Baffle Configuration Effects on Dynamo Self-Generation

Understanding the Dynamics of the Earths Magnetic Field

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What is a Dynamo?

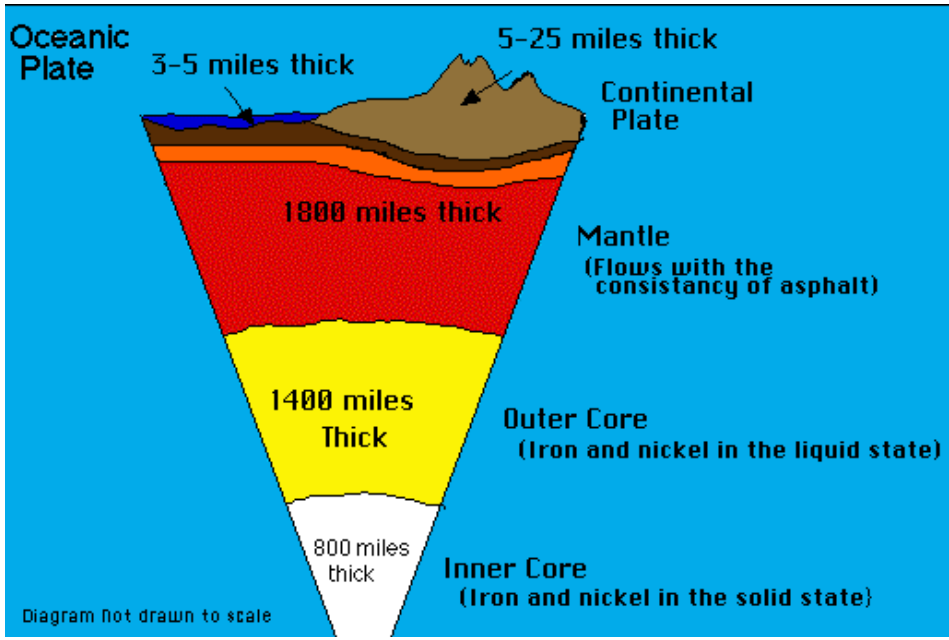
- General Definition: A process that converts Mechanical Energy into Electrical and Magnetic Energy
- Earth, an example of a self generating magnetic field.

- Self Generation, what helps:
  High magnetic Reynolds number
  Geometry- helicity, and strong hyperbolic points

