

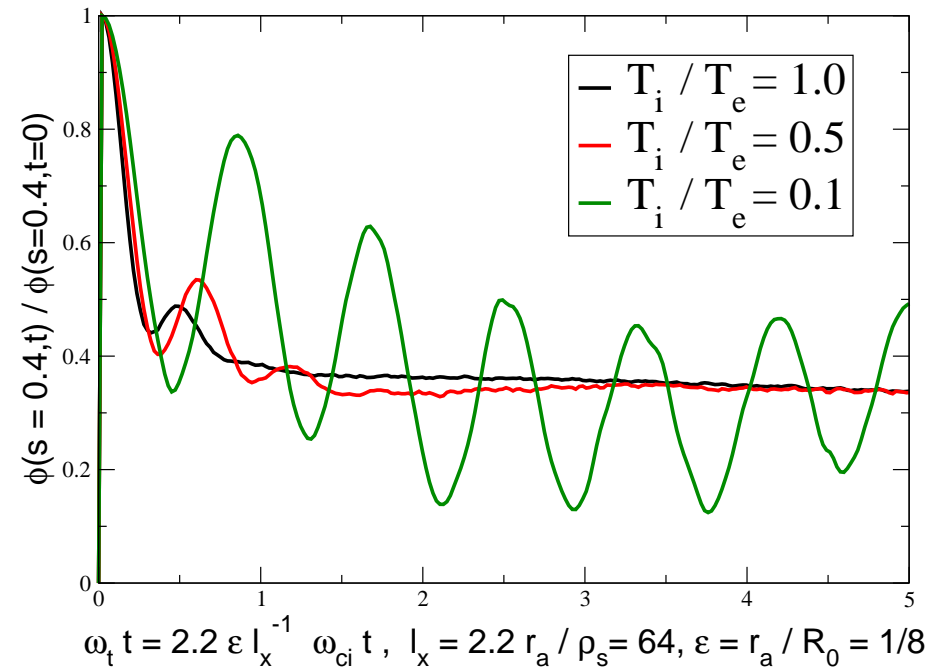
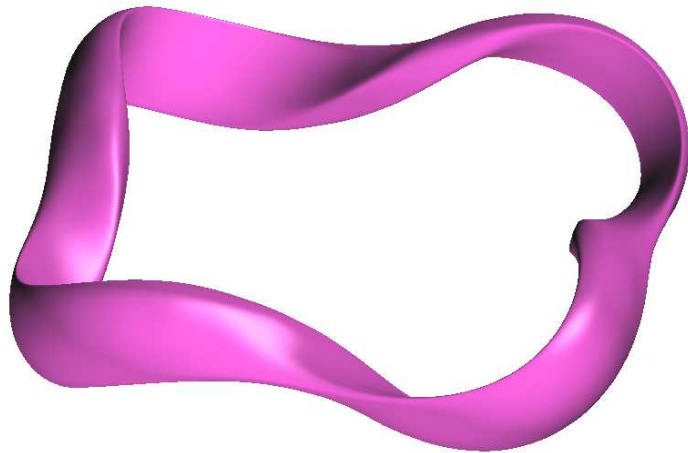


