2"). The resonator consisted of external confocal dielectric mirrors (R = 500 mm) with 0.6% transmission. The generation was excited by a xenon flash lamp (IFP-800) in an elliptical cylindrical illuminator (semiaxes L_1 = 16 mm and L_2 = 14 mm). The stimulated emission was recorded with an FEU-28 photomultiplier with a silicon input filter. The signal from the photomultiplier was fed to an S-1-17 oscilloscope. The generation threshold was 5.6 J without allowance for the inequality of the lengths of the luminous column of the lamp and of the sample. With allowance for this inequality, the threshold was approximately 1 J. Under similar conditions, the threshold of a calcium tungstate crystal of comparable dimensions and optical quality was 2.4 J.

Figure 2 shows a photograph of the generation spectrum, obtained with a PGS-2 diffraction spectrograph. The reference was the set of an iron-arc lines in third order. The generation wavelength was 10631 Å and the generation line width 0.2 Å. Thus, FA:Nd^{3+} crystals have optical properties (narrow and intense luminescence line and exceptionally large level splitting) and generation parameters (low threshold and high gain) making it a promising material for continuous and pulsed lasers, and also for the investigation of the magnetic properties of the Nd^{3+} ion.

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MICROTRON WITH PLASMA INJECTOR

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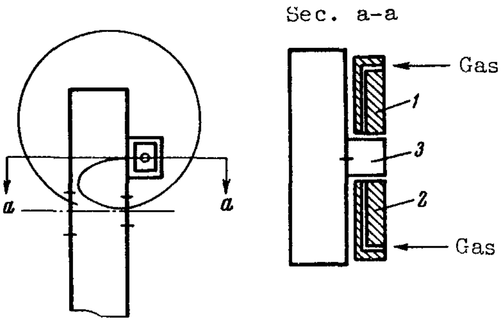
In modern strong-current microtrons, the injection is by means of a scheme proposed by S. P. Kapitza, wherein the electron emitter is a thermionic cathode installed near the injection aperture of the resonator [1]. A number of limitations imposed by the thermionic cathode on the capabilities of the microtron can be eliminated in principle by using a plasma injector, which ensures large density of the currents extracted from the plasma surface, is free of incandescent parts, and has little sensitivity to the gas atmosphere in the vacuum chamber.

We started up a microtron in which the electrons were injected into the accelerating resonator from the plasma of a low-pressure gas discharge localized near the injection aperture. The injection scheme, shown in the figure, is similar to that developed earlier [1], but the thermionic cathode was replaced by a Penning discharge produced in the microtron magnetic field. The electrody system of the discharge chamber consists of two cold aluminum cathodes 1 and 2, and a copper anode made up of part 3, mounted on the cover of the resonator, and the part of the cover having the injection aperture (2.8 mm diameter). To improve the discharge-chamber characteristics, the gas (air) was admitted through



cavities in the cathodes, making it possible to realize the hollow-cathode effect in the Penning electrode system. The discharge chamber was sealed off from the high-vacuum volume by means of a polyethylene ring and communicated with this volume only through the injection aperture. The electrons were extracted from the plasma with a high-frequency field extending from the resonator cavity through the injection aperture in the discharge region.

The discharge power supply generated pulses of 30 μsec duration with a repetition frequency 1 - 10 Hz. At a gas flow of 60 cm^3/hr and a discharge voltage 2 kV, the discharge current was 4 A (pulsed). The pressure in the microtron chamber was 3×10^{-5} Torr. The current of the electrons accelerated to 6 MeV reached 15 mA. With the discharge sufficiently stable, instability of the accelerated current appeared with increasing pressure.

Work on the stabilization of the accelerated current is continuing.

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CONTROL OF THE FREQUENCY OF A CO_2 LASER BY A BORON TRICHLORIDE FILTER

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We present here the results of experiments aimed at controlling the frequency of a CO_2 laser by introducing in the laser resonator a cell containing BCl_3 at pressures 10^{-2} - 30 Torr.

The maximum of the radiation of a CO_2 laser without a dispersive element occurs at the rotational transition P(20) of the $00^01 - 10^00$ vibrational band. When the dispersive element is placed in the resonator, generation is possible at practically all the transitions of the P and R branches of the vibrational bands $00^01 - 10^00$ and $00^01 - 02^00$ (see, e.g., the review [1]).

The form and mutual arrangement of the absorption lines $_3$ of the molecules $B^{10}Cl_3$ and $B^{11}Cl_3$ (see Fig. 1), lying in the region of the possible CO_2-laser generation frequencies, make it possible to use BCl_3 as a selective element for the control of the frequency of this laser.

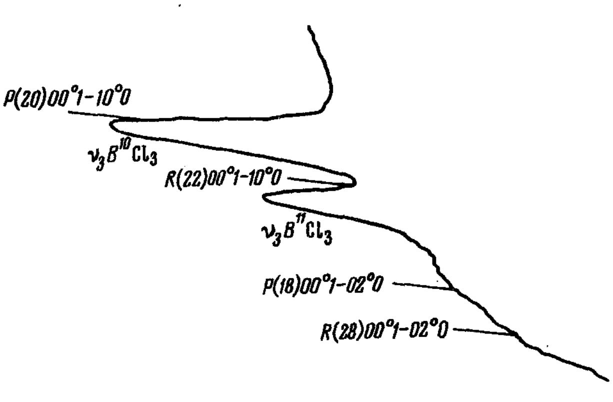

Fig. 1. Absorption spectrum of BCl_3 gas together with P and R branches of the $00^01 - 10^00$ and $00^01 - 02^00$ vibrational bands.

The experiments were performed on a laser with a resonator 200 cm long, made up of gold-coated spherical mirrors with curvature radius 500 cm. The diameter of the exit aperture was 0.7 cm. A cell with BCl_3, of 100 cm length and 5.5 cm diameter, was inserted in the resonator.

In the absence of BCl_3 (pressure in cell 10^{-2} Torr), generation takes place at