This is a review submitted to Mathematical Reviews/MathSciNet.

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Title: Explicit formulas for the Schrödinger wave operators in $\mathbb{R}^2$.

MR Number: MR3089680

Primary classification: 81U20

Secondary classification(s): 35P25 47A40

Review text:

In the majority of textbooks on quantum physics, the apparently straightforward presentation of quantum scattering proceeds via wave operators $W_\pm$ defined in terms of certain limits of resolvents. It is well known (cf., e.g., [25]) that the underlying rigorous mathematical analysis is fairly subtle. In this context, the MS in question underlines the relevance of some of these subtleties, taking, for the particularly difficult correct description of the centrally asymmetric scattering in two-dimensional space, advantage of important assumptions of a quick growth of the interaction potential ($|V(x)| \leq \text{Const.}\,(1+|x|)^{-\sigma}$ with $\sigma > 11$ for almost every $x \in \mathbb{R}^2$) and of a "generic" absence of eigenvalues or of resonances at zero energy. The main result (theorem 1.1) are formulae $W_- = 1 + R(A)(S-1) + K$ in $B(\mathcal{H})$ (bounded operators - plus a similar one for W_+) where symbol A stands for the generator of dilations in $\mathbb{R}^2$ while $R(A) := \frac{1}{2}\,(1+\tanh(\pi A/2))$. The compactness of K (from an ideal) is emphasized to establish connections to the reinterpretation of the Levinson's theorem as an index theorem.