anisotropy of the surface conductivity of metal at low temperatures and the non-tensorial anisotropy of the penetration depth of the electromagnetic field in superconductor, as arrived at in references 1-3, does not have sufficient experimental basis. The phenomena observed can be explained, at least qualitatively, on the basis of the above mentioned concept concerning the bond between the two fundamental oscillations of the coaxial resonator, with the aid of the usual tensorial anisotropic conductivity.

In any case, it should be most evident that there is a need for further and extensive investigations as to the anisotropy of surface conductivity at low temperatures before final conclusions as to its character can be formulated.

Translated by A. Andrews
15

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The Problem of the Invalidity of One Statistical Treatment of Quantum Mechanics

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WIGNER and Szilard [1] have proposed a probability distribution in phase space of a quantum particle

$$F(q;p)=\frac{1}{2\pi}\int\psi^*\left(q-\frac{h\tau}{2}\right)e^{-i\tau p}\psi\left(q+\frac{h\tau}{2}\right)d\tau, \qquad (1)$$

satisfying the time-dependent equation

$$\frac{\partial F}{\partial t}+\frac{p}{m}\frac{\partial F}{\partial q}=\frac{i}{4\pi^2 h}\int\left[V\left(q-\frac{h\tau}{2}\right)-V\left(q+\frac{h\tau}{2}\right)\right]F(q;\eta)\,e^{i\tau(\eta-p)}d\eta d\tau. \qquad (2)$$

Here q, p, m are coordinate, momentum and mass of of the particle; $V(q)$, its potential energy; h, Plank's constant; t, the time.

In an extension of this work [2] an interpretation of Eq. (2) has been given as the equation of a certain stochastic process of change of coordinate and momentum of a particle, i. e., a statistical treatment of quantum mechanics. For the validity of such a treatment it is necessary, in the first place, that $F(q;p)$, non-negative at a given moment of time, should remain non-negative at all later moments, proof of which was given by Bartlett (see Moyal [2]). However, in a recent work [3] it was correctly shown that F in general does not preserve its sign with the passage of time. From this follows the conclusion of the invalidity of the quantum mechanical treatment given by Moyal.

It is necessary only to point out Bartlett's error. Bartlett supposed that a quantum system possesses a cyclic coordinate θ (it is obvious that it is always possible formally to incorporate into a given system an additional cyclic degree of freedom). He takes the general solution of the time-dependent equation for such a system in the form

$$F(q,\theta;p,g)=\sum_{\mu}e^{i\mu(t+\theta/\omega)}F_\mu(q;p,g), \qquad (3)$$

where g and ω are the cyclic momentum and frequency; and F_μ, certain constant functions. It is clear that if $F>0$ at a certain t and arbitrary θ, it will still be >0 at an arbitrary time. The error lies in the fact that the general solution of the time-dependent equation is

$$F(q,\theta;p,g)=\sum_{\mu_1\mu_2}e^{i\mu_1 t+i\mu_2\theta}F_{\mu_1\mu_2}(q;p,g). \qquad (4)$$

Therefore Bartlett's discussion necessarily applies only to a narrow class of solutions which actually preserve sign.

Translated by B. Leaf
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The Fermi Theory of Multiple Particle Production in Nucleon Encounters

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IN calculating the statistical weights of various states, Fermi [1] applied the law of conservation of energy in exact form, but the law of conservation of momentum only in approximate form. The purpose of the present work is the exact application of the law of conservation of momentum for two limiting cases: the non-relativistic limit