

So suppose I have an interaction part:

$L_{\text{int}} = \frac{n^2}{M} ((\partial_\mu a_\nu) n^\mu a_\rho \partial^\nu a^\rho)$, a_ν some vector field & n^μ constant vector. Lagrangian (11) from attached Arxiv paper.

Rewriting

$$L_{\text{int}} = \frac{n^2}{M} \int d^4x_1 d^4x_2 d^4x_3 \delta(x-x_1) \delta(x-x_2) \delta(x-x_3) \frac{\partial}{\partial x_1^\mu} n^\mu \frac{\partial}{\partial x_{\nu 3}} a_\nu(x_1) a_\rho(x_2) a^\rho(x_3)$$

As per diagrammar's notations

$$a = \delta(x-x_1) \delta(x-x_2) \delta(x-x_3) \frac{\partial}{\partial x_1^\mu} n^\mu \frac{\partial}{\partial x_{\nu 3}}$$

and a 's Fourier form:

$$\tilde{a} \sim (k_1 n) k_3 \quad (\text{each derivative is replaced by its momentum})$$

And for Vertice I(k...) I get:

$$I \sim \sum_{\text{Some_permutations}} (k_1 n) k_3$$

So I am getting product of different momentums and in paper is given $(k_1 n) k_1$, $(k_2 n) k_2$, $(k_3 n) k_3$

Can you help me please what I do wrong?