Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Deep inelastic scattering on ultracold gases JOHANNES HOFMANN, University of Cambridge, WILHELM ZWERGER, Technische Universitaet Muenchen — I shall discuss the dynamic structure factor of both Bose and Fermi gases with strong short-range interactions, focussing on the deep inelastic regime of large wave vector transfer q. Here, the dynamic structure factor is dominated by a resonance at the free-particle energy $\hbar\omega = \varepsilon_{\mathbf{q}} = \hbar^2 q^2/2m$ and is described in terms of scaling functions. I will show that the high-momentum structure has a rich scaling behavior characterized by two separate scaling regions: first, for frequencies that differ from the single-particle energy by terms of order $\mathcal{O}(q)$ (i.e., small deviations compared to the single-particle energy), the dynamic structure factor is described by the impulse approximation (IA) of Hohenberg and Platzman. Second, deviations of order $\mathcal{O}(q^2)$ (i.e., of the same order or larger than the single-particle energy) are described by the operator product expansion (OPE), with a universal cross-over connecting both regimes. Furthermore, I present an exact expression for the shift of the single-particle peak at large momentum due to interactions, which extends an old result by S. T. Beliaev for the low-density Bose gas to arbitrary values of the scattering length

Johannes Hofmann
University of Cambridge

Date submitted: 11 Nov 2016 Electronic form version 1.4