Supplementary Material for: Scaling and localization lengths of a topologically disordered system Jacob J. Krich and Alán Aspuru-Guzik

Scaling curves without corrections to scaling

As discussed in the main text, several fitting procedures can be used to produce plots similar to those in Figs. 1 and 2. We illustrate here that the choice of fitting procedure does not significantly change the localization lengths extracted. Fig. 3 shows fits equivalent to those in Fig. 1, without including corrections to scaling. The scaling still looks very good, though Fig. 3b shows that the data points do not fall on the scaling curve as precisely as in Fig. 1b. The overall shape of the scaling curve deviates from that in Fig. 1 mostly in the extended region, $\phi > 0$, which is not well determined from the data. Additionally, though the overall curve is very similar in shape to that in Fig. 1b, the underlying Gaussians are different, which illustrates the difficulty in converging the fits of $\delta(x)$.



FIG. 3. Scaling function for data with $w \ge 25$, including no corrections to scaling. The scaling is very similar to that in Fig. 1 and produces similar ξ (see Fig. 4a). In (b), blue points are the same as in Fig. 1b while green points are those of the new fit. Dashed lines show the three Gaussians from the new fit of δ , which are clearly different from those in Fig. 1. There are 5829 data points and 449 fit parameters. The normalized χ^2 statistic per degree of freedom d is 71.2. 39% of the data points are within error of the fit.



FIG. 4. (a) Correlation lengths $\xi(\rho, E)$ from the fit of Fig. 3, for each of the 13 densities which produced enough data to be studied, offset for clarity. Plot is similar to Fig. 2a. Solid circles mark localized states and crosses mark extended states. Solid and dashed lines are guides to the eye. (b) Similar to Fig. 2b, deviations in the fitted values of $\phi(\rho, E)$. Blue points show deviations for 65 fits with no corrections to scaling. Green points show deviations for 27 fits with corrections to scaling. Both include data sets with $w \geq 22$, 25, and 28.

The correlation lengths ξ extracted from these fits are shown in Fig. 4a. They are clearly very similar to those in Fig. 2a, showing that the scaling fits robustly determine $\xi(\rho, E)$, regardless of whether corrections to scaling are used. Fig. 2b shows the deviations in the fitted values of ϕ for 92 different fits with and without corrections to scaling.

Fits including corrections to scaling have larger disagreements in $\phi(\rho, E)$. Fig. 4b shows the deviations for 65 fits without corrections to scaling (blue) and 27 fits with corrections to scaling (green). The fits without corrections to scaling have a smaller number of fit parameters, which seems to constrain the fits more. In any of the cases studied, the states with $\xi < 100a_b^*$ are quantitatively determined within 10% by the fits. The consistency of the fits without corrections to scaling argues for use of that method in future studies, despite the large values of χ^2 produced by ignoring the corrections to scaling.