Supplementary material to the manuscript
Edwards Localization

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We give the listings of the Wolfram Mathematica code used to generate Fig. 1 and 2.

Keywords: Polaron localization; Anderson localization; Edwards localization

I. THE CODE

We generated the data of Fig. 1 & 2 with the following Wolfram Mathematica [1] code:

```
(*********************************************************************)
(*           Mathematica Wolfram Code for Fig. 1 & 2                 *)
(*********************************************************************)



(* wave function between the scattering centers *)
Psi[x_, k_, A_, phi_] := A*Sin[k*x + phi];
dPsi[x_, k_, A_, phi_] := A*k*Cos[k*x + phi];

(* normalization condition for the wave function *)
AAA[k_, phi_] :=
 A /. Solve[Integrate[Psi[x, k, A, phi]^2, {x, 0, L}] == 1, A][[1]]

(* transfer matrices *)
RR[theta_] := {{Cos[theta], -Sin[theta]}, {Sin[theta], Cos[theta]}};
TT[m_, g_, k_] := {{1, 2*m*g/k}, {0, 1}};

(* PARAMETERS *)
Clear[AA, phi, xx]
NN = 3;      (* number of scattering sites NN=1,2,3,... *)
L = 1;       (* segment length [0,L] *)
m = 1;       (* mass of the particle *)

(* RECURRENCE RELATION FOR AMPLITUDES *)
Clear[AA];
Do[AA[i + 1] =
   AA[i + 1] /.
    Solve[dPsi[xx[i + 1], k, AA[i + 1], phi[i + 1]] ==
       dPsi[xx[i + 1], k, AA[i], phi[i]] +
        2*m*g*Psi[xx[i], k, AA[i], phi[i]], AA[i + 1]][[1]], {i, 0,
   NN - 1}];

(* RECURRENCE RELATION FOR PHASES *)
Clear[phi];
Do[phi[i + 1] =
   phi[i + 1] /.
     Solve[Psi[xx[i + 1], k, AA[i + 1], phi[i + 1]] ==
        Psi[xx[i + 1], k, AA[i], phi[i]], phi[i + 1]][[1]] /.
    C[1] -> 0, {i, 0, NN - 1}];

(* NORMALIZATION OF EIGENSTATE (amplitude AA[0]) *)
Do[AA[i] = AAA[k, phi[i]], {i, 0, 0}];




(* MONTE CARLO *)
M = 100;         (* MC Steps *)
g = 100;         (* coupling constant between particle and scattering centers *)
tt = 1;          (* time *)

SeedRandom[1];
PsiMC[x_] = 0;
PsiMCt[x_] = 0;
EMC = 0;
Do[{
  (* RANDOM POSITIONS OF SCATTERING CENTERS *)
  Clear[xxxx, xx];
  Do[xxxx[i] = RandomReal[]*L, {i, 1, NN}];
  xx[0] = 0;
  Do[xx[i] = Sort[Array[xxxx, NN]][[i]], {i, 1, NN}];
  Do[Print["r(", i, ") = ", xx[i]], {i, 1, NN}];
  Print["------------1------------"];
  (* EIGENVALUE (search for the ground state with Newton-Raphson) *)
  Clear[MM, k];
  MM[0] = {{1, 0}, {0, 1}};
  Do[MM[i + 1] =
    Dot[Dot[RR[k*(xx[i + 1] - xx[i])], TT[m, g, k]], MM[0]], {i, 0,
    NN - 1}];
  Print["------------2------------"];
  FR = FindRoot[Tr[MM[NN]] == 1, {k, 0.01}];
  k = k /. FR;

  EE = k^2/2/m;
  Print["E(", j, ") = ", EE];
  (* PBC DETERMINATION OF PHI[0] *)
  RRR = FindRoot[
    Psi[0, k, AA[0], phi[0]] == Psi[L, k, AA[NN], phi[NN]], {phi[0],
     1}];
  phi[0] = phi[0] /. RRR;
  Print["------------3------------"];
  xx[NN + 1] = L;
  PsiF[x_] =
   Piecewise[
    Table[{Psi[x, k, AA[i], phi[i]], xx[i] <= x < xx[i + 1]}, {i, 0,
      NN}]];
  PsiFt[x_] = Exp[-I*EE*tt]*PsiF[x];
  PsiMC[x_] = PsiMC[x] + PsiF[x];
  PsiMCt[x_] = PsiMCt[x] + PsiFt[x];
  EMC = EMC + EE;
  Print["EMC = ", EMC/j];
  }, {j, 1, M}]



Plot[PsiMC[x]/M, {x, 0, L}, PlotRange -> Full]
Plot[Abs[PsiMCt[x]/M]^2, {x, 0, L}, PlotRange -> Full]
```

AUTHOR DECLARATIONS

Conflicts of interest

None declared.

Data availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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[1] Wolfram Mathematica `https://www.wolfram.com/mathematica/`.

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