# Description of the dataset

**Title:** Experimental data for the manuscript titled *Rotating quantum wave turbulence*

**Description:** This submission contains the minimal dataset required to reproduce the experimental findings related to the manuscript titled *Rotating quantum wave turbulence*, associated with the DOI 10.1038/s41567-023-01966-z.

The manuscript describes experiments in superfluid $^3$He-B, where turbulence was generated in a 150-mm-long cylindrical sample container with 5.85 mm inner diameter by periodic modulation of its angular velocity at temperatures well below 1 mK. Most measurements presented in the manuscript rely on pulsed nuclear magnetic resonance measurements, where the frequency at the end of the decay is sensitive to orientation of quantized vortices in the middle of the excitation coils.

A more detailed description of the experimental setup, as well as the experimental procedures and methods, can be found in the preprint and references within – the purpose of this submission is to make the presented data available to anyone interested. Raw and additional data can be provided on a reasonable request from corresponding author.

The listed files contain the data presented in the manuscript in human-readable comma-separated (.csv) format. Additional relevant information is provided below the general description of each file.

This submission includes the files listed below.

**Fig1d.csv** contains the data shown in Figure 1d:
- *The first row* contains the frequencies relative to the Larmor value. Units: Hz.
- *The first column* contains the time elapsed from stopping the excitation pulse. Units: seconds.
- *The rest of the elements* contain the corresponding FFT amplitudes as shown in the figure. Units: arbitrary.

**Fig2a_Bottom_BottomSpectrometer.csv** contains data from the lowest panel in Fig. 2a, measured with the lower of the two spectrometers.
- *The first column* contains the time elapsed since the angular modulation was started. Units: seconds.
- *The second column* contains the extracted relaxation time of the amplitude of the pulsed nuclear magnetic resonance signal. Units: 1/s.

Files **Fig2a_Middle_[Top/Bottom]Spectrometer.csv** contain data from Fig. 2a, middle panel. The file name indicates which spectrometer was used to record the data.
- *The first column* contains the time elapsed since the angular modulations were started. Units: seconds.
- *The second column* contains the corresponding frequency at the end of the decaying nuclear magnetic resonance signal, i.e. at the zero-magnon limit, relative to its steady-rotation value. Units: Hz.

**Fig2a_Top.csv** contains the data for the top panel in Fig. 2a.
- *The first column* contains the time elapsed from beginning of the modulating drive. Units: seconds.
- *The second column* contains the measured angular velocity. Units: rad/s.

**Fig2b_Bottom_TopSpectrometer.csv** contains the data presented in the bottom panel of Fig. 2b.
- *The first column* contains the time elapsed from stopping the modulating drive. Units: seconds.

- *The second column* contains the corresponding frequency at the end of the decaying nuclear magnetic resonance signal, i.e. at the zero-magnon limit, relative to its steady-rotation value. Units: Hz.

**Fig2b_Top.csv** contains the data for the top panel in Fig. 2b.
- *The first column* contains the time elapsed from stopping of the modulating drive. Units: seconds.
- *The second column* contains the respective set angular velocity. Units: rad/s.

**Fig2c.tar.gz** contains seven files related to Figure 2c:
- *Fig2c_[Time in seconds]s.csv* contains a *i*-by-3 matrix marking the coordinates of vortices at time [*Time in seconds*] after starting the vortex filament simulations. Columns correspond to (x,y,z) coordinates, in that order. Each vortex is separated by a row of *NaN*s (Not a Number). These vortex configuration snapshots correspond to those shown in Fig 2c in the manuscript, with time increasing from left to right. Units: mm.

The vortex positions were obtained from numerical simulations as written in the Methods section of the manuscript. In simulations, the normal component was modulated, starting at 1.60 rad/s at $t$=0, between 1.40 rad/s and 1.80 rad/s with angular acceleration of 30 mrad/s for approximately 600 seconds. The drive was stopped at 1.60 rad/s and not changed afterwards. The mutual friction parameter alpha was approximately 1.77e-3 until 1000 s, at which point is was increased to approximately 4.7e-2 to reduce the computation time.

