

Third IAEA Technical Meeting on Divertor Concepts

Monday, 4 November 2019 - Thursday, 7 November 2019

IAEA Headquarters, Vienna, Austria

Programme

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Monday 04 November 2019

Registration - Board Room C (C Building, 4th Floor) (4 Nov 2019, 08:30-09:00)

Arrival of participants, distribution of badges, possibility to register and pay for events.

Welcome and Opening - Board Room C (C Building, 4th Floor) (4 Nov 2019, 09:00-09:30)

Welcome addresses by the IAEA and by Programme Committee.

-Conveners: Denecke, Melissa (IAEA); Barbarino, Matteo (International Atomic Energy Agency); Leonard, Anthony W. (USA)

Plasma Facing Component Design - Board Room C (C Building, 4th Floor) (4 Nov 2019, 09:30-10:20)

Oral sessions collect all contributions invited or accepted by the Programme Committee for a complete in depth plenary session. The reserved time slot for 30' talks is 25' for presentation and 5' for discussion. The reserved time slot for 20' talks is 17' for presentation and 3' for discussion.

time	[id] title	presenter
09:30	[18] Development and testing results of water-cooled divertor target concepts for EU DEMO reactor	VISCA, Eliseo (ENEA)
10:00	[23] New developments in the design of a helium-cooled divertor for the European DEMO	GHIDERSA, Bradut-Eugen (Karlsruhe Institute of Technology)

Coffee Break - Board Room C (C Building - 4th Floor) (10:20-10:40)

Plasma Facing Component Design: Continued - Board Room C (C Building, 4th Floor) (4 Nov 2019, 10:40-11:20)

Oral sessions collect all contributions invited or accepted by the Programme Committee for a complete in depth plenary session. The reserved time slot for 30' talks is 25' for presentation and 5' for discussion. The reserved time slot for 20' talks is 17' for presentation and 3' for discussion.

time	[id] title	presenter
10:40	[75] Additive manufacturing of tungsten by means of laser powder bed fusion for plasma-facing component applications	VON MÜLLER, Alexander (Max-Planck-Institut für Plasmaphysik)
11:00	[36] Damages on tungsten plasma facing components after experimental campaigns in WEST	FIRDAOUSS, Mehdi (CEA/IRFM)

Discussion Session: PFC Components - Board Room C (C Building, 4th Floor) (4 Nov 2019, 11:20-12:10)

Discussion sessions aim at identifying the most critical issues, based on both their uncertainty and impact, and what would be the most productive path to address those issues. These findings will be compiled in a report highlighting issues and approaches to resolution for future divertor design.

Divertor Plasma Control - Board Room C (C Building, 4th Floor) (4 Nov 2019, 12:10-13:10)

time	[id] title	presenter
12:10	[59] Using variations in divertor magnetic topology and geometry to optimize divertor detachment	LIPSCHULTZ, Bruce (University of York)
12:30	[68] The Small Angle Slot Divertor Concept for Steady-State Fusion	GUO, Houyang (General Atomics)
12:50	[42] Latest advances in active control of H-mode detachment and its physics on EAST for ITER/CFETR	WANG, Liang (Institute of Plasma Physics, Chinese Academy of Sciences (ASIPP))

Lunch - Board Room C (C Building - 4th Floor) (13:10-14:50)

Divertor Plasma Control: Continued - Board Room C (C Building, 4th Floor) (4 Nov 2019, 14:50-15:10)

time	[id] title	presenter
14:50	[58] X-point radiation and detachment control at ASDEX Upgrade	BERNERT, Matthias (IPP Garching, Germany)

Discussion Session: Divertor Control - Board Room C (C Building, 4th Floor) (4 Nov 2019, 15:10-16:10)

Discussion sessions aim at identifying the most critical issues, based on both their uncertainty and impact, and what would be the most productive path to address those issues. These findings will be compiled in a report highlighting issues and approaches to resolution for future divertor design.

Coffee Break - Board Room C (C Building - 4th Floor) (16:10-16:30)

Poster Session I - Board Room C (C Building - 4th Floor) (4 Nov 2019, 16:30-18:30)

All submissions accepted as "Poster" should provide a poster conforming to the rules published in the meeting announcement. Posters will be shown outside of Board Room C near by the coffee area.

Board numbers correspond to Indico [ID] numbers.

