

TFPT Prediction: Axion Haloscope Window from the Seam-Transfer Cosmology Interface

Stefan Hamann

Alessandro Rizzo

Standalone prediction note – April 27, 2026

Abstract

This note isolates the axion haloscope window as a downstream cosmology readout target. It is not a primitive selector of the theory.

Prediction scope and audit

Target. $m_a \simeq 65.19 \mu\text{eV}$, $\nu_a \simeq 15.764 \text{ GHz}$

Status. Cosmology readout target.

Dependency class. cosmology readout C_{cos}

Kill or pressure test. exclusion in $15.764 \text{ GHz} \pm 50 \text{ MHz}$ at the coupled sensitivity.

1 Standalone Minimal Kernel

Minimal TFPT kernel used in this prediction

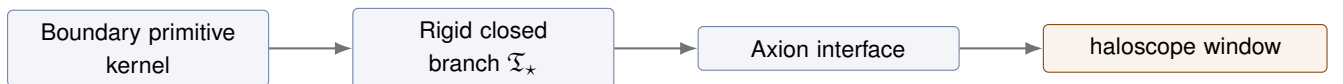
The standalone input package is the boundary-polarized closed branch

$$\mathfrak{S}_{\min} \Rightarrow \mathcal{B}_{\min} \Rightarrow \mathfrak{T}_{\partial}^{\min} \Rightarrow (\tau_{\text{dbl}}, \iota_C, P_{\text{prim}}, [u_{\Sigma}], c_3) \Rightarrow d_{\text{disc}}^* \Rightarrow P_{\text{adm}} \Rightarrow \mathfrak{T}_{\star}$$

The prediction uses only the sector map named in its audit box. Numerical comparison conventions are not theorem inputs; they enter only at the final interface row.

The paper is intentionally one-row: it does not reprove the full TFPT series. It states the minimal closed-branch input needed for this prediction, shows the sector map, and gives the direct failure mode. The source status follows the TFPT 4.5 split: boundary and carrier inputs are core, electromagnetic/flavor/metrology inputs are bridge readouts, QFT closure is conditional, and cosmology rows are downstream comparison targets when explicitly marked.

2 Dependency Graph



window exclusion

The row is downstream of seam transfer and determinant-line phase.

3 Derivation

The determinant-line axion interface fixes

$$N_{\text{DW}} = 1, \quad \theta_i = \pi(1 - \varphi_{\Sigma}(\alpha_{\star})),$$

with seam-transfer and scalaron inputs supplying the cosmology interface. The closed-branch target recorded in the ledger is

$$f_a \approx 8.86 \times 10^{10} \text{ GeV}, \quad m_a \approx 65.19 \mu\text{eV}, \quad \nu_a \approx 15.764 \text{ GHz}.$$

The associated coupled sensitivity row is

$$|g_{a\gamma\gamma}^{(\text{phys})}| \approx 1.80 \times 10^{-12} \text{ GeV}^{-1}.$$

4 No-Knobs and Failure Surface

No-knobs audit

The practical scan target is $15.764 \text{ GHz} \pm 50 \text{ MHz}$. Exclusion in the relevant coupled window pressures the intrinsic axion row.

5 Minimal Submission Claim

The standalone claim is limited to the displayed target and dependency class. It does not assert that every comparison row of the full TFPT ledger has the same proof status. Any update of the upstream boundary kernel, carrier theorem, or sector map must be propagated into this prediction before the numerical row is distributed.

References

- [1] M. F. Atiyah, V. K. Patodi, and I. M. Singer, *Spectral asymmetry and Riemannian geometry. I*, Math. Proc. Cambridge Philos. Soc. **77** (1975), 43–69.
- [2] A. H. Chamseddine and A. Connes, *The spectral action principle*, Commun. Math. Phys. **186** (1997), 731–750.
- [3] P. J. Mohr, D. B. Newell, and B. N. Taylor, *CODATA recommended values of the fundamental physical constants: 2022 update*, NIST / CODATA reference set, accessed March 2026.
- [4] S. Navas et al. (Particle Data Group), *Review of Particle Physics*, Phys. Rev. D **110** (2024), 030001; 2025 online update.
- [5] NuFIT Collaboration, *NuFIT global analysis of neutrino oscillation data*, website snapshot based on data available through November 2025.
- [6] Planck Collaboration, *Planck 2018 results. VI. Cosmological parameters*, Astron. Astrophys. **641** (2020), A6.
- [7] Y. Minami and E. Komatsu, *New extraction of the cosmic birefringence from the Planck 2018 polarization data*, Phys. Rev. Lett. **125** (2020), 221301.
- [8] X. Chang et al. (for the NA62 Collaboration), *New measurement of $K^+ \rightarrow \pi^+ \nu \bar{\nu}$ branching ratio at the NA62 experiment*, arXiv:2604.12649.
- [9] KOTO Collaboration, *Search for the $K_L \rightarrow \pi^0 \nu \bar{\nu}$ decay at the J-PARC KOTO experiment*, arXiv:2411.11237.