SESSION EX2

Wednesday, 21 October 1998, at 8.50 a.m.

Chairman: G. Grieger (Germany)

HELICAL EXPERIMENTS

Paper IAEA-CN-69/EX2/1 (presented by A. Weller)

DISCUSSION

Y. NAGAYAMA: Why do modes with the same number have different frequencies? For example, the m = 5 mode has a very high and a very low frequency.

A. WELLER: The m = 5 mode at very low frequency is probably not a global Alfvén eigenmode. In the case of the two m = 3 modes, the radial eigenfunctions are different. Thus, different eigenfrequencies are to be expected. No numerical modelling with a 3-D code, which could explain the frequencies observed, is available for this discharge.

G.Y. FU: What is the calculated beta limit of high-n ballooning modes (for the 2% β case)?

A. WELLER: In the $< \beta > \approx 2\%$ case, a local ballooning analysis gave stability against high-n ballooning modes. The actual limit has not yet been determined for this case. According to earlier studies, the expected ballooning limit is a little over $\beta = 2\%$.

G.Y. FU: Can a regime of unstable ballooning modes be accessed in the experiments?

A. WELLER: With the available power, configurations can be established that should have reduced stability limits. However, ballooning modes have not yet been identified experimentally.

Paper IAEA-CN-69/EX2/2 (presented by K. Ida)

DISCUSSION

F. WAGNER: Could you please clarify the possible mechanism for the improvement of χ_i along with the peaking of the density profile, assuming $\chi_i = \chi_i^{neo} + \chi_i^{turb}$? Is it associated with improvement of χ_i^{neo} (E_r) with a more negative E_r, or has it to do with a reduction in χ_i^{turb}, either because it is T_i' driven and stabilized with peaked density or perhaps because there is more E_r x B decorrelation?

K. IDA: The mechanism for improvement of χ_i associated with density peaking is unclear at the moment. The observed χ_i is still larger than that estimated by neoclassical theory. Therefore, χ_i^{neo} may not be responsible. The E_r and E_r shear are larger in high T_i mode discharge than in L-mode. However, the observed E_r shear is much smaller than that observed in H-mode plasma and so the observed E_r shear may not be enough to explain the reduction in χ_i.

J.H. HARRIS: Can you use your charge exchange data to compute directly the power loss due to the helical ripple and thus cross-check your conclusion that ripple losses do not affect overall confinement?

K. IDA: Yes, we can calculate the power loss, because the range of the pitch angle and the loss cone energy have been measured with a neutral particle analyser. The power loss is not important, as long as the neutral beam is injected tangentially, because only fast ions with nearly perpendicular velocity escape from the plasma through the loss cone.

Paper IAEA-CN-69/EX2/3 (presented by M. Fujiwara)

DISCUSSION

R.J. GOLDSTON: Wall conditioning must be an important part of your success. Could you describe your wall-conditioning techniques, including baking, surface depositions or gettering?

M. FUJIWARA: Baking of the vacuum vessel is limited to a temperature of 100°C. We have conducted ECR and glow discharge cleaning. In addition, Ti gettering is applied, typically, for an hour a day.

K. HANADA: What is the reason for density clamping in the hydrogen discharge? Is it a kind of wall saturation phenomenon?

M. FUJIWARA: The present wall is stainless steel, which pumps hydrogen. In addition, hydrocarbon molecule generation may play a role in pumping. Density clamping occurs before wall saturation.

Paper IAEA-CN-69/EX2/4 (presented by C. Alejaldre)

DISCUSSION

J.H. HARRIS: An important feature of the flexible heliac is the very large range of rotational transforms that can be attained. Although your operations are still in an early stage, can you say yet whether the effect of higher transform is good, bad or indifferent?

C. ALEJALDRE: The dominant effect we have studied so far is the influence of volume, and in these configurations the influence of rotational transform in confinement is not evident. A dedicated campaign will be carried out in the future.

S. OKAMURA: The quality of the electron temperature profile measurement is sufficiently high to discuss the small shift in the axis position. Do you have an explanation for it? Could it be related to the finite beta effect?

C. ALEJALDRE: The value of the beta is too small ($\simeq$ 0.2%) to have an effect on the shift observed. It is most likely due to the uncertainty in the model used for conversion from real co-ordinates to flux co-ordinates.

Paper IAEA-CN-69/EX2/5 (presented by T. Obiki)

DISCUSSION

F. WAGNER: From your on-axis, off-axis ECRH experiments you conclude that the confinement time τ_E improves with peaking of the temperature profile. As the definition of τ_E contains the volume integral over the power density, there is a trivial reason why τ_E is larger for central than off-axis heating (same total power). Is there evidence that χ_e is higher in the off-axis case in the gradient region in comparison to the on-axis case?

T. OBIKI: The estimation of the power absorption profile was made for only part of the experimental data. We cannot discuss the difference in χ_e for on- and off-axis heating in detail at present. No clear differences in T_e at about a/2 were observed in either case, although the power density there was higher for the off-axis case. To explain this observation, the degradation of χ_e and/or the existence of non-diffusive heat flow should be taken into account. The details are under investigation.