Central Detector Integration / Magnet subgroup summary

*Conveners: William Brooks and **Alexander Kiselev***

EICUG Yellow Report Temple virtual Meeting, March 2020

session agenda & talks https://indico.bnl.gov/event/7449/sessions/3687/#20200320

The scope

- **All the questions associated with the solenoid magnet:**
  - Options, overall design, geometry, GEANT model, field map(s)
  - Central field strength: photo-sensors, tracking resolution, acceptance for low Pt tracks, fringe field & gaseous RICH performance, etc

- **Detector components "co-existence" verification**
  - Geometry conflicts, fiducialization, realistic space for sub-detectors, etc
  - Combined sub-detector performance (?)

- **Dead material accounting**
- **Integration in the IR**
- **Backgrounds (?)**
- **Infrastructure, support, services**

Central detector solenoid options

- **Re-use Babar and/or CLEO magnets**

- **Come up with a new solenoid straw man design**

  (A) A similar size but 3T field

  (B) A large bore greenfield solenoid

  -> a small task force is being setup right now; experts welcome!

  - Homogeneous central field
  - Specially designed fringe field in the gaseous RICH volume
  - Fit in the IR, stray fields, other “usual” engineering constraints

- **Other configurations?**

Central detector solenoid options

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  - ~~Homogeneous central field~~
  - Specially designed fringe field in the gaseous RICH volume
  - Fit in the IR, stray fields, other “usual” engineering constraints
  - *Other requirements (allocate space for DIRC expansion volume, etc)?*

- **Other configurations?**

Solenoid field strength

- Photo-sensors in the magnetic field
  - Junqi Xie (Argonne)
    https://indico.bnl.gov/event/7449/contributions/36024/attachments/27216/41540/YR-Temple-Magnet.pdf

We are good for 1.5 T field; there are options even for 5T but then cost is an issue

- Tracking resolution
  - Nicholas Lukow (Temple)
    https://indico.bnl.gov/event/7449/contributions/36028/attachments/27226/41509/YellowReport_MagneticFieldStrengthTrackingResolution.pdf

A compromise between the two objectives needs to be found

-> a set of combined eic-smear parameterizations will be provided

- Acceptance for low Pt tracks
  - Yulia Furletova (JLab)
    https://indico.bnl.gov/event/7449/contributions/36027/attachments/27229/41512/TrackingField_Feb2020.pdf

- Fringe field & gaseous RICH performance
  - Jin Huang (BNL)
    https://indico.bnl.gov/event/7449/contributions/36025/attachments/27209/41610/sPHENIX_Magnet.pdf
  - AK (BNL) / also BeAST field map calculation summary /
    https://indico.bnl.gov/event/7449/contributions/36026/attachments/27242/41531/ayk-2020-03-20-beast-magnetic-field.pdf

If one has a freedom to optimize the fringe field on the design stage, high momentum RICH should work fine

Infrastructure

- Adding services to the EIC Monte-Carlo simulations
  - Leo Greiner (Berkeley)
    https://indico.bnl.gov/event/7449/contributions/36038/attachments/27241/41530/2020_03_20_EIC_Si_services_parametrization_for_sim.pdf

A very practical approach; should be used by all groups

-> requests to the detector and the software WGs will follow

- EIC detector infrastructure
  - Mark Breitfeller (BNL)
    https://indico.bnl.gov/event/7449/contributions/36039/attachments/27201/41474/EIC_Detector_Infrastructure_-_Breitfeller.pdf

You may have missed this: quite a lot was considered already -> see the slides

- IR vacuum chamber design
  - Charles Hetzel (BNL)
    https://indico.bnl.gov/event/7449/contributions/36037/attachments/27245/41538/Yellow_book_workshop_3-20-20.pdf

We do have a CAD model for 25mrad crossing angle (central area), but more work needed for the far forward region

-> a request to the software WG will follow

Backgrounds

- Synchrotron radiation studies with the current IR design
  - Charles Hetzel (BNL) / the same talk / https://indico.bnl.gov/event/7449/contributions/36037/attachments/27245/41538/Yellow_book_workshop_3-20-20.pdf

This is a problem, but we can seemingly manage it

- Background sources and studies at the EIC
  - Latifa Elouardhiri (JLab) https://indico.bnl.gov/event/7449/contributions/36034/attachments/27260/41566/BGS-03202020-LE.pdf

A set of comprehensive studies for JLEIC configuration

- Beam-gas induced background, neutron flux, radiation dose at the EIC
  - Jin Huang (BNL) https://indico.bnl.gov/event/7449/contributions/36036/attachments/27210/41611/EIC_BeamGas_background.pdf

Several studies for EIC-sPHENIX and BeAST configuration

The amount and the quality of all the studies performed so far *in principle suffices for the YR*; they need to be adopted to the current EIC IR geometry though

-> a joint meeting is being setup to unify the efforts