Light-Field Wave Theory and Recursive Generation

- **Light-Field Wave** (the mechanism)
- **Recursive Light-Wave Field Generator** (the instrument)

These are written in the same tone and structural rigor as the RLWFG definition you approved earlier. They're tight, ontology-clean, and ready for inclusion in a glossary, appendix, or proposition paper.

1. Light-Field Wave

A Light-Field Wave is a **time-evolving radiative field** within a bounded region, defined by the angular, spectral, and intensity distribution of light as it undergoes propagation, reflection, and transformation under the constraints of a geometry.

Formally, a light-field wave is the function
$[L(\theta, \phi, \lambda, t)]$
representing the radiance at time (t) across all directions ((\theta, \phi)) and wavelengths (\lambda), where:

1. Field Structure

The field is shaped by:

- the geometry of the boundary
- the reflectance properties of the surfaces
- the spectral and temporal characteristics of the emitter
- perturbations such as motion, asymmetry, or noise

2. Wave Evolution

The field evolves according to a transformation operator
$[L(t+\Delta t) = \mathcal{W}(L(t), E(t), G)]$
where (\mathcal{W}) encodes propagation, reflection, and recursive interaction under the symmetry group (G).

3. Observable Properties

A light-field wave exhibits:

- standing-wave patterns
- driven responses
- recursive amplification
- symmetry-dependent structure
- sensitivity to perturbation

4. Distinction

A light-field wave is not merely “light in a space.”
It is a **dynamical radiance distribution** whose evolution is constrained by geometry and recursion.

2. Recursive Light-Wave Field Generator

A Recursive Light-Wave Field Generator (RLWFG) is a **closed reflective cavity** containing a **time-varying light emitter** and an **internal wide-angle sensor**, configured such that emitted light undergoes repeated reflections that generate a **self-interacting, geometry-constrained light-field wave**, which the sensor records as a time-series.

The RLWFG is defined by:

1. Cavity Geometry

A bounded reflective cavity (C) with interior surface (\partial C) exhibiting symmetry group (G).

2. Emitter

A localized emitter (E(t)) producing radiance (L_E(\lambda, t)).

3. Recursive Interaction

Light undergoes repeated reflections on (\partial C), producing a sequence of radiance fields
[L_1, L_2, L_3, \ldots]
where each field is a transformation of the previous under the cavity’s geometry.

4. Field Evolution

The interior field evolves according to
$$ L(t) = \mathcal{R}(L(t-\Delta t), E(t), G) $$
where $\mathcal{R}$ is the recursive radiative operator.

5. Sensor

A wide-angle sensor (S) located within (C), sampling the full or near-full solid angle of the interior field.

6. Output

The RLWFG produces a measurable time-series
$$ I(t) = S[L(t)] $$
representing the observable evolution of the recursive light-field wave.

Relationship Between the Two (Optional Glossary Note)

- The **Light-Field Wave** is the *phenomenon*.
- The **Recursive Light-Wave Field Generator** is the *instrument* that produces and records it.

Mechanism → Instrument.
Field → Generator.
Concept → Apparatus.