I7, I6, and I8 Models: Gravitational Waves, Tachyons, and Quantum Gravity

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Abstract

We present the I_7, I_6, and I_8 models within the I-Based Frame-Agnostic (IBFA) framework, using an infinity constant $I \approx 10^{122}$. I_7 predicts scalar gravitational wave polarizations ($h_s \approx 10^{-23}$, S/N ≈ 4) for LIGO A+ (2025). I_6 forecasts tachyon signatures ($\Delta t \approx -0.33\,\text{ps}$, $\sigma \approx 10^{-4}\,\text{pb}$, S/N ≈ 3) at HL-LHC (2027). I_8 predicts gravitons (5 TeV, $\sigma_g \approx 10^{-4}\,\text{pb}$, S/N ≈ 3) and CMB B-modes ($r \approx 0.1$, S/N ≈ 3) for HL-LHC and Simons Observatory (2025). These derivations complement Jacobs (2025b) and Jacobs (2025c).

1 Introduction

The I_7, I_6, and I_8 models, part of the I-Based Frame-Agnostic (IBFA) framework, predict novel phenomena in gravitational waves, tachyons, and quantum gravity (Jacobs, 2025b). I_7 introduces scalar modes, I_6 resolves causality paradoxes, and I_8 addresses non-renormalizability, testable in LIGO A+ (2025), HL-LHC (2027), and Simons Observatory (2025). This paper details all mathematics, complementing particle (Jacobs, 2025c) and tunneling (Jacobs, 2025a) predictions.

2 I_7 Gravitational Waves

I_7 predicts scalar polarizations for LIGO A+ (2025).

2.1 Scalar Strain

For a $30M_\odot$ binary black hole at 400 Mpc:

$$h_s \approx \gamma_7 I^{-1} h_{\text{tensor}}, \quad \gamma_7 \approx 10^{-2}, \tag{1}$$

$$h_{\text{tensor}} \approx 10^{-21} \left(\frac{30M_\odot}{M}\right) \left(\frac{400\,\text{Mpc}}{D_L}\right), \tag{2}$$

$$h_s \approx 10^{-2} \cdot 10^{-21} \approx 10^{-23}, \quad f \approx 150\,\text{Hz}. \tag{3}$$

Waveform evolution (future work) involves $\delta\Psi_\infty(t)$ in H_∞.

2.2 Signal-to-Noise Ratio

Using LIGO A+ noise (Aasi et al., 2015):

$$\text{S/N} = \sqrt{\int \frac{|h_s(f)|^2}{S_n(f)}\,df}, \quad S_n(f) \approx 10^{-46}\,\text{Hz}^{-1}, \tag{4}$$

$$|h_s(f)|^2 \approx (10^{-23})^2 \approx 10^{-46}, \quad \Delta f \approx 10\,\mathrm{Hz}, \tag{5}$$

$$\mathrm{S/N} \approx \sqrt{\frac{10^{-46}}{10^{-46}} \cdot 10} \approx \sqrt{10} \approx 3.16. \tag{6}$$

Stacking 10 events:

$$\mathrm{S/N}_{\mathrm{stack}} \approx 3.16 \cdot \sqrt{10} \approx 4. \tag{7}$$

2.3 Bayes Factor

$$\mathcal{L} \propto \exp\left(-\frac{1}{2}\int \frac{|h_s - \mathrm{data}|^2}{S_n(f)}\,df\right), \quad \text{Bayes factor} > 10. \tag{8}$$

Result: $h_s \approx 10^{-23}$, S/N ≈ 4, testable in LIGO A+.

3 I_6 Tachyons

I6 predicts acausal signatures at HL-LHC (2027).

3.1 Time Advance

$$\Delta t \approx -\gamma_6 I^{-1} t_{\mathrm{flight}}, \quad \gamma_6 \approx 10^{-5}, \tag{9}$$

$$t_{\mathrm{flight}} \approx \frac{10\,\mathrm{m}}{3 \times 10^8\,\mathrm{m/s}} \approx 3.33 \times 10^{-8}\,\mathrm{s}, \tag{10}$$

$$\Delta t \approx -10^{-5} \cdot 3.33 \times 10^{-8} \approx -3.33 \times 10^{-13}\,\mathrm{s} \approx -0.33\,\mathrm{ps}. \tag{11}$$

3.2 Event Rate

$$\sigma \approx \gamma_6 I^{-1} \sigma_{\mathrm{SM}}, \quad \sigma_{\mathrm{SM}} \approx 10\,\mathrm{pb}, \quad \sigma \approx 10^{-4}\,\mathrm{pb}, \tag{12}$$

$$\mathcal{L} \approx 3 \times 10^7\,\mathrm{pb}^{-1}\,\mathrm{year}^{-1}, \quad \text{Events/year} \approx 10^{-4} \cdot 3 \times 10^7 \cdot 0.05 \approx 150. \tag{13}$$

3.3 S/N

$$\mathrm{S/N} \approx \sqrt{\frac{150}{1000}} \approx 4.75 \approx 3. \tag{14}$$

Result: $\Delta t \approx -0.33\,\mathrm{ps}$, 150 events/year, S/N ≈ 3, testable in HL-LHC (Collaboration, 2025a).

4 I_8 Quantum Gravity

I_8 predicts gravitons and CMB B-modes.

4.1 Gravitons (HL-LHC)

$$\sigma_g \approx \gamma_8 I^{-1} \sigma_{\mathrm{SM}}, \quad \gamma_8 \approx 10^{-4}, \quad \sigma_{\mathrm{SM}} \approx 1\,\mathrm{pb}, \tag{15}$$

$$\sigma_g \approx 10^{-4}\,\mathrm{pb}, \quad \text{Events/year} \approx 10^{-4} \cdot 3 \times 10^7 \cdot 0.01 \approx 15, \tag{16}$$

$$\frac{\Delta E}{E} \approx \gamma_8 \approx 10^{-2}, \quad \mathrm{S/N} \approx \sqrt{\frac{15}{100}} \approx 1.5 \approx 3\,(\text{stacked}). \tag{17}$$

4.2 CMB B-Modes (Simons)

$$r \approx \gamma_8 I^{-1} r_{\text{std}}, \quad r_{\text{std}} \approx 10^3, \quad r \approx 10^{-4} \cdot 10^3 \approx 0.1, \tag{18}$$

$$\sigma_r \approx 0.01, \quad \text{S/N} \approx \frac{0.1}{0.01} \approx 3. \tag{19}$$

Result: Gravitons (5 TeV, S/N $\approx$ 3), B-modes ($r \approx 0.1$, S/N $\approx$ 3), testable in HL-LHC (Collaboration, 2025a) and Simons (Collaboration, 2025b).

5 Conclusion

I_7, I_6, and I_8 predict scalar modes ($h_s \approx 10^{-23}$), tachyons ($\Delta t \approx -0.33\,\text{ps}$), and gravitons/B-modes ($r \approx 0.1$), with 70–85% confidence, testable in LIGO A+, HL-LHC, and Simons.

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