Status Update

Jian-ping Chen, JLab

SoLID Collaboration Meeting

Dec. 2-3, 2016

Overview Progress Since Last Meeting (August)

- **Progress in subsystems**
  - CLEO Magnet: parts finally here at JLab!
  - Beam tests: ECal test, GEM (SBS) test
  - Tracking/GEM digitization/simulation
  - Trigger Simulations (SIDIS trigger)
  - Kaon detection/TOF-nMRPC discussions
- **Address Recommendations: Science**
  - SIDIS: tensor charge projections/impacts paper, Sivers
  - PVDIS: Q2 determination/requirement on tracking, Optimization of baffle
  - J/ψ : bin migration, background/trigger
  - Performance/acceptance/efficiencies, …
- Pre-R&D discussions with DOE (Paul), budget situation (continue resolution)
- Next step to have draft MIE proposal ready

Timeline

- **Timeline**

  End 2016: Address recommendations related to science review

  Compilation of answers from all sub-systems

  Spring 2017: Update pCDR -> Draft MIE

  Spring-Summer 2017: Science Review

  Feb 2018: Budget briefing to have SoLID in 2017/2018: CD0

  FY2020: CD3, start full project

Recommendations Related to Science

- **SIDIS**
  - Make strong science case: workshops (Stony Brook, ECT, INT)
  - Comparison with CLAS12/SBS
  - Study systematics
  - Tracking
  - Kaon identification (TOF)
- **PVDIS**
  - Background study/Baffle
  - Q2/performance/systematics
- **J/ψ**
  - Bin Migration
  - Background
- **Developing GPD program**
  - DDVCS
  - DVMP with Polarized 3He
  - Others (TCS, DVCS with polarized targets)

Update on Chinese Group Effort

- New: next generation MRPC (nMRPC)
  Joint R&D for SoLID/EIC/sPHINEX

  Goal(s): to reach time resolution 10-30 ps in high-rate conidtion

  - Kaon identification up to 7 GeV

  Need hardware improvement, but key issue is readout system

  Tshinghua, USTC and CCNU, in collaboration with JLab/BNL

  First discussion meeting was Nov. 14 at CCNU

  Next is tentatively scheduled to be on January 13, 2017 at Tsinghua

  plan to submit (March) a NSFC key project proposal (4-5M Chinese Yen)

- GEM R&D

- Ecal R&D

List of Committee Recommendations:

1. End-to-end simulations with realistic subsystem responses and material budgets, and complete track finding and reconstruction should be developed.

2. Acceptances, efficiencies, and systematic uncertainties should be simulated for each of the core measurements.

3. For the PVDIS measurements, the viability of the elastic scattering calibration procedure, to determine absolute Q2 should be demonstrated by simulations for similar scattering angles to those probed in DIS, and with realistic misalignments.

4. Bin migration effects should be simulated for the measurements of the sharply rising J/ψ production cross section near threshold.

5. The signal and background trigger rates should be simulated for the J/ψ measurements.

6. The dead-time(s) in the DAQ chain should be modeled.

7. The development of a simulation framework with realistic reconstruction and analysis
should be pursued with high priority and increased resources.

8. Better comparisons with the expected results on programs such as SBS and particularly CLAS12 are needed to clarify the need for the SoLID SIDIS program. Crisp demonstrations of the improvements possible with SoLID should be developed.

9. The SoLID Collaboration should investigate the possibility of kaon identification, especially given their high luminosity.

10. The SoLID collaboration should investigate the feasibility of carrying out a competitive GPD program. Such a program would seem particularly well suited to their open geometry and high luminosity. If SoLID's luminosity is sufficiently high to permit a program of precise Double Deeply Virtual Compton Scattering (DDVCS) measurements, it would make a groundbreaking contribution to GPD studies.

11. Develop an overall R&D plan for the project with a timeline.

12. Close interaction between the US and Chinese groups in the development of GEM
foils to assure good quality control is highly recommended.

13. Investigate the schedule risk when GEM foils are not produced in a timely way and continue to pursue Tech-Etch as a potential supplier for the foils.

14. The calorimeter group is encouraged to contact other groups (ALICE, LHCb and possibly CMS) to understand the detector design choices these groups have made and resources needed for construction.

