Bibilashvili[2] obtained $\rho_\mu = 0.77 \pm 0.027$ for the penetrating component density at 45.5 m from the shower axis.

A comparison of the densities in both cases enables us to determine the exponent $\gamma$ of the penetrating component energy spectrum at $\sim 46$ m from the shower axis. Assuming that

$$\rho_\mu(>E) = A(E+1.5)^{-\gamma},$$

we obtain $\gamma = 1.15 \pm 0.41$. We note that in reference 1 for an effective distance of 28 m the energy spectrum exponent is $\gamma = 1.09 \pm 0.21$. This can serve as an indirect verification that the effective distance from the axis was obtained correctly in reference 1.

Our data also permit us to draw certain conclusions regarding the lateral distribution of the penetrating component at 127 m.w.e., at which depth we know the penetrating component density for two distances from the axis: $\rho_\mu = 0.20 \pm 0.02$ at $r = 27$ m and $\rho_\mu = 0.077 \pm 0.018$ at $r = 45$ m. Assuming that at this depth, as at 61 m.w.e.,[2] the lateral distribution obeys a law of the form $\rho_\mu(r) = a \exp[-\alpha r^2]$, we can use our data to determine the parameters a and $\alpha$ of this distribution. Our calculation gives $a = 0.34 \pm 0.01$ and $\alpha = 0.0074 \pm 0.00011$.

Our data give $30 \pm 5$ m as the half radius R of the muon distribution at 127 m.w.e. It is interesting that the data for 61 m.w.e. in reference 2 give $R = 34 \pm 3$ m.

In conclusion we wish to thank Prof E. L. Andronikashvili and M. F. Bibilashvili for their interest and for their participation in a discussion of the results.

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## *PECULIARITIES OF MAGNETIZATION OF THE DISORDERED* $Ni_3Mn$ *ALLOY AT LOW TEMPERATURES*

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It is known[1] that, close to the stoichiometric composition $Ni_3Mn$, the Ni-Mn alloy become ordered with a sharp dependence of the physical properties on the degree of order in the arrangement of the atoms. Particularly remarkable is the appearance of strong ferromagnetism at the maximum degree of long range order. Thus, for example, the saturation magnetization $I_s$ of the alloy exceeds the $I_s$ of pure nickel by 50%.[2] According to the data of Kaya and Kussman,[1] $Ni_3Mn$ in the disordered state is not ferromagnetic at room temperature. Our investigations show that it already becomes ferromagnetic at liquid nitrogen temperatures with $I_s = 1350$ Oe.

Determination of the Curie temperature was made from data of a precise measurement of the temperature dependence of the electrical resistivity. As is seen from Fig. 1 the Curie temperature $\Theta$ is equal to 110°K.

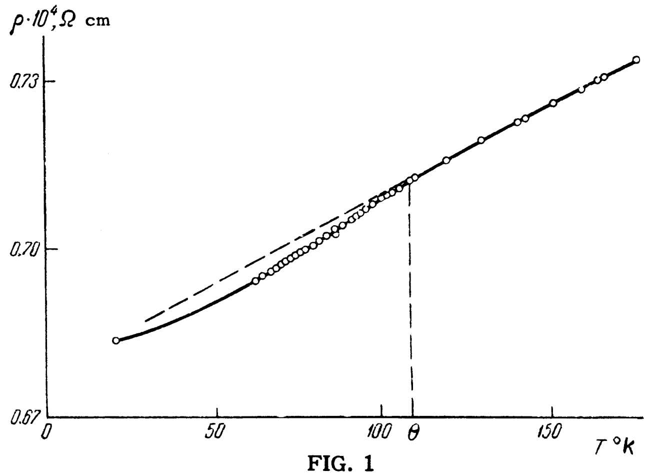


FIG. 1

A detailed examination of the magnetization curves at various temperatures down to that of liquid helium shows that the character of the magnetization has a series of peculiarities. First, the commutation magnetization curves 1a and 2a (Fig. 2), plotted at 20.4 and 4.2°K right after cooling the specimen from room temperature, run considerably below curves 1b and 2b, taken on a repeat magnetization after preliminary demagnetization by commutation from the maximum field to zero at the temperature of measurement, i.e., at 20.4

