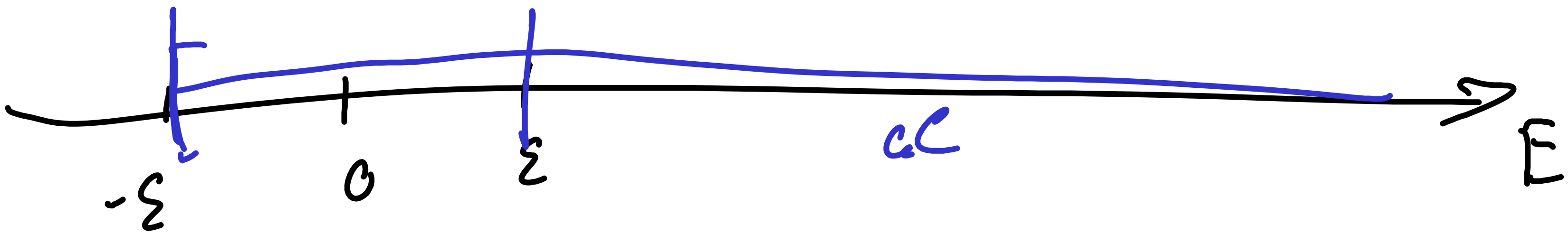
$$\varepsilon \sigma^3 = \varepsilon \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix} \qquad \sigma_1 = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} \quad \sigma_2 = \begin{pmatrix} 0 & -i \\ i & 0 \end{pmatrix}$$

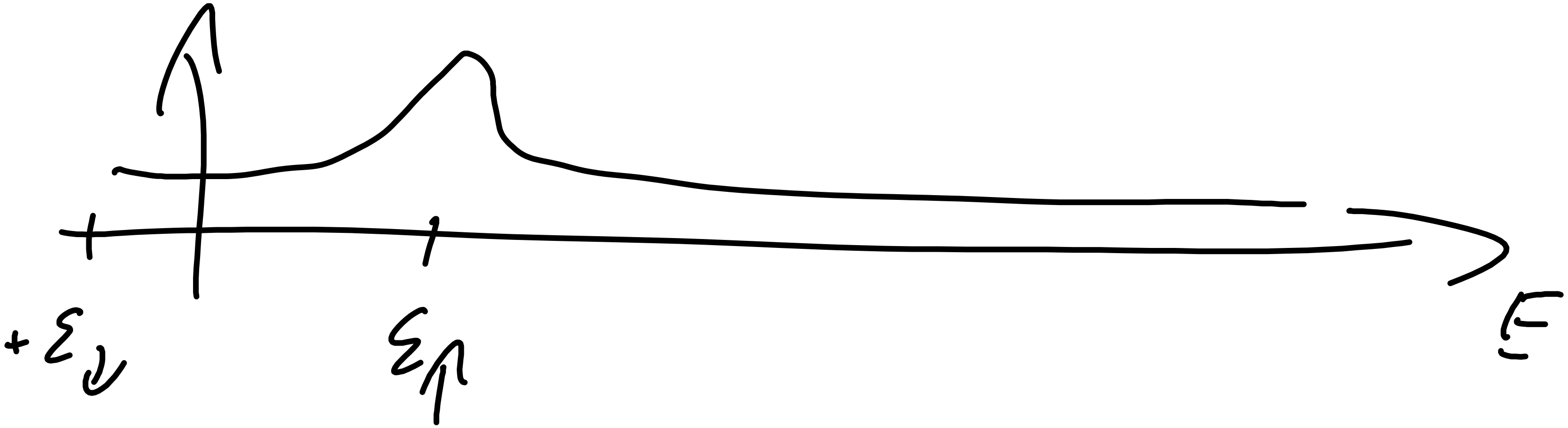
$$H_0 = \underbrace{\varepsilon \sigma^3}_{H_{el}} \otimes \mathbb{1} + \mathbb{1} \otimes \underbrace{\int d^3k \; a^*(k)\, \omega(k)\, a(k)}_{H_f}$$

