# Absorption coefficient of weak electromagnetic waves caused by confined electrons in quantum wires

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Abstract: The quantum theory of the absorption of weak electromagnetic waves (EMWs) caused by confined electrons in quantum wires has been studied based on Kubo's linear response theory and Mori's projection operator method. Analytical expressions for the absorption coefficients of weak EMWs in quantum wires with electron-acoustic phonon and electron-optical phonon scattering mechanisms are obtained. The dependence of the absorption coefficient of a weak EMW on its frequency ?? as system temperature T, and the parameters charactering the sample are analyzed. Numerical calculations have been done, and the results are discussed for a typical wire of GaAs/GaAsAl.

Author Keywords: Absorption coefficient; Conductivity tensor; Electron-phonon interaction; Quantum wires

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References:

1. Mori, N., Ando, T., (1989) Phys. Rev. B, 40, p. 6175
2. Rucker, H., Molinari, E., Lugli, P., (1992) Phys. Rev. B, 45, p. 6747
3. J. Pozela and V. Juciene, Sov. Phys. Tech. Semicond. 29, 459 (1995)Vasilopoulos, P., Charbonneau, M., Van Vliet, C.M., (1987) Phys. Rev. B, 35, p. 1334

4. Suzuki, A., (1992) Phys. Rev. B, 45, p. 6731
5. Badjou, S., Argyres, P.N., (1987) Phys. Rev. B, 35, p. 5964
6. Suzuki, A., Dunn, D., (1982) Phys. Rev. B, 25, p. 7754
7. Choi, S.D., Fujita, S., (1981) Solid State Commun, 37, p. 293
8. Kenkre, V.M., (1971) Phys. Rev. A, 4, p. 2327
9. Kenkre, V.M., (1972) Phys. Rev. A, 6, p. 769
10. Kenkre, V.M., (1973) Phys. Rev. A, 7, p. 772
11. Sug, J.Y., Choi, S.D., (1997) Phys. Rev. E, 55, p. 314
12. Kang, N.L., Ryu, J.Y., Choi, S.D., (1998) J. Korean Phys. Soc, 32, p. 553
13. Kang, N.L., Ji, Y.J., Lee, H.J., Choi, S.D., (2003) J. Korean Phys. Soc, 42, p. 379
14. Kang, N.L., Shin, D.H., Yi, S.N., Choi, S.D., (2005) J. Korean Phys. Soc, 46, p. 1044
15. Kim, J., Kim, B., Sug, J.Y., Lee, Y.J., Jo, S.G., Choi, S.D., (2002) Phys. Rev. B, 66, p. 73107
16. Mori, H., (1965) Prog. Theor. Phys, 34, p. 399
17. Kubo, R., (1957) J. Phys. Soc. Japan, 12, p. 570
18. Pavlovich, V.V., Epshtein, E.M., (1977) Sov. Phys. Stat, 19, p. 1760
19. G. M. Shmelev, I. A. Chaikovskii and N. Q. Bau, Sov. Phys. Tech. Semicond. 12, 1932 (1978)Bau, N.Q., Nhan, N.V., Phong, T.C., (2002) J. Korean Phys. Soc, 41, p. 149
20. Bau, N.Q., Phong, T.C., (1998) J. Phys. Soc. Japan, 67, p. 3875
21. Zakhleniuk, N.A., Bennett, C.R., Constantinou, N.C., Ridley, B.K., Babiker, M., (1996) Phys. Rev, 54, p. 17838
22. Tonucci, R.J., Justus, B.L., Campillo, A.J., Ford, C.E., (1992) Science, 258, p. 783
23. Nishiguchi, N., (1996) Phys. Rev, 54, p. 1494
24. Wang, X.F., Lei, X.L., (1994) Phys. Rev. B, 49, p. 4780
25. Ham, H., Spector, H.N., (2000) Phys. Rev. B, 62, p. 13599
26. Gold, A., Ghazali, A., (1990) Phys. Rev. B, 41, p. 7626
27. Phong, T.C., Dinh, L., Bau, N.Q., Vuong, D.Q., (2006) J. Korean Phys. Soc, 49, p. 2367