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Ioffe-Regel limits of marginally jammed solids XIPENG WANG, NING XU, University of Science and Technology of China — We measure both the transverse and longitudinal dynamical structure factors from the normal modes of vibration of marginally jammed solids, from which Ioffe-Regel limits for transverse and longitudinal modes are obtained. We find that the Ioffe-Regel limit for transverse modes lies at a lower frequency than the boson peak, in contrast to the previous observation that the Ioffe-Regel limit and boson peak coincide. At the unjamming transition, while the Ioffe-Regel limit for transverse modes approaches zero frequency, the Ioffe-Regel limit for longitudinal modes approaches a constant. We also find that the longitudinal dynamical structure factor consists of two components: the liquid-like Rayleigh part and solid-like Brillouin part. At fixed volume fraction, the Rayleigh contribution increases with decreasing the wavelength. We thus determine a crossover wavelength at which contributions of the Rayleigh and Brillouin parts to the dynamical structure factor are equal. This crossover wavelength increases with decreasing the volume fraction following a power-law scaling and diverges at the unjamming transition.

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