

卒業論文要旨

Approximation scheme for singular delta-prime potential in Schoedinger equation using finite potential consisting of box-type functions

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シュレディンガー方程式におけるデルタ＝プライム特異ポテンシャルを箱型関数からなる有限ポテンシャルで近似する方法について

The Schrödinger equation with three near-by delta functions

$$-\frac{1}{2} \frac{d^2 \varphi(x)}{dx^2} + v_0 \delta(x+a) + u_0 \delta(x) + v_0 \delta(x-a) = E \varphi(x)$$

With appropriate scaling of v_0 and u_0 , in $a \rightarrow 0$, produces the delta-prime connection condition

$$\begin{cases} \frac{d \varphi(0_+)}{dx} - \frac{d \varphi(0_-)}{dx} = 2(2v_0 + u_0) \varphi(0_-) \\ \varphi(0_+) - \varphi(0_-) = 0 \end{cases}$$

Let $D(x)$ be a rectangle function of width b and height $1/b$ with its center placed at $x=0$. We show, analytically and tnumerically, that the potential $v_0 D(x+a) + u_0 D(x) + v_0 D(x-a)$ reproduce the above connection condition by taking the limits $a \rightarrow 0$ and $b \rightarrow 0$, under the condition that b converges faster than a^2 .

Reference: T. Cheon, T. Shigehara, Phys. Lett. A 243 (1998) 111-116