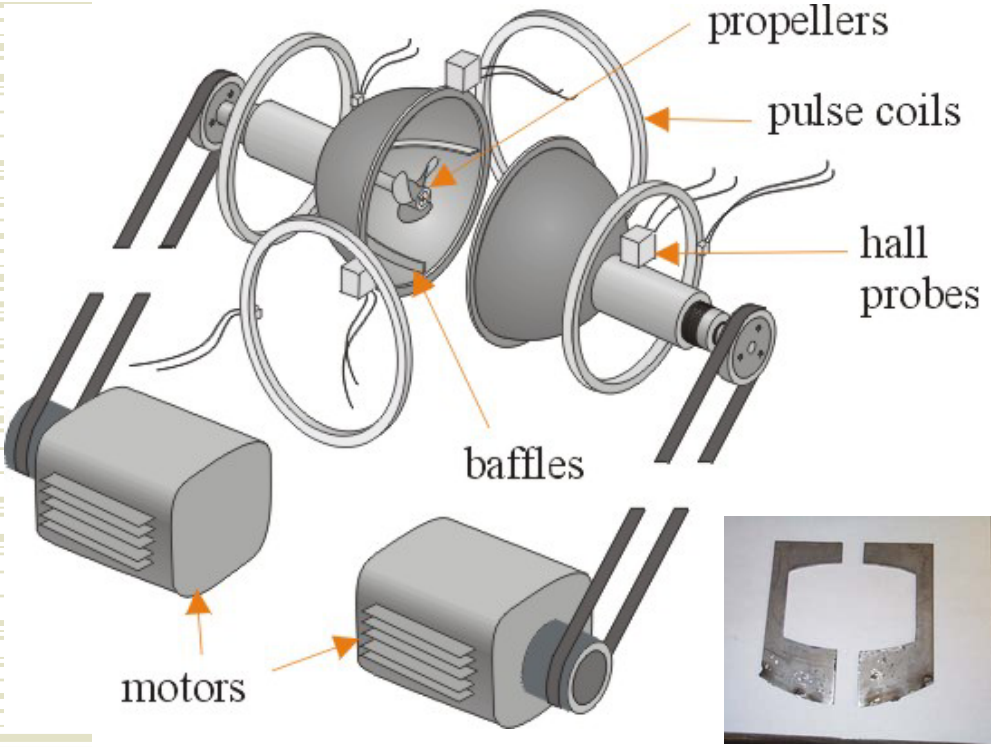
Key Variable:
magnetic Reynolds number

$$\mathrm{Re}_m = \frac{UL}{\eta} \approx \frac{\text{Magnetic Field Stretching}}{\text{Magnetic Field Diffusivity}}$$

U= characteristic velocity
L= characteristic length scale
η = magnetic diffusivity characteristic of sodium



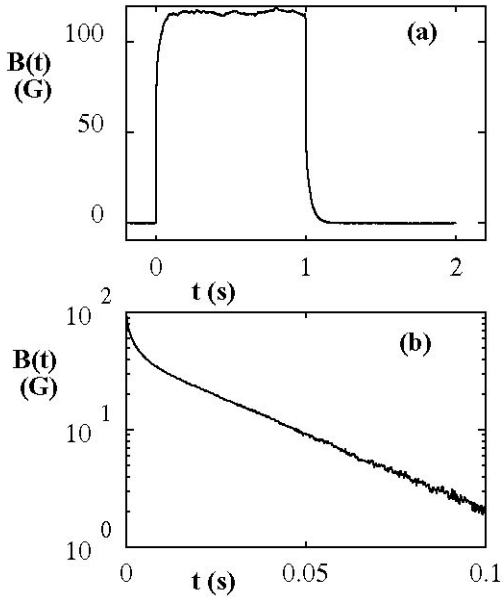
What Experiments are Being Done?



