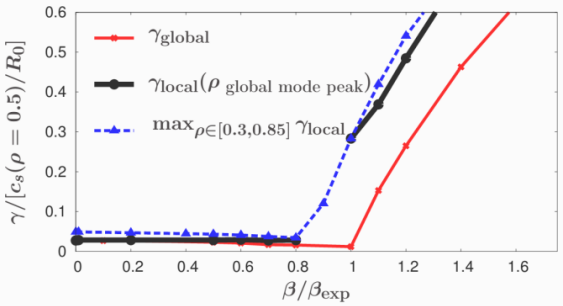
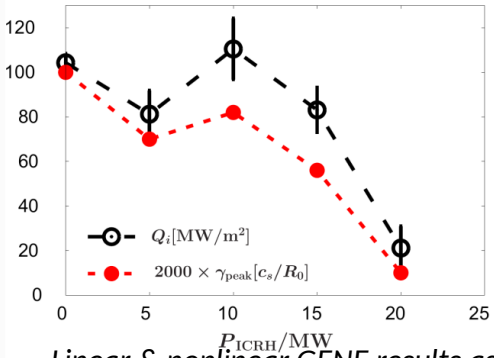
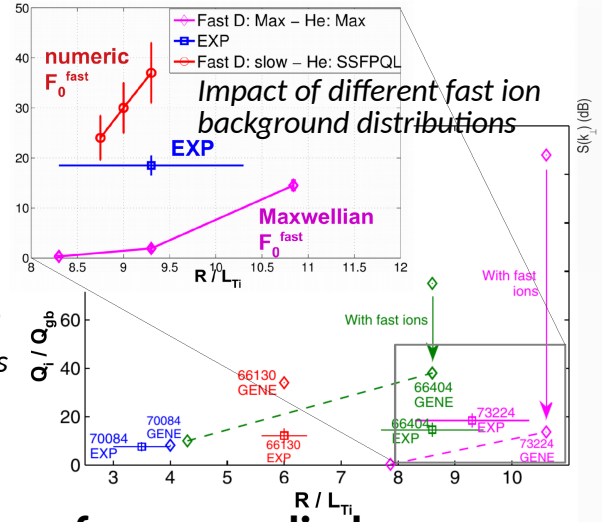
Gyrokinetics - en route to high-performance discharges



Linear growth rates from local and global GENE simulations as function of ß for an actual non-inductive ASDEX Upgrade discharge



Linear & nonlinear GENE results as function of the fast ion power deposition in the ramp-up phase of the ITER standard scenario.



Electromagnetic effects in global simulations:

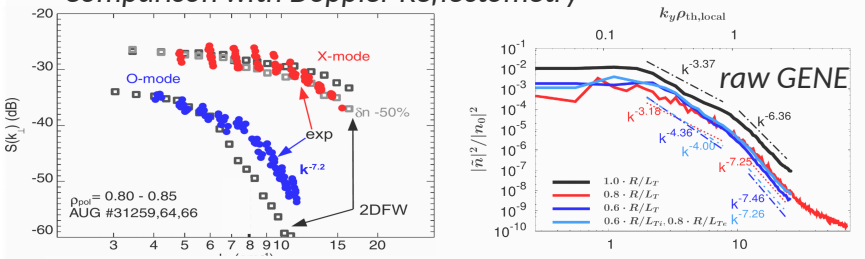
- Non-inductive AUG discharge found to be near KBM threshold
- Finite gyroradius (global) effects may be crucial to determine exact mode transition

Challenges in high-performance discharge simulations: large electromagnetic fluctuations and fast ion physics - knowledge still poor

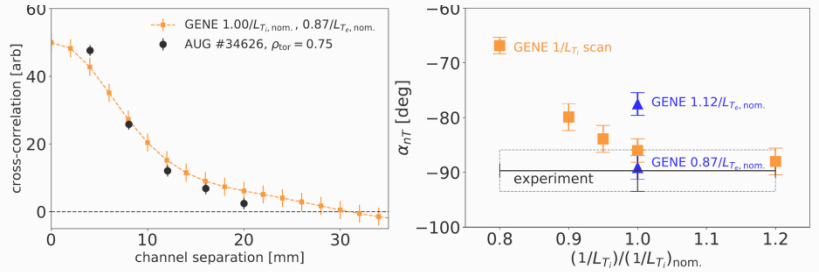
Fast ion physics:

- Discovered new wave – fast ion resonance which offers ways to further enhance fast ion related turbulence stabilization; may enable much more optimistic ITER ramp-up phase predictions
- Realistic fast ion background distribution functions in gyrokinetic codes significantly improve agreement with experiments

Comparison with Doppler Reflectometry



Comparison: CECE cross correlation/phases measurements



Continuous validation of gyrokinetic codes: crucial to assess reliability and offer guidance for exp. diagnostics design

- Recent examples comparing various AUG fluctuation measurements (Doppler refl., CECE) with synthetic diagnostics applied to GENE data encouraging
- First implementations of forward uncertainty quantification methods