$$\frac{4\pi n T_i}{H^2} \lesssim 4 \frac{m_e}{m_i} \frac{\omega_{Hi}^2}{c^2} L^2.$$

Instability sets in when the plasma density decreases during the course of the decay to this value.

The plasma parameters in our experiments satisfly this relation ($L = 75$ cm, $T_i \approx 1$ keV, $H = 3000$ Oe, $n \simeq (0.5 - 1.0) \times 10^{10}$ cm^{-3}).

In conclusion we note that density jumps outward similar to those described in this article were observed also in a decaying plasma with hot electrons [6,7]. In this case the instability develops at electron-cyclotron frequencies.

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NEW PHASE OF BISMUTH

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Submitted 3 December 1965
ZhETF Pis'ma 3, No. 2, 96-98, 15 January 1966

Because of its unusual properties, bismuth occupies a special place as an object of research in solid-state physics. The existence of several phase transitions in bismuth, in a broad range of pressures, has made it an indispensable substance for the calibration of high-pressure apparatus. The phase diagram of bismuth is very complicated and has been investigated many times [1-6]. The results of investigations of various authors are in sufficiently good agreement. However, the melting curve of BiII, as obtained by all investigators, has a somewhat unusual form. We have therefore investigated the P-T diagram of bismuth 1) up to 30,000 kg/cm^2 by the thermal analysis method. The pressure was produced by compressing gasoline in the multiplicator described in [7]. The packing for the piston and for the electric leads of the high-pressure chambers was of O-shaped rubber rings together with metallic protecting rings. The temperature was measured with a chromel-alumel thermocouple. The thermocouple leads were also made from chromel and alumel alloys, making it possible to reduce the extraneous thermal emf to a minimum [8]. The signals from the ordinary and differential thermocouples were amplified and recorded with an EPP-09 chart recorder. The temperature was calculated only from the heating curves. The accuracy with which the temperature was measured was ±1°C, and the reproducibility error in a single experiment did not exceed ±0.5°C. The pressure was measured with a manganin resistance manometer graduated against a piston manometer up to 10,000 kg/cm^2. Pressures above 10,000 kg/cm^2 were calculated with the aid of an extrapolation formula. The readings of the manganin manometer were registered with a bridge circuit feeding the EPP-09 recorder. The pressure measurement accuracy was ±75 kg/cm^2 up to 15,000 kg/cm^2 and ±150 kg/cm^2 at higher pressures.

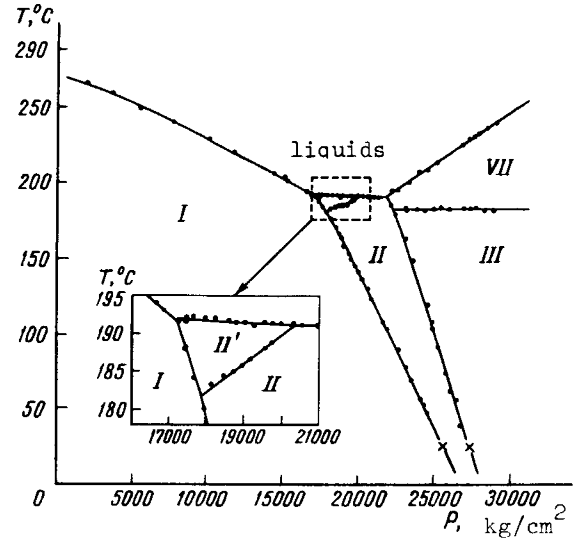

Fig. 1. Phase diagram of Bi up to 30000 kg/cm^2.