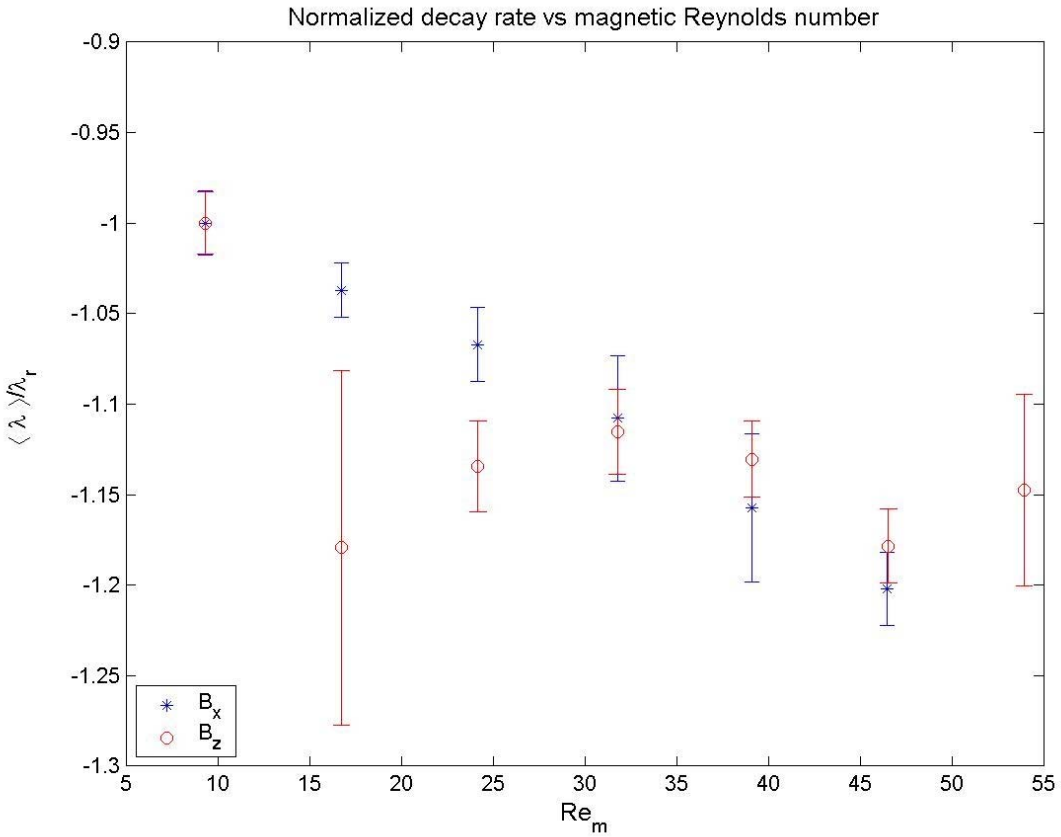
2 baffles

Different Propeller and Baffle Configurations

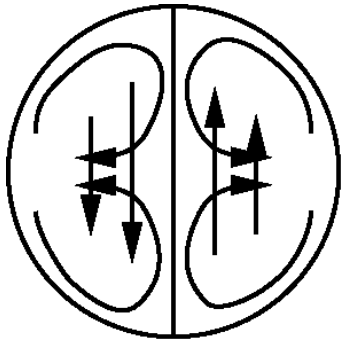
Measurement of Pulsed Magnetic Field.



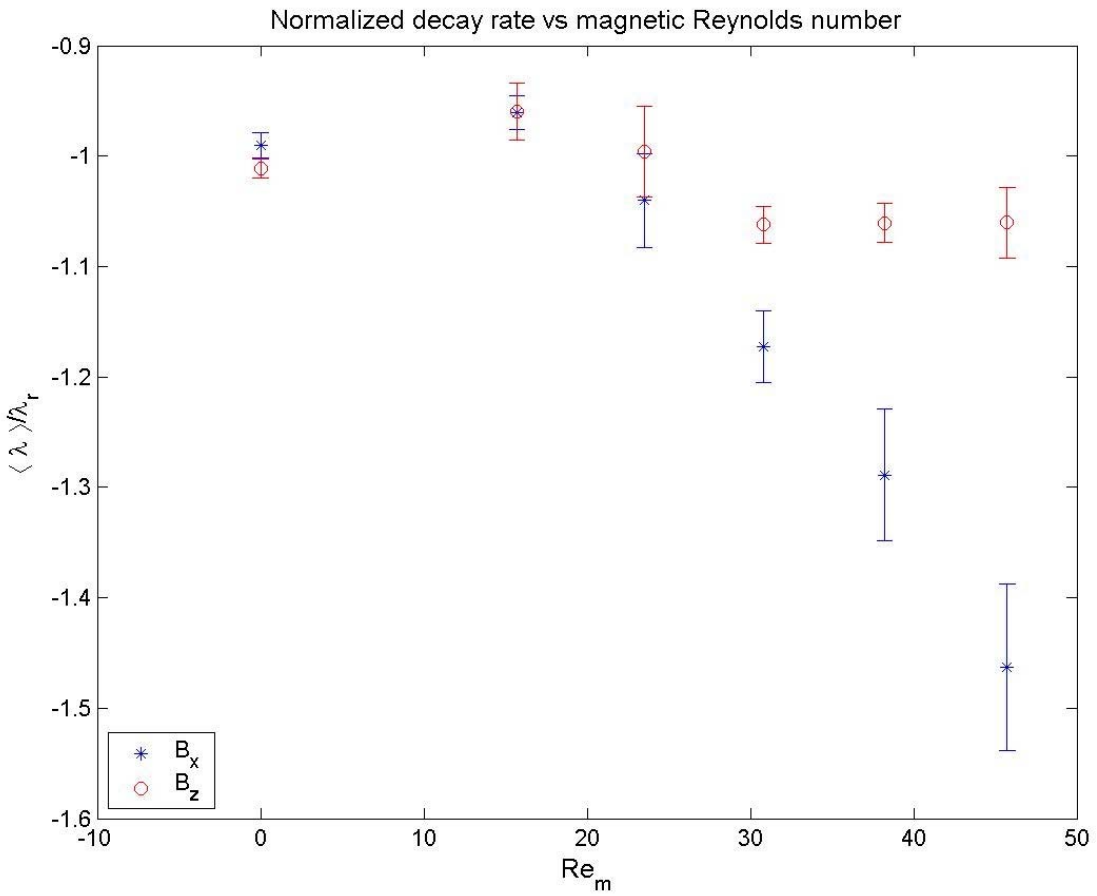
Results



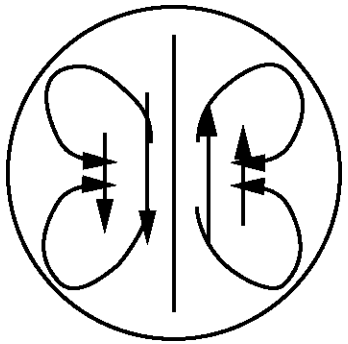
- 2 Baffles per hemisphere
- Poleward Sodium Flow



