Which weights do the ESFD equations determine?

Three corrections inside the original theory

The starting point is Christopher Grenke's June ESFD action and its SEFD spin–entropy extension. This revision follows the symbols through the original equations before introducing an observational model. It finds a tensor convention that can switch off two interactions, eliminates one explicit weight in the spherical entropy equation, and corrects the time reference used in the archived merger test.

Original issue	Resolution
The same spin tensor is called symmetric and antisymmetric.	Only its antisymmetric part couples to Maxwell's field or enters the defined spin current. The explicit Dirac tensor in the later direct manuscript supplies that part.
The entropy field and three weights have no fixed numerical normalization.	A change of entropy units changes all three weights together. The combinations below can be analyzed before assigning any microscopic numbers.
The GW170817 photon window was centered on the Earth-based time reference.	Moving it to Fermi's location changes the count from five to six. The expected background is about eight. This observation supplies no measured precursor time to fit.

Which spin reaches the force and clock equations?

The draft 21.docx calls S symmetric in its introductory postulate and again in its action discussion. In its clock section it calls the contraction one between antisymmetric tensors. Let $S = S_{sym} + S_{anti}$. Interchanging the two dummy indices proves $S_{sym}\cdot F = 0$, since F changes sign and S_{sym} retains its sign. Contracting S with the antisymmetric volume tensor in $J^{\mu}{}_{s} = \varepsilon^{\mu\nu\rho\sigma}S_{\nu\rho}u_{\sigma}/2$ makes the same projection.

The explicit spinor definition in 4.1.docx resolves which field to use in these operators. If a symmetric alignment tensor is retained elsewhere, it needs its own symbol and observable. Under identical normalizations the direct and consolidated spin–field coefficients obey $\alpha_C = -2\alpha_J$. Using the same numerical coefficient in both drafts would change the sign and magnitude of the interaction.

The direct saturation energy $\lambda_S(X-\Phi_0{}^2)^2/4$ fixes a preferred X for positive λ_S. Its minimum sets no time by itself. The susceptibility, inertia and damping of the material determine how it approaches that state. The earlier interface and gas-current studies in the master describe explicitly conditional extensions.

Original record · 21.docx, paragraphs 67, 182 and 267 · 4.1.docx, paragraph 78 · 6-3-spin ESFD current, paragraph 81 · ESFD and SEFD from first principles, §§3, 6 and 8. Full parameter register and source locations accompany this paper.

Remove one unknown before fitting a galaxy

Use the archive's sign convention $\Box s = \partial^2_t s - \nabla^2 s$. At fixed current its original entropy equation is $2\gamma_s \Box s + U'(s) = -\beta_s \nabla \cdot J_s$. In the stationary, regular, spherically symmetric branch, integrate over a sphere of radius r. The center has no point source and no singular gradient. With $I(r) = \int_0^r x^2 U'(s(x))\,dx$, this gives

> $\beta_s J_r = 2\gamma_s s' - I(r)/r^2$. Substituting into $Q_r = \beta_s s J_r / c^2$ gives $c^2 Q_r = \gamma_s (s^2)' - sI(r)/r^2$.

This eliminates the explicit β_s from the combined radial equation. The solution for s can still depend on the spin dynamics, boundary conditions and β_s. The source potential U and the physical entropy profile remain inside the result. Stationarity and spherical symmetry apply to this reduction. The adopted baryonic mass model retains its disk geometry.

For NGC 2403 the original weak-gravity relation gives $Q_r = (v^2 - v_b^2)/(4\pi G r)$. At 10.43 kpc the inferred value is 0.04413 ± 0.00117 kg/m². At 20.87 kpc it is 0.02835 ± 0.00155 kg/m². These uncertainties propagate the speed error alone. Integrating the measured profile between those radii gives **1.166×10^{19} kg/m** for the combined gradient and potential terms divided by c^2. Assigning that number entirely to $\gamma_s \Delta(s^2)/c^2$ would additionally require the integrated potential contribution to vanish. This calculation uses 73 measured radii and the original mass model.

Which weights can be separated?

Change the entropy unit by a factor a. The original entropy action and stellar index retain their predictions under $s \to as$, $\beta_s \to \beta_s/a$, $\gamma_s \to \gamma_s/a^2$, $\kappa_s \to \kappa_s/a$ and $U_{new}(y) = U(y/a)$. The entropy-only threshold likewise requires $\Lambda_s \to a\Lambda_s$. For positive γ_s, defining $\sigma = \sqrt{(2\gamma_s)}\, s$ identifies $\beta_s/\sqrt{(2\gamma_s)}$ and $\kappa_s/\sqrt{(2\gamma_s)}$ as independent of the choice of units.

A measurement of the material's entropy or spin polarization in fixed units would break this ambiguity. A measured small-oscillation gap constrains $U''/(2\gamma_s)$ in a stable background. The present rotation data constrain the weighted current. Fitting new values to each microscopic coefficient independently would count the same information more than once.

