東北大学 宇宙創成物理学国際共同大学院プログラム



**GPPU** Seminar

## 2) "Cosmic very small dust grains as a natural laboratory of mesoscopic physics"

## by Kenji Amazaki (Tohoku University) Time and Date: 15:00-17:00, April 18, 2025 Place: Room 745, Science Complex B (H-03) (hybrid)

**Registration:** "https://us02web.zoom.us/meeting/register/77KIFvPIRBS2cvp4EswOqw"

When viewed from Earth, the entire sky is covered by Galactic interstellar dust, which absorbs, scatters, and re-emits light across a broad spectral range from millimeter waves to ultraviolet. Among these, nanoscale very small grains (VSGs)—containing 10<sup>2</sup> to 10<sup>4</sup> atoms—are "mesoscopic" systems with unique thermal and optical properties. For example, at low temperatures, the quantization of energy levels limits the number of thermally accessible states, making it difficult to describe thermal properties using the conventional thermodynamical temperature. In this study, we construct a new emission model for carbonaceous VSGs by incorporating mesoscopic physics. We applied the method of energy level statistics to account for the effect of free electrons, which contribute to the thermal emission at low temperatures. We found that the spectral energy distribution of carbonaceous VSGs exhibits an excess emission at wavelengths beyond the submillimeter range. The observational implications of this result will be discussed. Interstellar dust—being extremely cold and isolated—provides an ideal environment to study mesoscopic physics. The future high-precision observational data will enable us to explore the detailed properties of interstellar dust that have previously been overlooked.

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