



US HL-LHC Accelerator Upgrade Project

Report of the MQXFA08 structure and shim review

April 12, 2021

- Rodger Bossert, FNAL chairperson
- Mike Anerella, BNL
- Helen Felice, CERN



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US-HiLumi-doc-4058

Other:

Date: 04/12/2021

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1. Goal and scope

The HL-LHC AUP project is starting the assembly of MQXFA08 magnet. This is the first series magnet of the MQXFA low beta quadrupoles to be used in Q1 and Q3 for the High Luminosity LHC. If MQXFA08 meets MQXFA requirements [1] it will be used in a Q1/Q3 cryo-assembly to be installed in the HL-LHC.

MQXFA08 coils were reviewed on March 31, 2021 [2].

MQXFA Series magnet specifications are presented in [3]. Discrepancy or Non-Conformity Reports are generated whenever a component does not meet specifications.

The goal of this review is to evaluate the MQXFA08 structure and shim plan. The reviewers are requested to assess that discrepancies and non-conformities of the magnet structure have been adequately processed, and that the shims will allow MQXFA08 to meet MQXFA requirements [1].

2. Technical details

Committee

- Rodger Bossert, FNAL chairperson
- Mike Anerella, BNL
- Helen Felice, CERN

Date and Time

April 12, 2021. Start time is 7/9/10/16 (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/48394/>



3. Review Charges response

The committee was requested to answer the following questions:

1. Have discrepancies and non-conformities been adequately documented and processed? Yes
2. If there are major non-conformities, have they been adequately documented and processed? Yes.
3. Are the proposed shims adequate for allowing MQXFA08 to meet MQXFA requirements [1]? Yes.
4. Have all recommendations from previous reviews [4] been adequately addressed? Yes.
5. Do you have any other comment or recommendation to assure MQXFA08 is going to meet requirements? See comments below.

4. Comments

1. A recommendation from the previous (MQXFA07) review asked that a coil measurement be added at the strain gauge location to allow readings to be directly compared with coil size at the location that preload is measured. This was done. The strain gauge location was the maximum average size for the coils, but well within the target values, indicating that average coil preload in MQXFA08 should be slightly smaller than that read by the strain gauges.
2. Per a question from the review committee, slides were presented that demonstrated that the 2D magnetic field quality based upon the coil shimming system used was within requirements.
3. According to a question from the committee, data was presented which shows the cooldown and unloading data from magnets 03 and 04. Unfortunately, the information from magnet 05 could not yet be analyzed. Based on data from either cooldown or unloading, preloads of both 03 and 04 were acceptable, including the correction to exclude the unexpected anomaly in the data in coil Q3 from magnet 04.
4. Warm preload in magnet 05 has a large spread between coils, still not completely explained, although average preload is within the target range.
5. We thank all personnel who gave talks for their descriptive and thorough presentations and answers to our questions.



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5. Recommendations

1. Proceed with the Assembly.

6. References

- 1) MQXFA Functional Requirements Specification, US-HiLumi-doc-36.
- 2) MQXFA08 Coils Acceptance Review, US-HiLumi-doc-4057.
- 3) MQXFA Series Magnet Production Specification, US-HiLumi-doc-4009.
- 4) MQXFA07 Structure & Shims Review, US-HiLumi-doc-4006.