

eRHIC IR Design Meeting

Minutes for February 22, 2019

1 Draft Agenda

1. (Add) discussion of priorities.
2. Update from Steve on electron ring matching.
3. Update from Guillaume on hadron ring matching.
4. Update on Dave's list of questions.
5. Update from Bob on status of write up.
6. Update from Qiong on the status of the 22 mm to 25 mm crossing angle change control process.
7. Any other business.

2 Priorities

1. Brett is responsible for the technical aspects of the IR design.
2. Ferdinand: Need to clarify the priorities for the group to efficiently and effectively proceed.
3. Brett: Will try and guide the effort to arrive at the optimal IR design (low cost, high performance).
4. The electron outgoing design and setup looks promising and should be generally kept.
5. The cost estimate is the highest priority.
6. We need to stop tweaking the lattice for the cost estimate.
7. Change control:
 - (a) Switch from 22 mrad to 25 mrad.
 - (b) Don't freeze current lattice in change control since that will end up needing to be undone.
8. We need to buckle down and converge on a design.
9. The cost estimate will be based on the January 25 design—the October design with the corrections from December.
 - (a) One vendor said the Q2PF magnet parameters for the cost estimate was too tough and needs to be relaxed.

- (b) The cost estimate design will include the relaxed magnet parameters.
 - (c) Need to communicate information and better coordinate things. Brett should be kept in the loop regarding things like the need to relax the magnet parameters.
10. How many additional elements will be needed in the straight sections?
 11. How many magnets will be needed to match the IR to the main lattice for the cost estimate design?
 - (a) Use best judgment and have a logical reasoning for the number.
 - (b) Guillaume has a preliminary lattice geometry matched to a hybrid IR, which is partially based on Bob's design.
 - i. Brett wants to see the matching.

3 Steve: Electron Ring Matching

1. Slide 1: “[1] B. Palmers’ Fit to IR”
 - (a) β functions and dispersions for the January 25 design.
 - (b) Doesn't have high β s for crab cavities.
2. Slide 2: “[2] MADX Fit to IR with CRAB Cavities”
 - (a) Have crab cavities in design in the $\beta_x = 300$ m regions at $S \simeq 25$ m and $S \simeq 95$ m.
 - (b) Dispersion $\lesssim -0.8$ m at $S \simeq 95$ m crab cavity.
3. Slide 3: “[3] MADX Fit to IR with CRAB Cavities and higher Q0EF”
 - (a) Refit quadrupoles in $s \lesssim 50$ m region.
 - (b) β_x needs to come down at $S \simeq 80$ m (where target is).
4. Slide 4: “Table for the Quadrupole Gradients”
5. Slide 5: “Geometry, 8 mrad angle to DX axis”
 - (a) Final/overall geometry.
 - (b) IP 6 to be moved 1 m down with respect to present DX centerline to allow RCS to pass detector.
 - (c) Try something similar at IP 8.
 - (d) This one should fit in tunnel.
 - (e) The “funny horns” are dispersion suppressors.
 - (f) Christoph: (proposal) Get rid of dispersion suppressors at IR 12 (where we inject) since we need dispersion there anyhow.

- i. Then, 0 dispersion sextapoles at IRs —.
- (g) Rotate by 8 mrad at IPs 6 and 8.
 - i. This makes electron matching possible.

4 Qiong: 25 mrad change

1. Up to Christoph.
2. Christoph is waiting till Tuesday for responses from other affected parties.

5 Holger

See earlier discussion of magnets parameter relaxation in section 2, item 9(a) on page 1.

6 Dave: List

1. We need to make sure there is enough beamline instrumentation to set up the crab cavities.
2. Dave will work with Brett regarding other instrumentation for the cost review.

7 Bob: DRAFT IR-Parameters-6 Post Cost Review

(File: 190222-IR2.pdf)

1. Slide 1:
 - (a) First iteration of ‘Cost Review Forward Design’ (from 1/25/19).
2. Slide 2: “Steps taken”
 - (a) Recombine the two Q2EF magnets.
3. Slide 3: “Layout”
4. Slide 4: “Detail”
 - (a) Detectors shown in yellow.
5. Brett: Increasing L^* of Q1PF by 2 m raises β peaks, chromaticity, and increases magnet apertures. Hence having the quadrupoles as close to the IP as possible.
 - (a) Bob mentioned the synchrotron radiation from pre-CDR disaster, but he did not show plot. Was this before we added Q0EF?
6. Brett:
 - (a) First, 100 GeV alternate design approach geometry matching.

- (b) Then, put a quadrupole corrector in the gap between Q1PF and Q2PF to make a closed orbit bump to limit the change in geometry to the inner IR and to avoid impacting the ring geometry at different energies.
- (c) Then, apply offsets and angling to magnets as a perturbation.

7. Slides 5 and 6: [parameter tables]

- (a) Slide 5: “TB18w7e zbFe362 Hadron forward 275”
- (b) Slide 6: “TB18w7e zbFe362 Electron Forward 18”
- (c) Bad on B1 aperture.

8. Slide 7: “Central orbits for other energies”

- (a) Considerable B0 kick at low energy.

9. Slide 8: “Conclusion”

- (a) Bob’s current program is not exact, but it could be fixed to perform accurate calculations of the α , β , and γ matrices.
- (b) Brett: The priority is the MAD lattice for both beams.
 - i. We need it for Monte Carlo simulations.
 - ii. Brett will look at using B-MAD for the offset, angled magnets. (See also item 6(c).)
 - iii. Guillaume needs a stable set of parameters.
- (c) Brett: Wants to proceed forward in a systematic manner, interacting with all the various parties involved.

8 Next Meeting: Friday, March 8, 2019 at 2:30 p.m.

8.1 Draft Agenda

1. Brett: Process Moving Forward.
2. Guillaume: Hadron Matching.
3. Dave: Questions.
4. Mike (Sullivan, SLAC): Feedback/Progress Report.