Geodesic Acoustic Modes in non-axisymmetric geometries

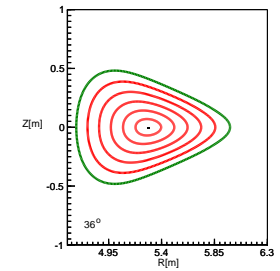
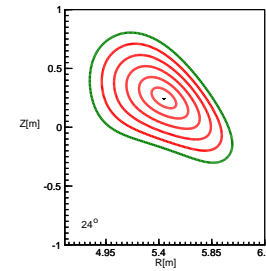
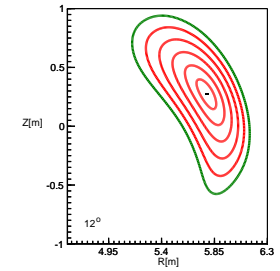
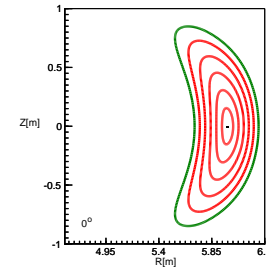
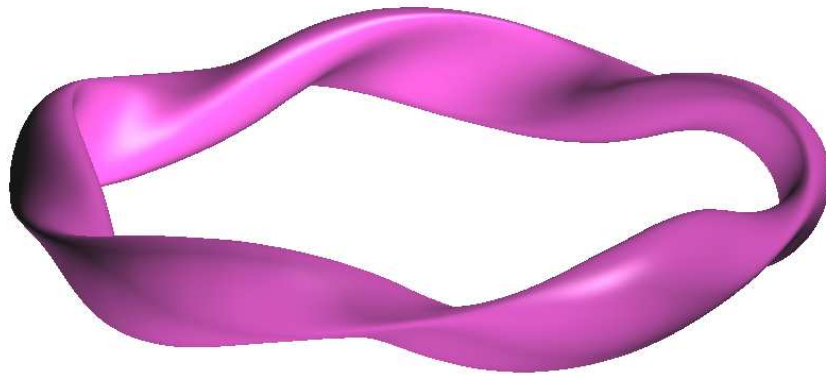
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A. Biancalani

Introduction

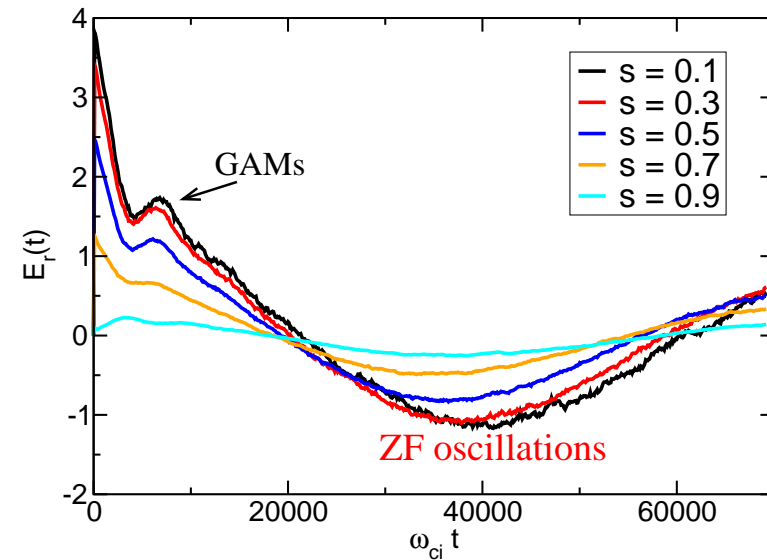
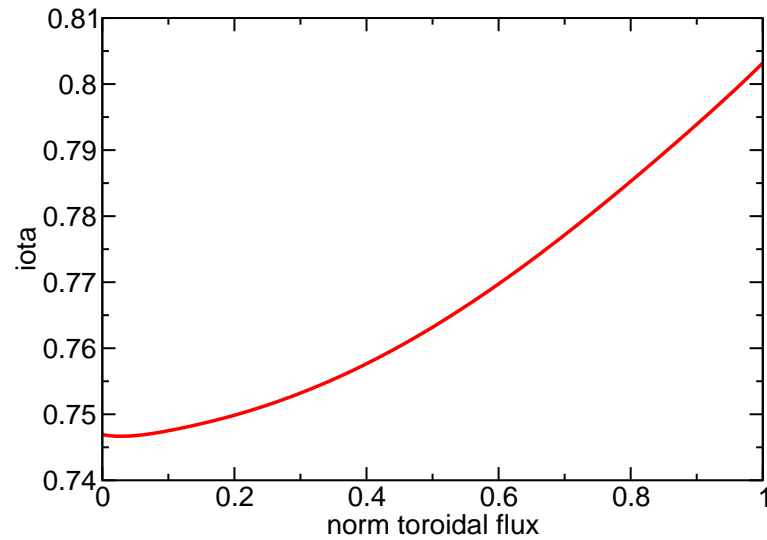
- GAMs are important in tokamaks \longrightarrow this ER project
- GAMs have been studied in LHD \longrightarrow theory (Sugama), experiment
- Strong damping of GAMs in standard W7-X (large ν) \longrightarrow seen with EUTERPE
- Questions:
 1. GAMs at large T_e/T_i
 2. GAMs in W7-X with ν deformation
 3. GAMs in QuASDEX (IPP Garching 2030+)
 4. Fast particle effect
 5. Interaction with turbulence



