Supplementary material for the paper

"Tunable Low Frequency Band Gap and Waveguide of Phononic Crystal Plates by Different Filling Ratio"

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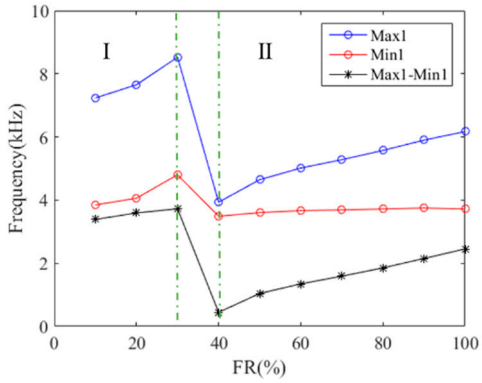
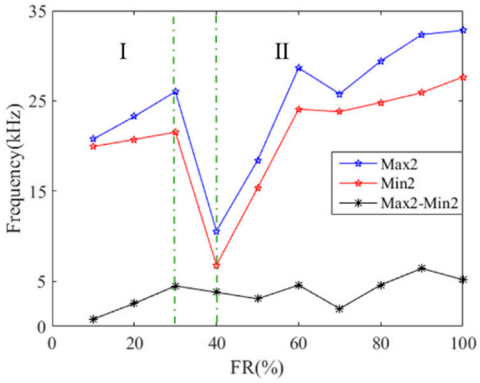
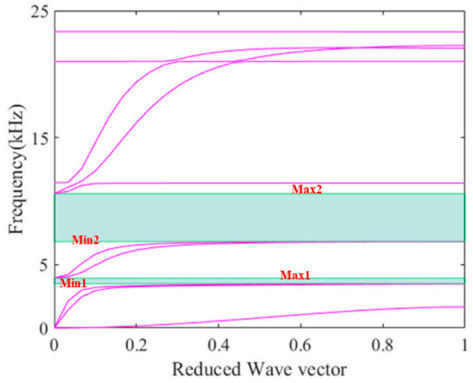


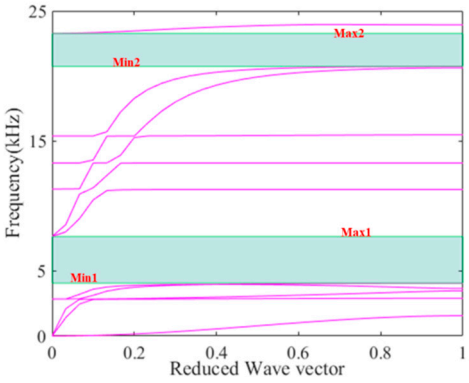
(a) The first band gap



(b) The second band gap



(c)Dispersion curve at FR=40%



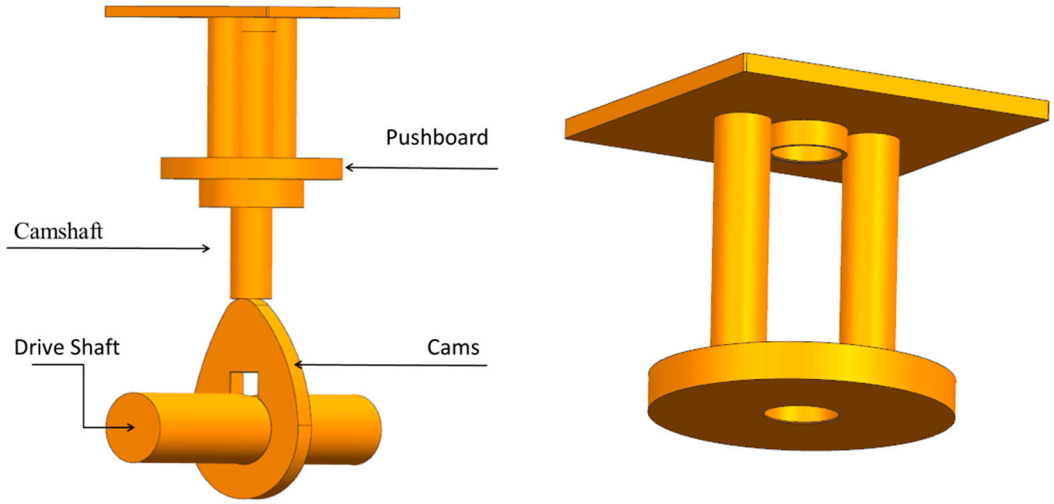
(d) Dispersion curve at FR=20%

Figure S1. Dispersion curve and the value of band gap with different FR values.

We have performed simulations at a 10% interval with FR. The upper and lower boundary curves of the first band gap are given in Figure1 (a). The boundary values of the second band gap are given in Figure1 (b). The lower boundary value of the band gap is defined as Minj and the upper boundary value is defined as Maxj, where j is 1, 2. It is interesting that there are similar two distinguished zones I and II, separated by vertical dotted-lines. So we give the dispersion curves for FR= 40% and FR=20%. The first and the second band gaps are selected and labeled to show more details.

Within each zones, the values of 'Maxj', 'Minj' and 'Maxj-Minj' of the first band gap increase with the rise of 'FR'. The second band gap boundary values have the similar features with those of the first gaps, except for a decreasing at a FR=70. 'Maxj-Minj' for the first band gap has the same trend but the deviation for the second gap will increase

slowly. Although the reason for the distinguished two zones is still not clear and need further studies, the study for band gaps could still provide a theoretical basis for the low frequency sound insulation of the structure.



(a) (b)

Figure S2: The structure diagram for changing the filling ratio with modular thinking and implement the structure with STM32F103 chip. (a) The picture of the whole structure. (b) The structure of Push board.

The STM32 series is a set of ARM Cortex-M3-based master chips specially developed and designed for high-performance, low-cost and low-power embedded systems. The clock rate is 75MHz, which is expected to meet the experimental requirements.

The idea of modular thinking is that a regional area of changing filling ratio can be achieved by the push board. The push board has a limit structure to control the upward movement distance.