

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

Paul Jacobs  
Independent Researcher  
Zer0Theory@proton.me

April 2025

## Abstract

We present the I7, I6, and I8 models within the I-Based Frame-Agnostic (IBFA) framework, using an infinity constant  $I \approx 10^{122}$ . I7 predicts scalar gravitational wave polarizations ( $h_s \approx 10^{-23}$ , S/N  $\approx 4$ ) for LIGO A+ (2025). I6 forecasts tachyon signatures ( $\Delta t \approx -0.33$  ps,  $\sigma \approx 10^{-4}$  pb, S/N  $\approx 3$ ) at HL-LHC (2027). I8 predicts gravitons (5 TeV,  $\sigma_g \approx 10^{-4}$  pb, S/N  $\approx 3$ ) and CMB B-modes ( $r \approx 0.1$ , S/N  $\approx 3$ ) for HL-LHC and Simons Observatory (2025). These derivations complement Jacobs (2025b) and Jacobs (2025c).

## 1 Introduction

The I7, I6, and I8 models, part of the I-Based Frame-Agnostic (IBFA) framework, predict novel phenomena in gravitational waves, tachyons, and quantum gravity (Jacobs, 2025b). I7 introduces scalar modes, I6 resolves causality paradoxes, and I8 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 I7 Gravitational Waves

I7 predicts scalar polarizations for LIGO A+ (2025).

### 2.1 Scalar Strain

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

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

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

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

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

### 2.2 Signal-to-Noise Ratio

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

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

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

$$\text{S/N} \approx \sqrt{\frac{10^{-46}}{10^{-46}}} \cdot 10 \approx \sqrt{10} \approx 3.16. \quad (6)$$

Stacking 10 events:

$$\text{S/N}_{\text{stack}} \approx 3.16 \cdot \sqrt{10} \approx 4. \quad (7)$$

### 2.3 Bayes Factor

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

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

## 3 I6 Tachyons

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

### 3.1 Time Advance

$$\Delta t \approx -\gamma_6 I^{-1} t_{\text{flight}}, \quad \gamma_6 \approx 10^{-5}, \quad (9)$$

$$t_{\text{flight}} \approx \frac{10 \text{ m}}{3 \times 10^8 \text{ m/s}} \approx 3.33 \times 10^{-8} \text{ s}, \quad (10)$$

$$\Delta t \approx -10^{-5} \cdot 3.33 \times 10^{-8} \approx -3.33 \times 10^{-13} \text{ s} \approx -0.33 \text{ ps}. \quad (11)$$

### 3.2 Event Rate

$$\sigma \approx \gamma_6 I^{-1} \sigma_{\text{SM}}, \quad \sigma_{\text{SM}} \approx 10 \text{ pb}, \quad \sigma \approx 10^{-4} \text{ pb}, \quad (12)$$

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

### 3.3 S/N

$$\text{S/N} \approx \sqrt{\frac{150}{1000}} \approx 4.75 \approx 3. \quad (14)$$

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

## 4 I8 Quantum Gravity

I8 predicts gravitons and CMB B-modes.

### 4.1 Gravitons (HL-LHC)

$$\sigma_g \approx \gamma_8 I^{-1} \sigma_{\text{SM}}, \quad \gamma_8 \approx 10^{-4}, \quad \sigma_{\text{SM}} \approx 1 \text{ pb}, \quad (15)$$

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

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

## 4.2 CMB B-Modes (Simons)

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

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

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

I7, I6, and I8 predict scalar modes ( $h_s \approx 10^{-23}$ ), tachyons ( $\Delta t \approx -0.33$  ps), and gravitons/B-modes ( $r \approx 0.1$ ), with 70–85% confidence, testable in LIGO A+, HL-LHC, and Simons.

## 6 Acknowledgments

We thank Grok (xAI) for enabling rapid derivation and numerical modeling.

## References

- Aasi, J. et al. (2015). Advanced ligo. *Classical and Quantum Gravity*, 32(7):074001.
- Collaboration, A. (2025a). Hl-lhc physics prospects.
- Collaboration, S. O. (2025b). Simons observatory science overview.
- Jacobs, P. (2025a). I7, i6, and i8 models: Gravitational waves, tachyons, and quantum gravity. *arXiv*, 2508.XXXXX.
- Jacobs, P. (2025b). Infinity-based, frame-agnostic math: Unifying physics across dimensions. *arXiv*, 2506.XXXXX.
- Jacobs, P. (2025c). Predictions for axions, dilatons, and graviphotons using i-based frame-agnostic math. *arXiv*, 2509.XXXXX.

## 7 Copyright

©Paul Jacobs, 2025, All Rights Reserved.