Quantum Gravity Model Framework: Milky Way Galaxy Origins and the Supermassive Black Hole Sagittarius A*

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This paper presents observational and falsifier diagnostic research developed through the Quantum Gravity Model Framework (QGMF), focused on the role of Sagittarius A*, the supermassive black hole at the center of the Milky Way Galaxy. The framework explores how quantum gravity may influence curvature and spacetime in ways that suppress classical black hole formation. Rather than asserting a replacement for existing models, this work offers an alternative reference for interpreting galactic structure and origins. The QGMF proposes that spiral galaxy formation may arise from torus-governed spin logic and filament coherence, rather than collapse dynamics or entropy gradients. This research is shared to support falsifiability, encourage collaborative inquiry, and contribute to the broader understanding of cosmological behavior.

I. INTRODUCTION

Sagittarius A*, the supermassive black hole at the center of the Milky Way Galaxy, remains a focal point in cosmological research. Traditional models often describe its formation through relativistic collapse and entropy-driven processes. These approaches have yielded valuable insights, yet certain assumptions—such as time dilation, dual-disk accretion, and singularity logic—warrant further examination.

The Quantum Gravity Model Framework (QGMF) emerged from ongoing observational and diagnostics inquiry. It proposes that quantum gravity may alter spacetime curvature in ways that contradicts classical collapse, offering a different lens through which to interpret galactic formation. In this framework, Sagittarius A* is considered not as a terminal singularity, but as a filament core with torus spin dynamics.

This paper shares the QGMF as a working model, developed in real time, with the intent to support falsifiability and collaborative refinement. It is not presented as a definitive theory, but as a contribution to the ongoing effort to understand the structure and behavior of galaxies through quantum gravitational principles.

II. OBSERVATIONAL PREDICTIONS FROM QGMF

The Quantum Gravity Model Framework (QGMF) proposes torus-governed filament dynamics as a basis for galactic formation. The following predictions are offered for observational testing and falsifiability.

Prediction 1: Single-Disk Accretion Structure Sagittarius A* is expected to exhibit a singular accretion disk. High-resolution imaging should reveal a coherent, curvature-aligned flow, rather than dual-disk fragmentation.

Prediction 2: Suppression of Entropy Gradients Entropy gradients near the filament core should be suppressed. Temperature and particle dispersion may show rhythmic modulation rather than stochastic decay.

Prediction 3: Filament Spin Cadency

Spiral arm structure may reflect harmonic torus pulses. Rotational modes could exhibit cadence signatures governed by:

$$\omega^2 A + \omega A^2 \cos^2 \alpha + \omega A^2 \cos^2 \theta = 0 \tag{1}$$

Assuming filament spin frequency $\omega \sim 10^{-15}$ rad/s and amplitude $A \sim 10^5$ ly, cadence effects may appear at radial distances $r \sim 10^3$–10^4 light-years. Detectable via Doppler shift with resolution $\Delta v < 1$ km/s.

Prediction 4: Torus-Induced Dynamics

Matter distribution may follow curvature gradients rather than gravitational wells. This is modeled by:

$$\nabla \cdot \lambda \nabla \mu \tag{2}$$

For torus gradient $\nabla\mu \sim 10^{-30}$ m^{-3} and coupling $\lambda \sim 10^{-10}$, induced orbital deviations $\delta r \sim 10^{-2}$ AU may be observed over 10-year baselines. Measurable via Gaia astrometry.

Prediction 5: Metric Modulation

Gravitational lensing near cosmic filaments may involve time-variable distortions. This is expressed as:

$$\Phi_{\mu\nu} = \eta_{\mu\nu} + \Phi_{\mu\nu}(\omega r) \tag{3}$$

With modulation amplitude $\Phi_{\mu\nu} \sim 10^{-22}$, lensing shift $\delta\theta \sim 10^{-6}$ arcseconds may be detectable via Euclid or Hubble over $\Delta t \sim 5$ years.

Prediction 6: Absence of Classical Singularity Behavior Sagittarius A* is not expected to exhibit classical singularity behavior. Instead, matter dissipates near the core:

$$\lim_{r \to r_c} R(r) = 0 \tag{4}$$

III. TORUS DYNAMICS AND FILAMENT SPIN IN QGMF

In the Quantum Gravity Model Framework (QGMF), galactic formation is governed by torus dynamics and filament spin cadence. Sagittarius A* is modeled not as a singularity, but as a filament core with rotational coherence.