$$\sigma(H_f) = [0, \infty)$$

$$\sigma(H_{el}) = \{\pm \varepsilon\}$$

$$\sigma(H_0) = [-\varepsilon, \infty)$$





$$\sigma^{\pm} = \frac{1}{2}(\sigma_1 \mp i\,\sigma_2)$$

$$\sigma^{+}\,|\downarrow\rangle = |\uparrow\rangle$$

$$\sigma^{+} = \begin{pmatrix} 0 & 1 \\ 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 & 1 \\ 0 & 0 \end{pmatrix}\begin{pmatrix} 0 \\ 1 \end{pmatrix} = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$

$u(k)$

$$\|u\|_\mu := \left(\int \frac{d^3k}{|k|^{3+2\mu}} \, |u(k)|^2 \right)^{1/2} < \infty$$

$\mu > 0$

spezielle Wahl

$$u(k) = \text{const.} \; |k|^{2\mu} \, e^{-\varepsilon |k|^2} \, , \qquad \varepsilon > 0$$

$$M = \begin{pmatrix} \overset{n\times n}{A} & B \\ C & \underset{m\times m}{D} \end{pmatrix}$$

Sei A invertierbar

$$\rightarrow |A| \begin{vmatrix} 1 & A^{-1}B \\ C & D \end{vmatrix} \rightarrow \begin{vmatrix} 1 & A^{-1}B \\ 0 & D - CA^{-1}B \end{vmatrix} |A|$$

$\rightarrow$ M invertierbar $\Leftrightarrow$ $D - CA^{-1}B$ invertierbar

formal $H = H_0 + W$ $\quad [P, H_0] = 0$

$$H \hat{=} \begin{pmatrix} P^\perp H P^\perp & P^\perp W P \\ P W P^\perp & P H P \end{pmatrix}$$

Annahme $P^\perp H P^\perp$ invertierbar

Vermutung $\Rightarrow$ H invertierbar $\Leftrightarrow$ $F_P(H) = PHP - PWP^\perp (P^\perp H P^\perp)^{-1}_{P^\perp} WP$

allgem. $H - z$ " $\Leftrightarrow$ $F_P(H-z) = P(H-z)P - PWP^\perp (P^\perp (H-z) P^\perp)^{-1}_{P^\perp} WP$

QED: Wahl von P z.B. Projektion auf Feldenergien kleiner < 1

$P = \chi[H_f < 1]$

$T \circ H^{(n)} = F_{p(n-1)}(H^{(n-1)}, T^{(n-1)})$

Projektoren P, Q $[P, Q] = 0$

$$F_P \circ F_Q = F_{PQ}$$

— $P^2 + P^{\perp 2} = 1$

— x vergeben

Funktionalkalkül $\bar{x} := \sqrt{1 - x^2}$

$$H^{-1} = Q_x \; F_x(H,T) \; Q'_x + \bar{x} \, H^{-1}_{\bar{x}} \, \bar{x}$$

$$F_x(H,T)^{-1} = x \, H^{-1} \, x + \bar{x} \, \bar{T}^{-1} \, \bar{x}$$

Wechselwirkungen

$$W_{m,n} P_{red} \int_{B_1^{m+n}} \frac{dK^{(m,n)}}{|K^{m,n}|^{1/2}} \; a^*(k^{(m)}) \, w_{m,n} [H_f, K^{m,n}] \, a(\tilde{k}^{(n)}) \, P_{red}$$

$$a^*(k^{(m)}) = a^*(k_1) \dots a^*(k_m)$$

$$|K^{m,n}| = |k_1| \dots |k_m| \cdot |\tilde{k}_1| \cdot \dots \cdot |\tilde{k}_n|$$

