# Poster Session Summary

Tetsuo Shindou (Kogakuin University)

# Overview

- Yesterday evening (17:00-~~18:30~~19:10)
- There are 18 poster presentations.
- We have a lively discussions.
- The 10 of the poster presentations are students and the best poster award for students are selected. The result will be presented by the selection committee  just after this summary.

# Covered Topics

Many subjects are covered

- Theoretical studies on the Higgs sectors
  - Machida, Orikasa, Yu
- Features of extra dimension and SUSY models
  - Fujimoto,Hatanaka, Kakuda, Lee, Taniguchi
- Neutrino motivated physics
  - Eijima, Ishida,Kikuchi, Morita, Sharma,Takaesu,Yokoya
- DM, Baryogenesis, and Inflation
  - Kashiwase, Matsui, Takano

Some talks are inter-subjects

# Higgs sector

Models with extended Higgs sector are interesting

e.g. 2HDM is a well-studied benchmark scenario

Various motivations:
SUSY, DM,
Baryogenesis, Neutrino,
…

Discrete symmetry is often introduced to such extended Higgs sector

→ FCNC, DM, radiative seesaw, enhancement of EWPT,…

# Higgs sector

Theoretical studies on Higgs sector with $Z_2$

- The origin of the $Z_2$ symmetry (gauged U(1)):

"A Resolution of the Flavor problem of Two Higgs Doublet Models wit h an Extra $U(1)_H$ Symmetry for Higgs Flavor" by Chaehyun Yu (KIAS)

- Vacuum stability of SUSY extended Higgs sector with $Z_2$ (4HD+X models):

"Vacuum Stability of supersymmetric extended Higgs sector with a discrete symmetry" by Naoki Machida (Univ. of Toyama)

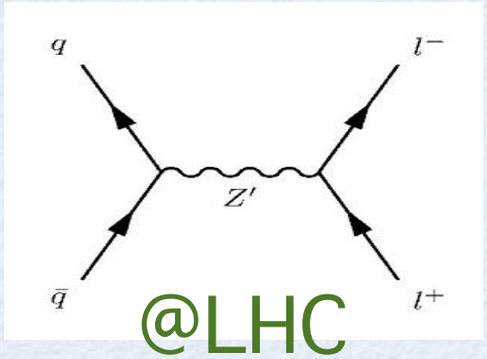
# Higgs sector

- Study on Electroweak symmetry breaking:

"Classically conformal B-L extended Standard Model and phenomenology" by Yuta Orikasa (Osaka Univ)

B-L symmetry is broken by CW mechanism

EW symmetry is broken by B-L Higgs vev




@LHC

$$\frac{\sigma(e^+e^- \to \gamma, Z, Z' \to \mu^+\mu^-)}{\sigma_{SM}(\sigma(e^+e^- \to \gamma, Z \to \mu^+\mu^-)} - 1$$

@ILC

# Extra dimension, SUSY

Extra dim and SUSY are interesting frameworks

- They can be a solution of Hierarchy problem
- Gauge Higgs unification, SUSY can provide a natural explanation of light Higgs
- Extra dimension is also interesting as a origin of flavor structure in matter sector
  - Alternative ideas to the flavor symmetries

# Extra dimension, SUSY

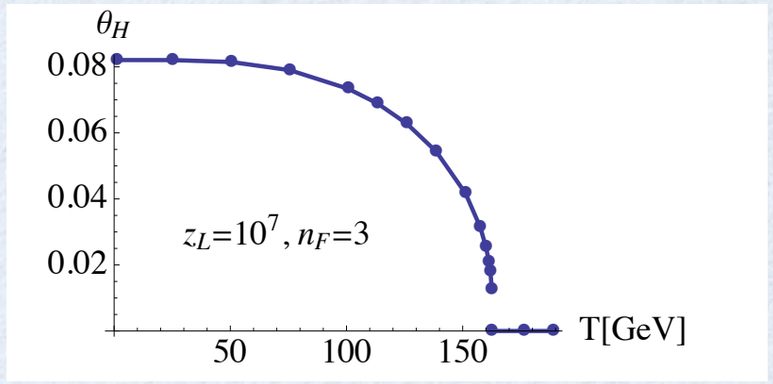
- Bound on the KK mass in UED models:

"Phenomenology of Universal Extra Dimensions at the LHC and Electroweak precision test" by Takuya Kakuda (Niigata Univ.)

- EWPT in Gauge Higgs Unification model:

"Thermal Phase Transition in the gauge-Higgs unification with 126GeV Higgs" by Hisaki Hatanaka (Osaka Univ.)

The weak ($\phi_c/T_c<1$)1st order EWPT is realized



# Extra dimension, SUSY

- SUSY Grand Gauge Higgs Unification model:

"Higgs phenomenology of the supersymmetric grand gauge unified theory with the Hosotani mechanism" by Hiroyuki Taniguchi (Univ. of Toyama)

TeV scale adjoint multiplets contributions can be tested

- CP and flavour mixing in 5D model on the circle:

"CP phase from Higgs's boundary condition" by Yukihiro Fujimoto (Kobe Univ.)