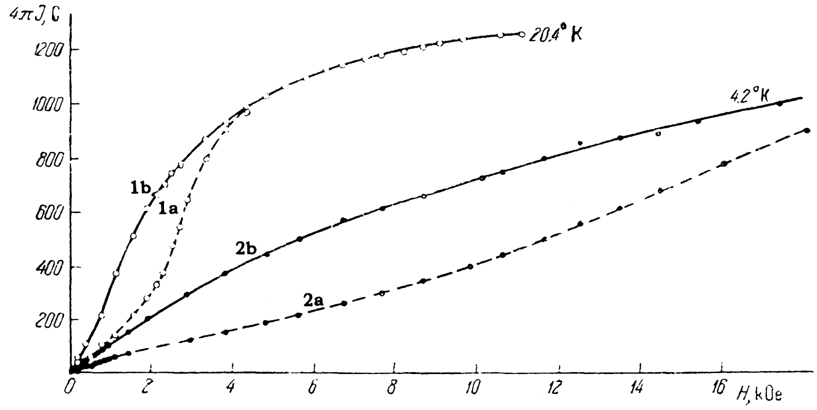


FIG. 2

and 4.2°K respectively. Such an unusual character of the curves can be explained by a large energy of magnetic anisotropy.

Repeated demagnetization and magnetization at the measurement temperature again leads to curves 1b and 2b. Secondly, the strong difference of the magnetization curves at 20.4°K from the magnetization curves at 4.2°K is remarkable. The latter run considerably below the former up to a field of 18,000 Oe and do not reach saturation there. Kouvel, Graham, and Becker[3] attribute the specific magnetic properties of these alloys to the occurrence of a ferrimagnetic structure. It seems to us that the data which they present is insufficient for such a judgement.

Measurements of the coercive force at 77.8 and 20.4°K have shown it to increase by one order of magnitude, from 140 Oe at 77.8°K to 1000 Oe at 20.4°K. Such a strong increase attests to the sharp temperature dependence of the magnetic anisotropy constant.

A final conclusion about the nature of the magnetic properties of the alloy $Ni_3Mn$ in the disordered state can be made only after a precise determination of the magnetic anisotropy constant and after a neutron diffraction analysis to determine the character of the sublattices and to establish the antiferromagnetic interaction, if such exists.

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## *ALPHA DECAY OF ISOMERIC $Bi^{210}$*

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INVESTIGATIONS of the radioactivity of $Bi^{210}$ have established that in addition to RaE ($T_{1/2}$ = 5 days, $E_{\beta max}$ = 1170 kev) there is a long-lived isomer of $Bi^{210}$ which emits $\alpha$ particles with an energy of 4935 ± 20 kev and $T_{1/2} = 2.6 \times 10^6$ years.[1,2] In the present work we have investigated the decay of long-lived $Bi^{210}$.

The $\alpha$-particle spectrum was studied using a pulse ionization chamber filled with a mixture of argon (90%) and $CH_4$ (10%) at atmospheric pressure.[3] The half-width of the line from the $\alpha$ particles of $Pu^{239}$, with energy 5150 kev, was 30 kev. We investigated an enriched and purified sample of $Bi^{210}$ with a specific activity of 14000 $\alpha$ decays per min. per mg. The source area was 25 cm² and the thickness of the active layer was 10 microgram/cm².

The measured $\alpha$ spectrum of $Bi^{210}$ is shown in Fig. 1. In addition to the previously observed $\alpha$ particles with energy 4935 ± 10 kev, we found new $\alpha$-particle groups with energies of 4900 ± 10 and 4640 ± 30 kev. The relative intensities of these