**Advancing RFT to Version 7.8: Refinement and Validation**

**1. Unified Scalaron Parameter Set**

**Objective:** Determine a single set of scalaron parameters (coupling constants α, β, γ, Tsallis entropy index *q*, and activation thresholds) that fit multiple scales of astrophysical data. This involves simultaneously modeling: galactic rotation curves, cluster merger dynamics, cosmic void expansion, and wide binary stellar orbits.

* **Galaxy Rotation Curves:** We will use the SPARC database, which provides rotation curves for 175 disk galaxies with precise 3.6 μm photometry and kinematic data​

[galaxiesbook.org](https://galaxiesbook.org/chapters/II-02.-Galactic-Rotation.html#:~:text=We%20can%20repeat%20Kent%20,m%7D%5C%29%29%20and%20precise)

. The goal is to tune RFT’s parameters so that the model reproduces the flat rotation curves without dark matter. By applying Bayesian inference (e.g. MCMC), we will constrain parameters like α, β, γ and *q* such that RFT’s predicted rotation velocities match SPARC data across high-surface-brightness and low-surface-brightness galaxies. This ensures RFT 7.8 maintains the successes of MOND-like theories on galaxy scales​

[darkmattercrisis.wordpress.com](https://darkmattercrisis.wordpress.com/2010/08/04/the-bullet-cluster-and-galaxy-clusters-in-modified-gravity-theories/#:~:text=Modified%20gravity%20theories%20do%20well,why%20this%20statement%20is%20wrong)

while using a consistent parameter set.

* **Cluster Mergers:** Massive merging galaxy clusters (Bullet Cluster, El Gordo, Abell 520) provide a critical test. In Newtonian gravity, these systems require large invisible mass to explain gravitational lensing and high collision speeds. Alternative gravity models historically struggled here, but RFT’s scalaron might address the mass discrepancy. For example, MOND reduces the “missing mass” in clusters from about 4× to ~2× the visible mass​

[darkmattercrisis.wordpress.com](https://darkmattercrisis.wordpress.com/2010/08/04/the-bullet-cluster-and-galaxy-clusters-in-modified-gravity-theories/#:~:text=But%20how%20to%20explain%20the,even%20be%20real%3A%20a%20factor)

, and Moffat’s MOG even claimed that normal matter alone can account for the Bullet Cluster’s lensing signal​

[darkmattercrisis.wordpress.com](https://darkmattercrisis.wordpress.com/2010/08/04/the-bullet-cluster-and-galaxy-clusters-in-modified-gravity-theories/#:~:text=,%E2%80%9D)

. We will fit RFT to cluster observables (lensing mass maps, X-ray gas profiles, merger dynamics) to see if one set of (α, β, γ, *q*) can explain the gravitational potential without dark matter. Any tension—such as needing a different *q* for clusters vs. galaxies—will be documented and used to refine the theory.

* **Cosmic Voids:** Voids are regions of low density that expand faster than the cosmic average, and their internal dynamics and lensing offer a test of gravity in extremely low-density environments. Modified gravity models predict distinctive void behaviors: for instance, simulations in *f(R)* gravity find that void walls (surrounding matter density) become denser as gravity is strengthened​

[aanda.org](https://www.aanda.org/articles/aa/full_html/2019/12/aa35949-19/aa35949-19.html#:~:text=f%28R%29%20and%20the%20symmetron%20theory,parameters%20that%20are%20derived%20independently)

. We will use data from DESI and upcoming Euclid surveys on void density profiles, expansion rates, and weak lensing through voids. The unified parameter set should predict void properties (like their expansion velocity and lensing convergence) consistent with observations. A Bayesian analysis will incorporate void metrics to further tighten the constraints on the Tsallis index *q* (which modulates how entropy affects large-scale gravity) and the coupling constants.

* **Wide Binary Stars:** Recent analyses of wide binary star orbits in the Milky Way (using Gaia data) suggest a gravitational anomaly at accelerations ~1×10^−10 m/s^2. Specifically, beyond separations of ~5,000 AU (where relative accelerations fall below ~0.1 nm/s^2), observed orbital accelerations appear higher than Newton/EIN predicted​

[physicsworld.com](https://physicsworld.com/a/binary-star-study-favours-modified-gravity-over-dark-matter/#:~:text=order%20of%201%20nm%2Fs,the%20difference%20is%20clearly%20seen)

. RFT’s scalaron-based modification will be tested against this phenomenon. The same parameter set must reproduce the slight boost in gravitational strength at these tiny accelerations. We will use Gaia DR4 data on wide binaries to perform a Bayesian fit, ensuring the model’s *activation thresholds* (e.g. the acceleration scale at which modifications “turn on”) align with the wide-binary observations. This unified fitting across galaxies, clusters, voids, and binaries will yield a best-fit parameter table with credible intervals, and reveal if any domain of data remains in tension with the others.

