**Presentation of the ITER Goal Oriented Training Program on Port Plug Engineering**

**Auteur(s)**

L. Doceul, P. Messina

**Résumé**

Presentation of the ITER Goal Oriented Training Program on Port Plug Engineering done during SOFT-26 EFDA GOT PROGRAMS satellite meeting on Wednesday 29 September 2010

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**Destinataires :**


EFDA : B. Franel, A. Malaquias, S. Gonzalez

FZJ: O. Neubauer, R. Voinchet

FZK: A. Gaetano, H. Neuberger, T. Scherer, C. Zeile

HAS: G. Grunda, J. Nemeth

IO: B. Levisy

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**Visa Rédacteur**

L. Doceul

date : signé le

**Visa Vérificateur**

date :

**Visa Qualité, Structure**

date :

**Visa émetteur**

M. Faury
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<tr>
<th>Structure</th>
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Recall of the aim of this training programme:

It is intended to train early-stage engineers during 3 years. This program will take place within a large collaborative group to provide the technical know-how in fusion technology. The participating “Host Associations” will host at least one trainee each, covering fields where special knowledge or facilities is located at these associations. Each trainee will work on particular engineering tasks falling under a defined project within the “Host Association” together with the other participating partners supporting the project (about 80% within host association, 20% within partner associations).

Specific courses will also be chosen in order to quickly become familiar with fusion physics and fusion technology. The trainee will also take an active part to operational activities.
Introduction to the PPE Work Programme:

The thematic of the PPE WP is in the field of Engineering Design and Construction, this training program is associated to the procurement of the ITER Port Plug including: design, structural analysis, neutronics, material requirement, nuclear requirement, safety, manufacturing aspect, assembly aspect, maintainability.

The official starting date of the ITER GOT PPE is 1st September 2008 established for 4 years the first year being devoted to the recruitment of the trainees.

The leading association for the programme achievement is CEA

Six work packages of three years duration are identified: 2 CEA, 1 FZJ, 2 KIT, and 1 HAS

The starting date of each work package being the official date of each euro-trainee recruitment.
PLANNING

SCOPE

TOPICS

WORK STATUS

ACHIEVEMENTS

CONCLUSION

Visiting researcher at ITER Organization, Nuclear Safety & Environment Division

Analysis of the effect of different configurations of the neutron flux penetrations on the back of the Equatorial Port Plug
Preliminary neutronic analyses of ITER High Resolution Neutron Spectrometer collimator

SCOPE
- TOPICS
- WORK STATUS
- ACHIEVEMENTS
- CONCLUSION

Design and Remote Handling activities supported by virtual reality tools, application on TBM EQPP 16

ITER Port tolerancing study for remote handling compliance
Perspectives for using a Virtual Reality Platform in CEA IRFM

Aiming to give more realism to the maintenance scenario and CAD models, CEA IRFM decided to build a Virtual Reality platform in the institute, integrated to the design office. The objective of the Virtual Reality platform at IRFM is to simulate maintenance scenario with master-slave manipulators, the operator is immersed in the scene as if he had to do it in real. This mean could help to validate RH compatibility assessment for ITER, operation maintenance and to optimize the design process. This platform could be used in fine for maintenance scenario validation, design review and also for operator training.

The operator can interact with the virtual environment in real time through a haptic device with force feedback.

Virtuose 6D 35-45 - Haption

Host Association: FZK

Associated: CEA, HAS

Companies/Industries: Kloppein GmbH, Bruh-Wellman, Reuter GmbH

Universities: University Karlsruhe

Prototyping and testing of the BSM identify the optimum manufacturing strategy for double wall components
Experimental outgassing measurements for the structural material of the ECH UL

An experimental setup has been developed to investigate the partial outgassing rates $q$ of HIPed stainless steel samples. Outgassing depends on temperature, time, surface finish...

Interface programs are able to convert CAD (Catia) geometry data into a suitable model for the Monte Carlo transport code MCNP.

