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Anomalously Localized States at the Anderson Transition HIDEAKI OBUSE, Condensed Matter Theory Laboratory, RIKEN, Wako, Saitama 351-0198, Japan, KOUSUKE YAKUBO, Department of Applied Physics, Graduate School of Engineering, Hokkaido University, Sapporo 060-8628, Japan — Anomalously localized states (ALS) at the critical point of the disorder induced metalinsulator transition, namely, the Anderson transition, are investigated. ALS are states in which most of amplitudes of a wave function concentrate on a narrow spatial region even in a metallic phase. While the existence of ALS in the metallic phase was analytically predicted and confirmed by numerical and experimental works, ALS at the critical point are far from understood due to lack of proper analytical methods describing critical phenomena of this phase transition. In this work, it is numerically shown that ALS exist at the critical point of the Anderson transition in both the three-dimensional orthogonal class and the two-dimensional symplectic class by quantifying non-multifractality of critical wave functions due to a characteristic length originating in their concentration nature of ALS. These results may suggest that the existence of non-multifractal states at criticality is generic in many disordered systems.

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