It is obvious that these devices, which employ pulsed non-stationary processes, have a maximum efficiency if they are used in conjunction with accelerators that deliver compact plasmoids of pre-accelerated particles in sections of spark chambers 1).

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1) Contributing to conservation of the bunch dimensions during the acceleration is the magnetic field due to the time variation of the edge field (since this field counteracts the transverse field component), or an external magnetic field, and also the self-phasing processes of the longitudinal drift of the bunch particles from the weak-field to the strong-field region and vice versa.

CONCERNING THE DIFFERENCE BETWEEN ν_μ AND ν_e

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It is known [1] that the main experimental support for the hypothesis that the muonic and electronic neutrinos are different is the absence of the $\mu \to e + \gamma$ decay, which must result from the $\mu \to e + \bar{\nu} + \nu$ interaction. We consider below two questions: 1) Has it been proved that a neutrino-antineutrino pair is emitted when the meson decays, and consequently that the lepton charges of the negative muon and the electron are equal? 2) Do the results of the CERN experiment [2] and the absence of the $\mu \to e + \gamma$ decay require the existence of two types of neutrinos?

1. Figure 1 shows the spectrum of the μe transition as given by Rozenson [3], while Fig. 2 indicates all the allowed decays. For the first and second schemes of Fig. 2, the theory [4] yields a spectrum in the form

$$W(x) \sim [(1 - x) - (2/9)\rho(1 - 3x)]x^2 \qquad (1)$$

which agrees with experiment when $\rho = 3/4$. If two identical neutrinos are emitted (third scheme) it is necessary to have $\rho = 0$. This variant includes also the fourth case, where the hypothetical particle $\bar{\gamma}_\nu$ in the second channel must be assigned a lepton charge -2, a spin 1, and a right-hand polarization (left-hand for μ^+e^+ transition). Its rest mass is determined in the following manner. The spectrum of the electrons in the first channel should satisfy formula (1) for $\rho = 0$. Such a curve was drawn through the experimental points ($x \leq 0.7$), and then subtracted from the experimental curve. The remainder should give a mono-energetic line. It follows from Fig. 1 that $m_{\gamma\nu} \approx 0$. The reduction of the data of other papers [5,6] yields ~ 7% for the probability of the decay $\mu \to e + \gamma_\nu$.

The introduction of the quantum γ_ν of polarized "neutrino light" makes it possible to explain why the interaction constant g_e in β decay is smaller than G_μ, the constant calculated from the first meson decay scheme (for more details see [7]). Indeed, if the four-fermion universal weak-interaction hypothesis and the fourth decay scheme are simultaneously correct, then $g_e = g_\mu$, where g_μ is the interaction constant in the first channel of the fourth scheme. Evidently, however, $g_\mu < G_\mu$, so that both are proportional to the probabilities of the corresponding decays. It is possible that a more precise determination of the corrections encountered in the calculation of g_e and g_μ (for example, the form of the μe-decay spectrum) will make the two more accurately equal.

Although the existence of particles with lepton charge ±2 does not seem very natural, it does not contradict other experimental data. We must not therefore regard as fully proved the conclusion that two identical neutrinos cannot be emitted in meson decay.

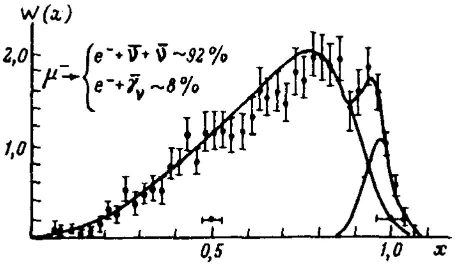

Fig. 1

	Transition	$\mu^- \to e^- + \gamma$
1	$\mu^- \to e^- + \nu + \bar{\nu}$	Yes
2	$\mu^- \to e^- + \nu_\mu + \bar{\nu}_e$	No
3	$\mu^- \to e^- + \bar{\nu} + \bar{\nu}$	No
4	$\mu^- \to \begin{cases} e^- + \bar{\nu} + \bar{\nu} \\ e^- + \bar{\gamma}_\nu \end{cases}$	No

