New I_9 Model: Infinite-Directional Waves, Colliding Big Bangs, and Zero-Point Energy in IBFA Math

Paul Jacobs
Independent Researcher

May 22, 2025

Abstract

This document consolidates the mathematical derivations and cosmological tests for the "New I_9 Model: Infinite-Directional Waves, Colliding Big Bangs, and Zero-Point Energy" within the Infinity Based Frame-Agnostic (IBFA) Math framework. The model posits that the Big Bang emits $\sim 10^{12}$ faster-than-light (FTL) subatomic particles, generating space-time waves linked to zero-point energy fluctuations, producing triplet echoes and colliding at "intersectional junctures." We derive nonlinear wave terms (up to Φ_2), juncture statistics (correlation functions), and test predictions against datasets (Planck 2020, NANOGrav 2023, DESI DR2, CMB-S4, LISA, LIGO O4).

1 Introduction

The New I_9 Model posits that the Big Bang emits $\sim 10^{12}$ FTL subatomic particles, generating undulating space-time waves potentially driven by zero-point energy fluctuations. These waves form triplet echoes (periodic interference patterns) and collide at junctures, producing cosmological signatures like CMB anisotropies, gravitational waves, or galaxy clustering. IBFA Math, being frame-agnostic, models these phenomena without relativistic constraints, supporting multiversal implications. This document consolidates I_9 work from two preliminary papers (May 22, 2025), deriving nonlinear terms (e.g., Φ_2), juncture statistics (e.g., correlation functions), and testing against datasets.

2 I_9 Model and IBFA Framework

The I_9 model describes FTL particles as sources of space-time perturbations, linked to zero-point energy, with:

- **Source term**:

$$S(x) = \sum_n q_n \delta(x - x_n(t)), \tag{1}$$

  where q_n is the perturbation amplitude (tied to zero-point energy), and $x_n(t)$ is the FTL trajectory ($|v_n| > c$).

- **Nonlinear wave equation**:

$$\mathcal{D}\Phi(x) = S(x) + \lambda|\Phi(x)|^2\Phi(x), \tag{2}$$

where $\mathcal{D} = \nabla^2 - \kappa\frac{\partial^2}{\partial t^2}$, κ adjusts for FTL dynamics, and λ is the nonlinear coupling.

- **Linear solution**:

$$\Phi_0(x) = \sum_n \frac{q_n}{|x - x_n(t)|} e^{ik_n\cdot(x - x_n(t))}, \tag{3}$$

representing 3D spherical waves, potentially zero-point energy emanations forming triplet echoes.

Triplet echoes are periodic interference patterns from wave superpositions, testable via gravitational wave detectors (e.g., LIGO O4).

3 Nonlinear Terms

We use a perturbative expansion $\Phi(x) = \Phi_0 + \lambda\Phi_1 + \lambda^2\Phi_2 + \ldots$ for strong juncture interactions.

3.1 First-Order Correction (Φ_1)

The first-order term satisfies:

$$\mathcal{D}\Phi_1 = |\Phi_0|^2\Phi_0, \tag{4}$$

where:

$$|\Phi_0|^2\Phi_0 = \sum_{n,m,l} \frac{q_n q_m^* q_l}{|x - x_n(t)||x - x_m(t)||x - x_l(t)|} e^{i(k_n - k_m + k_l)\cdot(x - x_n(t))}. \tag{5}$$

The solution is:

$$\Phi_1(x) = \int G(x, x')|\Phi_0(x')|^2\Phi_0(x')d^4x', \tag{6}$$

with Green's function:

$$G(x, x') = \frac{1}{4\pi|x - x'|}\delta(t - t' - |x - x'|/c). \tag{7}$$

3.2 Second-Order Correction (Φ_2)

The second-order term satisfies:

$$\mathcal{D}\Phi_2 = |\Phi_0|^2\Phi_1 + 2\mathrm{Re}(\Phi_0\Phi_1^*\Phi_0). \tag{8}$$

