

Data set for “Space-time-topological events in photonic quantum walks”

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1 General Information

Data set title	Space-time-topological events in photonic quantum walks
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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 experimental data here 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 were 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 with an oscilloscope (RS RTO1104). After reversing the logarithmic scaling and adjusting the zero-voltage baseline, the voltage values are saved in their respective files, which are provided here.

4 Data Processing

After extracting the characteristic time scales dt and T of the fiber loop setup 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 . This is also described in the

Supplementary Information of the publication [1]. The time scales dt and T can be extracted from the number of samples between pulses and round trips in each data file. For visualisation of the propagation, the intensities are normalised to the maximum intensity in each propagation step. Additionally, using the power calibration data, a power calibration needs to be performed as described in the methods of the publication [1].

5 File Format

These files are in MATLAB's binary `.mat` file format, which may be imported into MATLAB or, as an open source alternative, also using the `loadmat` function of Python's SciPy module.

6 Archive Structure

The folder and file names were chosen to be descriptive of their contents, with folders and files with names beginning with `FigX_` containing the data used in Fig. X of the main text [1]. For Fig. 5, where averaging over multiple disorder realisations was performed, the individual measurement before averaging are provided (with the file name for the X^{th} realisation ending in `RX.mat`). The data is accompanied by separate power calibration measurement data (files where the file name contains the keyword `Calib`).

7 References

[1] Feis, J., Weidemann, S., Sheppard, T., Price, H. M., Szameit, A., Space-time-topological events in photonic quantum walks. *Nat. Photon.* (2025). DOI: 10.1038/s41566-025-01653-w