A Transluminal Energy Quantum Model of the Cosmic Quantum

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Cosmological Relevance of the Cosmic Quantum Model

- A single-quantum model (a boson) for the ‘primeval atom’ of the universe
- Provides two models for cold dark matter particles (a boson and a fermion)
- Clarifies the predominance of matter over antimatter in the universe
- Clarifies the development of the universe from a very low initial entropy state

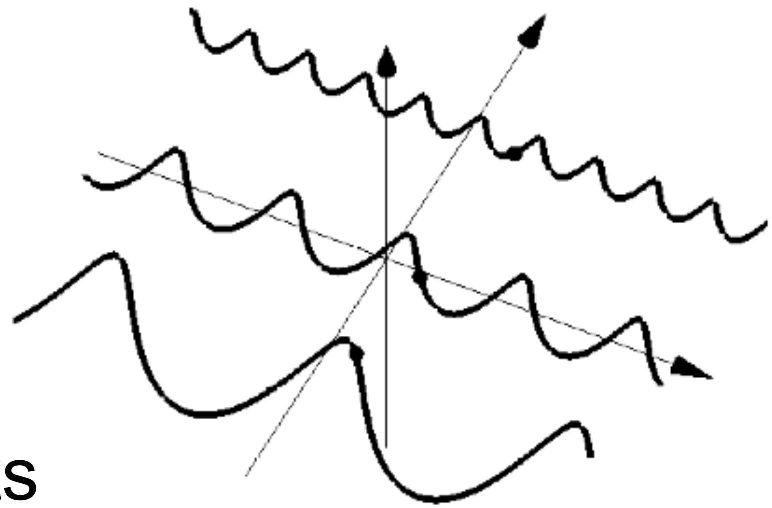
Hypothesis: The Cosmic Quantum Was the First Cold Dark Matter Particle

- Origins of CQ and CDM particles are unknown
- Predominance of CQ and later CDM in very early universe
- Both CQ and CDM have same or similar energy structure in the present models
- The CQ first generated Cold Dark Matter and then other matter, leading to the development of structure (galaxies) in the universe

Transluminal Energy Quantum's characteristics

- Pointlike
- Can move in open or closed helical trajectory
- Can have variable speed less than, equal to, or greater than c
- Carries energy by its helical frequency
- Carries momentum by its helical wavelength
- Carries spin by its helical rotation
- May carry charge
- Massless but can generate mass

