ПИСЬМО В. И. ВЕКСЛЕРА В РЕДАКЦИЮ ЖУРНАЛА «PHYSICAL REVIEW»*

О НЕКОТОРЫХ НОВЫХ МЕТОДАХ УСКОРЕНИЯ РЕЛЯТИВИСТСКИХ ЧАСТИЦ

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В двух статьях [1, 2], появившихся в 1944 г. под вышеуказанным названием, автор настоящей публикации указал на два новых принципа ускорения релятивистских частиц, которые обобщают резонансный метод.

Новые возможности для резонансного ускорения частиц в постоянном магнитном поле описаны в первой из этих статей. Кроме того, отмечена возможность резонансного ускорения в магнитных полях, которые возрастают со временем.

Результаты специального исследования последнего случая детально рассмотрены во второй статье. Показано, что фазовая стабильность устанавливается автоматически, если изменение поля во времени достаточно мало. Найдено соотношение между амплитудой меняющегося электрического поля и скоростью изменения магнитного поля.

Также показано, что радиационные потери при таком ускорении не нарушают фазового механизма. Наконец, проведен анализ работы ускорителя тяжелых частиц, основанного на принципе изменения частоты, который дан подробно в работе [3].

Таким образом, названные выше статьи полностью охватывают содержание заметки Макмиллана [4], в которой нет ссылки на мои исследования.

Создание ускорителя на 30 МэВ с меняющимся магнитным полем в Физическом институте АН СССР в настоящее время приближается к завершению.

1. *V. Veksler* // Comptes Rendus (Doklady), Acad. Sci. U.S.S.R. V. 43, No. 8, 444 IX (1944) (communicated April 25, 1944).

2. *V. Veksler* // Comptes Rendus (Doklady), Acad. Sci. U.S.S.R. V. 44, No. 9, 393 (1944) (communicated July 19, 1944).

3. *V. Veksler* // J. Phys. (U.S.S.R.) V. 9, No. 3, 153 (1945) (received March 1, 1945).

4. *E. McMillan* // Phys. Rev. 68, 143 (1945).

*Перевод с английского.

zero angular momentum, such pairs must obey Bose-Einstein statistics. If the effective mass does not exceed twice the electron mass by an extremely large factor, then the calculated degeneration temperature[5] at the concentrations in question is relatively high—of the order of a few hundred degrees absolute. It is postulated that the liquid-liquid phase separation which occurs on slow cooling (upper consolute temperature 232°K) is the device adopted by the systems to avoid the Bose-Einstein condensation, with its unfavorable free energy change. In the more dilute phase the electron constituent is still predominantly the trapped pair, but at a concentration low enough to raise the degeneracy temperature to just above the prevailing temperature. In the more concentrated phase, the trapped electron pairs have become unstable because of the greater interionic forces, and one has essentially a liquid metal, the trapped single electrons being below the Fermi-Dirac degeneration temperature. The small, temperature independent paramagnetism[4] of very concentrated solutions would appear to support this latter model.

By sufficiently rapid cooling, it appears that the liquid-liquid phase separation is prevented, and that the system becomes frozen and hence metastable in the "forbidden" concentration region, which is thus characterized by the Bose-Einstein condensation of trapped electron pairs. From the discussion of London,[6] apparently such a state must display the phenomenon of electrical superconductivity, in agreement with the above experimental observations.

The extension of the above model to explain previously observed superconductivity is apparent, and is the more plausible in view of the essentially only quasi-metallic character of the large number of alloys and compounds which display the phenomenon.[6]

[1] R. A. Ogg, Jr., J. Chem. Phys. 13, 533 (1945).
[2] For literature references, see W. C. Johnson and A. W. Meyer, Chem. Rev. 8, 273 (1931).
[3] R. A. Ogg, Jr., J. Chem. Phys. 14, 114 (1946).
[4] E. Huster, Ann. d. Physik [5], 33, 477 (1938); S. Freed and N. Sugarman, J. Chem. Phys. 11, 354 (1943).
[5] F. London, Phys. Rev. 54, 947 (1938).
[6] H. G. Smith and J. V. Wilhelm, Rev. Mod. Phys. 7, 237 (1935).

Concerning Some New Methods of Acceleration of Relativistic Particles

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February 16, 1946

IN two papers[1,2] appearing in 1944 under the above title the author of the present letter pointed out two new principles of acceleration of relativistic particles which generalize the resonance method.

New possibilities for the resonance acceleration of particles in a constant magnetic field are described in the first of these papers, and the possibility of resonance acceleration in magnetic fields which increase with time is also noted.

This latter case is specially examined in the second paper. It is shown that phase stability automatically sets in if the time variation of the field is sufficiently small; relation between the amplitude of the variable electric fields and the rate of variation of the magnetic field is established.

It is also pointed out that the radiation losses in such acceleration do not violate phasing mechanism. Finally in a detailed paper[3] an accelerator of heavy particles based on a variation in frequency is analyzed.

Thus the foregoing papers cover completely the contents of the note by McMillan[4] in which no reference is made to my investigations.

Construction of a 30-Mev accelerator with varying magnetic field is now nearing completion at the Physical Institute of the Academy of Sciences, U.S.S.R.

[1] V. Veksler, Comptes Rendus (Doklady), Acad. Sci. U.S.S.R. 43, No. 8, 444 IX (1944) (communicated April 25, 1944).
[2] V. Veksler, Comptes Rendus (Doklady), Acad. Sci. U.S.S.R. 44, No. 9, 393 (1944) (communicated July 19, 1944).
[3] V. Veksler, J. Phys. (U.S.S.R.) 9, No. 3, 153 (1945) (received March 1, 1945).
[4] E. McMillan, Phys. Rev. 68, 143 (1945).

Erratum: A Method for Measuring Effective Contact e.m.f. between a Metal and a Semi-Conductor

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[Phys. Rev. 69, 42 (1946)]

UNFORTUNATELY Fig. 1 which should have appeared with the above Letter to the Editor was omitted. It is reproduced here.

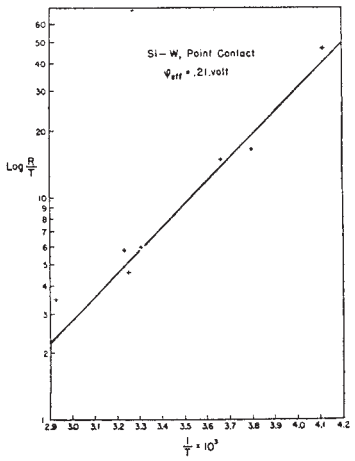

FIG. 1

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