PEP-19 Basic mechanisms of plasma edge transport with resonant magnetic perturbations in toroidal confinement devices

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| **TG priority:** High | **Start date:** 2008 | **Status:**  Closing | **Personnel exchange:**  Yes |
| **IO priority:** | **End date:** 2015 | **Motivation:** Look at dedicated RMP aspects | |

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| **Device** | **Contact** | **Activity** | | | | |
| **2012** | **2013** | **2014** | **2015** | **2016** |
| DIII-D | T. E. Evans | Committed | Committed | Committed |  |  |
| AUG | W. Suttrop | Committed | Committed | Committed |  |  |
| TEXTOR | O. Schmitz |  | Committed | Committed |  |  |
| MAST | A. Kirk | Committed | Committed | Analysis |  |  |
| COMPAS | P. Cahyna |  |  |  |  |  |
| NSTX | J.-W. Ahn | Analysis | Analysis | Not doing |  |  |
| LHD | K. Ida |  | Analysis | Analysis |  |  |
| HSX | O. Schmitz |  |  |  |  |  |
| RFX | G. Spizzo |  |  |  |  |  |

**Results for 2015**

* Comparison between ExB driven particle transport around magnetic islands and in open field line layers in the RFX reversed field pinch, and TEXTOR as cylindrical tokamak with ergodic divertor, has been executed and have been published in Physics of Plasmas [G. Ciaccio et al., PoP **22** (2015) 102516]. Application of the framework developed for TEXTOR/RFX to a diverted configuration in ASDEX-Upgrade has been started, within the EUROfusion-MST1 agreement. The purpose is to assess the sensitivity of the island-driven electric field Er to ECRH heating (G.Spizzo in collaboration with B.Esposito, G.Granucci and M. Maraschek at AUG).
* Investigation of the link between the internal plasma response and divertor strike striation as signature for 3D boundary formation has been investigated in cross machine data analysis mainly between NSTX (J.-W. Ahn) and DIII-D (O. Schmitz & J.-W. Ahn). Presently the focus is put on utilizing the new knowledge about the dependence of the plasma response on the RMP phase for different collisionalities to maintain a strong 3-D structure during transition into detachment.
* Helium exhaust has been studied at TEXTOR and LHD and comparative experiments have shown that edge magnetic islands are a fine tuning actuator to enhance the helium exhaust. These results have been presented in talks on the International Stellarator and Heliotron Workshop, Greifswald, Germany, 2015 and on the APS DPP meeting, Savannah, GA, 2015 by O. Schmitz.
* At DIII-D it has been shown that inter-ELM heat flux striations disappear when high density divertor conditions are established with enhanced overall ionization losses dissipating much of the divertir power flux. These results were presented by A. Briesemeister in ITPA DSOL group meetings and will be continued there.
* At HSX, the relation of fractal magnetic field structures with plasma density, temperature and potential have been resolved for the first time in such detail. The results were presented on the International Stellarator and Heliotron Workshop, Greifswald, Germany, 2015 by A. Akersona nd will be published soon in a PPCF paper.
* An open access paper describing spontaneous changes in the thermal transport across a large q=2 magnetic island produced by an applied n=1 field from the DIII-D C-coil was published in Scientific Reports by K. Ida, T. Kobayashi, T. E. Evans, et al. (<http://www.nature.com/articles/srep16165>).
* Experiments in low-rotation limiter L-mode plasmas, with n=1 RMP fields from the DIII-D C-coil, have resulted in an enhancement of the particle confinement that behaves like a low-power branch of the H-mode. These results appeared in a paper by T. E. Evans in the December 2015 issue of PPCF.

**While this task has been very successful to investigate basic mechanisms of RMP application, many aspects are directly applicable to goals in the RMP working group within the ITPA pedestal group. We therefore suggest closing this task.**