OCC Canonical Addendum — Nuclear Domain Expansion (v1.4.0)

Marker: **NUCLEAR-LOCK-PACKAGE-V1.4.0**
Date: 2026-02-16
Scope: Formal integration of the numbered nuclear judge/locks (J4, L4C/L4E), MRD module, prediction anchor, and batch Experiment Lab alignment.

1. Canonical alignment and numbering

Foundational judges remain J0–J3 (ISAAC/PA/IO/RFS), as defined in Documento A+. This addendum introduces the operational nuclear frontend judge **J4**, with numbered lock families **L4C*** (consistency/evaluability) and **L4E*** (evidence anchor/provenance).

2. Lock classes and equations

Class C (consistency / evaluability in Ω_I): declare energy window, isotope set, reaction channel, and detector set. Missing declarations imply NO-EVAL(L4C*). Malformed numerical declarations imply FAIL(L4C*).

```
Eq. (1): 0 <= E_min < E_max (MeV)
```

Class E (evidence anchor): compare model prediction against declared observable anchor with uncertainty and source provenance (dataset reference + URL/DOI locator). Missing anchors imply NO-EVAL(L4E*).

```
Eq. (2): z = |sigma_pred - sigma_obs| / sigma_obs_err
```

```
PASS(E) iff z <= z_max; FAIL(L4E5) iff z > z_max.
```

Lock map: L4C1..L4C7 (domain declarations) and L4E1..L4E7 (evidence/provenance anchor).

3. Operational semantics of violations

- NO-EVAL: claim is not operationally compilable (missing domain/evidence declarations).
- FAIL: claim is compilable but inconsistent with declared consistency/evidence locks.
- PASS: claim satisfies J4 lock set inside Ω_I, with explicit witness values.

4. MRD implementation and reproducibility

Extension module: **ILSC_MRD_suite_extensions/mrd_nuclear_guard**
Cases: PASS(J4), NO-EVAL(L4C6), FAIL(L4E5)
Prediction anchor extension: registry entry P-0004.
Batch matrix workflow: `occ lab run --claims-dir ... --profiles core nuclear`.

```
CLI judge profile:
occ judge examples/claim_specs/nuclear_pass.yaml --profile nuclear
```

```
MRD execution:
occ verify --suite extensions --strict --timeout 60
```

Anexo ES — Integración nuclear formal (v1.4.0)

Este anexo integra el juez nuclear numerado J4 y su paquete de candados L4C*/L4E* compatible con la arquitectura OCC. La jerarquía canónica se conserva: J0-J3 siguen como jueces fundacionales.

Clase C (consistencia): energía, isótopos, canal de reacción, detectores.
Clase E (evidencia): anclaje observable con incertidumbre, contraste z-score y metadatos de procedencia (referencia + URL/DOI).

```
z = |sigma_pred - sigma_obs| / sigma_obs_err <= z_max
```

Si faltan anclajes: NO-EVAL(L4E*). Si hay contradicción cuantitativa: FAIL(L4E5).

Files covered: occ/judges/nuclear_guard.py, ILSC_MRD_suite_extensions/mrd_nuclear_guard/, examples/claim_specs/nuclear_*.yaml, predictions/registry.yaml (P-0004).