Magnetic Fields in Star-Forming Molecular Clouds: JCMT Polarimetry of OMC-3 in Orion A

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ABSTRACT

The first polarization map of the OMC-3 region in Orion A's Integral Filament is presented. Using the new imaging polarimeter mounted on SCUBA at the James Clerk Maxwell Telescope, we have detected thermal emission at 850 μm from dust along the $6'$ length of the dense filament. The polarization pattern is highly ordered and is aligned with the long axis of the filament throughout most of the region, diverging only near the southern boundary by $30 - 50°$. This configuration indicates a plane-of-sky magnetic field, $B_\perp$, oriented normal to the filament along most of its length whether the polarization arises from thermal emission of dust grains aligned by the magnetic field via paramagnetic inclusions or radiative torques. The mean percentage polarization measured is 4.2% with a 1σ dispersion of 1%. Depolarization effects, as previously detected in many other star-forming cores and protostars, are also detected toward the densest parts of the filament.

Subject headings: ISM: clouds, magnetic fields, molecules – polarization – Stars: formation – submillimeter – OMC-3