[id] title	presenter	board
[44] Advanced divertor detachment in H-mode and baffled TCV plasmas	THEILER, Christian (EPFL-SPC)	
[29] Flat Tungsten High Heat Flux Components Development Based On Different Technologies	YAO, Damao (Institute of Plasma Physics Chinese Academy of Sciences)	
[73] Modelling of cooling performance in single and multi-channel high heat flux structures for fusion applications	SHARP, Samuel (Loughborough University)	
[28] Simulation study of the radiative quasi-snowflake divertor for CFETR	YE, Minyou (University of Science and Technology of China)	
[38] A multi-physics modeling approach to predicting erosion, re-deposition and gas retention in fusion tokamak divertors	WIRTH, Brian (University of Tennessee, Knoxville)	
[32] A Study of the Maintainability of the Lower (Divertor) Port & Divertor Cassette	WILDE, Andrew (UKAEA)	

[56] Investigation of detachment in Double-Null configurations in the TCV tokamak	FÉVRIER, Olivier (Ecole Polytechnique Fédérale de Lausanne (EPFL), Swiss Plasma Center (SPC), CH-1015 Lausanne, Switzerland)	
[17] Thermal hydraulic modeling and analysis of ITER tungsten divertor mono block	EL-MORSHEDY, Salah El-Din (Prof. Dr. of Thermal-hydraulics, Egyptian Atomic Energy Authority)	
[5] Activity and Decay Heat Estimates for the European DEMO Divertor with Respect to WCLL and HCPB Breeder Blanket Module Integration	TIDIKAS, Andrius (Lithuanian Energy Institute)	
[49] DEMO Divertor - Cassette Design and Integration	MAZZONE, Giuseppe (ENEA Department of Fusion and Technology for Nuclear Safety and Security, via E. Fermi 45, 00044 Frascati, Italy)	
[7] Radiation-condensation instability: a driver for up-down or in-out asymmetry of divertor plasma	KUKUSHKIN, Andrei (NRC Kurchatov Institute)	
[22] Some implications of recent technology advances on divertor physics performance requirements of DT fusion tokamaks	WISCHMEIER, Marco (IPP Garching)	
[51] Overview of the gas baffle effects on TCV Lower Single Null edge plasmas: multi-code simulations and comparison with experiments	GALASSI, Davide	
[63] The Impact of Nonambipolar Energy Flow on Plasma Facing Materials Erosion and Forecast for ITER.	KHIMCHENKO, Leonid (Institution "Project center ITER") BUDAEV, Viacheslav (RNC "Kurchatov Institute")	

Tuesday 05 November 2019

Registration - Board Room C (C Building, 4th Floor) (5 Nov 2019, 08:30-09:00)

Arrival of participants, distribution of badges, possibility to register and pay for events.

Implications of Applied 3D Fields - Board Room C (C Building, 4th Floor) (5 Nov 2019, 09:00-10:10)

time	[id] title	presenter
09:00	[77] Three-Dimensional Boundary Physics Aspects for the Development of Next Generation Divertor Concepts with Resonant Magnetic Perturbations	JAKUBOWSKI, Marcin (Max-Planck-Institut für Plasmaphysik)
09:30	[80] Recent progress in understanding the outer divertor heat flux dynamics during the ELM-crash-suppression by RMPs on KSTAR	LEE, Hyungho (National Fusion Research Institute)
09:50	[76] First-time analysis of detached divertor conditions in RMP ELM suppressed H-mode plasmas in ITER	FRERICHS, Heinke (University of Wisconsin - Madison)

Coffee Break - Board Room C (C Building - 4th Floor) (10:10-10:30)

Discussion Session: 3D Fields - Board Room C (C Building, 4th Floor) (5 Nov 2019, 10:30-11:10)

Discussion sessions aim at identifying the most critical issues, based on both their uncertainty and impact, and what would be the most productive path to address those issues. These findings will be compiled in a report highlighting issues and approaches to resolution for future divertor design.

Stellarators Divertors - Board Room C (C Building, 4th Floor) (5 Nov 2019, 11:10-12:30)

time	[id] title	presenter
11:10	[31] The Island Divertor Concept of the Wendelstein 7 Stellarator Line – Concept, Experimental Experience and Up-scaling to Reactor Relevant Size	KOENIG, Ralf (Max-Planck-Institut for Plasma Physics)
11:30	[39] Advantage and disadvantage of the LHD heliotron divertor	KOBAYASHI, Masahiro (NIFS)
11:50	[13] Divertor and Exhaust Modelling in the Framework of a Systems Code for a Stellarator Power Plant	WARMER, Felix (Max Planck Institute for Plasma Physics)

Discussion Session: Stellarators - Board Room C (C Building, 4th Floor) (5 Nov 2019, 12:30-13:10)

Discussion sessions aim at identifying the most critical issues, based on both their uncertainty and impact, and what would be the most productive path to address those issues. These findings will be compiled in a report highlighting issues and approaches to resolution for future divertor design.