**Fig3a_[Top/Bottom]Spectrometer.csv** contains the data related to Figure 3a, measured with the respective spectrometer:
- *The first column* contains the approximate temperature. Units: $T/T_c$.
- *The second column* contains the pressure. Units: bar.
- *The third column* contains the final angular velocity relative to the mean angular velocity for a given pressure - i.e. in the *x*-coordinates of the plot. Units: rad/s.
- *The fourth column* contains the extracted waiting time $t_g$. Units: seconds.
- *This fifth column* contains the approximate mutual friction parameter alpha. Unitless.

The data was measured at 15.0 and 15.7 bar pressures, mean angular velocity during excitation of 1.60 rad/s, and 0.40 rad/s peak-to-peak drive amplitude with 26.67 s period. Note: Data was not measured with the bottom spectrometer at 15.7 bar pressure nor at all temperatures.

**Fig3b_TopSpectrometer.csv** contains all data measured with the top spectrometer, including that presented in Figure 3b:
- *The first column* contains the approximate temperature. Units: $T/T_c$.
- *The second column* contains the respective pressure. Units: bars.
- *The third column* contains the final angular velocity relative to the mean angular velocity for a given pressure - i.e. in the same units as in the figure. Units: rad/s.
- *The fourth column* contains the extracted relaxation times $t_g$ relative to the one measured at the same conditions, but with modulation stopped at the mean angular velocity during the drive – i.e. in the same units as in the figure. Units: seconds.

The efficiencies were extracted using top spectrometer data at all measured temperatures, mean angular velocity during excitation of 1.60 rad/s, and 0.40 rad/s peak-to-peak drive amplitude with 26.67 s period.

**Fig3c.csv** contains the data presented in Figure 3c:
- *The first column* contains the pressure. Units: bar.
- *The second column* contains the extracted inverse efficiency 1/beta. Unitless.

- *The third and fourth columns* contain the 1-sigma deviation below and above the data point, respectively. Units: deviation from data in units of 1/beta (i.e. the confidence intervals to be constructed as [column 2 – column 3, column 2 + column 4] ).

The efficiencies were extracted using data at all measured temperatures, mean angular velocity during excitation of 1.60 rad/s, and 0.40 rad/s peak-to-peak drive amplitude with 26.67 s period.

**Fig3d.csv** contains data related to Figure 3d:
- *The first column* contains the drive periods. Units: seconds.
- *The second column* contains the extracted waiting times $t_g$. Units: seconds.

All measurements were done at 0.5 bar pressure, at 0.15 $T_c$, 1.60 rad/s mean angular velocity during the drive, 0.40 rad/s peak-to-peak drive amplitude, and 1.40 rad/s final angular velocity after stopping the modulating drive.

**Fig4_Raw_TopSpectrometer.csv** contains the processed data including that shown in Figure 4a:
- *The first column* contains the approximate temperature. Units: $T/T_c$.
- *The second column* contains the pressure. Units: bar.
- *The third column* contains the final angular velocity. Units: rad/s.
- *The fourth column* contains the extracted relaxation time constant. Units: seconds.

In these measurements the peak-to-peak amplitude was kept at constant 0.40 rad/s and the ratio (mean angular velocity during the drive)-to-(angular acceleration during drive) was kept at constant value of about 53 s.

**Fig4_Slopes_TopSpectrometer.csv** contains the extracted slopes from Figure 4a and similar data, used to produce Figure 4b and 4c:
- *The first column* contains the approximate $T/T_c$. Unitless.
- *The second column* contains the pressure. Units: bars.
- *The third column* contains the extracted cascade slope (decay rate)/(final angular velocity) extracted from data similar to that shown in panel a. Unitless.
- *The fourth column* contains the one-sigma deviation below. Units: Unitless, deviation from the estimated value  (i.e. the confidence intervals to be constructed as [column 3 – column 4, column 3 + column 5] ).
- *The fifth column* contains the one-sigma deviation above. Units: Unitless, deviation from the estimated value  (i.e. the confidence intervals to be constructed as [column 3 – column 4, column 3 + column 5] ).
- *The sixth column* contains the estimated value for the mutual friction parameter alpha. Unitless.