Design and Analysis of the attachment system between TBM HCPB and Shield

L. Doceul / SOFT 2010 EFDA GOTP satellite meeting
Technical Work

Design and Analysis of the attachment system between TBM HCPB and Shield including:
- New arrangement of 4 blocks
- Improvement of lamella design
- Design of the connection to the shield
- Optimization of the transition between back plate and block

Design optimization based on thermo-mechanical analyses

Deformation due to thermal expansion and mechanical loads
Resulting mechanical stresses

SCOPE TOPICS

WORK STATUS

ACHIEVEMENTS

CONCLUSION

Thermal analysis for MAST Beam Emission Spectroscopy In-vessel Optics
Mechanical assessment of the TBM AEU supporting structure
Thermal analysis of the EQPP 1 and its associated diagnostic.
**SCOPES**

- **IMF1 (responsible: Theo Sherer):**
  Thermal and mechanical comparison of different geometries of cooling channels in the prototype for the cooled double-wall structure of the EC-H&CD Upper launcher:

- **INR (responsible: Heiko Neuberger):**
  Transient thermal analysis of the TBM for accident simulation (plasma shut-down and helium cooling interruption) up to 86400s (24h).

**COURSES AND EVENTS**

- **FZK Summer school**
  3rd Karlsruhe International School on Fusion Technologies at Forschungszentrum Karlsruhe, Germany, August 31-September 11, 2009

- **JET-Culham**
  EFTS_EODI training week, 8-12 June 2009

- **CEA-Cadarache**
  Specificities INB ITER for CEA/IRFM-AREVA TA Training Session, 8-11 December 2009

**Training on Engineering Tools:**

- CATIA V5 Training: Basic and advanced
- Ansys Workbench and Classic
- PDM System: Smarteam
### Sharing between association

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<td>WP1/CEA</td>
<td>Host WP1/CEA</td>
<td>2 months Neutronics Oct-Nov 2010</td>
<td>3 months Manufacturing 2011</td>
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<td>WP2/CEA</td>
<td>1 month RH ECRH 2011</td>
<td>1 month RH TBM 2011</td>
<td>3 months Diag assembly End of 2010</td>
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<td>WP3/KIT</td>
<td>2 months Diagnostics May-June 2010</td>
<td>1 months Remote Handling July 2010</td>
<td>3 months Diag assembly End of 2010</td>
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<td>3 months Design 2011</td>
<td>3 months Assembly 2011</td>
<td>3 months Analysis 2011-2012</td>
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<td>WP5/HAS</td>
<td>3 months Analyses EQPP Diag Oct-Nov-Dec 2010</td>
<td>1.5 months Analyses EQPP ECRH 2011</td>
<td>1.5 months Analyses UPPP TBM 2011</td>
<td>2 months Analyses UPPP CXRS 2011</td>
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<td>WP6/FZJ</td>
<td>2 month Design EQPP Diag Sept-Oct 2010</td>
<td>1 month Design UPPP ECRH June-July 2010</td>
<td>1 month Design EQPP TBM July 2010</td>
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### Sharing with industry

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SOFT 2010 participation:

M. Dapena: Preliminary neutronic analyses of ITER High Resolution Neutron Spectrometer collimator
J. Wagrez: ITER Port tolerancing study for remote handling compliance
G. Aiello: Outgassing measurements for the ITER EC H&CD Upper Launcher
C. Zeille: ITER PPE Trainee Program: Design of an attachment system for integration of plasma-facing test components
J. Nemeth: Thermo mechanical analyses of in-vessel components
R. Voinchet: Thermo-hydraulic analysis of the First Mirror and its cooling system for the ITER core CXRS diagnostic

Conclusion

The thematic of the ITER Goal Oriented Training Programme on Port Plug Engineering is associated to the procurement of the ITER Port Plug.

Six work packages of three years duration are identified: 2 CEA, 1 FZJ, 2 KIT, and 1 HAS.

The ITER GOT PPE training program will run from the 01 September of 2008 to the 07 July of 2012.

This programme is now running effectively and in good accordance with the spirit of the Task Agreement WP08-GOT-ITER_PPE signed with EFDA.

The sharing between associations and sharing with industry is organised for 2010 and 2011.
Thank you for your attention