This review of the MOLLER experiment and project was conducted on December 12 and 13 at Jlab. The committee members for this review were:

Tim Michalski, Jlab
Dave Mack, Jlab
Matthew Poelker, Jlab
Greg Smith, Jlab
Mike Snow, Indiana University (chair)
Timothy Whitlatch, Jlab

We thank the MOLLER collaboration for their clear and organized presentations and prompt answers to the questions from the committee.

Recommendations:

1. Specify in one location the physics acceptance and collimation for the experiment.

2. We recommend that MOLLER formulate a plan to search for the possible sources of the inconsistency of the beam current monitors and continue to improve the noise performance of the beam current monitors.

3. Simulate the single-sector and whole detector sensitivities for the existing design with the tolerances specified in the CDR.

4. Organize a preliminary liquid hydrogen target and associated shielding structure safety review for design input.

5. Study in simulation the robustness of the background extraction procedure and Moller asymmetry with respect to hotspots and soft backgrounds.

The charge to the committee was as follows:

"In support of the upcoming Critical Decision-1 (CD-1) reviews, we request the review committee to assess the readiness of the Conceptual Design and the Conceptual Design Report that have been developed by the MOLLER team in preparation for CD-1. In particular, we request that the review committee address the following charge questions:

1. Are all of the performance requirements that are necessary for achieving the scientific goals of the experiment identified and documented in the Conceptual Design Report (CDR)?

All are specified except for the required accuracy of the beam current monitors asymmetries.

2. Does the conceptual design satisfy the performance requirements of the experiment?

Yes. Note however that some of the designs presented in the CDR are notional (two-bounce collimation, beamline windows, etc.) and will require more work in preparation for CD2.

3. Are the technical specifications that drive the Conceptual Design defined clearly, and are the specifications directly motivated by the performance requirements?

The technical specifications are defined clearly. The specifications are directly motivated by the performance requirements.

4. Does the Conceptual Design represent a feasible and efficient approach for achieving the scientific goals?

Yes, but the millimeter tolerances on the hybrid magnet seem aggressive.

5. Are the specifications sufficiently complete to guide development of the Conceptual Design into a Final Design that satisfies the requirements?

We recommend that the collaboration needs to specify the physics acceptance and collimation for the experiment in one place.

We recommend a preliminary liquid hydrogen target and associated shielding structure design and safety review.

6. Have remaining required technical studies necessary to resolve risks and technology choices been identified?

We recommend that MOLLER formulate a plan to search for the possible sources of the inconsistency of the beam current monitors.

We recommend that MOLLER conduct a study of the robustness of the background extraction procedure with respect to hotspots, soft backgrounds, etc.

We recommend that MOLLER simulate the single-sector and whole detector sensitivities for the existing design with the tolerances specified in the CDR.

7. Has the project responded satisfactorily to the technical recommendations from previous reviews?

The collaboration has closed some of the technical recommendations and is working on the remainder. However not all of these remaining issues were presented to this committee, and some might be important for CD1.