IOS-5.1 ICRF impurity generation

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| **TG priority:** Moderate | **Start date:** 2016 | **Status:**  New | **Personnel exchange:**  Yes |
| **IO priority:**   | **End date:** 2019 | **Motivation:** Plasma operation |

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| --- | --- | --- | --- |
| **Device /Association** | **ContactPersons** | **TGRequest** | **Activity** |
| **2016** | **2017** | **2018** | **2019** |
| WEST | Laurent COLAS | Desirable |   |   |   |   |
| JET | Philippe JACQUET | Desirable |   |   |   |   |
| AUG | Vladimir BOBKOV | Desirable |   |   |   |   |
| C-Mod | Steven WUKITCH | Desirable |   |   |   |   |
| DIII-D | Robert PINSKER | Desirable |   |   |   |   |
| EAST | Xinjun ZHANG | Desirable |   |   |   |   |
| NSTX | Joel HOSEA | Desirable |   |   |   |   |
| KSTAR | Sonjon WANG | Desirable |   |   |   |   |

**Purpose**

The use of ICRF heating in metal wall machines has the positive effect of decreasing the concentration of high-Z impurities in the central plasma, probably via central heating. However, in many cases, enhanced high-Z impurity generation is also observed during ICRH compared to NBI at equivalent power, which contributes to the negative impact of the impurities. Although the immediate vicinity of the ICRH wave launchers contributes to the impurity production, e.g. on ASDEX-Upgrade, more remote sources of high-Z impurities are suspected e.g. on JET. Enhanced influxes could also result from ICRH-induced changes in the local SOL transport, e.g. **ExB** plasma drifts around biased regions.

The purpose of this joint experiment is to use the ‘natural’ variation of the antenna and wall materials and geometry to understand the role of the ICRF power on direct impurity generation (as opposed to simple increase of power to the machine). AUG, C-Mod, JET, and WEST will be operating with significant ICRF power with varieties of antenna designs in metal walls. KSTAR and NSTX-U will be operating with carbon walls, which may allow separation of wall versus antenna material. AUG, DIII-D, JET, Tore Supra and JT-60U may have relevant legacy data for carbon walls. EAST will be using two types of ICRF antennas in a mixed material environment (C and W divertors, Mo first wall).

Changes of the antenna electrical settings (current amplitude/phase balance between radiating straps, antenna matching), machine conditioning (boronizations, lithiations,…) as well as active modifications of the SOL (localized gas puffs, controlled impurity injections) could also be envisaged to evaluate their impact on sputtering and core plasma contamination.

**Plans for 2016**

* Start accumulating relevant existing data for comparison of effects
* Discuss with DIVSOL the possibility of this being a joint activity
* Analysis should stimulate focused experimental proposals for 2017