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Multiple-band transmission in an acoustic metamaterial RUWEN PENG, DONG-XIANG QI, REN-HAO FAN, Nanjing University, XIANRONG HUANG, Argonne National Laboratory, MING-HUI LU, XU NI, QING HU, MU WANG, Nanjing University, NATIONAL LABORATORY OF SOLID STATE MICROSTRUCTURES, NANJING UNIVERSITY COLLABORATION, ADVANCED PHOTON SOURCE, ARGONNE NATIONAL LABORATORY COLLABORATION — We demonstrate that acoustic waves can achieve extremely flat transmission through a metallic grating under oblique incidence within multiple frequency bands separated by Wood's anomalies. At the low-frequency band, the transmission of acoustic wave is independent of the frequency and presents a flat curve with the transmission efficiency reaching about 100%; while at high-frequency bands, the transmission decreases to be lower flat curves due to the diffraction effect. The transmission efficiency is insensitive to the thickness of the grating. This phenomenon is verified by experiments, numerical simulations, and an analytical model. The broadband high transmission is attributed to the acoustic impedance matching between the air and the grating. This research may open up a field for various potential applications of acoustic gratings, including broadband sonic imaging and screening, grating interferometry, and antireflection cloaking. References: D. X. Qi, R. H. Fan, R. W. Peng et al., Appl. Phys. Lett. 101, 061912 (2012); and R. H. Fan, R. W. Peng, X. R. Huang et al., Adv. Mater. 24, 1980 (2012).

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