TEP Seminar

UCLA

Tuesday, February 15th @ 4pm
Virtual- Zoom

"What is the iε for the S-matrix?"

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Can the S-matrix be complexified in a way consistent with causality? Since the 60's, the affirmative answer to this question has been well-understood for 2→2 scattering of the lightest particle in theories with a mass gap, where the S-matrix is analytic everywhere except at normal-threshold branch cuts. We ask whether this picture extends to realistic theories, such as the Standard Model, that include massless fields, UV/IR divergences, and unstable particles. Especially in the presence of light states running in the loops, the traditional iε prescription for approaching branch cuts breaks down, because causality requirements for the individual Feynman diagrams can be mutually incompatible. To fix this issue, we propose an iε-like prescription for deforming branch cuts in the space of Mandelstam invariants without modifying the analytic properties. This procedure results in a small complex strip around the real slice of the kinematic space, where the S-matrix remains causal.