OCC Integrated Section - Nuclear Domain (J4 / L4C* / L4E*) v1.5.0

Marker: **NUCLEAR-INTEGRATED-SECTION-EN-V1.5.0**
Date: 2026-02-17
Editorial status: integrated canonical section (not detached addendum).

1. Canonical placement and numbering

Foundational judges remain J0-J3 (ISAAC/PA/IO/RFS). Nuclear-domain constraints are integrated as J4 with lock families L4C* (consistency/evaluability) and L4E* (evidence/provenance).

J4 is evaluated as the immediate continuation of J0->J3: J0 bounds operational access, J1 certifies projection, J2 certifies identifiability, J3 certifies finite-resource stability, and J4 closes domain-specific nuclear consistency against observational anchors.

If J4 declarations are absent -> NO-EVAL(L4C*/L4E*). If declarations are present but physically inconsistent -> FAIL(L4E5).

2. Operational lock semantics

Class C requires explicit domain declarations (energy range, isotopes, reaction channel, detectors). Missing declarations -> NO-EVAL(L4C*). Malformed domain constraints -> FAIL(L4C*).

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

Class E requires an evidence anchor and provenance reference.

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

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

3. MRD and prediction coupling

Integrated assets in OCC runtime: occ/judges/nuclear_guard.py, ILSC_MRD_suite_extensions/mrd_nuclear_guard/, examples/claim_specs/nuclear_*.yaml, predictions/registry.yaml (P-0004).

```
CLI path:
occ judge examples/claim_specs/nuclear_pass.yaml --profile auto
occ verify --suite extensions --strict --timeout 60
```

Nuclear integration checklist (J4/L4) - operational

Required claim declarations: domain.energy_range_mev, domain.isotopes, domain.reaction_channel, domain.detectors, evidence anchor, dataset reference and URL/DOI locator.

Editorial policy: all future judge/lock/module/prediction updates must be integrated in-line in the compendium flow with numbering continuity.