

# PCS NEWSLETTER

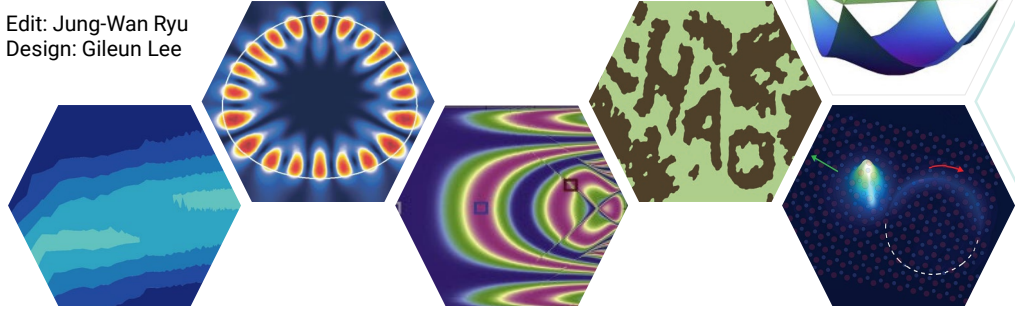


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November 2024

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## Member news

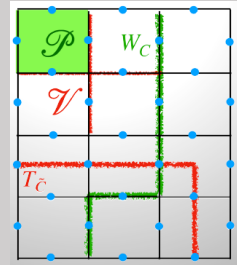


Congratulations!

**Dr. Kyoung-Min Kim** was selected as **Leader of a new Independent Research Group (JRG)** at the Asia Pacific Center for Theoretical Physics (APTCP).

## PCS Workshops and Meetings

PCS will run and host [International Workshop on Effective Field Theory Beyond Ordinary Symmetries](#) on December 2 – December 6, 2024



## PCS IBS Seminars

[“Shuttling of flying qubits”](#)

by Sunhun Park, PCS IBS, Korea (October 15)

[“Irreversibility & Inference: Classical & Quantum Reverse Processes via Bayesian Inversion”](#)

by Clive Cenxin Aw, National University of Singapore, Singapore (October 17)

[“A study of neutron star property based on the PDM-NJL crossover model”](#)

by Masayasu Harada, Nagoya University, Japan (October 22), *IBS Physics Colloquium @ Daejeon*

[“Are we on the way to the room temperature superconductivity?”](#)

by Boris Altshuler, Columbia University, USA (October 24)

[“Nanomechanical two-dimensional cat states generated by a dc voltage-driven Cooper pair box”](#)

by Leonid Gorelik, Chalmers University of Technology, Sweden (October 29)

[“The Leverage of Nuclei in the Cosmos”](#)

by Michael S. Smith, Stellar Science Solutions LLC, USA (October 30), *IBS Physics Colloquium @ Daejeon*

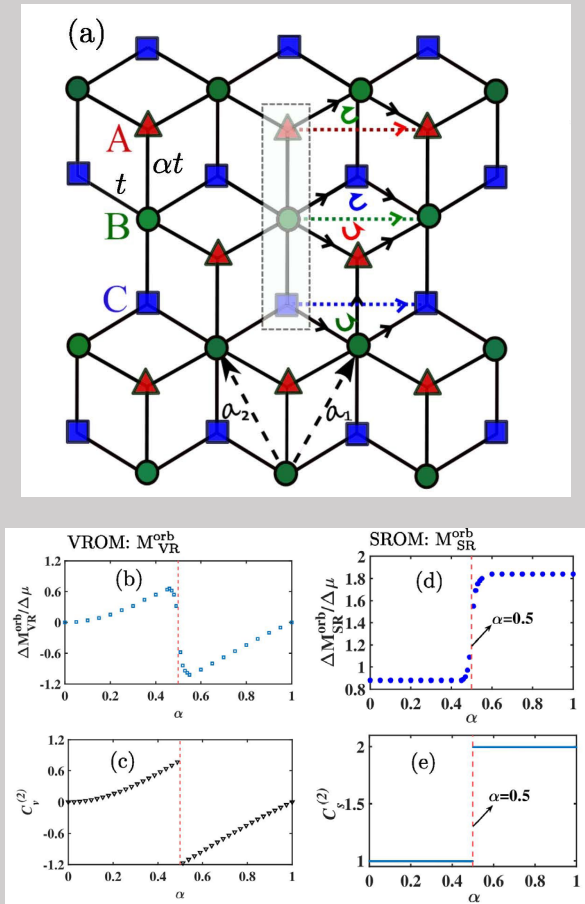
You can find more seminars on [this page](#).

Orbital magnetization senses the topological phase transition in a spin-orbit coupled  $\alpha$ - $T_3$  system

Lakpa Tamang, Sonu Verma, and Tutul Biswas

[Phys. Rev. B 110, 165426 \(2024\)](#)

The  $\alpha$ - $T_3$  system [Fig. (a)] undergoes a topological phase transition (TPT) between two distinct quantum spin-Hall phases across  $\alpha=0.5$  when the spin-orbit interaction of Kane-Mele type is taken into consideration. As a hallmark of such a TPT, the authors find that the Berry curvature and the orbital magnetic moment change their respective signs across the TPT. They also find the trails of the TPT in another physical observable, namely, the orbital magnetization (OM) that can, in principle, be detected experimentally through the circular dichroism associated with optical absorption. The topological features of the OM are understood in terms of valley and spin physics. The valley-resolved OM (VROM) and the spin-resolved OM (SROM) exhibit characteristics similar to the valley and the spin Chern number, which are clear from Figs. (b), (c) and Figs. (d), (e), respectively. It is further seen that a definite spin-valley optical selection rule governs the circular dichroism. The  $k$ -resolved degree of the optical polarization and the low-frequency differential optical absorbance manifest sign change across the TPT. The authors discuss experimentally viable signatures of various quantum spin-Hall phases in the optical absorbance.



Puzzle of the Month

October puzzle solution:

$x=8, y=5$ .

The correct solutions were sent in (after applying the time ordering operator):  
Ihor Vakulchyk, Victor Kagalovsky, Oleg Utesov. Congratulations!

November puzzle:

An airplane (with infinite fuel supply) starts on the equator indirection north east 60 degrees with velocity  $v$ . When will it cross the equator again?

Send your solution to [eun@ibs.re.kr](mailto:eun@ibs.re.kr)  
The winner will be announced in the next issue.