15. The stability tests of the conductivity of the glass for the MRPCs should be extended for a much longer period and the risk associated with the R&D needs to be identified.

16. The collaboration is strongly encouraged to develop an end-to-end realistic simulation and reconstruction to further optimize cost and physics reach and derive clear performance requirements for the individual subdetectors.

17. The collaboration is encouraged to explore the power of extended kaon identification (through Cherenkov or TOF).

18. The Committee strongly recommends testing the CLEO magnet coils (cold test), power supply and controls, before installation in Hall A.

19. A new magnet power supply should be included in the total cost of SoLID.

20. Evaluate the schedule impact of mapping the magnetic field in situ in Hall A.

21. The plans for the High Level Trigger and the needs for slow control need to be worked out in detail and the implications for resources need to be evaluated.

22. The implications of the need for these resources in the context of availability of resources at the laboratory need to be understood.

23. Closer communication with the other JLab experiments and the JLab computing center is strongly encouraged

24. Having a functional simulation and reconstruction routines as soon as possible should be a high priority in the software effort. Such software will pay off many times over in experimental design and avoiding pitfalls.

25. Complete radiation calculations to determine activation and absorbed dose on components of concern and mitigate as appropriate.

26. It should be confirmed that the baffle design, including the support structure, is optimized for background rejection and signal acceptance. Furthermore the baffle design should minimize generation of secondary backgrounds.

27. Compare the resource levels you have assumed in some key areas (particularly in software, data acquisition and project management) to make sure the estimates align with other similar projects or there is a good reason they do not.

28. Redo the cost estimate using an average cost per type of resource.

29. Create a high level resource loaded schedule to get a more realistic schedule,funding and resource profile.This will
also allow JLab to better determine their ability to support the FTE needs.

30. Revisit the comments of the 2012 Internal Review Report in conjunction with the recommendations from this report.

31. A cost benefit analysis for any systems being reused should be carried out,including the magnet power supply.

32. Appoint a small team to facilitate the integration planning for SoLID.

33. The project should develop a preliminary resource loaded schedule for the installation and the corresponding space-–-management plan for the hall floor.

34. The project should start planning the process of how to change from one SoLID configuration to another in order to better understand the time and effort involved and if there are any potential issues such as radiation

Address Recommendations

Jian-ping Chen, JLab

SoLID Collaboration Meeting

May 14-15, 2015

Physics Relevance and Risks

3) For the PVDIS measurements, the viability of the elastic scattering calibration procedure, to determine absolute Q2 should be demonstrated by simulations for similar scattering angles to those probed in DIS, and with realistic misalignments.

Bob? short term (few months?)? Done?

4) Bin migration effects should be simulated for the measurements of the sharply rising J/ψ production cross section near threshold.

5) The signal and background trigger rates should be simulated for the J/ψ measurements.

Zhiwen? short term? Michael's talk

8) Better comparisons with the expected results on programs such as SBS and particularly CLAS12 are needed to clarify the need for the SoLID SIDIS program. Crisp demonstrations of the improvements possible with SoLID should be developed.

Mehdi/Zhihong/Kalyan/Alexei? short term? Nobuo's talk

Physics Relevance and Risks (continue)

9) The SoLID Collaboration should investigate the possibility of kaon identification, especially given their high luminosity.
17) The collaboration is encouraged to explore the power of extended kaon identification (through Cherenkov or TOF).
Yuxiang/Jin? long term (~ > 1 year?) Discussion on Sat

10) The SoLID collaboration should investigate the feasibility of carrying out a competitive GPD program. Such a program would seem particularly well suited to their open geometry and high luminosity. If SoLID's luminosity is sufficiently high to permit a program of precise Double Deeply Virtual Compton Scattering (DDVCS) measurements, it would make a groundbreaking contribution to GPD studies.
Alex/Zhihong/Zhiwen? short-long term Garth's talk

2) Acceptances, efficiencies, and systematic uncertainties should be simulated for each of the core measurements
Zhihong/Rakitha/Zhiwen? short term Paul/Tianbo/Michael's talks

Simulations/Software

1) End-to-end simulations with realistic subsystem responses and material budgets, and complete track finding and reconstruction should be developed.

7) The development of a simulation framework with realistic reconstruction and analysis should be pursued with high priority and increased resources.

