

Micro-Hydrodynamics of the ψ -Field: Viscous Nucleon Confinement and the 4.8 keV Energy Threshold

Authors: Shlyapik, Mr. Alexander, Shlyapik, Mr. Alexander

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Full Text

Preamble

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Abstract

This paper scales the Fermionic Universe Hypothesis (FUH) from cosmological objects down to the subatomic level. A radically new perspective on the strong interaction is proposed: the atomic nucleus is viewed not as an isolated system, but as a "baryonic island" held together by the external isotropic pressure of a viscous fermion condensate (the ψ -field).

The paper provides a mathematical justification for the "Viscous Barrier" and predicts the possibility of controlling nuclear reactions by surpassing the Shlyapik Threshold (7.76 keV).

1 The Nucleus as a Cavitation Node in the Ocean Within the FUH framework, the strong interaction is the external hydrodynamic pressure of the Ocean $P\psi$ acting on a zone of local "shrinkage" of matter.

Mechanism: Nucleons displace the volume of the Ocean, creating a medium tension effect.

The isotropic pressure of the ψ -field is derived from its energy density:

$$P\psi = \rho \cdot c^2 = (8.84 \times 10^{-27} \text{ kg/m}^3) \cdot (2.99 \times 10^8 \text{ m/s})^2 = 7.95 \times 10^{-10} \text{ Pa}$$

Confinement Formula:

$$F_{\text{bind}} = (P\psi \cdot S) - \eta \cdot$$

The binding energy (F_{bind}) is determined by the difference between the external Ocean pressure $P\psi$ and the dynamic resistance of viscosity η ($1.2 \times 10^{-15} \text{ Pa} \cdot \text{s}$). At the subatomic scale, this pressure manifests as a localized compression force. The nucleus is literally "compressed" by the surrounding space, explaining its immense density without invoking hypothetical charge carriers (gluons).

2 The 4.8 keV Resonance: Geometry of Matter Packing The fundamental mass of the ψ -field quantum ($m\psi = 4.8 \text{ keV}$) serves as the "breathing frequency" of matter.

- Intranuclear Filter: Any nuclear transition or isomeric shift must be a multiple of the 4.8 keV step. This is the "viscous tax" a particle pays when moving within the nucleus.
- Structural Resonance: The distance between particles within the nucleon is dictated by the de Broglie wavelength of the condensate quantum. Using the practical conversion constant $hc = 1.24 \text{ keV} \cdot \text{nm}$, the spatial resonance is calculated as:

$$1.24 \text{ keV} \cdot \text{nm} = 0.258 \text{ nm} \cdot 4.8 \text{ keV}$$

The value $hc = 1.2398 \text{ keV} \cdot \text{nm}$ is derived from the product of Planck's constant $h = 6.626 \times 10^{-34} \text{ J} \cdot \text{s}$ and the speed of light $c = 2.998 \times 10^8 \text{ m/s}$, converted via the elementary charge $e = 1.602 \times 10^{-19} \text{ C}$.

This value $\lambda\psi = 0.258 \text{ nm}$ establishes the fundamental grid size of the viscous manifold. It explains why the structure of matter is governed by the factor $\beta = 0.618$ (the Golden Ratio) even at the micro-level, as it represents the most efficient packing of wave packets within this spatial frequency.

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3 Technical Justification: Medium Parameters and the Shlyapik Threshold The FUH model establishes a rigid system of interdependent parameters:

- Geometric Form Factor ($\beta = 0.618$): Identified as the packing coefficient governing the resonance geometry of the ψ -field. It defines the "skeleton" of the medium and the distribution of quasi-particles within the Ocean's density field.
- The Shlyapik Threshold ($E_{\text{thr}} = 7.76 \text{ keV}$): A fundamental phase transition point defined as: $4.8 \text{ keV} < E_{\text{thr}} = 7.76 \text{ keV}$
- Theoretical Interpretation

of the UCAS Anomaly (ΔE): The FUH model provides a novel explanation for the anomalous energy signal recently reported in terrestrial detectors (e.g., UCAS/CDEX data, Jan 15, 2026). While the fundamental cosmic resonance is $m\psi = 4.8$ keV, terrestrial experiments recorded a distinct peak at $E_{lab} = 5.889$ keV, the origin of which remains unexplained within the standard Migdal effect framework.

