



**Report of the
MQXFA19
Structure & Shim Review**

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US HL-LHC Accelerator Upgrade Project

**Report of the MQXFA19 Structure & Shim
Review**

November 20th 2024

- Peter Wanderer, chairperson (BNL)
- Rodger Bossert, (FNAL)
- Susana Izquierdo Bermudez (CERN)



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1. Goal and scope

The HL-LHC AUP project is starting the assembly of MQXFA19 quadrupole magnet. If MQXFA19 meets MQXFA requirements [1] it will be used in a Q1/Q3 cryo-assembly to be installed in the HL-LHC.

MQXFA19 coils were presented and approved at the MQXFA19 Coil

Acceptance Review [2]. Discrepancy or Non-Conformity Reports are generated whenever a component does not meet specifications [3-4].

The goal of this review is to evaluate MQXFA19 structure and the proposed shim plan including tapered load shims.

Committee

- Peter Wanderer, chairperson (BNL)
- Rodger Bossert, (FNAL)
- Susana Izquierdo Bermudez (CERN)

Date and Time

November 20, 2024. Start time is 7:00/9:00/10:00/16:00 (LBNL/FNAL/BNL/CERN)

Location/Connection

Video-link by Zoom, info by email.

Link to agenda with talks and other documents

<https://indico.fnal.gov/event/66901/>

2. Review Charges responses

The committee is requested to answer the following questions:

1. Have all recommendations from previous reviews [5] been adequately addressed?

YES. The assembly review of magnet MQXFA17b had this comment: Consider starting with 0.050 mm shims instead of 0.100 mm shims. The response was (a) that the group tries to minimize the number of loading steps to minimize the chance of bladder failure and (b) 0.050 shims were used in the assembly of MQXFA12b and MQXFA16.

2. Have discrepancies and non-conformities been adequately documented and processed?

YES. The twelve NCR's recorded so far, mostly minor flaws in the components, were described in detail during the reviews. All have been processed.

3. If there are major/critical non-conformities, have they been adequately



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documented and processed?

There were no major/critical non-conformities.

4. Are the proposed shims adequate for allowing MQXFA19 to meet MQXFA requirements [1]?

YES. The proposed shims were calculated using the method developed for the previous magnet MQXDF17b which was based on the successful magnets MQXFA05 and MQXFA14b.

5. Do you have any other comment or recommendation to assure MQXFA19 is going to meet requirements?

YES. In regard to the issue of using tapered load keys in the non-lead end, it was noted that the coil lead end is undersized at two positions, whereas the non-lead end is undersized at only one position, that being where the shim contacts only the metal part of the end shoe. This may not be desirable, because the larger shim over the metal area may have the effect of reducing the preload where the cable is making the turn. Coupled with the adage ("if it ain't broke, ..."), the committee supports the decision to not use tapered shims at the non-lead end.

The committee is confident that the assembly crew will continue to implement the procedure changes made to correct problems found previously so it is not necessary to include these solved problems in future magnet assembly reviews.

3. Recommendations

Proceed with the assembly of MQXFA19.