DSOL-32 **Comparison of N2 and Ne divertor seeding**

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| **TG priority:** High | **Start date:** 2014 | **Status:**  On-going | **Personnel exchange:**  Yes |
| **IO priority:** | **End date:** Not fixed | **Motivation:** Physics Basis | |

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| **Device / Association** | **Contact** | **2016 TG Request** | **Activity (from JEX/JA spreadsheet)** | | | | |
| **2015** | **2016** | **2017** | **2018** | **2019** |
| ITER | R. A. Pitts | Desirable |  |  |  |  |  |
| AUG | M. Wischmeier | Desirable | Committed |  |  |  |  |
| JET | S. Wiesen | Desirable | Committed |  |  |  |  |
| DIII-D | A. W. Leonard | Desirable | Committed |  |  |  |  |

Impurity seeding is required in ITER to protect the divertor from excessive power load. In all metal devices nitrogen seeding has been identified as an efficient radiator in the divertor volume. However, ITER might face a technological challenge when seeding nitrogen that could allow only a limited amount of nitrogen to be used for impurity seeded radiated cooling. An alternative candidate for radiative cooling of the divertor plasma is neon. In past experiment on C-Mod stationary high-confinement (H98 ~ 1) H-modes were produced at low divertor power loading (PODIV/PIN ~ 10%). Recent experiments in JET using Ne as a seeding gas appear to produce an enhanced amount of radiation inside the core volume. Here a similar radiative efficiency of Ne in the divertor as N2 as an impurity seeding species could not be confirmed thus far. It is critically important to experimentally, as well as numerically, to try to improve our understanding of Ne as a divertor, SOL and pedestal radiator in comparison to N2. The understanding of the implication of the size as well as geometry of the divertor, the impact of achievable hydrogenic neutral densities and their compression ratios under impurity seeding conditions on the radiation efficiency is of crucial importance to the selection of the ratio of impurity species foreseen on ITER and its technological as well as budgetary implication.

**Results for 2015**

* JET: Planning of dedicated experiments for upcoming experimental campaign is ongoing. Detailed analysis and reporting for 2016.
* AUG: First dedicated experiments with Ne done in H-mode, N2 seeding in H- and L-mode, for L-mode also with active MP coils. Detailed analysis to be reported in 2016
* DIII-D: experiments done, which can provide data for this task, even if not dedicated; requires data mining in 2016
* C-Mod: experiments with N2 seeding undertaken, analysis and reporting foreseen for 2016

**Plans for 2016**

* JET: Undertaking experiments in L-mode as well as H-mode for comparing the radiative efficiency in the divertor and the stability of the radiation front in horizontal as well as vertical target configuration. Mining and numerical modeling of existing as well as of upcoming experimental data is encouraged. Motivating a dedicated similarity experiment between JET and AUG.
* AUG: Undertaking scheduled experiments in L-mode as well as H-mode for comparing the radiative efficiency in the divertor and the stability of the radiation. Mining and numerical modeling of existing as well as of upcoming experimental data is encouraged. Motivating a dedicated similarity experiment between AUG and JET.
* DIII-D: No “active” experiments are currently foreseen. Mining and numerical modeling of existing data is encouraged. Despite the presence of C as a PFCs the efficiency of Ne as a divertor radiator and its impact on divertor conditions can be studied well exploiting the excellent volumetric diagnostics.
* C-Mod: No “active” experiments are currently foreseen but might be encouraged if control experiments become necessary inside this task. Mining and numerical modeling with external support of existing data is encouraged.