Transluminal Energy Quantum Models of Three Photons



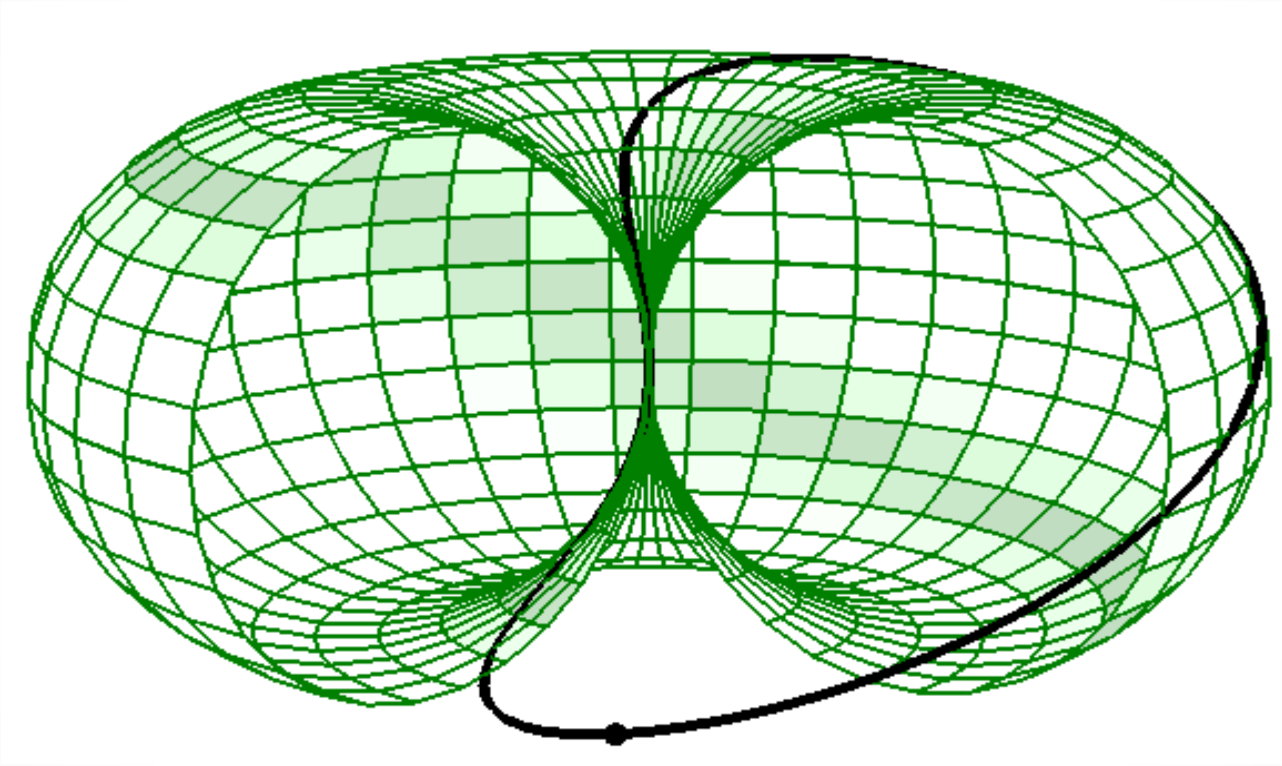
Derived Results

*Speed of TEQ (black dot) along helical trajectory =$\sqrt{2}c$

*Radius of helical axis = $\lambda / 2\pi$

*Helical angle = 45^{o}

Energy Structure of the Cosmic Quantum



The Transluminal Energy Quantum (black spot) travels along the surface of a mathematical helical torus generated by the trajectory of a closed-loop TEQ photon model.

