

Enchan H0 Test Report v0.1

Reproducing a public TDCOSMO chain-export posterior for H_0

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Abstract

This report documents a minimal, reproducible extraction of the H_0 posterior from a publicly released TDCOSMO chain-export file (LambdaCDM1a.h5). We load the MCMC samples, select the parameter h_0 (in km/s/Mpc), and compute summary statistics (median, 16th/84th percentiles) and a single diagnostic plot. For the analyzed chain (Dataset: TDCOSMO + Pantheon+; Lens label: RXJ1131-1231), we obtain $H_0 = 71.64^{+3.89}_{-3.33}$ km/s/Mpc (16–84%: 68.30–75.53).

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1 Scope and deliverable

This document is intentionally narrow: it records a **single** verification task that can be rerun from public data with short Python code. The goal is to establish an externally intelligible handle for later work:

- verify that the publicly released chain-export data reproduce a concrete H_0 posterior;
- fix the extraction steps and outputs (figure + CSV summary) for transparent reuse.

No claim of definitive model selection is made here.

2 Data and method

Data

We analyze the chain-export HDF5 file:

- file: LambdaCDM1a.h5
- model label: LambdaCDM (from filename)
- dataset label: TDCOSMO + Pantheon+
- lens label in metadata: RXJ1131-1231

The file contains an array of samples and a list of parameter names.

Extraction

We read the dataset `samples` and the array `parameters`, locate the column named `h0`, and compute:

- median and 16th/84th percentiles of H_0 ;
- a histogram of the posterior with percentile markers.

Additionally, we report $P(H_0 < 67)$ as a simple reference probability. This value is *not* a full tension metric and is included only to provide a transparent, single-number comparison point.

3 Results

Summary statistics

Table 1 summarizes the extracted posterior statistics.

Chain	Median	16th	84th	$P(H_0 < 67)$
LambdaCDM1a	71.64	68.30	75.53	0.079

Table 1: Extracted H_0 posterior summary (km/s/Mpc).

Posterior shape

Figure 1 shows the posterior histogram with median and 16th/84th percentile markers.

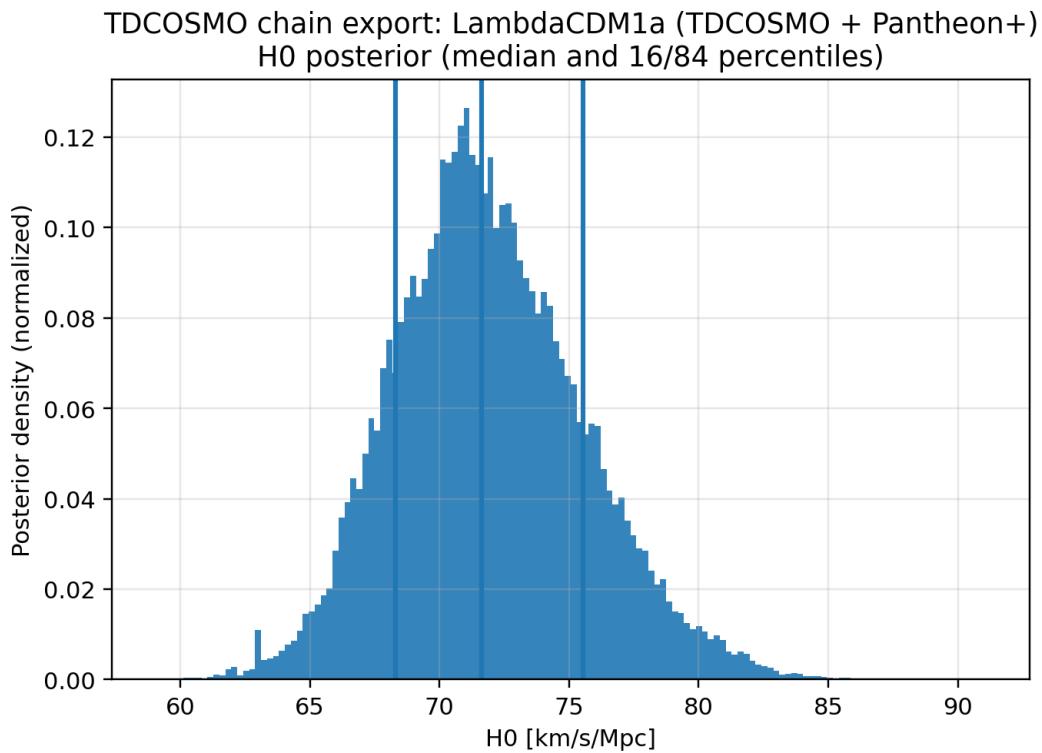


Figure 1: Posterior for H_0 extracted from LambdaCDM1a.h5.

4 Interpretation: geometry vs particles (minimal statement)

This report establishes one empirical fact about the provided public chain: **the extracted posterior has median H_0 around 71–72 km/s/Mpc in this configuration.**

Does this test validate a geometric explanation?

No. The chain samples are produced under standard gravitational lensing modeling assumptions. This report only verifies and summarizes the released posterior. To test a geometric modification, one would need a forward model that changes the inferred time-delay distance and then re-fit (or re-weight) against the data.

How it can still help later Enchan work

The value and uncertainty reported here provide a reproducible target. Any proposed mechanism (geometric or particle-based) that aims to address late-vs-early H_0 differences can be checked against this posterior using the same extraction interface.

5 Reproducibility artifacts

This report is accompanied by:

- `tdcosmo_h0_summary_LambdaCDM1a.csv`: extracted posterior summary
- `fig_h0_posterior_LambdaCDM1a.png`: diagnostic posterior plot

Reproduction procedure (minimal): load `LambdaCDM1a.h5`, locate `h0` in `parameters`, compute quantiles on the `samples` column, and export the CSV + histogram figure.

6 References

- TDCOSMO 2025 public repository (chain export): https://github.com/TDCOSMO/TDCOSMO2025_public