

HOW THE EPR HAS BEEN DISCOVERED? THE ANALYSIS OF ZAVOISKY'S LOGBOOKS

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The analysis of E.K. Zavoisky's logbooks allowed us to come to the conclusion that the discovery of the EPR phenomenon took place due to four circumstances:

1. Zavoisky, long before the rest of the scientific community, realized that radio engineering methods allow indirect methods to study the interaction of matter with electromagnetic fields. The reason is that Zavoisky became interested in amateur radio from a young age. One of the discoverers of the NMR phenomenon, Nobel laureate Robert V. Pound, in his article "From radar to nuclear magnetic resonance" [1] concludes that in his scientific group such realization came only as a result of the fact that they spent all the years of World War II at the Massachusetts Institute of Technology developing a Radar. The Zavoisky generator, although it operated at very low frequencies, not typical of modern EPR spectrometers, had excellent sensitivity to additional losses in the coil of the oscillatory circuit of the generator arising from EPR absorption. The sensitivity of the generator was so high that if Zavoisky had an electromagnet with a highly uniform magnetic field, he could have discovered the NMR phenomenon [2].

2. Zavoisky realized that at a frequency of the order of 10 MHz, the ESR phenomenon should be observed in a magnetic field of several Oerstedes. To get rid of the residual magnetization of the electromagnet used, Zavoisky switched from an electromagnet to a solenoid, which, as is known, does not have a residual field.

3. The use of low-frequency (50 Hz) magnetic field modulation made it possible to easily observe the EPR phenomenon on the screen of the oscilloscope he had, the horizontal sweep of which was synchronized with the modulation voltage.

4. And finally, Zavoisky was very lucky that the width of the EPR line in the concentrated paramagnets he studied was not the typical several hundred Oerstedes, but due to exchange narrowing it was much lower. This, by the way, was noted by C.J. Gorter in his speech at the ceremony of awarding him the Fritz London Prize in 1966 [3].

1. R. Pound. "From Radar to nuclear magnetic resonance". Review of Modern Physics, Vol. 71, No. 2, S54-S58 (1999)

2. I.I. Silkin, F.R. Vagapova, A.V. Dooglav. "E.K. Zavoisky i YaMR: analiz laboratornyh zapisej i povtorenie eksperimentov." Low Temperature Physics, т. 41, № 1, 7-13 (2015) (In Russian)

3. C.J. Gorter. "Bad luck in attempts". Physics today, Vol. 76, 76-81 (1967)