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The Pauli exclusion principle in semi-local quantum criticality DAVID RAMIREZ, RICHARD ANANTUA, SEAN HARTNOLL, VICTORIA MARTIN, Stanford University — A crucial consequence of the Pauli exclusion principle in weakly coupled systems is the presence of low energy degrees of freedom at finite momenta; a natural question is then to what extent does this aspect of Pauli exclusion persist at strong coupling, which may not even admit well-defined quasiparticles? We use holography to address this issue by studying the momentum space structure of low energy current-current correlation functions in finite density field theories exhibiting semi-local criticality. The semi-locally critical theories are characterized by an exponent η that determines the low temperature scaling of entropy density to be $s \sim T^{\eta}$. Despite the fact that spatial momenta do not scale in semi-locally critical theories, we find that operator dimensions can have non-trivial momentum dependence, leading to novel momentum space structure. In particular, for $0 < \eta < 2$, we find sharp discontinuities in the transverse response functions at a non-zero k_*, reminiscent of Pauli exclusion-type dynamics. Finally, we comment on the $\eta = 1$ geometry, which allowed for analytic expressions for correlation functions at finite temperature as well as interesting phenomenological properties and string theory embeddings.

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