**2. External Field Effects (EFE) Refinement**

**Objective:** Incorporate the Milky Way’s external gravitational field explicitly into RFT’s predictions for local systems, and validate against wide-binary observations. In MOND, the **external field effect** is a distinctive prediction: a nearby external gravitational field can suppress or enhance internal dynamics of a smaller system, breaking the strong equivalence principle​

[physicsworld.com](https://physicsworld.com/a/binary-star-study-favours-modified-gravity-over-dark-matter/#:~:text=Furthermore%2C%20Chae%20says%20that%20when,binary%20star%20%E2%80%93%20the%20gravitational)

. RFT 7.8 will include an EFE through the scalaron’s equations.

* **Milky Way Field in Simulations:** We will simulate wide binary star systems embedded in an ambient field approximating the Milky Way’s gravity at the Sun’s location. This means adding a constant background acceleration (~1.8×10^−10 m/s^2 towards the Galactic center) to the binary system. The scalaron field equations will be solved with this external field present, to see how the binary’s effective gravity is modified. The expectation (by analogy with MOND-like behavior) is that in low internal accelerations, the binary’s orbital velocity is boosted when an external field is present but not too strong​

[astro.theoj.org](https://astro.theoj.org/article/67862#:~:text=Several%20recent%20studies%20have%20shown,binary)

. In fact, MOND predicts that wide binaries (>7 kAU separation) should orbit about 15% faster than Newtonian gravity would predict, if the external field of the Galaxy is properly accounted for​

[astro.theoj.org](https://astro.theoj.org/article/67862#:~:text=predict%20that%20wide%20binaries%20,can%20be%20modelled%20and%20subtracted)

. We will quantify RFT’s version of this boost.

* **Environment-Dependent Behavior:** By running simulations for binaries located in different galactic environments (e.g. in the outskirts of the Milky Way versus near the dense central region), we can map how the external field threshold affects orbital accelerations. The scalaron’s activation threshold parameter is expected to control when the EFE becomes significant. We will verify that RFT predicts negligible EFE in strong-field regions (inner galaxy) and a growing EFE in weaker-field regions (outer galaxy or isolated galaxies), matching the qualitative behavior required to explain open cluster dynamics and dwarfs in MOND​

[physicsworld.com](https://physicsworld.com/a/binary-star-study-favours-modified-gravity-over-dark-matter/#:~:text=Furthermore%2C%20Chae%20says%20that%20when,binary%20star%20%E2%80%93%20the%20gravitational)

.

* **Gaia DR4 Validation:** With Gaia DR4/DR5, thousands of wide binary systems with better astrometric accuracy will be available. We will select subsets of wide binaries in low-density environments (to maximize EFE) and in higher-density environments (to serve as a control). RFT 7.8’s predictions (with the previously fitted parameter set) will be compared to the observed relative accelerations. A successful validation would be, for example, that RFT reproduces the observed trend: beyond ~5 kAU separation, wide binaries show an extra acceleration that can be explained by including the Galactic field​

[physicsworld.com](https://physicsworld.com/a/binary-star-study-favours-modified-gravity-over-dark-matter/#:~:text=order%20of%201%20nm%2Fs,the%20difference%20is%20clearly%20seen)

. If RFT’s EFE model is accurate, we expect a close match to the Gaia data signal (e.g. a 1.4× boost in orbital acceleration at the widest separations, as reported by Chae 2023​

[physicsworld.com](https://physicsworld.com/a/binary-star-study-favours-modified-gravity-over-dark-matter/#:~:text=Furthermore%2C%20Chae%20says%20that%20when,binary%20star%20%E2%80%93%20the%20gravitational)

). Any discrepancy will guide adjustments in the EFE formulation (for instance, tweaking how the scalaron’s coupling α or threshold are applied in external fields).

**3. Dynamic Entropy Response**

**Objective:** Ensure that the RFT framework remains stable and physical when entropy conditions change rapidly (a key consideration since RFT includes a Tsallis entropy component). The scalaron field is coupled to the system’s entropy (with index *q* defining the degree of non-extensivity). Here we test RFT in transient events like shock heating, where entropy jumps, to verify there are no unphysical oscillations in the scalaron or gravity response.

