

S8 Tension

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S8 Tension Latest News

The Subaru Telescope in Hawaii, using the Hyper Suprime-Cam, conducted a deep sky survey from the University of Tokyo, reported an S8 value of 0.747, consistent with prior lensing estimates.

What is S8?

- **S8 (Sigma Eight)** is a parameter used in **cosmology to quantify the “clumpiness” or clustering of matter** in the universe on a scale of about **26 million light-years**.
- It helps determine **how much matter (both visible and dark) is clustered** in different cosmic regions.

Background

- The **universe began** with the **Big Bang ~13.8 billion years ago**, starting off **highly uniform**, as revealed by the **Cosmic Microwave Background (CMB)**.
- **Small fluctuations in density** (1 in 100,000) eventually evolved into **galaxies, star clusters, and filaments**, forming the **lumpy structure** of the present universe.

What is the S8 Tension?

- The **S8 tension** refers to the **mismatch in the value of S8** as obtained by:
 - **CMB measurements** (higher value).
 - **Cosmic shear/lensing surveys** (lower value).
- This discrepancy challenges the **Λ CDM (Lambda Cold Dark Matter)** model, the **standard model of cosmology**.

Cosmic Microwave Background (CMB)

- CMB is a **sea of photons**, the particles of light, **present throughout** the **universe**. They are left over from the Big Bang, its afterglow.
- Scientists have **measured temperature changes in the CMB** and studied its large-scale properties using complicated trigonometry.
- **Based on these studies**, cosmologists have **estimated space to be expanding at** around 68 kilometres per second per megaparsec ((km/s)/Mpc). That is, an object one megaparsec (3.26 million lightyears) away is moving away at **68 km/s)/Mpc**.

Cosmic Shear & Gravitational Lensing

- **Cosmic shear** refers to the **distortion in galaxy shapes** due to **gravitational lensing** by intervening matter.
- This lensing helps map **dark matter distribution** and provides an **indirect method to calculate S8**.
- **Lower S8 from lensing** suggests **less clumping** than expected.

Source: **TH**

Source: <https://vajiramandravi.com/current-affairs/s8-tension/>

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