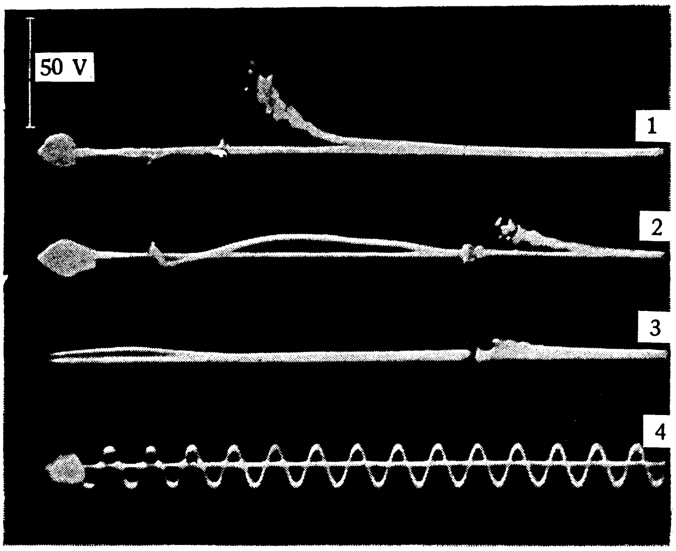

FIG. 1. Oscillogram showing probe readings obtained with different delay between the triggering of the resonant circuit and the gun pulse: 1) delay 7.5 μsec, 2) 20 μsec, 3) 35 μsec. In the last case the oscilloscope trigger is delayed by 15 μsec. The time marker separation is 2 μsec. The oscillogram readings give the ion temperature in electron volts. In 2 and 3 one notices the effect of transverse velocities of the ions due to Coulomb scattering. The gun voltage is 10 kV, the fixed magnetic field $H_0 = 600$ Oe, and the variable field $H_\sim = 1000$ Oe.

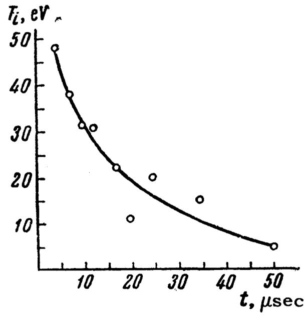

FIG. 2. The ion temperature T_i in eV as a function of the delay in triggering the circuit with respect to the gun operation pulse. The circuit delay time in microseconds is plotted along the abscissa axis while the ion temperature directly after triggering is plotted along the ordinate axis. The gun voltage is 10 kV, the fixed magnetic field $H_0 = 600$ Oe, and the variable magnetic field $H_\sim = 1000$ Oe.

reasonable to assume that the observed effect is associated with ion scattering on microelectric fields arising in the plasma as a consequence of the instability associated with the double streaming motion of the ions.

We are indebted to A. A. Vedenov and E. P. Velikhov for valuable discussions.

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ELECTRON PARAMAGNETIC RESONANCE OF Zr^{3+} IN GLASSES

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OF the compounds of elements of the palladium group those of trivalent zirconium are very unstable and have not been studied by EPR (electron paramagnetic resonance). The present note communicates the results of an EPR investigation of silicate glasses containing Zr^{3+}.

The measurements were made at frequencies of 450 and 9320 Mc and at temperatures 77 and 295°K. The samples of silicate glass of composition $20Na_2O \cdot 70SiO_2 \cdot 10ZrO_2$ (in mole percent at synthesis) were founded under strongly reducing conditions.

At 450 Mc and 77°K a narrow and symmetric EPR line was observed; the spectroscopic splitting factor $g = 1.89 \pm 0.01$ and the width between the maximum and minimum slope points was 5 Oe. With gradually increasing temperature from 77 to 295°K the line width increased monotonically until at 295°K it could no longer be observed.

At 9320 Mc and 77°K a broad, asymmetric EPR line is observed with $g_{eff} = 1.906 \pm 0.002$ and width 126 ± 6 Oe. At this frequency also there was no EPR signal at room temperature.

