

## PREFACE

The Ninth International Symposium on Foundations of Quantum Mechanics in the Light of New Technology (ISQM-TOKYO '08) was held on August 25–28, 2008 at the Advanced Research Laboratory, Hitachi, Ltd. in Hatoyama, Saitama, Japan. The symposium was organized by its own scientific committee under the auspices of the Physical Society of Japan, the Japan Society of Applied Physics, and the Advanced Research Laboratory, Hitachi, Ltd. A total of 137 participants (28 from abroad) attended the symposium, and 32 invited oral papers, 7 contributed oral papers, and 47 poster papers were presented.

Just as in the previous eight symposia, the aim was to link the recent advances in technology with fundamental problems in quantum mechanics. It provided a unique interdisciplinary forum where scientists from different disciplines, who would otherwise never meet each other, convened to discuss basic problems of common interest in quantum science and technology from various aspects and “in the light of new technology.”

*Quantum Coherence and Decoherence* was chosen as the main theme for this symposium because of its importance in quantum science and technology. This topic was reexamined from all aspects, not only in terms of quantum computing, quantum information, and mesoscopic physics, but also in terms of the physics of precise measurement, spin related phenomena, and other fundamental problems in quantum physics.

We are now very happy to offer the fruits of the symposium in the form of the proceedings to a wider audience. As shown in the table of contents, the proceedings include a special lecture by Professor C.N. Yang and 75 refereed papers in ten sections: cold atoms and molecules; spin-Hall effect and anomalous Hall effect; magnetic domain wall dynamics and spin related phenomena; Dirac fermions in condensed matter; quantum dot systems; entanglement and quantum information processing, qubit manipulations; mechanical properties of confined geometry; precise measurements; novel properties of nano-systems; and fundamental problems in quantum physics.

We will mention just some of the important keywords here to give the flavor of the proceedings: Bose-Einstein condensate, quantum computation and communication, qubits, quantum dots, spintronics, graphene, rattling, atomic clocks, and vortices in high-temperature superconductors. We hope that the proceedings will not only be the record of the symposium but also serve as a good reference book for experts on quantum coherence and decoherence and as an introductory book for newcomers in this field.

In conclusion, we thank the participants for their contribution to the symposium's success. Thanks are also due to all the authors who prepared manuscripts and to the referees who reviewed the papers. We also thank the members of the Advisory Committee and Organizing Committee; without their invaluable assistance, the symposium would not have been a success. Finally, we express our deepest gratitude to the Advanced Research Laboratory, Hitachi, Ltd. and Dr. Nobuyuki Osakabe, who was its General Manager at that time, for providing us with financial support and an environment that was ideal for lively discussion. We also thank his staff members, in particular Mr. Yoshimichi Yamamoto and Ms. Tamae Nagamine, for their efforts in making the symposium enjoyable as well as productive.

March 2009

Sachio Ishioka  
Kazuo Fujikawa