XP 623: Stability limits at high current with n=1 correction fields

D. A. Gates

q* range calculated

$$q^* = \frac{\pi a^2 (1+\kappa)^2}{\mu_o R I_p} B_\varphi = 0.35 \frac{(1+\kappa)^2}{I_p}$$

Ip	kappa 2	2.1	2.2	2.3	2.4
1.2	1.45919118	1.57884485	1.70433529	1.8356625	1.97282647
1.3	1.3469457	1.45739525	1.57323258	1.69445769	1.82107059
1.4	1.25073529	1.35329559	1.46085882	1.573425	1.69099412
1.5	1.16735294	1.26307588	1.36346824	1.46853	1.57826118
1.6	1.09439338	1.18413364	1.27825147	1.37674688	1.47961985
1.7	1.0300173	1.11447872	1.20306021	1.29576176	1.39258339

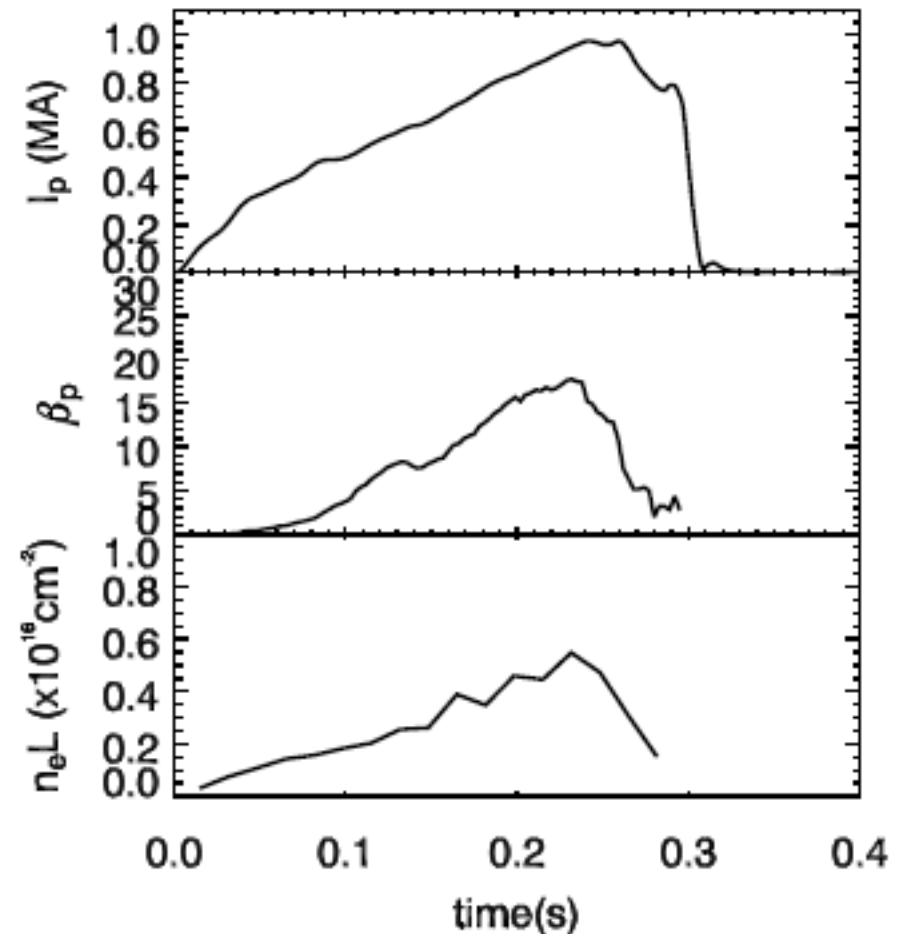# rtEFIT now able to maintain shape control during current ramp

