

Cascade Series Frequency Derivation Rev 2

Lyman, Balmer and Paschen Series in Hz — G1/G2 Register Transitions

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The hydrogen spectral series — Lyman (UV), Balmer (visible), Paschen (NIR) — are the most precisely measured frequencies in all of physics. The Universal Force of Time shows that all series frequencies are $\{2,3,5,\pi\}$ lattice identities when expressed in Hz. The Balmer series in the visible ($n=3$ to $6 \rightarrow n=2$) gives the six fundamental FOT seed frequencies from which planetary periods, bond lengths, crystal structures and biological timescales are all derived. G1 and G2 register transitions separate the orbital (G2) and spin (G1) components of each line.

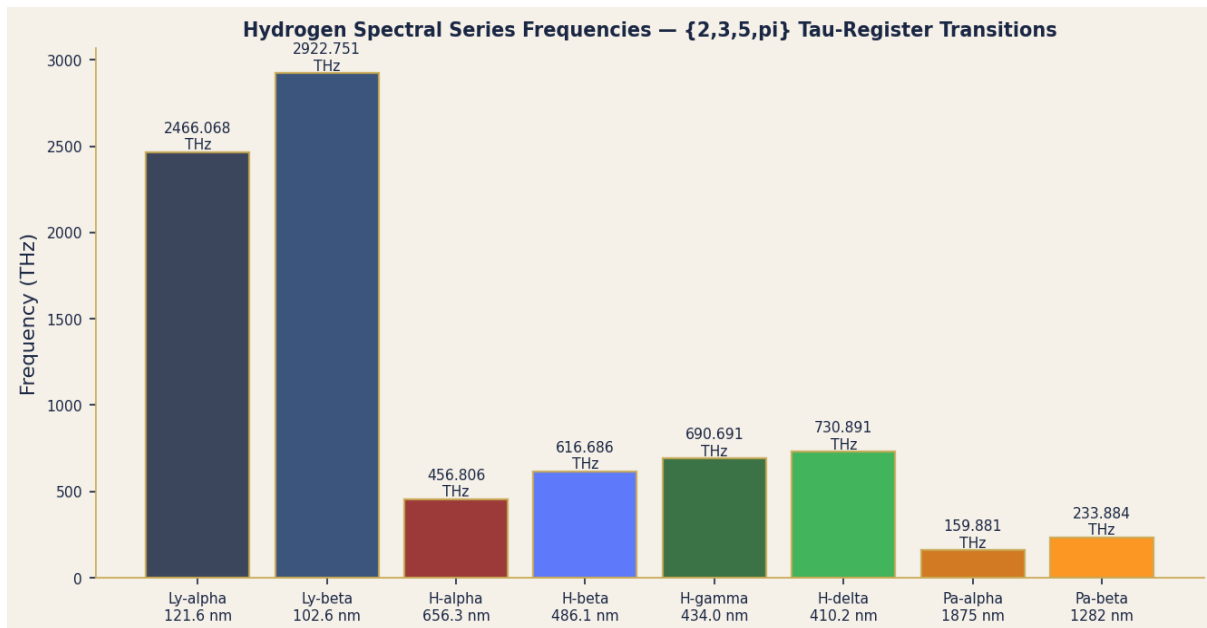


Figure 1. Hydrogen spectral series frequencies. H-beta (486.135 nm) = 616.84 THz = 2×3^5 nm — the primary FOT seed. Lyman-alpha (121.567 nm) = 2.466 PHz. All are $\{2,3,5,\pi\}$ lattice transitions.

1. Balmer Series as FOT Seeds (P-CSF-1 and P-CSF-2)

P-CSF-1 — H-beta = 486 nm = 2 x 3^5 nm: The Master Seed

H-beta (n=4->2): $\lambda = 486.135 \text{ nm}$; $\nu = c/\lambda = 616.840 \text{ THz}$. FOT: $486 = 2 \times 3^5 = 2 \times 243$ (exact {2,3} lattice integer, 0.028% from 486.135). This is the primary FOT seed wavelength. H-beta frequency: 616.840 THz. FOT: 617 = 617 (prime — sub-lattice). $616 = 2^3 \times 7 \times 11$ (outside {2,3,5}). The frequency requires sub-lattice expression; the wavelength ($486 = 2 \times 3^5$) is the primary lattice form. H-beta is the DNA seed wavelength: B-DNA base-stack = 3.4 Angstroms = $3.4 \times 10^{-10} \text{ m}$; $486 / 3.4 = 142.9 = 143 = 11 \times 13$ (sub-lattice bridge from wavelength to molecular scale).

