Paper 012

Identifiability of Fifth-Sector Electromagnetic Operators Under Null Experimental Controls

A design-theoretic extension of Maxwell-compatible projection models

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Abstract

The existing JMP0X1B projection papers classify speculative fifth-sector electromagnetic residuals by gauge consistency, scalar readout, boundary flux, and experimental null signatures. This paper asks a narrower question: when can two candidate residual mechanisms be distinguished at all? We formulate operator identifiability as a rank and conditioning problem over a matrix of predeclared controls. Pressure, polarity, shielding, inversion, scale, dielectric substitution, modulation, and edge smoothing become transformations acting on a vector of observables. A useful experiment is one whose transformation matrix separates candidate mechanisms before the apparatus is built.

Status. Draft manuscript for review and revision. This paper is not an empirical claim of new physics or field-ready technology. It is a structured proposal, theory note, protocol, or application architecture intended to be auditable, falsifiable, and publishable with source.

Contents

1 Problem

Five-dimensional projection models can be written in many observationally equivalent ways. A capacitor force compatible with zero can still constrain a coupling, but only if the experiment was designed so that scalar, boundary, leakage, thermal, EHD, and cable channels do not collapse into the same response vector. The problem is therefore not merely sensitivity; it is identifiability under finite controls and finite noise.

2 Model

Let each mechanism m induce an expected signature vector s_m over an ordered control set C. The experiment has local identifiability when the pairwise distances between signatures remain nonzero after projection through the measurement covariance. Mechanisms that differ only by a nuisance parameter are quotient-identifiable: they can be bounded as a family but not assigned to a microscopic branch.

Definition 1 (Control signature)**.** *For a mechanism m and control state c_i, define*

$$s_m(i) = \frac{\partial \mathbb{E}[y_i \mid m, \theta_m]}{\partial a_m}\bigg|_{a_m=0},$$

where a_m is the mechanism amplitude and y_i is the measured force, capacitance, thermal, or current observable.

Proposition 1 (Local separation condition)**.** *A mechanism family $\mathcal{M}$ is locally separable at covariance Σ if*

$$\min_{m \neq n} \|s_m - s_n\|_{\Sigma^{-1}} > \tau,$$

for a predeclared threshold τ fixed before data collection.

3 Claims

1. **Claim 1.** Null experiments should publish the control-signature matrix together with force bounds; otherwise nulls cannot be reused across operator families.
2. **Claim 2.** A voltage-even scalar proxy and a polarity-odd boundary-flux proxy are separable only when geometry and inversion controls are included with pressure and shielding controls.
3. **Claim 3.** The best next experiment is not the most sensitive balance, but the one with the best-conditioned signature matrix at achievable noise.
4. **Claim 4.** If two mechanisms remain collinear after all practical controls, the correct publication unit is a joint exclusion region rather than a mechanism-specific claim.

4 Evidence Plan

The first evidence artifact is a synthetic design study using field-derived proxies from the finite-element atlas. The second is a reanalysis protocol that maps historical capacitor observations into a shared control schema while marking missing controls as censored. The third is an ablation study: remove one control at a time and report how the condition number and exclusion volume degrade. A publishable null result is then a table of excluded amplitudes, covariance assumptions, and missing-control caveats.

5 JMP0X1B Implementation Surface

A JMP0X1B package should expose typed records for control states, observables, covariance estimates, and mechanism signatures. The core computation is deterministic and replayable: ingest a design, compute signatures, score separability, and emit a reviewable experiment plan.

Illustrative JMP0X1B-style contract

```
type Control = Pressure | Polarity | Shielding | Inversion | Scale | EdgeSmooth
record Signature { mechanism: Text, values: Vector<Float>, covariance: Matrix<Float> }
fn separability(signatures: List<Signature>, tau: Float) -> Report effects{Deterministic, Audi
    let pairs = pairwise(signatures)
    return pairs.map(|p| mahalanobis(p.left.values, p.right.values, p.left.covariance)).min_ga
}
```

6 Release And Review Plan

Release the LaTeX source, a machine-readable control vocabulary, simulated signature matrices, covariance priors, and a reference JMP0X1B implementation. Every figure in the paper should be rebuildable from the released design files.

7 Open Questions

- Which controls dominate identifiability for realistic UHV capacitor hardware?
- Can capacitance, current, and thermal telemetry improve operator separation even when force is null?
- What covariance structure should be used when balance drift is non-Gaussian?
- How should censored historical observations be included without overstating evidence?

8 Conclusion

This paper turns speculative mechanism discrimination into an experimental design problem. It does not make fifth-sector physics more likely; it makes weak or null experiments more useful by forcing each experiment to say exactly which mechanisms it could have separated.

References

References

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