

# Higgs modes in condensed matter and quantum gases

## 23-25 June 2014, YITP, Kyoto University

### Program

#### June 23<sup>rd</sup> (Mon.)

- 8:30-9:00 Registration  
9:00-9:10 Opening (Ippei Danshita)

#### Higgs mode in bosons in optical lattices

Chair: Ippei Danshita (YITP)

- 9:10-9:40 **T01** Sebastian Huber (ETH)  
*"The amplitude mode in cold atoms"*
- 9:40-10:30 **T02** Daniel Podolsky (Technion)  
*"Higgs mode and universal dynamics near quantum criticality"*
- 10:30-11:00 --- Coffee break ---

Chair: Daniel Podolsky (Technion)

- 11:00-11:30 **T03** Takeshi Fukuhara (Max-Planck Institute)  
*"Observation of the Higgs amplitude mode in a two-dimensional superfluid"*
- 11:30-12:00 **T04** Kun Chen (UMass Amherst)  
*"Universal quantum dynamics near the two-dimensional Superfluid-to-Insulator transition"*
- 12:00-12:30 **T05** Adam Rancon (Univ. of Chicago)  
*"Higgs amplitude mode in the vicinity of a (2+1)-dimensional quantum critical point"*
- (group photo)
- 12:30-14:20 --- Lunch break ---

## Higgs particle in high-energy physics

Chair: Muneto Nitta (Keio Univ.)

- 14:20-14:50 **T06** Masaya Ishino (Kyoto Univ.)  
*"Higgs Particle properties from High Energy experiment"*
- 14:50-15:20 **T07** Koichi Hamaguchi (Univ. of Tokyo)  
*"Supersymmetry after Higgs discovery"*
- 15:20-15:50 **T08** Mikhail Zubkov (Univ. of Western Ontario)  
*"Possible compositeness of the 125 GeV Higgs boson"*
- 15:50-16:20 --- Coffee break ---

## Higgs mode in quantum magnets

Chair: Keisuke Totsuka (YITP)

- 16:20-17:10 **T09** Masashige Matsumoto (Shizuoka Univ.)  
*"Higgs mode in quantum spin systems"*
- 17:10-17:40 **T10** Haruhiko Kuroe (Sophia Univ.)  
*"First-Order Magnetic Raman Scattering from Higgs Mode through Second-Order Magnetic Raman Process"*

June 24<sup>th</sup> (Tue.)

Higgs mode in fermionic superfluids, superconductors

Chair: Dirk Manske (Max-Planck Institute)

- 9:00-9:50    **T11** Chandra Varma (UC Riverside)  
*“Amplitude / Higgs Modes in Condensed Matter Physics”*
- 9:50-10:20    **T12** Ryo Shimano (Univ. of Tokyo)  
*“Observation of Higgs mode in s-wave superconductors”*
- 10:20-10:50    **T13** Emil Yuzbashyan (Rutgers Univ.)  
*“Far from Equilibrium Phases of Superconducting Matter”*
- 10:50-11:20    --- Coffee break ---

Chair: Chandra Varma (UC Riverside)

- 11:20-11:50    **T14** Dirk Manske (Max-Planck Institute)  
*“Density-Matrix Theory for Superconductors in non-equilibrium: Higgs mode and Pairing glue”*
- 11:50-12:20    **T15** Naoto Tsuji (Univ. of Tokyo)  
*“Higgs mode and Anderson pseudospin resonance in superconductors”*
- 12:20-12:50    **T16** Shunji Tsuchiya (Tohoku Institute of Technology)  
*“Higgs mode in a superfluid of Dirac fermions”*
- 12:50-14:00    --- Lunch break ---

Higgs mode in exciton-polariton, cavity photon

Chair: Tetsuo Ogawa (Osaka Univ.)

- 14:00-14:50    **T17** Peter Littlewood (Univ. of Chicago)  
*“Polariton condensation and dynamics”*
- 14:50-15:20    **T18** Yoshihisa Yamamoto (NII)  
*“Nambu-Goldstone modes in exciton-polariton condensates”*
- 15:20-15:50    **T19** Wuming Liu (Chinese Academy of Science)  
*“Higgs type excitations in cold atoms and cavity”*

--- Coffee break ---

16:00-18:00 Poster session

18:30- Banquet

June 25<sup>th</sup> (Wed.)

Higgs mode in charge density waves

Chair: Naoto Tsuji (Univ. of Tokyo)

9:00-9:50     **T20** Dragan Mihailovic (Jozef Stefan Institute)  
                  *“Peculiar phenomena in the time-dynamics of condensed matter systems undergoing symmetry-breaking transitions”*

9:50-10:20   **T21** Fahad Mahmood (MIT)  
                  *“Fluctuating charge density waves in a cuprate superconductor”*

10:20-10:50   --- Coffee break ---

Nambu-Goldstone mode I

Chair: Yusuke Kato (Univ. of Tokyo)

10:50-11:20   **T22** Yoshimasa Hidaka (RIKEN)  
                  *“Dispersion relation of Nambu-Goldstone modes at finite temperature and density”*

11:20-11:50   **T23** Haruki Watanabe (UC Berkeley)  
                  *“Nambu-Goldstone bosons in nonrelativistic systems”*

11:50-14:00   --- Lunch break ---

Nambu-Goldstone mode II

Chair: Yoshimasa Hidaka (RIKEN)

14:00-14:30   **T24** Muneto Nitta (Keio Univ.)  
                  *“Nambu-Goldstone modes localized around vortices and solitons”*

14:30-15:00   **T25** Yusuke Kato (Univ. of Tokyo)  
                  *“Transmission and scattering properties of Nambu-Goldstone modes”*

15:00-15:30   --- Coffee break ---

Higgs, Nambu-Goldstone: summary

Chair: Muneto Nitta (Keio Univ.)

