for admissible parameter values $\lambda \sim 3 \times 10^{-7}$ cm and $\epsilon_d \sim 0.3$ kev. (Experiment gives $n \sim$ from 10 to 100 depending on the degree of superheating.) A certain arbitrariness in the choice of specific values of the parameters λ and ϵ_d* which we have assumed for illustrative purposes in our estimate of the order of magnitude of $\bar{n}$, was due to the absence of data regarding the dependence of the parameters on the degree of superheating. This dependence is unimportant, however, for a comparison of the ionizing powers of two particles passing through the liquid when the extent of superheating is either unknown or not accurately determined. The comparative estimate is particularly useful when the bubble chamber is used with an accelerator, when, simultaneously with the tracks of particles participating in the investigated nuclear reactions, there are also recorded the tracks of particles of known energy emitted by the accelerator.

It is evident that all that has been said above may apply not only to a superheated liquid but also to a supersaturated solution of a gas in a liquid.[8] A gassy liquid behaves very much like a superheated one[9] when pressure is released, the decreased resistance of the liquid to disturbance (because of excess dissolved gas) lowers the required operating pressures and justifies an experimental attempt to realize a gas bubble chamber.

It can be expected that the above considerations concerning the role of the formation of molecular groups and the introduction of the concepts of the localization interval, withdrawal energy and sufficient conditions for the creation of microcavities will facilitate the study of the peculiar and complicated phenomena which take place in bubble chambers.

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The Elastic Scattering of Protons by Tritium

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THE experimental data on the angular distribution of $p - H^3$ scattering[1] fit very well on a curve of the form $a + b \cos\theta + c \cos^2\theta$ (see the Figure). In the angles measured (up to 54.7°) there is little Coulomb scattering. It is possible to carry through a phase analysis of the experimental data taking into consideration moments of relative motion $l = 0$ and 1. The vector scheme of the decomposition in this instance is:

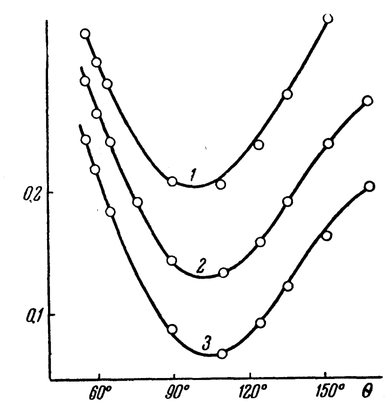
$$s_{1/2} + 1/2 = 0^+ + 1^+,\ p_{1/2} + 1/2 = 0^- + 1^-,\ p_{3/2} + 1/2 = 1^- + 2^-.$$

In agreement Ref. 2 we assume that the principal role is played by the phases

$$\delta_0 = \delta(s_{1/2},\ 0^+),\qquad \delta_1 = \delta(p_{3/2},\ 1^-)$$
$$\delta_2 = \delta(p_{3/2},\ 2^-).$$

The analysis shows that the experimental data cannot be accounted for if only three phases are used. It is necessary to take into account the phase which can materially increase the terms in $\cos\theta$ and $\cos^2\theta$, i.e., the phase $\delta_3 = \delta(p_{1/2}, 1)$.

For three values of proton energy we have obtained the phases which describe satisfactorily the angular distribution of the scattering (see the figure):



Curves of the shape $a + b \cos + c\cos^2\theta$ obtained from the phases mentioned in the text (θ is the angle in the center of mass system). o — experimental points. The curves are displaced relative to each other by 0.05; *1* — 2.54; *2* — 3.03; *3* — 3.50 mev

For $E = 2.54$ mev:

$\delta_0 = 90°;\ \delta_1 = 33°;\ \delta_2 = 27°;\ \delta_3 = 5.7°.$

For $E = 3.03$ mev:

$\delta_0 = 90°;\ \delta_1 = 48°;\ \delta_2 = 18.5°;\ \delta_3 = 14°$

or

$\delta_0 = 80°;\ \delta_1 = 43°;\ \delta_2 = 25°;\ \delta_3 = 10°.$

For $E = 3.50$ mev:

$\delta_0 = 90°;\ \delta_1 = 52°;\ \delta_2 = 16°;\ \delta_3 = 21°.$

Experiment gives three parameters, so that the choice of phases is not unique. But the unusually small constant term in the angular distribution strongly reduces the arbitrariness in the selection of phases. Thus the phase δ_0, which accounts for potential scattering, cannot be chosen to be smaller than 70°.

