Modular Design and Modular Program for High Gradient Quadrupoles*

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Introduction

- A magnet design with simple flat rectangular coils with large head radii
- Achieves similarly high gradients as those achieved in circular coil designs
- Modular design can be modular in nature that allows rapid turns around cost-effective magnetic fields
- One can vary the quadrupole apertures and even the magnet type (quadrapole, canonical coil, open multipole dipoles, etc.) using the same hardware (modular)
- Allows both "Wind & React" or "React & Wind"

Modular Quadrupole Design Concepts

- Customized design allows different gradient values which can be configured to meet different needs
- The design needs to be flexible to accommodate future needs
- Modular design allows for easier modifications and testing

Basic Considerations

- Developing a racetrack quadrupole design that can generate a high gradient is critical to create a successful design
- Once a high-gradient magnet is designed, the design should be efficient in creating high-gradient gradients, if not used efficiently, it can be detrimental to the overall design
- No single homogeneity level is universally applicable. Relatively narrow homogeneity requirements may be more cost-effective for HPS.

Support Structure

- Concepts need to evolve
- One can be creative here
  - "Think geometry" — it's different!

More Unique Features

- Different aperture with the same coils
- 3 of a kind: Single, Double, Flexible, and Cost-effective

Benefits of Modular Design

- Simple, Fast, Flexible & Cost-effective
- A modular design can be modified to suit different applications
- "Wind & React" or "React & Wind" programs are possible
- More unique features include "proof-of-principle" magnets
- Modular design can be used in different applications

SUMMARY

- Modular designs can be used in different applications
- The modular design allows for easier modifications and testing
- Creative concepts can be developed for different applications
- Modular design can be used for a variety of applications