



Doctoral Thesis

Forward dispersion relations for alpha-alpha scattering and alpha-carbon-12 scattering

Author(s):

Fang-Landau, Shyh-rong

Publication Date:

1972

Permanent Link:

<https://doi.org/10.3929/ethz-a-000089150> →

Rights / License:

[In Copyright - Non-Commercial Use Permitted](#) →

This page was generated automatically upon download from the [ETH Zurich Research Collection](#). For more information please consult the [Terms of use](#).

Diss. Nr. 4931

**Forward Dispersion Relations for Alpha
- Alpha Scattering and Alpha -
¹²Carbon Scattering**

a Dissertation submitted
to the
Swiss Federal Institute of Technology
Zürich

for the degree of
Doctor of Natural Sciences

Presented by

Shyh-rong Fang-Landau
M. S. Physics (University of Massachusetts)
born 29. 10. 1943
Citizen of China

Accepted on the recommendation of
Prof. Dr. C. Schmid
Prof. Dr. K. Hepp

aku-Fotodruck
Zürich
1972

Abstract.

Forward dispersion relations are applied to the study of alpha alpha and alpha - ^{12}C scattering. For alpha alpha scattering, the unphysical region is dominated by exchange channel poles, normal and anomalous cuts. Contributions from these singularities are discussed, and a least square fit to the unphysical region contribution is found using either three effective poles or two effective poles and a model calculation for the anomalous cut. These two parametrizations turn out to have a very similar energy dependence in the physical region. Coulomb corrections to the phase shifts, cross sections, and discrepancy functions are calculated and shown to play an important role. After Coulomb corrections the ^8Be ground state becomes a bound state and is represented by a pole at 0.1 Mev (lab) below threshold. It contributes about half of the unphysical region contribution at moderate energies above threshold. An effective pole representing primarily the two pion cut is relatively unimportant, while the remainder of the unphysical region contribution is simulated by a pole very close to the $\text{N-N-}^3\text{He}$ anomalous branch point, or by an effective anomalous cut contribution with branch point near the $\text{N-N-}^3\text{He}$ threshold. For alpha ^{12}C scattering the results are preliminary. Direct channel ^{16}O poles give the dominant contributions from the unphysical region. Improved experimental data on ^{16}O reduced alpha particle widths are needed for a reliable dispersion calculation.