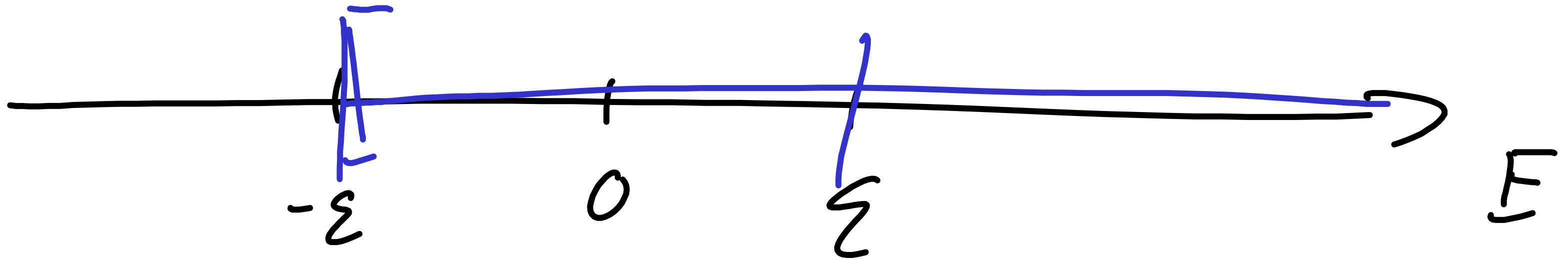
$\to$ allgemeine WW $\sum_{m,n} W_{m,n}$

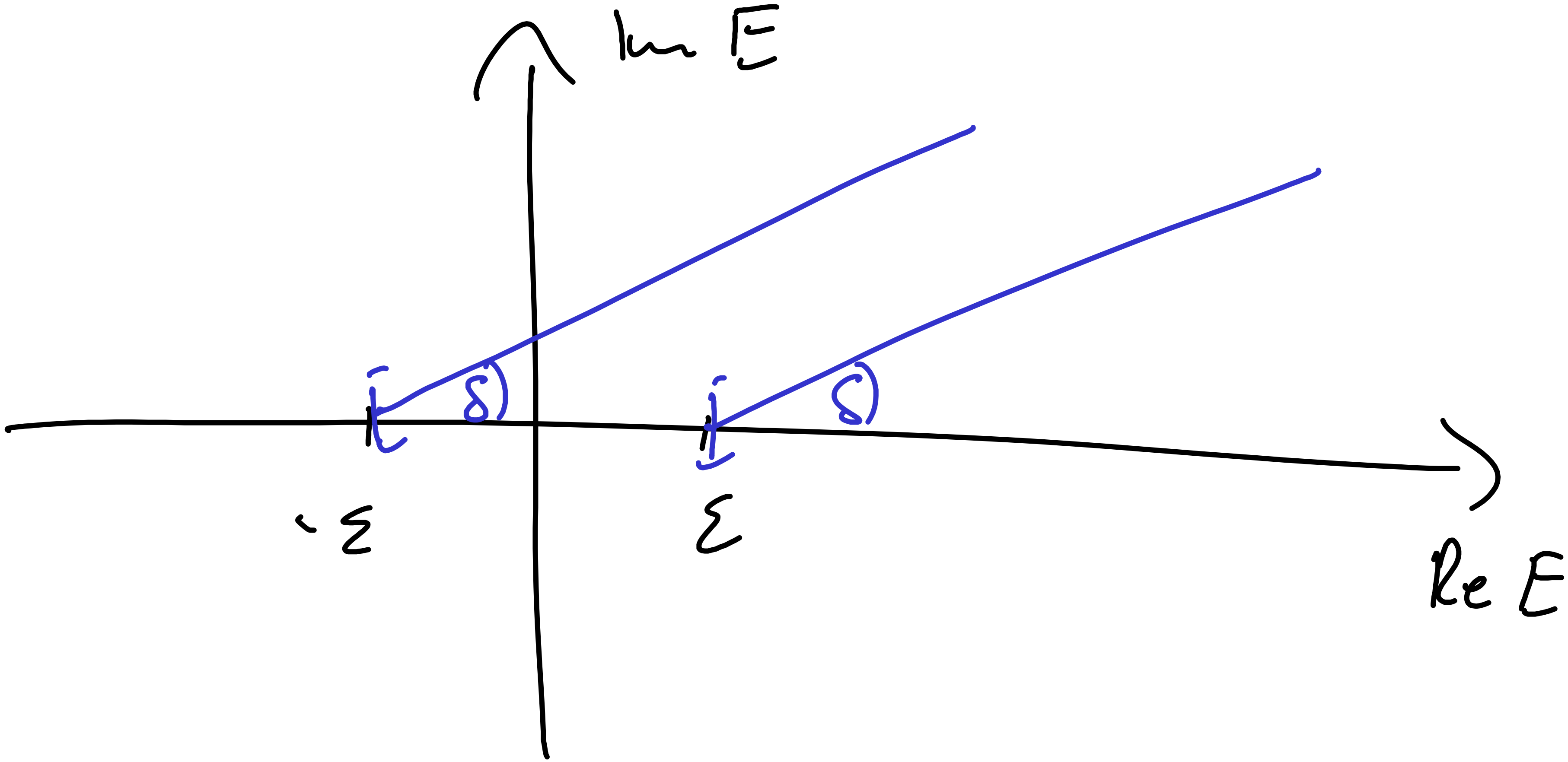
$$\| w_{m,n} \|_\mu \longleftrightarrow \| W_{m,n} \|_{\mathcal{H}_{red}}$$