Lunch - Board Room C (C Building - 4th Floor) (13:10-14:10)

Alternative Materials for PFCs - Board Room C (C Building, 4th Floor) (5 Nov 2019, 14:10-15:30)

time	[id] title	presenter
14:10	[65] Fast Flowing Liquid Metal Divertor Design Options: Experimental and Numerical Studies	EGEMEN, Kolemen (Princeton University)
14:40	[12] Liquid Metal Conceptual Divertor Designs for the European DEMO	MORGAN, Thomas (Dutch Institute for Fundamental Energy Research)
15:10	[20] Analyses and Experiments Towards a Lithium Vapor Box Divertor	GOLDSTON, Robert (Princeton University)

Discussion Session: Alternative Surfaces - Board Room C (C Building, 4th Floor) (5 Nov 2019, 15:30-16:10)

Discussion sessions aim at identifying the most critical issues, based on both their uncertainty and impact, and what would be the most productive path to address those issues. These findings will be compiled in a report highlighting issues and approaches to resolution for future divertor design.

Coffee Break - Board Room C (C Building - 4th Floor) (16:10-16:30)

Poster Session II - Board Room C (C Building - 4th Floor) (5 Nov 2019, 16:30-18:30)

All submissions accepted as "Poster" should provide a poster conforming to the rules published in the meeting announcement. Posters will be shown outside of Board Room C near by the coffee area.

Board numbers correspond to Indico [ID] numbers.

[id] title	presenter	board
[62] Impact of X-point geometry and neutrals recycling on edge plasma turbulence	TAMAIN, Patrick (CEA Cadarache)	
[67] KINETIC TRAJECTORY SIMULATION METHOD FOR INTERACTION OF MAGNETIZED PLASMA HAVING TWO SPECIES OF POSITIVE IONS WITH TUNGSTEN SURFACE	KHANAL, Raju (Tribhuvan University)	
[57] Tests of Plasma Facing Component Materials with Steady State Plasma	BUDAEV, Viacheslav (NRU "MPEI")	
[33] Integrating advanced plasma-wall interaction in 3D turbulent simulations for WEST	BUFFERAND, Hugo (CEA)	
[72] Impact of divertor configuration on tokamak performances: focus on WEST experiments supported by SOLEDGE2D modelling	CIRAOLO, GUIDO (CEA, IRFM)	
[48] Radiative divertor experiments with Ne, N, and Kr seeding in LHD	MUKAI, Kiyofumi (National Institute for Fusion Science)	
[71] Behaviour of Tin under Low-Temperature Deuterium Plasma Irradiation	NEU, R. (MPI für Plasmaphysik)	
[46] Importance of divertor physics modeling in system design of LHD-type helical reactor	KOBAYASHI, Masahiro (NIFS)	
[37] The role of molecular reactions on power, particle and momentum balance during detachment	VERHAEGH, Kevin (CCFE)	

[10] Characterization of liquid metals as prospective divertor materials under transient plasma loads	MAKHLAI, Vadym (National Science Center "Kharkov Institute of Physics and Technology", Institute of Plasma Physics)	
[3] Addressing the effect of $E \times B$ on closure divertor detachment onset by SOLPS	DU, Hailong (Southwestern Institute of Physics)	
[74] Two-phases hybrid model for neutral gas transport in Soledge2D-EIRENE	MARANDET, Yannick (PIIM, CNRS/Aix-Marseille Univ., Marseille, France, EU)	
[41] Liquid Metal Modeling for Plasma Facing Components	KHODAK, Andrei (Princeton Plasma Physics Laboratory)	
[61] Results of a model of interchange turbulent transport on the correlation between scrape off layer width and core confinement in tokamaks	FEDORCZAK, Nicolas (CEA)	
[6] Assessment of vapor shielding efficiency in lithium divertor for steady-state and transient events	MARENKOV, Evgeny (National Research Nuclear University MEPhI, Moscow, Russian Federation)	

Wednesday 06 November 2019

Registration - Board Room C (C Building, 4th Floor) (6 Nov 2019, 08:30-09:00)

Arrival of participants, distribution of badges, possibility to register and pay for events.

