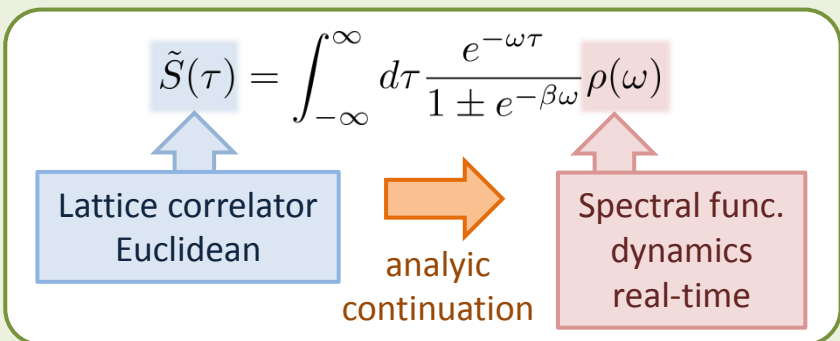


Examining real-time functions on the lattice using inverse propagator and self-energy

Masakiyo Kitazawa, Masayuki Asakawa (Osaka U.)

To investigate **dynamical properties** on the lattice, one has to take an analytic continuation:



Examining $\rho(\omega)$ contains large uncertainty.

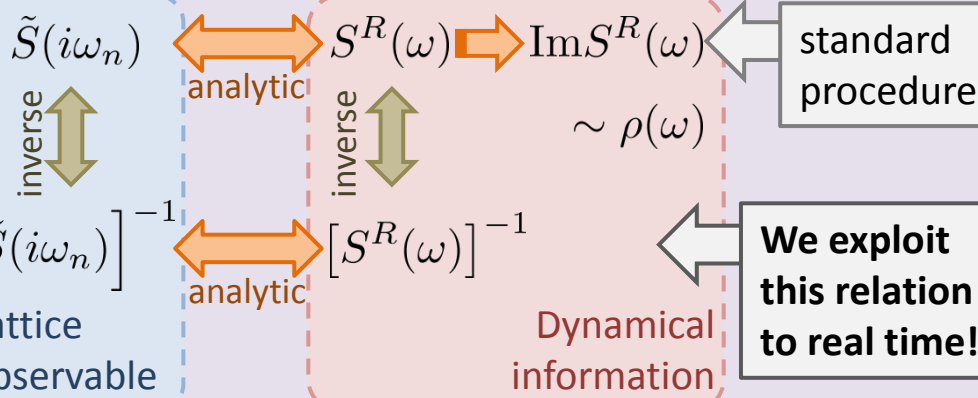
Complemental use of other formula would improve the predictions of real-time functions.

cf: sum rules?

Are there other useful functions besides $\rho(\omega)$?

We investigate **inverse propagator**.

Motivation



For elementary fields,

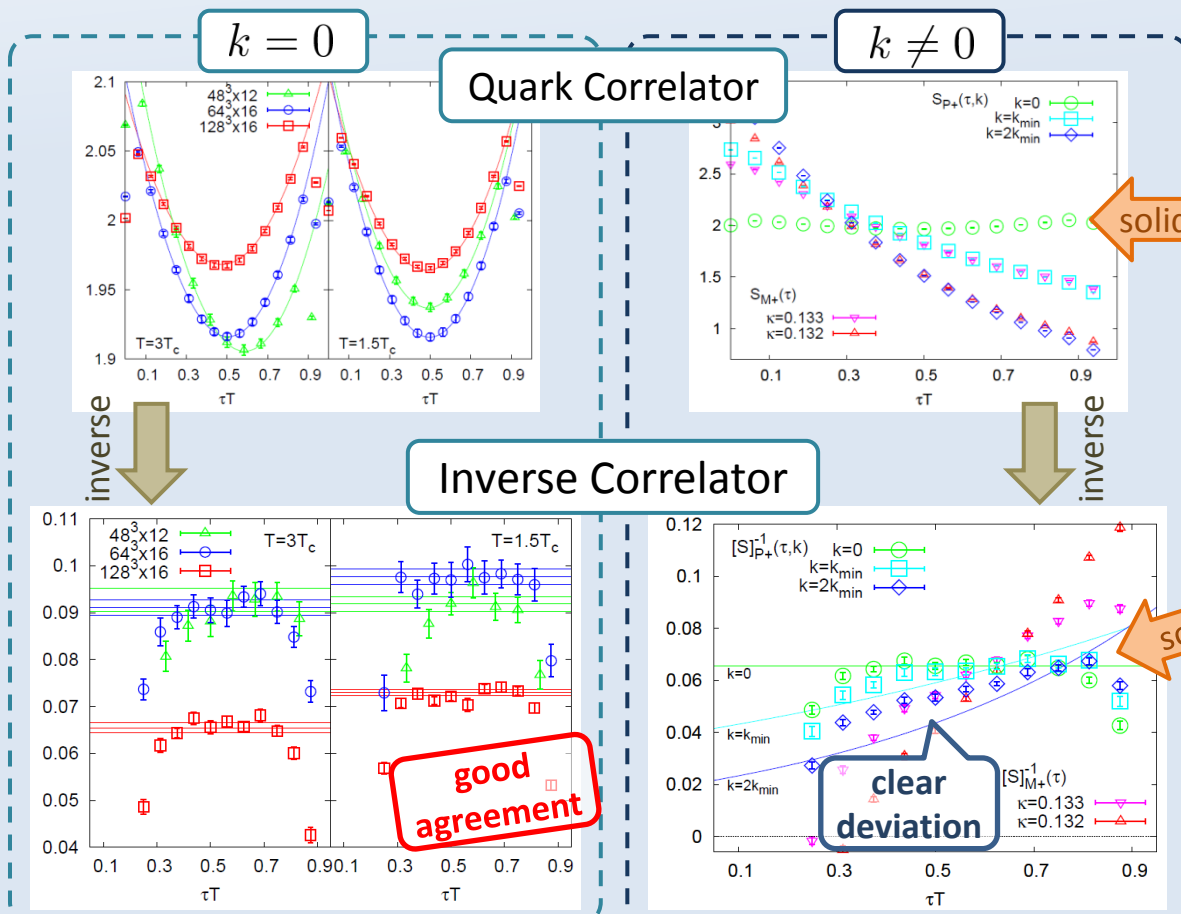
$$[S^R(\omega)]^{-1} = [S_0^R(\omega)]^{-1} - \Sigma(\omega)$$

