宇宙地球フロンティア実地研修 報告書

Report for Onsite Training in Earth-Space Frontier Science

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Institute for Basic Science, Daejeonにおいて開かれた、Kavli Asian Winter School on Strings, Particles and Cosmologyにて素粒子論、宇宙論についての講義をオンラインで受講した。受講した講義は 4 つで、 各 3,4 回であった。

1. Black holes and quantum error correction – Chris Akers

AdS/CFTの基本的な導入から始まり、AdS/CFTの状態の対応を決めるうえで重要な手法であるHKLL reconstruction、Quantum Extremal Surface (QES) Formulaについて学んだ。

2. Multiparty entanglement in many-body systems – Shinsei Ryu

2　サイト状態のentanglement　entropyを計算する手法やcanonical　purificationと呼ばれる手法を使った reflected entropyの導入を学んだ。

3. The Quantum Gravity Landscape and the Swampland – Cumrun Vafa

swamplandの予想と標準模型の拡張への応用をいくつか学んだ。

4. Non-invertible symmetry in 3+1d – Kantaro Ohmori

対称性をtopological operatorの側面でとらえなおし、non-invertible symmetryへ拡張する手法を学んだ。

I took lectures online in Kavli Asian Winter School on Strings, Particles and Cosmology held at Institute fo Basic Science, Daejeon. I took 4 lecture serieses, each separated into 3 to 4 classes, about high-energy physics and cosmology.
1. Black holes and quantum error correction – Chris Akers
I learned the dictionary between states in AdS/CFT, such as HKLL reconstruction and Quantum Extremal Surface Formula.
2. Multiparty entanglement in many-body systems – Shinsei Ryu
I learned how to compute the entanglement entropy of 2-sites states and the difinition of reflected entropy using canonical purification.
3. The Quantum Gravity Landscape and the Swampland – Cumrun Vafa
I learned some statements of swampland conjecture and applications of them to beyond standard model.
4. Non-invertible symmetry in 3+1d – Kantaro Ohmori
I learned the extension of the concept of symmetries to non-invertible symmetries in terms of the topological operators.