The source term is:

$$\begin{aligned} |\Phi_0|^2\Phi_1 = &\left(\sum_{n,m} \frac{q_n q_m^*}{|x - x_n(t)||x - x_m(t)|} e^{i(k_n - k_m)\cdot(x - x_n(t))}\right) \\ &\times \left(\int G(x, x') \sum_{p,q,r} \frac{q_p q_q^* q_r}{|x' - x_p(t')||x' - x_q(t')||x' - x_r(t')|} e^{i(k_p - k_q + k_r)\cdot(x' - x_p(t'))} d^4x'\right), \end{aligned} \tag{9}$$

$$
\begin{aligned}
2\mathrm{Re}(\Phi_0\Phi_1^*\Phi_0) = 2\mathrm{Re}\Bigg[\left(\sum_n \frac{q_n}{|x - x_n(t)|} e^{ik_n\cdot(x-x_n(t))}\right) \\
\times \left(\int G(x,x') \sum_{p,q,r} \frac{q_p^* q_q q_r}{|x' - x_p(t')||x' - x_q(t')||x' - x_r(t')|} e^{-i(k_p - k_q + k_r)\cdot(x' - x_p(t'))} d^4x'\right) \\
\times \left(\sum_m \frac{q_m}{|x - x_m(t)|} e^{ik_m\cdot(x-x_m(t))}\right)\Bigg].
\end{aligned} \tag{10}
$$

The solution is:

$$
\Phi_2(x) \approx \int G(x,x') \left[|\Phi_0(x')|^2\Phi_1(x') + 2\mathrm{Re}(\Phi_0(x')\Phi_1^*(x')\Phi_0(x'))\right] d^4x'. \tag{11}
$$

3.3 Nonlinear Intensity

The intensity at junctures is:

$$
I(x) = |\Phi_0 + \lambda\Phi_1 + \lambda^2\Phi_2|^2 \approx |\Phi_0|^2 + 2\lambda\mathrm{Re}(\Phi_0^*\Phi_1) + 2\lambda^2\mathrm{Re}(\Phi_0^*\Phi_2 + \Phi_1^*\Phi_1). \tag{12}
$$

The Φ_2 term enhances peaks, potentially linked to triplet echoes or primordial black holes.

4 Juncture Statistics

We quantify juncture distribution and intensity via correlation functions.

4.1 Juncture Density Correlation

The juncture density is:

$$
n_J(x) = \sum_{i,j} \delta(x - x_{ij}), \tag{13}
$$

with mean density:

$$
\langle n_J(x)\rangle = \lambda_J \propto N^2 \langle |v_n|\rangle^{-3}, \quad N \sim 10^{12}. \tag{14}
$$

The two-point correlation function is:

$$
\xi_J(x,x') = \langle n_J(x)n_J(x')\rangle - \langle n_J(x)\rangle\langle n_J(x')\rangle \approx \lambda_J^2 \frac{1}{|x - x'|^3}, \tag{15}
$$

assuming isotropic FTL velocities $|v_n| \sim 10c$.

4.2 Intensity Correlation

The intensity correlation is:

$$
C_I(x,x') = \langle I(x)I(x')\rangle - \langle I(x)\rangle\langle I(x')\rangle, \tag{16}
$$

with linear contribution:

$$
\langle I(x)\rangle = \sum_n \frac{q_n^2}{|x - x_n(t)|^2}, \tag{17}
$$

$$C_{I,0}(x,x') \approx \left| \sum_n \frac{q_n^2}{|x - x_n(t)||x' - x_n(t)|} e^{ik_n \cdot (x - x')} \right|^2. \tag{18}$$

Nonlinear correction:

$$C_{I,\text{nonlinear}}(x,x') \approx 2\lambda \langle \text{Re}(\Phi_0^* \Phi_1) I(x') \rangle + 2\lambda^2 \langle \text{Re}(\Phi_0^* \Phi_2 + \Phi_1^* \Phi_1) I(x') \rangle. \tag{19}$$

This predicts non-Gaussian tails, potentially manifesting as triplet echoes in CMB or GWB data.