Thus the scheme for the interaction of a proton with H^3 which was proposed by Baz' and Smorodinskii[2] is not in contradiction with the experimental results for the elastic scattering of protons by tritium.

In conclusion I wish to thank Professor Ia. A. Smorodinskii for suggesting the subject and for his guidance.

Note in the proof: Frank and Gammel[3] have carried through a phase analysis of $p - H^3$ scattering assuming LS coupling.

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Absorption Curve Moments for Solid Solutions

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MEASUREMENTS of resonance absorption in solid solutions enable us to make conclusions about the character of the interaction forces between the particles. The first calculation of the moments of these absorption curves was carried out by Kittel.[1] However, he took into account only the dipole interactions. Below are presented the results of a calculation of the moments of absorption curves when not only dipole, but also exchange, interaction forces of paramagnetic ions are present.

A crystal of solid solution of two salts grows in a bath of their liquid solution. The filling of any particular lattice point of the growing crystal by one or the other ion appears to be a random process. The probability of occupation of a lattice point by a paramagnetic ion will be considered to be independent of the manner in which the remaining crystal lattice points are filled. This is the case when there is a small difference between the binding energies of the ions of both metals in the crystal, between their masses, etc. We shall calculate the moments of the paramagnetic resonance absorption curve in solid solutions at high frequencies.

1. The zero order moment is

$$\nu_0 = \mathrm{Sp}\sum_j S_{x_j}^2 = \overline{N}\frac{\lambda}{2}\,(2S+1)^{\overline{N}}$$

$$= N_0 f\frac{\lambda}{3}(2S+1)^{N_0 f},$$

where N is the average number of paramagnetic ions, equal to $N_0 f$ (N_0 is the number of lattice points in the crystal), $\lambda = S(S+1)$ (S is the spin quantum number).

2. The second order moment is

$$\Delta\overline{\nu_2} = h^{-2}\frac{\lambda}{3}\frac{\Sigma B_{jk}^2\overline{\delta_j\delta_k}}{\overline{N}} = h^{-2}\frac{\lambda}{3}\sum_k B_{jk}^2 f,$$

where $\delta_j(\delta_k)$ are equal to unity if the lattice point $j(k)$ is occupied by a magnetic ion and to zero in the opposite case, and $\overline{\delta_j\delta_k} = f.^2$

3. The fourth order moment is

$$\Delta\overline{\nu_4} = h^{-4}\Big\{f\Big[\sum_k A_{jk}^2 B_{jk}^2\Big(\frac{2}{5}\lambda^2 - \frac{3}{10}\lambda\Big) + A_{jk}B_{jk}^3\Big(\frac{4}{15}\lambda^2 - \frac{2}{10}\lambda\Big) + B_{jk}^4\Big(\frac{\lambda^2}{5} - \frac{\lambda}{15}\Big)\Big]$$
$$+ f^2\Big[\sum_{k,l} 3B_{jk}^2B_{jl}^2 + 2A_{jk}^2(B_{jl} - B_{kl})^2 + A_{jk}A_{kl}(B_{jk} - B_{jl})(B_{kl} - B_{jl}) + 2A_{jk}B_{jk}(B_{jl} - B_{kl})^2\Big]\frac{\lambda^2}{9}\Big\}$$

where the remaining symbols are taken from an article of Van Vleck.[2]

The numerical values of the moments are not given in the present work, but they could be easily evaluated. It is not difficult to see that the quantity

$$X = \Delta\overline{\nu_4}/(\Delta\overline{\nu_2})^2$$

increases with a decreasing concentration of paramagnetic ions, and the moments decrease. It is possible to expect the half width of the curve to