Coordinates of the Cosmic Quantum's TEQ

$$x(t) = R(1+\cos(\omega t))\cos(\omega t)$$

$$y(t) = R(1+\cos(\omega t))\sin(\omega t)$$

$$z(t) = R\sin(\omega t)$$

$$R = \hbar / Mc = 2.9\times 10^{-97}\ \mathrm{m}$$

$$\omega = Mc^2 / \hbar = 1.0\times 10^{105}\ \text{radians/s}$$

$$M = \text{mass of observable universe} = 1.2\times 10^{54}\ \mathrm{kg}$$

$$(M > 10^{90}\times 10^{54}\ \text{kg for total inflationary universe})$$

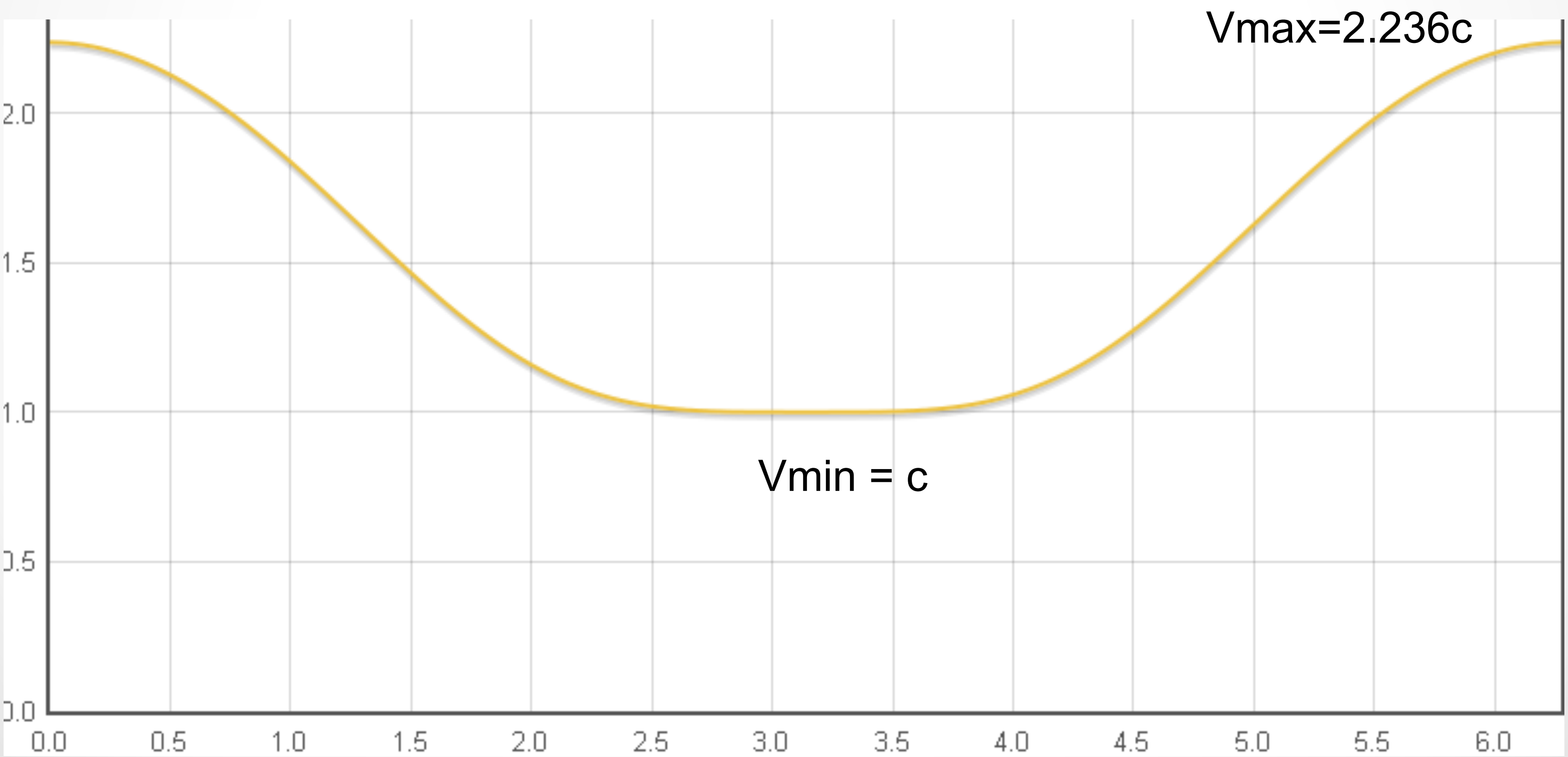
Structure of the Cosmic Quantum

- It is an internallly transluminal close-looped photon model composed of a Transluminal Energy Quantum (TEQ) circulating helically from speed c to $\sqrt{5}c$.

- It has a calculated mass, energy, frequency, wavelength, period, mass density and energy density based on the total normal matter and dark matter content of the observable universe.

Speed of the Cosmic Quantum's TEQ versus rotation angle

Units of c



Rotation angle of $\theta = \omega t$ in the x-y plane , from 0 to 2π = 6.2832

Cosmic Quantum's Parameters

(based on mass of ordinary and dark matter in observable universe)

Mass $M = 1.2\times10^{54}\,\text{kg}$

Radius $R = \hbar / Mc = 2.9\times10^{-97}\,\text{m}$

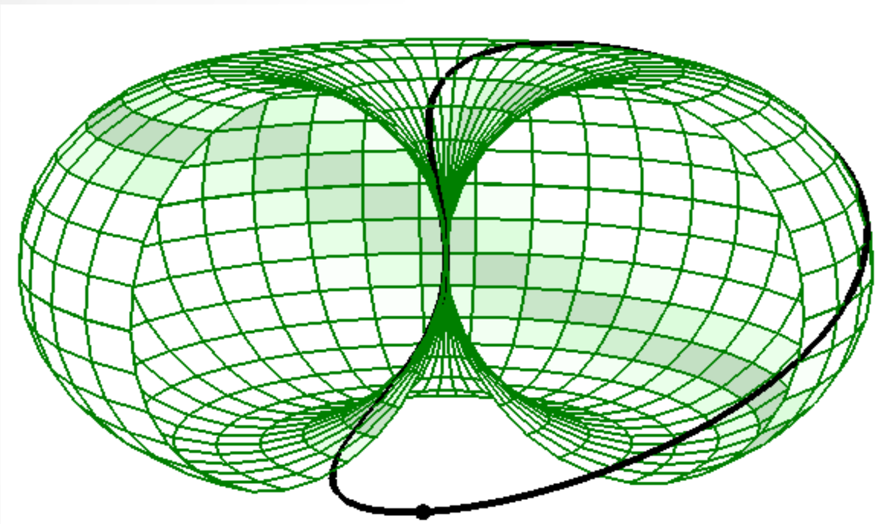
Frequency $\nu = 1.6\times10^{104}\,\text{Hz}$

