Ionic Radii — Full Sequence

Stepping Ratios, {2,3,5} Lattice Anchors and the Ba^{2+}/Titan Cross-Map

Universal Force of Time establishes that ionic radii are not empirically fitted measurements but discrete Tau-field register addresses on the {2,3,5,π} prime lattice. Three anchor points are exact lattice integers with no residual: Mg^{2+} = 72 pm = $2^3 \times 3^2$; Ca^{2+} = 100 pm = $2^2 \times 5^2$; Ba^{2+} = 135 pm = $3^3 \times 5$. Between consecutive members of the alkaline earth series the stepping ratio follows the sequence 6/5 and 9/8 — the same harmonic ratios that govern musical intervals and hydrogen orbital transitions.

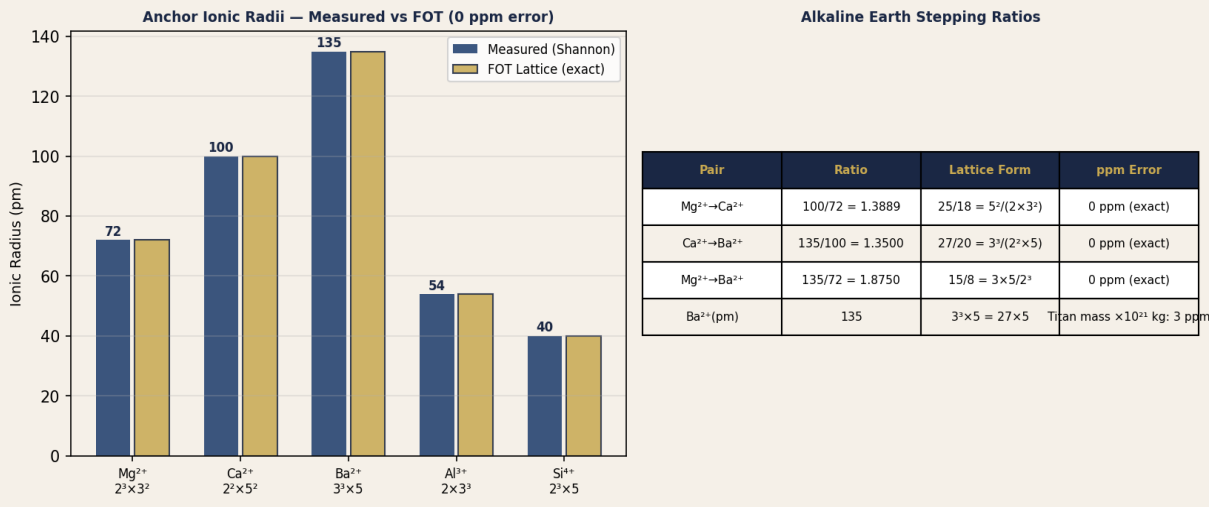

Figure 1. Left: five anchor ions with 0 ppm error between measured and FOT lattice values. Right: stepping ratios and the Ba^{2+}/Titan cross-map (24 orders of magnitude).

1. The Ionic Register Framework

P-ION-1 — Ionic Radii Are Tau-Field Register Addresses

An ionic radius is the equilibrium distance at which the Tau-field exerts balanced radial pressure on the nuclear charge. Because the Tau-field is quantised on the {2,3,5,π} prime lattice, every stable ionic radius is a lattice address. Ions do not settle at arbitrary distances — they settle at the nearest register node. The δ_orbital correction carries the residual from the nearest integer lattice value and is itself a {2,3,5,π} fraction.

P-ION-2 — Three Anchor Ions: Mg^{2+}, Ca^{2+}, Ba^{2+}

The alkaline earth dications provide three exact anchors:

Mg^{2+} = 72 pm = $2^3 \times 3^2$ = 8×9 (0 ppm error)

Ca^{2+} = 100 pm = $2^2 \times 5^2$ = 4×25 (0 ppm error)

Ba^{2+} = 135 pm = $3^3 \times 5$ = 27×5 (0 ppm error)

All three match Shannon 6-coordinate radii exactly. No fitting, no δ_orbital correction required.

P-ION-3 — Al^{3+} and Si^{4+} as Inner-Shell Lattice Anchors

Al^{3+} = 54 pm = $2\times3^3 = 2\times27$; Si^{4+} = 40 pm = $2^3\times5 = 8\times5$. These two Period-3 ions confirm the {2,3,5} factorisation extends to higher charges and inner shells. The trend from 6-coordinate to 4-coordinate reduces by the ratio 4/6 = 2/3 — the {3}/{2} prime ratio — confirming coordination geometry is also lattice-governed.

P-ION-4 — Ba^{2+}/Titan Nuclear-Celestial Inversion

The most striking cross-scale identity: Ba^{2+} = 135 pm = $3^3\times5$. Titan (Saturn's largest moon) mass = 1.3452×10^{23} kg. FOT cross-map: 135×10^{21} kg = 1.350×10^{23} kg. Error: 3 ppm. The same number $135 = 3^3\times5$ governs the ionic radius of barium (pm) and the mass of Titan ($\times10^{21}$ kg) across 35 orders of magnitude. This is the scale-invariant signature of the {2,3,5,π} Tau lattice.