1. Schritt

Projektion auf Unterraum von H_{el}

$$P = \begin{pmatrix} 0 & 0 \\ 0 & 1 \end{pmatrix} \quad \text{oder} \quad P = \begin{pmatrix} 1 & 0 \\ 0 & 0 \end{pmatrix}$$





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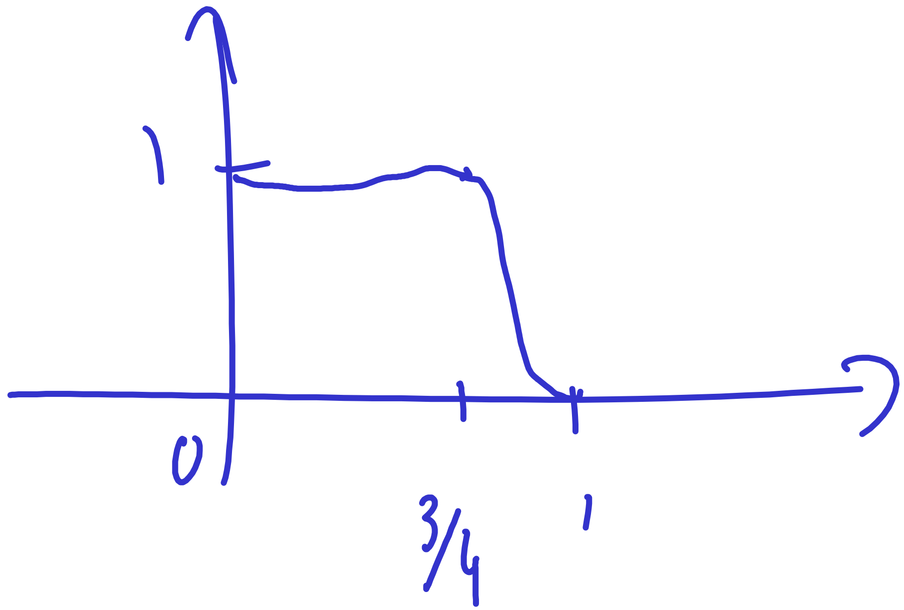

Wende $S_\varrho W$ an

$\Rightarrow \quad \|S_\varrho W\| \leq \varrho^{\mu} \|W\|$

$S_\varrho(E \cdot \mathbb{1}) \Rightarrow \frac{1}{\varrho} E^{<1}$

$$e_{(\alpha,\beta)} = \left(E_{\rho}^{-1}(\alpha) \circ \ldots E_{\rho}^{-1}(\beta) \right)(\pm \varepsilon)$$

$$\rightarrow \quad e_{(0,\infty)}$$