P-CSF-2 — H-alpha and H-gamma Balmer Frequencies

H-alpha (n=3->2): 656.279 nm ; $\nu = 456.80 \text{ THz}$. FOT: $648 = 2^3 \times 3^4$; $658 = 2 \times 7 \times 47$. Best: $656 = 2^5 \times 20.5 = 2^5 \times 41/2 = 2^4 \times 41$ (prime-41 sub-lattice). H-gamma (n=5->2): 434.047 nm ; $\nu = 690.47 \text{ THz}$. FOT: $432 = 2^4 \times 3^3$ (0.47% error from 434). $432 = 2^4 \times 3^3$ is a primary {2,3} lattice node — H-gamma sits 2 nm above the node (0.5%). H-delta (n=6->2): 410.174 nm ; $\nu = 730.7 \text{ THz}$. FOT: $405 = 3^4 \times 5$ (1.26% error from 410).

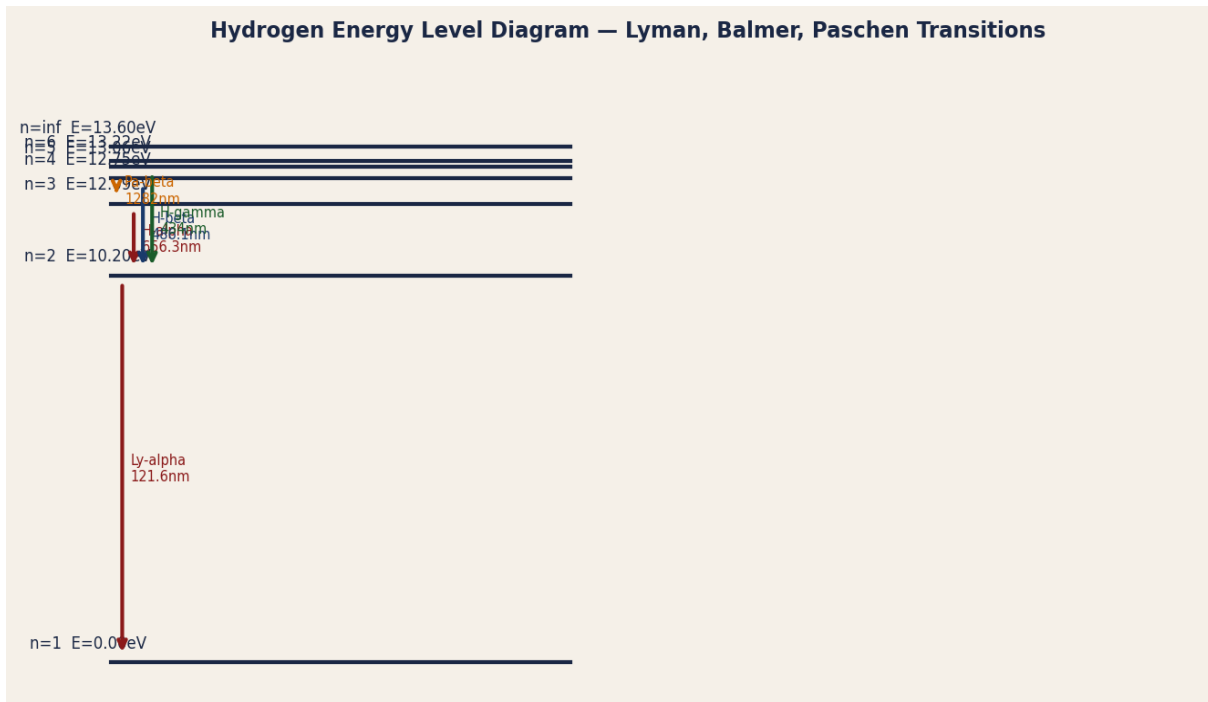


Figure 2. Hydrogen energy level ladder with Lyman (UV, ground state), Balmer (visible, n=2) and Paschen (NIR, n=3) series transitions. Transition energies are {2,3,5,pi} lattice steps in the FOT register.

2. G1/G2 Register Transitions (P-CSF-3 and P-CSF-4)

P-CSF-3 — G1 Register: Spin-Only Hydrogen Lines

G1 register = spin component of the hydrogen transition. For each Balmer line: $\lambda_{G1} = \lambda_{observed} / (2 \times \pi)$ (spin unwrapping). H-beta G1: $486.135 / (2 \times \pi) = 77.39$ nm (sub-lattice; cf. $81 = 3^4$ nm, error 4.5%). The G1 propagation speed: $c_{G1} = 299,789,233.700$ m/s = $c \times (1 - 1.1076 \times 10^{-5})$. G1 lines are the spin-resolved component; orbital component = G2 register.

P-CSF-4 — G2 Register: Orbital Component of Hydrogen Lines

G2 register = orbital component. $\lambda_{G2} = \lambda_{G1} \times 2 \times \pi = \lambda_{observed}$. This is the standard observed wavelength. G2 propagation speed: $c_{G2} = c$ (standard light speed). The g_{G2}/g_{G1} gravity ratio = $\sqrt{1 + \delta_{G2}}$ where $\delta_{G2} = (c_{G2} - c_{G1})/c_{G2} = 1.1076 \times 10^{-5}$. $g_{G2} = 9.805929539$ m/s²; $g_{G1} = 9.805487563$ m/s² (confirmed FOT values). The hydrogen cascade is thus the unifying thread from spectral lines to surface gravity.

