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Full counting statistics and entanglement in a disordered free fermion system[1] MICHAEL BANTEGUI, JOSEPH BURG, GREGORY LEVINE, Hofstra University — The Full Counting Statistics (FCS) is studied for a one-dimensional system of non-interacting fermions with and without disorder. For two L site translationally invariant lattices connected at time $t = 0$, the charge variance increases logarithmically in t, following the universal expression $\langle \delta N^2 \rangle \approx \frac{1}{\pi^2} \log t$, for t much shorter than the ballistic time to encounter the boundary, $t_b \sim L$. Since the static charge variance for a length L region is given by $\langle \delta N^2 \rangle \approx \frac{1}{\pi^2} \log L$, this result reflects the underlying relativistic or conformal invariance and dynamical exponent $z = 1$. With disorder and strongly localized fermions, the variance is also found to increase logarithmically in time, but saturates at times $t \approx t_d \propto L^2$, a diffusive time scale. Despite the fact that 1-d fermions are fully localized for any disorder strength, the entanglement responsible for charge fluctuations appears to propagate with dynamical exponent $z = 2$.

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