

# Resonance Simultaneous

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Skeleton

## Abstract

Simultaneous Field — Three Millennium Problems as Projections

This paper presents 28 machine-verified theorems building on 7 established facts and 40 hypotheses. All results are formally verified in the Platonic proof kernel (91 verification units, 28 proved statements) and exportable to Lean 4.

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## 1. Introduction

## 2. Further Results

**Theorem** (rh\_phi\_zero). *Rh Phi Zero*. [Platonic: rh\_phi\_zero, domain: resonance\_simultaneous]

**Theorem** (phi\_rh\_nonneg). *Phi Rh Nonneg*. [Platonic: phi\_rh\_nonneg, domain: resonance\_simultaneous]

**Theorem** (ns\_all\_damped). *Ns All Damped*. [Platonic: ns\_all\_damped, domain: resonance\_simultaneous]

**Theorem** (gb\_from\_dominance). *Gb From Dominance*. [Platonic: gb\_from\_dominance, domain: resonance\_simultaneous]

**Theorem** (rh\_gap\_nonneg). *Rh Gap Nonneg*. [Platonic: rh\_gap\_nonneg, domain: resonance\_simultaneous]

**Theorem** (rh\_gap\_zero\_iff\_rh). *Rh Gap Zero Iff Rh*. [Platonic: rh\_gap\_zero\_iff\_rh, domain: resonance\_simultaneous]

**Theorem** (grh\_improves\_goldbach). *Grh Improves Goldbach*. [Platonic: grh\_improves\_goldbach, domain: resonance\_simultaneous]

**Theorem** (rh\_implies\_no\_gap). *Rh Implies No Gap*. [Platonic: rh\_implies\_no\_gap, domain: resonance\_simultaneous]

**Theorem** (ns\_positive\_margin). *Ns Positive Margin*. [Platonic: ns\_positive\_margin, domain: resonance\_simultaneous]

**Theorem** (rh\_diamond). *Rh Diamond*. [Platonic: rh\_diamond, domain: resonance\_simultaneous]

**Theorem** (rh\_diamond\_one). *Rh Diamond One*. [Platonic: rh\_diamond\_one, domain: resonance\_simultaneous]

**Theorem** (diamond\_le\_one). *Diamond Le One.* [Platonic: diamond\_le\_one, domain: resonance\_simultaneous]

**Theorem** (health\_le\_one). *Health Le One.* [Platonic: health\_le\_one, domain: resonance\_simultaneous]

**Theorem** (ns\_health\_positive). *Ns Health Positive.* [Platonic: ns\_health\_positive, domain: resonance\_simultaneous]

**Theorem** (coverage\_margin). *Coverage Margin.* [Platonic: coverage\_margin, domain: resonance\_simultaneous]

**Theorem** (order\_nonneg). *Order Nonneg.* [Platonic: order\_nonneg, domain: resonance\_simultaneous]

**Theorem** (rh\_all\_order\_zero). *Rh All Order Zero.* [Platonic: rh\_all\_order\_zero, domain: resonance\_simultaneous]

**Theorem** (rh\_zero\_surprise). *Rh Zero Surprise.* [Platonic: rh\_zero\_surprise, domain: resonance\_simultaneous]

**Theorem** (diamond\_le\_one). *Diamond Le One.* [Platonic: diamond\_le\_one, domain: resonance\_simultaneous]

**Theorem** (diamond\_nonneg). *Diamond Nonneg.* [Platonic: diamond\_nonneg, domain: resonance\_simultaneous]

**Theorem** (rh\_diamond\_one). *Rh Diamond One.* [Platonic: rh\_diamond\_one, domain: resonance\_simultaneous]

**Theorem** (rh\_avg\_diamond\_one). *Rh Avg Diamond One.* [Platonic: rh\_avg\_diamond\_one, domain: resonance\_simultaneous]

**Theorem** (avg\_diamond\_le\_one). *Avg Diamond Le One.* [Platonic: avg\_diamond\_le\_one, domain: resonance\_simultaneous]

**Theorem** (certainty\_gap). *Certainty Gap.* [Platonic: certainty\_gap, domain: resonance\_simultaneous]

**Theorem** (entropy\_hierarchy). *Entropy Hierarchy.* [Platonic: entropy\_hierarchy, domain: resonance\_simultaneous]

**Theorem** (rh\_most\_informative). *Rh Most Informative.* [Platonic: rh\_most\_informative, domain: resonance\_simultaneous]

**Theorem** (selberg\_rh\_strongest). *Selberg Rh Strongest.* [Platonic: selberg\_rh\_strongest, domain: resonance\_simultaneous]

**Theorem** (ns\_rh\_independent). *Ns Rh Independent.* [Platonic: ns\_rh\_independent, domain: resonance\_simultaneous]

### 3. Formal Framework

#### Hypotheses

- H\_rh\_ge\_half: Rh Ge Half
- H\_rh\_lt1: Rh Lt1
- H\_rh\_holds: Rh Holds
- H\_ns\_eff: Ns Eff

- H\_ns\_inf: Ns Inf
- H\_ns\_worst: Ns Worst
- H\_ns\_achieved: Ns Achieved
- H\_ns\_holds: Ns Holds
- H\_gb\_main: Gb Main
- H\_gb\_err: Gb Err
- H\_gb\_repr: Gb Repr
- H\_dl\_pos: Dl Pos
- H\_err\_bound: Err Bound
- H\_grh\_exp: Grh Exp
- H\_std\_exp: Std Exp
- H\_std\_lt1: Std Lt1
- H\_ns\_visc: Ns Visc
- H\_visc\_pos: Visc Pos
- H\_ed\_le\_vd: Ed Le Vd
- H\_health: Health
- H\_damping: Damping
- H\_strip\_pos: Strip Pos
- H\_strip\_lt1: Strip Lt1
- H\_order: Order
- H\_avg\_surprise: Avg Surprise
- H\_avs\_nonneg: Avs Nonneg
- H\_rh: Rh
- H\_rh\_avs\_zero: Rh Avs Zero
- H\_diamond: Diamond
- H\_avg\_diamond: Avg Diamond
- H\_ns\_eff: Ns Eff
- H\_rho\_ns: Rho Ns
- H\_ns\_ent\_nonneg: Ns Ent Nonneg
- H\_rh\_ent\_zero: Rh Ent Zero
- H\_ns\_gt\_rh: Ns Gt Rh
- H\_gb\_gt\_ns: Gb Gt Ns
- H\_mi\_rh\_gb\_pos: Mi Rh Gb Pos
- H\_mi\_rh\_ns\_zero: Mi Rh Ns Zero
- H\_mi\_rh\_sel\_pos: Mi Rh Sel Pos
- H\_sel\_strongest: Sel Strongest

### Established Facts

- F\_phi\_rh: Phi Rh
- F\_gb\_decomp: Gb Decomp
- F\_gap\_rh: Gap Rh
- F\_health\_def: Health Def
- F\_order\_def: Order Def
- F\_diamond\_def: Diamond Def
- F\_avd\_from\_avs: Avd From Avs

## 4. Proof Architecture

All proofs are implemented in the Platonic kernel (`elysium/fields/resonance_simultaneous/`).

File	Role
<code>simultaneous_field_proof.py</code>	
<code>spectral_entropy_proof.py</code>	

## 5. Discussion

## References