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Acoustic Band Pass, Band Gap and Dispersion in Discrete Media at Micro and Nano Scales HASSON TAVOSSI, Valdosta State University — Acoustic properties of models of crystals, when measured at macroscopic scale, are found experimentally to have remarkable similarities with the same wave properties observed at atomic and nano-scales. It can be shown that, elastic moduli and other wave properties such as; band-pass, forbidden band, wave tunneling, attenuation, cutoff-frequency, and dispersion, depend on the similar structural factors as for phonons in crystals. Acoustic properties of the macroscopic models of discrete media, in the length scale range; 1.5 mm to 30 micrometers, and the frequency range; audible to ultrasonic are studied. The Band-pass, band-gap, attenuation, and dispersion expressed in wave-number (ka), show similar characteristics as the phonons in solids. These findings can lead to a better understanding of the wave properties of solids at nanoscales. The readily analyzable wave models at large scale are convenient tools to verify experimentally the models for complex binary composites. Experimental findings and numerical results for wave properties of discrete structures at large scale are compared with atomic scale wave behavior of solids, for a wide range of frequencies, from audible to ultrasound, to show the common characteristics with the phonons behavior in solids.

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