ON NUMERICAL MODELING OF NONLINEAR EQUATIONS OF STIMULATED MANDELSTAM-BRILLUIN SCATTERING IN PLASMA [[1]](#footnote-1)\*)

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

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

In this paper, we consider a numerical solution of the equations of the nonlinear SBS theory in a homogeneous and inhomogeneous plasma, taking into account the generation of the second harmonic of the sound wave and the depletion of the pump wave. In contrast to [1, 2, 3], where the dissipation of sound waves was not taken into account, the case of strong dissipation, when the mean free path of sound waves is small in comparison with the dimensions of the interaction region, was studied. In contrast to [4], the effect of the pump wave depletion on the reflection coefficient and the intensity of interacting waves was studied.

To consider the SMBS, we use the system of equations for the amplitudes of the scattered electromagnetic wave , sound wave ν1, its second harmonic ν2, and for the amplitude of the pump wave 

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The paper considers the solution of this system of equations in the approximation of strong attenuation of sound waves.

Main results of the work.

1. A system of differential equations for the intensities of interacting waves in the approximation of strong dissipation of sound waves in an inhomogeneous plasma is obtained.
2. It is shown that taking into account the generation of the second harmonic in a strongly decaying approximation in a homogeneous plasma significantly reduces the reflection coefficient.
3. The dependences of the reflection coefficient on the dissipation of scattered waves and the thickness of a uniform plasma in a linear and nonlinear approximation are determined.
4. The threshold size of the plasma inhomogeneity at which its inclusion becomes significant is determined. It is shown that this size depends on the ratio of the mean sound waves free path to the pump wavelength.
5. It is shown that taking into account the nonlinearity of sound waves in an inhomogeneous plasma leads to an increase in the reflection coefficient compared to the linear theory due to the expansion of the region of waves resonant interaction.

References

1. Silin V.P., Tikhonchuk V.T. JETP Letters, 1981, **34**, N7, p. 385.
2. Silin V.P., Tikhonchuk V.T. JETP Letters, 1982, **83**, N4(10), 1332.
3. Kartunen S.J., Salomaa R. R. Phys. Lett, 1982, **88A**, N7, 350.
4. Gorbunov L.M., Polyanichev A.N., Solikhov D.K. Sov. Physics: Fizika Plasmy, 1983, **9**, N4, 815.

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