Core-Boundary Plasma Compatibility - Board Room C (C Building, 4th Floor) (6 Nov 2019, 09:00-10:20)

time	[id] title	presenter
09:00	[81] Core-pedestal constraints on divertor design	LEONARD, Anthony W. (USA)
09:30	[15] Role of transport versus fueling upon the pedestal density	MORDIJCK, Saskia (The College of William and Mary)
10:00	[47] Radiative Power Exhaust Research at DIII-D - From Divertor Science to Core-Edge Integration of High Performance Plasmas	JAERVINEN, Aaro (Lawrence Livermore National Laboratory)

Coffee Break - Board Room C (C Building - 4th Floor) (10:20-10:40)

Core-Boundary Plasma Compatibility: Continued - Board Room C (C Building, 4th Floor) (6 Nov 2019, 10:40-11:40)

time	[id] title	presenter
10:40	[43] Experimental studies of the nitrogen concentration required for divertor detachment in ASDEX Upgrade	HENDERSON, Stuart (UKAEA)
11:00	[66] Progress towards understanding ITER's divertor heat-flux width from gyrokinetic simulation	CHANG, C.S. (Princeton Plasma Physics Laboratory)
11:20	[16] On the Divertor Heat Flux Width Scaling	XU, Xueqiao (Lawrence Livermore National Laboratory)

Discussion Session: Core-Edge - Board Room C (C Building, 4th Floor) (6 Nov 2019, 11:40-12:30)

Discussion sessions aim at identifying the most critical issues, based on both their uncertainty and impact, and what would be the most productive path to address those issues. These findings will be compiled in a report highlighting issues and approaches to resolution for future divertor design.

DEMO Divertor Designs - Board Room C (C Building, 4th Floor) (6 Nov 2019, 12:30-13:20)

Plenary sessions collect all contributions invited or accepted by the Programme Committee for a complete in depth plenary session.

time	[id] title	presenter
12:30	[19] Overview of the physics and diagnostics modelling activities for the EU-DEMO divertor	SICCINIO, Mattia (EUROfusion Consortium)
13:00	[79] Insights from Systems Code Analysis on Power Exhaust Requirements for Future Fusion Power Systems	WADE, Mickey R. (General Atomics)

Lunch - Board Room C (C Building - 4th Floor) (13:20-14:30)**DEMO Divertor Designs: Continued - Board Room C (C Building, 4th Floor) (6 Nov 2019, 14:30-15:10)**

Plenary sessions collect all contributions invited or accepted by the Programme Committee for a complete in depth plenary session.

time	[id] title	presenter
14:30	[25] Investigation of divertor operation for Japanese DEMO under low density SOL and large power exhaust of $P_{sep}/R \sim 30$ MW/m level	ASAKURA, Nobuyuki (National Institutes for Quantum and Radiological Science and Technology (QST), Naka Fusion Institute)
14:50	[40] Assessing Alternative Divertors for DEMO – strategy and first results	MILITELLO, Fulvio (Culham Centre for Fusion Energy)

Discussion Session: DEMO Design - Board Room C (C Building, 4th Floor) (6 Nov 2019, 15:10-16:10)

Discussion sessions aim at identifying the most critical issues, based on both their uncertainty and impact, and what would be the most productive path to address those issues. These findings will be compiled in a report highlighting issues and approaches to resolution for future divertor design.

Coffee Break - Board Room C (C Building - 4th Floor) (16:10-16:30)**Poster Session III - Board Room C (C Building - 4th Floor) (6 Nov 2019, 16:30-18:30)**

All submissions accepted as "Poster" should provide a poster conforming to the rules published in the meeting announcement. Posters will be shown outside of Board Room C near by the coffee area.

Board numbers correspond to Indico [ID] numbers.

