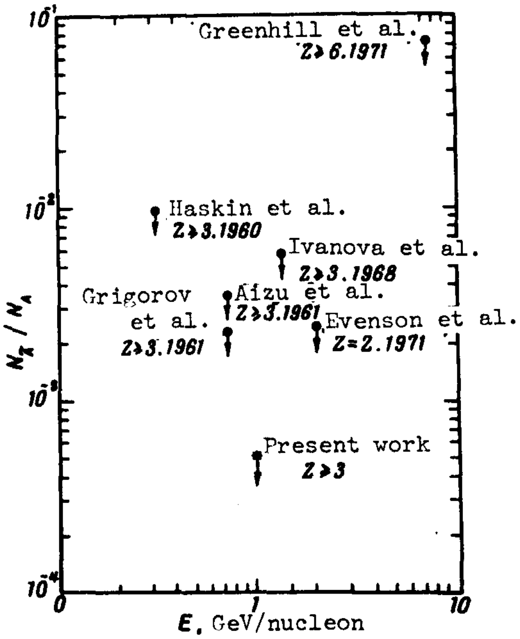
the geomagnetic hardness cutoff of positive and negative particles traveling in a definite direction. The detector was a telescope of scintillation counters in conjunction with a gas Cerenkov counter. The value obtained was $N_{\tilde{A}}/N_A < 7.5\%$.

Data on the upper limit of the content of antinuclei in cosmic rays, obtained by different workers, are gathered in the figure. The points obtained by the emulsion method pertain to the upper limit of the investigated energy interval, while the results of [5, 6] pertain to the mean-weighted energy value. We note that a correction for the difference in the interaction cross sections of the nuclei and antinuclei in emulsion was made only in our earlier paper [4] and in the present paper. Introduction of such a correction into the data of [1 - 3] should improve the obtained upper limit by an approximate factor of 2 (for an emulsion depth ~10 cm).

From the data shown in the figure it is seen that the accuracy with which the upper limit of antinuclei is determined in the present paper greatly exceeds all the earlier ones.



Data on the upper limit of the relative content of antinuclei in primary cosmic rays, obtained by different workers.

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INFLUENCE OF "PARASITIC" GENERATION WITH WAVELENGTH 3.39 μ ON THE RADIATION FLUCTUATIONS OF AN Ne-He LASER OPERATING IN THE 0.63 μ REGION

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Of the two neon lasing transitions $3s_2 - 2p_4$ ($\lambda = 3.39$ μ) and $3s_2 - 3p_4$ ($\lambda = 0.63$ μ), which are connected by a common upper level, the former has a much larger gain and saturation parameter. One can therefore expect lasing at 3.39 μ to decrease the sensitivity of a 0.63 μ Ne-He laser to pump fluctuations. To estimate this effect quantitatively, a laser was constructed consisting of a discharge cell C filled with a $Ne^{20} - He^3$ mixture and a compound resonator made up of mirrors M_1, M_2, and M_3 (Fig. 1). The mirror M_2 had maximum reflectance at $\lambda = 0.63$ μ, M_3 at $\lambda = 3.39$ μ, and mirror M_1 reflected both wavelengths sufficiently well. As a result, the laser could operate simultaneously at 0.63 μ (resonator M_1 - M_2) and 3.39 μ (resonator M_1 - M_3). The knife-edge diaphragm D could control the level of the 3.39 μ generation, and the germanium plate G eliminated the influence of mirror M_3 on the 0.63 μ generation. The resonators M_1 - M_2 and M_1 - M_3 were tuned simultaneously to the centers of the corresponding gain lines. The fluctuations of the 0.63 μ radiation were measured with a photoreceiver Ph_1 and analyzer A, using a procedure described in [2]. The 3.39 μ radiation was registered with photoreceiver Ph_2.

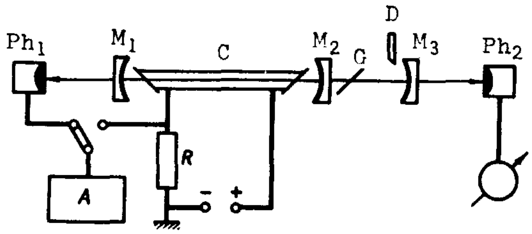

Fig. 1. Diagram of setup.

In the absence of 3.39 μ generation and at a discharge current I_d > 4 mA, the amplitude fluctuations of the 0.63 μ radiation were determined predominantly by the gas-discharge plasma [1, 2]. Curve 1 on Fig. 2 gives an idea of the energy spectrum S(f) of these fluctuations. Excitation of 3.39 μ generation suppressed these fluctuations to a greater degree than assumed: the spectral density S(f) became practically independent of the plasma oscillations and decreased to the level of the natural fluctuations, while the limit of the latter shifted towards higher frequencies (curve 2 on Fig. 2). In the region of the quiescent plasma (I_d < 4 mA), excitation of 3.39 μ generation was accompanied by a certain increase of the intensity and width of the natural-fluctuation spectrum. It should be noted that the change of S(f) depended relatively little on the level of the 3.39 μ generation. In particular, for the case shown in Fig. 2, turning on of the 3.39 μ generation changed the power of the 0.63 μ radiation by only 10%.

