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Single particle measurements of material line stretching in turbulence: Experiments STEFAN KRAMEL, Wesleyan University, SASKIA TYMPEL, FEDERICO TOSCHI, TU Eindhoven, GREG VOTH, Wesleyan University — We find that particles in the shape of chiral dipoles display a preferential rotation direction in three dimensional isotropic turbulence. The particles consist of two helical ends with opposite chirality that are connected by a straight rod. They are fabricated using 3D printing and have an aspect ratio of 10 and a length in the inertial range of our flow between oscillating grids. Due to their high aspect ratio, they move like material lines. Because material lines align with the extentional eigenvectors of the velocity gradient tensor they experience a mean stretching in turbulence. The stretching of a chiral dipole produces a rotation about the dipole axis and so chiral dipoles experience a non-zero mean spinning rate in turbulence. These results provide a first direct experimental measurement of the rate of material line stretching in turbulence.

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