Let R be the Ricci scalar curvature. Near the filament core radius r_c, we propose a suppression condition:

$$\lim_{r \to r_c} R(r) = 0 \tag{5}$$

This implies that matter dissipates near the core, preventing classical singularity formation.

Spin cadence is modeled as a harmonic oscillator:

$$\frac{d^2\theta}{dt^2} + \omega^2\theta = 0 \tag{6}$$

where $\theta(t)$ is the angular displacement of curvature pulses and ω is the spin frequency of the filament core.

Matter distribution is governed by torus gradients. Let $R^{\mu\nu}$ be the Ricci tensor and J^ν the induced matter current:

$$\nabla_\mu R^{\mu\nu} = J^\nu \tag{7}$$

This equation suggests that torus dynamics generate observable matter flows, potentially testable via galactic rotation curves.

We also propose a metric modulation model. Let $g_{\mu\nu}$ be the spacetime metric and $\Phi_{\mu\nu}$ the torus potential:

$$g_{\mu\nu} = \eta_{\mu\nu} + \Phi_{\mu\nu}(r,t) \tag{8}$$

where $\eta_{\mu\nu}$ is the Minkowski background and $\Phi_{\mu\nu}$ encodes torus modulation from filament spin.

QUANTITATIVE METRICS FOR QGMF PREDICTIONS

To support falsifiability, the following metrics are proposed for observational validation of the Quantum Gravity Model Framework (QGMF):

Filament Spin Cadence
Assuming filament spin frequency $\omega \sim 10^{-15}$ rad/s, harmonic signatures may appear in galactic rotation curves at radial distances:

$$r \sim 10^3\text{–}10^4 \text{ ly}$$

Detectable via Doppler shift measurements with resolution:

$$\Delta v < 1 \text{ km/s}$$

Torus-Induced Matter Flow
For curvature gradients:

$$\nabla_\mu R^{\mu\nu} \sim 10^{-30} \text{ m}^{-3}$$

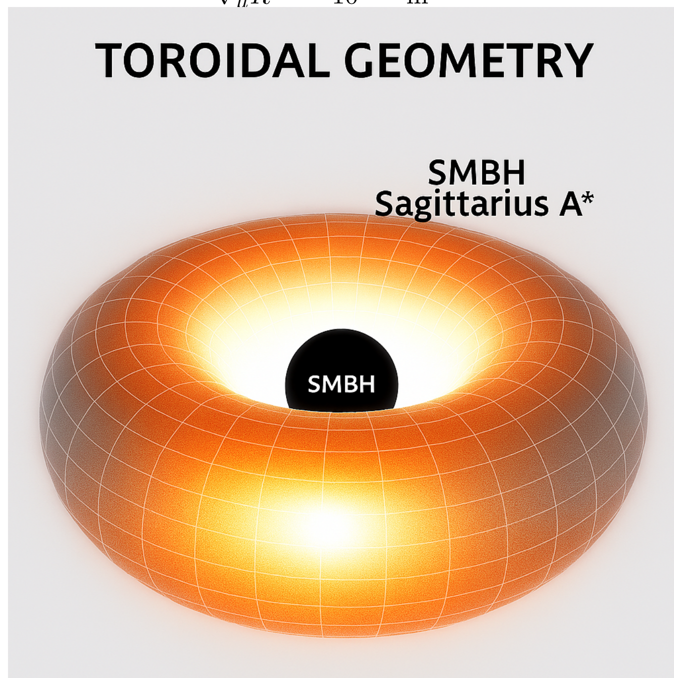

FIG. 1. Three-dimensional toroidal geometry mapped onto the supermassive black hole Sagittarius A*. The central black sphere represents the SMBH, while the surrounding torus illustrates matter coherence and filament spin cadence.

Induced matter currents J^ν may produce orbital deviations:

$$\delta r \sim 10^{-2} \text{ AU over 10-year baselines}$$

Measurable via Gaia astrometry.

Metric Modulation Signatures
Metric modulation amplitude:

$$\Phi_{\mu\nu} \sim 10^{-22}$$

Yields lensing shift:

$$\delta\theta \sim 10^{-6} \text{ arcseconds}$$

Detectable via Euclid or Hubble with time-series imaging over:

$$\Delta t \sim 5 \text{ years}$$

Matter Suppression Near Core
Near the filament core radius r_c, matter dissipation is modeled as:

$$\lim_{r \to r_c} R(r) = 0$$

Expected observational density limit:

$$\rho(r_c) < 10^{17} \text{ kg/m}^3$$

Below classical singularity thresholds.