biguous result for the sign of the g factor, opposite to that generated by a sample of DPPH in the same apparatus, and therefore negative. The value recorded is -48. The breadth of the line is attributed partially to mounting strain, absent in the case of Fig. 1.

Anomalies of the carrier magnetic moment arise in the band theory of solids from antisymmetrical terms in the effective mass Hamiltonian, as first pointed out by Luttinger for Ge.[10] According to the band structure calculation of Kane[7] the spin-orbit effects, in the absence of inversion symmetry in the InSb crystal structure, remove the degeneracies of the valence bands near the center of the Brillouin zone, except for the special point k (000). A recent analysis by Rashba and Sheka[11] based on Kane's work shows that this crossing of the valence bands at k (000) leads to spin-dependent terms in the diagonalized velocity operator in the effective mass formalism. Electric dipole transitions between the different spin levels of adjacent Landau bands of the conduction band are shown to follow. Magnetic transitions of this type have been observed previously in Bi and Sb by Smith, Galt, and Merritt.[12] The electric dipole effect may also be made plausible[13] by considering a particle whose g factor varies with momentum being accelerated by the microwave electric field in the presence of a steady magnetic field. Off-diagonal components of the g factor tensor, arising from slight anisotropies of the band structure, will generate an equivalent microwave magnetic driving field which can flip the spin.

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SUGGESTED EXPERIMENT ON APPROXIMATE LOCALIZED MODES IN CRYSTALS*

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(Received May 21, 1962)

The secular equation which determines the lattice vibration frequencies of a lattice containing a single isotopic impurity is (for cubic Bravais lattices)

$$D(\omega)=1+\frac{\Delta m}{mN}\sum_q\frac{\omega^2}{\omega^2-\omega_q^{\,2}}=0, \qquad (1)$$

where $m+\Delta m$ is the impurity mass, and the sum is over the N phonons of the perfect lattice. If ω_D designates the largest ω_q, then it is well known[1] that if $\Delta m<0$, one of the solutions of Eq. (1) lies outside the continuum; $\omega>\omega_D$. It has been proposed that the Mössbauer effect be used to study this "localized mode,"[2] but because of the high driving velocities required, it would be difficult to observe the isolated peak directly.

In this Letter we point out that an approximate localized mode also can exist for $\Delta m>0$. Such a state decays into the continuum, but we shall show below that if $\Delta m/m\gg1$ the decay rate is slow compared to the frequency. The situation here is closely analogous to the theory of the unstable V particle in the Lee model,[3] where it is shown that the V-particle energy is given by the solution of the analog of Eq. (1) in the limit $N\rightarrow\infty$ and the sum replaced by a principal value integral. The width of the state is then calculated by realizing that the complex response function of the system is $D^{-1}(Z)$, where Z is chosen slightly off the real axis for $\omega^2<\omega_D^{\,2}$ which is the locus of a cut for $N\rightarrow\infty$. Thus

$$D(\omega+i\epsilon)=(\omega-\omega_0)\,\mathrm{Re}D'(\omega_0)+\mathrm{Im}D(\omega+i\epsilon), \qquad (2)$$

where ω_0 satisfies $\mathrm{Re}D(\omega_0)=0$, and the width of our approximate eigenstate is

$$\Gamma/2=\left|\frac{\mathrm{Im}D(\omega_0+i\epsilon)}{\mathrm{Re}D'(\omega_0)}\right|. \tag{3}$$

We expect the Debye model to be adequate for very heavy impurities, since then $\omega_0 \ll \omega_D$. Using it we find, with $x=\omega/\omega_D$,

$$D(\omega+i\epsilon)=1-\frac{3\Delta m}{m}x^2\left(1-\frac{x}{2}\ln\left|\frac{1+x}{1-x}\right|\right)-\frac{3\pi i}{2}\frac{\Delta m}{m}x^3. \tag{4}$$

For $\Delta m/m \gg 1$, we find

$$x_0=\omega_0/\omega_D=(m/3\Delta m)^{1/2},$$
$$\Gamma=\tfrac{1}{6}\pi(m/\Delta m)\omega_D,$$
$$\Gamma/\omega_0=\pi x_0/2. \tag{5}$$

It is thus seen that for $\Delta m/m \gg 1$ one may have quite a sharp resonance in the continuum. For example, a mass ratio of 25 in a material of Debye temperature 300°K (such as a heavy metal placed in a light molecular solid by evaporation) would give $\omega_0 \cong 3\times10^{-3}$ eV and $\Gamma/2\cong 3\times10^{-4}$ eV. The cross section for absorption of Mössbauer γ rays will have a peak at ω_0 with width Γ and a height which can be shown to be approximately x_0^{-2} times the one-phonon background, a factor of 100 for the example above.

A more direct experiment to pick up the approximate eigenstate is a measurement of neutron transmission. Scattering should be enhanced by x_0^{-2} at ω_0, and a neutron experiment would yield both the location and width of the resonance.

We are grateful to Dr. Paul Craig and Dr. Darragh Nagle for discussions on the feasibility of this experiment.

*Work performed under the auspices of the U. S. Atomic Energy Commission.

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OSCILLATORY INTERBAND FARADAY ROTATION AND VOIGT EFFECT IN SEMICONDUCTORS

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We have performed a preliminary experiment on thin Ge samples in fields up to 90 kG at room temperature in order to investigate the oscillatory behavior of the interband Faraday rotation predicted theoretically.[1] The infrared radiation from a monochromator was polarized with a Polaroid sheet and focussed on a sample 4 microns thick which was placed in the center of a Bitter solenoid. The transmitted radiation was split into two beams, each being focussed on a PbS detector. Analyzers in front of both detectors had their planes of polarization perpendicular to each other and 45 degrees to that of the polarizer. The signal outputs of the detectors were balanced out to zero in the absence of a magnetic field. With the field on, the Faraday rotation in the sample gave rise to an unbalanced component of signal output which was calibrated in terms of actual rotation in the plane of polarization. The results of our experiments are shown in Figs. 1 and 2. The oscillatory character is shown prominently at 23 kG which has eleven minima and maxima within the range of 0.1 eV above the energy gap. With increased field, only a few peaks are observed within this range of energy. However,