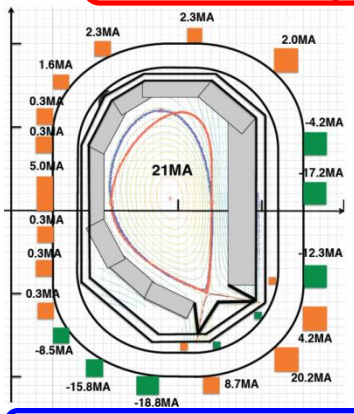
ICC/P3-47 S.Yu.Medvedev, M. Kikuchi et al.

Single Null Divertor in Negative Triangularity Tokamak

SN-NTT is a possible solution for power and particle control as compared to D-shaped δ > 0 tokamak with H-mode optimized for core confinement

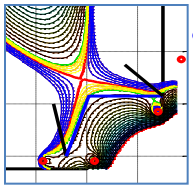


Reactor relevant configuration

R/a=9m/3m, k=1.8, δ_x=-0.9, low δ_u<0

I_p=21MA, B=5.86T

- Racetrack superconducting TF coils
- Flux tube expansion divertor +/-3MA
- 3GW power for $n_e = 6.5\times10^{19}m^{-3}$ β_N=2.1



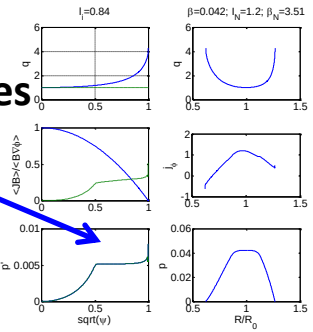
Assess negative D to solve power and particle exhaust problem!

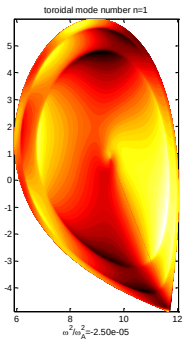
- Edge stability → different ELM regime (MHD stability)
- Geometry of power handling area: larger R_{div} → larger separatrix wetted
- Better confinement: δ < 0 edge transport rather than core
  - Lower pedestal height but electron temperature gradient R/L_{Te} ~10–12 for β_N~3 is compatible with core turbulence
- Wider trapped particle free SOL
- Technical merits: HFS ECCD, lower background magnetic field for internal PF coils, larger pumping conductance from divertor

MHD stability

- Beta limit against n=1 external mode β_N>3 for optimized profiles
- Edge stability : no 2nd stability access in the pedestal
- 4 times lower pedestal pressure for δ < 0 compared to δ > 0

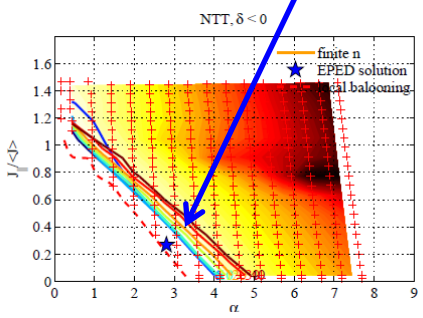
l_i=0.9 → β_N=3.1

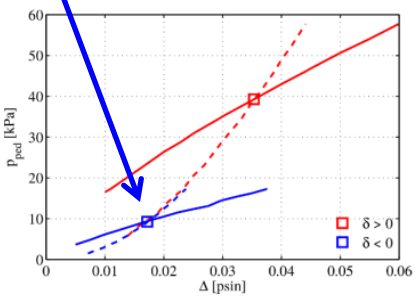


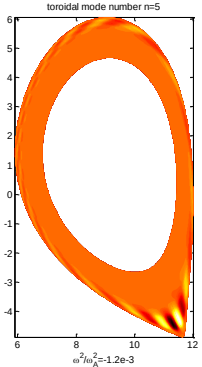


Experimental proposals:

TCV, HL-2M, DIII-D







Experimental data from TCV #43872 at $t = 0.7$ and 1.8 s