QFD CMB Brief: Photon–Photon Scattering with sin² Kernel

This brief summarizes how Quantum Field Dynamics (QFD) interprets Cosmic Microwave Background (CMB) anisotropies. Instead of relic acoustic oscillations, the fluctuations arise from spatial variations of the fundamental ψ-field, projected onto the sky via photon–photon (γγ) scattering. The angular dependence of the kernel is proportional to sin²θ, generating polarization in the same quadrupole geometry as Thomson scattering, but with a different optical depth history.

Key Equations

Photon–photon depth: $d\tau = a(\eta) \cdot \sigma\blacksquare \cdot n\_vis(\eta) \cdot n\_radio(\eta) \cdot c \cdot d\eta$

Visibility function: $g(\eta) = - d\tau/d\eta \cdot \exp(-\tau)$

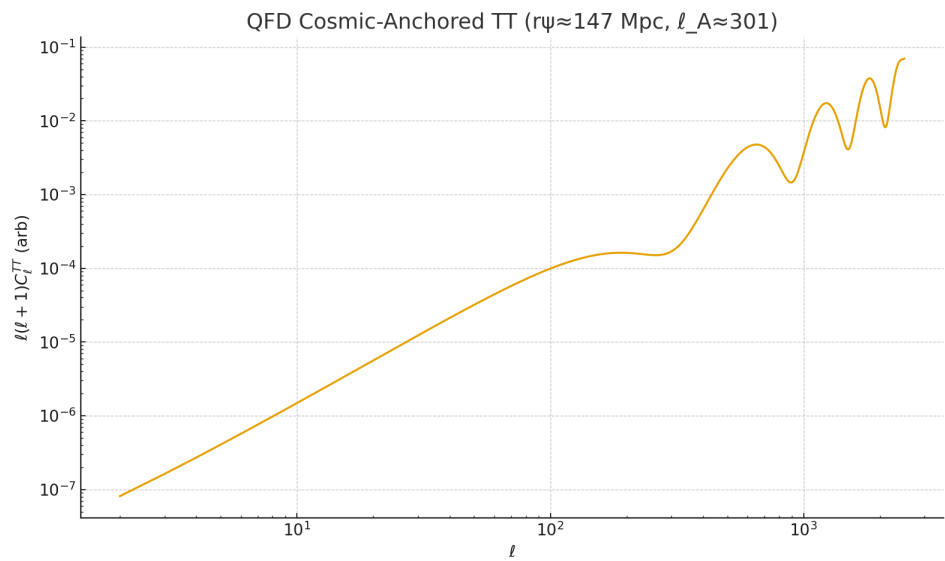Field power spectrum: $P\psi(k) = A \cdot k^{\wedge}(n\blacksquare-1) \cdot [1 + A\_osc \cdot \cos(k \cdot r\psi) \cdot \exp(-(k \cdot \sigma\_osc)^2)]^2$

Projection (high-$\blacksquare$): $C\_\blacksquare \approx \int d\chi \cdot [W(\chi)^2 / \chi^2] \cdot P\psi((\blacksquare+\frac{1}{2})/\chi)$
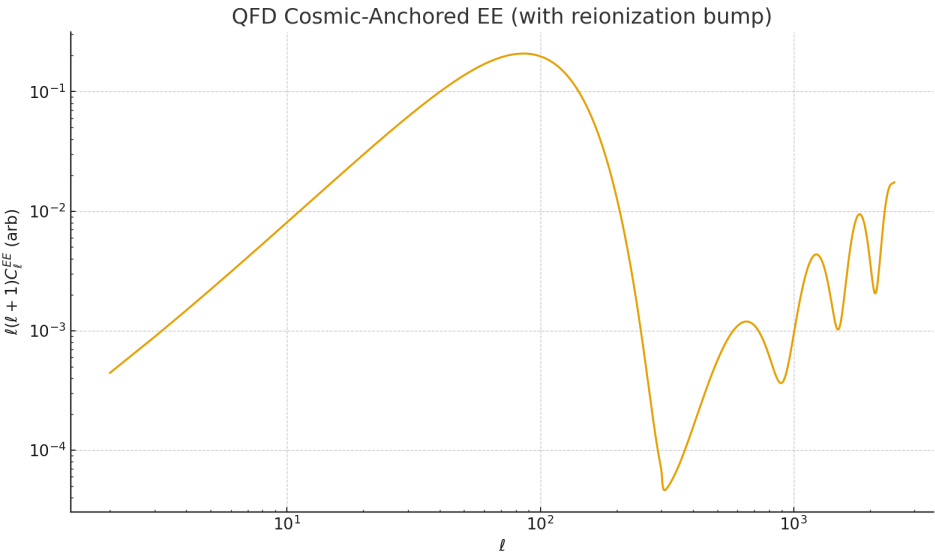
Peak spacing: $\Delta\blacksquare \approx \pi \cdot \chi^* / r\psi$ with $\blacksquare\_A \approx 301$, $r\psi \approx 147$ Mpc

Cosmic-Anchored Spectra

TT Spectrum

QFD Cosmic-Anchored TT (rψ≈147 Mpc, ℓ_A≈301)

EE Spectrum (with reionization bump)

QFD Cosmic-Anchored EE (with reionization bump)

TE Spectrum

QFD Cosmic-Anchored TE (lensing-smoothed)
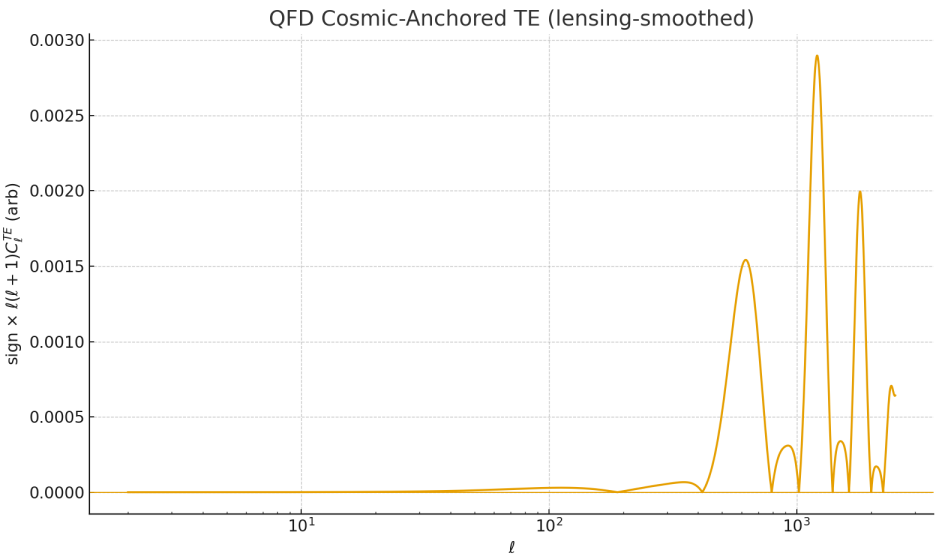
Comparison: ΛCDM vs QFD–γγ

Aspect	ΛCDM / Inflation	QFD with γγ scattering
Origin	Quantum fluctuations + inflation	Spatial ψ fluctuations projected by γγ scattering
Peaks	Acoustic oscillations in plasma	Harmonic structure in Pψ(k)
Polarization	Thomson quadrupole	sin² kernel, same quadrupole
Low-■ EE	Reionization (τ)	Reionization (τ)
BAO	Sound horizon imprint	Same rψ drives galaxy clustering wiggles