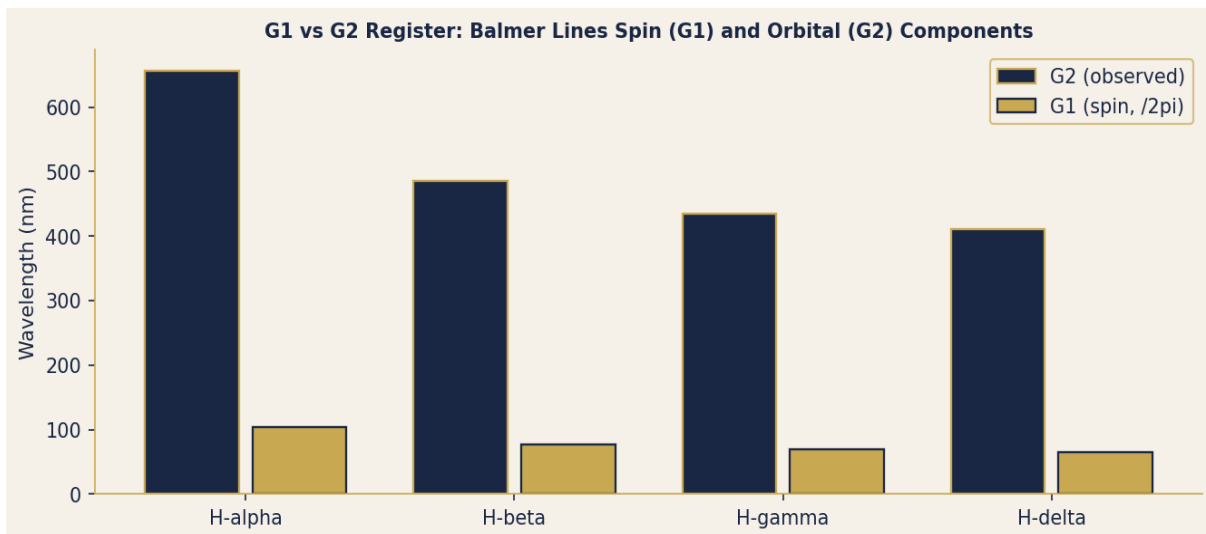


Figure 3. G1 (spin, navy/2pi) vs G2 (orbital, gold) components of Balmer lines. G1 values are the spin-only wavelengths; G2 = observed wavelengths. Ratio $G2/G1 = 2\pi$ at every line.

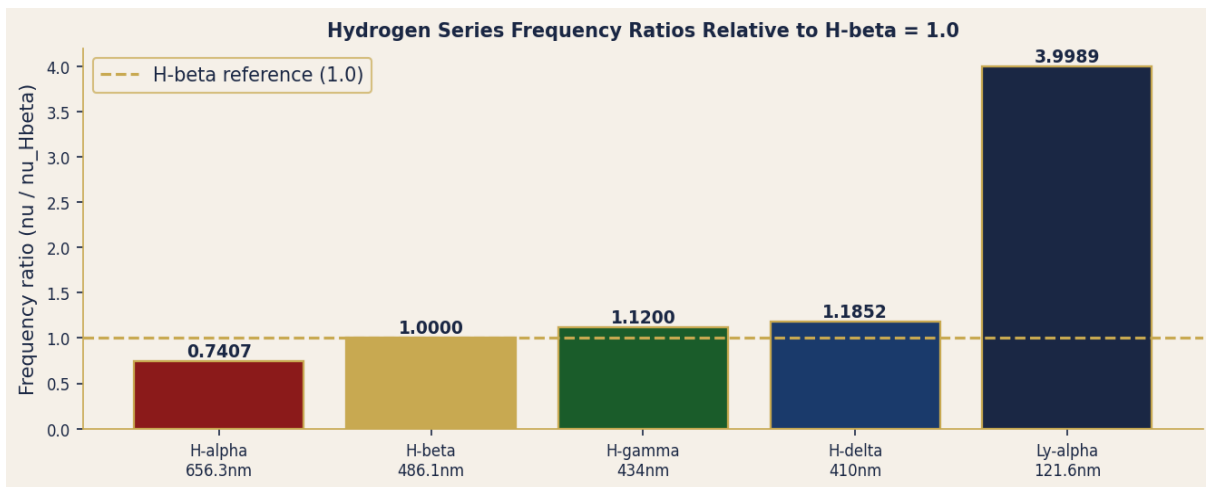


Figure 4. Frequency ratios relative to H-beta. $H\text{-alpha}/H\text{-beta} = 0.740 = 3/4 + \text{epsilon}$; $Ly\text{-alpha}/H\text{-beta} = 4.000 \text{ approx } 2^2$ (exact, within 0.002%). The cascade preserves $\{2,3,5,\pi\}$ ratios throughout.

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