Mode observations and confinement characterization during configuration scans in Wendelstein 7-X

T. Andreeva[1], M. Hirsch[1], G. Wurden[2], A. Alonso[3], C. Beidler[1], S. Bozhenkov[1], R. Brakel[1], C. Brandt[1], R. Burhenn[1], V. Bykov[1], A. Dinklage[1], G. Fuchert[1], J. Geiger[1], M. Grahl[1], O. Grulke[1], M. Jakubowski[1], G. Kocsis[4], T. Klinger[1], A. Krämer-Flecken[5], S. Lazerson[6], U. Neuner[1], K. Rahbarnia[1], H. Thomsen[1], E. Trier[7], J. Zhu[1], S. Zoletnik[4], and W7-X team

[1]Max Planck Institute for Plasma Physics, Wendelsteinstr. 1, 17491 Greifswald, Germany

[2]Los Alamos National Laboratory, Los Alamos, NM, 87545, USA

[3]Laboratorio Nacional de Fusión, CIEMAT, Av. Complutense 40, 28040 Madrid, Spain

[4]Wigner RCP RMI, Budapest, Hungary

[5] Institute for Climate and Energy Research – Plasma Physics, Forschungszentrum Jülich, 52425 Jülich, Germany

[6]Princeton Plasma Physics Laboratory, Princeton NJ, 08543, USA

[7]Max Planck Institute for Plasma Physics, Boltzmannstraße 2, 85748 Garching, Germany

Wendelstein 7-X is a modular advanced stellarator, which successfully finished its second test divertor unit experimental campaign in October 2018. Besides establishing divertor operation, this campaign was devoted to the verification of the optimization principles of the machine in different magnetic configurations, created by the superconducting magnet system. In addition configuration scans were performed between several reference magnetic configurations with the aim to analyse confinement and performance changes by the gradual successive variation of the rotational transform.

This contribution focuses on the analysis of the intermediate configurations, performed between ‘high iota’ and ‘standard’ reference magnetic configurations. The experimental programs of the scan were conducted with the same density and ECRH power in order to identify the relative changes between the configurations studied. A large set of diagnostics, including magnetic measurements and the ECE, accompanied these experiments. Observations include confinement changes and mode activities detected by various diagnostic systems. An overview of experimental results is presented as well as a study of the relation of the mode activity to the size of the internal magnetic islands.