

Multiparticle Creation Operator Wholeness Chart 10-2, pg 283

In the second and third rows, insert factors below with square roots in denominators.

$\begin{aligned} \phi_q, \phi_r, \dots\rangle &= (C_q C_r \dots) 0\rangle \\ &= \left(\sum_{\mathbf{k}} \frac{A_{q\mathbf{k}}}{\sqrt{n_{q\mathbf{k}} + 1}} a^\dagger(\mathbf{k}) \right) \left(\sum_{\mathbf{k}} \frac{A_{r\mathbf{k}}}{\sqrt{n_{r\mathbf{k}} + 1}} a^\dagger(\mathbf{k}) \right) (\dots) 0\rangle \\ &= \left \sum_{\mathbf{k}} A_{q\mathbf{k}} \frac{e^{-ikx_q}}{\sqrt{V}}, \sum_{\mathbf{k}} A_{r\mathbf{k}} \frac{e^{-ikx_r}}{\sqrt{V}}, \dots \right\rangle \end{aligned}$ <p style="text-align: center; margin-top: 5px;">where $n_{q\mathbf{k}}$ (or $n_{r\mathbf{k}}, \dots$) = number of \mathbf{k} momentum particles in ket when C_q (or C_r, \dots) operates</p>	$\begin{aligned} \phi_q, \phi_r, \dots\rangle &= (C_q C_r \dots) 0\rangle \\ &= \left(\int \frac{A_q(\mathbf{k})}{\sqrt{n_{q\mathbf{k}} + 1}} a^\dagger(\mathbf{k}) d^3k \right) \left(\int \frac{A_r(\mathbf{k})}{\sqrt{n_{r\mathbf{k}} + 1}} a^\dagger(\mathbf{k}) d^3k \right) (\dots) 0\rangle \\ &= \left \int A_q(\mathbf{k}) \frac{e^{-ikx_q}}{\sqrt{(2\pi)^3}} d^3k, \int A_r(\mathbf{k}) \frac{e^{-ikx_r}}{\sqrt{(2\pi)^3}} d^3k, \dots \right\rangle \end{aligned}$
$C_q = \sum_{\mathbf{k}} \frac{A_{q\mathbf{k}}}{\sqrt{n_{q\mathbf{k}} + 1}} a^\dagger(\mathbf{k})$	$C_q = \int \frac{A_q(\mathbf{k})}{\sqrt{n_{q\mathbf{k}} + 1}} a^\dagger(\mathbf{k}) d^3k$