* **Tsallis Entropy Coupling:** RFT’s use of Tsallis entropy means the theory effectively modifies gravity based on a power-law of area or volume entropy (e.g. $S \propto A^{\beta}$ for horizon entropy in cosmology)​

[arxiv.org](https://arxiv.org/abs/2106.15551#:~:text=gravitational%20field%20equations%20by%20using,BAO)

. We will derive how sudden changes in entropy (ΔS) feed into the scalaron equation of motion. For instance, during a cluster merger shock, the intracluster gas entropy increases sharply at the shock front. RFT should predict a smooth adjustment of the gravitational acceleration (or scalaron field value) to the new entropy state, without overshooting or oscillating.

* **Shock-Heating Simulations:** Using high-resolution hydrodynamical simulations, we will set up idealized scenarios: (a) a **shock-tube test** – a one-dimensional gas shock propagation in a constant gravitational background, and (b) a **cluster merger** – colliding gas clouds mimicking a 1E0657–56 (Bullet Cluster) shock. The modified gravity solver (with scalaron) will run in tandem with the gas dynamics. We expect the scalaron to adiabatically follow the rising entropy behind the shock. To verify numerical stability, we will apply standard shock tests used in code verification. For example, Sod’s shock-tube and Sedov blast wave tests are common benchmarks that have known analytic solutions​

[academic.oup.com](https://academic.oup.com/mnras/article/390/3/1267/1067892#:~:text=A%20test%20suite%20for%20quantitative,tests%20concern%20the%20stability)

. RFT’s code must reproduce these solutions closely, ensuring that the presence of the scalaron does not induce deviations in the hydrodynamic shock profile.

* **Stability Criteria:** We will analyze the simulations for any sign of **unphysical oscillations** or instabilities in the scalaron field. This includes checking energy conservation and positivity of entropy. If, for example, a rapid entropy increase caused the scalaron to overshoot and produce negative effective masses or oscillatory forces, that would indicate a flaw. Through a von Neumann stability analysis of the finite-difference scheme, we will derive conditions for the time-step and grid resolution needed to keep the system stable. Adaptive mesh refinement (AMR) will be utilized around shock fronts to capture steep gradients without sacrificing stability. The end result is a demonstration that RFT 7.8 can handle rapid astrophysical events (supernova feedback, AGN heating, cluster shocks) while remaining well-behaved. The absence of spurious oscillations builds confidence that the theory’s coupling to entropy is physically viable in dynamic settings.

**4. Comparative Model Assessments**

**Objective:** Quantitatively compare RFT 7.8’s performance against leading alternative gravity models and the standard ΛCDM paradigm, using statistical metrics. We will employ Bayesian model selection (Bayes factors) and information criteria (AIC, BIC) on the same datasets to see which theory provides the best balance of fit quality and complexity.

* **Models Considered:** The comparison set includes **ΛCDM** (General Relativity + cold dark matter + cosmological constant), **MOND** (empirical modified gravity with acceleration scale ~1.2×10^−10 m/s^2), **TeVeS** (Bekenstein’s relativistic theory giving MOND-like behavior via tensor-vector-scalar fields), and **Verlinde’s Emergent Gravity** (an entropy-based explanation of extra gravity with essentially no free parameters​

[phys.org](https://phys.org/news/2016-12-verlinde-theory-gravity.html#:~:text=his%20alternative%20to%20Einstein%27s%20theory%2C,mass%20of%20the%20visible%20matter)

). Each of these models has had success in certain regimes: ΛCDM on cosmological scales, MOND on galactic scales, etc. RFT aims to unify those regimes.

* **Dataset and Method:** We use a joint likelihood constructed from rotation curves (SPARC galaxies), dynamics and lensing of the three merging clusters, void lensing statistics, and wide binary kinematics. For each theory, we find the best-fit parameters (e.g. mass-to-light ratios and halo profiles in ΛCDM; $a\_0$ in MOND; coupling constants in TeVeS; etc.) and compute goodness-of-fit. Then we calculate the Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC), which penalize model complexity. Because RFT has a few extra parameters (e.g. entropy index *q*), we need to check that the improvement in fit (likelihood) justifies those parameters. We will also compute Bayes factors via Monte Carlo integration of the posterior, comparing RFT vs others in pairs.
* **Expectation and Documentation:** We anticipate RFT 7.8 will outperform ΛCDM on galaxy scales by providing excellent fits without requiring dark matter halos (similar to MOND’s notable success on the radial acceleration relation​

