Report on SAIF (A) Grant: Quantum Effect of Nanoscale Double-Well Structure and Its Applications in Optical Devices

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The research on Quantum Effect of Nanoscale Double-well Structure and Its Application in Optical Device is very fruitful. We almost have achieved all the goals planned in the proposal. Through the research, we have a deeper understanding on the quantum interference effect on the quantum well structure. Some innovative device is designed based on this coherent effect. The research results are published in the leading journals of this area. We published one paper in Physical Review B and one paper was accepted in IEEE Journal of Quantum Electronics (The papers are attached). PI also participated in IEEE International Electro Information Technology Conference at Lincoln, Nebraska in May, 2005 to present our achievements in nanotechnology research to colleagues (The paper presented in the conference is also attached).

This research activity not only advances the understanding of physics and engineering application on this interesting phenomenon. It also helps to build up the PI’s reputation in nanotechnology domain through interactions with the researchers with the same interests in the conference, and communications. Through the research activity, we also found that there were more related topics to be investigated and we also tried to seek for possible extramural resources. This research as expected leads to an NSF research proposal on Coherently Controlled Photonic Band Gap and Its Applications in Optoelectronic Devices (The NSF proposal is attached).

In fact, the research also benefits the education in our department. The PI has tailored some research results into his courses such as Application of Modern Physics and Electromagnetic Field Theory. This activity will be continued in the following terms. As
we know, UWP is proposing a new program on MEM/Nanotechnology. The PI is a member of the Steering Committee. The research results are shared with the colleagues of our department and EMS. We believe that it will greatly contribute to the related curriculum development. Next spring, PI may joint other faculty members to offer a nanotechnology course in EMS.

We also made effort to let research results available to other faculty members and students in general. The PI posted his results and achievements in the University Research Poster Day. He also made a presentation on quantum device in Engineering Physics Week, which is an activity to introduce modern engineering technology to engineering students.

To conclude, this research has great accomplishments in (1) the understanding of basic scientific principles and engineering applications. (2) the PI’s professional development. (3) undergraduate education and related curriculum development. The research will be continued if funded by NSF.

The PI would like to express his great appreciation for the support from Office of Sponsored Program. Hopefully the support will be continued on the other research/teaching activities of PI and lead to more fruitful results.