NINETEENTH FUSION ENERGY CONFERENCE

SESSION OV/5 & EX/C1

Tuesday, 15 October 2002, at 10:40

Chair: G.S. LEE (Republic of Korea)

SESSION OV/5 & EX/C1: Confinement

Paper IAEA-CN94/OV/5-1 (presented by Jiangang Li)

Discussion

R. Cesario: Do you have information about non-linear wave–plasma interactions at the edge during the IBW phase in HT-7?

Jiangang Li: Please see my paper in Plasma Phys. Control. Fusion (2001) page 1227 for details. Higher edge density and low Z_{eff} are important to get rid of the PDI.

Paper IAEA-CN94/EX/C1-1 (presented by K. Tsuzuki)

Discussion

J. Ongena: Can you specify the maximum Greenwald fraction (and absolute density) and Z_{eff} values for the high recycling steady H-mode?

K. Tsuzuki: The maximum density is $n_e/n_{GW} \sim 1$. We didn't measure Z_{eff}. The experiments were carried out just after a boronization, which resulted in a remarkable decrease of the oxygen impurity. The radiation level was low. Thus we think that Z_{eff} was kept at a low level.

U. Shumlak: What was the mass inventory of the injected CT compared to the mass of the tokamak? Was there any measured current increase due to helicity injection?

K. Tsuzuki: The CT mass was between 5 and 10% of the tokamak mass. No current increase was measured.

G.S. Lee: For ferritic steel insertion, it was shown to be effective to reduce the magnetic ripple without adverse effects on plasma performance. However, in an advanced tokamak with high β_N, the resistive wall mode in low-n modes could be strongly driven with field errors induced by ferritic steel inserts in low (m,n). Have you made experimental investigations for that area?

K. Tsuzuki: At present, no. We are now trying to obtain such discharges by optimizing operation and/or making the plasma position closer to the wall. However, we are not sure whether we can produce such high β plasmas in JFT-2M. So the installation of ferritic steel in larger devices is important.

Paper IAEA-CN94/EX/C1-2 (presented by P. Martin)

Discussion

T.R. Jarboe: How much higher is the pressure inside the helical structure than that outside the structure?

P. Martin: The pressure in the helical structure can increase up to about 40% of the value outside it in RFX. In other devices studies are under way.

D.D. Ryutov: What is the physical mechanism that selects the toroidal mode number?

P. Martin: The dominant helicity corresponds usually to one of the two innermost resonant modes. The q profile therefore selects the dominant mode, which is resonating where the gradient of **J** is larger.

V.P. Pastukhov: You observe a spontaneous transition from RFP to a helical topology. Is the confinement time in the new state comparable with the confinement times in conventional helical stellarators?

P. Martin: A complete answer cannot be given yet. Work is being done on this issue, in particular to find proper equivalent conditions for comparing the two configurations.

Paper IAEA-CN94/EX/C1-3 (presented by D.N. Hill)

Discussion

D. Escande: Both in the RFP and in the solar corona the plasma is thought to be far from the minimum energy state. What is the proof that the plasma reaches the Taylor state in your experiment?

D.N. Hill: We use edge magnetic field measurements to reconstruct the current profile of the spheromak plasma and find that lambda is nearly constant, equal to the eigenvalue of the flux conserver, i.e. it is close to the Taylor state. Future internal field measurements will improve the precision of our reconstruction of the current profile.

D. Escande: The fact that the high efficiency in B field production is related to the slower drive may be indicative that it might be good for the plasma to go away from the Taylor state.

D.N. Hill: We find that the lowest fluctuations are observed when our MHD reconstructions show the current profile to be closest to the Taylor state (uniform lambda). We think that the fast formation creates a plasma that quickly becomes unstable to n=1 modes in the central column which grow large and limit buildup.

S. Ortolani: Which are the dominant toroidal modes in the fluctuation spectrum? Do they change when you increase the gun current?

D.N. Hill: When the SSPX gun current is well above the formation threshold, a large-amplitude n=1 mode is observed. In many cases, when the gun current is maintained near the threshold, n=2, 3, 4 modes are seen; these modes are often incoherent so that the overall spectrum looks quite turbulent.

Paper IAEA-CN94/EX/C1-4Ra (presented by T. Cho)

Discussion

D.D. Ryutov: You have shown results from the GOL-3 device. This is an axisymmetric multiple mirror device, and the plasma lifetime is much longer than the flute (MHD) instability e-folding time. What is the stabilizing mechanism?

T. Cho: It is important and useful to identify the MHD stability issue in the GOL-3 geometry. Anomalous high electron collisionality due to microturbulence found in GOL-3 might be one of the candidates to suppress or modify such an unstable coherent mode. At this time, the problem remains still an open question.