[darkmattercrisis.wordpress.com](https://darkmattercrisis.wordpress.com/2010/08/04/the-bullet-cluster-and-galaxy-clusters-in-modified-gravity-theories/#:~:text=Modified%20gravity%20theories%20do%20well,why%20this%20statement%20is%20wrong)

). We also expect RFT to match cluster observations better than MOND alone (since RFT’s scalaron and entropy terms might effectively emulate hidden mass or higher gravity needed for clusters). If RFT is successful, the Bayes factor comparing RFT to ΛCDM using the full dataset could significantly favor RFT, indicating that a single coherent theory explains everything from binaries to clusters. On the other hand, if certain tensions remain (e.g. RFT struggles with the acoustic peaks of the CMB or some cluster lensing aspects), those will show up as ΛCDM being favored in those domains. All such outcomes will be explicitly documented. For instance, we will note if RFT underperforms emergent gravity in explaining weak lensing profiles of galaxies – Verlinde’s model, with no free parameters, already reproduced the lensing profile of ~33,000 galaxies to good accuracy​

[phys.org](https://phys.org/news/2016-12-verlinde-theory-gravity.html#:~:text=Brouwer%20calculated%20Verlinde%27s%20prediction%20for,25%2C%20without%20free%20parameters)

. Any regime where RFT 7.8 doesn’t match a competitor will guide future improvements. The end result is a comprehensive report on which theory best explains which phenomena, highlighting RFT’s strengths and weaknesses in context.

**5. Predictive Observational Benchmarks**

**Objective:** Lay out clear, testable predictions of RFT 7.8 for upcoming astronomical surveys and missions. By identifying “smoking gun” phenomena for RFT, we enable future observations to confirm or falsify the theory. Each prediction will be linked to specific measurable outcomes that differ from ΛCDM or other models.

* **Euclid & LSST (Vera Rubin Observatory):** These will map billions of galaxies and cosmic large-scale structure with unprecedented detail. **Prediction:** RFT 7.8 may predict a specific relationship between galactic outer rotation curves and environment. For example, RFT could imply that galaxies in low-density environments (void outskirts) have slightly higher apparent mass discrepancies at large radii than similar galaxies in high-density environments, due to the entropy-sensitive scalaron. This is a distinct signature (a small environmental dependence of rotation curves) that ΛCDM would not predict. Euclid’s weak lensing maps and LSST’s galaxy rotation curve data (via follow-up spectroscopy) can test this by comparing isolated galaxies vs. cluster galaxies. A falsification criterion: if no difference at all is observed and a single gravity law fits all, RFT’s entropy coupling might be ruled out or require tweaking.
* **Gaia DR5:** By the time of DR5, Gaia will provide even more wide binaries and also precise orbital data for star clusters and satellite galaxies. **Prediction:** RFT expects the wide-binary anomalous acceleration to become more pronounced and cleaner with better data – for instance, a specific acceleration vs. separation curve that flattens out below ~$10^{-10}$ m/s^2. If DR5 instead shows a Newtonian $1/r^2$ decay in binary gravity with no flattening, that would challenge RFT’s scalaron threshold idea. Additionally, RFT might predict subtle anomalies in the motions of stars at the outer edges of the Milky Way (where the Galactic entropy profile changes); Gaia could test this by proper motions of halo stars.
* **JWST:** While primarily a telescope for high-redshift and infrared observations, JWST can observe rotation curves of distant galaxies in the early universe. **Prediction:** RFT 7.8 might predict less dark mass needed in high-*z* galaxies compared to ΛCDM (since RFT provides extra gravity from modified physics). If JWST finds **early galaxies** that already show flat rotation curves without enough time to build massive halos, it could support RFT. Conversely, if high-*z* galaxies strictly follow ΛCDM halo predictions, that would be a point against RFT. This is a qualitative benchmark to see if modified gravity effects appear at early epochs.
* **XRISM and Athena (X-ray Observatories):** These missions will measure intracluster gas dynamics and temperatures with high precision. **Prediction:** RFT’s entropy-based modifications might imply a different temperature and pressure profile in galaxy clusters. For example, RFT could predict that cluster outskirts (where entropy per particle is high due to shock heating) feel a boost in gravity, causing slightly higher gas pressure support at large radii than expected in ΛCDM. Athena’s observations of cluster outer regions and XRISM’s spectroscopy of cluster cores can map the mass distribution via hydrostatic equilibrium. A specific RFT prediction could be a reduced drop-off in gas density in cluster outskirts (since gravity remains stronger out to larger radii), which Athena could detect. If clusters instead match the NFW halo profiles of ΛCDM exactly in gas pressure, it may indicate no such modification is present.
* **eROSITA (X-ray All-sky survey):** eROSITA will detect thousands of galaxy clusters and groups, providing statistical power. **Prediction:** RFT might predict a narrower scatter in the baryon fraction vs. mass relation for clusters, because the scalaron effect could reduce the need for varying dark matter fractions. eROSITA’s cluster catalog can test if low-mass clusters behave as RFT expects (e.g. showing less mass discrepancy than in ΛCDM at a given temperature). Any deviation from RFT’s predicted trend would be a potential falsification.

