Optimize error field correction vs. rotation

XP618 (Experiment run March 23-24, 2006)

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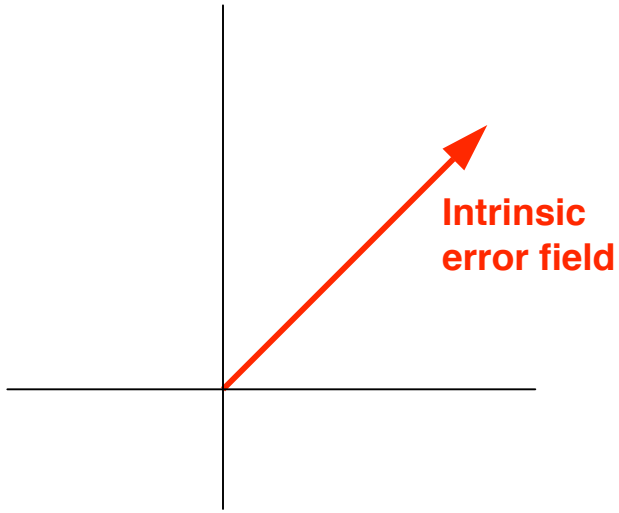
Goal: determine empirical error field correction in a small number of shots



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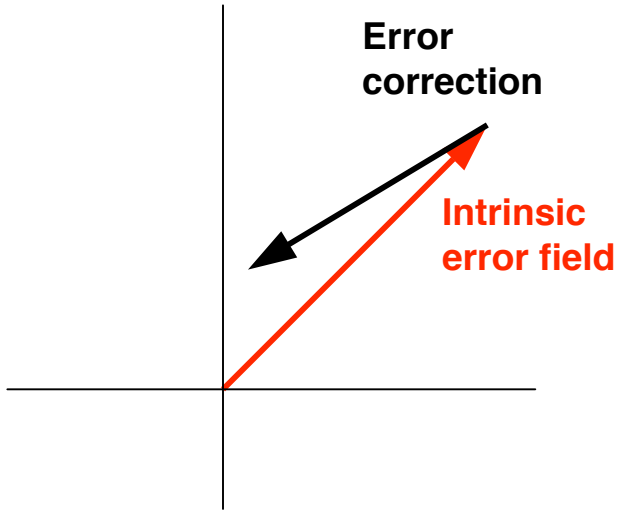

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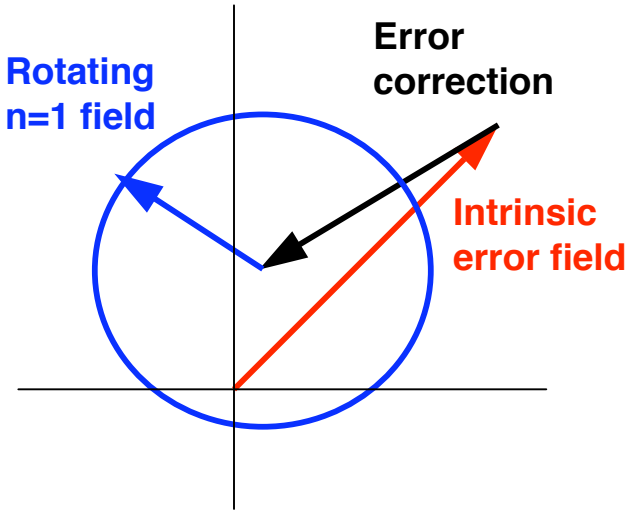