A similar albeit much weaker "suppression effect" could be observed by subjecting the discharge current to a forced periodic modulation of low depth (in our case $\sim 10^{-4}$). Figure 3 shows the frequency dependence of the ratio α of the depth of modulation of the intensity of the 0.63 μ radiation in the absence and presence of generation in the infrared region, respectively.

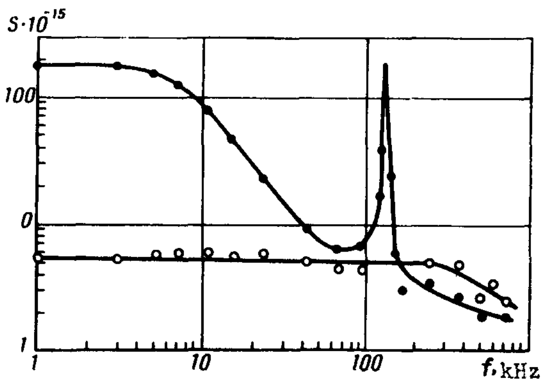

Fig. 2

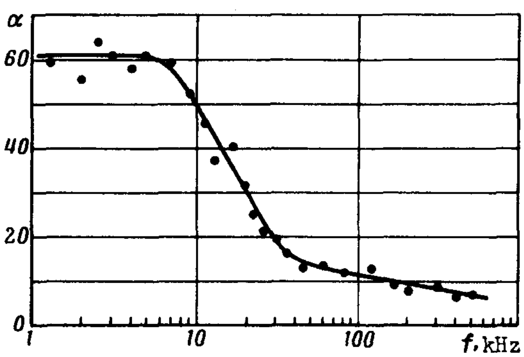

Fig. 3

Fig. 2. Fluctuation spectra of radiation with λ = 0.63 μ in the absence (1) and presence (2) of generation at 3.39 μ (I_d = 5.3 mA).

Fig. 3. Frequency dependence of the suppression coefficient for I_d = 5.3 mA.

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EFFECTIVE STIMULATED SCATTERING IN THE ULTRAVIOLET AND DISPERSION OF GAIN IN THE 1.06 - 0.26 μ BAND

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1. We obtained effective Raman and Mandel'shtam-Brillouin scattering in the UV region and investigated some of their characteristics. The increase of the Raman susceptibility in the UV region has made it possible to develop an effective Raman laser using liquid nitrogen with pumping at λ = 0.26 μ (using a pump power of 10 kW in a system without mirrors, we were able to excite Stokes generation with an efficiency reaching several dozen per cent). Noticeable increase of the gain in the UV region was registered also for SMBS.

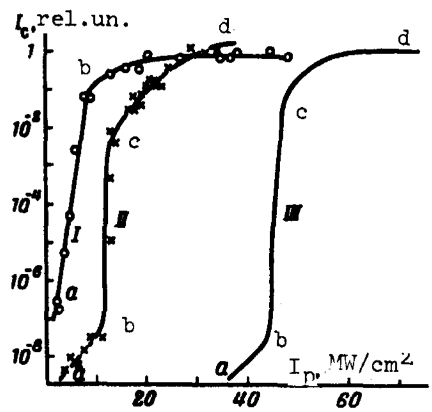
2. The exciting radiation was a stable fourth harmonic of a neodymium laser operating in a regime where one longitudinal and one transverse mode is generated (see [1]). The use of a cascade scheme has made it possible to have simultaneously single-mode emission at λ_1 = 1.06 μ, λ_2 = 0.53 μ, λ_3 = 0.35 μ, and λ_4 = 0.26 μ. The stability of the fourth harmonic output power was not worse than 10%. The maximum fourth-harmonic energy reached 0.1 J.

3. The working medium for the Raman laser with UV pumping was chosen to be liquid nitrogen (see [2, 3]). It turns out that SRS with λ_p = 0.26 μ is quite effective; when a lens (F = 17 cm) is used, a nonlinear scattering regime (the efficiency of conversion into the Stokes components exceeded 10%) could be obtained at $P_p \approx$ 100 kW (three intense Stokes components were excited simultaneously). At $P_p \approx$ 1 MW, up to five Stokes components and one anti-Stokes components were excited.

The SRS gain in the UV region was measured in a parallel beam. The figure shows the experimental dependence of the intensity of the first Stokes component I_s on the pump intensity I_p (length of cell with nitrogen ℓ = 13 cm). Assuming that the linear section of the curve, measured at $I_s/I_p \ll 1$, is described by the formula

$$I_s = I_{s0}\exp(gI_{\text{II}}\ell), \qquad (1)$$

we can determine the growth factor g. For comparison, we present the results obtained by us at λ_p = 0.53 and the results of [3] (see Table 1).



Experimental plots of the intensity of the first Stokes SRS component in liquid nitrogen vs. pump intensity, measured for different pump wavelengths in a parallel beam. Length of cell with nitrogen ℓ = 13 cm. I) λ_p = 0.26 μ, II) λ_p = 0.53. The plot for λ_p = 0.69 μ (III), borrowed from [3] and measured in a parallel beam in a cell of length ℓ = 6 cm, is shown for comparison.