Summary of Stability and Transport Session,
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Loren Steinhauer

Two papers addressed experimental FRC stability. Fujimoto (Nihon Un.) reported measurements on NUCTE-III of n = 1 (wobble) and n = 2 mode activity using line-integrated emission profiles of bremsstrahlung. Using this diagnostic the stabilizing effect of quadrupole and hexapole coils was demonstrated. Kikuchi (Un. Tokyo) reported detailed internal magnetic probe measurements on TS-3. For example, improvements in this method enabled the tilt and shift modes to be distinguished. The tilt is found to be dominant. In oblate equilibria, the elongation E was found to be more important for stability than the radial scale parameter S. Field index control was effective to suppress tilting. In prolate FRCs, a large enough central shell prevented tilting.

Two papers addressed theoretical FRC stability. Belova (PPPL) presented results from hybrid simulations (kinetic ions, cold fluid electrons). Tilting is *not* linearly stabilized by FLR because the mode changes character to one destabilized by resonant-particle effects. In small FRCs with $\bar{s} < 2$, the tilt nonlinearly saturates to a noisy, quasi-stable state at reduced $\bar{s}$. This may be the result of an altered distribution function. For increasing E, the mode localizes near the ends of the FRC. Oblate equilibria are stabilized by a close-fitting conducting wall, but higher-n modes are not. Horiuchi (NIFS) presented results from fully kinetic simulations (ion and electron). The self-generation of a hollow current profile is observed on a rapid timescale (comparable to ion cyclotron time). This is identified as a drift-kink mode, a “narrow beam” instability. In low-$\bar{s}$ equilibria the mode saturates when the “meandering ion” beam broadens out to about an ion gyroradius width. Higher-$\bar{s}$ equilibria are unstable as usual. The mode localization for larger E is not observed. This may be because the equilibria considered were limited to large $x_s \approx 0.9$ (separatrix radius / coil radius).

In the discussion period two summary points were made. (1) The frequently used $\bar{s}/E$ < const stability scaling no longer has a theoretical basis. (2) There is still no theoretical explanation for the stability of FRC experiments; this motivates the need to look elsewhere than FLR effects, e.g. flow effects and a better electron physics model.

A single paper addressed FRC transport theory. Takahashi (Gumma Un.) investigated the effect of a generic magnetic fluctuation on the ion canonical momentum P_θ, which is the magnetic surface “marker” for a particle. A generic fluctuation was used since it is unclear which turbulent mechanism is responsible for anomalous transport in experiments. The P_θ shows a preferentially *outward* drift (toward the separatrix). Its cause is unclear, although it may be a phase-space diffusion effect. Lower frequency fluctuations lead to larger outward drifts of P_θ.