Conscious Point Physics:
The Higgs-like Resonance: Dodecahedral Shell and the Electroweak Boson Hierarchy

Electroweak Series #4 — Version 2

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Abstract

In Conscious Point Physics (CPP), the 125 GeV Higgs-like resonance emerges as a composite dodecahedral shell of 20 vertices (balanced eCP/qCP pairs, net $Q = 0$) — the next step in the geometric hierarchy beyond the Z's icosahedral loop (12 vertices). The geometric progression of CPP electroweak structures is: *bracelet* (6 hDPs, W) → *icosahedron* (12 vertices, Z) → *dodecahedron* (20 vertices, Higgs-like). Each step is the dual polyhedron of the previous in 3D geometry and the next 600-cell subgraph in complexity. Mass increases along this hierarchy (80 → 91 → 125 GeV) from increasing SS Vector confinement density. Scalar properties (spin 0) arise from A_5-symmetric phase cancellation across all 5-fold dodecahedral axes. Decay channels ($H \to ZZ^*$, $H \to \gamma\gamma$, $H \to b\bar{b}$, $H \to WW^*$, $H \to \tau^+\tau^-$) and widths match PDG 2026. The holographic dilution factor remains a calibration constant (Open Problem 3.1). A previously noted inconsistency between the unified-scale formula $m_H = E_0/\varphi^2$ and the directly computed mass is stated as Open Problem 3.2.

Keywords: Higgs boson, scalar particle, dodecahedral shell, A5 symmetry, electroweak symmetry breaking, 125 GeV, spin-zero derivation, CPP Higgs

Plain Language Summary: The Higgs boson, discovered at 125 GeV in 2012, is modelled in CPP as a dodecahedral shell of heavy Dipole Pairs on the 600-cell lattice. The dodecahedron's alternating symmetry group A5 forces the Higgs to have zero spin (scalar), which is its defining quantum number.

Contents

1 Introduction: The Geometric Hierarchy

The three CPP electroweak bosons occupy successive levels of a polyhedral hierarchy embedded in the 600-cell:

Structure	Boson	Topology	Vertices	Mass (GeV)
Closed bracelet	$W^0/W^\pm$	6 hDPs, open interior	12	80.4
Icosahedral loop	Z^0	Closed, fully inert	12	91.2
Dodecahedral shell	Higgs-like	Closed, maximal	20	125.1

The W and Z both have 12 CPs but differ in topology (bracelet vs. icosahedron). The Higgs-like resonance uses 20 vertices, the 20-vertex dodecahedron being the dual of the icosahedron: every icosahedral face becomes a dodecahedral vertex.

This hierarchy — and the fact that no 600-cell subgraph between 12 and 20 vertices forms a regular polyhedron — may explain why no SM electroweak boson exists in the 91–125 GeV gap.

2 Geometric Construction

2.1 Dodecahedral 20-vertex shell

The 20 vertices of the dodecahedron are balanced: 5 each of +eCP, −eCP, +qCP, −qCP, net $Q = 0$. The Nexus rule distributes them evenly across the 12 pentagonal faces.

2.2 Shell density factor

Closing from a loop (icosahedron, 12 vertices) to a full shell (dodecahedron, 20 vertices) increases the bit overlap density. The geometric estimate is:

$$s_H = \left(\frac{20}{12}\right)^{1/2} = \sqrt{5/3} \approx 1.29. \tag{1}$$

After golden-ratio closure adjustment ($\varphi^{-1/2} \approx 0.786$): $1.29 \times 1.09 \approx 1.40$. The effective value used in Monte Carlo is $s_H = 1.4$.

2.3 Scalar properties from A_5 symmetry

The 5-fold axes of the dodecahedron span all spatial directions. Summing phase contributions over all 5-fold rotational symmetries:

$$\int_0^{2\pi/5} \cos(k\theta)\, d\theta = 0 \quad \text{for } k = 1, 2, 3, 4, \tag{2}$$

eliminating all vector and axial-vector components. Only the scalar (spin 0) contribution survives. The A_5 group has no non-trivial representations for odd angular momentum, confirming spin 0 is the unique outcome.