Each of these benchmarks will be formulated as quantitative as possible. We will summarize them in a **roadmap table**, listing the phenomenon, the RFT 7.8 prediction, the mission/data needed, and the pass/fail criterion for RFT. This roadmap ensures that RFT remains falsifiable – for instance, if *any* of these future tests clearly contradict RFT while favoring another model, then RFT would need revision or could be ruled out. By the same token, if multiple upcoming observations align with RFT’s distinctive predictions, it will greatly strengthen the theory’s credibility.

**Computational Approach**

To achieve the above objectives, robust computational methods will be employed in implementing RFT 7.8:

* **Finite-Difference & Multigrid Solvers:** The scalaron field equation (a modified Poisson equation with extra terms from entropy) will be solved on a grid. We use finite-difference discretization to handle spatial derivatives. Because the scale spans are large (e.g. resolving inner galaxy and outer void in one simulation), a multigrid algorithm is incorporated to accelerate convergence of the solver. The multigrid approach efficiently relaxes low-frequency errors in the field solution, ensuring that even with millions of grid points the scalaron equation can be solved to high precision. This is crucial for fitting rotation curves and cluster potentials accurately without exorbitant computation time.
* **Adaptive Mesh Refinement (AMR):** Many regions of interest (galaxy centers, shock fronts, void edges) require high resolution, while other zones can be coarse. We implement AMR such that the grid refines based on either mass density gradients or entropy gradients. For example, in a cluster merger simulation (Objective 3), the AMR will refine around the shock front where entropy changes sharply, so that the solver can accurately capture the scalaron’s rapid response. In galaxy simulations, cell refinement will occur in the dense disk and gradually de-refine in outer halos/voids. This adaptive strategy balances resolution with computational load, providing fine detail where needed (e.g. avoiding numerical instability at entropy discontinuities) and efficiency elsewhere.
* **Time-Stepping and Integration:** For dynamic simulations (e.g. evolving a cluster merger or a wide binary orbit), we use an explicit time integration scheme with adaptive time-stepping. The time step is chosen based on the Courant condition and a stability criterion derived from the coupled gravity-entropy equations. Ensuring the code can handle the **stiffness** introduced by the scalaron (if any) is part of the implementation. Implicit solvers may be used for the scalaron field at each step if the system is very stiff. All simulations will be run long enough to reach either a steady state or the completion of the physical event (e.g. a full orbital period for binaries, or the merger relaxation for clusters).
* **Software and Performance:** The RFT 7.8 code will be written in C++ or Fortran for performance, with Python bindings for configuring runs and analyzing outputs. We will leverage existing libraries for Poisson solvers and possibly modify an N-body/hydro code (like RAMSES or FLASH) to include RFT gravity. Each test (galaxy rotation fit, cluster lensing, void expansion, binary orbits) will be first run on simplified scenarios to verify against known solutions (e.g. Newtonian limit, or analytical expectations). The code will be optimized to run on parallel architectures (MPI for distributed memory across cluster nodes, and OpenMP for shared memory) given the large problem sizes.

By using this computational approach, we ensure that RFT 7.8’s implementation is both **stable** and **efficient**. The combination of finite-difference accuracy, multigrid speed, and AMR resolution will allow us to explore the full parameter space in the Bayesian inference and to simulate complex scenarios (like cluster mergers) with high fidelity. This forms the backbone for obtaining the results and deliverables described.

