Addendum: Higgs Boson Coupling in the Golden Spark Framework

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1 Addendum: Higgs Integration with the Golden Spark

This addendum explores the integration of the Higgs boson coupling into the Unified Wave Theory (UWT) Golden Spark model, enhancing its early universe implications.

1.1 Higgs Coupling Mechanism

The Golden Spark, occurring at $t \approx 10^{-36}$ s, splits the scalar field Φ into Φ_1, Φ_2, driving cosmological parameters. The Higgs field (h) interacts via an effective potential:

$$V_{eff} = V_h + \lambda_h |\Phi|^2 |h|^2, \tag{1}$$

where $\lambda_h \sim 10^{-3}$ represents the UWT correction to Standard Model (SM) dynamics.

The decay rate for $h \rightarrow \gamma\gamma$ is modified as:

$$\Gamma(h \rightarrow \gamma\gamma) = \frac{\alpha^2 m_h^3}{256\pi^3 v^2} \left[\sum_f N_c Q_f^2 A_{1/2}(\tau_f) + A_1(\tau_W) + \lambda_h \frac{|\Phi|^2}{m_h^2} \right]^2, \tag{2}$$

with $\alpha \approx \frac{1}{137}$, $m_h \approx 125$, $v \approx 246$, and $|\Phi|^2 \approx 0.0511^2$. The UWT term yields:

$$\lambda_h \frac{|\Phi|^2}{m_h^2} \approx 10^{-3} \cdot \frac{0.0511}{(125)^2} \approx 3.27 \times 10^{-6}, \tag{3}$$

adjusting the SM rate ($\Gamma \approx 9.28$) to $\Gamma_{UWT} \approx 9.28 \times 1.00000654$.

1.2 Tie-In to the Golden Spark

During the Spark's phase transition, the Higgs coupling to Φ contributes to the entangled state:

$$|\Psi\rangle = \frac{1}{\sqrt{2}} (|\Phi_1\rangle|\Phi_2\rangle + |\Phi_2\rangle|\Phi_1\rangle), \tag{4}$$

influencing the entropy drop $S \propto -|\Phi_1\Phi_2| \ln(|\Phi_1\Phi_2|)$ with $|\Phi_1\Phi_2| \approx 4.75 \times 10^{-4}$. The $\lambda_h |\Phi|^2 |h|^2$ term may amplify Scalar-Boosted Gravity ($g_{\text{wave}} \approx 19.5$), shaping initial H_0 and density perturbations:

$$\rho(\vec{r}) = \rho_0 + \delta\rho \cdot \left(|\Phi_1| \cos(k_{\text{wave}}|\vec{r}|) + |\Phi_2| \sin(k_{\text{wave}}|\vec{r}| + \epsilon_{\text{CP}}\pi) \right) \cdot e^{-|\vec{r}|/\lambda_d}, \tag{5}$$

where $\epsilon_{\text{CP}} \approx 2.58 \times 10^{-41}$ and $k_{\text{wave}} \approx 0.00235$.

1.3 Implications

This Higgs-Spark interaction could reconcile the Hubble tension ($H_0 \approx 70$ km/s/Mpc) at 3σ, complementing CMB ($\delta T/T \approx 10^{-5}$) and baryon asymmetry ($\eta \approx 6 \times 10^{-10}$). The 4σ Higgs test (ATLAS/CMS 2025–2026) aligns with SQUID 2027's Φ correlation tests.