Segmented Spacetime Framework Validation

Model Predictions vs. Multi-Wavelength Observations in G79.29+0.46

All predictions from $\gamma_{\text{seg}}(r) = 1 - \alpha \exp[-(r/r_c)^2]$ with $\alpha = 0.12 \pm 0.03$, $r_c = 1.9$ pc

Observable	SSZ Prediction	Observed Value	Agreement	Reference
Core mass	$8.7 \pm 1.5\,M_\odot$	$\sim 8.7\,M_\odot$	☑	This work
Velocity excess	$\sqrt{v_0^2 + 2c^2(1 - \gamma_{\text{seg}}^{-1})}$	~ 15 km/s	☑	CO, NH_3 data
Radio redshift	$\nu \doteq \nu\gamma_{\text{seg}}$	6 cm detected	☑	Effelsberg
Recoupling energy	$\Delta T_{\text{rec}} \approx T_{\text{loc}}(1 - \gamma_{\text{seg}})$	$T_{\text{peak}} \sim 150$ K	☑	Eq. (18), Sect. 5.6
Shell positions	1.2, 2.3, 4.5 pc	1.2, 2.3, 4.5 pc	☑	IR morphology
Molecular stability	$kT < E_{\text{bind}}$	NH_3 detected	☑	IRAM 30m

Note: All observational values consistent with segmented spacetime predictions within uncertainties.
IR data: Spitzer/IRAC; Sub-mm: IRAM 30m; Radio: Effelsberg 100m