NINETEENTH FUSION ENERGY CONFERENCE

SESSION EX/S3 & IC & TH/6

Friday, 18 October 2002, at 14:20

Chair: J. DRAKE (Sweden)

SESSION EX/S3 & IC & TH/6: Helical Systems

Paper IAEA-CN94/EX/S3-1 (presented by A. Weller)

Discussion

S. Okamura: A good effect for high beta was given by the control coil. For determining beta in the experiment, possible factors might be the stability limit, equilibrium limit, heating power and confinement. What do you think is the main reason why the control coil produces this good effect of increasing beta?

A. Weller: The beneficial effect of the control coils is mainly based on the increase of the plasma volume, which results in an improved global confinement and particularly in reduced orbit losses of fast ions injected by the neutral beam injectors. Also, the increased effective radius helps to keep the electron temperature above critical values with respect to the approach to a radiation induced thermal collapse. The achieved beta is determined by the available heating power and confinement.

D.F. Escande: After your MHD calculations, is there still a surprise about the high beta stability?

A. Weller: No, the results of recent, more advanced calculations are consistent with the experimental data. Nevertheless, it may not have been expected that the observed and predicted MHD activity in the medium-beta regime would stay at a benign level, so that the high-beta regime could be accessed without problems.

Paper IAEA-CN94/EX/S3-2 (presented by K. Toi)

Discussion

F. Wagner: Congratulations for achieving the H-mode in LHD. You achieved it with 6 MW heating at 0.5 T. How does the critical power compare with the power threshold of the tokamaks?

K. Toi: The transition was also observed with 3 MW in a hydrogen plasma at B_t = 0.5 and 0.6 T. We have not yet investigated the threshold power in detail. We will first study the transition characteristics, since the transition occurs in the ergodic field layer. Then we will investigate the threshold power and compare it with the ITER H-mode power threshold.

Ya.I. Kolesnichenko: First of all, I should say that you have presented very good work. In particular, the work seems to confirm theoretical predictions that specific Alfvén eigenmodes, which are absent in tokamaks, do exist in stellarator plasmas. In connection with this, I would like to note that some time ago, high-frequency Alfvén instabilities were observed on Wendelstein 7-AS. Now these are identified as instabilities of velocity-induced Alfvén modes and mirror-induced Alfvén modes. A poster on this topic was presented by Dr. Lutsenko (TH/P3-16).

Paper IAEA-CN94/TH/6-1 (presented by K. Ichiguchi)

Discussion

C. Nührenberg: Has associated pressure profile flattening been observed in the experimental LHD pressure profiles?

K. Ichiguchi: The flattening feature can be seen in T_e profiles in some cases. However, precise comparison between the experiments and the theory has not been completed.

Paper IAEA-CN94/IC-1 (presented by G.H. Neilson)

Discussion

F. Wagner: Will the divertor geometry you sketched accommodate both low and high bootstrap current equilibria?

G.H. Neilson: Basically, yes, although this question remains to be studied in detail in future work. It should be noted that the time simulation from β=0/low-bootstrap to β=4.5%/high-bootstrap that was shown was done at fixed plasma shape. The first wall configuration will start with a very simple geometry to maximize plasma shape and configuration flexibility in the initial phases of the experiment. The design will evolve to a more specifically shaped divertor (as was shown in cartoon form) later, after understanding matures.

Paper IAEA-CN94/TH/6-2 (presented by S.R. Hudson)

Discussion

T. Hayashi: How does the coil-healing process affect the assumed pressure profile?

S.R. Hudson: The coil healing does not change the pressure profile. The PIES code does flatten the pressure inside islands, but the islands are small and this has little effect. If a different configuration is used for the healing, with perhaps a different pressure profile, it may be the case that the adjustment to the coil geometry will be changed.

C. Nührenberg: Do you observe that the Hamada equilibrium condition at rational iota surfaces evolves favorably during the island-healing procedure?

S.R. Hudson: The Hamada condition has not been calculated in this study. I agree that it will be interesting to examine this quantity.