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Magnetic Force Microscopy Characterization of Perpendicular Magnetic Writers with Wrap-around Shield

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Magnetic force microscopy (MFM) was employed to characterize the magnetic field distribution of two different designs of perpendicular magnetic writers with fully wrap-around shield (WAS). Typical magnetic write heads, located on a slider at the so-called air bearing surface (ABS), are composed of a magnetic write pole and a magnetic return pole. The write pole has a much smaller cross section area at the ABS than the return pole which is connected to magnetic shield. The write pole and the shield are separated by a non-magnetic gap layer. The shield structure is designed in such a way that it can confine the magnetic fields without significantly degrading field strength. In this work, MFM imaging was used to investigate the relationship between the gap structure and magnetic field strength/gradient. Magnetic field distributions of two different head designs were compared and discussed in detail. Experimental results revealed that the magnetic field intensity is linearly proportional to pole dimensions, especially the pole width. The field gradient, however, is dependent on not only spacing gap between shields and the write pole, but also the pole widths and thicknesses

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