mesons were found incidentally, when extending the tracks from the selected stars) in the interval of ionization $(2.5-7)\ I_{min}$; in all cases, the identification of the particles proved to be correct. Moreover, for two hyperons found by the above-described method the tracks of the π mesons produced in the decay could be followed. The ranges of the π mesons were in good agreement with the kinematics of the decay via the scheme $\Sigma^{\pm} \rightarrow \pi^{\pm} + n$.

In the method chosen for searching for the decays, the only cause for the missing of $\pi^{\pm}$ mesons could have been a low efficiency in detecting relativistic particles. To estimate this efficiency, we investigated 226 cases of $\pi \rightarrow \mu$ decay in which the μ meson stopped inside the emulsion stack. The electrons from the μ meson were not observed in eight cases. On this basis, one can evidently assume that there was no preferential selection of $\pi^{\pm}$ mesons in any direction in the $\Sigma^{\pm}$-hyperon decays found.

In all, 72 cases of $\Sigma^{\pm}$-hyperon decays in flight were found in this way. If it is assumed that the angular distribution has the form $(1 + a \cos\theta)$, where θ is the angle between the direction of flight of the Σ hyperon and the π meson in the hyperon rest system, then the value of a turns out to be 0.09 ± 0.2. After adding seven cases found by the same method, but under somewhat different conditions, we obtained $a = 0.03 \pm 0.2$.

In the process of searching for and identifying the hyperons, two cases were observed in which the secondary particle turned out to be an electron. The kinetic energies of the electrons were equal to ~ 1.5 Mev and (11 ± 2) Mev. Both cases could be explained by the proton undergoing charge exchange in a carbon nucleus of the emulsion and the subsequent β decay of the resulting nitrogen isotope N^{12}:

$$p + C^{12} \rightarrow N^{12} + n, \qquad N^{12} \rightarrow C^{12} + \beta^{+}.$$

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ON THE POSSIBILITY OF MEASURING IN THE LABORATORY THE SPEED OF PROPAGATION OF GRAVITATIONAL WAVES

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In recent years there has been some discussion[1-5] of possible new experiments to investigate the gravitational field, in particular, experiments to detect gravitational waves, terrestrial tests of general relativistic effects, a repetition of the classical Eötvös experiment, and so on. In view of the recent developments in electronics, it is natural to use the most modern, sensitive measuring techniques. The question of whether we can measure the speed of gravitational waves has been discussed in reference 5. To do this it is necessary to have a gravitational oscillator, radiating an intense, high-frequency gravitational wave, and, at some distance, a gravitational receiver. To use language borrowed from electrodynamics, we can say that a gravitational experiment with macroscopic objects must necessarily be done in the "induction zone," i.e., the distance between the oscillator and receiver must be less than a wavelength.

In the linear approximation to Einstein's equations, a weak gravitational field is described by D'Alembert's equation, with a suitable right-hand side. We therefore write a tentative expression for a typical component of the field strength, at distances small compared with a wavelength, with a dipole frequency ω (reference 6)

$$E_R = 2p_0 e^{i\omega t} R^{-3} \cos\theta \,(1 + k^2R^2/2 - ik^3R^3/2 + \ldots), \quad (1)$$

where $k = \omega/c_g$, c_g is the speed of propagation of the gravitational field in the wave zone, p_0 is the dipole moment, and R is the distance. This expression holds for $kR \ll 1$. There are two "nonstatic" terms in the brackets: $k^2R^2/2$ and $ik^3R^3/2$

(the other terms are of higher order). The first term takes into account the effect of c_g on the amplitude of the field, while the second essentially expresses the "phase shift" associated with the finiteness of c_g. Thus, in principle, c_g can be obtained from a measurement of E_R. In reference 5 it is proposed to measure the phase shift to obtain c_g; however, it should be noted that while reference 5 claims this phase shift to be a first-order effect (kR), it is really of third order, $ik^3R^3/2 \approx iv^3/c_g^3$, as is evident from (1) (v is the amplitude associated with the linear velocity of the oscillator). For the experiment proposed in reference 5, it would be necessary to measure an angle $\approx 10^{-17}$ radian, taking $c_g = 3 \times 10^{10}$ cm/sec. At the present time, phase shifts of $10^{-5} - 10^{-6}$ radian are known to have been measured.[7]

From (1) we see that the decrease in amplitude is frequency dependent and at a frequency $\omega/2\pi \sim 200$ cps, and at a distance $R = 1$ m, we have $k^2R^2/2 \approx 10^{-11}$. Such a small decrease in amplitude can be measured if the oscillator frequency is modulated at some low frequency, ≈ 0.5 cps, and the signal detected synchronously. With such an arrangement, the band-width could be decreased to $\approx 10^{-3}$ cps.

As a detector of the gravitational field, Weber[1] has proposed a piezoelectric transducer, together with associated amplifiers. Such a transducer would consist of a piezoelectric crystal between two sufficiently large masses; the inhomogeneous gravitational field due to the oscillator would lead to a stress in the crystal. We note a number of technical difficulties which would have to be solved before such a scheme would work.

The frequency response of transducer plus amplifiers would have to be horizontal to at least one part in 10^{11}. This implies that the transducer and the reactive elements in the amplifier would have to be temperature controlled within 0.1° C. After demodulation, the signal, proportional to k^2R^2, has an amplitude of only 10^{-10} volts.

Such small signals can be measured with the photo-electric amplifier built by Kozyrev.[8] The oscillator can be a mechanical rotator with diameter $D_0 = 2$ m, operating at a frequency $25 - 50$ cps, and with four additional masses distributed along its circumference. The stress appearing upon rotation is $\approx 10^3$ kg/cm^2 which is not too large for the usual grades of steel.

In conclusion the authors would like to thank V. V. Migulin and M. S. Akulin for their discussions of versions of the experiments.

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ON THE RADIATIVE CORRECTION IN WEAK-INTERACTION PROCESSES

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It has been shown in a number of papers[1-4] that, in first order in α, the radiative corrections to μ-meson decay lead to a finite renormalization of the interaction constants (with different renormalization for the vector and axial-vector parts). At the same time the analogous correction for β decay, for example that of the neutron, diverges, and moreover this divergence cannot be removed by ordinary mass renormalization.

The cause of the different behavior is that the diagram for μ decay is of a type analogous to the diagram for the emission of a photon. In fact, the interaction Hamiltonian for the decay of a μ meson can be written either in the ordinary V-A form

$$H = \frac{G}{\sqrt{2}} \langle \nu | \gamma_\alpha (1 + \gamma_5) | \mu \rangle \langle e | \gamma_\alpha (1 + \gamma_5) | \nu \rangle, \qquad (1)$$

or in the equivalent form

$$H = \frac{G}{\sqrt{2}} \langle e | \gamma_\alpha (1 + \gamma_5) | \mu \rangle \langle \nu | \gamma_\alpha (1 + \gamma_5) | \nu \rangle; \qquad (2)$$

the change from form (1) to form (2) consists only in interchange of two particles of the same helicity, ν and e. In the latter expression the radiation corrections affect only the first factor (there are