Configuration Development: QAS3_C93

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- We have developed a new configuration, QAS3_C93, which has similar stability properties as C82, but

  - Thermal ion confinement is ~10% better (18.5 ms versus 16.9 ms),
  - Maximum current density in sheet current solution is 25% lower (0.82 versus 1.02 with 18 cm offset using the "old" algorithm generating the coil surface).

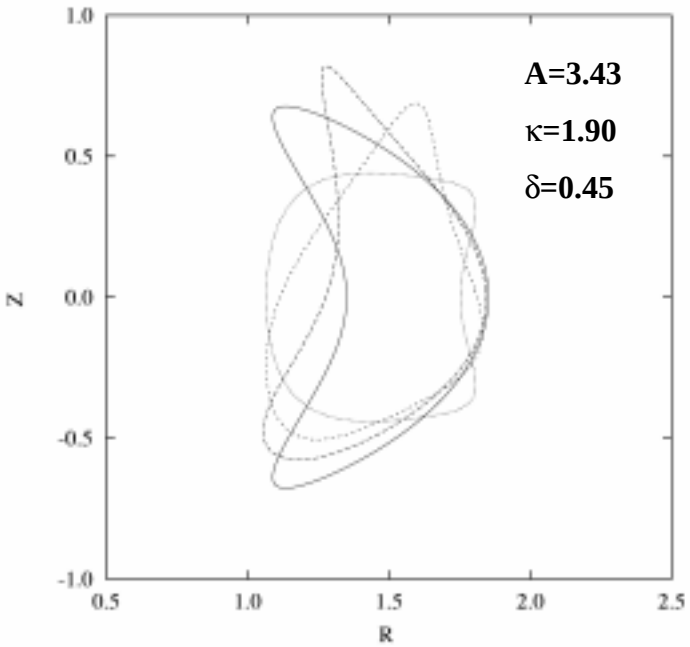
  However,
  - β is 6% lower (3.7% versus 3.9%), and
  - fast ion confinement is marginally worse (energy loss 36.2% versus 35.7%).

- This configuration may be more attractive than C82 as the candidate for the NCSX design if more detailed studies do not reveal surprises.

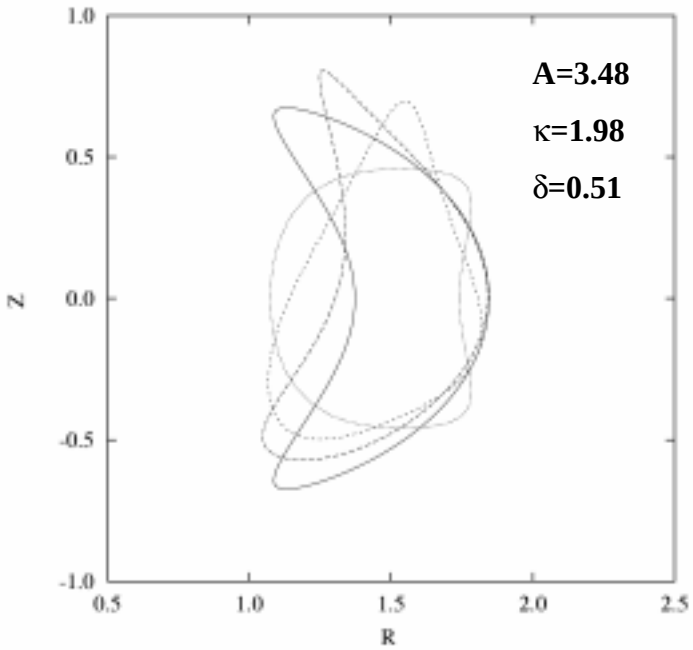
Comparison of Boundary Shape of C82 and C93

C93 has a larger elongation and triangularity than C82 has.

