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DC septum magnet with low current density for the synchrotron light source

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We have designed and fabricated a new DC septum magnet for modern accelerators. Septum magnets feature a dipole magnetic field deflecting designated beams at one side of the septum while providing no deflecting field on the other side. Conventional direct-drive type DC septa is embedded with coils inside the magnet gap, which usually results in rather high current density in the thinner septum conductor as the septum thickness is required as thinner as possible upon request from beam trajectory design. It can, however, lead to failures in coils due to harsh heat cycles and faults in high-current power supplies. We propose an alternative septum magnet design to significantly reduce the current density by an order of magnitude. The new design has achieved a high flux density of 1.2 T with the current density of as low as 5 A/mm2 with the 5 mm thick septum that comes in a dogleg shape for optimizing the magnetic field configuration on the both sides of the septum. We present our new magnet design and the measured performance of the magnet.

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Footnotes

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