MAR and NFMR excitation thresholds coincide. 2) In transversely pumped yttrium ferrite, the region of MAR excitation is much broader than under longitudinal pumping; in the lithium ferrite the width is approximately the same in both cases. In addition, in the lithium ferrite MAR excitation is observed in a weak magnetizing field. 3) The MAR excitation threshold under longitudinaly pumping is always higher than under transverse pumping.

Similar relations were observed in yttrium-gallium, yttrium-gadolinium, and lithium-gallium ferrites.

In all the experiments, the MAR frequency corresponded to the transverse S_1 oscillation mode of the spherical sample [9]:

$$F = 0.848 \frac{V_t}{d},$$

where V_t is the velocity of propagation of the transverse elastic oscillations and d is the sample diameter.

At certain values of the magnetizing field, the MAR was excited at several frequencies close to the S_1-mode frequency. Calculation has shown that the observed difference between the resonant frequencies corresponds to the difference between the transverse propagation velocities of the elastic oscillations, due to the crystallographic anisotropy of the sample. The propagation velocity of the transverse elastic oscillations deviates from the average value $V_t = 3.865 \times 10^5$ cm/sec by approximately ±2% in yttrium ferrite and approximately ±20% in lithium ferrite. It was also observed that when MAR is excited the excitation threshold of the NFMR auto-modulation increases and its intensity decreases strongly. This effect is particularly noticeable in yttrium ferrites.

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DYNAMICS OF LOW FREQUENCY OSCILLATIONS OF GUNN DIODES

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Simultaneous generation of high-frequency oscillations at 17.8 GHz and low-frequency oscillations at ~12 MHz by a Gunn diode was observed experimentally in [1]. The low-frequency oscillations were sinusoidal and their amplitude increased with increasing voltage applied to the sample.

We observed low-frequency oscillations of frequency 5.9 - 9.8 MHz in five Gunn diodes with Gunn-oscillation frequencies 0.8 - 1.2 GHz. The dynamics of these oscillations had a complicated character and depended on the voltage applied to the sample.

All the diodes were made of the same n-GaAs plate with electron density at room temperature $n_0 = 3 \times 10^{14}$ cm^{-3} and mobility $\mu_0 \approx 5000$ cm^2/V-sec. Hall measurements made in the temperature range 77 - 293°K showed that the forbidden band contained a deep "effective" [2] donor level, located at a distance $\Delta E = 0.18 \pm 0.05$ eV below the edge of the conduction band.

A low-resistance ohmic contact was obtained by fusing, at 500°C in a hydrogen atmosphere, InTe in samples D2 - D5 and In in sample D1. Samples D1 - D4 were 100 μ long and sample D5 150 μ.

The voltage was applied to the samples in the form of pulses of duration $\tau = 1$ μsec and repetition frequency 60 pulses/sec.

Diodes D1 - D3 revealed qualitatively similar oscillation dynamics. We shall describe it with the diode D2 as an example. In the voltage range $0 < V < 20.5$ V, the current-voltage characteristic of the diode is linear. At voltages $V \geq 20.5$ V, the current-voltage characteristic exhibits a sharp "Gunn" current saturation [3,4]. At 20.5 V, incoherent noise appears on the top of the pulse, with an amplitude commensurate with the thickness of the oscilloscope sweep line (~0.1 V). With increasing applied voltage, the oscillations increase strongly in amplitude and lose the noise character, acquiring at 21.2 V a strictly coherent character. At this voltage, the oscillations are in the form of a sine wave with an amplitude that increases with time from zero to a stationary value of 2.8 V within 0.57 μsec (four cycles). The oscillation frequency is $f_0 = 7.0$ MHz. With further increase in voltage, the time during which the oscillation amplitude reaches the steady state decreases sharply, and amounts to 0.14 μsec (one cycle) at 22 V. The amplitude of the steady-state oscillations is 3.1 V.

Table

Applied voltage, V	Amplitude of voltage half-wave, V										Frequency f_0, MHz
	1	2	3	4	5	6	7	8	9	10	
24	4.4	3.5	4.1	3.2	3.8	3.0	3.5	2.7	3.2	2.5	7.0
26	5.0	4.2	4.0	3.2	3.0	2.2	2.0	1.1	0.9	-	7.0
28	5.7	4.8	3.2	2.2	2.0	1.2	0.5	-	-	-	7.0
30	6	5	3.5	1.5	0.3	-	-	-	-	-	7.0
38	13.5	6.5	0.5	-	-	-	-	-	-	-	7.0

