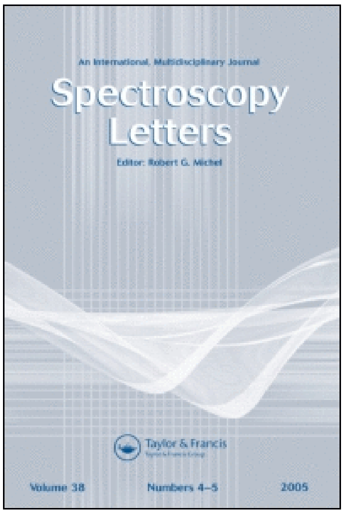

Spectroscopy Letters
Publication details, including instructions for authors and subscription information:
http://www.informaworld.com/smpp/title~content=t713597299

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To cite this Article Nagibarov, V. R. and Zeldovich, S. A.(1971) 'On the Use of the Two-component Liquid in the Critical Point of Stratification for the Optical Detection of the Gravitational Waves', Spectroscopy Letters, 4: 7, 209 — 212
To link to this Article: DOI: 10.1080/00387017108064640
URL: http://dx.doi.org/10.1080/00387017108064640

SPECTROSCOPY LETTERS, 4(7), 209-212 (1971)

ON THE USE OF THE TWO-COMPONENT LIQUID IN THE CRITICAL POINT OF STRATIFICATION FOR THE OPTICAL DETECTION OF THE GRAVITATIONAL WAVES

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The axis of the vessel $\vec{z}$ with the two-component liquid in the critical point of stratification is oriented along the d rection of trial mass in the field of gravitational wave. Suppose that vessel sides are less than the wave length and the rate of equilibrium establishment in such system greater than the rate of the gravitational field of the wave in the place of solution arrangement. Mark the coordinate of the liquid stratification boundary in the constant gravitational field parallel to $\vec{z}$ as ℓ_o.

If such solution is lighted along $\vec{z}$ by the monochromatic light source of the frequency ν_o the Mandelshtam-Brillouin component (MBC) scattered by the liquid layer at $z = \ell$ with test the periodic displacement with the amplitude $\Delta\nu_G$ which may be easy determined by use of [1-4] :

$$\Delta\nu_G = 0{,}17\,\frac{\Delta\nu_o}{C_1}\left\{\left[\frac{6}{B}\left(M_1 - V_1\,\frac{M_{kp}}{V_{kp}}\right)\right](\ell-\ell_o)^{1/3}\right\}\left(\frac{K_G\,I_G}{\pi c}\right)^{1/6} =$$

$$= A(\ell-\ell_o)^{1/3}(I_G)^{1/6}; \quad \Delta\nu_G(t) = \Delta\nu_G \cos^{2/3}\omega_G t \quad , \qquad (1)$$

where ω_G - gravitational wave frequency, t - time, K_G - gravitational constant , I_g - amplitude of gravitational flow intensity, $\Delta\nu_0 = 2n\nu_0(\vartheta/c)\sin\frac{\theta}{2}$ Mandelshtam--Brillouin displacement, n - refraction exponent, C - rate of the light, ϑ - rate of the sound in mixture in ordinary (noncritical) state, $M_{\kappa p} = M_1 c_1^{\kappa p} + M_2 c_2^{\kappa p}$, $V_{\kappa p} = V_1 c_1^{\kappa p} + V_2 c_2^{\kappa p}$; $c_2^{\kappa p} = 1 - c_1^{\kappa p}$, M_i, V_i, c_i, μ_i $(i = 1, 2)$ - molecular weight, volume, concentration and chemical potential of the i-th component, κp - the corresponding values in the critical point, $\beta = (\partial^3\mu_1/\partial c_1^3)$.
In derivation of (1) the attraction force of Earth (or other celestial bodies) is supposed to be compensated (for example, the experiment of Sputnik), θ - angle between direction of scattering and $\vec{Z}$ - axis.

Evaluate $\Delta\nu_G$, which may be provided by cosmic of the gravitational radiation if to use nitrobensol solution-normal hexane with nitrobensol concentration C_1 =0,4 normal parts as in [2] .

We find for such mixture near the upper temperature of stratification $T_c = 20 \pm 0,5°C$ accounting experimental date from (1) given in [2] $(T - T_c = 1,1°C,\ \ell - \ell_0 = 10\,mm)$

$$\Delta\nu_G = 3\cdot 10^7 \left(K_G I_G/\pi c\right)^{1/6} \quad c/s \tag{2}$$

So we find from (2) $\Delta\nu_G = 300$ c/s for stars $i\,Boo$ and $WZ\,Sge$ which are at a short distance to use and producing the flow of gravitational radiation in the neighbourhood of

Earth $I_G \approx 10^{-11} \frac{erg}{cm^2 sec}$ with periods $T_{01} \simeq 0{,}194$ /days and $40{,}5$ min. correspondently.

This value exceeds greatly the linewidth of the modern gaseous lasers. If the experimental conditions allow to determine $\Delta\nu_G = 1$ c/s we find from (2) that radiation flow with intensity $(I_G)_{min} \sim 10^{-27} \frac{erg}{cm^2 sec}$ may be registrated by the method suggested. Such flows may be generated even in the laboratories (see, for example, [5–7]).

It is perspective to use the low-temperature and quantum liquid for the noise decrease. For example the analogous effect may be expected in the mixture $He^3 - He^4$ $(T = 0{,}84\,°K$ at $c_1 = 0{,}63\ He^3)$

From this example the great possibilities of the use of substances in critical states where their compressibilities are very large for the purposes of registration of gravitational radiation.

We thank proffessor U.H. Kopvilljem for useful discussion.

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