT2-01/FOM</p> <p>Modelling of C wall discharges by replacing C with Be and W to check the effect of impurity on current diffusion (request of IOS-ITPA, work in progress)</p>	<p>D. Hogeweij</p>
<p>WP13-ITM-ISM-ACT2-01/IPP</p> <p>Improvement of theory-based descriptive capability of existing experiments</p>	<p>E. Fable</p>

ACT-2 tasks and people

<p align="center">WP13-ITM-ISM-ACT2-01/IPPLM</p> <p align="center">Impurity transport in JET ILW discharges, effect of impurity on plasma confinement – <i>data analysis of ILW shots to be moved under the JET Task. Simulations of C wall shots given to ISM replacing C with Be and W to check the effect on confinement still can be done under ISM.</i></p>	<p align="center">Roman Stankiewicz, Irena Ivanova-Stanik</p>
<p align="center">WP13-ITM-ISM-ACT2-01/IST</p> <p align="center">Current ramp down simulations in carbon shots at higher density.</p>	<p align="center">João Bizarro</p>
<p align="center">WP13-ITM-ISM-ACT2-01/ÖAW</p> <p align="center">Continuation / finalization of projects related to partly / fully predictive integrated scenario modelling, focusing on the modelling of particle transport and the analysis of transient events in JET plasmas.</p>	<p align="center">Florian Köchl</p>
<p align="center">WP13-ITM-ISM-ACT2-02/CEA</p> <p align="center">First exploitation of ETS-C for analyzing JET discharges</p>	<p align="center">Xavier Litaudon</p>
<p align="center">WP13-ITM-ISM-ACT2-01/TEKES</p> <p align="center">Transport properties of the dimensionless identity experiment performed between JET and JT-60U Advanced Tokamak (AT) scenarios. The main emphasis is on understanding the evolution of the plasma current</p>	<p align="center">Paula Siren</p>

WP13-ITM-ISM-ACT3: Support to predictive scenario modelling for future devices (e.g. JT-60SA, ITER, DEMO)

- 1. Current diffusion and transport modelling for ITER hybrid current ramp down**
- 2. Predictive density modelling with first principle models for ITER, addressing the density peaking effect.**
- 3. ITER scenario modelling with METIS (operational domain ...) including simulation of the real time control of the fusion burn.**
- 4. Expansion of the operational domain of ITER hybrid scenario with q on-axis below one by controlling the sawtooth period**
- 5. 1D 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 ISM-ACT2.**
- 6. DEMO modelling using ITM Kepler workflows, in coordination with EFDA PPPT Work Programme (in collaboration with IMP3-ACT1-T9]**

ACT-3 tasks and people

Task	Responsible
WP13-ITM-ISM-ACT2-01/Belgium_ERM-KMS Predictive density modelling with first principle models for ITER, addressing the density peaking effect. DEMO modelling using ITM Kepler workflows, in coordination with EFDA PPPT Work Programme (in collaboration with IMP3-ACT1-T9)	B. Baiocchi, J. Garcia, C. Reux
WP13-ITM-ISM-ACT3-01/ENEA_Frascati Predictive scenario modeling of JT-60SA by using different transport models in ASTRA.	E. Barbato
WP13-ITM-ISM-ACT3-01/ENEA_RFX 1D JT-60SA scenario modelling: implementation of the JT-60SA H&CD configuration (NBI) in EU transport codes, in particular CRONOS.	T. Bolzonella
WP13-ITM-ISM-ACT3-01/FOM Model current ramp-down phase for ITER, starting from a standard H-mode (15 MA) or hybrid (12 MA) scenario with full alpha heating. Emphasis will be on the careful ramping down in H-mode as far as feasible.	D. Hogewej
WP13-ITM-ISM-ACT3-01/IPP Improvement of predictive capability of foreseen devices using existing theory knowledge	E. Fable
WP13-ITM-ISM-ACT3-01/IPPLM DEMO modelling using ITM Kepler workflows, in coordination with EFDA PPPT Work Programme (in collaboration with IMP3-ACT1-T9)	R. Stankiewicz, I. Ivanova-Stanik

ACT-3 tasks and people

Task	Responsible
WP13-ITM-ISM-ACT3-01/ÖAW Continuation / finalization of projects related to partly / fully predictive integrated scenario modelling, focusing on the modelling of particle transport and the analysis of transient events in ITER plasmas.	Florian Köchl
WP13-ITM-ISM-ACT3-02/CEA JT-60SA modeling, ITER, WEST modeling with METIS	Xavier Litaudon