15:30-16:20 **T26** Hitoshi Murayama (Kavli IPMU, UC Berkeley)

*“Higgs and Goldstone bosons with and without Lorentz invariance”*

Closing (Chandra Varma)

## Poster session (June 24<sup>th</sup>, 16:00-18:00)

- P01** Kazushi Aoyama (Kyoto Univ.)  
*“Broken translational symmetry in superfluid  $^3\text{He}$  confined in narrow cylinders”*
- P02** (cancelled)
- P03** Ryo Hanai (Keio Univ.)  
*“Precursor of the Nambu-Goldstone mode in a non-equilibrium strongly interacting Fermi gas”*
- P04** Hiroki Ikegami (RIKEN)  
*“Direct Detection of Chirality in Superfluid  $^3\text{He-A}$ ”*
- P05** Daisuke Inotani (Keio Univ.)  
*“Effects of collective excitations on single particle properties in a two-dimensional Dirac electrons system with a superconducting interaction”*
- P06** Shintaro Karasawa (Kyoto Univ.)  
*“Nambu-Goldstone bosons and the Higgs mechanism without Lorentz invariance”*
- P07** Kenichi Kasamatsu (Kindai Univ.)  
*“Atomic simulation of lattice gauge-Higgs model: Realization of lattice gauge model by atoms with dipole-dipole interaction”*
- P08** Kenichi Kasamatsu (Kindai Univ.)  
*“Nambu-Goldstone modes in phase-separated two-component Bose-Einstein condensate”*
- P09** Shinji Koshida (Univ. of Tokyo)  
*“Superfluidity of a Bose system in a non-uniform potential”*
- P10** Masaya Kunimi (Univ. of Electro-Communications)  
*“Metastable Spin Textures and Excitations of Spin-1 Bose-Einstein Condensates in a Ring Trap”*
- P11** Yoshihito Kuno (Nagoya Institute of Technology)  
*“Atomic simulation of lattice gauge-Higgs model: Phase diagram and time-evolution of atomic simulator”*

- P12** Haruhiko Kuroe (Sophia Univ.)  
*"First-Order Magnetic Raman Scattering from Pressure-Induced Higgs Mode through Second-Order Magnetic Raman Process"*
- P13** Giacomo Marmorini (RIKEN)  
*"New results for quantum antiferromagnets in high magnetic fields"*
- P14** Takeshi Mizushima (Okayama Univ.)  
*"Anderson-Higgs modes of superfluid  $^3\text{He}$  confined in a restricted geometry"*
- P15** (cancelled)
- P16** Yuya Nakagawa (ISSP, Univ. of Tokyo)  
*"Flux quench in the  $S = 1/2$  XXZ chain"*
- P17** Yusuke Nakamura (Waseda Univ.)  
*"Quantum state for Nambu-Goldstone mode of Bose-Einstein condensate"*
- P18** Takeru Nakayama (ISSP, Univ. of Tokyo)  
*"Tunneling Higgs mode and Nambu-Goldstone mode in Bose condensates in optical lattices"*
- P19** Shigeo Ohkubo (Univ. of Kochi / RCNP Osaka Univ.)  
*"Alpha particle condensation in light nuclei"*
- P20** Naoyuki Sakumichi (RIKEN)  
*"Lee-Yang cluster expansion approach to the BCS-BEC crossover"*
- P21** Takahiro Sakurai (Kobe Univ.)  
*"High-pressure ESR measurement of spin gap system and future prospects for Higgs mode research"*
- P22** Keiya Shirahama (Keio Univ.)  
*"Higgs Modes in Superfluid Helium  $^3$ "*
- P23** Daisuke A. Takahashi (RIKEN)  
*"Bogoliubov theoretical formulation for counting rule and dispersion relations of Nambu-Goldstone modes"*
- P24** Junichi Takahashi (Waseda Univ.)  
*"Nambu-Goldstone mode associated with a soliton and its dynamics"*



- P25** Akihiro Tanaka (National Institute for Materials Science)  
*“Axion physics in topological phases of condensed matter”*
- P26** Jun Tokimoto (Tokyo Univ. of Science)  
*“Higgs mode in a trapped superfluid fermi gas”*
- P27** Manuel Valiente (Heriot-Watt Univ.)  
*“Monopole mode in mesoscopic trapped Fermi gases”*
- P28** Daisuke Yamamoto (Waseda Univ.)  
*“Effects of phase and amplitude fluctuations on the ground state of a frustrated Bose-Hubbard system”*
- P29** Ryosuke Yoshii (YITP)  
*“Time crystal phase in a superconducting ring”*
- P30** Yu-Xiang Zhang (Univ. of Science and Technology of China / Institute for Molecular Science)  
*“Direct quantum process tomography”*