**Deliverables**

By the conclusion of the RFT 7.8 development cycle, we will produce several key deliverables that document our findings and provide resources for the community:

* **Unified Scalaron Parameter Table:** A table of the best-fit values for α, β, γ, Tsallis *q*, and any activation acceleration thresholds, along with their Bayesian credible intervals. This table will be accompanied by notes on how these parameters compare to previous version 7.7 values and whether any were fixed or derived. We will highlight any *residual tensions* – for example, if one dataset (say, cluster lensing) pulls a parameter in a direction that is slightly inconsistent with another dataset (like galaxy rotation curves), we will note that. This provides transparency in how well the “one set fits all” approach succeeded.
* **External Field Effect Validation Report:** A document (and/or journal paper) detailing the RFT predictions for the external field effect and the comparison with Gaia wide binary data. It will include figures showing the wide binary relative velocity or acceleration as a function of separation, with RFT 7.8 curves overplotted on Gaia DR4 data points. We will list quantitative measures (e.g. χ² or likelihood values) that demonstrate how including the Milky Way’s field in RFT improves the fit to observations. Additionally, we’ll provide an analysis of how EFE in RFT could affect other systems (like satellite galaxies or planetary systems) and propose observational tests for those.
* **Dynamic Entropy Response Simulations:** We will release simulation results for the shock tests conducted. This includes plots of shock-tube density/pressure profiles with and without the scalaron effect, demonstrating stability (these will show that RFT 7.8 reproduces the standard Sod shock solution​

[academic.oup.com](https://academic.oup.com/mnras/article/390/3/1267/1067892#:~:text=A%20test%20suite%20for%20quantitative,tests%20concern%20the%20stability)

to within a small error). For the cluster merger case, we’ll provide visualizations of the scalaron field before, during, and after the shock passage, illustrating that no unphysical oscillation occurred. Any code modifications made to ensure stability (e.g. adding artificial viscosity or using a particular solver) will be documented. These results may be included in a supplementary section of a paper or in an online repository for other researchers to inspect and even recreate.

* **Comparative Model Performance Analysis:** A comprehensive comparison table or plot will be delivered, showing the goodness-of-fit (likelihood or χ²) and information criteria for RFT 7.8 versus ΛCDM, MOND, TeVeS, and Emergent Gravity. For clarity, this might be broken down by data category (galaxies, clusters, etc.) as well as a combined score. For example, a chart might show ΔAIC between RFT and ΛCDM for each test, where a negative ΔAIC would indicate RFT is favored. We will also summarize in writing *where* RFT outperforms others (e.g. “RFT provides a significantly better fit to the SPARC rotation curves than ΛCDM with NFW halos, with ΔBIC = –50 indicating strong evidence in favor of RFT”) and *where* it does not (e.g. “RFT and TeVeS perform equivalently on cosmic void lensing, neither offering a clear advantage”). This assessment will likely be part of a peer-reviewed publication to formally introduce RFT 7.8.
* **Observational Test Roadmap:** As mentioned, a detailed roadmap listing future surveys and missions with the specific RFT predictions will be compiled. This will be in the form of a white paper or appendix, which can be shared with observational teams. For instance, it will note that **Euclid** can test RFT’s void lensing prediction by looking for the signature of enhanced void lensing that RFT expects. It will also describe how **Athena** could measure cluster outer density profiles to confirm the slight deviation RFT predicts from hydrostatic equilibrium under GR. Each entry will have thresholds like “if observable X is above Y or below Z, RFT is falsified/supported”. The roadmap acts as a guide for astronomers to design experiments that target RFT’s unique features.
* **Software and Data Release:** Where possible, we will release the RFT 7.8 simulation code (or at least a stripped-down version sufficient to reproduce key results) on a platform like GitHub. Along with it, the data products (e.g. Markov Chain samples for the parameter posteriors, processed rotation curve data with RFT fits, etc.) will be made available. This allows independent verification and further use of RFT 7.8 in the community. We will ensure the code is documented, citing the appropriate sections of theory (for example, how Tsallis entropy is implemented, referencing $S \propto A^{\beta}$​

[arxiv.org](https://arxiv.org/abs/2106.15551#:~:text=gravitational%20field%20equations%20by%20using,BAO)

in the documentation).

In summary, **RFT 7.8** will emerge as a more robust and empirically grounded framework than its predecessor. By unifying its parameter set across scales, validating the external field effect, proving stability under dynamic conditions, benchmarking against rival theories, and setting up clear future tests, we aim to solidify RFT as a compelling alternative to dark matter. The deliverables above will not only mark the progress made in this version but also provide the foundation for continuous testing and improvement of RFT in the face of new data, keeping it on a solid scientific footing.