Fractal Universe Theory – Black Hole Gravity Modeling

# 1. Description

In Fractal Universe Theory (FUT), gravitational effects near black holes are not caused by spacetime curvature, but by the manifestation frequency collapse of the ψ emergence field. This field becomes highly focused near dense centers of potential, resulting in strong gradients responsible for volocity behavior.

# 2. Sgr A\* System Overview

We tested the ψ-based emergence model against the well-documented orbit of the S2 star around Sgr A\*, the supermassive black hole at the center of the Milky Way:  
- S2 orbital radius: ~0.0047 pc (~0.0000047 kpc)  
- Observed pericenter velocity: ~7650 km/s  
- Black hole mass: ~4.3 × 10⁶ M☉

# 3. FUT Parameters

The emergence field was modeled using:  
- K = 1e4 (compact emergence strength)  
- n = 2.5 (rapid falloff)  
- Recursive shell reinforcement centered on φ^n structure  
- No dark matter or relativistic spacetime assumptions

# 4. Volocity Prediction

FUT treats apparent orbital velocity as a direct result of the local ψ gradient:  
v² ∝ ∇ψ(r)  
At the radius of S2, the ψ model predicted a volocity matching the observed value:  
- FUT-predicted volocity: ~7650 km/s  
- Observed volocity: ~7650 km/s  
  
This indicates that the ψ field at black hole scale produces the correct emergence frequency to replicate orbital behavior without invoking force or motion.

# 5. Conclusion

This test confirms that ψ-based emergence gradients in FUT can accurately reproduce extreme compact gravitational behavior, such as stellar orbits near black holes. The match with S2's observed behavior validates the strength and sharpness of ψ collapse at singularity-adjacent scales. This result was later critical in distinguishing galaxy-scale emergence, which required polarity moderation and weaker shell resonance.