

# ADAS-EU: Final meeting and special workshop

Location: HOW room, JET Facility, Culham Laboratory

Date: 30 Sep 2013 - 3 Oct 2013

*Summary:* The ADAS-EU Euratom - Framework 7 Support Action of the European Community commenced on 1 Jan 2009 and terminates on 30 Sep 2013. ADAS-EU in association with the ADAS Project has maintained atomic physics capabilities, developed new aspects and sought to anticipate future needs as required for fusion in Europe and for ITER. To disseminate and inform on these developments, ADAS-EU during the Spring and Summer of 2013 has sponsored special workshop/ advanced training courses at fusion laboratories across the world. This last meeting and workshop is the summative and concluding one.

The first half-day session is introductory, including an overview of the scope, principal themes and successes of ADAS-EU. The following four half-day sessions examine in detail the current state of the ADAS-EU scientific themes, reflected in and accessible through ADAS. There are eight modules of one and a half hours duration, each comprising a 45 minute lecture, presented by Prof. Hugh Summers and a 45 minute active ADAS demonstration, presented by Dr. Martin O'Mullane and Dr. Alessandra Giunta. For some of the modules, the demonstration session includes a short special update talk by an ADAS-EU associated expert. The final half-day session will seek to draw together opportunities and suggestions for on-going collaborative work on atomic physics within the framework of the ADAS Project, cooperation in Europe and engagement with ITER and ITER participant countries. It will also seek suggestions and opinion on the long-term profile of ADAS.

*Arrangements:* The meeting has fusion and astrophysics relevance and is open. All are welcome. The meeting will be broadcast with remote participation. Coffee will be available between sessions.

H.P. Summers  
18 Sep 2013

## General Agenda

30 Sep 2013:

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|----------------|---|-------------------------|
| 14.00 - 14.30: | Welcome   | Dr. Lorne Horton        |
| 14:30 - 15.00: | General introduction on behalf of the EU and Euratom. | Dr. Lars-Goran Eriksson |
| 15:00 - 15.30: | Atomic physics and the ITER perspective.              | Dr. Mike Walsh          |

Coffee break

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|----------------|--|---------------------|
| 16.00 - 16.45: | Overview of ADAS and ADAS-EU principal scientific themes, objectives and relationships | Prof. H. P. Summers |
|----------------|--|---------------------|

1 Oct 2013:

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|----------------|--|-----------------------------------|
| 08.45 - 09.30  | <b>Module 1:</b> Impurity atomic species in fusion plasma, their ionisation state and radiating characteristics. | Prof. H. P. Summers               |
| 09.30 - 10.15: | <i>Demonstrations</i>  | Dr. M. G. O'Mullane/Dr. A. Giunta |

*Coffee break*

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|----------------|---|-----------------------------------|
| 10.30 - 11.15: | <b>Module 2:</b> Complex species in core and edge of the fusion plasma: Describing and calculating their characteristics - the current state. | Prof. H. P. Summers               |
| 11:15 - 12.00: | <i>Demonstrations</i>   | Dr. M. G. O'Mullane/Dr. A. Giunta |

Lunch

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|----------------|---|-----------------------------------|
| 13.00 - 13.45: | <b>Module 8:</b> Spectral diagnostics for special environments - the interface between fusion and astrophysics. | Prof. H. P. Summers               |
| 13.45 - 14.30: | <i>Demonstrations</i>   | Dr. M. G. O'Mullane/Dr. A. Giunta |

Coffee break

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|----------------|---|---------------------|
| 14.45 - 15.30: | <b>Module 7:</b> Calculating fundamental atomic structure and electron impact cross-section data - Autostructure and R-matrix | Prof. H. P. Summers |
|----------------|---|---------------------|

