

Configuration Design Studies  
-- High Iota Configurations --

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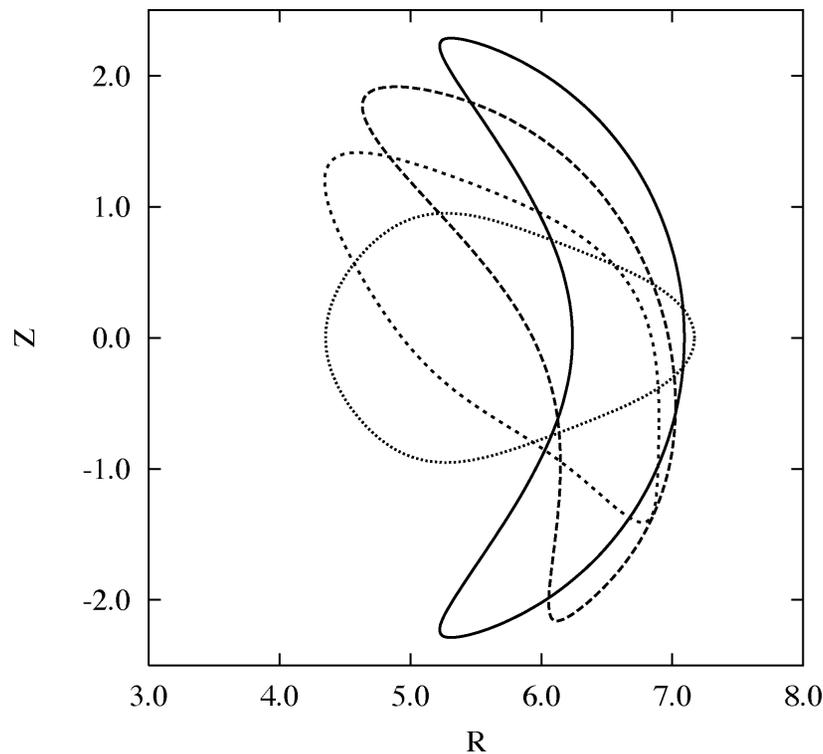
April 20, 2000

## Outline

- Rotational transform and helical excursion of the axis
  - Memo. LPK-041300-1 “Effects of Axis Excursion on Rotational Transforms”
- Design progress of high iota configurations ( $\iota > 0.5$ )
  - Configuration QAS3\_II19

A high iota configuration, II19, has been found which has some interesting properties.

