WG3-MDI: Priority list

- Topics identified in MDI meeting series Autumn/Winter 2021/22 and updates since (mainly after LCWS2023) plus reminder by Tom

  - Control of QD0 position
    - Positioning of QD0 (50nm level needed, require precise stepping motors and laser systems)
      - Remark bringing beams into collisions depends on QD0 position
    - How well can QD0 be positioned after push pull?
    - Vibration analysis
    - Updates since 2021/22:
      - Connection to He II system (might be considered with detectors)
      - Final doublet optimisation bears strong sysnergies with EiC, SuperKEKB and FCC-ee (see Brett's talk at LCWS)

  - Software tools and simulation studies for interplay machine-detector (collaboration with C3)
    - Description
      - Start to end simulation (beam beam interaction, spin-tracking, stability of beam spot)
      - Optimisation of beam parameter determination and revision of luminosity feedback system with BeamCal, LumiCal, GAMCAL and Vertex detector
        - Application of machine learning tools (a la Belle II)!?
      - Monitor consequences of beam dump design changes
      - Revision of CAIN, maintenance and extension of Guinea Pig and CIRCE
      - Remark: Check also details of ATF3 program for further studies

  - Polarimetry
    - Description
    - Laser control and detectors
      - Remark: Polarimeters are essential to constrain off-line analysis and to deliver precise results early during ILC running

  - A list of requests and interested institutes exists based on the status on Feb. 2022, confimation/update would be needed

The Elephant … - Detector Magnets

Karsten@LCWS23

Conclusions

There is a problem with the bread-and-butter technology of particle detector magnets

- Al-stabilized conductors are an established technology, best adapted to our requirements
  - high fields, large volumes, low material budget
- Unfortunately, industry in large parts of the world has abandoned the technology
  - there are no available production sites with a proven track record (e.g. from LHC detectors)
- Russian institutes and industry are not an option anymore
- A newcomer from China (TOLY) is doing R&D for CEPC
  - an on-going R&D process
- Ideas for R&D facility at CERN

Soldering/EB-Welding might be an alternative

- was used in the past, but has not being followed up for large detector magnets since decades

CICC might be worth to look into in more detail (CICC = Cable-in-Conduit Conductors)

- requires different magnet system design

HTS are attractive (HTS = High Temperature Superconductors)

- but the Al-stabilization is also a good idea for them

Need to push for R&D in labs together with industry to keep the timelines of future projects!

Tom's list from 2018

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Scope of R&D

SLAC

Crab Cavity
- EM design
- Warm & Cold prototypes
- LLRF system with adequate phase jitter

QD0
- Complete QD0 prototype
- Prototype with incoming & extraction line quads & all windings
- Field measurements
- Vibration measurements

Vibration & Vibration Suppression
- Design & prototype Mover system with Feedback

SC Cable Design
- SiD and ILD based on 25 year old CMS cable design

He Distribution
- The He II system from the 4k cold box to the FFS is not trivial and should be identical for the two detectors.
- A joint R&D opportunity, which very likely is tied to the one for QD0.

ALCW 2018 17

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Scope of R&D

SLAC

Feedback (FONT)

Spot Size (ATF2)

Diagnostics

Polarimeters

Energy Spectrometers

Collimators & Dumps: Probably beyond scope of MDI

Screensh

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Uncovered? →