

Some Analyticity Properties Arising from Asymptotic Completeness in Quantum Field Theory

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Abstract. It is well-known that two-particle unitarity of the S-Matrix in quantum field theory implies (modulo regularity assumptions) second sheet analyticity for the 2-body scattering amplitude. Here this is first used to prove off-mass-shell analyticity for the 4 point function in a complex neighborhood of any real mass-shell point under the 3-particle threshold. Then this is applied to the study of the 5 and 6-point functions near the real mass-shell of $2 \rightarrow 3$ and $3 \rightarrow 3$ processes below the 4-particle threshold: the results are those suggested by perturbation theory apart from the 3-particle cut and away from some submanifolds. The advantage of this method, which could presumably be extended to the exploitation of n -particle unitarity, is that the regularity assumptions only refer to the physical scattering amplitudes.

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Introduction

The primary source of analyticity of Green functions in quantum field theory consists of the geometric properties arising from locality and the spectral condition. However it has been known for a very long time [1–3] that the assumption of asymptotic completeness entails a considerable improvement of these analyticity