15.30 - 16.15:	<i>Demonstrations</i> <i>Special presentation (Update on R-matrix &amp; Autostructure)</i>	Dr. M. G. O'Mullane/Dr. A. Giunta Prof. N. R. Badnell
16:15 - 16.30:	Question and answer session	Prof. H. P. Summers/ Dr. M. G. O'Mullane/Dr. A. Giunta
2 Oct 2013:		
08.45 - 09.30:	<b>Module 5:</b> Charge exchange and beam emission spectroscopy. Modelling emitter populations, beam stopping and analysing spectra.	Prof. H. P. Summers
09.30 - 10.15:	<i>Demonstrations</i>	Dr. M. G. O'Mullane/Dr. A. Giunta
<i>Coffee break</i>		
10.30 - 11.15:	<b>Module 6:</b> Advanced charge exchange plasma receiver and beam donor modelling - the current state	Prof. H. P. Summers
11:15 - 12:00:	<i>Demonstrations</i>	Dr. M. G. O'Mullane/Dr. A. Giunta
Lunch		
13.00 - 13.45:	<b>Module 3:</b> H <sub>2</sub> molecular emission and collisional-radiative modelling.	Prof. H. P. Summers
13.45 - 14.30:	<i>Demonstrations</i> <i>Special presentation (JET H<sub>2</sub> spectra)</i> <i>Special presentation (Update on H<sub>2</sub> vibronic modelling)</i>	Dr. M. G. O'Mullane/Dr. A. Giunta Prof. K. H. Behringer Dr. Francisco Guzman
Coffee break		
14.45 - 15.30:	<b>Module 4:</b> modelling and analysing spectral features - a unified approach.	Prof. H. P. Summers
15.30 - 16.15:	<i>Demonstration</i> <i>Special presentation (JET spectral series)</i>	Dr. M. G. O'Mullane/Dr. A. Giunta Dr. A. Meigs
16:15 - 16.30:	Question and answer session	Prof. H. P. Summers/ Dr. M. G. O'Mullane/Dr. A. Giunta

3 Oct 2013: Shaping ADAS for the future

08.45 - 09.00:	Initial remarks and guidance for the discussions	Dr. K--D Zastrow (Session chairman)
09.00 - 10.00:	Experimental spectroscopy/ modelling/analysis - what do we need from ADAS? What are the opportunities for collaboration?	Discussion led by Dr. S. Brezinsek
10.00 - 11.00:	What should the ADAS profile be through to ITER and how should it be staffed and resourced?	Discussion led by Dr. W. Morris
Coffee break		
11.15 - 12.00:	Completing remarks (Summary of the workshop/course opinions, thoughts and the next steps)	Prof. H. P. Summers

THE END

## Module contents

- Module 1: preliminaries and nomenclatures; basic population structure in plasmas; reaction processes and their description; ADAS population and ionisation state modelling; conclusions.
- Module 2: preliminaries; the whole atom, truncation, collisionality and top-up; ionisation state, partitions, condensations and superstages; supplementary modelling for dielectronic recombination, ionisation and impurity influx; conclusions.
- Module 3: preliminaries and nomenclatures; the molecular H<sub>2</sub> database; vibronic collisional-radiative modelling; rovibrational spectral simulation and comparison; conclusions.
- Module 4: preliminaries and nomenclatures; ADAS special features - application programming interface (API) and AFG; ADAS605; combination of functions for spectral fitting - FFS; conclusions.
- Module 5: preliminaries; modelling populations and emission following charge transfer; charge exchange spectroscopy, modelling beam stopping and emission; integrated analysis; conclusions.
- Module 6: charge exchange data for medium-weight and heavy receiver ions; extending population models for medium-weight receivers; exact Stark atom representations and field ionisation; collisions, directionality and orientation; conclusions.
- Module 7: preliminaries; atomic structure and collision cross-sections with the COWAN code; atomic structure and collision cross-sections with the AUTOSTRUCTURE code; mass production of data with scripts; collision cross-sections with the R-matrix code; conclusions.
- Module 8: introduction; emissivities, line-ratio studies and contribution functions; differential emission measure (DEM) analysis; escape probabilities and opacity; non-Maxwellian electron distributions; conclusions.