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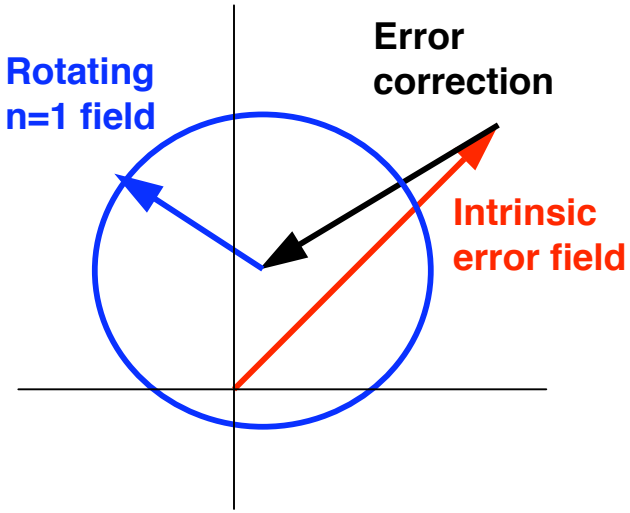
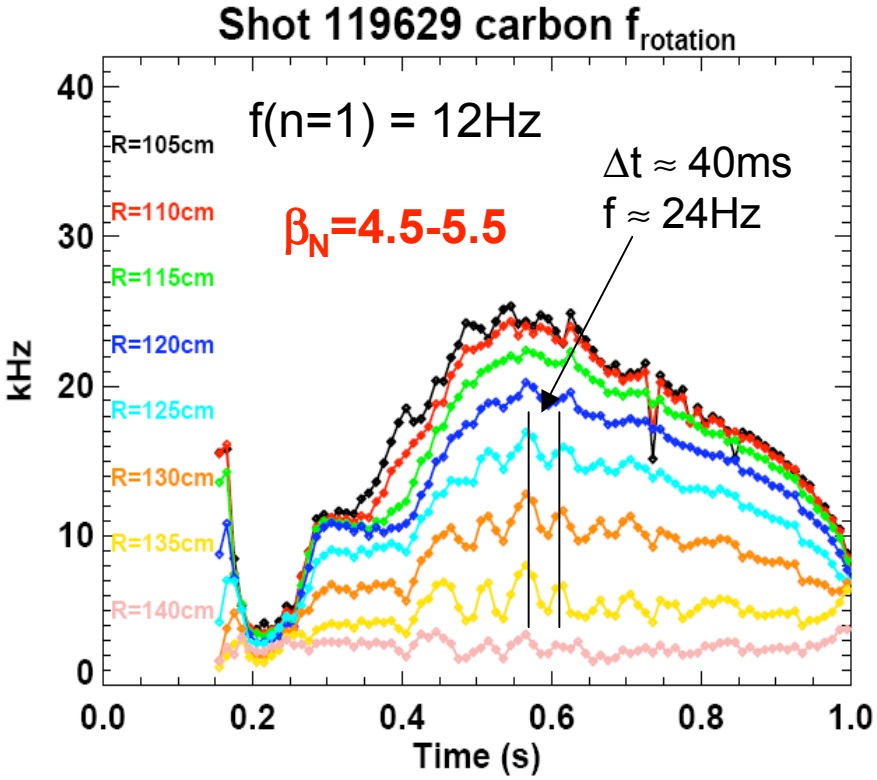
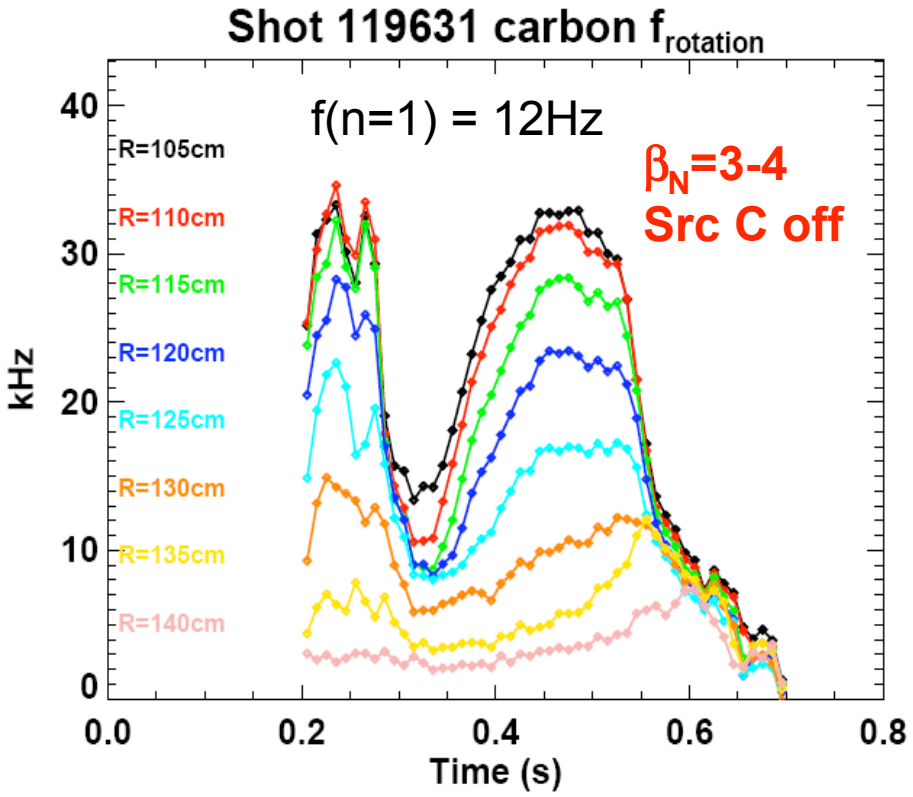
- **Advantages:**
  - Can be applied in varying plasma conditions
  - Can test a range of correction fields in a single shot
  - In principle, 1-2 shots yield information to determine optimum error correction