- Low-shear configuration with $\iota = 1/q \approx 1$
- Strong GAM damping: $\gamma_{GAM} \sim \exp\left(-\frac{q^2 R^2 \omega_{GAM}^2}{v_{Ti}^2}\right)$, $\omega_{GAM}^2 \approx \frac{v_{Ti}^2}{R^2} \left(\frac{7}{4} + \frac{T_e}{T_i}\right)$
- GAM activity at $T_e \gg T_i$ (similar to OP1.1 W7-X plasma)

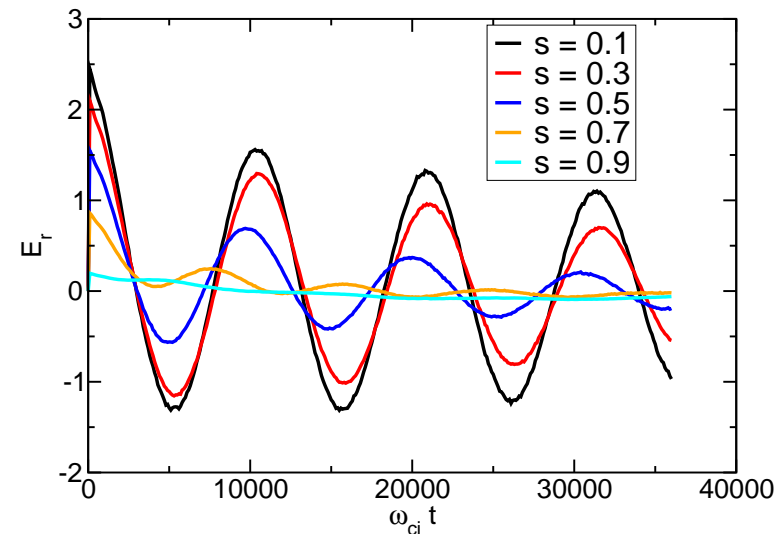
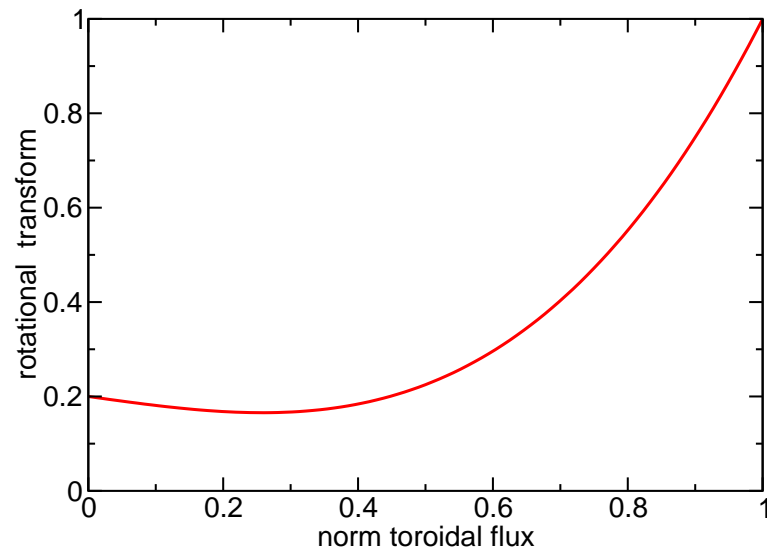


