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Theory of Cyclotron Resonance in Si,Ge,Zn and Cd SHIGEJI FUJITA, ROBERT SIMION, ROHIT SINGH, ROHIT SINGH, SEICHI WATANABE, SALVADOR GODOY — A quantum theory is developed for the cyclotron resonance (CR) in Si and Ge by introducing the concept of the Cyclotronic Planes (CP) in which the conduction electrons ("electrons","holes") complete circulations. The angular dependent CR peaks for heavy "holes" are analyzed, using the Dresselhaus-Kip-Kittel (DKK) formula: $\omega = (\omega_t^2 cos^2\theta + \omega_t\omega_l sin^2\theta)$, $\omega_t \equiv eB/m_t$, $\omega_l \equiv eB/m_l$.The Fermi surfaces for Si(Ge) are spheroids oriented along $\langle 100\rangle$ axes with the transverse mass $m_t = 0.46(0.29)m$ and the longitudinal mass $m_l = 1.03(0.78)m$.The fluted energy surfaces used by DKK were avoided.The angular-independent CR peaks for light "holes" in Ge(Si) arise from the spherical Fermi surface with the effective mass $m_l = 1.03(0.78)m$ with the CP $\{100\}$. The reason why there are light and heavy "holes" with the same CP in $\{100\}$ is explained by decomposing the fcc lattice in two sets of sublattices. The theory is extended to treat the CR peaks in Zn and Cd, both hexagonal-close-packed metals.

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