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Single Circuit Parallel Computing with Phonons through Magneto-acoustics[1] SOPHIA SKLAN, JEFFREY GROSSMAN, Massachusetts Institute of Technology — Phononic computing – the use of (typically thermal) vibrations for information processing – is a nascent technology; its capabilities are still being discovered. We analyze an alternative form of phononic computing inspired by optical, rather than electronic, computing. Using the acoustic Faraday effect, we design a phonon gyrator and thereby a means of performing computation through the manipulation of polarization in transverse phonon currents. Moreover, we establish that our gyrators act as generalized transistors and can construct digital logic gates. Exploiting the wave nature of phonons and the similarity of our logic gates, we demonstrate parallel computation within a single circuit, an effect presently unique to phonons. Finally, a generic method of designing these parallel circuits is introduced and used to analyze the feasibility of magneto-acoustic materials in realizing these circuits.

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