QAS3_C82

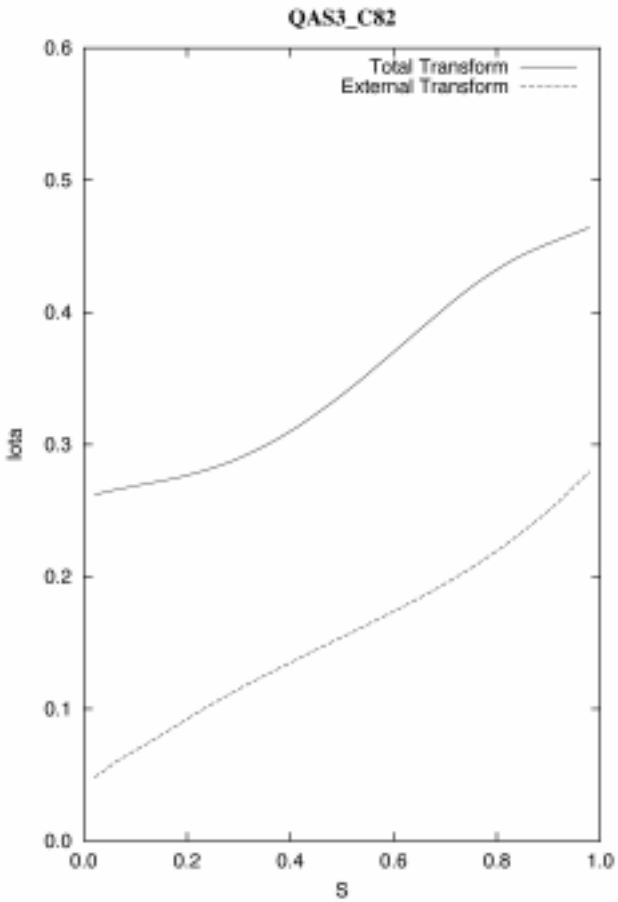


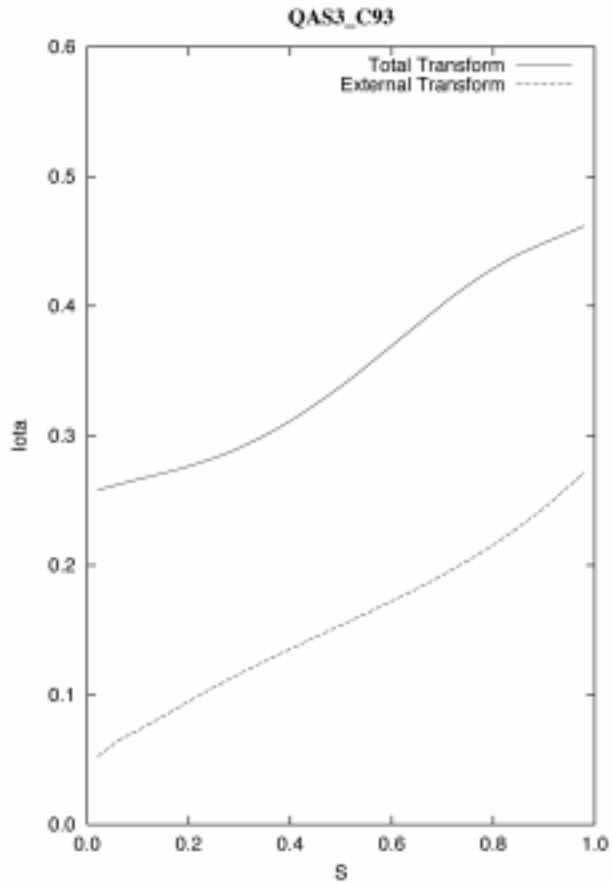
QAS3_C93



Comparison of Rotational Transform

The rotational transform profiles of C93 and C82 are very similar.

