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Theory of the Cyclotron Resonance in Al,Pb,Zn and Cd SHIGEJI FUJITA, ROHIT SINGH, ROBERT SIMION, University of Buffalo, SEIICHI WATANABE, Hokkaido University, Japan, SALVADOR GODOY, UNAM, Mexico — A quantum theory of the cyclotron resonance is developed. For a face-centered-cubic (fcc) metal the obvious candidates for the Cyclotron Planes (CP) in which the conduction electron ("electron","hole") circulates are the three families of planes $\{100\}$, $\{110\}$ and $\{111\}$. Following Dresselhaus-Kip-Kittel (DKK,1955) we assume a quadratic energy-momentum ($\hbar k$) relation with the effective mass (m_1, m_2, m_3) and analyze the angle- dependent resonance peaks in terms of Shockley's formula (a generalization of the DKK formula) .For aluminum Al (fcc) an "electron" ellipsoid with the major axes in [110] with $(m_1, m_2, m_3) = (0.108, 0.156, 1.96)m$ is obtained. For lead (Pb) (fcc) a hyperboloid in [110] with $(m_1, m_2, m_3) = (1.18, 0.244, -8.71)m$ and an "electron" sphere with $m^* = 1.30m$ associated with the CP $\{100\}$ are obtained. For a hexagonal- closed-pack (hcp) metal,the CP is the hexagonal base plane. The effective mass m_b for the basal-plane motion and the mass m_c along the c-axis for zinc (Zn)[cadmium (Cd)] (both hcp)are (m_b, m_c)=(1.04,0.212)m [(1.14,0.217)m], which characterize the spheroids with the major axis along the c-axis.

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