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January 2, 2026

Editorial Board
Foundations of Physics
Springer

Dear Editors,

I am pleased to submit the manuscript entitled **"Realisability Constraints and the Emergence of Standard Model Structure"** for consideration for publication in *Foundations of Physics*.

Summary. The paper presents a *constraint-based analysis* of Standard Model structure. Rather than proposing a new dynamical theory, we trace a derivation chain from general realisability requirements to specific features of particle physics.

Three contributions distinguish this work:

1. **Logical unification**: We connect results from quantum reconstruction theorems (Hardy, CDP), gauge theory (Coleman–Mandula), anomaly cancellation (Geng–Marshak), and division algebra approaches (Furey, Gresnigt) into a single chain with explicit dependencies.
2. **Saturation theorem**: We prove that the Standard Model *saturates* the space of realisable theories—extensions violate realisability axioms or are merely effective, not fundamental.
3. **Fundamental/effective criterion**: We distinguish UV-complete structure (constrained by realisability) from emergent effective symmetries (not constrained).

What this paper is not. This is not a theory of everything. It makes no new particle predictions. It does not explain mass values or mixing angles. The contribution is *organisational*: connecting known results with explicit logical dependencies.

Fit with Foundations of Physics. The paper is methodological rather than phenomenological: it does not predict new particles or propose experiments. Instead, it asks *why* the mathematical structure of fundamental physics takes the form it does. This places it squarely within the tradition of foundational analysis that *Foundations of Physics* has long championed—from axiomatic quantum mechanics to information-theoretic reconstructions.

The manuscript has not been submitted elsewhere and contains no material previously published.

Suggested Reviewers.

- **Markus Müller** (Institute for Quantum Optics and Quantum Information, Vienna) — expert on quantum reconstructions and operational approaches.
- **Latham Boyle** (Perimeter Institute) — work on algebraic approaches to the Standard Model.
- **Niels Gresnigt** (Xi'an Jiaotong-Liverpool University) — division algebra approaches to particle physics.
- **Fedele Lizzi** (Università di Napoli) — noncommutative geometry and particle physics.

I believe this work will be of interest to your readership and look forward to your consideration.

Sincerely,

[Author Name]