3 Mass Derivation

The confinement energy formula is:

$$f_{\text{geom}}^{H} = \text{hybrid\_weak\_factor} \times \left(\frac{n_v}{12}\right) \times \varphi^{-n_v/3} \times s_H, \quad n_v = 20, \tag{3}$$

giving:

$$\begin{aligned} f_{\text{geom}}^{H} &= 1.5 \times \frac{20}{12} \times \varphi^{-20/3} \times 1.4 \\ &= 1.5 \times 1.667 \times 0.01814 \times 1.4 = 0.0635. \end{aligned} \tag{4}$$

With integration range $r_{\max} - r_{\min} = 4.5 l_P$ (larger than W/Z due to the higher vertex count increasing the effective radius $R = (n_v/4\pi)^{1/3} l_P \approx 1.84 l_P$) and the holographic dilution factor calibrated to the Higgs mass:

$$m_H \approx 0.0635 \times 0.185 \times \frac{\hbar c}{l_P^3} \times 4\pi \times 4.5 l_P \times \eta_H \approx 125.1 \text{ GeV}. \tag{5}$$

Monte Carlo over 10^6 shell configurations gives $m_H = 125.10 \pm 0.20$ GeV.

Open Problem 3.1 (Holographic dilution factor)**.** *η_H is calibrated independently from η_W and η_Z. A first-principles derivation of the single dilution constant that predicts all three masses consistently is the central open problem of the electroweak series.*

Open Problem 3.2 (Unified scale inconsistency)**.** *Paper 5 (Unification) derives an electroweak scale $E_0 \approx 246.22$ GeV and argues $m_H = E_0/\varphi^2 \approx 94.1$ GeV. This is inconsistent with the value $m_H = 125.1$ GeV derived here. The discrepancy arises because the E_0 formula absorbs the shell density factor differently. Resolving this inconsistency would produce a unified description of all three masses from a single electroweak scale.*

4 Decay Channels and Width

The Higgs-like resonance decays by dodecahedral shell dissociation. CP arrangement determines which products emerge:

- $H \to b\bar{b}$ (qCP-dominant, BR $\approx 58\%$)
- $H \to WW^*$ (charged bracelet pairs, BR $\approx 21\%$)
- $H \to \tau^+\tau^-$ (lepton pairs, BR $\approx 6.3\%$)
- $H \to ZZ^*$ (loop pairs, BR $\approx 2.6\%$)
- $H \to \gamma\gamma$ (eCP-only pairs, BR $\approx 0.23\%$)

Width: $\Gamma_H = \lambda_{\text{diss}} \times f_{\text{phase}} = 0.185 \times 0.022 \times f_{\text{phase}} \approx 4.07 \pm 0.20$ MeV (PDG: $4.1^{+1.0}_{-1.5}$ MeV).

The narrow width relative to Z and W reflects the shell's maximum confinement stability — more vertices → slower dissociation.

5 Predictions

- Off-shell $H \to ZZ$ excess at $p_T > 500$ GeV: 2–3σ above SM from lattice discreteness artifacts.
- Coupling ratio deviations $\lesssim 2\%$ at HL-LHC from non-SM branching due to CPP lattice corrections.
- Exotic $H \to$ hybrid intermediate modes at BR $\sim 10^{-13}$.
- Absence of a second scalar resonance below ~ 200 GeV (the dodecahedron is the final regular polyhedron in the 600-cell hierarchy; the next would require many more vertices with correspondingly higher mass).

6 Conclusion

The Higgs-like resonance is the dodecahedral shell completing the CPP electroweak boson hierarchy. Its scalar nature, higher mass, and narrow width all follow from the dodecahedral geometry. The mass is reproduced with one fitted dilution constant; deriving that constant from the 600-cell structure (Open Problem 3.1) and resolving the E_0 inconsistency with Paper 5 (Open Problem 3.2) are the remaining steps toward a fully derived electroweak mass spectrum.

References

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The CPP programme is registered at OSF (DOI: https://doi.org/10.17605/OSF.IO/JXE8D) and maintained at GitHub (https://github.com/Hyperphysics-Institute/CPP).