GAMs in low-iota OP1.2 W7-X



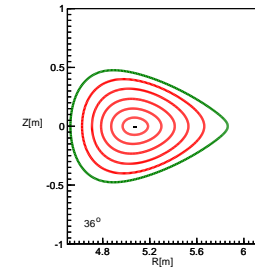
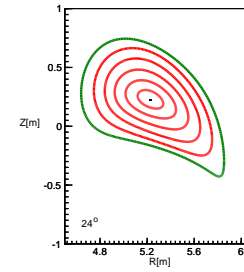
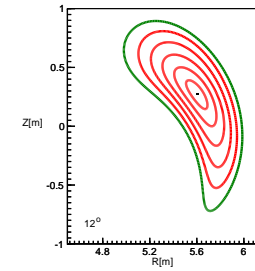
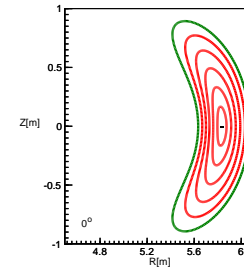
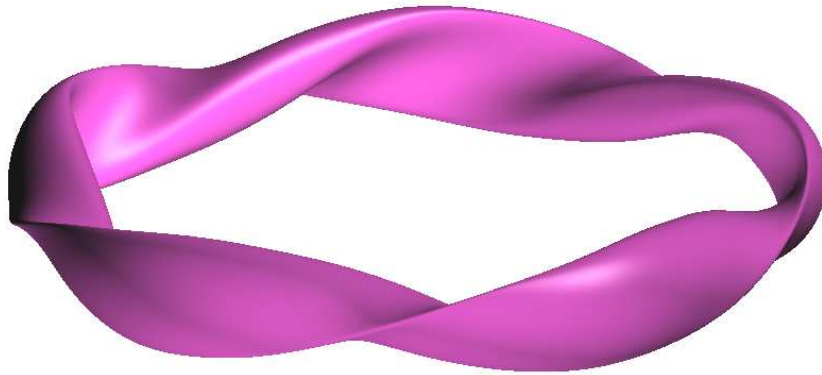
- Rotational transform profile (low-iota OP1.2 finite beta)
- Time traces at different radial positions
- Strong damping of GAMs observed
- Low-frequency zonal flow oscillations

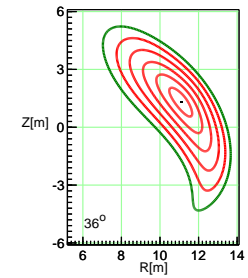
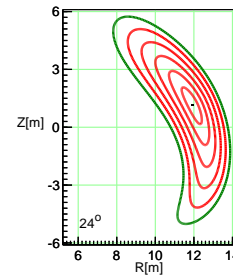
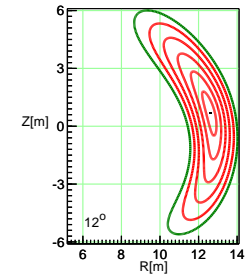
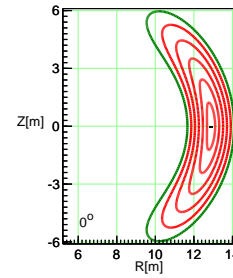
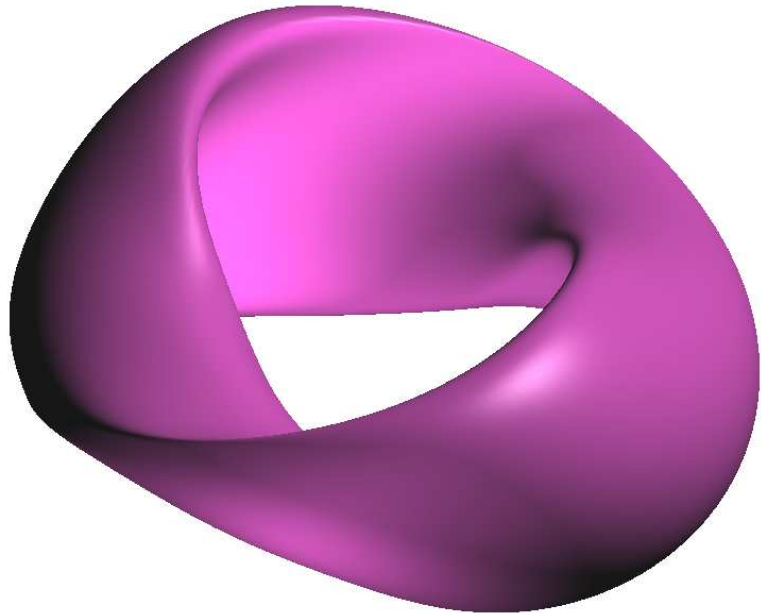
GAM in W7-X with modified ι

