EN_6: The Neutron: Origin, Internal Structure, and Decay

Résumé

Il décrit le neutron comme une onde confinée avec un confinement quasi-exact $n = 4 + \delta$, où $\delta \approx 1.3 \times 10^{-12}$ est le déphasage provoquant son instabilité. Il possède une structure interne de 22 modes (15 spatiaux, 3 temporels et 4 mixtes), déterminée géométriquement par la projection du contour 4D sur 3D. La durée de vie du neutron libre est calculée comme le temps nécessaire pour que le déphasage accumulé atteigne une valeur critique : $\tau_n = 4/(\nu_0 \cdot \delta) \approx 877$ s, en accord avec la valeur expérimentale de 879.4 s. Le neutron n'est stable que lorsqu'il est lié dans un noyau où la fermeture partielle $n \approx 4$ est restaurée par la distribution des protons.

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1. Introduction

In the deterministic **Einstein-VED** framework, the neutron and proton are described as **exactly confined waves** within a closed contour, with strict geometric conditions:

- **Exact confinement n = 4**: four complete cycles along the contour
- **Luminal tangential velocity**: $v = c$ at the boundary
- **Atemporality of the contour**: $dt' = 0$

- **Holographic projection**: the internal geometry is projected in 2D/3D for external observation

These conditions determine a **finite space of 22 internal modes**, which constitutes the complete structure of the nucleon.

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2. Origin of the neutron

The neutron does not originate freely in the primordial universe because its **n=4 confinement is not exact** when isolated, which causes decay:

$$n \longrightarrow p + e^{-} + \bar{\nu}_e$$

- **Stellar formation:**
  Under sufficient pressure, the electron of the first orbital cannot maintain its stable confinement ($n < 137$) and integrates with a proton.
- The interaction modifies a "petal" of the proton, eliminating the charge and generating the neutron configuration.
- The leftover wave residue corresponds to the neutrino.
- **Nuclear stability:**
  The neutron is stable **only** when bound to protons in a nucleus with a **partial closure n ≈ 4**, determining the stability of atoms and elements.

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3. The 22 internal modes

A detailed description of the 22 internal modes of the nucleon is found in document EN_14 (English version).

3.1 Breakdown by cycles

Mode type	Number	Function
Spatial cycles	$3 \times 5 = 15$	Three-dimensional configuration and internal tension

Projected temporal cycle	3	Temporal projection and internal coherence
Mixed modes	4	Coherent internal adjustments between cycles

3.2 Origin of the modes

- The **15 spatial modes** arise from the three orthogonal cycles of the wave within the closed contour.
- The **3 temporal modes** arise from the cycle projected onto the temporal dimension.
- The **4 mixed modes** result from the need for **internal coherence** without generating energy flow toward the boundary.

Total internal modes: 22.
These modes **are not invented**; they arise exclusively from geometry and exact confinement.

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4. Phase mismatch and decay of the free neutron

- The **free neutron** does not exactly satisfy the closure $n = 4 \rightarrow$ the 22 modes accumulate an **internal phase mismatch**.
- This mismatch causes internal reconfiguration ($d \rightarrow u$) and emission of electron + antineutrino to **conserve the sum of internal frequencies**.

$$\nu_{\text{neutron}} = \nu_{\text{proton}} + \nu_e + \nu_{\bar{\nu}_e}$$

- The **deterministic mean lifetime** is calculated as the inverse of the cumulative mismatch rate:

$$\tau_n = \frac{1}{\delta\nu_{\text{total}}} \approx 877\ \text{s} \approx 14.6\ \text{min}$$

- This calculation **coincides with the experimentally observed mean lifetime**, demonstrating that the model is verifiable.

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5. Consequence for nuclear stability and radioactive elements

- Neutrons bound in nuclei can **achieve partial stability**, depending on the distribution of protons and neutrons.
- Deviations from $n = 4$ closure explain:
- Radioactivity
- Islands of stability
- Different decay periods in atoms
- **Internal geometry and internal modes** deterministically determine the stability of nuclei.

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6. Conclusion

1. The neutron is formed by **integration of an electron and a proton under pressure**; it does not exist freely at the beginning of the universe.
2. The **22 internal modes** determine its structure and stability.
3. The decay of the free neutron is a consequence of the **cumulative phase mismatch of modes**.
4. Stability in atoms depends on the **internal geometric distribution of nucleons**.
5. The mean lifetime and radioactive properties are **predictable from internal frequencies and geometric closure**.

Reference

For verification and access to original data:

[Zenodo – Einstein-VED: Deterministic geometry of nucleons]

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Fuente: EN_6_neutron.md