# Recursive Light-Wave Field Generator

## Abstract

A recursive light-wave field generator (RLWFG) is an instrument consisting of a recursive reflective cavity, a time-varying emitter, and an internal wide-angle sensor. It produces and records the evolution of a recursive light-field wave. This paper defines the RLWFG as the first instrument of the field.

## 1. Definition

An RLWFG is a system
[ {C, E(t), S} ]
where ( C ) is a recursive reflective cavity, ( E(t) ) is a localized emitter, and ( S ) is an internal sensor. The system generates a recursive light-field wave and records its evolution.

## 2. Cavity Geometry

The cavity ( C ) defines the symmetry group ( G ) that constrains field evolution. Examples include:

- sphere (continuous symmetry)
- cube (discrete symmetry)
- cubix (hybrid symmetry)

These form a basis set for studying recursive behavior.

## 3. Emitter

The emitter produces radiance ( $L_E(\lambda, t)$ ). Temporal variation drives the recursive system and enables controlled perturbation.

## 4. Recursive Mechanism

Light undergoes repeated reflections, generating a sequence of radiance fields. The recursive operator
[ $L(t) = \mathcal{R}(L(t-\Delta t), E(t), G)$ ]
defines the system's dynamics.

## 5. Sensor

A wide-angle sensor ( S ) samples the interior field, producing a time-series
$$[ I(t) = S[L(t)] ]$$
representing the observable evolution of the light-field wave.

## 6. Output

The RLWFG produces a measurable, geometry-constrained, time-evolving radiative field. The output encodes symmetry, perturbation, and recursive amplification.

## 7. Purpose

The RLWFG is introduced as the first instrument for studying light-field waves and recursive reflective cavities. It provides a practical, low-cost, and visually accessible platform for exploring recursion in physical systems.