

Mandelstam–Brillouin oscillations in specially prepared 3D film metamaterials

Inogamov N.A.^{1,2,3,@}

¹ Landau Institute for Theoretical Physics of the Russian Academy of Sciences, Akademika Semenova 1a, Chernogolovka, 142432, Russia

² Dukhov Research Institute of Automatics (VNIIA), Sushchevskaya 22, Moscow, 127055, Russia

³ Joint Institute for High Temperatures of the Russian Academy of Sciences, Izhorskaya 13 Bldg 2, Moscow, 125412, Russia

@ nailinogamov@gmail.com

The report presents the results of the [1–4] papers carried out by the team of co-authors, see [1–4]. We use a structured nickel film sprayed onto the glass using a magnetron. The operating mode of the magnetron is chosen so that partial condensation of nickel vapor occurs during its diffusion through argon. The film turns out to be clogged with nickel nanoparticles randomly scattered on the nickel surface [1–4]. This is how our 3D meta-system is formed from a structured nickel film and glass substrate. The Mandelstam–Brillouin oscillations (MBO) is associated with the reflection of light from a traveling acoustic wave in glass. Thanks to a radical increase in the transmittance of the meta-film, it is possible to observe MBO through film. For the first time, the phase of MBO is described. The work is at the junction of nanophotonics, plasmonics and optoacoustics and describes effects in active meta-devices and highly sensitive sensors.

- [1] Dyshlyuk A, Inogamov N and Vitrik O 2024 *Bulletin of the Russian Academy of Sciences: Physics* **88(3)** S450–S456
- [2] Petrov Y, Romashevskiy S, Dyshlyuk A, Khokhlov V, Eganova E, Polyakov M, Evlashin S, Ashitkov S, Vitrik O and Inogamov N 2025 *ZhETF* **167(5)** 645–671
- [3] Dyshlyuk A, Inogamov N and Vitrik O 2025 *Bulletin of the Russian Academy of Sciences: Physics* **89** S479–S486
- [4] Dyshlyuk A, Romashevskiy S, Petrov Y, Khokhlov V, Vitrik O and Inogamov N 2026 *Pis'ma ZhETF* **123(3)**