Test 009 — Executive Diagnostic Summary

Paper: *On Average Properties of Inhomogeneous Fluids in General Relativity I — *Thomas Buchert (2000)*
Audit Class: Division 1 — Backreaction / Averaging
CEDA Version: v1.2 (frozen)

Final Classification

Reinterpretation — Scale-Dependent Bookkeeping Framework

That verdict is precise, not dismissive.

What the Paper Actually Does (and does well)

Buchert derives **exact, non-perturbative scalar-averaged Einstein equations** for irrotational dust. No fake fields. No horizon mysticism. No conservation violations. The formalism is honest and mathematically clean.

Crucially, the paper **explicitly states**:

- the equations are **not closed** without extra assumptions,
- results are **domain-dependent**,
- no universal acceleration mechanism is claimed.

This restraint is why Test 009 is a *gold-standard diagnostic case* rather than a takedown.

009 - CEDA MODEL CARD

Why It Fails (and Why That's Not an Insult)

D2 — Coarse-Graining Stability

Result: ⚠️ Conditional Fail (by design)

The effective expansion depends explicitly on:

- domain size,
- domain shape,

- domain location,
- slicing choice.

There is **no physically preferred coarse-graining** and no convergence claim. That's not a bug—it's the point of the construction. But under CEDA, that means the effect **cannot be promoted to a global dynamical mechanism**.

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C1 — Functional Redundancy

Result: ❌ Fail

The backreaction term $Q_D(t)$QD(t):

- has no independent evolution equation,
- must be *chosen or constrained externally* to close the system,
- can mimic many effective equations of state depending on closure.

That places it squarely in **free-function territory**. Once you pick a closure, you've injected structure from outside the formalism. That's descriptive freedom, not earned dynamics.

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