## **SLAC Traveler for the LCLS ‘1.259Q3.5’ BSY Quadrupole Magnet QSM1**

(May 2, 2014)

This traveler covers magnetic measurements of the LCLS “1.259Q3.5” BSY quadrupole magnet QSM1. This quadrupole magnet is 0.108 m long, with a 0.032 m diameter.

Account # 7720080

**Receiving:**

The following information is to be noted upon receipt of the magnets by the SLAC MFD group:

|  |  |
| --- | --- |
| Received by (initials): | SDA |
| Date received (dd-mmm-yyyy): | 5/1/2014 |
| SLAC barcode number: 421 | 000421 |
| Serial number on the magnet: 22 | 22 |

|  |  |
| --- | --- |
| Place duplicate the barcode sticker here → |  |

**Preparation:**

Verify that a beam direction arrow is in place applied to the top and/or connector side of the magnet.

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| Beam-direction arrow in place (initials): | SDA |

**Fiducialization:**

Fiducialization was performed in 2006 and is deemed adequate.

URL of on-line Alignment fiducialization data (please modify or correct if necessary):

|  |
| --- |
| [\\web002\www-group\met\Quality\FIDUCIAL REPORTS\](file:///\\web002\www-group\met\Quality\FIDUCIAL%20REPORTS\)LCLS QUADS\LCLS QUAD 000421.pdf |

**Magnetic Measurements:**

Enter URL of on-line magnetic measurements data (please modify or correct if necessary):

|  |
| --- |
| <http://www-group.slac.stanford.edu/met/MagMeas/MAGDATA/LCLS/skew_quad/QSM1/> |

1. QSM1 is a “QF” (positive polarity”) skew quad.

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| Magnet marked as (please enter “QF”): | SDA |

1. Determine the connection polarity (with supply outputting positive current) which produces the correct field polarity for the positive or QF skew magnet as shown in Figure 1.



**Figure 1**. QSM1 is a positive skew quad. A “*positive*” skew quadrupole magnet is simply a 45° clockwise-rotated (around *z* axis) normal “*positive*” quadrupole.

1. Mark the polarity near the magnet leads with clear “+” and “” labels as shown above.

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| Polarity has been labeled (initials): | SDA |

1. Connect the magnet terminals in the correct polarity as established above, to a bipolar power supply with maximum current *I* ≥ +/-12 A.
2. Run the magnet up to 8 A for ~30 minute to warm it up (record temperature).

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| --- | --- |
| Ambient temperature (°C): | 22.8 °C |
| Final magnet temperature (°C): | 24.8 °C |

1. Standardize the magnet, starting from -12 A to +12 A through three full cycles, finally ending at -12 A, with a flat-top pause time (at both -12 A and +12 A) of 10 seconds. Use a ramp rate of 1 A/sec, and ramp style three-linear, and record the ramp rate and ramp style used.

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| Standardization complete (initials): | SDA |
| Ramp rate used (A/sec): | 1 A/sec |

1. Measure the length-integrated field gradient, ∫*Gdl*, from -12 A to +12 A to -12 A in 1-A steps, and then back down from +12 A to -12A in 1-A steps (49 measurements total).

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| Filename & run number of ∫*Gdl* up & down data: | Strdat.ru1 |

1. Confirm the pole-tip field using a Hall probe at an excitation current of 4 A.

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| Hall probe pole-tip field at 4 A (mean of 4 poles): | 0.097 Tesla at 4.00255 Amps |

1. Measure the field harmonics at a A current setting using a 0.8-inch diameter probe.

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| Rotating coil designation (coil name): | 1\_124DQB22\_4\_Layer |
| Rotating coil radius (m): | 0.01402 m |
| Harmonics data file name: | Hardat.ru1 |

1. Measure the inductance and resistance of the magnet:

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| --- | --- |
| Inductance of coil (mH): | 9.72 mH @ 1000 Hz |
| Resistance of coil (Ohms): | 0.4005 Ohm at 12 Amps |

1. Standardize the magnet, starting from -12 A to +12 A through three full cycles, finally ending at -12 A, with a flat-top pause time (at both -12 A and +12 A) of 10 seconds. Use a ramp rate of 1 A/sec, and ramp style three-linear, and record the ramp rate and ramp style used.

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| Standardization complete (initials): | SDA |
| Ramp rate used (A/sec): | 1 A/sec |

1. Establish optimum de-gauss cycle to achieve a remnant field of less than 0.02 kg. Record the current set points, number of cycles, ramp rate and ramp style used.

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| De-gauss complete (initials): | SDA |
| Mean integral remnant field after de-gauss: | 0.00055 kg |
| Ramp rate used (A/sec): | 10 A/sec |
| Ramp Wait (sec) | 2 sec |
| Ramp Style | Three Linear |
| Data File(s) | strdat.ru2 and strdat.ru3 |

1. Upon completion of tests, attach the traveler to the magnet and send a copy to Alev Ibrahimov at mailstop 51 and to Rick Iverson at mailstop 51.

This section is to be completed by R. Iverson.

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| Magnet accepted (signed): |  |
| Assigned beamline location (MAD-deck name): | QSM1 |