# Extra dimension, SUSY

- A SUSY breaking mediation mechanism:

"Is there something missing in the MSSM?" by Jae Yong Lee(Korea Univ.)

# Neutrino mass

Parameters at low energy scale are not fixed yet:

CP phases(Dirac and Majorana), mass hierarchy (NH? IH?), absolute scale of the mass, Dirac or Majorana?

$\sin^2\theta_{13} \sim 0.1$ is observed

Neutrino mass is another window to the physics beyond the Standard Model

Smallness of the neutrino mass is from heavy mass suppression? or loop suppression? or …?

Why so different from the quark sector?

Many interesting models are discussed

# Neutrino mass

- Reactor experiments and mass hierarchy:

"Determination of mass hierarchy with medium baseline reactor neutrino experiments" by Yoshitaro Takaesu (KIAS)

We can know the MH with 20GW, 5kton, 50km BL, good energy resolution,5years data

- Mass matrix with discrete symmetry (IH/QD):

"Partial Mass Degenerated Model and Spontaneous CP Violation in the Leptonic Sector" by Hiroyuki Ishida (Maskawa institute for science

# Neutrino mass

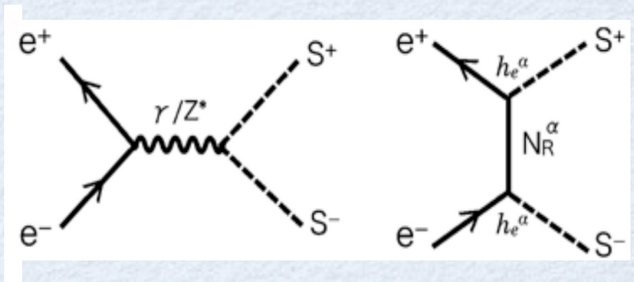
- A Neutrino mass model based on U(1) sym.

"Neutrino Mass and Proton Stability in a $U(1)_R$ symmetric model" by Yusuke Morita (Niigata Univ.)

- Collider pheno. of radiative seesaw models

"Direct probe of Majorana and extended Higgs particles in radiative seesaw models at the ILC" by Hiroshi Yokoya (Univ. of Toyama)

ILC (with $e^-e^-$ option) is the best machinery to probe these models.



# Neutrino mass

- Study of LHC signals of triplet Higgs

"Same-sign Tetra Leptons from type II seesaw at the LHC" by Pankaj Sharma (KIAS)

- Detectable deviation at ILC due to triplet Higgs:

"Radiative corrections to the Higgs coupling constants in the Higgs triplet model" by Mariko Kikuchi (Univ. of Toyama)

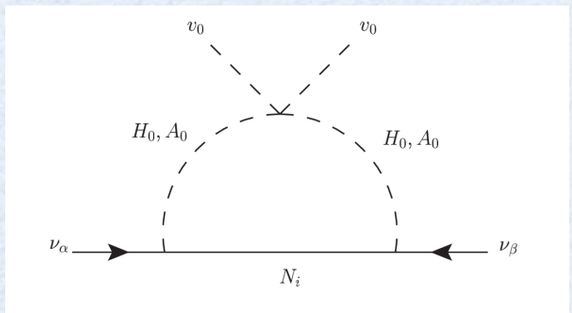
# Cosmological Problems

Extension of the SM is strongly required by cosmological problems such as DM, Baryogenesis, Inflation, …

Sometimes solutions are provided in neutrino mass generation models

Radiative seesaw in inert model → Dark matter candidate

Type I seesaw → Leptogenesis



# Cosmological Problems

- Exp. consequences on model with $M_N < m_K$

"Probing origins of neutrino masses and baryon asymmetry in kaon decays" by Shintaro Eijima (Niigata Univ.)

- Collider pheno. of Higgs inflation scenario

"Testability of Higgs inflation in a radiative seesaw model" by Toshinori Matsui (Univ. of Toyama)

In order to realize the Higgs inflation, DM abundance, and neutrino masses, parameter space is strongly restricted. → Prediction power is strong

ILC can test it!

# Cosmological Problems

Radiative seesaw scenario in inert doublet model

- DM, leptogenesis, and neutrino mass:

"Baryon number asymmetry and dark matter in the neutrino mass model with an inert doublet" by Shoichi Kashiwase (Kanazawa Univ.)

- In the case with multiple DM candidates:

"Multi-Component Dark Matter Systems and Their Observation Prospects", Hroshi Takano (Kanazawa Univ.)

e.g. $Z_2 \times Z_2$ case, SUSY Ma model

Multiplicity can significantly affect the relic abundance in some cases

# Summary

- We hope that there is some kind of New Physics within our reach, ~O(TeV)
- Problems in the SM such as hierarchy problem, neutrino masses, DM candidate, Baryogenesis, … are very strong hint for going to more fundamental picture.
- In particle physics, there is no subject which is decoupled from the Higgs physics

# Summary

Thank you very much
for the nice poster presentations
and
quite lively discussion in the session!!

# Best Poster Award

The selection committee members:

H.E. Haber(chair), A. Djouadi, M. Krawczyk, Y. Hosotani