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The birth and the growth of Boson peak – insights from the normal modes analysis of granular experiments? JIE ZHANG, LING ZHANG, JIE ZHENG, Shanghai Jiaotong University — The origin of the Boson peak in amorphous materials has been a long-lasting puzzle for more than decades for researchers in the field. In order to understand the physics of the boson peak, we have experimentally measured the density of states (DOS) from the hexagonal lattice to the disordered structures in 2D packing of granular materials, which are made of photo-elastic disks allowing a precise measurement of contact forces between disks to determine the dynamical matrix of the system. These disks are wrapped with Teflon tapes to mimic frictionless particles so that the rotational degree of freedom can be ignored to a good approximation. By varying the pressure of the disordered crystal, we find the strong evidence that the first Van Hove singularity gradually evolves into the Boson peak. In geometrically disordered packing, the position of the Boson peak is influenced by the degree of the geometric disorder. Starting from a geometrically ordered crystal packing, a slight increase of the geometrical disorder will cause the Boson peak to have a sudden discontinues shift to a lower frequency. We find that such a shift might be related to the change of the topology of the strong and weak force networks in the system, which is currently still under investigation.

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