- $\kappa \sim 2.4$ is maintained from t = 0.1s

- Simultaneous $\delta \sim 0.8$

- ➢ Move high β shots to rtEFIT control

Shot= 119992, time= 445ms
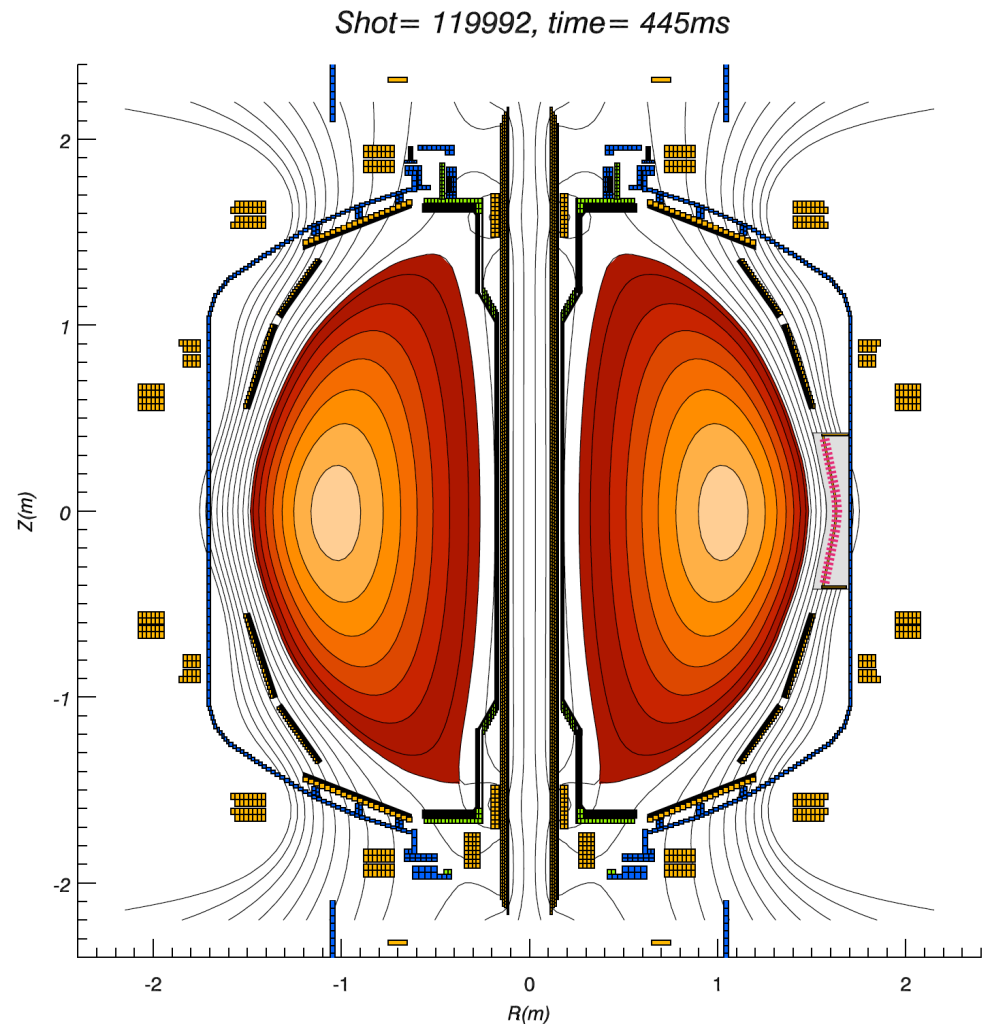
Test shot reached full current

Shot 119992, B = 3kGauss

- Simple reload of 119992 reached 1MA at 3kGauss

- Third beam delayed to avoid beta limit during ramp

- Shape well controlled

n=1 correction shows promising results

- Choice of algorithms up for discussion
- Maybe should try both (or new combo algorithm)
  - Decide on the day based on best results

Run plan

- 1. Recreate shot 119992 at 3kGauss. If necessary adjust I_p ramp rate and PF1A time history and beam timing to permit successful ramp-up. (5-10 shots)

- 2. Increase current in steps of 100kA, maintaining best Ip ramp rate. (5-10 shots)

- 3. Repeat current scan with error field correction/RWM feedback. (5-10 shots)

- 4. Repeat best shot at 3.5kGauss (4-5 shots)