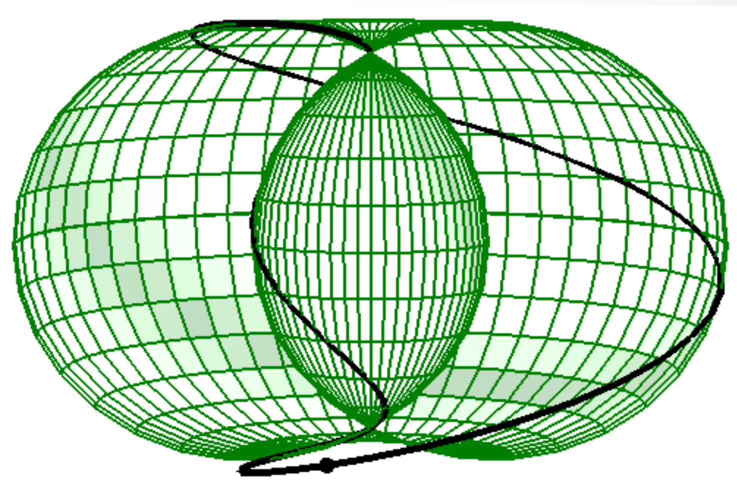
Period $T = 6.2\times10^{-105}\,\text{s}$

