Matsubara representation

Hiroshi SHINAOKA

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\begin{aligned}
u^{\alpha}_{nl} &\equiv \frac{1}{\sqrt{2}} \int_{-1}^{1} dx\ e^{\mathrm{i}\pi\{n+(1/2)\delta_{\alpha,\mathrm{F}}\}(x+1)} u^{\alpha}_{l}(x), && (1)\\
&= \tilde{u}_{nl} + (-1)^{\delta_{\alpha,\mathrm{F}}+l} \tilde{u}^{*}_{nl}, && (2)\\
\tilde{u}^{\alpha}_{nl} &\equiv \frac{1}{\sqrt{2}} \int_{0}^{1} dx\ e^{\mathrm{i}\pi\{n+(1/2)\delta_{\alpha,\mathrm{F}}\}(x+1)} u^{\alpha}_{l}(x), && (3)\\
&= \sum_{s} \frac{\sqrt{\Delta x_s}}{2} \sqrt{p+\frac{1}{2}} e^{i\omega((x_{s+1}+x_s)/2+1)} \int_{-1}^{1} dx P_p(x) e^{i\omega \Delta x_s/2x}. && (4)\\
\int_{-1}^{1} dx P_l(x) e^{ia} &= 2 i^{l} j_l(a), && (5)\\
\omega &\equiv \pi\{n+(1/2)\delta_{\alpha,\mathrm{F}}\}. && (6)
\end{aligned}
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