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Letter to Editor

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Revisiting Compton Composites Late in the Early Universe

Frederick J. Mayer

Mayer Applied Research, Inc,USA

Article Info

***Corresponding author:**
Frederick J. Mayer
Mayer Applied Research, Inc.
1417 Dicken Drive, Ann Arbor
MI 48103
USA
E-mail: fred@frederickjmayer.net

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Background

In our now ten-year-old paper [1] my late colleague, John R. Reitz, and I described the evolution of the Universe from the "big-bang" until the present. Ours is a unique cosmological model that includes the tresino phase transition and other composites that we call *Compton composites*. The reader may find it useful to look over this earlier paper in order to understand some definitions and numbers involved before continuing with this paper.

The Electron Collision Connection

Figure 2 and caption below have been copied from [1] for later comparisons.

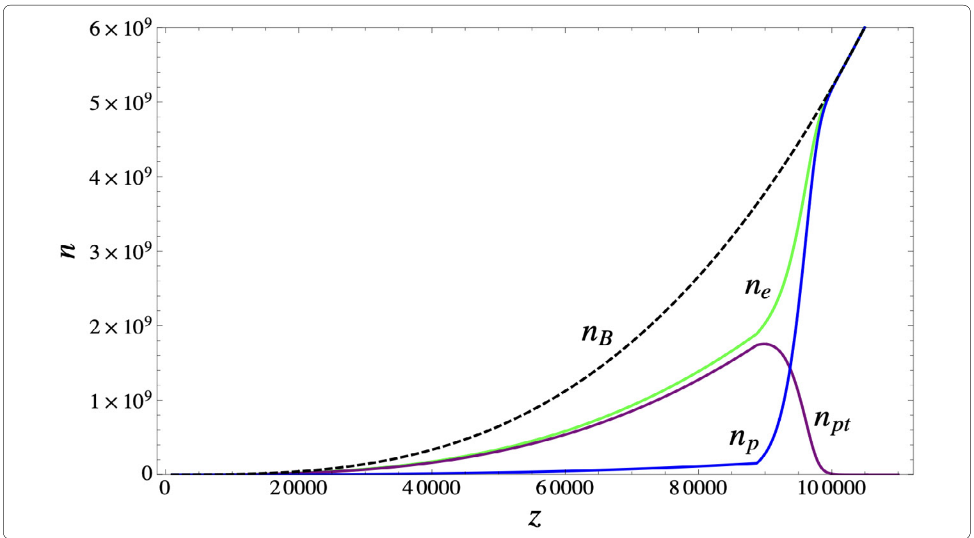

Figure 2. Evaluation of the equilibrium Saha-Boltzmann *ptre* combination displaying the proton density n_p in blue, the electron density n_e in green, the *ptre* density n_{pt} in purple and n_B in dashed-black, with Ω_M = 1, *h* = 0.71, T_0 = 2.72 °K.

Also recall that the temperature in [1] went as $T = T_0(1 + z)$ so the temperatures at the beginning and end of the *phase transitions* were ≈ 24 eV and ≈ 20 eV respectively. Furthermore, notice that Figure 2 (copied from [1] for later comparisons) makes it clear that the *tresino phase transition* begins near $z = 10^5$ and is finished at about $z = 8.5 \times 10^4$. Prior to the start of the *phase transition* our cosmological model tracts the usual ΛCDM cosmology, however, after the *transition* the particle-composition of the Universe has been changed substantially. Note that the proton density and electron density have fallen and n_{pt} the *ptre* density, quickly becomes n_t the *tresino* density (the reason has been discussed in [1]).

Also notice that the densities shown were determined from the numerical solutions of the equilibrium Saha-Boltzmann system and accounts for the conservation of particle species. However, the solution dynamics did not account for the importance of electron collisions that were found, under certain circumstances, to be another *Compton composite* as discussed in my recent papers [2 & 3]. These "scattering resonances" are herein referred to as *tandem electrons*. Therefore, in this paper, I re-examine the *tresino phase transition* by calculating the dynamics of the phase-transition accounting for particle species separately.

