SHMS

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- Combined Function magnet
- Two longer quads
- Horizontal bend

- CF magnet
- Co-axial design offers very high quality fields that exceed SHMS spec’s but it has one significant challenge
- The Coaxial CF magnet ahs a large de-centering force due to the highly asymmetric fields ~ 600 tons!

- CF magnet solutions
- Keep the coaxial design and design a support that can tolerate the high load and still be cryogenically efficient
- Keep the design and use cold iron
- Get ride of the iron and use an active shield
- Change the design to a co-linear magnet

- Co-linear design
- Two separate shorter magnets in one cryostat that each produce the same required integral fields
- Eliminates the de-centering force and in principal is easier to build
- Shorter magnet have the same peak fields but they have higher multipole content

- The co-linear magnet has ~twice the sextupole content as the coaxial design and the shorter dipole is closer to the detector so there is some loss of resolution
- First order optics study looks OK
- Co-linear magnet has the same or better operating margins in field, current and temperature
- The decoupled magnets can be wound separately and joined after initial tests mounted into a common cryostat

- SHMS CF magnet PIX here

- Q1 pair
- It is desirable to increase the integral gradient of the Q1’s as this makes elimination of the global “slider” possible while reaching high energy at near constant acceptance.
- Requires use of a hoizontal bend

- Q1’s at 15 % increased length simply gives a 15 % increase in integral strength without raising the fields in the Q1’s.
- The space is found by mounting the longer Q1’s in a common cryostat.
- This eliminates cryostat parts, separate cryo reservoirs, one of the magnet controls systems but keeps the separate DC power and energy dump systems.

- We plan to award an R&D contract to the original designers of the Q1 magnets to study:
- The 15 % longer design
- The 2 in 1 cryostat
- The use of JLAB supplied SSC cable for the Q1’s
- Evaluate the cost , schedule and technical risk and mitigations for the above

- New Q1 pix here

- Horizontal bend
- This new magnet is required to eliminate the SHMS slider.
- Two designs are considered resistive and SC
- The resistive design has poor field quality and kicks the electron beam at about half the Integral B.dL as the SHMS particles so a big corrector is needed.

- The SC horizontal bend has beautiful fields and very low stray fields on the beam line but will clearly be more costly.
- The SC horizontal bend requires about 40 % of the achieved performance of the Hall A septum’s so it is a relatively low tech SC magnet

- Horizontal bend pix here

- Overall SHMS PIX here

- Conclusions

- A conceptual design review is planned to be held before Aug 31, 2006
- R&D effort on 2 in 1 longer Q1 magnets
- JLAB effort to further develop the CF magnet