

How to “View at z” in the Past

Partial Input Form

The image shows a partial input form with the following elements:

- A text input field containing "3.0" with the label "z (redshift)" to its right.
- Two buttons: "Open" and "Flat".
- A text input field containing "0.714" with the label "Omega_{vac}" to its right.
- Two buttons: "Manual Omega_r" and "General".
- A section header "Alternate Display Modes" followed by two buttons: "View at z" and "Show z Tables".
- A text input field containing "No Notes".
- A green button labeled "Documentation PDF".

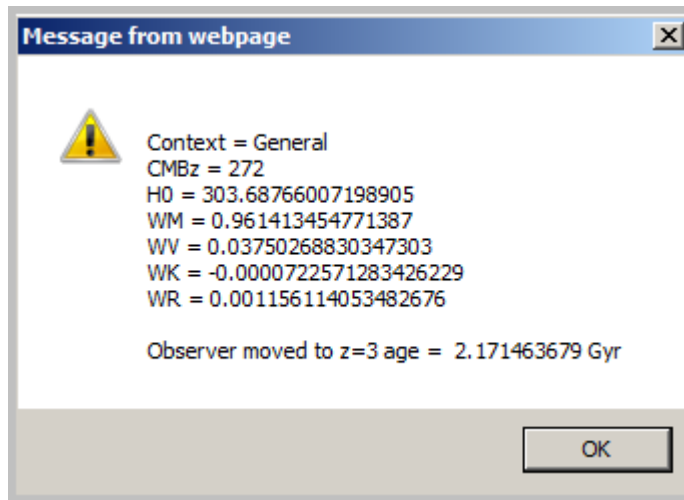
The partial Input Form shown above includes the z value for the normal Default Output. The user may change this z value to various values and the Default Output will change accordingly.

However, many of the Default Output answers are based in the “visible universe” as defined by the other Input Form data, including the CMBz value (1091 is the default).

To change the model to a different time orientation (for example z=3.000 and at age=2.171 Gyr) than now (today), the various Input Form data for **CMBz**, **H₀**, **Omega_M (Ω_m)**, and **Omega_{vac} (Ω_{vac})** at that age would have to be known.

Fortunately, the model already calculates this and shows it in Default Output Section 5.

In order to move to that time (age) – simply click the “View at z” button on the Input Data From (shown above). You will be presented with:



The model will now shift the entire “visible universe” to that age and display the results. The geometry chosen (**Open, Flat, or General**) will be retained when the model moves to that time and may not be changed. However, the new z value is defaulted to 1.000 for the view at that age. The user may change this as desired.

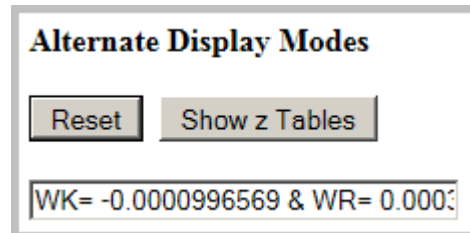
After moving to the new age, the user may select the “**Show z Tables**” button with all z Tables and calculated answers relating to the new age, CMBz, and other values.

One of the more interesting things that shows up in the example above was the calculation of when the expansion of the universe began to accelerate.

- **Universe expansion accelerates at $z = -0.5727$ (+/- 0.0001) at age 7.293485526 Gyr.**
- **\implies Hubble Parameter = 101.87635 with CMB_z viewed as $z = 637.89539$.**

The Observer had been moved to 2.171 Gyr and the acceleration does not begin until 7.293 Gyr. The model had to calculate a future z value (negative) in order to accommodate this fact. While this looks strange, it is correct and more can be found about the z scale (for future events) in the “**How to move Observer to the future**” section in the main **Table of Contents** for the documentation.

When in the “**View at z**” mode, the **View at z Button** will be changed to a “**Reset**” **Button** as shown below:



To revert to the previous Observer position, click the “**Reset**” **Button**. The user must do this before changing geometry or to change any Input Data (except for the z Value relative to the View at z Observer or to create z Tables with the “**Show z Tables**” **Button**

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