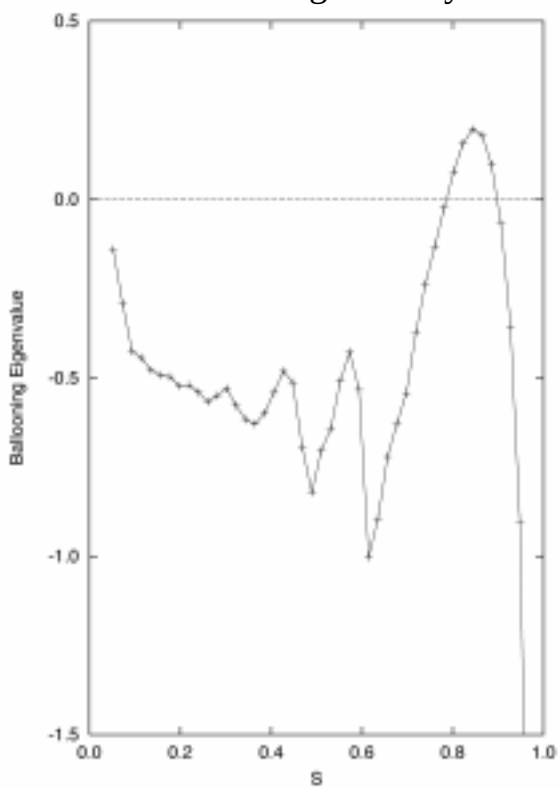




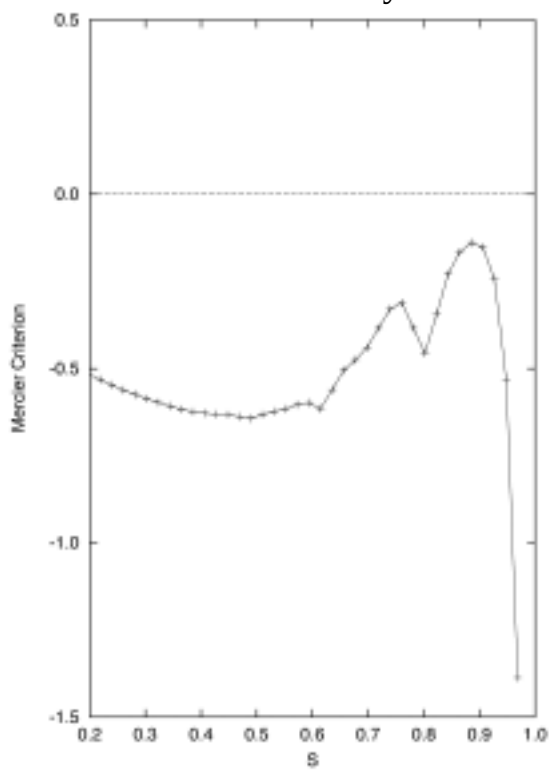
Kink, Ballooning, and Mercier Stability of C93

The eigenvalue of external kinks is calculated to be 5.5e-5 using Terpsichore (nearly the same as C82). The configuration is unstable to ballooning in a narrow region with the reference pressure profile as shown below. Presumably, by modifying p' the ballooning can be stabilized, as we've done for C82.

