Supporting material for the paper "Tunable and state-preserving frequency conversion of single photons in hydrogen"

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This dataset includes all raw data and numerical codes employed in the study. It is organized as follows:

- The compressed file (folder) "***numerical_simulation_code.zip***" contains 2 subfolders with the numerical codes (written in Matlab) used in the study.
  - The scripts included in the folder "*forward_only_code*" are used to simulate the forward propagation dynamics of the pump fields and the quantum mixing fields, coupled to the evolution of the molecular coherence. To run this code, one must simply include this folder in the corresponding Matlab path or simply run it directly within the folder. The script "parameter_tuning.m" is the trigger of the simulations, where the user can select which hydrogen pressure (or pressure range) is to be simulated. The results of the simulations can then be visualized using the script "plot_selected_pressure". This code was used to produce the theoretical results displayed in Fig. 2A, Fig. 3 and Fig. S4.
  - The scripts included in the folder "*forward_backward_code*" solve a bi-directional set of coupled Maxwell-Bloch equations to produce the results displayed in Fig. S5. To run this code, simply use the script "BSRS_code_FigS5.m"
- The compressed file (folder) **"*raw_data.zip*"** contains subfolders with all the raw data required to produce the figures displayed in the main text and supplementary materials. Each subfolder includes the following data:
  - "*Fig_1*" contains two scripts to plot the dispersion diagram depicted in Fig. 1C. To do so, run the script "dispersion_diagram_sciencepaper.m"
  - "*Fig_2*" contains two subfolders: "panel_2A" contains two scripts to plot the theoretical and experimental data included in the pressure scan displayed in Fig. 2A. The data of the numerical simulations are stored in the folder "pressure_tuning". The experimental raw data are stored in the file "Pressure_scan_efficiency_sciencepaper_Fig2.txt", where the first column indicates pressure in bar, the second column the overall conversion efficiency and the third column its error (standard deviation). "Panel_2B" contains the raw data to plot the idler depletion at 70 bar
  - "*Fig_3*" contains a script to plot the numerical simulation results displayed in Fig. 3, which are encoded in the workspace stored within the folder "P_70bar". To obtain the different subfigures of Fig. 3, simply run the script "plot_sciencepaper_Fig3.m"
  - "*Fig_4*" contains the raw data for the results displayed in Fig. 4 of the main text. The data is included in two .txt files, whose names are self-explanatory. They are organized in two columns: the first column contains the temporal bins in ps and the second column the actual normalized

$g^{(2)}(\tau)$ values. The figures can be plotted with the script "plot_normalized_correlations_Fig4.m".

- "*Fig_S1*" contains the raw data for the results displayed in Fig. S1 of the supplementary material. The subfolder "*left_panel*" includes the raw data (file "894_RamanONOFF.txt") for the plot of the temporal evolution of the up-shifted idler signal at 70 bar. That file has 3 columns. The relevant ones are the first column (time in ps) and the third one (up-shifted idler count rate in s^{-1}). The script "plot_upshifted_idler_70bar_FigS1.m" can be used to obtain the left panel of Fig. S1. The subfolder "*right_panel*" includes the raw data for the scan of the monochromator wavelength divided in two files. The file "Scan_800nm_1000nm_PairsPump0mW…" includes the data where the biphotons are absent. It is organized in three columns, where the relevant ones are the first (wavelength in nm) and the third (up-shifted idler count rate in s^{-1}). The file "Scan_800nm_1000nm_PairsPump1.1mW…" includes the same data as before but in the case where the biphotons are present. The script "PlotLambdaScan.m" can be used to obtain the right panel of Fig. S1.
- "*Fig_S2*" contains the raw data for the results displayed in Fig. S2 of the supplementary material. There are two .txt files in this folder, each of them containing the raw data of the experimental calibration of the biphoton source ("pair_source_calibration_experimental_data.txt") and its analytical fit to a squared hyperbolic sine function ("pair_source_calibration_sinh_fit.txt"). Fig. S2 can be obtained by using the script "plot_biphoton_source_calibration.m"
- "*Fig_S4*" contains the simulation data displayed in Fig. S4. Each subfolder named e.g. "P_*xx*bar" contains the simulation data for that specific *xx* pressure. The script "plot_selected_pressure.m" can be used to obtain the subpanels of Fig. S4.
- "*Fig_S5*" contains the simulation data displayed in Fig. S5. The binary file "workspace_BSRS_FigS5.mat" contains all the results of that numerical simulation (carried out using the bi-directional code described above), and the coherence plot displayed in Fig. S5 can be produced using the script "plot_sciencepaper_FigS5.m"
- "*Fig_S6*" contains the raw data for the results displayed in Fig. S6. There are two .txt files in this folder, each of them containing the raw data of the coincidence counts obtained for the un-shifted biphotons ("849nm_and_1425nm_coincidences_raw.txt") and the corresponding Gaussian fit of the pedestal of accidentals ("849nm_and_1425nm_Gaussian_fit.txt"). These files have two columns, the first one containing the time variable in ps and the second one either the actual coincidence counts or the Gaussian fit, respectively. Fig. S6 can be obtained by using the script "Normalization_Gaussian_fit.m"