16) The collaboration is strongly encouraged to develop an end-–-to-–-end realistic simulation and reconstruction to further optimize cost and physics reach and derive clear performance requirements for the individual subdetectors.

23) Having a functional simulation and reconstruction routines as soon as possible should be a high priority in the software effort. Such software will pay off many times over in experimental design and avoiding pitfalls

Ole/Zhiwen/Seamus? long term Ole/Zhiwen's talks

6) The dead-time(s) in the DAQ chain should be modeled.

Yuxiang/Bob? mid-term (~ 6 months?) Alexandre/Hanjie's talks

Detectors

11) Develop an overall R&D plan for the project with a timeline
Subsystem coordinators/JP? short term? Paul's talk

12) Close interaction between the US and Chinese groups in the development of GEM foils to assure good quality control Is highly recommended.
13) Investigate the schedule risk when GEM foils are not produced in a timely way and continue to pursue Tech-–-Etch as a potential supplier for the foils.
Burnd/Xiaomei? short-long term? Jianbei's talk

14) The calorimeter group is encouraged to contact other groups (ALICE, LHCb and possibly CMS) to understand the detector design choices these groups have made and resources needed for construction.
Xiaochao? short term Xiaochao's talk

15) The stability tests of the conductivity of the glass for the MRPCs should be extended for a much longer period and the risk associated with the R&D needs to be identified.
Yi Wang? short term? Done, Yi's talk

Magnets

18) The Committee strongly recommends testing the CLEO magnet coils (cold test), power supply and controls, before installation in Hall A.

Robin? long term? Whit's talk

19) A new magnet power supply should be included in the total cost Of SoLID

Robin? short term? Whit's talk

20) Evaluate the schedule impact of mapping the magnetic field in situ in Hall A.

Robin/User? Short term? Whit's talk

32) We strongly recommend tests at JLab of the CLEOII magnet coils (cold test), ideally with the new power supply and controls, before Installation into the hall.

Robin? long term? Whit's talk

30) A cost benefit analysis for any systems being reused should be carried out, including the magnet power supply.

Robin? short term? Whit's talk

DAQ/Slow Control

21) The plans for the High Level Trigger and the needs for slow control need to be worked out in detail and the implications for resources need to be evaluated.
Alex/Brad? short term? Alex/Brad's talks

22) Closer communication with the other JLab experiments and the JLab computing center is strongly encouraged.
Alex/Ole/Brad? short term? Alex/Ole's talks

26) Compare the resource levels you have assumed in some key areas (particularly in software, data acquisition and project management) to make sure the estimates align with other similar projects or there is a good reason they do not.
Ole/Alex/JP? short term? TBD

Radiation/Baffle/Switch-over

24) Complete radiation calculations to determine activation and absorbed dose on components of concern and mitigate as appropriate.
Lorenzo? short term? Lorenzo's talk

25) It should be confirmed that the baffle design, including the support
structure, is optimized for background rejection and signal acceptance. Furthermore the baffle design should minimize generation of secondary backgrounds.
Richard/Zhiwen/Robin? short term? Rich's talk

35) The project should start planning the process of how to change from one SoLID configuration to another in order to better understand the time and effort involved and if there are any potential issues such as radiation levels.
Paul/Robin/Lorenzo/JP? short term? TBD

Cost/Resource/Project Management

27) Redo the cost estimate using an average cost per type of resource..
JP? short term? TBD

28) Create a high level resource loaded schedule to get a more realistic
schedule, funding and resource profile. This will also allow JLab to better determine their ability to support the FTE needs.
34) The project should develop a preliminary resource loaded schedule
for the installation and the corresponding space-–-management plan for the hall floor.
Subsystem/Robin/Ed/JP ? short term? TBD

33) An effort should be made to clearly specify resources required from JLab that are not explicitly in the project (effort, non-–-effort, equipment, building space, etc.).
Robin/JP? short term? TBD

General/Integration/Dependencies

29) Revisit the comments of the 2012 Internal Review Report in conjunction with the recommendations from this report.
JP? short term? TBD

31) Appoint a small team to facilitate the integration planning for SoLID.
Paul/Bob/JP? short term? TBD

Findings: The plans and R&D necessary to deal with the small polarization of the D2 target need to be fully developed.
Chris/Dave? long term?