Data set for Fractal topological insulators

Experimental data and simulation results

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1. General information

Dataset title: Data set for Fractal topological insulators

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2. Description

This document provides information to extract the data used and presented in the publication from the raw measurements, as well as structural information about the deposited files.

3. Structure

The subfolders include raw data, processing scripts and pre-selected data for the associated figures shown in the manuscript. For Figures 2-4, they also include a "Mask" subfolder containing .txt-files with relative positions for the used cutting masks (necessary for correct positioning of the cutting mask on the data), an "Output" folder containing the extracted data used for the manuscript and a "Position" folder containing additional .txt-files providing the relative waveguide positions used in the extraction process.

./Figure 1

This folder contains the eigenvalues and associated real-space Chern numbers for the Sierpinski- and honeycomb lattices in their trivial and topological configurations, respectively. Execute the MATLAB script "`plotEVandChern.m`" to display.

./Figure 2

This folder contains all materials for the calculation of the Inverse Participation Ratio (IPR). First, use the MATLAB script "`Extract_intensity.m`" to extract the shown pictures of the samples end facette. The user can manually select the following properties:

- "`data_file_name`": Resembles the file name prefix, select between "`Honeycomb_static`", "`Honeycomb_driven`", "`Fractal_static`" and "`Fractal_driven`"

- "`data_file_index`": Index from 1 to 9, in line with the numbering in the manuscript

- "`position_file_name_xx`": "`xx_honeycomb`" or "`xx_fractal`" depending on the extracted structure

- "`position_file_name_yy`": "`yy_honeycomb`" or "`yy_fractal`" depending on the extracted structure

- "`mask_position_file_name`": "`Relative_Position_Honeycomb_static`" or "`Relative_Position_Fractal_static`"

"`Calculate_IPR.m`" automatically extracts and saves the necessary data to the output folder. All relative positions are already included here. It will output the extracted and calculated inverse participation rations (IPR) in the "Output" folder as `.mat` files. To visualize the ratios, use the included "`Plot_IPR.m`" script, which extracts and plots the IPR.

./Figure 3

This folder includes the data for Figure 3. The basic folder structure is similar compared to "Figure 2", but the raw data now also includes the excitation as JPEG files. The subfolder names describe the included data. To extract the data, the MATLAB scripts "Extract_intensity.m" and "Extract_intensity_combined_structure.m" can be used. The parameters, which the user can manually change, are analogous to the previous extraction script.

./Figure 4

This measurement also includes the front, back and top view of the propagation for the Honeycomb as well as the Fractal structure. To extract the parameters, the user choses the "data_file_index" property in the "Extract_intensity_[…]" files. The script will extract the intensity at the beginning and end of the sample, and save the data in respective .txt files. These files will include the waveguide index, the intensity add the beginning of the sample and the intensity after the full propagation, as well as the fit parameters used in the manuscript. As every measurement has a new starting point, the individual starting positions are included in the scripts. They are extracted via the "Find_initial_excitation.m" MATLAB script. The edge propagation speed can then be determined from the fitted wave packet positions.