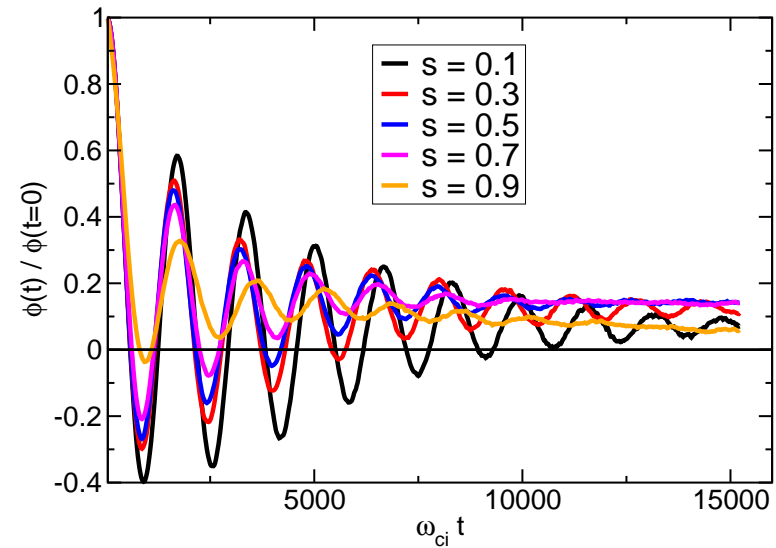
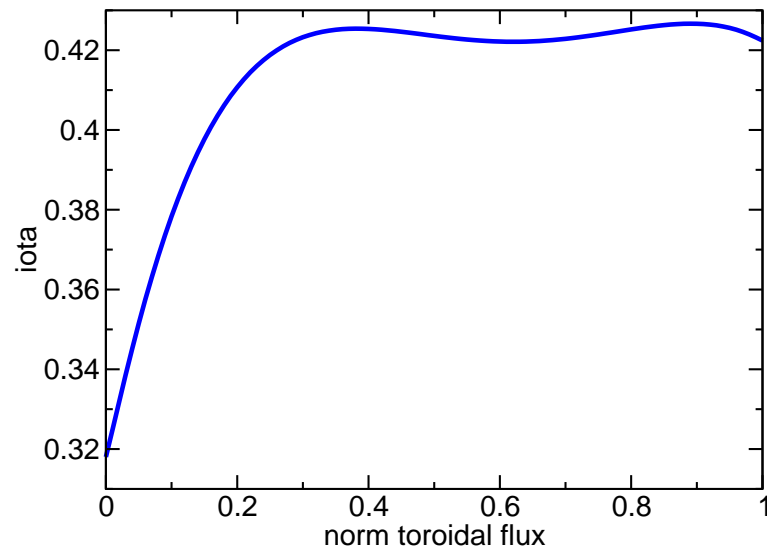


- Modified rotational transform profile (e. g. by ECCD or return currents)
- Time traces at different radial positions
- GAM activity observed
- GAM are weakly damped in the centre (small ι)

Flux surfaces in W7-X with modified ι







- Rotational transform profile
- Time traces at different radial positions
- GAM activity observed
- GAM are weakly damped in the centre (small ι)

- Questions:

1. GAMs at large T_e/T_i
2. GAMs in W7-X with ι deformation
3. GAMs in QuASDEX (IPP Garching 2030+)
4. Fast particle effect \rightarrow to be done
5. Interaction with turbulence \rightarrow to be done

- DONE:

- GAMs in HSX for large T_e/T_i ; similar to W7-X OP1.1 conditions
- GAMs W7-X with modified ι profile (e. g. by ECCD or return currents)
- GAMs in QuASDEX (IPP Garching 2030+) for $\rho_* \sim \mathbf{0.005}$