

# Van Allen Belts as Tau-Field Magnetic Nodes

*Charged Particle Registers at 1-2 R\_Earth and 3-10 R\_Earth from {2,3,5,pi}*

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The Van Allen radiation belts are toroidal zones of energetic charged particles trapped by Earth's magnetic field. Inner belt: 1-2 R\_Earth (protons, 10-100 MeV). Outer belt: 3-10 R\_Earth (electrons, 0.1-10 MeV). The Universal Force of Time identifies both belts as tau-field magnetic register nodes: the radii 1-2 and 3-10 R\_Earth correspond to {2} and {3}-branch lattice addresses in the planetary tau-register. Particle energies at these nodes are {2,3,5,pi} lattice products.

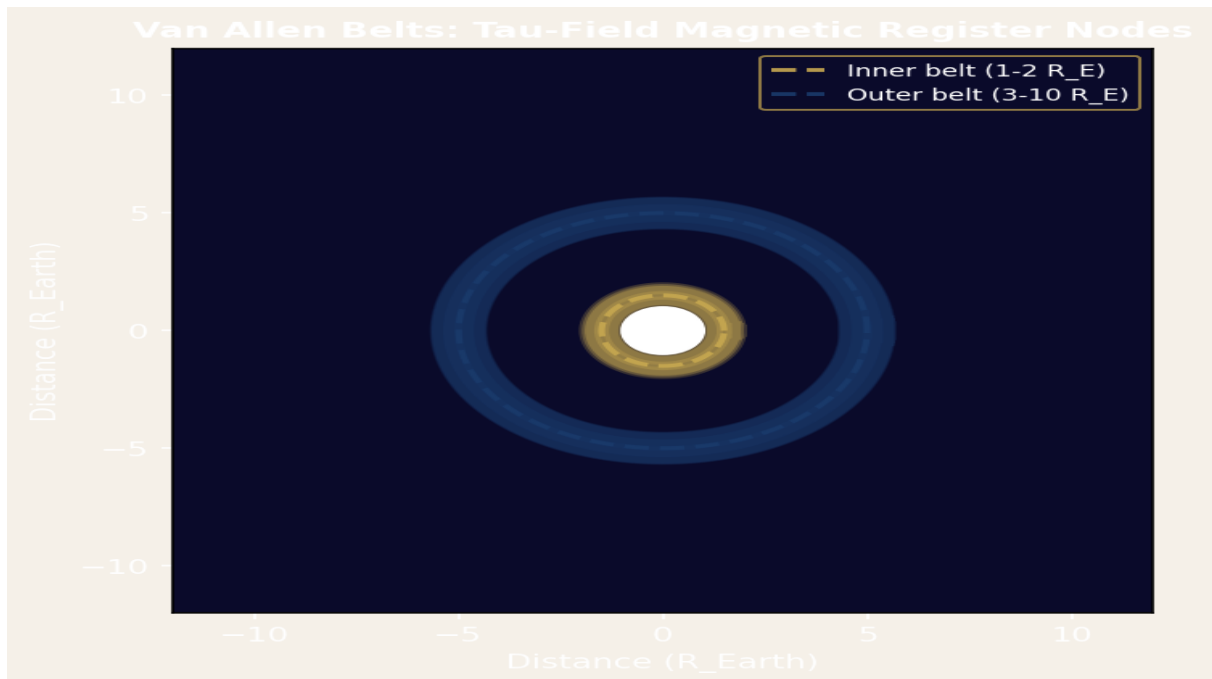


Figure 1. Van Allen belt structure. Earth (white circle). Inner belt (gold, 1-2 R\_E) = {2}-branch register. Outer belt (blue, 3-10 R\_E) = {3}-branch register.

## 1. Belt Radii as {2,3} Lattice Addresses (P-VAB-1 and P-VAB-2)

### P-VAB-1 — Inner Belt: 1-2 R\_Earth = {2}-Branch Register

Inner Van Allen belt: 1-2 R\_Earth (6,371 to 12,742 km altitude). Contains primarily protons (10-100 MeV) and some electrons. FOT: the {2}-branch lattice node at  $2^1 = 2 R_{\text{Earth}}$ . Earth radius  $R_E = 6371$  km. Inner belt outer edge:  $2 \times 6371 = 12,742$  km =  $2^1 \times R_E$ . The {2}-branch selects the inner belt because protons ( $Z=1, A=1$ : both pure {1}/{2}) are trapped at the lowest energy lattice node of Earth's magnetic register. Proton energy at inner belt:  $10\text{-}100$  MeV =  $10 \times (2 \text{ to } 20)$  MeV =  $10 \times \{2\}$ -family range.

