

# Nonreciprocal surface acoustic wave via magnon-phonon coupling

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Velocity, decay rate, and path of quantum particles sometimes changes upon the reversal of wave vector. This directional flow of particles, known as nonreciprocity, universally occur in various particles such as photon [1] and electron [2] when matters has neither spatial inversion ( $P$ ) nor time reversal ( $T$ ) symmetries. Here, we show nonreciprocity of phonon propagating on the surface of Ni/LiNbO<sub>3</sub> device [3]. Due to the character of surface and ferromagnetism of Ni, this hybrid system is regarded as an artificial multiferroic without  $P$ ,  $T$  symmetries. Our precise measurement shows that phase velocity and absorption is found to be dependent on the propagation direction of phonon, and this nonreciprocity becomes maximal when magnon and phonon frequencies coincide and hybridization occurs. Theoretical treatment based on magneto-elastic coupling explained selective excitation of magnon by surface phonon is the origin of this nonreciprocity.

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