# SLAC Traveler for *1.26D18.43* Vertical Soft-Bend Magnets in HXR & SXR Dump Lines

**(Apr. 15, 2016)**

This traveler is intended to cover reception, preparation, mechanical fiducialization, and magnetic measurements of the two (BYDSS & BYDSH) vertical soft-bend magnets. These magnets are newly manufactured, are about 0.5 m long, and have LCLS-II MAD designations of 'BYDSS' and 'BYDSH' (soft bends for the dump lines). It is assumed that the magnets will be oriented with horizontal fields (vertical bends) during magnetic measurements; therefore the field is described as $B_x$ below. In fact they are each rolled by 10 degrees in their final installations.

**Receiving:**

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

| | |
|---|---|
| Received by (initials): | |
| Date received (dd-mmm-yyyy): | |
| SLAC barcode number: | 4508 |
| Vendor serial number from magnet label: | 16090 |
| SLAC approved electrical safety covers? (Y or N): | N |
| SLAC approved lifting eyes? (Y or N): | N |
| Magnet damage? (Y or N) – add detail if "yes": | N |

| | |
|---|---|
| Place a barcode sticker on the magnet and also duplicate the barcode sticker here → | |

**Preparation:**

A beam direction arrow, with text "beam direction", is to be applied to the top and/or connector side of the magnet with a sticker supplied by LCLS-II. John Amann will indicate the beam direction.

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|---|---|
| Beam-direction arrow in place (initials/date): | SDA 8/8/2016 |

**Fiducialization:**

Alignment fiducialization may be done before or after magnetic measurements. The magnet is to be fiducialized by the CMM group. This will require the installation of removable tooling balls, location of the geometric axis of the poles of the magnet, and location of tooling balls with respect to the center of this geometric axis when the poles are aligned precisely horizontal.

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|---|---|
| CMM technician (initials/date): | AEG 6/16/2016 |

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

| |
|---|
| http://www-group.slac.stanford.edu/met/MagMeas/MAGDATA/LCLS-II/Dipole/BYDSS/4508%20Fiducial%20Report.pdf |

**Magnetic Measurements:**

1) Verify that the magnets are complete and undamaged, including wiring connections.

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|---|---|
| Incoming inspection OK (initials): | SDA |
| Date of arrival to mag. meas.(mmm-dd-yyyy): | 8/8/2016 |

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

| |
|---|
| http://www-group.slac.stanford.edu/met/MagMeas/MAGDATA/LCLS-II/Dipole/BYDSS/ |

2) Mark each magnet as BYDSS or BYDSH. The magnets have the same polarities which are "negative" (bending electrons down – ignoring the 10-deg roll added at installation).

| | |
|---|---|
| Magnet marked as (BYDSS or BYDSH): | BYDSS |

3) Determine the main-coil connection polarity which produces a "negative" field polarity for BYDSS and BYDSH, as shown below:

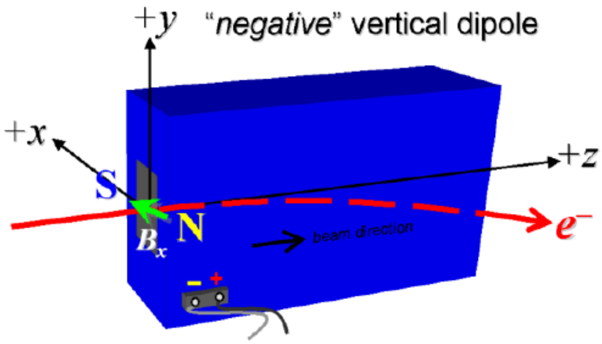


**Figure 1**. BYDSS and BYDSH are "negative" vertical bends (bending electrons down).

4) Mark the polarity near the magnet leads with clear "+" and "–" labels as shown above. If trim coils exist, they are not used here.

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|---|---|
| Polarity is marked according to Fig. 1 (initials/date): | SDA 8/8/2016 |

5) Connect the magnet terminals, in the correct polarity as established above, to a power supply with maximum current $I \geq 10$ A.

6) Run the magnet up to 10 A for ~2 hours to warm it up (record temperature).

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|---|---|
| Ambient temperature (°C): | 28.5 °C |
| Final magnet coil temperature (°C): | 41.6 °C |
| Final magnet steel temperature (°C): | 37.3 °C |

7) Standardize the magnet, starting from zero to 10 A and back to zero, through **six** full cycles, finally ending at zero, with a flat-top pause time (at both 0 and 10 A) of 10 seconds. Use a ramp rate of 2.5 A/sec, if possible, and record the ramp rate used.

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|---|---|
| Standardization complete (initials/date): | SDA 8/8/2016 |
| Ramp rate used (A/sec): | 2.5 A/sec - 3 Linear Ramp |

8) Maintaining this cycle history, measure the length-integrated horizontal dipole field, $\int B_x dl$, from 0 to 10 A in 1-A steps, including zero (11 'up' measurements). Then, still maintaining the cycle history, measure $\int B_x dl$ back down from 10 A to 0 in 1-A steps, including zero (11 'down' measurements).

| | |
|---|---|
| Filename & run number of $\int B_x dl$ 'up' & 'down' data: | Wiredat.ru2 |

9) For just one of these magnets, with the main coil still at 7 A, use a stretched wire to measure the length-integrated horizontal field (assuming the magnet is oriented on the bench with a horizontal field). With the wire located at the mid-plane ($y$ = 0), measure the length-integrated horizontal field at each 1-mm step of vertical wire position, from $y$ = –10 mm to +10 mm, with $y$ = 0 at the magnet's vertical center. Record data file name:

| | |
|---|---|
| Data filename (if applicable): | Wirevsx.ru3 |

10) Measure the inductance and resistance of the main magnet coils:

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|---|---|
| Inductance of main coil (mH): | 46.5 mH |
| Resistance of main coil (Ohms): | 1.13 Ohm |

11) Upon completion of tests, email traveler for review to: John Amann (amann@slac.stanford.edu).

This section is to be completed by P. Emma, or designee.

| | |
|---|---|
| Magnet accepted (signed/date): | Via email |
| Assigned beamline location (MAD-deck name): | BYDSS |

12) Upon full completion, send this traveler to John Amann at mailstop 52.