

PPPL- 5225

Electro-Magnetic Analysis of the ITER Upper Visible Infrared Wide Angle Viewing System

M. Smith ^a, Y. Zhai^a, A. Jariwala^a, T. Edgemon^a, L. Konkel^a,
M. Smiley^b, J. Vasquez^b, A. L. Verlaan^c, J. A. C. Heijmans^c

^aPrinceton Plasma Physics Lab, Princeton, NJ, USA

^bGeneral Atomics San Diego, CA

^cTNO Netherlands

February 2016



Princeton Plasma Physics Laboratory

Report Disclaimers

Full Legal Disclaimer

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, nor any of their contractors, subcontractors or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or any third party's use or the results of such use of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or its contractors or subcontractors. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

Trademark Disclaimer

Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or its contractors or subcontractors.

PPPL Report Availability

Princeton Plasma Physics Laboratory:

<http://www.pppl.gov/techreports.cfm>

Office of Scientific and Technical Information (OSTI):

<http://www.osti.gov/scitech/>

Related Links:

[U.S. Department of Energy](#)

[U.S. Department of Energy Office of Science](#)

[U.S. Department of Energy Office of Fusion Energy Sciences](#)

Electro-Magnetic Analysis of the ITER Upper Visible Infrared Wide Angle Viewing System

M. Smith^{a,1}, Y. Zhai^a, A. Jariwala^a, T. Edgemon^a, L. Konkel^a,
M. Smiley^b, J. Vasquez^b, A. L. Verlaan^c, J. A. C. Heijmans^c,
^a*Princeton Plasma Physics Lab, Princeton, NJ, USA*
^b*General Atomics San Diego, CA,* ^c*TNO Netherlands*
¹ email: msmith@pppl.gov

The Upper Visible Infrared Wide Angle Viewing System (UWAVS) is a diagnostic used in five upper ports of ITER. Each UWAVS provides visible and infrared views of various sections of the divertor. A single UWAVS is designed in three main sections: in-vessel, interspace and port cell assemblies. Each assembly utilizes multiple steering and relay mirrors to direct the in-vessel light out of the tokamak to the port cell camera sensors.

For the in-vessel components, the transient electro-magnetic (EM) environment resulting from the ITER magnet operation and plasma events induces design driving Lorentz forces. As such, all in-vessel systems require detailed electro-magnetic finite element analysis (FEA) to derive the resulting time dependent Lorentz loads.

Ansys Maxwell software was used to perform transient electro-magnetic simulations of the UWAVS in ITER upper port 14. A 20 degree sector, cyclic symmetric model was employed and included, inner and outer vacuum vessel, blanket shield modules, diagnostic fist wall (DFW) and shield module (DSM), upper port structure, DSM shield blocks, and a detailed model of the UWAVS in-vessel assembly.

The resulting data includes eddy current density and vector plots along with force and moment summation for various UWAVS components. Front end optical components are specifically reported upon as these components have significant EM loads.

This work is supported by US DOE Contract No. DE-AC02-09CH11466. All US activities are managed by the US ITER Project Office, hosted by Oak Ridge National Laboratory with partner labs Princeton Plasma Physics Laboratory and Savannah River National Laboratory. The project is being accomplished through a collaboration of DOE Laboratories, universities and industry. The views and opinions expressed herein do not necessarily reflect those of the ITER Organization.

TOFE Track and Session: 3f – Diagnostics (plasma and other)
Oral or poster preference: poster

Princeton Plasma Physics Laboratory Office of Reports and Publications

Managed by
Princeton University

under contract with the
U.S. Department of Energy
(DE-AC02-09CH11466)

P.O. Box 451, Princeton, NJ 08543
Phone: 609-243-2245
Fax: 609-243-2751

E-mail: publications@pppl.gov
Website: <http://www.pppl.gov>