EIC IR Design Meeting

Draft Minutes for Friday, June 12, 2020

Agenda

1 Simulation results—Friends from Physics

Postponed.

2 Synchrotron radiation update—C. Hetzel

Title: "Magnets Upstream of D1 (Electron Forward)"
File: IR Meeting 200612.pptx

1. Impact of upstream eF magnets is low compared to closer magnets.
2. SynRad likes to normalize parameters to go from 0 to 100. So the 62 mm diameter of the beam pipe is normalized from 0 to 100 by SynRad in lower right plot of [slide 1].
3. Side opposite lumi. monitor has notable photon flux density that could be relevant to electron tagger.
4. May need to add/adjust tapering.
5. Updates From Materion [slide 4]
   (a) Beryllium section are limited to 1 m in length
   (b) Multiple section can be joined but filler wire is used (more opaque than Be)
   (c) Conical section can be fabricated
   (d) 0.8 mm is minimum wall thickness for vacuum integrity
   (e) Atlas beam pipe 7.3 m ±0.4 mm straightness
   (f) Willing to work with us to develop geometry (send concept drawings)
6. F. Willeke: Is the 0.81 mm minimum thickness for room temperature?
   (a) Yes.

7. Can't accommodate a 20 mm off-center beam radiating 10 MW with shadowing.
8. Scaling of geometry in slide 10 is deceptive.
9. There will need to be a masking scheme upstream from the IR.
10. C. Montag: The large orbit error numbers come from the PEP II design manual.
11. R. Palmer: "I was trying to say that we had used 23 sigma vertical not 15"
    (a) C. Montag:

        Charlie uses fully coupled emittances for determining the vertical beam size, so he is vastly over-estimating the required vertical aperture. That is standard practice, though, because it may get vey hard to start up the machine if the vertical aperture was based on the small design emittance.
        Charlie's vertical emittance is 10 nm, half of the horizontal value.

    (b) R. Palmer: "I will write something and send it in after the meeting"
    (c) C. Montag: "I just realized that the actual vertical emittance of 4 nm happens to correspond to 23 sigma when with 10 nm we get 15 sigma, so it turns out to be the same absolute aperture in the end."
    (d) R. Palmer:

        I was trying to say that, from Mike Sullivan's work we expected a larger vertical electron tail than horizontal. The maximum that would fit in the currently round focusing magnets at the IP turns out to be 23 sigma vertical, rather than the 15 sigma horizontally. This was assuming, at 275 GeV, a horizontal emittance of 24 nm, and a much smaller vertical emittance. As Christoph pointed out, you had been using a symmetric emittance, of, was it 40 nm? In any case far larger than the actual beam in that case. So you probably have plenty of aperture. But we need to get this straight to avoid later heart attacks, and we need to do this for all the energy cases including 5 GeV with vertical emittance 10.2 nm and horizontal 20 nm.

    (e) A. Drees:

        Bob,
        sorry, probably dumb question: we were talking about electrons? What do you mean with 275 GeV (which is the proton energy)? A

    (f) C. Montag:

        The vertical emittance used by Charlie is half the horizontal design emittance, which corresponds to a fully coupled machine. This means it's 10 or 12 nm, which is larger than the vertical design emittance in most cases. Assuming the design emittance is 4 nm, this gives us about 23 sigma aperture if we get 15 sigma with a 10 nm emittance.

I highly doubt that a vertical emittance if 10 nm is viable in terms of polarization. I really would like that value to come down to 5 nm or at most 6 nm.

Christoph

3 Update on proton IR lattice—J.S. Berg

Title: "Proton IR Lattice"
File: JSBerg-200612.pdf

1. Proton forward: generating more chromaticity to the get the beta down than the IR does.
2. Summary [slide 11]
   (a) Have matches in place for proton IR (IP6)
   (b) Proton forward very tight, high chromaticity
   (c) A couple choices to be made
      i. Live with low phase advance to the crab on the proton rear side?
      ii. Position snake correctly?
   (d) To do:
      i. Final polishing, primarily on rear
      ii. Integrate into main lattice. Should just drop in, but the forward layout near the IP may be tricky to translate
3. G. Robert-Demolaize: How long is the section between IP and BPM-10?
   (a) Will check and follow up.
4. H. Witte: Which version is preferred?
5. Q. Wu: Change in phase at crab seems okay, will confer with colleges.
6. C. Montag: The 2.5° probably doesn't come form simulations.
7. Would be good to know what the actual bounds are.
8. Any guidance about "steeling" quads from other parts of the ring?
   (a) S. Pegs: Could probably be done.
   (b) C. Montag: Might be able to take tripplet quads from IR-8 (since it doesn't currently have a functioning IR). Might also be able to take them from IR-2 since they have to be removed for the cooler.
9. S. Pegs: Are there plans to put a momentum collimator in one of the dummy chryostats with cold-to-warm transition?

(a) A. Drees: Yes, but it could be anywhere.

(b) S. Pegs: So if there's space in IR-2, it would be fine there?

(c) A. Drees: Yes.

4 All other business

None

5 Draft agenda for Friday, June 19, 2020 from 2:30 to 3:30 p.m.

1. Simulation results—Friends from Physics
2. Vacuum system/collimation—A. Blednykh [tentative]
3. All other business

Contact H. Witte or W. Christie to be added to the agenda.