

# Supplementary Figures: A random matrix definition of the boson peak

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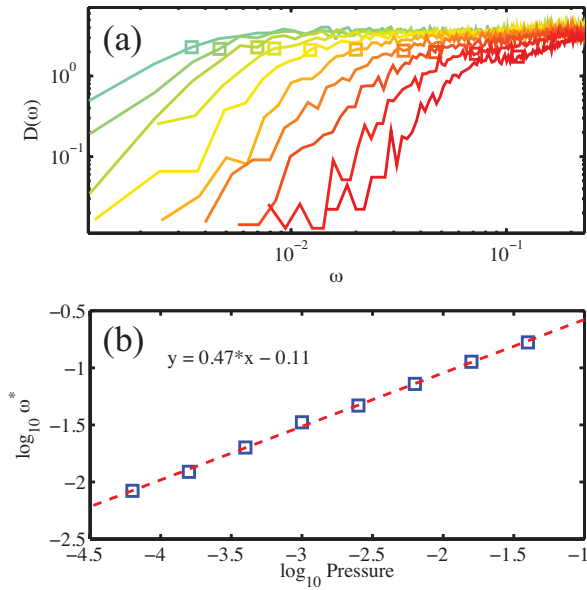


Figure 1: **1/2 Definition** (a) Low-frequency spectrum of the density of states  $D(\omega)$  for jammed packings. Different colors correspond to different pressures ranging logarithmically from  $10^{-1.4}$  to  $10^{-4.8}$ . Squares indicate the point where  $D(\omega)$  reaches 1/2 of its maximum value, at a frequency  $\omega_{1/2}^*(p)$  (b) Plot of  $\log_{10} \omega_{1/2}^*(p)$ , with best fit line of slope 0.47.

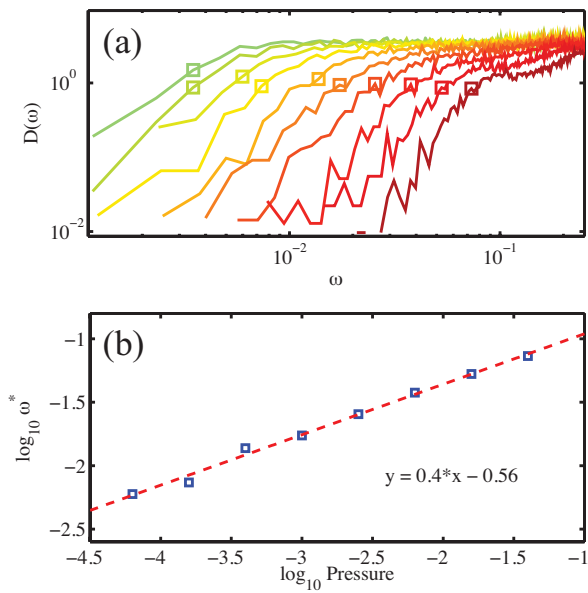


Figure 2: **1/4 Definition** (a) Low-frequency spectrum of the density of states  $D(\omega)$  for jammed packings. Different colors correspond to different pressures ranging logarithmically from  $10^{-1.4}$  to  $10^{-4.8}$ . Squares indicate the point where  $D(\omega)$  reaches 1/4 of its maximum value, at a frequency  $\omega_{1/4}^*(p)$  (b) Plot of  $\log_{10} \omega_{1/4}^*(p)$ , with best fit line of slope 0.40.

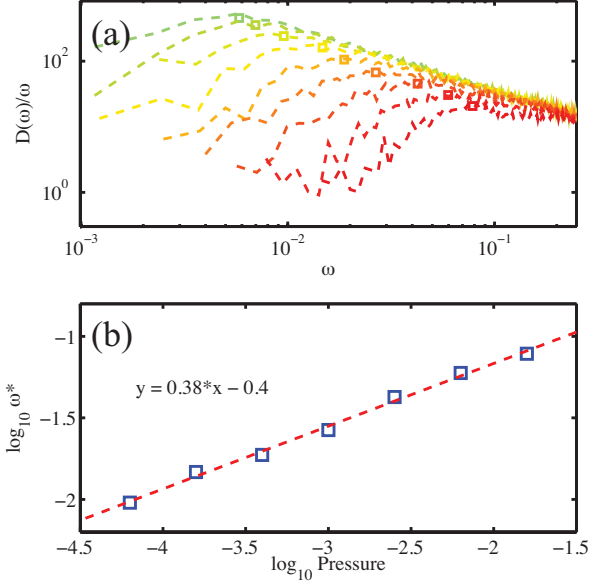


Figure 3:  $D(\omega)/\omega^{d-1}$  **Definition (a)** Low-frequency spectrum of the density of states divided by the Debye scaling in 2D  $D(\omega)/\omega$  for jammed packings. Different colors correspond to different pressures ranging logarithmically from  $10^{-1.4}$  to  $10^{-4.4}$ . Squares indicate the point where  $D(\omega)\omega$  attains its maximum value, at a frequency  $\omega_{max}^*(p)$  **(b)** Plot of  $\log_{10} \omega_{max}^*(p)$ , with best fit line of slope 0.38.

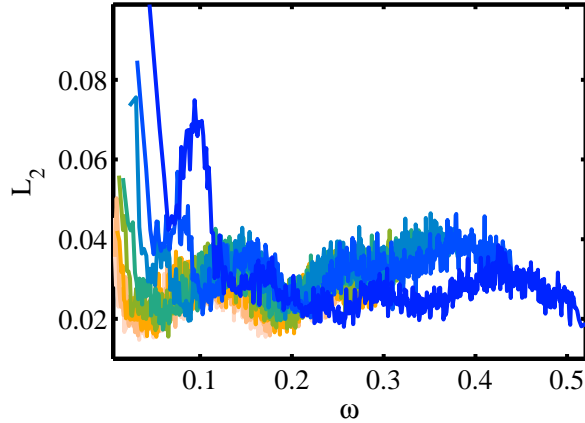


Figure 4: **(a)** Unscaled  $L_2$  difference between eigenvector cdfs and the universal distribution for jammed packings as a function of frequency  $\omega$ . Different colors correspond to different pressures ranging logarithmically from  $10^{-1.4}$  to  $10^{-4.2}$ .