Summary. — Starting from data on \( \pi K \) scattering in the physical region, we perform an analytic continuation to the unphysical region of the \( \pi \pi \rightarrow K\bar{K} \) scattering. For this we write dispersion relations on hyperbolic curves that connect \( t \)- with \( s \)-channel and are asymptotically in the physical regions. We determine the \( \pi \pi \rightarrow K\bar{K} \) \( p \)-wave for \( 4m_{\pi}^2 < t < (m_{\pi} + m_{\omega})^2 \) and a value of the coupling constant \( g_{pK\bar{K}} \) which is consistent with the \( SU_{3} \) prediction.

1. Introduction.

From the knowledge of the structure of the \( \pi \pi \rightarrow K\bar{K} \) amplitudes below \( K\bar{K} \) threshold (in the region of extended unitarity) one may obtain further information of relevance to other scattering processes. For instance from the \( p \)-wave one can obtain values for the \( pK\bar{K} \) coupling constant and for the imaginary part of the isovector contribution to the electromagnetic kaon form factor. Like in the kinematically similar process \( \pi\pi \rightarrow N\bar{N} \) \(^{(1)}\) the information on \( \pi \pi \rightarrow K\bar{K} \) can be obtained from physical \( \pi K \) scattering data with the help of an analytic continuation. Contrary to \( \pi N \)—which can be measured directly

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in the experiment—the πK scattering data are constructed by extrapolating KB → KπB scattering data (here B denotes a baryon, e.g. the proton) to the one-pion exchange pole. That procedure gives rise to large uncertainties in the results; this may be the reason why there have been only few attempts (2-4) to determine ππ → KKK amplitudes in the pseudophysical region with the help of dispersion relations from πK input, only two of them extracting p-waves (2-4).

In the meantime, there have been new experiments and analyses (e.g. (5-8), for a more complete list cf. (9)). Because of the relatively broad error band of the πK amplitudes, it is preferable to work with dispersion relations on curves that directly connect the physical πK region with the ππ → KKK region thereby minimizing the distance of continuation.

Hyperbolae provide a simple and efficient example of these curves. They may be chosen to lie asymptotically inside the physical regions and to run only through those parts of Mandelstam’s plane where partial-wave series still converge.

We introduce our notation in sect. 2 and discuss our choice of curves in sect. 3. The choice of input data, the estimation of the errors and the results for the ππ → KKK p-wave are all discussed in sect. 4, until we draw some conclusions in the last sect. 5.

2. Notation and parametrization.

For further details of the notation compare ref. (9). The t-channel amplitudes for ππ-KKK with isospin I = 0, 1 are represented through partial waves:

\[ A^I_i(s, t) = \sqrt{2} \sum_{\text{even } l \text{ for even } I} (2l + 1)(p_1 q_1)^l a^I_i(t) P_l(z), \]

where \( p = (t/4 - \mu^2)^{1/2} \) and \( q = (t/4 - M^2)^{1/2} \) are the pion and the kaon (*)

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(*) Throughout the paper we abbreviate \( m_\pi = \mu \) and \( m_K = M \). Wherever units are omitted we use \( m_\pi^2 = 1 \).