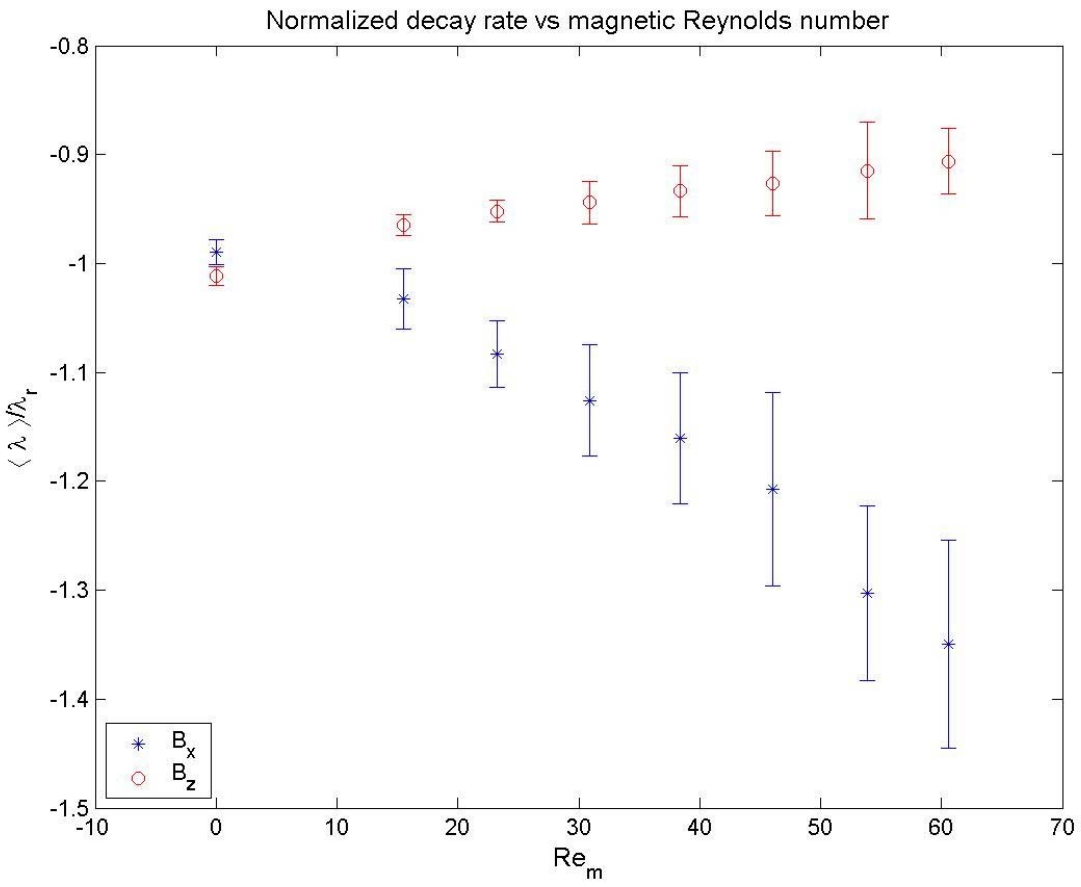
Results



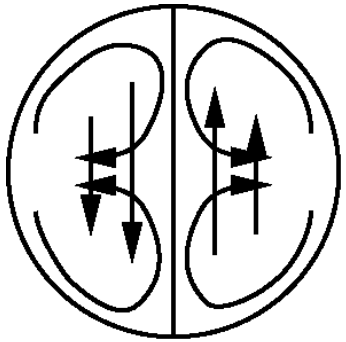
- 4 Baffles per hemisphere
- Equatorial Sodium Flow



Results



- 4 Baffles per hemisphere
- Poleward Sodium Flow



What Experiments Are Planned
(Now Think Bigger)

- 3 meter diameter device
- Large 13” Outer diameter magnets
- Capable of Magnetic Reynolds numbers up to 6 times that of the 30 cm device