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$$A = 5.37, \quad N = 3$$

$$\langle B \rangle = 5.55 \text{ T}, \quad I_p = 1.16 \text{ MA}$$

$$\text{If Vol (II19) = Vol (C82)}$$

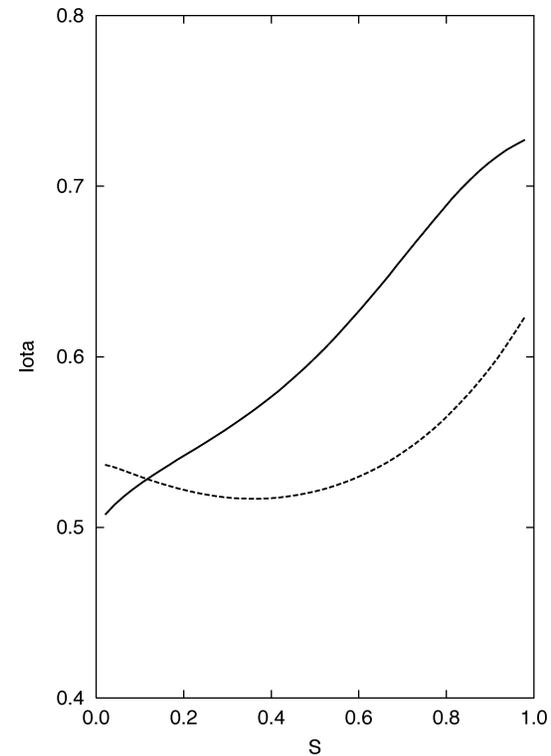
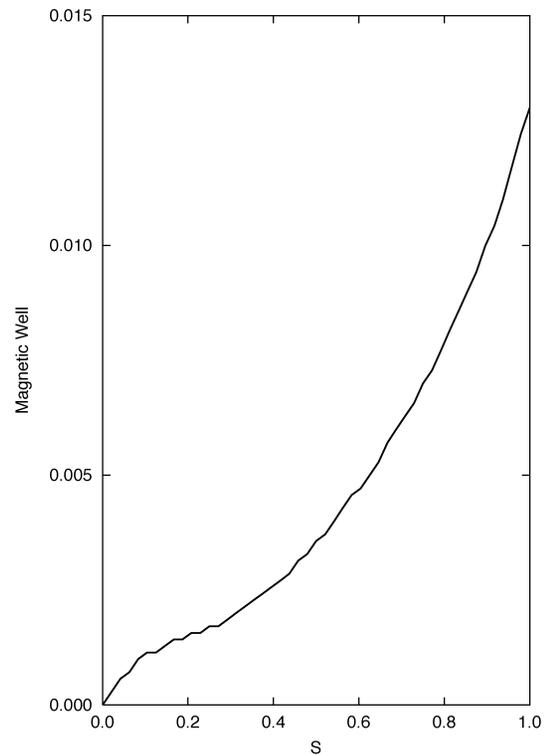
$$R = 1.97 \text{ m}$$

$$\langle a \rangle = 0.368 \text{ m}$$

$$a_{\min} = 0.14 \text{ m}$$

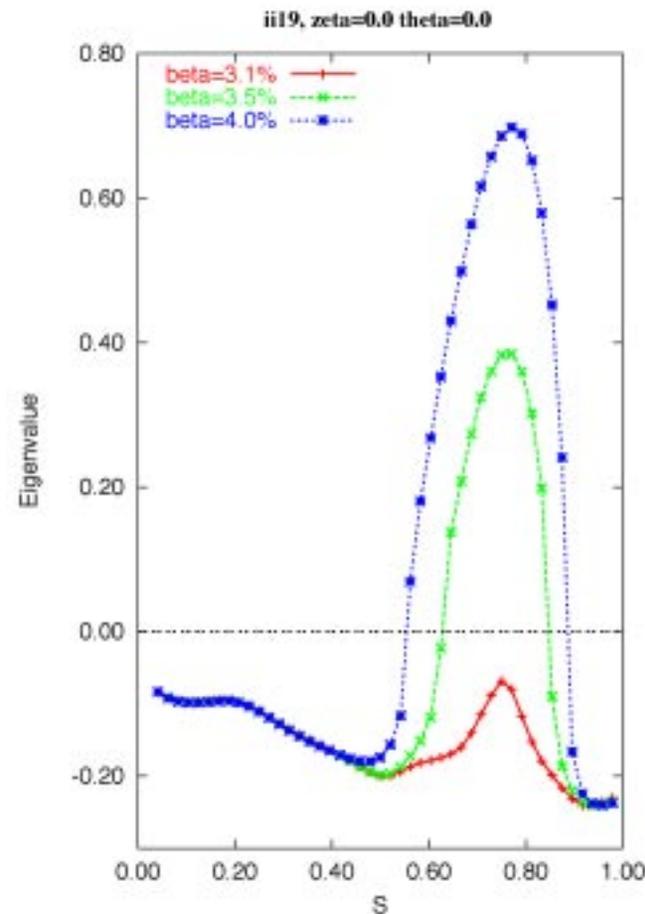
Unlike C82, the configuration has a vacuum magnetic well. With current, we are able to avoid 3/6 and 3/4 resonances and keep 3/5 resonance right in the middle. The  $\beta=0$  and  $I_p=0$  condition may be problematic because the 3/5 resonance is just inside the boundary.

