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Anisotropy of the competing superconducting and magnetic states in quasi-2D organic conductor κ-(BEDT-TTF)$_2$Cu[N(CN)$_2$]Br: An elastic investigation D. FOURNIER, M. POIRIER, K.D. TRUONG, Département de Physique, Université de Sherbrooke, Qc, Canada — Ultrasonic measurements performed on the quasi-2D organic conductor κ-(BEDT-TTF)$_2$Cu[N(CN)$_2$]Br reveal a phase separation between superconductivity and magnetism in the vicinity of the Mott transition line. We report here longitudinal (L) and transverse (T) ultrasonic velocity measurements propagating perpendicularly to the highly conducting planes; a magnetic field up to 18 Tesla could be applied along the same direction to differentiate the superconducting phase from the magnetic one. The huge velocity dip observed between 30 and 40 K and associated to a compressibility increase driven by the electronic degrees of freedom is not observed for T-waves polarized along [001]; this implies that only magnetic fluctuations associated to 1D sheets of the Fermi surface can couple to the ultrasonic waves. Around T_c= 12 K, both the temperature profile and the amplitude of the elastic anomalies are highly dependent on the wave polarization. A magnetic field investigation of these anomalies not only establishes the anisotropic character of the superconducting anomaly, but it reveals also the onset of a magnetic transition below 15 K over the same temperature range as the superconducting one. These anomalies likely favor a multi-component superconducting order parameter.

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