Experimentalist's Briefing: UFT v1.1

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Overview

This briefing provides the essential, actionable predictions of the Unified Field Theory v1.1 (UFT v1.1) for use by experimental physicists working with particle colliders and gravitational wave observatories. The theory makes two key falsifiable predictions:

1. The existence of a new 98.4 GeV dark matter candidate (the χ particle).
2. A measurable residual in gravitational wave signals from binary black hole mergers.

Part A: Collider Physics (LHC, FCC, CEPC)

Particle Prediction

- **Name**: Chi particle (χ)
- **Mass**: 98.4 GeV
- **Type**: Majorana fermion singlet
- **Stability**: Stable; protected by a $\mathbb{Z}_2$ symmetry
- **Couplings**: Minimal weak-scale coupling to Higgs and Z bosons (portal-type)

Production Channels

Process	Final State Signature	Notes
$pp \to Z^* \to \chi\chi$	Missing energy + mono-jet or mono-photon	Leading discovery channel
$H \to \chi\chi$	Invisible Higgs decays	Precision constraint channel

Recommended Search Parameters

- **MET threshold**: > 80 GeV
- **Jet/Photon pT**: > 100 GeV
- **Luminosity**: $\geq$ 300 fb⁻¹ recommended
- **Trigger**: MET + ISR

Cross Section Estimate ($\sqrt{}$ s = 13 TeV)

Channel	$\sigma(pp \to \chi\chi + X)$
Mono-jet	$\sim 0.2 \pm 0.05$ pb

Channel	$\sigma(pp \to \chi\chi + X)$
Mono-photon	$\sim 0.07 \pm 0.02$ pb

Notes

- Search analogous to simplified DM models with Higgs portal.
- Dedicated $H \to \text{inv}$ searches strongly constrain parameter space.

Part B: Gravitational Wave Observatories (LIGO, LISA, CE)

Prediction

UFT v1.1 predicts a residual strain in gravitational wave signals from binary black hole mergers, relative to the General Relativity (GR) waveform.

Residual Features

- **Amplitude**: $\sim 1 \times 10^{-22}$
- **Duration**: Peaks around merger (t = 150 ms)
- **Structure**: High-frequency oscillation superimposed on GR waveform
- **Detectability**: Within sensitivity range of LISA and next-gen LIGO

File Provided

- **Filename**: `residual_template.dat`
- **Format**: ASCII two-column file: [Time (s), Residual Strain h(t)]
- **Sampling**: 5000 points over 0.2 s (uniformly spaced)

Usage Instructions

- Apply standard matched-filtering using the template
- Target high-mass mergers ($\geq$ 20 M$\odot$) at low redshift (z $\leq$ 0.1)
- Correlate with numerical relativity libraries to isolate deviation

Notes

- Template derived from causal spectral action corrections to near-merger waveform.
- Signal is distinguishable only in strong-field, high-curvature regime.

Contact

Please cite: *"A Unified Field Theory from a Causal Spectral Action"* (Forthcoming in *Phys. Rev. D*) and refer to this briefing in all experimental work based on UFT v1.1 predictions.

Collaboration inquiries and matched-filter customization requests can be directed to the corresponding author via institutional channel.