Band structure calculations by modal analysis MAHMOUD HUS-
SEIN, University of Colorado at Boulder — In this paper, we present reduced Bloch
mode expansion for fast lattice band structure calculations. The expansion employs
a natural basis composed of a selected reduced set of Bloch eigenfunctions. The
reduced basis is selected within the irreducible Brillouin zone at high symmetry
points determined by the medium's crystal structure and group theory. At each of
the reciprocal lattice selection points, a number of Bloch eigenfunctions are selected
up to the frequency/energy range of interest for the band structure calculations.
Being in line with the well known concept of modal analysis, the proposed approach
maintains accuracy while reducing the computation time by up to two orders of
magnitudes or more depending on the size and extent of the calculations. Results
are presented for phononic, photonic and electronic band structures.

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