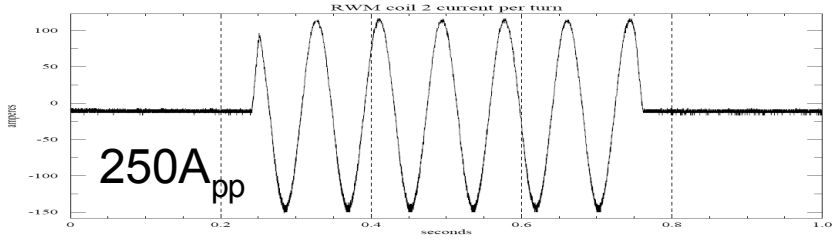


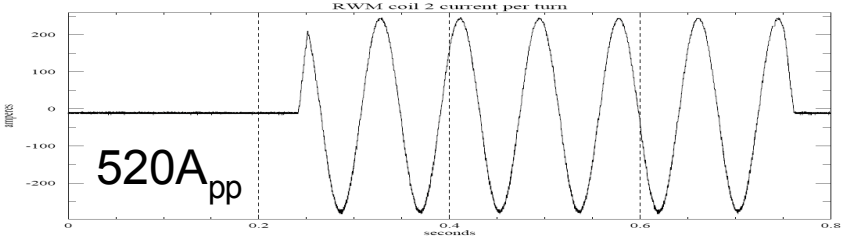
XP618: Optimize error field correction vs. rotation – LaHaye, Strait

- Observe rotation modulation at 2nd harmonic of applied field
- Little to no rotation modulation observed below no-wall limit

