

Description of the dataset

Title: Experimental data for the manuscript titled *Continuous time crystal coupled to a mechanical mode as a cavity-optomechanics-like platform*

Description: This submission contains the minimal dataset required to reproduce the experimental findings related to the manuscript titled *Continuous time crystal coupled to a mechanical mode as a cavity-optomechanics-like platform*, associated with the DOI: 10.1038/s41467-025-64673-8

The manuscript describes experiments in superfluid $^3\text{He-B}$, where a magnon Bose-Einstein condensate (from now referred to as the time crystal) was generated in a 150-mm-long cylindrical sample container with 5.85 mm inner diameter by pumping sufficient amount of magnons into a magneto-textural trapping potential at temperatures well below 1 mK. Simultaneously the container was shaken horizontally to modify the precession frequency of the time crystal.

A more detailed description of the experimental setup, as well as the experimental procedures and methods, can be found in the cited manuscript 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.

Fig1b.csv contains the data shown in Figure 1b:

- *The first column* contains the time elapsed from beginning of the experiment. The excitation pulse occurs some 58 ms after the start. Units: seconds.
- *The second column* contains the voltage induced on the pickup coils after amplification. Units: Volts (Scale: arbitrary)

Fig1c.csv contains the data shown in Figure 1c (based on raw data from Fig1b.csv):

- *The first row* contains the time elapsed from beginning of the experiment. The excitation pulse occurs some 58 ms after the start. Units: seconds.
- *The first column* contains the frequency shift from the late-time frequency of the time crystal. Units: Hz.
- *The remaining rows and columns* contain the extracted fast Fourier transformation (FFT) amplitude of the raw signal at given time/frequency, as given by the corresponding row/column. The inset corresponds to the column, where *Time* = 40 s. Units: Arbitrary.

Fig2a_53mHz.csv and **Fig2a_158mHz** contain data from the panel Fig. 2a, where the given frequency corresponds to the reading of the quartz tuning fork given in the legend.

- *The first column* contains the mechanical drive frequency. Units: Hz.
- *The second column* contains the extracted modulation amplitude G (see manuscript for details). Units: Hz.

Fig2b_84mHz.csv and **Fig2b_310mHz** contain data from the panel Fig. 2b, where the given frequency corresponds to the reading of the quartz tuning fork given in the legend.

- *The first column* contains the mechanical drive frequency. Units: Hz.
- *The second column* contains the extracted modulation amplitude G (see manuscript for details). Units: Hz.

Files **Fig2c_BulkCTC.csv** and **Fig2c_SurfaceCTC.csv** contain data from Fig. 2c. The file name indicates the position of the time crystal (in bulk liquid vs close to the surface).

- *The first column* contains the thermometer fork reading. Units: mHz.
- *The second column* contains the extracted surface wave resonance width. Units: Hz.

Files **Fig3abc_BulkCTC.csv** and **Fig3abc_SurfaceCTC.csv** contain data from Figs. 3, a,b, and c. The file name indicates the position of the time crystal (in bulk liquid vs close to the surface).

- *The first column* contains the square of the extracted maximum tilt angle $\theta_{\max}$ (see manuscript for definition). Units: deg².
- *The second column* contains the extracted modulation amplitude G (see manuscript for details). Units: Hz.
- *The third column* contains the extracted frequency shift of the precession frequency of the time crystal relative to its value at zero mechanical forcing. Units: Hz.
- *The fourth column* contains the extracted asymmetry $\Theta \times \theta_{\max}$ (see manuscript for definition). Units: deg.

Files **Fig3d_BulkCTC.csv** and **Fig3d_SurfaceCTC.csv** contain data from Fig. 3d. The file name indicates the position of the time crystal (in bulk liquid vs close to the surface). *Note:* For each set of data the magnetic field profile was slightly different (different minimum coil current), and for this reason the no-tilt frequency, which was used as a reference, is always set to zero to subtract the effect of the magnetic field to the precession frequency.

- *The first column* contains the extracted static tilt angles. Units: deg.
- *The other columns* contain the individual measured frequency shifts of the time crystals late-time precession frequency relative to the zero tilt value for the corresponding tilt angles. Units: Hz.

Fig3e.csv contains the data shown in Figure 3e (based on raw data related to Fig3abc_BulkCTC.csv):

- *The first row* contains the frequency shift from the central time crystal precession frequency. Units: Hz.
- *The first column* contains the the square of the extracted maximum tilt angle $\theta_{\max}$ (see manuscript for definition). Units: deg².
- *The remaining rows and columns* contain the extracted fast Fourier transformation (FFT) amplitude of the raw signal at late times, and for given frequency/maximum tilt angle, as given by the corresponding row/column. The inset corresponds to data from the 46th row, where $\theta_{\max} = 1.52$ deg. Units: Arbitrary.