$$[\tilde{S}(\tau)]^{-1} = -\frac{1}{\pi} \int_{-\infty}^{\infty} d\omega' \frac{e^{-\omega'\tau}}{1 \pm e^{-\beta\omega'}} \text{Im} \Sigma(\omega')$$

Below, we analyze inverse **quark** correlator.

Strategy

Numerical Results

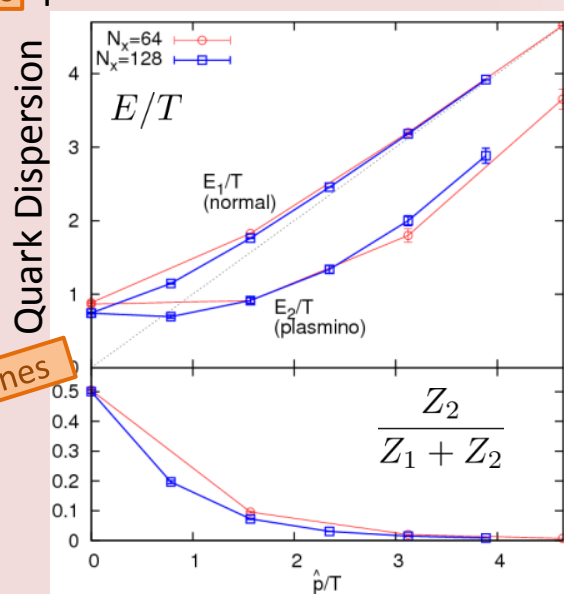


$k=0$: $[S]^{-1}(\tau)$ agrees with 2-pole prediction \rightarrow 2-pole ansatz supported
 $k>0$: $[S]^{-1}(\tau)$ deviates from 2-pole prediction \rightarrow Structure besides poles?

$$\rho_+(\omega) = Z_1 \delta(\omega - E_1) + Z_2 \delta(\omega + E_2)$$

fitting params: E_1, E_2, Z_1, Z_2

This ansatz well reproduces the quark correlator on the lattice.



Karsch, MK, '07, '09; MK, et al., in prep.

2-pole Ansatz for Quark SPC

Lattice Setting: clover Wilson, Landau gauge, chiral limit

| T/T_c | N_τ | N_σ | β | CSW | N_{conf} | κ_c | κ |
|---------|----------|------------|---------|--------|-------------------|-------------|----------|
| 3 | 16 | 128 | 7.457 | 1.3389 | 51 | 0.133999(9) | 0.1340 |
| | 16 | 64 | 7.457 | 1.3389 | 51 | 0.133999(9) | 0.1340 |
| | 12 | 48 | 7.192 | 1.3550 | 35 | 0.13454(3) | 0.1344 |
| 1.5 | 16 | 128 | 6.872 | 1.4125 | 44 | 0.134986(8) | 0.1350 |
| | 16 | 64 | 6.872 | 1.4125 | 51 | 0.134986(8) | 0.1350 |
| | 12 | 48 | 6.640 | 1.4579 | 51 | 0.13540(3) | 0.1354 |

A correlator which is consistent with a lattice result can be inconsistent with the inverse correlator. \rightarrow Inverse correlator can further constrain real-time functions!

Future: MEM analysis, meson propagator, comparison w/ analytic studies, etc.

Summary

