Data set for Coexistence of dynamical delocalization and spectral localization through stochastic dissipation

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1 General Information

Dataset title	Coexistence of dynamical delocalization and spectral localization through stochastic dissipation
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2 Description

This document serves as a guideline for the data repository of the publication [1]. The guideline concerns the acquisition and processing of measurement data as well as information about the deposited files.

3 Data Acquisition

The provided experimental data is obtained by time-resolved measurements of light pulse intensities within the coupled optical fibre loops upon injecting a single initial pulse in a certain lattice configuration. The pulse intensities have been measured with a photodiode (Thorlabs DET01CFC) in the shorter loop. The output voltages of the photodiodes are amplified with a logarithmic amplifier (FEMTO HLVA-100) and then sampled by an oscilloscope (RS RTO1104). After reversing the logarithmic scaling and adjusting the zero-voltage baseline, the voltage values are saved in the respective files „ExpRun0.txt“, „ExpRun1.txt“ etc. This data is accompanied by separate noise measurements, which stem from measuring the temporal evolution of optical noise without the initial pulse. The noise data is saved in the files „ExpRun0_Noise.txt“ etc. For each run, the corresponding noise data is subtracted and intensity discrimination is applied such that the minimum accepted signal to noise ratio is, depending on the optical noise, at least 1.2 but in most instances 3 or better.

The evaluation of the first moment (Fig. S3) and second moment (Fig. 4b), as well as the exponential decay of the wave function (Fig. 4a) and the propagation pictures (Fig. 3, Fig. S2) are based on the evaluation on these data files with numbering 0 to 40. The same protocol applies to the data for combined Hermitian and non-Hermitian disorder (Fig. S7), which is listed in the files „ExpRun41.txt“ and „ExpRun41_Noise.txt“ with consecutive numbering 41 to 46.

With the characteristic time scales dt and T of the fiber loop arrangement one can map the sampled voltage signals onto the discrete two-dimensional grid (m,n), which contains the intensities for the respective propagation steps m and lattice position n. The time scales dt and T can be extracted from the number of samples between pulses and round trips in each data file „ExpRun1.txt“ etc. For visualizing the propagation, the intensities are normalized to the maximum intensity in each propagation step. For estimating the first and second moment, as well as the exponential decay, the signal is normalized such that the overall intensity in the lattice is one. The data is then processed as described in publication [1].

4 File Format

The data is provided in an ASCII format file, using the delimiter (,) to separate array elements. For example, individual data files can be read out with MATLAB via the command load(filename).

5 Archive Structure

Raw Oscilloscope Data

Filename	Description
ExpRun0.txt	Photodiode voltages in the u-loop for disorder realization 0 upon excitation
ExpRun0_Noise.txt	Photodiode voltages in the u-loop for disorder realization 0 without excitation
ExpRun1.txt	Photodiode voltages in the u-loop for disorder realization 0 upon excitation
ExpRun1_Noise.txt	Photodiode voltages in the u-loop for disorder realization 0 without excitation
ExpRun2.txt	Photodiode voltages in the u-loop for disorder realization 0 upon excitation
ExpRun2_Noise.txt	Photodiode voltages in the u-loop for disorder realization 0 without excitation
...	...
ExpRun46.txt	Photodiode voltages in the u-loop for disorder realization 0 upon excitation
ExpRun46_Noise.txt	Photodiode voltages in the u-loop for disorder realization 0 without excitation

6 References

[1] Weidemann, S., Kremer, M., Longhi, S.,Szameit, A., Coexistence of dynamical delocalization and spectral localization through stochastic dissipation. *Nat. Photon.* (2021). DOI: 10.1038/s41566-021-00823-w