DOUBLE-DECKER FILAMENT CONFIGURATION
REVEALED BY MASS MOTIONS

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It is often envisaged that dense filament material lies in the dips of magnetic field lines
belonging to either a sheared arcade or a magnetic flux rope. But it is also debated which
configuration correctly depicts filaments magnetic structure, due to our incapacity to mea-
sure the coronal magnetic field. In this paper, we address this issue by employing mass
motions in an active-region filament to diagnose its magnetic structure. The disturbance in
the filament was driven by a surge initiated at the filament’s eastern end in the NOAA ac-
tive region 12685, which was observed by the 1-m New Vacuum Solar Telescope (NVST) in
the H-\(\alpha\) line center and line wing (\(\pm 0.4\) Å). Filament material predominately exhibits two
kinds of motions, namely, rotation about the spine and longitudinal oscillation along the
spine. The former is evidenced by antisymmetric Doppler shifts about the spine; the latter
features a dynamic barb with mass extending away from the H-\(\alpha\) spine until the transversal
edge of the EUV filament channel. The longitudinal oscillation in the eastern section of
the filament is distinct from that in the west, implying that the underlying field lines have
different lengths and curvature radii. The composite motions of filament material suggest
a double-decker host structure with mixed signs of helicity, comprising a flux rope atop a
sheared-arcade system.