



Report of the MQXFA08 Coils Acceptance Review

US-HiLumi-doc- 4057
Other:
Date: 4-9-2021
Page 1 of 6



US HL-LHC Accelerator Upgrade Project

Report of the MQXFA08 Coils Acceptance Review

March 30th 2021

- Steve Gourlay (chairperson), LBNL
- Arup Ghosh, BNL retired
- Juan Carlos Perez, CERN



Report of the MQXFA08 Coils Acceptance Review

US-HiLumi-doc- 4057
Other:
Date: 4-9-2021
Page 2 of 6

TABLE OF CONTENTS

1. GOAL AND SCOPE	3
2. TECHNICAL DETAILS	3
3. COMMENTS	4
4. RECOMMENDATION.....	4



Report of the MQXFA08 Coils Acceptance Review

US-HiLumi-doc- 4057

Other:

Date: 4-9-2021

Page 3 of 6

1. Goal and scope

The HL-LHC AUP project is planning to start assembly of MQXFA08 magnet in April 2021. MQXFA08 is the first series low-beta quadrupole magnet (MQXFA) for the Inner Triplet of 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.

For MQXFA08 assembly (including a spare coil) AUP is planning to use QXFA coils: 126, 128, 213, 215 and 117. Coil 117 was approved for use in MQXFA05 [2] and is assumed approved for use in MQXFA08.

Conductor and series coil specifications are presented in [3-7]. Discrepancy or Non-conformity Reports are generated whenever a component does not meet specifications.

The reviewers are requested to review discrepancies and non-conformities in strands, cables and coils, for the following coils: 126 (cable P43OL1137), 128 (cable P43OL1140), 213 (cable P43OL1123), and 215 (cable P43OL1122).

2. Technical details

Committee

Steve Gourlay (chairperson), LBNL

Arup Ghosh, BNL retired

Juan Carlos Perez, CERN

Date and Time

March 31, 2021. Start time is 7/9/10/16 (LBNL/FNAL/BNL-FSU/CERN)

Location/Connection

Video-link by Zoom, info by email.

Link to agenda with talks and other documents

<https://indico.fnal.gov/event/48290/>



Report of the MQXFA08 Coils Acceptance Review

US-HiLumi-doc- 4057

Other:

Date: 4-9-2021

Page 4 of 6

3. Review Charges responses

The committee is requested to answer the following questions:

QXFA08

Charge questions

The committee is requested to answer the following questions:

1. *Have Discrepancies and Non-conformities been adequately documented and processed?*

Yes. Discrepancies in coil winding, reaction and impregnation steps were carefully noted for all the coils. All of the discrepancies were non-critical for coils 126, 128 and 215. Coil 213 had one critical discrepancy that required a re-impregnation of the coil with good results.

2. *If there are critical Discrepancies/Non-conformities, have they been adequately documented and processed?*

Yes

The critical discrepancies and non-conformance to specification were adequately recorded and processed.

3. *Did the L3s properly identified critical Discrepancies/Non-conformities?*

Yes.

Coil 213 has a significant critical DR related to epoxy-impregnation. To correct the flaw, a second impregnation was successfully performed on this coil and then accepted for use in the magnet.

4. *Is there any coil that you recommend not to use in MQXFA08?*

No, all coils are acceptable. AUP has to decide on its choice of whether to use 117 instead of one of the FNAL coils 126 or 128 or the BNL coils 213 or 215. Inner radius coil deviations are observed both for the earlier measured 117 and the more recently measured 215.



Report of the MQXFA08 Coils Acceptance Review

US-HiLumi-doc- 4057
Other:
Date: 4-9-2021
Page 5 of 6

5. Do you have any other comment or recommendation regarding these coils and their conductor for allowing MQXFA08 to meet MQXFA requirements [1]?

The Committee notes that a number of discrepancies were discovered through careful observations by the technicians. It is obviously important to find ways to maintain a high level of vigilance throughout the project.

4. Comments

Strand and Cable

All cables are dimensionally within specification and fairly uniform. Although no Coil-reaction witness sample tests were presented, we find that, based on past history of the pre-series coils, the expected cable performance should have significant margin at operating current and temperature to ensure easily reaching the required operating current. This has been demonstrated for the pre-series coils.

Cable insulation shows good consistency in the thickness measurements done at the vendor and that performed at LBNL, and is within specification. We had questioned this at an earlier review.

Coil ordering analysis is done using the weighted average RRR of either rolled strand (data from the manufacturer) or extracted strand minor edge RRR of extracted strands measured at LBNL after cable fabrication. These analyses show that there are many options available for coil assembly for a voltage criterion of < 353 V. In the absence of witness sample tests of extracted strands, the present procedure will be used for all the series coils. This procedure needs to be captured in the Coil QC document.

5. Recommendations

None

6. References

- 1) MQXFA Functional Requirements Specification, US-HiLumi-doc-36
- 2) MQXFA05 Coils Acceptance Review Report, US-HiLumi-doc-2742
- 3) Specification for Quadrupole Magnet Conductor, US-HiLumi-doc-40
- 4) Cable Specification, US-HiLumi-doc-74



Report of the MQXFA08 Coils Acceptance Review

US-HiLumi-doc- 4057

Other:

Date: 4-9-2021

Page 6 of 6

- 5) Quadrupole Magnet Cable Insulation, US-HiLumi-doc-75
- 6) QXFA Series Coil Production Specification, US-HiLumi-doc-2986
- 7) QXFA Series Coil Fabrication Electrical QC plan, US-HiLumi-doc-521