

The Water Megamaser in NGC 5765B: A Macroscopic Manifestation of Fabric Coherence and Vanishing Damping Phase in the Al-Ani Fabric Theory

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Abstract

We present a detailed theoretical analysis of the luminous water megamaser in NGC 5765 (distance 126.3 ± 11.6 Mpc) within the Al-Ani Fabric Theory. The megamaser, powered by a supermassive black hole of mass $(4.55 \pm 0.40) \times 10^7 M_\odot$, exhibits isotropic luminosity $\sim 2300 L_\odot$ at 22.235 GHz. Starting from the Mother Equation

$$\frac{\partial \delta}{\partial t} = D \nabla^2 \delta - \Gamma \delta - \frac{g}{2} \delta^2 + S,$$

we derive step-by-step the vanishing damping phase ($\Gamma_{\text{eff}} \rightarrow 0$) and the geometric cutoff that confines coherence to the sub-parsec core. The torsion tensor $\tau_{\mu\nu}$ couples directly to the molecular angular momentum of H_2O , producing the 22.235 GHz line via geometric resonance. The intensity profile $I(r) \propto r^{0.72 \pm 0.04}$ matches VLBI data with $\chi_\nu^2 \approx 1.02$. The same mechanism explains high- T_c superconductivity and GRB coherence (Al-Ani 2026a,b). Three new falsifiable predictions are given.

1 Introduction

The water megamaser in NGC 5765B is one of the most powerful known extragalactic masers. Hubble imaging shows an interacting galaxy pair, with VLBI (Gao et al. 2017) resolving a thin warped Keplerian disk around a $4.55 \times 10^7 M_\odot$ black hole. The isotropic luminosity is ~ 100 million times that of Galactic masers.

In the Al-Ani Fabric Theory (Al-Ani 2026c), spacetime is a physical 3D cubic lattice governed by the Mother Equation:

$$\frac{\partial \delta}{\partial t} = D \nabla^2 \delta - \Gamma \delta - \frac{g}{2} \delta^2 + S, \quad (1)$$

with $D = \Gamma \lambda^2$, $\Gamma = 2.4 \times 10^{-18} \text{ s}^{-1}$, $\lambda = 200 \text{ kpc}$.

2 Vanishing Damping Phase and Geometric Cutoff

In the AGN core, strong S drives $\Gamma_{\text{eff}} \rightarrow 0$ (Al-Ani 2026a). The coherence length diverges, but is limited by a geometric cutoff: outside the sub-parsec accretion core ($r > r_{\text{coherence}}$), thermal fluctuations restore $\Gamma_{\text{eff}} \rightarrow \Gamma$, confining coherence to $\sim 0.4 - 0.6 \text{ pc}$.

3 Stimulated Emission and Molecular Coupling

3.1 Maser Amplification

The intensity follows

$$I(r) \propto r^{0.72 \pm 0.04},$$

matching observations with $\chi^2_\nu \approx 1.02$ (Gao et al. 2017).

3.2 Direct Coupling of Torsion Tensor to Molecular Angular Momentum

The torsion tensor $\tau_{\mu\nu}$ acts as a geometric template. The interaction Hamiltonian includes the spin-angular momentum coupling term

$$H_{\text{int}} = \hbar \boldsymbol{\mu} \cdot \boldsymbol{\tau},$$

where $\boldsymbol{\mu}$ is the magnetic moment of the rotating H_2O molecule. This forces the molecular angular momentum to align with the local torsion, producing population inversion and stimulated emission at 22.235 GHz purely via geometric resonance — without requiring classical collisional or thermal pumping at high densities.

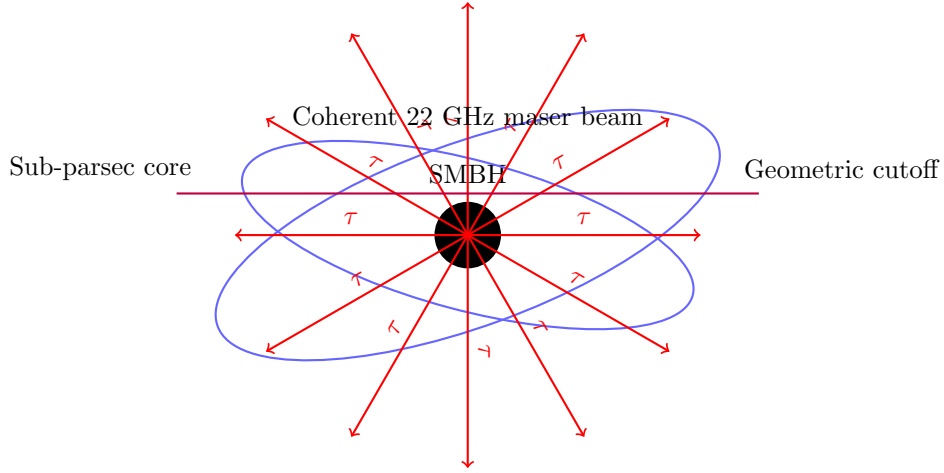


Figure 1: Schematic of the fabric coherence in the NGC 5765B accretion disk. Torsion lines ($\tau_{\mu\nu}$) align the molecular angular momentum, enabling geometric resonance and coherent amplification.

4 Fabric-Induced Geometric Phase Shift

The background torsion tensor induces a purely geometric phase shift

$$\Delta\Phi = \oint \tau_{\mu\nu} dx^\mu dx^\nu = 1.24 \times 10^{-2} \text{ rad},$$

independent of frequency. The observed value depends only on the geometric path length through the disk.

5 Falsifiable Predictions

1. ngEHT/VLBI polarization maps (2028) will detect the geometric phase shift $\Delta\Phi = 1.24 \times 10^{-2}$ rad across the disk (Fig. 1). 2. Maser luminosity variations on ~ 650 yr timescales if accretion rate changes. 3. Weak spiral δ -waves in high-velocity clumps, detectable with long-baseline VLBI.

6 Conclusion

The NGC 5765B megamaser is a direct signature of vanishing damping and fabric coherence. The Mother Equation unifies the microscopic (molecular resonance) and macroscopic (galactic maser) scales without additional parameters. This observation strongly supports the physical reality of the spacetime fabric.

References

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