SEMINAR - סמינר

הנך מוזמן/ת להרצאה סמינריונית של הפקולטה להנדסת מכונות, שתתקיים ביום ב' 11.12.2017 (כ"ג בכסלו, תשע"ח), בבניין דן קאהן, אודיטוריום 1, 14:30.

מרצה:

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על הנושא:

Interference of lattice waves in transport and storage of thermal energy in low-dimensional metamaterials of atomic scale

The seminar will be given in English

להלן תקציר ההרצאה:

The seminar will be devoted to the description of new low-dimensional metamaterials and transport phenomena, in which the interference of lattice waves (phonons) on atomic defects in crystals plays an important role. The possibility of resonant total reflection or complete absorption of a phonon by a two-dimensional lattice defect, the metamirror whose effective thickness is much less than the phonon wavelength, will be shown. Realization of the phenomenon of the total reflection (transmission antiresonance) is possible on monatomic crystal planes partially filled with atomic defects, and on two-dimensional lattice defects in which the interactions of both nearest and non-nearest neighbors are significant. The frequencies of such antiresonances are determined by the dynamic properties of the atomic defects. Analysis of the antiresonances shows that the decisive role in them, in contrast to the case of the Fano resonance, is played by the destructive interference of phonons propagating through the atomic-scale metamirror through the two paths: through the unperturbed (matrix) and perturbed (defect) interatomic bonds, or through the nearest-neighbor and non-nearest-neighbor bonds. Random defect distribution in the plane and the anharmonicity of the interatomic bonds do not destroy the antiresonance. The width of the antiresonance transmission dip can provide a measure of the coherence length of the phonon wave packet, similar to the case of destructive interference of two photon wave packets in the Hong-Ou-Mandel effect. Destructive phonon interference causes the reduction of the thermal conductance of the crystal metaplanes, fully or partially filled with resonance atomic defects. On the basis of atomic-scale metamirrors, an ultracompact phonon nanocapacitor can be constructed for storage and lasing of coherent terahertz lattice waves. Amplitude dependence of the antiresonance frequencies allows the tunable strain-engineered discharging of and coherent phonon emission (phonon lasing) from the nanocapacitor, which may be relevant for quantum computing with phonons.

מארח: פרופ' אולג גנדלמן

בברכה,

פרופ"א מתי סאס
מרכז הסמינרים