ticles and emerging upward and downward relative to the plane of the reaction will be different. The angular distribution of the two π mesons and the Λ particle in reaction (2) turns out to be proportional to $1 + \alpha \cos \vartheta$ (ϑ is the angle between $\mathbf{p}$ and $\mathbf{q}$), where

$$\alpha = 2\mathrm{Re}\,(a^*b)\,pq/(p^2\,|\,a\,|^2 + q^2\,|\,b\,|^2).$$

If we average Eqs. (7) and (8) over angles and energies, we find that the ratio of the total number of charged π mesons to the total number of neutral π mesons is given by

$$\sigma_2 : \sigma_1 = 1.34\,(1 + \bar{q}^2\,|\,b\,|^2/2\bar{p}^2\,|\,a\,|^2).$$

The use of reactions (1) and (2) for the determination of the sign of $P_K P_N P_\Lambda$ is made difficult by the fact that the cross-section for these reactions makes up only a fraction $2 - 3 \times 10^{-3}$ of the total cross-section for inelastic interactions of K^- mesons with protons. Another important difficulty comes from the fact that in order to get an unambiguous interpretation of the distributions obtained for the reactions (1) and (2) one must make sure that the K^- meson was captured by the proton from an S state.

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PHOTOGRAPHIC METHOD OF DETECTION OF DENSE SHOWERS OF CHARGED PARTICLES

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THE emission spectrum of the majority of phosphors used for detection of charged particles coincides, as a rule, with the spectral region of maximum sensitivity of photosensitive materials (λ = 3500 — 4500 A). This fact can be used for detection of showers of charged particles (in particular, electron-nuclear showers initiated in high-energy nuclear processes) by direct contact photography of scintillations.

The method can be used in practice if the density of particles is sufficient to produce an amount of light energy per unit surface of emulsion E which is larger than the sensitivity threshold of the material ϵ_T. If a shower of density σ constant within radius R falls upon luminiscent layer of thickness H and density ρ then, neglecting the absorption of light in the phosphor, we have

$$E_{\max} = 0.5\,\sigma\,\alpha\,(\partial E/\partial H)\,\rho\,\{H + R - \sqrt{H^2 + R^2}\},$$

where $\partial E/\partial H$ is the specific ionization loss of shower particles in the luminiscent medium and α is the relative energy yield of luminiscence. Assuming that $\partial E/\partial H = 2$ Mev $g^{-1}cm^2$, $\rho \sim 1$ g/cm^2, $\alpha \sim 0.1$,[1] $\epsilon_T \sim 300$ units GOST[2] (which corresponds to $\sim 3 \times 10^9$ ev/cm^2), R $\sim$ 0.1 cm (for electron-nuclear showers produced in lead[3]), and $H \gg R$ we obtain $N_T \sim 10^4$ for the minimum number of shower particles necessary for photographic detection. Production of such a shower requires a "primary" of $\sim 10^{12}$ ev. The detector might be therefore useful for study of interaction of high-energy cosmic ray particles with matter.

Various luminiscent materials were investigated for their applicability in the proposed detector. Besides the inorganic phosphors NaI, KI and CsI (Thallium activated), plastic scintillators (antracene, terphenyl in polystyrene) which are convenient for use in large-area detectors were tested. Showers were simulated by a collimated electron beam (collimator diameter 3 mm) from radioactive sources (P^{32} and Sr^{90}). The beam was directed perpendicularly to the surface of scintillator. The photographic film (35 mm motion picture film with sensitivity of $\sim$ 350 GOST) was placed in close contact with the scintillator. The most effective position for film without anti-halation backing was between two layers of scintillator. The lowest value of the threshold attained using this method was $\sim 1.5 \times 10^4$ particles. Short-wavelength luminiscence proved to be most active.

Photometric measurements showed that the image density increases with particle density according to the characteristic curve of emulsion.[2] Previous calibration of the detector permits it, therefore, to find the density and the number of particles in a shower. Large latitude of modern high-speed emulsions ($\sim 10^3$) together with the possibility of simultaneous use of several layers of different sensitivity makes it possible to obtain a practically unlimited range of measurement. The experiment shows, furthermore, that the recorded mark is not greatly diffused in comparison with the beam section (within a few tenths of a millimeter). This makes it possible to determine the position of the shower and the particle distribution with a good accuracy.

In practice, the most convenient detector would consist of a "sandwich" of several photographic and luminiscent layers in close contact with each other. Superposition of light marks in several layers increases the total density and excludes errors due to stray light spots.

A similar detector can be used as indicator of electron-nuclear showers produced by high-energy particles in a dense medium. The method may be of value for measurements of the number and distribution of shower particles, having a higher resolving power — for large densities — than ionization methods of detection; it can be used in conjunction with nuclear emulsions (in analogy with the method proposed by Grigorov for ionization chambers[3]) for determination of shower position (more accurately than with chambers). We shall mention also the (limited) possibility of timing the events by the use of moving film.

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POLYATOMIC DISTANCES IN FERROMAGNETICS

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IN the present paper we discuss the analogy noted by us between the dependence of the atomic magnetic moments of ferromagnetic metals and alloys on the concentration of electrons (total number of s- and d-electrons) in an atom and the same dependence of some quantity (of the dimensions of length) which, in the case of pure metals, is equal to the difference between the distance of nearest neighbors of the first coordination sphere of the crystalline lattice r_1 and some constant of the metal R. In the case of alloys, this quantity is expressed by an analogous difference.

Let us consider the transition elements with atomic numbers Z from 21 to 29 (see Fig. 1).

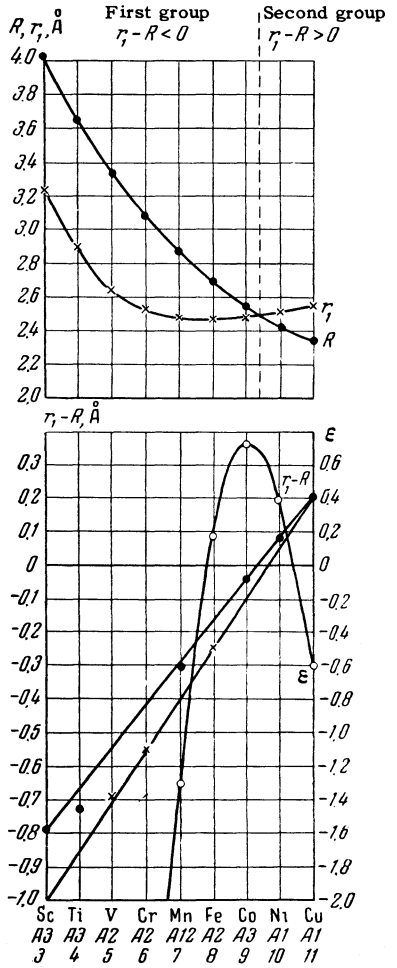

FIG. 1

We find that for these elements,

$$K = 0.13\,[(Z/2)^{\frac{1}{2}} - (13.75 + l)\,Z + 26\,(l - 1) + 235.525], \quad (1)$$

where $l = 0$ for $Z \leq 26$, $l = 1$ for $Z \geq 26$.*

In Fig. 1, we have plotted the values of r_1, R, $r_1 - R$, the electronic concentration C, and also the types of metallic lattices. It can be seen from the drawing that the metals separate into two groups: the first includes Co, Fe, etc, for which $r_1 - R < 0$; the second includes Ni and others, for which $r_1 - R > 0$. The value of $r_1 - R$, as a rule, depends linearly on C, in which case the points