Contribution ID: **442** Type: **Poster**

Experimental observations and modelling of poloidal asymmetries in radiation profiles during N_2 seeding compared with Ne seeding in LHD

Friday, 21 October 2016 14:00 (4h 45m)

Various noble gasses have been seeded in the Large Helical Device (LHD) to reduce the divertor heat load through enhanced radiation [1]. At the vertically elongated cross-section, in the case of N_2 seeding, bolometric images show additional outboard radiation, while in the case of Ne, only inboard radiation is observed. With N_2 seeding, radiation is observed by two imaging bolometers [2], viewing the same poloidal cross-section from top and bottom ports, respectively, at a location which is 36 degrees toroidally removed from the N_2 gas puff nozzle located at the bottom of the machine. These measurements both confirm that the additional radiation from the outboard side is coming exclusively from the top of the cross-section, indicating poloidal asymmetry. Triangulation between the two imaging bolometer signals indicates that the additional outboard radiation is coming from near the upper part of the last closed flux surface, and that the standard inboard radiation is coming from the upper x-point region. With N_2 seeding the radiation enhancement is observed to be from 20 - 100% depending on the discharge, while the reduction in divertor heat load indicated by I_sat was more than 50% in some locations but varied strongly toroidally, while in the case of Ne the I_sat signals are quite uniform toroidally. Modelling by EMC3-EIRENE [3] shows that the outboard radiation is enhanced with N_2 (versus Ne) seeding and with reduced recycling (0 versus 100 %) indicating that the localized outboard radiation may be attributed to reduced recycling of N2. Also, modelling with EMC3-EIRENE using a 90 degree (toroidally) model can reproduce the upper localization of the radiation at a cross-section which is 36 degrees toroidally separated from the N_2 source located at the bottom of the cross-section as is the case in the experiment.

[1] K. Mukai et al., Nucl. Fusion 55 (2015) 083016.
[2] B.J. Peterson et al., Rev. Sci. Instrum. 74 (2003) 2040.
[3] G. Kawamura et al., Contrib. Plasma Phys. 54 (2014) 437.

Paper Number

EX/P8-6

Country or International Organization

Japan

Primary author: Prof. PETERSON, Byron (National Institute for Fusion Science)

Co-authors: Dr KAWAMURA, Gakushi (National Institute for Fusion Science); Dr MOTOJIMA, Gen (National Institute for Fusion Science); Dr TANAKA, Hirohiko (National Instutute for Fusion Science); Dr MIYAZAWA, Junichi (National Institute for Fusion Science); Dr MUKAI, Kiyofumi (National Institute for Fusion Science); Dr KOBAYASHI, Masahiro (NIFS); Dr GOTO, Motoshi (National Institute for Fusion Science); Prof. OHNO, Noriyasu (Graduate School of Engineering, Nagoya University); Dr SAKAMOTO, Ryuichi (National Institute for Fusion

Science); Dr SANO, Ryuichi (National Institute for Fusion Science); Dr DAI, Shuyu (Dalian University of Technology); Dr PANDYA, Shwetang (Institute for Plasma Research); Prof. MASUZAKI, Suguru (National Institute for Fusion Science); Prof. MORISAKI, Tomohiro (National Institute for Fusion Science); Dr AKIYAMA, Tsuyoshi (National Institute for Fusion Science)

Presenter: Prof. PETERSON, Byron (National Institute for Fusion Science)

Session Classification: Poster 8

Track Classification: EXC - Magnetic Confinement Experiments: Confinement