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Completion of Superconducting Magnet Production by BNL for the HERA Luminosity Upgrade*

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Brookhaven National Laboratory (BNL) has completed delivery of the superconducting multi-function magnets that are now operating as part of the HERA luminosity upgrade at DESY. The magnets, cryostats, and lead assemblies were designed and built at BNL. To fit inside the existing detector, the coils plus cryostat structure had to meet a challenging radial budget (e.g., 39 mm horizontally). Two types of magnets were needed, and three of each type were built. Each magnet contained normal and skew quadrupole, normal and skew dipole, and sextupole coils. The magnets operate in the ~ 1.5 T solenoid field of a detector. The quadrupole coils produce gradients up to 13 T/m. The dipole coils generate fields up to 0.3 T. Coils were wound under computer control using either seven-strand round cable or a single strand. To simultaneously avoid excessive synchrotron radiation background scattered from the beam pipe and yet have a small cryostat, one type of magnet used a tapered support tube. The cryogenic system incorporates cooling with both 40 K helium and supercritical helium. All of the coils were tested in liquid helium in a vertical dewar. Quench test results have been excellent. The field quality of the magnets has met the stringent requirements imposed on interaction region magnets. One magnet of each type was tested at BNL as a completed assembly to verify the performance of the leads and cryostats. Two of each type were tested at DESY and then installed in the Zeus and H1 experiments. (The remaining magnets are spares.) Final results of quench testing, field quality measurements, and cryogenic performance will be reported.

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