We assume that the magnetic ion Zr^{3+} in these glass samples is in an octahedral environment formed by six oxygen atoms. The energy levels of Zr^{3+} ($4d^1$, $S = 1/2$) are similar to the levels of Ti^{3+} ($3d^1$, $S = 1/2$). In these ions an octahedral crystalline field splits the five-fold orbital level into a lower triplet and an upper doublet. Fields of lower symmetry acting on the magnetic ion Zr^{3+} as a result of distortions of the octahedron bring about a further splitting of the lower orbital triplet into a singlet and a doublet. For the interpretation of the nature of the width and shape of the Zr^{3+} EPR line we start from the theory Van Vleck[1] proposed for cesium-titanium alums, according to which the spin-lattice relaxation time $\tau \sim \Delta^6$, where Δ is the magnitude of the splitting of the lower orbital triplet. The width of the line at 450 Mc is determined by this relaxation mechanism. The shape and width of the line at 9320 Mc is in addition caused by g-factor anisotropy and by the fact that the oxygen octahedrons have a different degree of distortion.[2,3] Hence, the EPR line we observe at this frequency is a superposition of a large number of lines having different g-factors and can be described by a spin Hamiltonian of the form

$$\hat{H} = \sum_i (g_{xi}\beta H_x \hat{S}_x + g_{yi}\beta H_y \hat{S}_y + g_{zi}\beta H_z \hat{S}_z).$$

Finally, it should be mentioned that hyperfine splitting of the EPR line from the odd isotope Zr^{91} (11.23%) could not be detected. This can be explained by the fact that at 9320 Mc the line width is of the order of the hyperfine splitting constant, and at 450 Mc the strong-field condition is not fulfilled.

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RESONANCES IN THE BARYON SYSTEM WITH STRANGENESS $|S| = 1$

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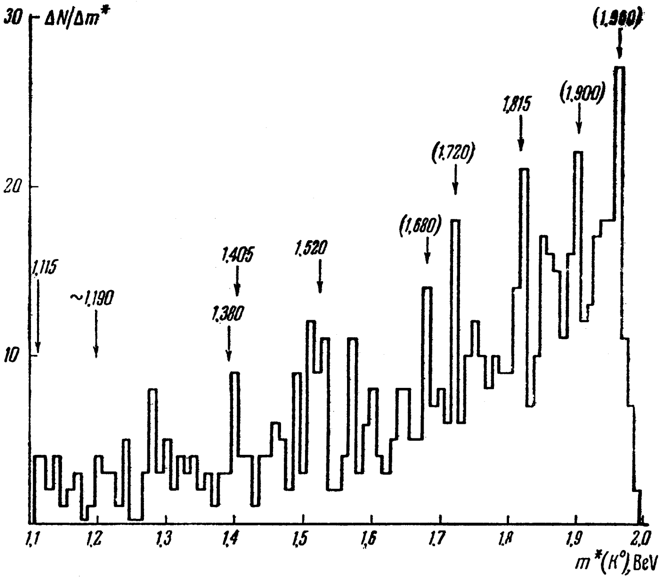
USING xenon[1] and freon[2] bubble chambers we have studied the spectrum of the missing mass, determined by the K_1^0 meson in the reaction

$$\pi^- + N \to K^0(\bar{K}^0) + Y(K, N) + m\pi, \qquad m = 0, 1 \ldots, \tag{1}$$

proceeding on bound nucleons of the nuclei of the freon mixture ($C_2F_5Cl_3$) and xenon. The momentum of the incident π^- mesons was equal to 2.8 BeV/c. In the scanning of the photographs those stars were selected that were accompanied by V^0 events correlated with the point of interaction. The K^0 mesons were identified by the angles of emission of the decay products relative to the trajectory of the decaying particle and by measured values of the ionization and range of the decay products. The details of the experimental setup were given in [3,4]. For each event corresponding to reaction (1) the momentum and angle of emission of the K^0 meson relative to the direction of the incident π^- meson in the laboratory system were determined. The momentum of the K^0 mesons was determined accurate to within $\pm 4\%$, and the angle of emission to within $\pm 1\%$.

Starting from the value of the momentum of the K^0 meson and the incident π^- meson and assuming that the incident π^- meson collides with a quasi-free nucleon at rest, it is possible to determine the energy and the momentum of the system Y(K, N) + $m\pi$ and, consequently, its effective mass m^* (by the well known relation $m^{*2} = E^{*2} - p^{*2}$). The spectrum of masses m^*, constructed on the basis of ~ 700 events of K_1^0 meson decays, is shown in the figure in which the arrows indicate the masses of presently known hyperons and hyperon resonances.[5-7] New maxima are also observed (shown in brackets) at 1680, 1720, 1900, and 1960 MeV, how-



Number of events versus the effective mass of the system of particles Y(K, N) + $m\pi$ (m = 0, 1, 2).