

eRHIC IR Design Meeting

Draft Minutes for Friday, November 1, 2019

Present: Holger Witte (Chair), Jaroslav Adam, Elke Aschenauer, Alexei Blednykh, Kyle G. Capobianco-Hogan, William “Bill” Christie, Alexander “Alex” Jentsch, Henry Lovelace, Gary “Mac” McIntyre, Christoph Montag, Alexander “Sasha” Novokhatski, Robert “Bob” Palmer, Brett Parker, Stephen “Steve” Plate, Vadim Ptitsyn, Michael Sullivan, Steven Tepikian, Ferdinand Willeke, Qiong Wu, Zhengqiao Zhang

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1 Crab Cavity Design—Qiong

Title: “Preliminary cryomodule for eSR crab cavity”

File: [SR400MHzcrabcavityCryomodule_20191101.pptx](#)

1. Can reduce aperture from 10 cm inner diameter, but is easier if we don't.
2. Stainless steel closure/thermal shield needed to hold pressure of helium vaporizing.
3. All dimensions in schematics are in millimeters.
4. Thermal shield can be moved in about 10 cm.
5. Elke: ZDC is about 60 cm by 60 cm.
6. Ferdinand: Large upper plate will stick into ZDC aperture.

7. Alex J.: Should be okay (i.e. able to get 6 mrad acceptance for neutrons to ZDC) if the thermal shield is moved in 10 cm (see item 4).
8. Crab cavity needs to be shielded down to 10 mG (1 μ T, less than Earth field) so cryogenic, magnetic shield is included within helium vessel.

2 Layout—Bob

Title: “1911-work-v1”

Subtitle: “Baseline Problems & possible fixes”

File: [1911-work-v1.pdf](#)

1. Crab cavity shown with 10 cm reduction in extent (see section 1, item 4) from $R = 67$ cm to $R = 57$ cm [slide 2].
2. Synchrotron radiation dangerously close to hitting crab cavity [slide 6].
 - (a) Focus beam tighter and decrease mask aperture to protect crab cavity from synchrotron radiation [slide 7].
3. Henry: Could another quadrupole magnet be added to the design?
 - (a) Bob: Yes.
4. In baseline rear layout, crab pR and crab eR overlap and there is a bending magnet (B3eR) immediately before crab eR “spraying” synchrotron radiation [slides 13–14].
 - (a) Steve and Bob will try and take out B3eR and the magnet it compensates for (B6eR).
5. Brett: Secondary electrons from quadrupoles may cause issues in crab cavity.
6. Alexei: What is the timeline?
 - (a) Ferdinand: (working backwards from CD-1)
 - i. CD-1 in September.
 - ii. Director’s review in July.
 - iii. Freeze design in April for Conceptual Design write-up to be done by July.

3 Luminosity monitor for EIC—Jaroslav

Title: “Luminosity monitor for the EIC”

File: [JA-Lumi_20191101.pdf](#)

1. Simulator validated by comparison for Hera parameters [slide 4].

2. Bob: Foil/window for luminosity monitor may need to be in beam pipe direction rather than perpendicular to undeflected electron beam path (as shown in slides 6–7 to avoid melting, as per Mike S.
 - (a) Elke: Can look into putting (run simulations with) exit window at angle.
3. e^+ and e^- pairs are separated with dipole to enable coincidence based background detection [slide 13].
4. Ferdinand: What is the $\gamma \rightarrow e^+e^-$ conversion efficiency?
 - (a) Jaroslav: Out of 1 000 000 runs, about 20 000 resulted in coincidences in detectors (2%).
5. Miss high energy tail since model is still rough (i.e. not yet calibrated based on energy) [slide 15].

4 Electron Polarimeter—Zhengqiao

Title: “Electron Polarimeter”

File: [20191101_Zhengqiao_Zhang.pdf](#)

1. Based on available space [slide 12], positions shown in slide 13 are preferred.
2. Need 30 cm magnet aperture for full acceptance (i.e. 0 GeV to half beam energy, as opposed to partial acceptance of e.g. 2 GeV to half beam energy).
 - (a) Still need to look into partial acceptance case.
3. Elke: May need to move the polarimeter.
 - (a) Will need overview of fill machine layout to find potential locations.
 - i. Will meet with Christoph regarding this.

5 IR/Roman Pots Simulation Update—Alex J.

Title: “IR/Roman Pots Simulation Update”

File: [IR_meeting_update_11_1_2019.pdf](#)

1. Initial assumption of a 4 mrad neutron cone is not accurate; neutron cone actually extends to 6 mrad [slide 2].
2. Correction: Beam pipe inner radius is not 6 cm; inner diameter is 6 cm [slide 3].
3. Do to difficulties with event generators, electron and proton beams were simulated at 0 mrad and 25 mrad, respectively.
4. Looking at exit face of B0 in slide 4.

6 An update on Hadron matching—Holger

Title: “Matching”

File: [2019-11-1_Matching.pdf](#)

1. We have a match. Also have a match for “Blue Ring Scheme” (i.e. if Blue Ring is kept).
2. pCDR Scenario:
 - (a) Need new magnets (i.e. not included in pCDR) [slides 3–4].
 - (b) Essentially complete match.
3. Blue Ring Scheme:
 - (a) Assuming we don’t need snakes in (storage) ring [slide 9].
 - (b) Adding 2 new dipoles to hadron forward [slide 9] and 1 new dipole to rear [slide 10].
 - (c) Changes angles.
 - (d) Simulations use D0 magnets at higher than initial design currents, but still below final training quench currents [slide 13].
 - (e) Pick up roughly 2 cm.

7 Next Meeting: Friday, November 15, 2019 from 2:30 to “3:30” p.m.

7.1 Draft Agenda

1. Plan moving forward—Holger
2. New electron rear design—Steve T.
3. Simulation update—“The Friends from Physics”
4. Status of Blue Ring integration—Henry
5. Beam pipe concept (design)—Sasha
6. All other business

8 Long Term Business

1. Elke: We need to look into whether the layout would fit in IR-8.
2. Holger: Steve P. from Magnet Division can look into cryostat layout.