disparity in wave resistance of the tunnel structure as a transmission line and the waveguide. At other values of the constant magnetic field, other steps can be observed at potentials not far from that for the case described; however, no increase in signal power is noted, since the frequency relation (1) is not satisfied within the transmission band of the receiver. Therefore the possibility of Cooper pairs tunneling between two superconductors with the emission of photons has been directly demonstrated by a direct experiment.

The inverse experiment, where the tunnel structure is irradiated by an external microwave generator, was also carried out. The results were, on the whole, analogous to the behavior described in Shapiro's work[3,4].

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MAGNETOSTRICTION OF RARE-EARTH FERRITE GARNETS AT LOW TEMPERATURES

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THERE are as yet no published data on the magnetostriction of rare-earth ferrite garnets below the temperature of liquid nitrogen. In the present study, the differential capacitor method was used to measure the magnetostriction of polycrystalline ferrite garnets, $R_3Fe_5O_{12}$ (R = Gd, Tb, Dy, Ho, Er, Yb), in the temperature range 4.2—100°K. The ferrites were prepared by the usual ceramic technique; the purity of the initial oxides was not less than 99.98%, and the average density of the prepared samples was 4.8 g/cm³.

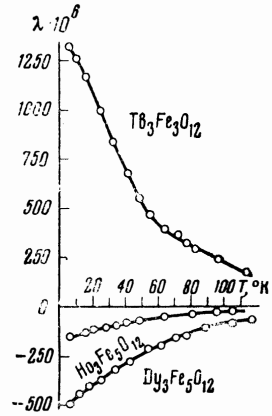

FIG. 1.

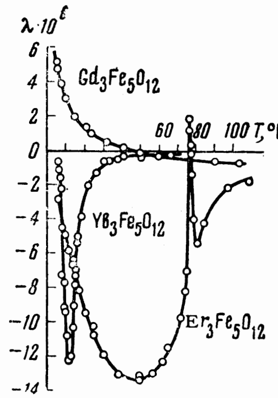

FIG. 2.

Figures 1 and 2 give the temperature dependences of the magnetostriction in a longitudinal magnetic field H = 5000 Oe. It is evident that the magnetostriction of the Gd and Tb ferrites is positive and that of the other ferrites is negative. It should be mentioned that, in the temperature range 4.2—25°K and a magnetic field of 5000 Oe, the ferrite garnets of Dy, Ho, and particularly Tb were far from saturation. Nevertheless, even in this field, the magnetostriction of Tb, Dy, and Ho reaches enormous values. The value of the magnetostriction of the Tb ferrite garnet at 78°K was in good agreement with the results for a single crystal of this ferrite.[1] In the Tb, Dy, and Ho ferrite garnets, the magnetoelastic energy makes a considerable contribution to the magnetic anisotropy energy. Thus, for the Tb ferrite, the magnetoelastic energy is of the order of 10^7 erg/cm³. At helium temperatures, the Tb, Dy, and Ho ferrites exhibited considerable magnetostriction hysteresis. Thus, the "remanent" magnetostriction of the holmium ferrite garnet at helium temperatures amounted to 45×10^{-6} (according to our measurements, the coercive force of the holmium garnet exceeded 1000 Oe at these temperatures).

In the present study, the magnetostriction was measured only up to 100°K. The compensation points of the majority of the investigated ferrites lay above this temperature, and only in the case of the Yb and Er ferrites were they below 100°K. The compensation point of the Yb ferrite garnet lay in the immediate vicinity of 0°K and therefore the magnetostriction of this ferrite was found to drop rapidly on approach to liquid helium temperature (Fig. 2). The compensation point of the Er ferrite lay approximately at 80°K; it is evident from Fig. 2 that the magnetostriction decreased strongly in the region of this temperature (and even passed through zero). However, the reason for the sharp drop of the magnetostriction of the Er ferrite below 50°K is not yet clear.

The magnetostriction of the gadolinium ferrite garnet changed its sign below the compensation point.[2,3] This was due to the different signs of the magnetostriction constants of the rare-earth and the ''effective'' iron sublattices: the magnetostriction constants of the former were negative while those of the latter were positive.

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BEHAVIOR OF THE SPECIFIC HEAT C_v OF PURE SUBSTANCES NEAR THE CRITICAL POINT

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EXPERIMENTAL studies [1,2] have shown that the specific heat C_V of argon and oxygen, plotted as a function of temperature, has a logarithmic singularity at the critical point. The slope of the curves for argon was found to be considerably less than that of the curves for oxygen. It was natural to expect the occurrence of a singularity at the critical point to be common among pure substances.

In the present study, we measured very carefully the specific heat of argon at the critical density (the density of argon in [1] differed by about 2% from the critical value) at temperature intervals as small as ≈0.02 deg K. The method of measurement was the same as in [2]. Since there are quite considerable discrepancies between the published values of the critical density of argon, we carried out measurements at several densities close to the critical value. The amount of the gas in the calorimeter was determined by weighing, the error in this measurement not having exceeded 0.1%.

Tables 1-3 list the values of the specific heat obtained experimentally, together with the corresponding temperature intervals ΔT.

The curve corresponding to the density $\rho_c = 0.533$ g/cm³ should be regarded as closest to the critical density. The ordinate in Fig. 1 gives the so-called ''configurational specific heat'' $C_V - (\frac{1}{2})iNk$ (i is the number of the degrees of freedom of the gas molecule), as used by Fisher.[3] As in earlier work, the semilogarithmic scale is used in Fig. 1, but temperature is

Table I. Specific heat of argon at $\rho_c = 0.533$ g/cm³

T, °K	ΔT, °K	C_V, J.mole⁻¹·deg⁻¹	T, °K	ΔT, °K	C_V, J.mole⁻¹·deg⁻¹	T, °K	ΔT, °K	C_V, J.mole⁻¹·deg⁻¹
132.74	0.228	73.3	147.89	0,140	101.4	150,64	0.089	62.0
132.97	0.168	72.3	148.83	0.130	110.3	150.65	0,039	67.4
133.25	0,191	75.7	149.03	0,124	116.8	150.68	0.041	65,0
133.69	0,176	74.6	149.44	0.069	117.0	150,71	0.046	50.6
137.31	0.168	79.1	149.92	0,077	138.3	150,81	0.105	45.6
137.51	0,163	83.3	149.93	0,066	138,0	150.89	0.146	41.9
139.79	0.162	83.7	149.98	0.068	137.0	150,96	0.107	43.9
140.57	0,155	86.6	150.21	0.041	155,8	151.00	0,120	40.6
140.70	0.158	85.3	150.30	0,060	155.9	151.08	0.147	40.8
140.85	0.166	80.7	150,41	0,018	172,4	151.18	0.111	45.3
142.49	0,172	80.6	150.44	0.017	177.9	151,30	0.248	37.0
145.12	0.150	92.8	150.44	0,035	194.5	151.37	0.119	41.2
145.28	0.148	94,6	150.44	0,048	184.8	151.53	0.132	34,8
145.44	0.150	93.3	150.45	0.025	199,2	151,59	0.257	34.8
145.60	0.152	91.8	150.50	0.048	93.6	151.70	0.134	33.9
146,90	0,084	103,9	150.51	0.064	96,2	151.85	0,114	37.2
147,01	0.084	106.6	150.56	0.056	76.4	152.43	0,657	31.5
147.13	0,091	97.1	150.59	0,042	60.9	153.13	0,683	29.3
147.17	0.139	98.1	150,62	0.078	68.5	152,01	0.130	35.6
147.72	0.140	101.1	150.62	0.043	59.0			