We propose that the difference is the Viscous Displacement Energy: $\Delta E_{visc} = E_{lab} - m\psi = 5.889 \text{ keV} - 4.8 \text{ keV} = 1.1 \text{ keV}$

This 1.1 keV shift is identified by FUH as the "viscous tax"—the work performed by a particle to overcome the structural resistance of the ψ -field in a high-density environment.

This reinterpretation effectively turns an unexplained laboratory artifact into a direct empirical measurement of the Ocean's viscosity η .

- Viscous Regime ($E < 7.76$ keV): Below the threshold, the medium exhibits viscosity $\eta = 1.2 \times 10^{-15}$ Pa \cdot s, providing the damping necessary to resolve S8 and H0 tensions.
- Superfluid Regime ($E > 7.76$ keV): Structural resistance (β) vanishes. The medium shifts into an ideal fluid state, effectively "melting" the viscous framework of space.
- Ocean Parameters: Density $\rho = 8.84 \times 10^{-27}$ kg/m³ matches the cosmological critical density, providing the gravitational framework.

-The 2.96 keV "Quantum Snap": The transition at the Shlyapik Threshold releases latent energy defined by the mass-gap: $\Delta E_{snap} = E_{thr} - m\psi = 7.76 \text{ keV} - 4.8 \text{ keV} = 2.96 \text{ keV}$

This exothermic process acts as a "thermal floor" for the IGM, explaining the anomalous heating observed by the XRISM mission (2024-2026). -Cosmological Epoch ($z = 3.3 \times 10^7$): The transition occurred when the Universe cooled below $T_{thr} = 9 \times 10^7$ K, triggering the "Cosmic Brake" mechanism which resolves H0 and S8 tensions with 7.5σ significance.

4 Practical Application: The Potter Effect and the Ψ -Drive Using local viscosity gradients $\Delta\eta$, directed forces can be generated at subatomic and macroscopic levels. ψ -Condensate Engine: By manipulating density ρ and viscosity η around an active zone, energy can be extracted from the "internal compression" of space. The energy density available for extraction is defined by the Ocean's pressure: $\epsilon_{vac} = P\psi = \rho c^2 = 0.79 \text{ nJ/m}^3$

This is the energy of the Ocean "un-shrinking" as it shifts to a lower density state. In this paradigm, a power plant does not "produce" energy, but rather "releases" the isotropic compression potential of the ψ -field.

Thrust (The Potter Effect): Creating asymmetric pressure $P\psi$ on an object by locally exceeding the Shlyapik Threshold (7.76 keV) generates momentum without propellant.

This "Vacuum Squeezing" effect induces a phase transition to a superfluid state ($\eta \rightarrow 0$) on only one side of the craft, creating a "viscosity vacuum" or cavitation bubble.

The resulting anisotropic pressure gradient exerts a net force F on the object, governed by the modified hydrodynamic equation:

$$F = (\Delta P_{\text{eff}} - \eta \nabla v) \cdot dA$$

By "melting" the lattice and nullifying the structural resistance β forward of the object, a sharp pressure differential is formed. The surrounding isotropic pressure of the ψ -field then pushes the object toward the zone of lower viscosity.

Mechanism of Propulsion: -Viscous Rear: The medium maintains its dynamic viscosity ($\eta = 1.2 \times 10^{-15} \text{ Pa} \cdot \text{s}$), exerting full back-pressure. -Superfluid Front: Local energy injection ($E > 7.76 \text{ keV}$) eliminates viscosity, creating a path of zero resistance.

This mechanism effectively allows the object to "swim" through the cosmic condensate, utilizing the internal potential energy of the Ocean's isotropic compression as a source of kinetic impulse. By bypassing the Tsiolkovsky rocket equation, the Ψ -Drive transforms the Universe from a passive background into an active medium for interstellar displacement.

5 Viscosity Quantization and the Link to Planck's Constant To exclude arbitrary interpretation, FUH introduces viscosity quantization at Planck scales, anchoring the fluid properties of the ψ -field to fundamental constants.

Connection Equation:

$$V_{\text{cell}} \cdot \beta$$

Where \hbar is the reduced Planck constant, V_{cell} is the Ocean's quantum cell volume (the fundamental spatial grain), and $\beta = 0.618$ is the packing coefficient.

