

Summary slide – Porkolab EX/P3-1

- The impact of main ion dilution (deuterium) on energy confinement by injecting medium Z_i ions (Nitrogen, Neon) was studied in Alcator C-mod because of its relevance to seeding ITER plasmas to control the injection of metallic impurities, similar to recent JET experiments
- In ohmic L- mode plasmas the dilution had a beneficial effect by reducing turbulent transport in the plasma core by increasing the critical ion temperature gradient scale lengths, thus stabilizing ITG modes; GYRO simulations reproduced the observed reduction of turbulence
- The density fluctuation amplitudes measured by Phase Contrast Imaging (PCI) showed substantial decrease with nitrogen seeding, in agreement with nonlinear GYRO simulations
- In spite of increased radiation losses from the plasma core, the neutron rate increased due to the dominance of confinement improvement and increased core ion temperatures
- In DIII-D ITER Baseline Scenario (IBS) plasmas turbulent transport was studied by measuring density fluctuations with state of the art diagnostics and interpreted with the aid of TGLF, a linear fluid code and nonlinear gyrokinetic codes GYRO and GS2
- Torque-free direct electron heating with ECH replacing part of NBI while maintaining fixed beta-N, was found to modify the profiles, increase ion scale fluctuations and deteriorate global energy confinement due to decreased flow shear
- The impact of ECH on fluctuations was also measurable at electron scales at high frequencies where, according to nonlinear modeling, considerable heat and particle pinches are generated
- Turbulence at both ion and electron scales thus led to the final ECH degraded confinement state