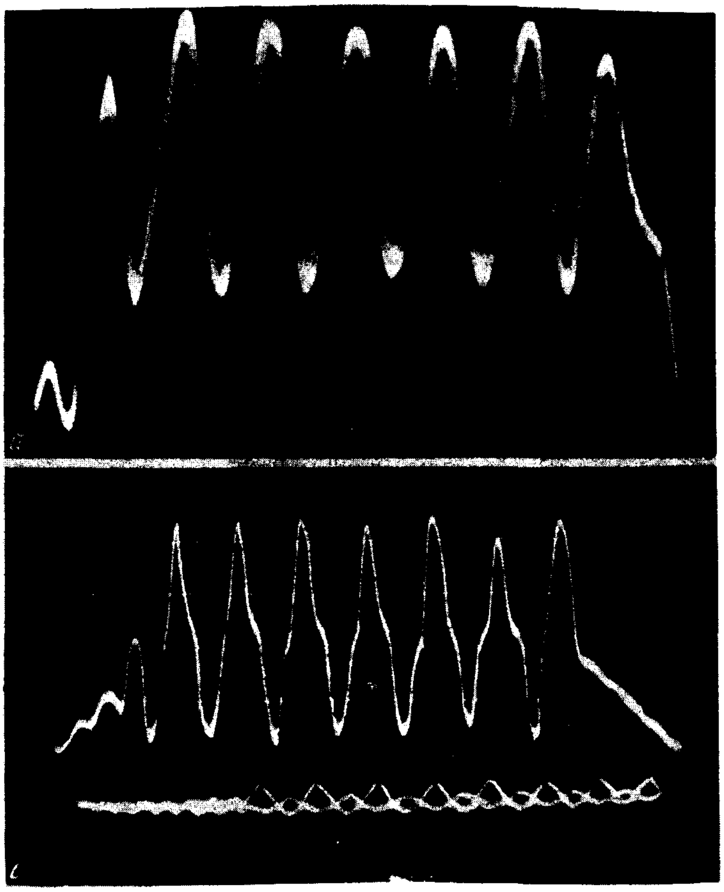
The odd half-waves correspond to voltages higher than those applied.

In the voltage range $22.2 \leq V \leq 23.8$ V, the amplitude of the sinusoidal oscillations does not depend on the time and amounts to 3.9 V at 23.8 V. At V = 24 V, the oscillations attenuate in time (and at the same time the amplitude of the first voltage half-wave increases). The attenuation of the oscillations is not exponential and therefore cannot be described, as usual, by a logarithmic damping decrement. The table lists the data characterizing the dynamics of the oscillations at voltages $V \geq 24$ V. As seen from the table, the damping time of the oscillations decreases sharply with increasing voltage. Pre-breakdown noise appears at 40 V.

The dynamics of the oscillations observed in samples D4 and D5 differs greatly from the dynamics of the oscillations of samples D1 - D3. We shall describe it with D5 as an example.

In the voltage range 0 - 45 V, the current-voltage characteristic of the diode is linear. At $V \geq 45$ V, "Gunn" current saturation appears. At $V = 45$ V, oscillations of very large amplitude, having a sharply nonlinear character, appear "jumpwise" on the sample. The amplitude of the negative half-waves is 21 V. The amplitude of the positive ones is 35 V. Thus, the oscillations are highly asymmetrical with respect to the applied voltage. The oscillation period is 0.17 μsec (5.9 MHz).

Following a small increase in voltage ($V = 47$ V), the oscillations decrease slightly in amplitude and lose their coherence, becoming noiselike in character. At $V = 52$ V, the oscillations become coherent again, and a second oscillation mode is observed, with frequency $f_0 = 9.8$ MHz and with a form which is likewise nonlinear but differs greatly from the preceding one. The oscillations of the second mode are symmetrical with respect to the applied



a - Horizontal scale 0.1 μsec/cm, vertical scale 1.5 V/cm.
b - Horizontal scale 0.1 μsec/cm, vertical scale 18 V/cm.

voltage. At V = 58 V, the amplitude of the oscillations is 33 V. At V = 60 V, pre-breakdown noise appears. Attention should be called to the high efficiency of the conversion of the dc energy into ac energy in both frequency modes, reaching 16% in the second mode.

Figure a shows the oscillations observed in the D2 diode at V = 23 V, and figure b shows the second mode of the oscillations of diode D5 at V = 54 V.

The oscillations are quite sensitive to changes of the temperature. Thus, an increase of the pulse repetition frequency to 200 pulses/sec, which leads to an increase in power dissipated by the sample, changes noticeably the dynamics of the oscillations in both types of diodes.

If the oscillations described by us have the same nature as those observed in [1], then their appearance can apparently not be attributed to the occurrence of some type of "slow domains" [5,6].

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PRODUCTION OF A HIGH TEMPERATURE DENSE PLASMA BY GAS BREAKDOWN WITH THE AID OF A LASER

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The production of a high-temperature dense plasma by means of lasers has recently been the subject of ever increasing efforts of scientists in a number of laboratories. The use for this purpose of the breakdown produced by focusing large-power coherent optical radiation is one of the most promising methods of obtaining a hot plasma with the aid of lasers [1-3]. Further increase of the radiation power of Q-switched lasers will make it possible to advance further towards obtaining uncontaminated plasma at thermonuclear temperatures, in spite of many difficulties involved in this method, connected with the dynamics of the development of the laser "spark" [4-6].

We present here the results of an experiment on the measurement of the temperature of the plasma of the "spark" in air and in a mixture of air with deuterium, in the pressure interval 70 - 160 mm Hg. The spark was produced by focusing the radiation of a neodymium-glass laser. The schematic diagram of the experiment is similar to that used in [3]. A three-stage laser, using KGSS-3 neodymium-glass rods of 45 mm diameter, with each element 260 mm long, produced in the giant pulse a power on the order of 6 GW at a pulse duration ~20 nsec. The Q-switch was a phototropic shutter based on liquid filter No. 2535. The laser output beam was focused inside a working chamber filled with the investigated gas. The focusing was