

## Objective of the Theory of Solid State Physics

Research subjects this division has examined to date are wide ranging, including early work of long-period ordered alloy, ferromagnetism and anti-ferromagnetism theory, mutual interaction of magnetism and superconductivity, and high-temperature superconductivity, in addition to work from the latter half of the 1980s on giant magnetoresistance effect, strongly correlated electron systems and spintronics for studying correlation between electric charge and spin, along with more recent investigations of spin-caloritronics related to spin current and heat current, and topological insulator. This division has long been contributing to the development of theories related to emergent phenomena developed for various substances and materials. In the field of theory of solid state physics, the accomplishments are well recognized as a world-leading research group.

This division, pertinent to exploration of basic physical laws, has been promoting theoretical studies of substances and materials by international research development by constructing worldwide networks from broad perspectives using basic physical laws while always maintaining good communication with experimental researchers.

This division, in charge of theory of solid state physics, is expected to fulfill leading roles for experimental researches of substances and materials. The major role is to show guiding principles for the development of new substances and materials to resolve social demands. Additionally, it is important to propose a new principle for the construction of models for unknown phenomena and functions and for unestablished observation means. Flexible and broad research promotion is necessary to cope with diverse fusion research and rapid internationalization occurring recently in material science and solid state physics fields. For international activities by this institute and this university in material science, this division is expected to play important roles for international cooperation and information transmission where theory of solid state physics is emphasized.

Research targets and research methods of this division are expected to become complementary or synergistic to those of the Division for Materials Design by Computer Simulation and Center for Computational Materials Science, which are mutually related as theoretical research fields in terms of

their broad vision and which are preferably addressed cooperatively with maintenance and development of theory and calculation of research execution environments examined by this division.

As described above, the objectives of this division are to present a broad overview of the theoretical research field, to play a leading role in close cooperation with experimental research, to respond to requests for creation and development of new substances and materials, and to promote theory of solid state physics progressively and internationally. For the cooperative graduate school, the graduate school of science, physics, is preferred.