Mass density $\rho_{\text{m}} = M / R^3 = 1.6\times10^{344}\,\text{kg/m}^3$

Energy density $\rho_E = Mc^2 / R^3 = 1.4\times10^{361}\,\text{J/m}^3$

Cold Dark Matter Particles: Boson and Fermion

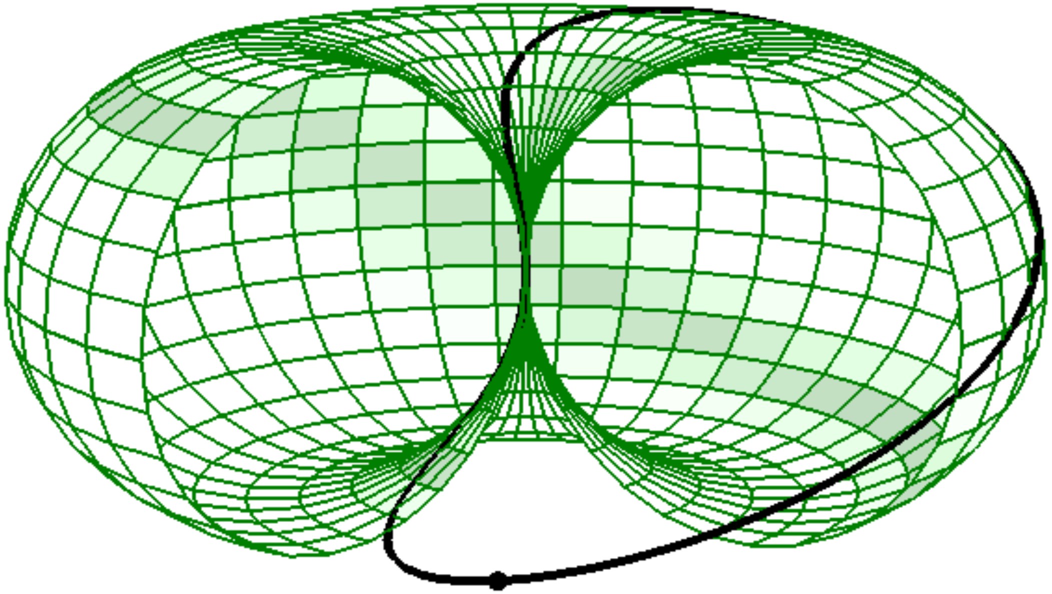




TEQ Boson
Single-looped
Closed TEQ photon

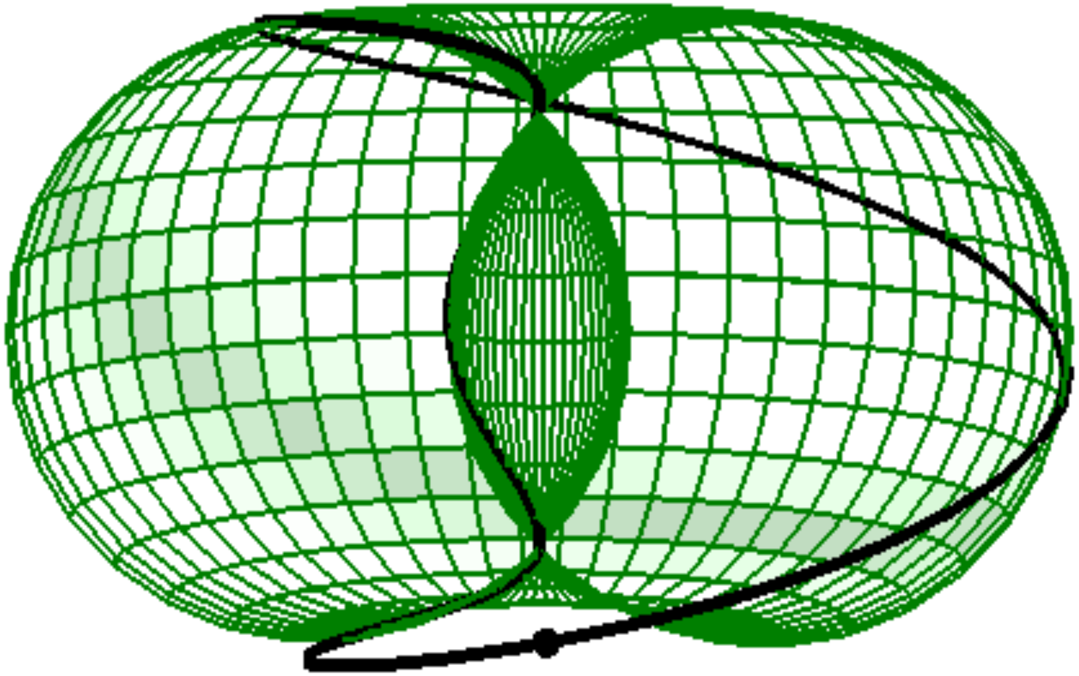
TEQ Fermion
Double-looped
Closed TEQ photon

Radius of 100 GeV Cold Dark Matter Boson Candidate



$$R = \hbar / mc = 2.0 \times 10^{-18}\,\mathrm{m}$$

TEQ Electron Model



A double-looped charged closed TEQ photon, with spin 1/2 and helical radius chosen so that Mz = -Bohr Magneton

Why Does Matter Dominate Antimatter in our Universe?

- The cosmic quantum is a matter particle due to its closure and helicity.

- An antimatter cosmic quantum would have opposite helicity.

- So our universe, evolving from the cosmic quantum, is biased towards matter.

Why Entropy is Very Low in the Very Early Universe

The cosmic quantum is a single quantum particle from which all other particles in our observable universe are derived.

A single quantum particle has much lower entropy than many quantum particles with the same total energy as the single particle.

So entropy increases rapidly after the cosmic quantum divides into many other particles.

Conclusions

The transluminal energy quantum model of the cosmic quantum may be a useful model in answering several fundamental problems facing cosmology today:

- What came before the Big Bang?
- What is the origin and particle nature of cold dark matter?
- Why does matter dominate over antimatter in our universe?
- Why did the very early universe have very small entropy?