[id] title	presenter	board
[24] Engineering integration constraints for advanced magnetic divertor configurations in DEMO	KEMBLETON, Richard (EUROfusion, CCFE)	
[78] Progress of divertor design concept for Japanese DEMO	ASAKURA, Nobuyuki (National Institutes for Quantum and Radiological Science and Technology (QST))	
[4] A possible divertor combined the advantages of super-X and snowflake for CFETR/DEMO	DU, Hailong (Southwestern Institute of Physics)	
[45] Status of Divertor/SOL modelling in PROCESS	MULDREW, Stuart (CCFE, UKAEA)	
[50] Study of Single Null divertor in DTT with Nitrogen, Neon and Argon seeding	RUBINO, Giulio (University of Tuscia)	
[11] Assessment of the pumping efficiency in DEMO conventional and alternative divertor configurations	IGITKHANOV, YURI (Karlsruhe Institute of Technology)	

[53] Edge and divertor modelling of JT-60SA ITER-like scenario with carbon wall	LUCA, Balbinot (Consorzio RFX)	
[64] Optimization of the impurity seeding recipe in terms of power dissipation, core radiation and fuel dilution with Ar and N seeded SOLPS 5.0 simulations for ASDEX Upgrade	HITZLER, Ferdinand (Max-Planck-Institut für Plasmaphysik)	
[55] Electromagnetic and mechanical analysis of alternative magnetic divertor configurations for DEMO	AMBROSINO, Roberto (Consorzio CREATE)	
[35] First multi-fluid modelling results of super-X divertor in DEMO with Ar seeding	XIANG, Lingyan (CCFE)	
[2] R-matrix calculations of electron-impact excitations of Ne-like W LXV	BARI, Muhammad Abbas (Pakistan Atomic Energy Commission)	
[60] Impact of impurity seedings for divertor protection against intolerable heat loads and tungsten sputtering on general on plasma performances using the SYCOMORE system code	KAHN, Sebastien (UKAEA)	
[70] The Divertor Tokamak Test facility	MARTIN, Piero (University of Padova and Consorzio RFX, Padova, Italy)	
[26] Simulation study of the radiative divertor of different seeded impurity species for CFETR	MAO, Shifeng (University of Science and Technology of China)	
[21] Advanced Power Exhaust Studies for New Lower Tungsten Divertor of EAST under High Power and Steady State Operations	SI, Hang (Institute of Plasma Physics Chinese Academy of Sciences)	
[69] Scoping study of dissipative divertor scenarios for SPARC	UMANSKY, Maxim (Lawrence Livermore National Lab)	

Programme Committee Meeting - Board Room C (C Building, 4th Floor) (6 Nov 2019, 16:30-17:00)

Dinner (6 Nov 2019, 19:00-21:00)

Dinner at Gasthaus Möslinger (Stuwerstraße 14, 1020 Wien)

Thursday 07 November 2019

Divertors in Next Step Devices - Board Room C (C Building, 4th Floor) (7 Nov 2019, 09:00-10:10)

time	[id] title	presenter
09:00	[82] The first ITER tungsten divertor: what do we hope to learn?	PITTS, Richard (ITER Organization)
09:30	[52] Recent progress on divertor physics design of CFETR	DING, Rui (Institute of Plasma Physics, Chinese Academy of Sciences)
09:50	[54] A strategy to develop power exhaust solutions for tokamaks beyond ITER	CANIK, John (Oak Ridge National Laboratory)

Coffee Break - Board Room C (C Building - 4th Floor) (10:10-10:30)

Divertors in Next Step Devices: Continued - Board Room C (C Building, 4th Floor) (7 Nov 2019, 10:30-11:10)

time	[id] title	presenter
10:30	[83] Power exhaust studies in the Divertor Tokamak Test facility	VIANELLO, Nicola (Consorzio RFX, Associazione Euratom-ENEA sulla Fusione)
10:50	[14] The physical design of EAST lower tungsten divertor by SOLPS modeling	SANG, Chaofeng (Dalian University of Technology)

Discussion Session: Next Steps - Board Room C (C Building, 4th Floor) (7 Nov 2019, 11:10-12:00)

Discussion sessions aim at identifying the most critical issues, based on both their uncertainty and impact, and what would be the most productive path to address those issues. These findings will be compiled in a report highlighting issues and approaches to resolution for future divertor design.

Discussion Session: Wrap up - Board Room C (C Building, 4th Floor) (7 Nov 2019, 12:00-13:00)

Discussion sessions aim at identifying the most critical issues, based on both their uncertainty and impact, and what would be the most productive path to address those issues. These findings will be compiled in a report highlighting issues and approaches to resolution for future divertor design.

Farewell and Closing - Board Room C (C Building, 4th Floor) (7 Nov 2019, 13:00-13:15)

Closing addresses by the Programme Committee and the IAEA.

-Conveners: Barbarino, Matteo (International Atomic Energy Agency); Leonard, Anthony W. (USA)

Executive Discussion - Board Room C (C Building, 4th Floor) (7 Nov 2019, 13:15-14:00)