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ERCEPTION OF INFRARED RADIATION OF LASERS BY THE HUMAN EYE*

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The paper reports on the visual observation of the infrared radiation of lasers by the eye on irradiation of the eye with pulses of induced radiation of 10–20 nsec duration in the wavelength range $0{\cdot}9\ \mu m < \lambda \leq 1{\cdot}5\ \mu m$.

ORDINARY conditions the human eye is capable of perceiving radiations of electro-gnetic waves in the range 0·38–0·75 μm. However after the creation in 1960–61 of erful sources of coherent radiation, communications have reported the observa- of infrared radiation at wavelengths longer than 0·8 μm [1–3].

The first paper on the direct visual observation of infrared radiation of the He–Ne is most probably the study in [1] in which authors report that the radiation of a

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laser at a wavelength 0·95 μm is perceived as redlight but at wavelength $\lambda = 1{\cdot}11$, 1·1 and 1·18 μm already as radiation with half the wavelength, i.e. as yellow-green ligh

In the present work we study the perception by the eye of infrared radiation nanosecond duration in the wavelength range $0{\cdot}9\ \mu m < \lambda \leq 1{\cdot}5\ \mu m$ at powers of inci dent radiation up to 10^4 W/cm^2.

As infrared radiation sources we chose pulsed gas discharge lasers based on vapou of metals working on self-restricted transitions [4, 5]. These lasers have quite powerf discrete lines of generation in the test wavelength range with a duration of radiatio of 10–20 nsec. Therefore, the energy in the single pulse usually does not exceed 10⁻ Joules, which allows one to work within permissible safety limits for the eye. The repe tition frequency of the pulses of radiation could be varied from 0 to 10^4 Hz.

The observations of radiation were made both directly from the end of the lase tube and at the output of the MDR-3 monochromator. In the first case in the beam pat were set up IRL light filters not transmitting the visible region of radiation of the ga discharge plasma.

Undesirable effect of random doubling on the elements of the optical tract wer prevented by expanding the light beam. The measurements of the threshold intensit of radiation were made in a darkened room.

A visual comparison was made of the colour sensation resulting from the no linear transformation in the eye of the infrared radiation with the radiation spectra hydrogen, helium and neon and from the continuous radiation spectrum of an inca descent lamp. Where possible, a comparison was also made with the second harmo of the radiation of the laser. To obtain the second harmonic we used $LiNbO_3$ crysta

In the author's view, from these measurements it follows that the wavelength infrared radiation visually perceived by the eye corresponds with high accuracy to th second harmonic (according to subjective evaluation the error of the measureme did not exceed 0·003 μm). The results of the work are presented in the Table.

No.	Wavelength of radiation of laser, μm	Wavelength perceived by eye, μm	Threshold power, W/cm^2	Active medium of laser
1	1·0020	0·5010	3–10	Eu$^+$
2	1·0322	0·5161	3–10	Yb
3	1·1303	0·5651	5–10	Ba
4	1·2714	0·6357	30–50	Yb
5	1·5000	–	–	Ba

As the Table shows, the sensitivity of the eye to infrared radiation the second harmo of which corresponds to the yellow and green regions of visible light is much the The sensitivity of the eye in the red region of the spectrum is lower by roughly one than in the yellow-green region. Irradiation of the eye with wavelength $\lambda = 1{\cdot}5\ \mu m$ not elicit any photosensations even for considerable powers of the incident radi

These results for the sorbing capacity of the radiation at the wavel We would note that t rceived as point. On se diation source is percei These results may be e infrared radiation by In conclusion the auth cts considered in this w

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These results for the longwave region of the spectrum may be explained by the high absorbing capacity of the eye for wavelength exceeding 1·2 μm and complete absorption of radiation at the wavelength $\lambda = 1{\cdot}5$ μm [6].

We would note that the source of radiation in the case of observation by the eye is perceived as point. On setting up scattering or collecting lenses in front of the eye the radiation source is perceived as several concentric rings.

These results may be useful in analysing the primary mechanisms of perception of the infrared radiation by the human eye.

In conclusion the author wishes to thank V. P. Chebotayev for discussion of the aspects considered in this work and V. G. Sokovikov for technical assistance.

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FFECT OF FREQUENCY OF RHYTHMIC EXCITATION ON THE BINDING OF OUBAINE BY SQUID GIANT AXONS*

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Jsing ^3H-labelled oubaine the authors have studied the changes in the binding of the glycoside vith the squid axons on conduction of rhythmic excitation. It was established that the amount f bound oubaine changes with change in the frequency of stimulation and that this amount maximal at a frequency of 10 pulses/sec. It is assumed that in the axon membranes as in ther excitable membranes rise in the activity of Na, K-ATPase on excitation results from increase in the number of of the enzyme active forms.

CONDUCTION of rhythmic excitation is essentially connected with change in the ratio e concentrations of sodium and potassium ions in the nerve fibres and with activa- of Na, K-ATPase [1]. The amount of the oubaine-sensitive portions in the mem-

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