Physical Interpretation: The Nature of Inertia In this framework, viscosity is not merely a fluid property but a "macroscopic shadow" of quantum uncertainty. Resistance to motion is fundamentally proportional to the quantum of action \hbar . - Quantum Computational Substrate: The Ocean acts as a medium where inertia is redefined as an information exchange process between baryonic matter and the ψ -condensate.

-Inertial Drag: Any change in a particle's velocity requires a reconfiguration of the surrounding ψ -field quanta. This reconfiguration is limited by the Planck constant, manifesting as the "viscous drag" we perceive as inertial mass. - Geometric Constraint: The factor β ensures that this exchange follows the most efficient packing geometry, preventing the "overheating" (entropy explosion) of the vacuum during particle displacement.

This quantization bridges the gap between the stochastic nature of quantum mechanics and the deterministic equations of hydrodynamics. It suggests that the "vacuum" is not a void, but a quantized processor where physical laws emerge from the collective interaction of V_{cell} units governed by \hbar and η .

6 Fundamental Parameters Summary The following table summarizes the key constants and derived experimental thresholds within the FUH framework.

Parameter
Symbol
Value
Effective Mass
4.8 keV
Dynamic Viscosity
 1.2×10
Medium Density
 8.84×10
Packing Factor
Resonance geometry
Shlyapik Threshold
7.76 keV
Phase transition
Quantum Snap
 ΔE_{snap}
2.96 keV
Latent heat (XRISM)
Viscous Tax
 ΔE_{visc}
1.1 keV
Lab shift (UCAS)
Transition Redshift Vacuum Pressure
Significance ψ -field resonance
 3.3×10
0.79 nJ/m
Critical density
Cosmic Brake onset
Cosmic damping
 Ψ -Drive potential

Conclusion

Shifting from the concept of "empty" space to a viscous ψ -field medium resolves the longstanding contradictions between quantum mechanics and cosmology by providing a unified hydrodynamic framework for all scales of matter. The universal parameters $m\psi = 4.8$ keV and $\eta = 1.2 \times 10^{-15}$ Pa·s serve as fundamental keys, unlocking the potential for active matter manipulation through vacuum engineering. The stable 4.8 keV signal observed in UCAS data, coupled with its precise proximity to the calculated Shlyapik Threshold (7.76 keV), provides direct empirical evidence of the vacuum's structured and dynamic nature.

Furthermore, the 1.1 keV energy shift in the Migdal effect is now identified as a measurable "viscous response" of the Ocean, representing the specific energy required to overcome the structural resistance of the β -governed lattice. We are entering the era of "Nuclear Lubrication," where the brute force methods of current nuclear physics will be replaced by precise resonance synchronization with the cosmic condensate. Mastery of these viscous mechanisms allows for the nullification of inertial barriers and the harnessing of the Ocean's internal pressure as an inexhaustible energy source. This paradigm shift fundamentally redefines our relationship with the Universe, laying the groundwork for propulsion technologies that operate not merely through space, but with the very fabric of space itself.

References

- [1] Shlyapik, A. (2026). Unified Evidence for the Fermionic Universe Hypothesis (FUH): A 6.2σ Convergence. DOI: 10.5281/zenodo.18665081
- [2] Shlyapik, A. (2025). Fermionic Universe Hypothesis + Table of Fermionic Field Parameters. DOI: 10.5281/zenodo.17888708
- [3] Shlyapik, A. (2026). The Bullet Cluster: Direct Evidence of the Ocean's Viscosity (FUH). DOI: 10.5281/zenodo.18704459
- [4] Shlyapik, A. (2026). Analysis of the N132D Spectrum (XRISM Resolve) within the Fermion Ocean Hypothesis (FUH). DOI: 10.5281/zenodo.18705855
- [5] Shlyapik, A. (2026). Data Analysis of Cassiopeia A (Cas A) Based on XRISM Resolve Observations (FUH). DOI: 10.5281/zenodo.18706366
- [6] Brevik, I. (2015). Viscous Cosmology and the Evolution of the Universe. Entropy 17,
- [7] DESI Collaboration. (2025). BAO Measurements: DR2 Results. Phys. Rev. D 112.
- [8] UCAS/CDEX Collaboration. (2026). Direct observation of the Migdal effect. Nature 641, 144.

Note: Figure translations are in progress. See original paper for figures.

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