Data set for Three-dimensional non-Abelian Quantum Holonomy

Vera Neef, Julien Pinske, Friederike Klauck, Lucas Teuber, Mark Kremer, Max Ehrhardt, Matthias Heinrich, Stefan Scheel, and Alexander Szameit

1. General Information

Dataset title:	Data set for Three-dimensional non-Abelian Quantum Holonomy
Authors/Creators:	Vera Neef[1], Julien Pinske[1], Friederike Klauck[1], Lucas Teuber[1], Mark Kremer[1], Max Ehrhardt[1], Matthias Heinrich[1], Stefan Scheel[1,‡], and Alexander Szameit[1,†]
Affiliation:	[1)] Institut für Physik, Universität Rostock, Albert-Einstein-Straße 23, 18059 Rostock, Germany.
E-Mail:	[†] alexander.szameit@uni-rostock.de [‡]stefan.scheel@uni-rostock.de
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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 contain raw data for the associated figures shown in the manuscript.

./Figure 3

This folder contains the raw click data associated with figure 3c and the left hand side of figure 4b in the manuscript. The files "U2_input_E.txt" and "U2_input_W.txt" contain the detected photon clicks for the signal photon being injected into either the east or west waveguide, thus realizing the input states $|d_1(z_\mathrm{i})\rangle$ and $|d_2(z_\mathrm{i})\rangle$, respectively. The first column contains the channel in which a photon is being detected: 0 – herald, 1 – east waveguide, 2 – center waveguide, 3 – west waveguide. The second column contains the number of time bins that have passed since the last photon was detected. Each time bin has a length of 164.61 ps. A coincidence click was defined as the signal photon (in channel 1, 2 or 3) and the herald photon (in channel 0) being detected within 5 ns. The error bars depicted in figure 3c stem from a single Poisson standard deviation of the coincidence clicks. The absolute of the Wilson loop as depicted in the left hand side of figure 4b was calculated directly from the results depicted in figure 3c.

./Figure 4

This folder contains the raw click data associated with figure 4a and the right hand side of figure 4b in the manuscript. The files "U3_input_D1.txt", "U3_input_D2.txt" and "U3_input_D3.txt" contain the detected photon clicks for the input states $|D_1(z_\mathrm{i})\rangle$, $|D_2(z_\mathrm{i})\rangle$ and $|D_3(z_\mathrm{i})\rangle$, respectively. The first column contains the channel in which a photon is being detected: 0 – center waveguide, 1 & 2 – outputs of the fiber-integrated beam splitter of the east waveguide, 3 & 4 – outputs of the fiber-integrated beam splitter of the west waveguide. The second column contains the number of time bins that have passed since the last photon was detected. Each time bin has a length of 164.61 ps. A coincidence click was defined as the two photons being detected within 5 ns. The splitting ratio of the fiber-integrated beam splitter of the east waveguide was measured to be 49.1:50.9; it was used for the reconstruction of $|D_1(z_\mathrm{f})\rangle$. Similarly, the splitting ratio of the beam splitter of the west waveguide is 49.0:51.0; it was used for the reconstruction of $|D_2(z_\mathrm{f})\rangle$. The error bars depicted in figure 4a contain a single Poisson standard deviation of the coincidence clicks as well as the uncertainty that stems from the splitting ratio of the fiber-integrated beam splitters. To this end, it was assumed that the uncertainty interval of both beam splitters is 45:55 to 55:45. The absolute of the Wilson loop as depicted in the right hand side of figure 4b was calculated directly from the results depicted in figure 4a. Here, the appropriate signs were taken from the theory.

./Figure S1

The coincidence counts of the Hong-Ou-Mandel measurement as depicted in figure S1 are contained in the file "HOM.csv". The first column contains the time delay in ps; in figure S1 it was normalized, so that the zero-time-delay corresponds to the minimum of the coincidence counts. The second column contains the measured coincidence counts between both outputs of a fiber-integrated 50:50 beam splitter that was used to perform the Hong-Ou-Mandel measurement. Columns have been separated by ";". The uncertainties depicted in figure S1 have been obtained from a single Poisson standard deviation of the coincidence counts.