5 Zero-Point Energy and Triplet Echoes

The I_9 model links FTL particle waves to zero-point energy fluctuations, modeled as:

$$q_n \propto \sqrt{\langle E_{\text{ZPE}} \rangle}, \quad \langle E_{\text{ZPE}} \rangle = \frac{1}{2} \hbar \omega_n, \tag{20}$$

where ω_n is the frequency of quantum fluctuations. Triplet echoes arise from interference of three-wave interactions:

$$\Phi_{\text{echo}}(x) = \sum_{n,m,l} \frac{q_n q_m q_l}{|x - x_n(t)||x - x_m(t)||x - x_l(t)|} e^{i(k_n + k_m + k_l) \cdot (x - x_n(t))}. \tag{21}$$

These periodic signals may produce detectable patterns in LIGO O4 or CMB-S4 data.

6 Testing Against Cosmological Datasets

Using DeepSearch (May 22, 2025), we compare predictions to:

- **CMB**: Planck 2020 (`https://www.cosmos.esa.int/web/planck`), BICEP2/Keck, CMB-S4 (projected, `https://cmb-s4.org`).
- **GWB**: LIGO/Virgo/KAGRA O3, O4 (`https://www.ligo.org`), NANOGrav 2023 (`https://nanograv.org`), LISA (projected, `https://www.elisascience.org`).
- **LSS**: SDSS/DESI DR2 (`https://desi.lbl.gov`), LSST (projected, `https://www.lsst.org`).

6.1 CMB Anisotropies

The power spectrum is:

$$C_\ell = \int I(x) Y_{\ell m}(\theta, \phi) d\Omega. \tag{22}$$

Computation: Simulate $I(x)$ with $N \sim 10^{12}$, $q_n \sim \sqrt{\hbar \omega_n}$, $\lambda \sim 0.1$. Compare to Planck's C_ℓ^{TT}, C_ℓ^{BB} ($f_{\text{NL}} \approx 0$). CMB-S4's $\sigma_r \approx 7 \times 10^{-3}$ may detect triplet echo peaks at $\ell \sim 100 - 1000$.

6.2 Gravitational Wave Background

The strain is:

$$h(x) \propto \frac{\partial^2 \Phi}{\partial x^i \partial x^j}, \tag{23}$$

with energy density:

$$\Omega_{\mathrm{GW}}(f) = \frac{1}{\rho_c} \int |h(f)|^2 d \ln f. \tag{24}$$

Computation: Fourier transform $\Phi_0 + \lambda \Phi_1 + \lambda^2 \Phi_2$, including Φ_{echo}. Compare to NANOGrav ($\Omega_{\mathrm{GW}} \sim 10^{-9}$, $f \sim 10^{-8}$ Hz), LIGO O3 ($< 10^{-5}$), and LIGO O4 (ongoing).

6.3 Large-Scale Structure

The matter power spectrum is:

$$P(k) \propto \int \xi_J(x) e^{ik \cdot x} d^3 x. \tag{25}$$

Computation: Simulate $\xi_J(x, x') \propto |x - x'|^{-3}$. Compare to DESI DR2 ($k \sim 0.01 - 0.1\, h/\mathrm{Mpc}$).

7 Viability Assessment

IBFA Math supports FTL-driven waves, zero-point energy, and nonlinear junctures, predicting:

- **CMB**: Peaked C_ℓ or $f_{\mathrm{NL}} \neq 0$, testable with CMB-S4.
- **GWB**: Non-standard $\Omega_{\mathrm{GW}}(f)$, compatible with NANOGrav, LIGO O4, LISA.
- **LSS**: Clumpy $P(k)$, potentially explaining Hubble tension ($H_0 \approx 73\,\mathrm{km/s/Mpc}$).

Challenges: FTL particles and zero-point energy links are speculative; numerical simulations need parameter choices (e.g., λ, κ, ω_n).

8 Conclusion

The I_9 model, integrating FTL waves, zero-point energy, and triplet echoes in IBFA Math, offers a robust framework for cosmological predictions. Current data (Planck, LIGO, DESI) favor ΛCDM, but anomalies (e.g., Hubble tension) and future experiments (CMB-S4, LISA, LIGO O4) may validate the model.

9 Copyright

©Paul Jacobs, 2025, All Rights Reserved.