# String Theory as Spectral Compression

Juha Meskanen

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**Abstract**

The objective is to study whether adding antisymmetric structure actually reduce description length under complexity measure.

## Contents



## 1 Hypothesis

Compression Advantage of Antisymmetry.

For ensembles that support persistent localized structures, encodings with antisymmetric constraints achieve lower total description length than purely symmetric (bosonic) encodings.

## 2 Define the Competing Models

Define two strictly comparable representations

### Bosonic

- State = multiset of modes
- No occupancy restriction
- Fully symmetric under exchange

Formally:

- coefficients $c_k \in \mathbb{C}$

- no constraint on reuse of modes

### 2.1 Fermionic / Antisymmetric

- State = antisymmetric combination of modes
- Enforced uniqueness / exclusion
- Order-sensitive with sign flips

Implementation-wise, we don't need full QFT. We can approximate via bitstrings with no duplicate occupancy, or determinant-like encoding (Slater-style).

This corresponds to the structure behind the Pauli exclusion principle, but we're testing it purely as an information constraint.

## 3 Define Description Length Operationally

Define a computable proxy for:

$$L(\text{state})$$

## 4 Experimental Design (Minimal Viable Spike)

TODO

## 5 Code

TODO