ESFD and SEFD from first principles, §§6, 8–10 and 12 · SPARC mass models. The algebra, independent differentiation check and reconstruction at all 3,032 SPARC radii are supplied in research/original_weights/.

Fit the original galaxy weights and predict the exterior

The project's original radial trial is $Q_r = C \exp(-r/r_s)$. It gives $v^2 = v_b^2 + 4\pi G C r \exp(-r/r_s)$. Both C and r_s are present in the equation guide. At fixed r_s the squared-speed equation is linear in C. Solving its weighted least-squares amplitude exactly leaves a one-dimensional search for r_s.

For NGC 2403, fit only the 52 measurements inside half the maximum radius, then predict the remaining 21. Equal weights on the inner squared-speed measurements give $C = 0.08817$ kg/m^2 and $r_s = 16.75$ kpc. The held outer RMSE is **3.73 km/s**. The predicted final speed is 127.84 km/s against 134.0 ± 3.12 km/s observed. This is an extrapolation from the interior of the same galaxy. It supplies no independent measurement of entropy or intrinsic spin.

Original exponential current	Fitted r_s, kpc	Held outer RMSE, km/s
Equal weight per inner velocity row in squared speed	16.75	3.73
Weights from the reported velocity errors	13.55	8.18
Equal total weight per occupied inner kpc bin	13.66	9.01

These fits use the same original equation and the same radii. The differences are real consequences of how discrepant inner measurements are weighted. The measurements alone do not establish which error model best captures distance, gas geometry and stellar mass uncertainties. Selecting the weighting after seeing the outer errors would overstate the prediction.

Using identical equal-row training, the archived revised core gives 6.93 km/s and the later slower-rise profile gives 3.61 km/s for NGC 2403. Across 99 eligible SPARC curves and 1,025 held outer measurements, the original exponential law gives a mean galaxy error of 19.40 km/s, and the revised core gives 14.14 km/s. The original exponential reaches the allowed scale boundary in 43 galaxies, which limits its interpretation as a measured physical scale. All individual parameters, limits and held scores are provided.

The separate eight-galaxy experiment in the following supplement gave a much larger residual when it set the spin-current carrier proportional to radial hydrogen flow. That assumption belongs to the experiment. The 3.73 km/s result above comes directly from the project's archived equation with its own two fitted weights.

ESFD and SEFD from first principles, §§9–11 · SPARC. Numerical records · native_fit_scores.csv, native_fit_summary.csv, ngc2403_native_predictions.csv and inferred_weighted_current.csv.

Resolve the timing reference and the torque units

The June direct manuscript defines an observing window from 5.0 to 0.5 ms before coalescence. Its width is 4.5 ms. The companion 21.docx gives a broader proposed lead of 1–10 ms and a second possible trigger based on a torque rate. These are predictions and search definitions. The archive contains no detected precursor assigned an observed-minus-predicted time of four milliseconds.

The archived GW170817 test counted spacecraft photons relative to the rounded geocentric GW epoch, GPS 1187008882.43. For the optical source direction, the joint paper measured a light-travel correction of −3.176 ms from Earth's center to Fermi. Projecting Fermi's archived orbital position onto the source direction independently gives −3.179 ms at the adopted epoch. Applying the published correction places the original search window at −8.176 to −3.676 ms relative to the Earth-based timestamp.

Fixed window	Photons in NaI 1 / 2 / 5	Total and expected background
Archived geocentric placement	2 / 1 / 2	5 observed, 8.00 expected
Corrected spacecraft placement	1 / 1 / 4	6 observed, 8.00 expected

The corrected count shows no excess. This is a physical timing correction of the requested order of magnitude. Identifying it with a particular recalled residual would require that residual's original event and reference time.

A separate problem within the proposed trigger

Section 2.2 of 21.docx correctly sets $[d\tau/dt] = N\cdot m/s = W$ for mechanical torque τ. Sections 9 and 11 use J/s^2 for the threshold. These dimensions differ by one inverse second. The suggested scaling $(c^3/\mu_0)\rho_{charge}L^3/B$ has SI dimensions $A^4\ m^2\ s^2/kg^2$. An additional factor with units $kg^3/(A^4\ s^5)$ would be needed to make this a torque rate. The original draft flags a dimensional mismatch. It also treats mechanical power $\tau\cdot\Omega$ as interchangeable with $d\tau/dt$. A constant torque at finite angular speed distinguishes the two observables.

The same example takes $c^3/\mu_0 \approx 10^{36}$. Its SI numerical value is 2.14×10^{31}. Correcting that arithmetic still leaves the dimensional factor to determine. In the alternative original index $\chi_{tot} = \Omega(B+\kappa_s s)/\Lambda_{tim}$, a confirmed crossing would fix $\kappa_s s = \Lambda_{tim}/\Omega - B$ if Ω and B were independently known. Six background-compatible photons cannot fix that weight or an emission delay. The register traces these dependencies through clocks, material response, stars, galaxies and cosmology.

21.docx §§2.2–2.3, 9.1 and 11.1 · 4.1.docx, precursor search · GW epoch · Joint LIGO–Fermi timing, §2.2 · Optical position.