# Nodal Ionisation Boundaries and the Lyman Break: Multi-Register Hydrogen Thresholds

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The Universal Force of Time — Academic Series | Paper 12 of 25

Propositions P-LBG-1 through P-LBG-5 | Source: Vol3 Section 177

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## §1 — Abstract

The Lyman Break technique — locating high-redshift galaxies through the sharp flux dropout at 912 Å — is one of modern cosmology's most powerful tools. This paper establishes that the Lyman limit is a pure {2,3,5} lattice node: 91.125 nm = $3^6/2^3$. Each dimensional register carries its own Lyman ionisation boundary, all pure {2,3,5}: Earth node 91.125 nm, Venus node 65.610 nm, Mercury node 35.156 nm, Sun H-bond axis 42.188 nm. The cosmological invariance of the 912 Å break confirms the G1 Rydberg constant is invariant across the observable universe.

## §2 — The FOT Lyman Limit

P-LBG-1: $\text{Tau}_\lambda(G1, D=0, n_1=1, n_2=\infty) = 10^9/\text{Tau}_R(G1) = 10^9 / (2^3\times10^9/3^6) = 3^6/2^3 = 729/8 = 91.125$ nm The Rydberg denominator $3^6 = 729$ reappears as the ionisation wavelength numerator. The universal emission formula and the ionisation threshold are arithmetically dual: the formula is its own inverse at n=∞.

## §3 — Nodal Ionisation Boundaries

All four dimensional nodes (D=0 to D=3) have pure {2,3,5} Lyman limits: D=0 (Earth): 91.125 nm = $3^6/2^3$ D=1 (Venus/216): 65.610 nm = $3^8/(2^2\times5^2)$ D=2 (Mercury/115): 35.156 nm = $3^2\times5^3/2^5$ D=3 (Sun H-bond): 42.188 nm = $3^3\times5^2/2^4$ Note: Mercury (35.156 nm) < Sun (42.188 nm) — the antisymmetric speed reversal at D=3 is encoded in ionisation thresholds. The H-bond axis node is distinguishable from the matter terminus by ionisation energy.

## §4 — LBG Universality Confirms Cosmological Invariance

LBGs are observable from z=3 to z=10+. In every case, the rest-frame break occurs at 912 Å. In FOT terms: hydrogen in those galaxies — separated from us by billions of light-years — operates at exactly the same G1 Rydberg constant as local hydrogen. $\text{Tau}_R(G1) = 2^3\times10^9/3^6$ is cosmologically invariant.

The D=0 Earth-node dimensional boundary is not a local property — it is the same register throughout the observable universe. The LBG technique works precisely because the {2,3,5} lattice is universal and the G1 ionisation threshold 91.125 nm is constant.

## §5 — Testable Predictions: Three Additional Boundaries

FOT predicts three additional Lyman ionisation boundaries beyond the known 912 Å edge: Boundary 2: 65.610 nm = $3^8/(2^2\times5^2)$ at the Venus/216 node Boundary 3: 35.156 nm = $3^2\times5^3/2^5$ at the Mercury/115 node Boundary 4: 42.188 nm = $3^3\times5^2/2^4$ at the Sun H-bond axis node Detectable as absorption edges in extreme-UV/soft-X-ray spectra, independent of source redshift. No equivalent prediction exists in standard physics.

## §6 — Registered Propositions: P-LBG-1 through P-LBG-5

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| **P-LBG-1** | The FOT Lyman ionisation boundary at Earth node (D=0) is 91.125 nm = $3^6/2^3$. The G1 Rydberg denominator ($3^6$) is the ionisation wavelength numerator. The emission formula and the ionisation threshold are arithmetically dual. |



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| **P-LBG-2** | Every dimensional speed node carries a pure {2,3,5} Lyman ionisation boundary: D=0: $3^6/2^3$; D=1: $3^8/(2^2\times5^2)$; D=2: $3^2\times5^3/2^5$; D=3: $3^3\times5^2/2^4$. The {2,3,5} lattice governs both emission spectra and ionisation thresholds at every register. |
| **P-LBG-3** | LBG universality (z=3 to z=10+) confirms Tau_R(G1) = $2^3\times10^9/3^6$ is cosmologically invariant. The Earth-node D=0 boundary is universal across the observable universe. |
| **P-LBG-4** | The antisymmetric speed reversal at D=3 is encoded in nodal Lyman ionisation thresholds. Mercury (35.156 nm, D=2) has higher ionisation energy than the Sun H-bond axis (42.188 nm, D=3). The matter terminus and H-bond axis are distinguishable by ionisation energy. |
| **P-LBG-5** | Three additional nodal Lyman ionisation boundaries predicted: 65.610 nm (Venus/216), 35.156 nm (Mercury/115), 42.188 nm (Sun H-bond axis). Detectable as absorption edges in extreme-UV/soft-X-ray spectra independent of source redshift. Unique testable FOT prediction. |

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Cross-references: Vol3 Section 177 | Section 176 (P-RYD — Three-Helix Rydberg Framework)



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