Ballooning Stability

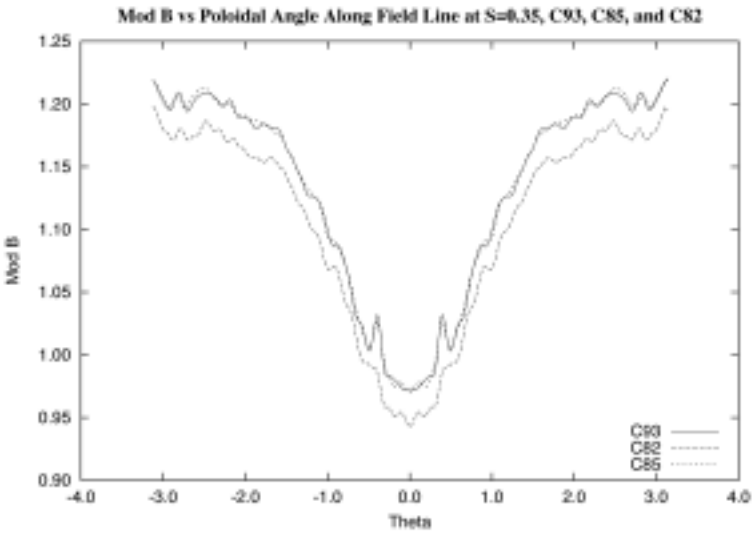


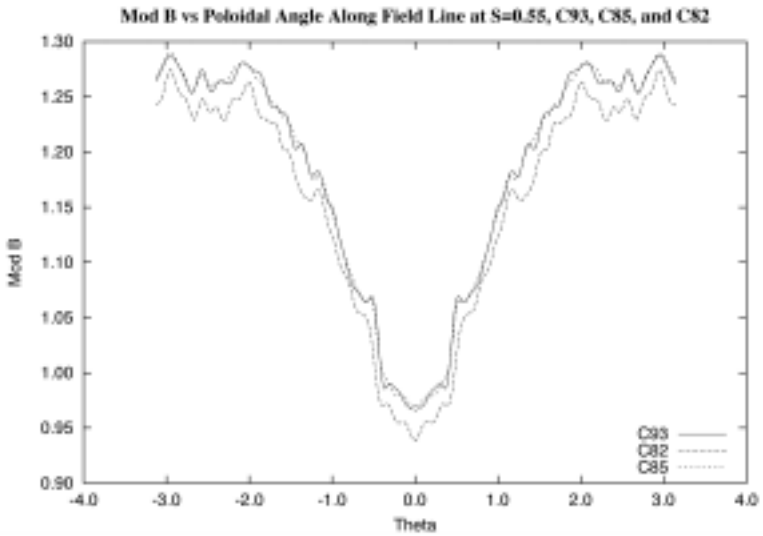
Mercier Stability



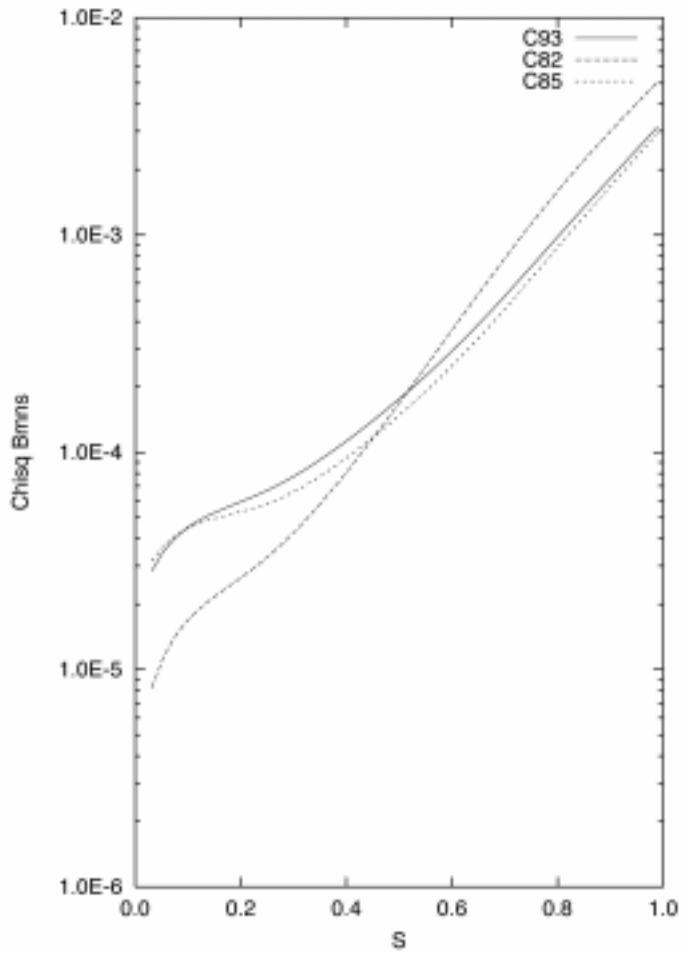
Comparison of Transport Measures for Particle Confinement

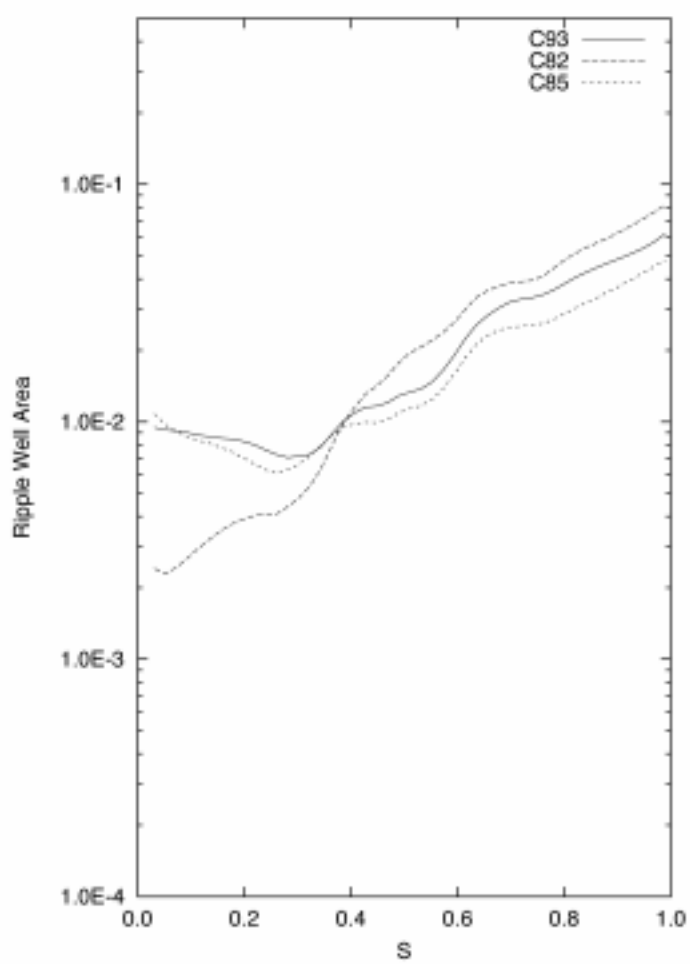
Mod B of C93 shows more ripples than C82 and C85, but C93 has a better thermal ion confinement.





Cont.


C93
C82
C85
1.0E-2
1.0E-3
1.0E-4
1.0E-5
1.0E-6
Chisq Bmns
0.0
0.2
0.4
0.6
0.8
1.0
S


C93
C82
C85
1.0E-1
1.0E-2
1.0E-3
1.0E-4
Ripple Well Area
0.0
0.2
0.4
0.6
0.8
1.0
S