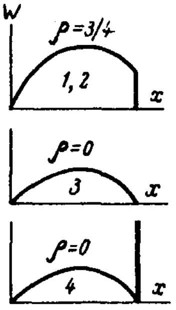

Fig. 2

2. With respect to the neutrino experiment performed at CERN, we must note the following.

a) The introduction of γ_ν requires that μ^+ and e^- be regarded as leptons and μ^- and e^+ as antileptons. Consequently, the left-screw neutrino can produce by interaction with nucleons only μ^+ mesons or electrons, and the right-screw (antineutrino) μ^- mesons or positrons.

b) A deflecting device (magnetic horn) was used at the accelerator output to focus the positively charged particles into the spark chamber. The neutrino beam had the following composition [2]

$$\begin{aligned} &90\%\ \bar{\nu} \text{ from the } \pi^+ \to \mu^+ + \bar{\nu} \text{ decay} \\ &9\%\ \bar{\nu} \text{ from the } K^+ \to \mu^+ + \bar{\nu} \text{ decay} \\ &1\%\ \bar{\nu} \text{ from the } K^+ \to \pi^0 + e^+ + \nu \text{ decay} \end{aligned} \qquad (2)$$

c) Since the neutrino energy is considerably higher than the nucleon binding energy in the nucleus, we can assume that the reactions occurred on free nucleons:

$$\begin{aligned} &\bar{\nu} + n \to p + \mu^- \\ &\nu + n \to p + e^- \end{aligned} \qquad (3)$$

$$\begin{aligned} &\nu + p \to n + \mu^+ \\ &\bar{\nu} + p \to n + e^+ \end{aligned} \qquad (4)$$

We measured in the experiment the yields of μ^- mesons and electrons. From a comparison of (2) - (4) it follows that approximately 100% of the neutrino-beam composition went into mesons and only 1% went into electrons. This ratio, characteristically, is close to the experimentally obtained $N_{\mu^-}/N_{e^-} = 1150/13 \pm 5$. It follows therefore that if the magnetic horn were to focus negatively charged particles, the reciprocal of the latter ratio should be obtained. No such experiment was carried out, however.

To check on the $\nu_\mu \neq \nu_e$ hypothesis it is desirable to perform an experiment with a proton target (hydrogen bubble chamber) in an antineutrino beam. According to (2) - (4), there should be no meson yield.

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CHANGE IN THE PROBABILITY OF THE MOSSBAUER EFFECT ON Sn^{119} IMPURITY NUCLEI IN THE FERROELECTRIC PHASE TRANSITION IN $BaTiO_3$

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There is at present little information on the change occurring in the parameters of the γ-quantum resonance absorption spectra during phase transitions. Of particular interest is the ferroelectric phase transition in crystals with perovskite structure, where, as shown in several papers [1-3], some normal oscillations of the low-lying transverse optical branch are expected to be unstable. The occurrence of spontaneous polarization in crystals of the $BaTiO_3$ type is attributed to the anomalous decrease in the frequency of the long-wave oscillation of the crystal lattice on approaching the phase-transition point in the para-electric region. The frequency of these oscillations at low values of the wave number, according to Cochran [3], is determined by the relation

$$\omega^2(T) \sim (T - T_C)$$

where T_C is the Curie temperature.

The presence of such an anomalous optical branch, responsible for the occurrence of the ferroelectric states in crystals with perovskite structure, should lead, as shown in [4], to an attenuation of the Mossbauer line intensity in the para-electric region as the Curie point is approached.

We have investigated the temperature variation of the probability of the Mossbauer effect on Sn^{119} impurity nuclei in the $Ba(Ti_{0.99}Sn_{0.01})O_3$ system near the ferroelectric phase-transition temperature. The introduction of so small an amount of tin impurity into barium