

## Information on Doctoral thesis of Fellows Le Thai Hung

1. Full name: Le Thai Hung
2. Sex: male
3. Date of birth: November 19th 1982
4. Place of birth: Hai Duong Province
5. Admission decision number: 5429 / SĐH on 30/10/2008, President of Viet Nam National University, Ha Noi.
6. Changes in academic process: No change
7. Official thesis title: Influence of confined phonon on some high frequency effects in low dimensional semiconductor
8. Major: Theoretical physics and Mathematical Physics
9. Code: 62 44 01 01
10. Supervisors: Prof. Dr. Nguyen Quang Bau

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11. Summary of the new findings of the thesis

The main findings are to collect the expression to clarify nonlinear absorption coefficient of a strong electromagnetic wave by confined electrons in doping superlattices, compositional superlattices and quantum wells applied for both cases of magnetic presence and absence when influence of confined phonon is taken into consideration. When factor  $m$  reaches 0, acquired analysis expressions returns to results of absorption coefficient in two-dimensional semiconductor when phonon capture is neglected. This confirms the correctness in the thesis's theoretical calculations when nonlinear absorption expression of strong electromagnetic wave is established with consideration of phonon confined effects.

It specifies the strong influence of confined phonon on strong electromagnetic wave absorption caused by confined electrons. Absorption coefficient value increases significantly,  $10\text{-}10^3$  times against the non-confined

phonon. When quantum indicator  $m$  increases, absorption coefficient value increases, accordingly. On the other hand, there is remarkable change in absorption coefficient survey results against other parameters.

It obtains the explicit analysis expression of threshold field magnitude and parametric transformation coefficient between acoustic phonons phonon and optical phonon in Doping Superlattices and cylindrical quantum wires when confining is taken into consideration. The acquired analysis expressions can return to results of non-confined phonon case when quantum indicator  $m(h, j)$  reaches to zero.

Phonon capture is confirmed in low dimensional semiconductor, resulting in parametric resonance and transformation between acoustic phonons phonon and optical phonon. Positions of resonance peaks are shifted against the non-confined phonon. When quantum indicator specific for increased phonon capture, magnitude of resonance peaks increases and positions shifted towards low temperature and wave vector magnitude of phonon.

The above findings vary in each kind of low dimensional semiconductor.

12. Practical applicability, if any:

The results of the thesis have contributed courtesy perfect understanding of the nature of low-dimensional semiconductors, and opens the possibility of fabricating electronic devices to the new system: modern, ultra-small, smart and versatile .

13. Further research directions, if any:

Study on the influence of confined phonons on other physics effects.

14. Thesis-related publications:

N.Q.Bau, D. M. Hung and L. T. Hung (2010), "The influences of confined phonons on the nonlinear absorption coefficient of a strong electromagnetic wave by confined electrons in doping superlattices", *Progress In Electromagnetics Research Letters USA* (15), pp.175–185.

N. Q. Bau, L. T. Hung and N. D. Nam (2010), "The nonlinear absorption coefficient of a strong electromagnetic wave by confined electrons in quantum wells under the influences of confined phonons", *J. of Electromagn. Waves and Appl. USA* (24), pp.1751–1761.

Le Thai Hung, Tran Anh Hung, Nguyen Thi Thanh Nhan, Nguyen Quang Bau (2011), "The Effect of Confined Phonons on the Nonlinear Absorption Coefficient of a Strong Electromagnetic Wave by Confined Electrons in Quantum Wells", *Vnu. Journal of Science, Mathematics – physics* 27 (1S), pp.119-124.

Nguyen Quang Bau, Le Thai Hung and Hoang Dinh Trien (2011), "Effect of Magnetic Field on Nonlinear Absorption of a Strong Electromagnetic Wave in Low-dimensional Systems", *Behaviour of Electromagnetic Waves in Different Media and Structures*, InTech, Croatia, pp.275-300.

N. Q. Bau, N. V. Nghia, and L. T. Hung (2011), "Parametric Transformation and Parametric Resonance of Confined Acoustic Phonons and Confined Optical Phonons by an External Electromagnetic Wave in Doping Superlattices", *PIERS Proceedings, Suzhou, China, Sept. 12-16*, pp.1180-1185.

Vu Thi Ngoan, Nguyen Thi Thanh Nhan, Nguyen Dinh Nam, Le Thai Hung (2011), "The parametric transformation coefficient of confined acoustic phonons and confined optical phonons in the cylindrical quantum wires with parabolic potential", *Vnu. Journal of Science, Mathematics – physics 27 (1S)*, pp.184-188.

Kim Thi Minh Hue, Nguyen Thi Thanh Nhan, Nguyen Dinh Nam, Le Thai Hung, Nguyen Quang Bau (2011), "Parametric resonance of confined acoustic phonons and confined optical phonons in the cylindrical quantum wires with parabolic potential", *Vnu. Journal of Science, Mathematics – physics 27 (1S)*, pp.88-93.

Hoang Dinh Trien, Le Thai Hung, Vu Thi Hong Duyen, Nguyen Thu Huong, Nguyen Vu Nhan and Nguyen Quang Bau (2012), "Impact of the external magnetic field and the confinement of phonons on the nonlinear absorption coefficient of a strong electromagnetic wave by confined electrons in compositional superlattices", *Proc. Natl. Conf. Theor. Phys.* 37, pp. 115-120.