

Fig. S1 Length-dependent thermal conductivity. The thermal conductivity of serpentine NWs and straight NWs from Ref. 14 measured at 4, 100, and 200 K.

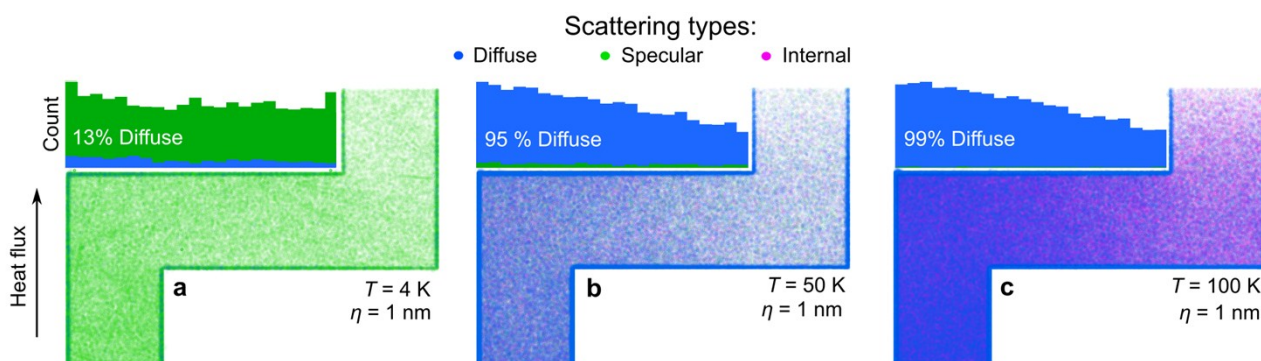


Fig. S2 Maps of diffuse (blue), specular (green), and internal (red) scattering events at (a) 4 K, (b) 50, and (c) 100 K for the surface roughness of 1 nm show a gradual transition to more diffuse phonon transport as the temperature is increased.

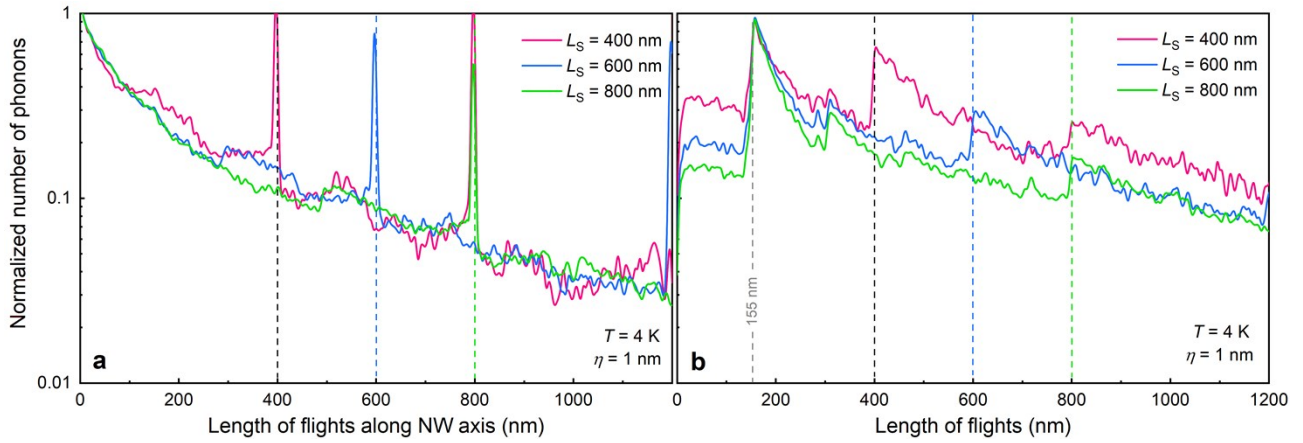


Fig. S3 (a) Normalised number of phonons as a function of phonon flight lengths (a) projected on NW axis and (b) non-projected. The surface roughness of sidewalls is 1 nm.

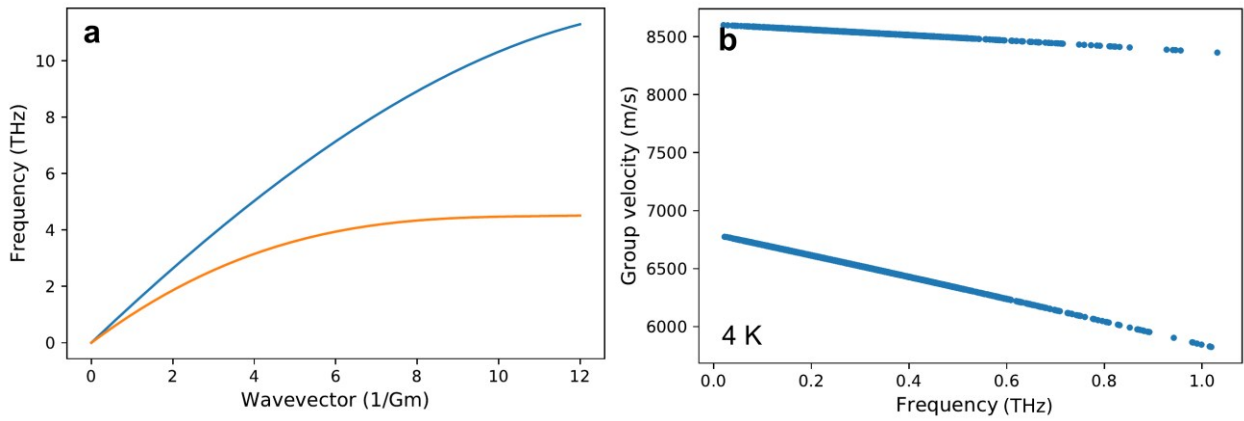


Fig. S4 (a) Bulk phonon dispersion used for the simulations. (b) Example of phonon group velocities obtained from the dispersion for simulations at 4 K.

Table S1 Percentage of different scattering events at different temperatures. Blue and green cells show the percentage of diffuse and specular scattering events of the given type, respectively.

Scattering type	4 K		50 K		100 K	
Top & bottom	75.44%	1.54%	52.34%	69.84%	35.42%	88.64%
		98.46%		30.16%		11.36%
Side walls	23.46%	37.32%	33.74%	98.34%	22.19%	99.53%
		62.68%		1.66%		0.47%
Internal	0%		11.79%		41%	
Rethermalization	1.10%		2.13%		1.38%	