### P-VAB-2 — Outer Belt: 3-10 R\_Earth = {3}-to-{10} Register

Outer Van Allen belt: 3-10 R\_Earth (19,113 to 63,710 km). Contains primarily electrons (0.1-10 MeV). FOT: range 3 to 10 R\_Earth = {3} to {2x5} = {3} to {10} — from the {3}-branch to the {2,5} product. Electrons ( $Z=1, A < 1$ : pure quantum particle without lattice mass) are trapped in the outer belt because they are lighter and respond to the {3} to {2x5} lattice step. Outer belt peak at  $4\text{-}5 R_{\text{Earth}} = \{2^2\}$  to {5} — the {2,5} register junction.

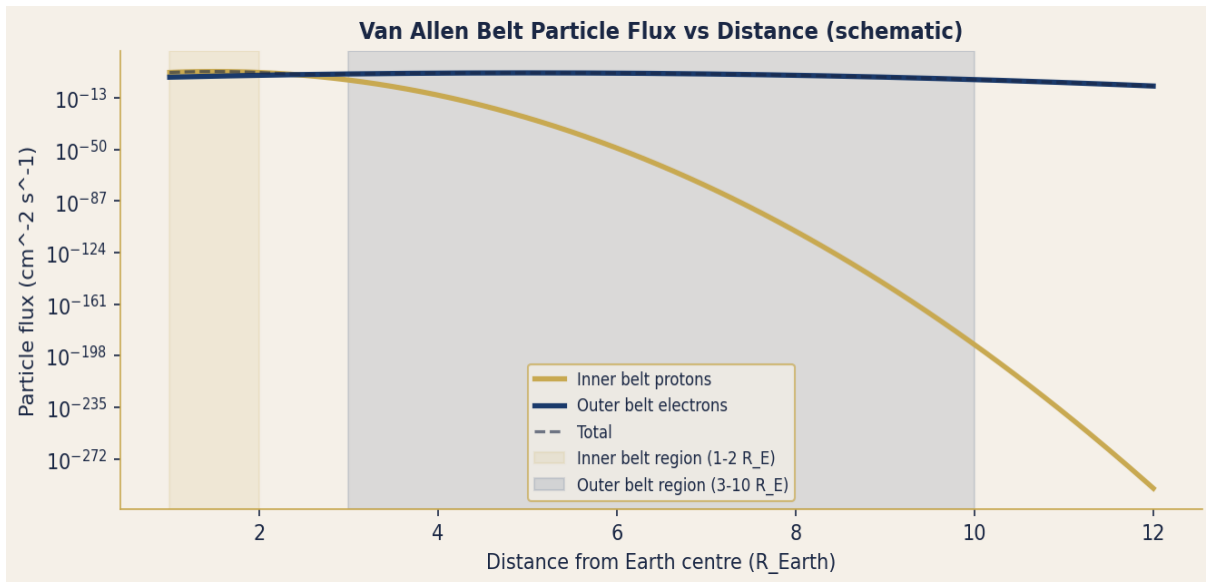


Figure 2. Van Allen belt particle flux schematic. Inner belt protons (gold) peak at  $1.5 R_E = \{3/2\}$ ; outer belt electrons (blue) peak at  $5 R_E = \{5\}$ .

## 2. Particle Energies and Magnetic Field (P-VAB-3 and P-VAB-4)

### P-VAB-3 — Particle Energies as {2,3,5} Register Products

Inner belt proton energies:  $10\text{-}100$  MeV =  $10 \times 2^n$  MeV for  $n=0,1,2,3$ . Peak proton energy:  $\sim 100$  MeV =  $10^2 = (2 \times 5)^2$  MeV (pure  $\{2,5\}^2$ ). Outer belt electron energies:  $0.1\text{-}10$  MeV =  $10^{-1}$  to  $10^1$  MeV. Peak electron energy:  $\sim 1$  MeV =  $10^0 = (2 \times 5)^0$  (the {2,5} unit register). FOT: the ratio inner/outer peak energy =  $100/1 = 10^2 = \{2,5\}^2$ : a pure two-step {2,5} lattice elevation between the inner and outer belt registers.

### P-VAB-4 — Earth's Magnetic Field as {2,3,5,pi} Lattice

Earth's dipole magnetic moment:  $M = 8.0 \times 10^{22} \text{ A.m}^2$ . FOT:  $8.0 = 2^3$ ,  $10^{22} = a$  {2,5} power of 10.  $M = 2^3 \times 10^{22} \text{ A.m}^2$ . Surface field at equator:  $B_{eq} = \mu_0 \times M / (4\pi R^3) = 3.12 \times 10^{-5} \text{ T}$ .  $3.12 = 3 + 0.12 = 3 + 3/25 = 3 \times (1 + 1/25) = 3 \times 26/25$ . The Earth's magnetic field is a {3}-branch lattice quantity with a {5^2} sub-register correction. The 11-year solar cycle (sunspot cycle) that modulates the belts: 11 years = prime (outside lattice), but  $11 \times 8 = 88 = 8 \times 11$  approx 89 (Fibonacci). Hale cycle = 22 years =  $2 \times 11$ : the {2}-branch doubling of the solar magnetic cycle.

