Discussion on "Vacuum in Light-Front Quantization"

Jianwei Qiu

❑ Quantization:

A classical field theory ➡ **Infinite "quantum" field theories**

various quantization conditions, $[\phi(x), \phi^\dagger(y)]_{x^0=y^0} \propto \delta^3(x-y)$, …
at equal time, t, or at equal LC time x^+, …
add some constraints to the classical theory, …

Independent of any choice of Lorentz frame (IMF, …),
or coordinate system, (x, y, z, t) *or* $(x^+, x^-, \vec{x}^\perp)$*, …*

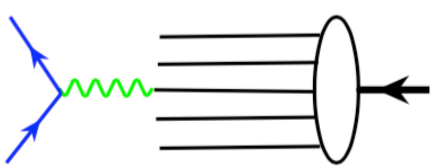
❑ Physical observables:

$\langle P, \sigma | \mathcal{O}(\phi, ...) | P', \sigma' \rangle$ ***Depend on both the "operator" and the "state"***

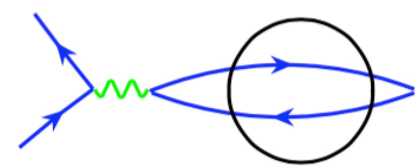
State: $|P, \sigma\rangle \propto \hat{O}(P, \sigma)|\Omega\rangle$ Depends on the "vacuum" $|\Omega\rangle$

Question: $\langle \Omega | \Omega \rangle_{quantum\ \ theory} = ?$ $|\Omega\rangle_{quantum\ \ theory} = ?$

❑ Lorentz frame – where the observer is:



Physical picture depends on frame



May help understand the approximation, …

❑ Coordinate system:

A "right" choice helps organize the calculation, approximation, presentation, …

t-ordered vs. x^+-ordered perturbation theory, which one converges better?