EN_25: Rigorous Framework of Confined Waves and Atomic Structure

Résumé

Il étend le principe de confinement à toute la structure atomique et moléculaire. Toute onde confinée stable doit satisfaire $\Delta\phi_{\text{total}} = 2\pi n$.

La première orbitale électronique stable correspond à $n = 137$, déterminant le rayon de Bohr et l'énergie d'ionisation de l'hydrogène. Les orbitales supérieures sont générées en augmentant n ($n = 138, 139, \ldots$), produisant des rayons et des énergies croissants avec une stabilité décroissante. Les paires de Cooper ont un contour $L_{\text{Cooper}} = 2 \cdot n \cdot \lambda_e$. Les molécules se forment lorsque la somme des contours d'électrons de différents atomes se ferme exactement : $\sum_i n_i \lambda_i = 2\pi R_{\text{ved}}^{\text{mol}}$. Ce principe unifie les particules élémentaires, les atomes, les molécules et les condensats bosoniques sous la même géométrie d'ondes confinées.

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1. General Principle of Confined Wave Stability

Any stable confined wave must satisfy:

$$\Delta\phi_{\text{total}} = 2\pi n, \quad n \in \mathbb{Z}^+$$

Conditions:

1. The phase must close exactly.
2. There must be no phase accumulation ($\Delta\phi(t) = 0$).
3. Stability is independent of external forces; it depends solely on the wavelength of the wave itself.

Direct consequence:
The equivalent projective radius of any confined wave is:

$$R_{ved} = \frac{n\lambda}{2\pi}$$

where $\lambda = h/(mc)$ for a particle of mass m.

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2. Application to the Proton

- Confinement in 3 spatial dimensions.
- Stable existence throughout all time T ($dt' = 0$).
- Exact contour closure for total stability.

Result:

$$n = 4 \quad \Rightarrow \quad R_p = \frac{4\lambda_p}{2\pi}$$

- The proton satisfies the exact integer $\rightarrow$ stable.

- The free neutron has $n = 4 + \delta \to$ phase drift $\to$ decays over time $\tau \approx 877\,\mathrm{s}$.

Interpretation:
The number 4 is not arbitrary; it is **the minimum integer compatible with three-dimensional stability without angular degeneracy**.

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3. Electron and First Atomic Orbital

Stability condition of the electron:

$$R_{ved} = \frac{n\lambda_e}{2\pi}$$

- First stable orbital: $n = 137$
- This automatically determines:
- Orbital radius
- Minimum energy
- Exact contour closure

Minimum energy:

$$E_{\min} = \frac{hc}{\lambda_e} = \frac{hc}{2\pi R_{ved}} \cdot n$$

- Coincides with the observed minimum energy (~13.6 eV for hydrogen)
- Higher orbitals: $n > 137 \to$ larger radii and energies $\to$ decreasing relative stability

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4. Method to Determine the Subsequent Orbitals

1. Take $n_{\min}$ (first stable orbital, 137).
2. Increment $n_i = n_{\min} + 1, n_{\min} + 2, \ldots$
3. Calculate radii and energies:

$$R_{ved}^{(i)} = \frac{n_i \lambda_e}{2\pi}, \quad E_i = \frac{hc}{2\pi R_{ved}^{(i)}} \cdot n_i$$

1. Evaluate stability: longer contours $\rightarrow$ lower rigidity $\rightarrow$ lower relative stability.
2. This generates **the complete hierarchy of orbitals and energies** without probabilistic postulates.

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5. Autonomous Confinement and Bosonic Condensates

- Each wave has its own λ and contour R_{ved}, independent of the nucleus.
- For bosons, multiple waves can share the same minimum contour state $\rightarrow$ **Bose-Einstein condensate**.
- Cooper pairs: $L_{\text{Cooper}} = 2 \cdot n \cdot \lambda_e \rightarrow$ maximum stability based on exact closure, not nuclear interaction.

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6. Molecules as Bound States

- Electrons from different atoms can form **combined contours**.
- Bonding condition:

$$\sum_i n_i \lambda_i = 2\pi R_{ved}^{\mathrm{mol}}$$

- Each n_i integer ensures **exact closure**.
- Bond hierarchy: more rigid contours $\rightarrow$ more stable bonds.
- Explains single, double, and triple bonds geometrically.

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7. Summary of the Conceptual Framework

Concept	Geometric Basis	Consequence
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Proton	3D, n=4, dt^{\prime}=0	Absolute stability
Neutron	3D, n=4+δ	Temporal decay
Electron	Orbital n=137	Minimum energy, exact closure
Higher orbitals	n>137	Increasing energies, decreasing stability
Cooper pairs	k=2, exact closure	Superconductivity, collective stability
Bosonic condensates	Shared n, independent Rved	Coherent macroscopic state
Molecules	Combined contours, $\sum n_i \lambda_i = 2\pi R_{ved}$	Stable chemical bonds

Unifying principle:

> Any stable confined wave must close its contour exactly at an integer n. From this, radii, energies, stability, and the hierarchy of bound states are deduced—from elementary particles to molecules and condensates.

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8. Conclusion

1. **Universal deterministic framework:** No probabilities, no ad hoc postulates.
2. **Constructive method:** From λ, n, R_{ved}, and E are determined.
3. **Unification of phenomena:** Proton, electron, Cooper pairs, condensates, molecules $\rightarrow$ same principle of confined waves.

4. **Orbital basis:** Exact integer n = orbital number → natural hierarchy of energies and radii.
5. **Future applicability:** Enables study of new bound states and predictability of atomic and molecular structures.

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