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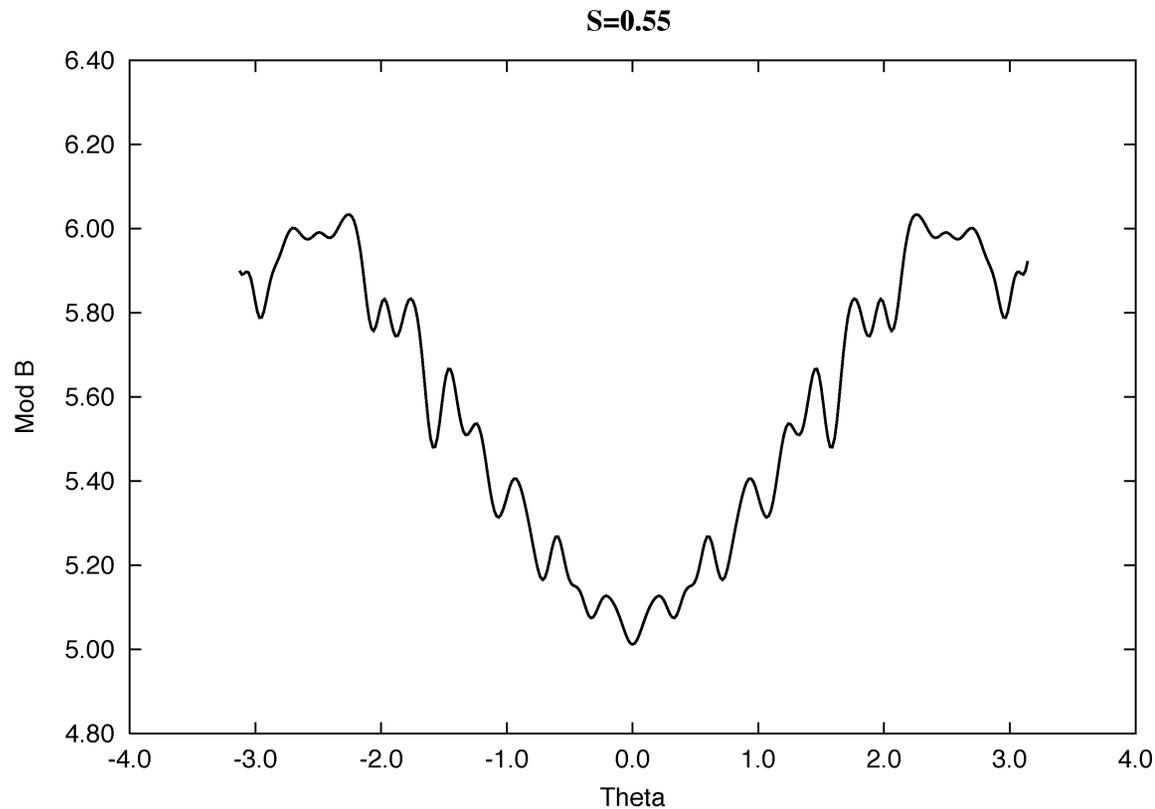
The configuration is stable to external kink modes to  $\sim 4\% \beta$ , and to Mercier and ballooning modes to  $3.1\% \beta$ . We have not been able to stabilize ballooning at  $4\% \beta$ , however.

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The largest  $B_{m,n}$  component at boundary is only 1.6%, compared to  $\sim 3\%$  for C82. At  $S=0.5$ ,  $\chi^2$  is twice as large as C82 and the largest component is about 0.7%, which is comparable to C82. However,  $|B|$  is much more ripply.

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## Work in Progress

- Improve II19 in ballooning and quasi-symmetry. Perform convergence studies, and self-consistent bootstrap current and global energy confinement calculations.
- Search for configurations with lower aspect ratios ( $A \sim 4.5$ ).
- Search for configurations with lower iotas (0.35-0.55).
- Search for configurations with 2 field periods.