FEATURES OF SMBS IN AN INHOMOGENEOUS PLASMA AT TWO-DIMENSIONAL PUMP WAVE LOCALIZATION [[1]](#footnote-1)\*)

DOI: 10.34854/ICPAF.2021.48.1.154

1Dvinin S.A., 2Solikhov D.K., 2Hobilov D.U.

1Lomonosov Moscow State University, Russia, Moscow, [dvinin@phys.msu.ru](mailto:dvinin@phys.msu.ru),  
2Tajik National University, Tajikistan, Dushanbe, [davlat56@mail.ru](mailto:davlat56@mail.ru)

The problem of convective amplification of waves in SBS under conditions when the pump wave propagates along the plasma layer in a two-dimensionally confined plasma is considered, taking into account the spatial inhomogeneity of the pump wave field. In contrast to [1], the inhomogeneity of the pump wave field in the direction of propagation was taken into account. Problems of this kind have practical applications for plasma diagnostics, particle acceleration, and interpretation of other nonlinear processes. In contrast to [2], we consider a two-dimensional problem in this paper. To consider SMBS, we used a system of truncated equations for the amplitudes of scattered acoustic electromagnetic waves, which can be obtained from the equations of hydrodynamics taking into account ponderomotive forces and field equations [3].

,  (1)

where   – is the perturbation of the electron concentration,  is the amplitude of the field of the scattered wave, , ,  are the projections of the group velocities on the directions OX and OY, ,  are the coefficients of nonlinear coupling of waves, ,  are the attenuation coefficients of the scattered and sound waves, *e*, *m*, *N*0 are the charge, mass and the concentration of electrons, *z*, *mi* are the charge number and mass of ions, *k*0, *ω*0, *Ε*0 are the wave number, frequency and amplitude of the pump wave, is the phase difference of interacting with the pump wave (wave number *k*0) scattered (wave number *k*') and sound (wave number *k*) waves arising from the plasma inhomogeneity, *χ*(x)=*k*0(*x*)+*k*’(*x*)–*k*(*x*). The scattered radiation intensity was calculated similarly to [4].

In the approximation of strong dissipation of sound waves, an exact solution is obtained for the squared modulus of the amplitude of the scattered wave and its spatial distribution is presented.

It is shown that the intensity of the scattered radiation reaches its maximum value near the resonance point and decreases with distance from it.

The threshold value of the wave amplification factor along the direction of propagation of the pump wave in the plasma is determined.

Comparison of the calculations of the characteristics of scattered radiation during SMBS using the obtained formulas with experiment [5, 6] showed their qualitative agreement.

References

1. S.A. Dvinin, D.K. Solikhov, Sh.S. Nurulkhakov. Optics and Spectroscopy, 2020, Vol. 128, No. 1, pp. 94.
2. D.К. Solikhov, S.А. Dvinin, D.U. Khobilov, Russian Physics Journal, 62, No. 12, 42 (2019).
3. L.M. Gorbunov, Uspekhi Fizicheskikh Nauk (Physics-Uspekhi), 109, 631, (1973).
4. D.К. Solikhov, S.А. Dvinin, Plasma Physics Reports, 42, No. 6, 590 (2016).
5. A. Ng, L. Pitt, D. Salzmanm, A.A. Offenberger, Phys. Rev. Lett., 42, N5, 307 (1979).
6. Z.Toroker, V.M. Malkin, N.Z. Fish, Physics of plasmas, 21, 113110 (2014)

1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/XLVIII/Pt/ru/GX-Dvinin.docx) [↑](#footnote-ref-1)