Table

Triple points	P, kg/cm^2	T, °C
BiI -BiII'-liq	17250 ± 150	192 ± 1
BiI -BiII -BiII'	17900 ± 150	181.5 ± 1
BiII'-BiII -liq	20350 ± 150	191 ± 1
BiII -BiVII-liq	21800 ± 150	191 ± 1
BiII -BiIII-BiVII	22300 ± 150	182 ± 1

The results are shown in Fig. 1, and the coordinates of the triple points are listed in the table. As can be seen from the experimental data, we observed a new phase, denoted BiII', and correspondingly two new triple points. The melting curve of the new phase BiII' has a small but clearly negative slope. The melting curve of BiII is parallel to the pressure axis within the limits of our measurement accuracy. The heat of the BiII - BiII' transition is comparable with the heat of the BiIII - BiVII transition. The slope of the BiII - BiII' curve is positive, so that the new phase of bismuth can be assumed to be a better metal than BiII.

Slight extrapolation yields respective values of (25,650 ± 150) and (27,400 ± 150) kg/cm^2 for the pressures of the transitions BiI - BiII and BiII - BiIII at 25°C.

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CONCERNING THE SEARCH FOR SPECIFIC INTERACTIONS BETWEEN μ MESONS AND ν_μ NEUTRINOS AT ULTRAHIGH ENERGIES

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ZhETF Pis'ma 3, No. 2, 98-101, 15 January 1966

In the analysis of experimental cosmic-ray data, especially data on underground neutrino experiments, an important assumption is that the muons experience only electromagnetic and weak interactions, and the ν_μ neutrino always interacts only weakly. The information gradually accumulating in cosmic-ray research may possibly offer evidence of the presence of specific muon interactions, and possibly also ν_μ neutrino interactions, which are effective essentially only at energies $E \geq 10^{12}$ eV [1-3].

By way of a model of such interactions, which increase with energy, let us consider a paseudovector (pseudo-Maxwellian) field with interaction of the type [1]

$$g(\hbar/mc)\gamma_5\gamma_\mu\gamma_\nu(\partial\mathcal{P}_\mu/\partial x_\nu).$$

Let g-charge be possessed by the muons and nucleons, and let the ν_μ neutrinos and the electrons have no g-charge, or in the case of electrons let the charge be appreciably smaller.

An analysis of the data obtained by neutrino experiments in CERN (the absence of "neutral currents," i.e., of "Compton" protons, the absence of mesic pairs from neutrinos, i.e., $\sigma_{2\mu} \leq 10^{-40} - 10^{-41}$ cm^2) shows that if the pseudophotons are at all present in the neutrino beam, the corresponding "fine structure" constant is $g^2 < 10^{-6} - 10^{-7}$. The cross section for production of pseudophotons with energy $E_\mathcal{P} \sim E_0/2$ from primary protons (E_0) could have a structure (up to proton energy $\sim 10^{15}$ eV) $\sigma_\mathcal{P} \sim \sigma_n g^2(E_0/m_n c^2)$, where σ_n is the total nucleon cross section of strong interactions. That is to say, under this assumption we have $\sigma_\mathcal{P} \lesssim \sigma_n$ for protons with energy $E_0 \sim 10^{15}$ eV and for $g^2 \sim 10^{-7} - 10^{-6}$.

The cross section for the production of μ pairs by pseudophotons in the Coulomb field of an extended nucleus with charge z can be expected to have the form

$$\sigma_{2\mu} \sim (e^2/m_\mu c^2)^2 \alpha z^2 g^2 (E_\mathcal{P}/m_\mu c^2) \sim 10^{-27} - 10^{-28} \text{ cm}^2$$

for

$$z \sim 10, \quad g^2 \sim 10^{-6} - 10^{-7}, \quad E_\mathcal{P} \sim 10^{14} \text{ eV}; \quad \alpha = e^2/\hbar c.$$

But even for pseudophotons with energy $< 10^{12}$ eV the cross section for μ-pair production is $\leq 10^{-29} - 10^{-30}$ cm^2, the corresponding muon pairs can be produced only deep underground, imitating, in particular, the effect of an intermediate meson created by a neutrino [3,4].

In the Coulomb field of the nucleus, the muon can produce directly a muon pair. Muon