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# Resonant Field Amplification (RFA) to n=2 or n=3 applied field


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**NSTX Research Forum**

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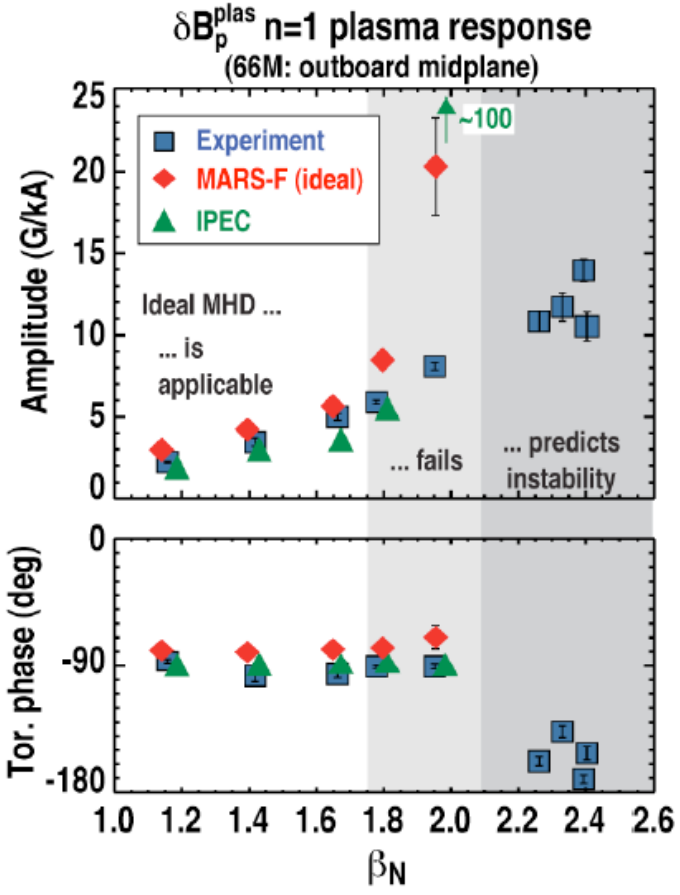
# Resonant Field Amplification (RFA) can show the essence of plasma response

- RFAs to n=1 fields have shown the validity of ideal plasma response below the no-wall limit

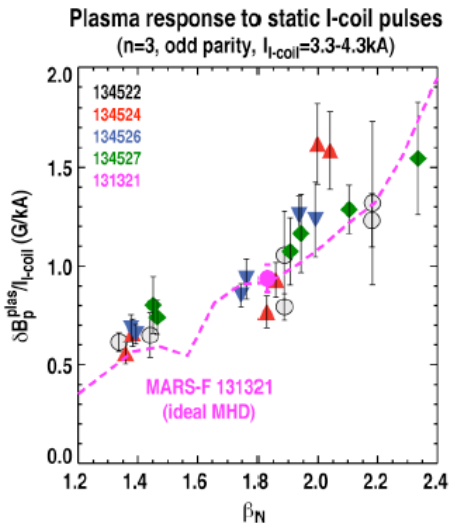
**Verification**
**&**
**Validation of**
**IPEC and MARS-F**
**for DIII-D RFA**



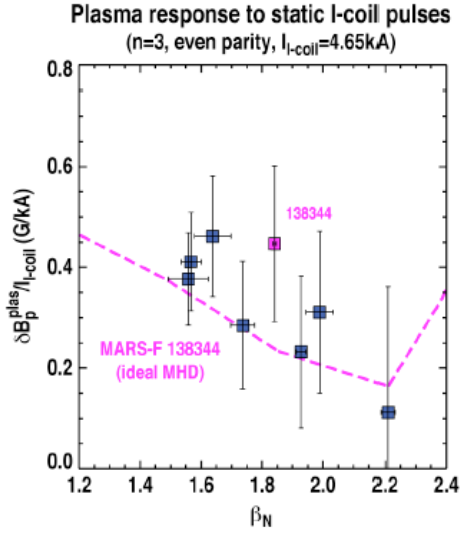
# Resonant Field Amplification (RFA) to higher n perturbations showed complications

- DIII-D showed the complicated plasma responses to n=3 applied field

**Measurement & CORSICA & MARS-F** →

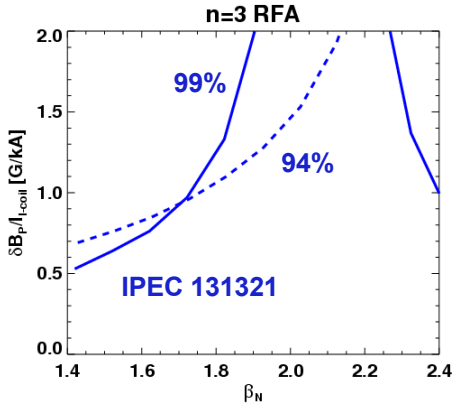


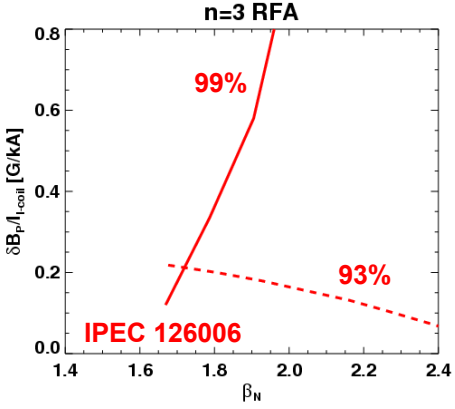

$q_{95}$~4.9




$q_{95}$~3.8

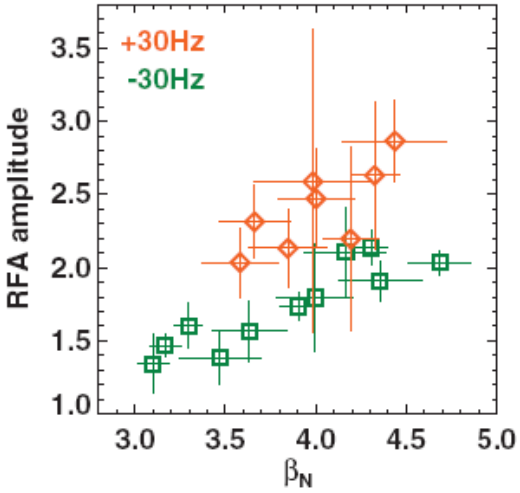
**CORSICA & IPEC** →



# Question : Would n=2,3 RFA increase along β ?

- The RFA change depending on β or $q_{95}$ can show the fundamental coupling between NSTX plasmas and n=2 and n=3 fields
  - RFA n=1 showed the linear increase along β, nearby the no-wall limit




  - Where is the point of marginal stability for n=2 and n=3?
  - RWM coils produce more non-resonant n=2 and n=3 fields for higher $q_{95}$, then RFA would decrease along with $q_{95}$?
  - Equilibrium + Stability code can confirm the observation?

# Shot plan (0.5~1 day)

- Study n=3 RFA with different β and $q_{95}$ (<0.5 day)
  - Apply n=3 oscillating fields (30,-30Hz) to 4~6MW NBI plasmas
  - Let plasma evolve to higher β
  - Try different $q_{95}$ (11, 9, 7)

- Study n=2 RFA to different β and $q_{95}$ (<0.5 day)
  - Use same target plasmas
  - Apply n=2 rotating fields (30,-30Hz)
  - Try different $q_{95}$ (11, 9, 7)

  - Either case, choose $q_{95}$ and frequency of fields to maximize RFA