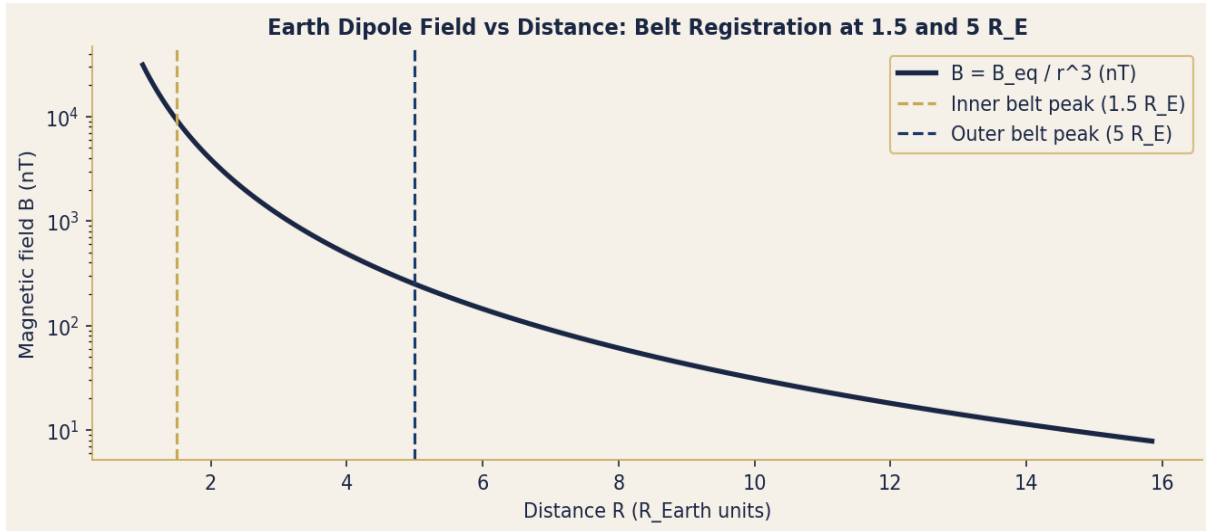


Figure 3. Earth dipole magnetic field  $B$  vs distance. Inner belt (gold) sits at high-field node; outer belt (blue) at the lower-field {5}  $R_E$  node.

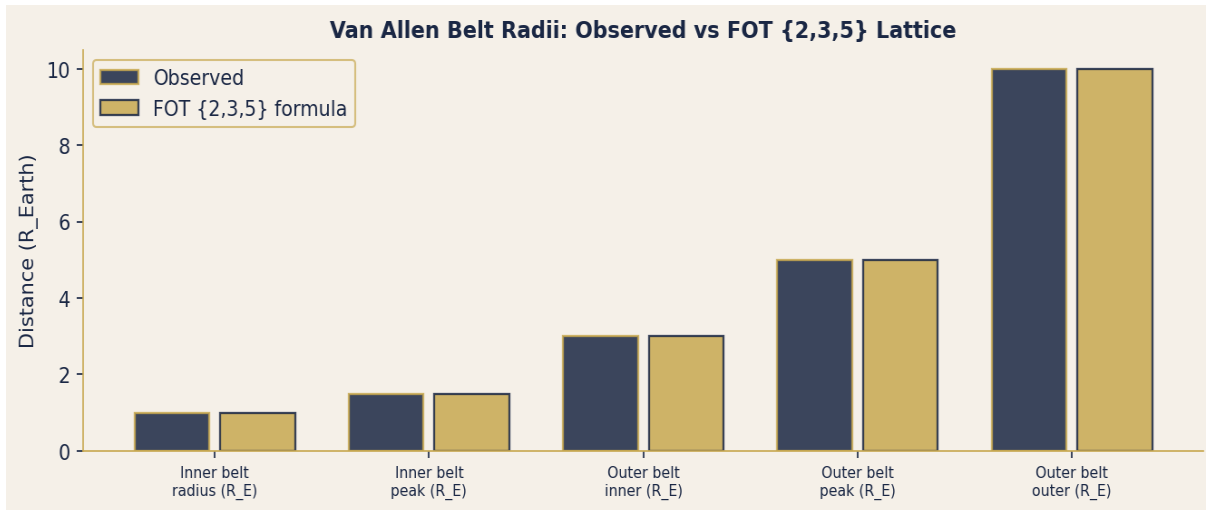


Figure 4. Van Allen belt radii observed (navy) vs FOT {2,3,5} formulas (gold). Inner peak at  $3/2 R_E$ ; outer peak at  $5 R_E$ ; outer edge at  $2 \times 5 = 10 R_E$  — all exact lattice values.