Revised Particle-Dynamic Solution

The calculations (below) again proceed by using the Saha–Boltzmann system (see[1]) along with the transformations given in Section 4 of [1] so x is the proton density, $(2x-1)$ is the electron density and $(1 - x)$ is the *tresino* density, all normalized to the *baryon* density as was also done in [1]. So the revised integrations of the Saha–Boltzmann system start at $x \approx 1$ or $z \approx 10^5$ and stepping down through the proton density until $x \approx 0.5$.

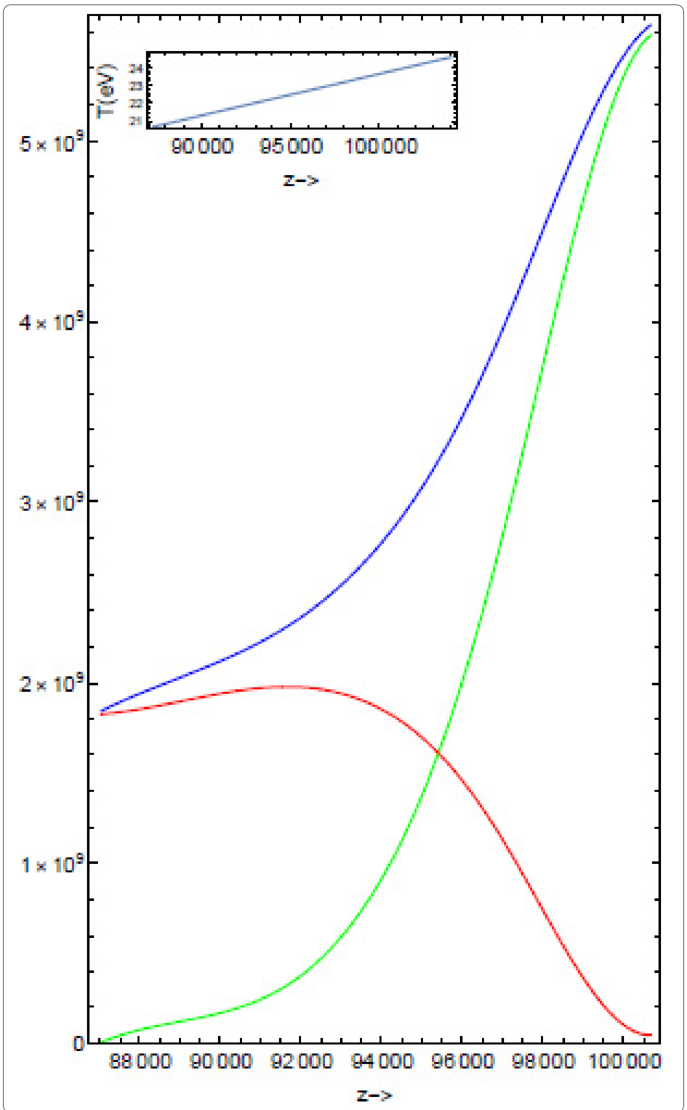

Figure 1. The combined data plots with temperature T(*ev*) (the insert at the top), the proton density in blue, the electron density in green, and the *tresino* density in red.

The results of these integrations are displayed in Figure 1 above. It is obvious that the proton and electron densities initially decline together but soon thereafter they diverge as the electrons are removed in pairs as they connect with the protons to form *tresinos*; this continues until there are no electrons remaining to form any more *tresinos*. The latter situation obtains when the proton and *tresino* densities are effectively equal, a situation we had already suggested in [1]. Furthermore, the densities of protons and *tresinos* are equal and gives rise to a fraction of them turned into *dark rotors* and and others that escape (see [4], Section 9).

Discussion

It is quite remarkable that the solutions of the Saha-Boltzmann system has located the *tandem-electron pairs* consistently in order to form the *tresinos* without any further considerations in the numerical evaluations. In summary, the results correctly produce the numbers of *tresinos* and protons such that 25% are"dark rotors" (our"dark matter"particles) and the others escape as a background of charged-particles (see [4]) that go unobserved in the CMB observations.

Therefore, our *tresino phase transition* cosmological model is completed within an equilibrium theory, i.e., without extra parameters.

References

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