

博士論文公聴会の公示（物理学専攻）

学位申請者： 横矢 毅

論文題目： Analysis on entanglement entropy for two-dimensional lattice gauge theories with matter fields（物質場のある二次元格子ゲージ理論におけるエンタングルメント・エントロピーの解析）

日時： 2018年2月5日（火） 10:30 - 12:00

場所： 理学研究科 H棟7階セミナー室（H701号室）

主査： 橋本幸士

副査： 飯塚則裕、兼村晋哉、山口哲、湯川諭

論文要旨：

We study entanglement entropy for 2-dimensional lattice gauge theories with matter fields. For gauge theories, even in lattice space we fail to define entanglement entropy as usual way due to non-local excitations characteristic of theories with constraints. To solve this problem, we apply extended Hilbert space formalism and define entanglement entropy in the generalized way. At first we review the formulation and outcomes by using it. As a result, in addition to ordinary quantum correlation (Bell pair part), two new types of contribution we call Shannon part and color part, will appear. After outlining this effect explicitly, we analyze entanglement entropy of the ground state for 2-dimensional $SU(N)$ gauge theory with fundamental scalar matter field. As tools to perform that, we use transfer matrix method and hopping parameter expansion(HPE), roughly the hopping parameter corresponds to inverse square of the mass for the matter. The evaluation is carried out in the perturbation from infinity mass limit. In the analysis, we observe that all of the three types of contribution emerge, while Bell pair part does in higher order than Shannon and color part. We discuss the implication by the result.