



# 19th International Conference on QCD in Extreme Conditions (XQCD 2023)

Contribution ID: 39

Type: **Talk**

## Hadron scatterings in small chemical potential

*Friday, July 28, 2023 2:50 PM (25 minutes)*

We discuss hadron scatterings in zero temperature and small chemical potential ( $\mu$ ). First, we derive the dispersion relation of a single hadron from the Euclidean-time dependence of the 2-point correlation function. It is found that the energy has linear behavior with respect to  $\mu$ . We then formulate the HAL QCD method in small  $\mu$ , where we extract scattering amplitudes via the interaction potentials. It indicates that the amplitude is independent of  $\mu$  for any scattering unless the spontaneous breaking occurs. Furthermore, we demonstrate this conclusion by analyzing S-wave scatterings of two pions with isospin  $I = 2$  and two scalar diquarks in two-color QCD using lattice simulation. The results of the scattering amplitudes in different chemical potentials agree with each other, which is consistent with our conclusion.

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**Session Classification:** Parallel session A