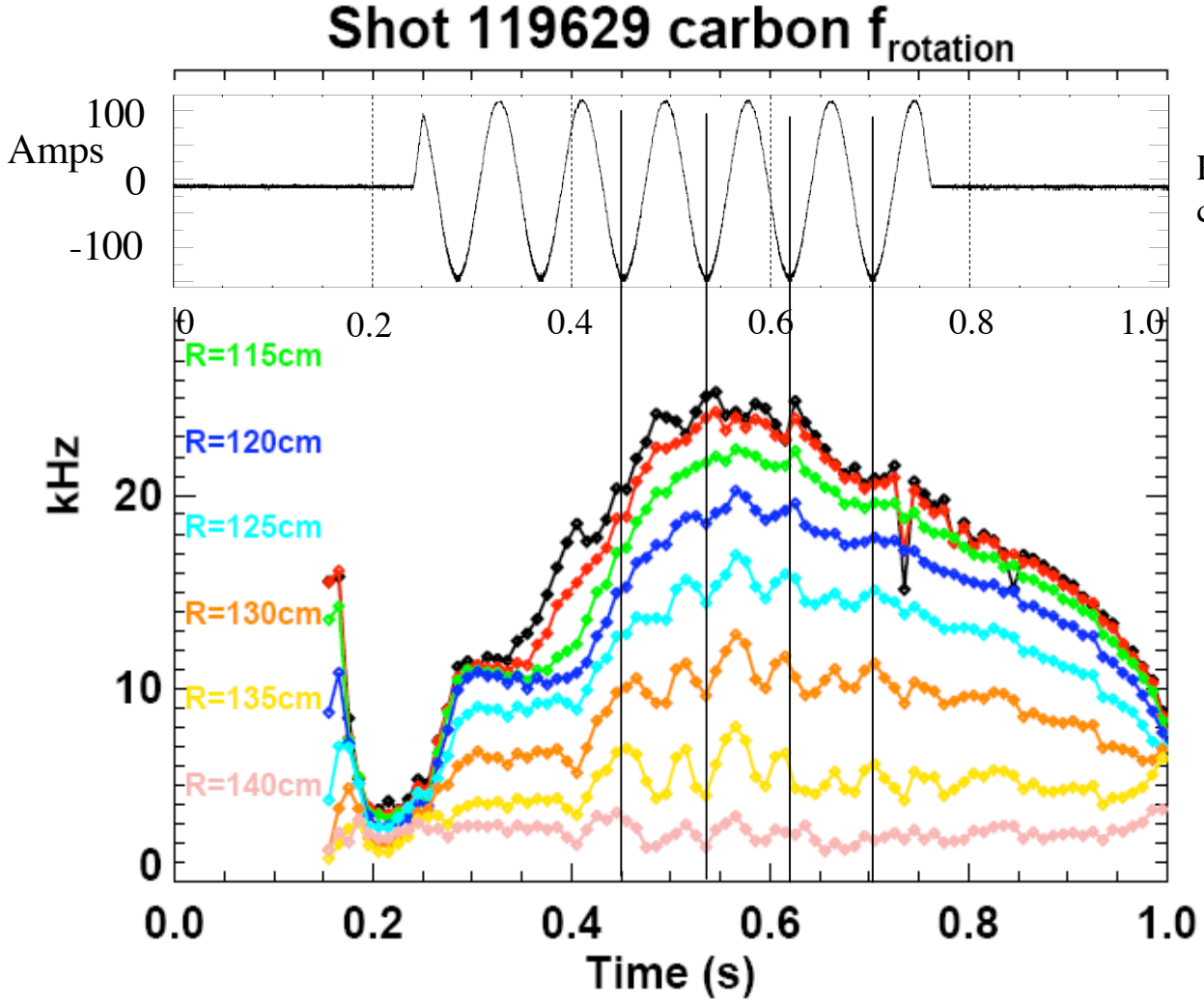








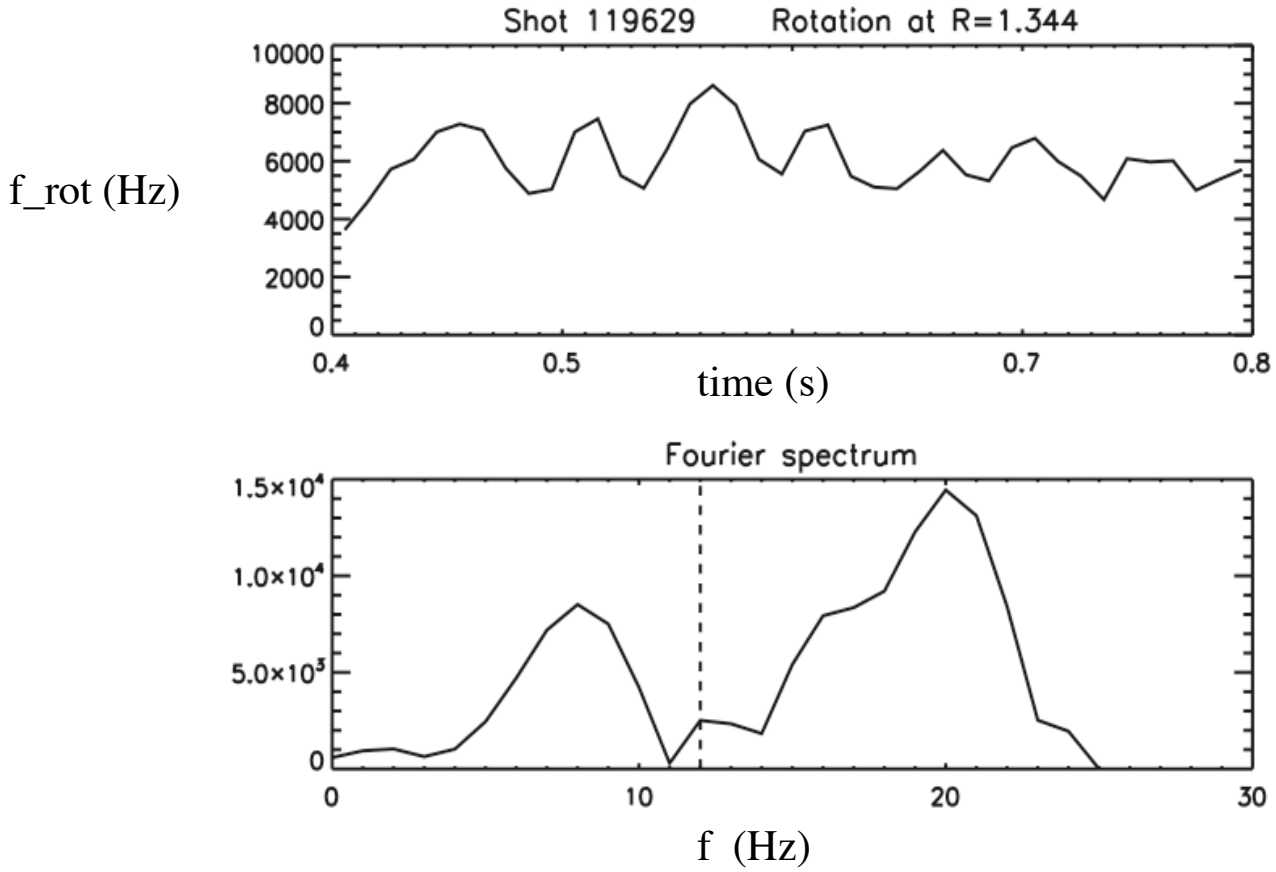
Modulation of rotation does not appear to be synchronous with the applied n=1 field



RWM coil 2
current per turn

Modulation spectrum is dominated by 20 Hz

- **There may be a small response at the 12 Hz applied frequency**



Possible explanations for the behavior of rotation

- **Modulation of rotation is strongest at high beta: suggests that resonant field amplification plays a role**
- **The apparent lack of synchronization may be due to a strong and rapidly changing phase shift of the resonant plasma response**
  - Time scale for changes in beta is not too different from the period of the perturbation
- **The modulation of rotation may be caused by ELMs (not n=1 perturbation)**
  - Resonant plasma response enhances the effect of the magnetic perturbation of the ELMs

Prospects for further tests of this concept

- **The method requires a clear separation of time scales:**
  Flattop duration >> Period of n=1 perturbation >> ELM period
  - Stationary discharge conditions are advantageous
  - Rapid ELMs (or no ELMs) are desirable

- **Resonant plasma response introduces additional complications**
  - It may be desirable to remain well below the no-wall limit