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Work in collaboration with:

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Black hole radiation spectrum in Loop Quantum Gravity

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CONTENTS

CONTENTS

CONTENTS

CONTENTS

CONTENTS

CONTENTS

INTRODUCTION

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Here: Some different new results.

BLACK HOLES IN LQG

[A.Ashtekar, J.Baez, A.Corichi, K.Krasnov]

Inner boundary introduced in the spacetime manifold before quantization procedure (*effective treatment*)

Isolated horizon boundary conditions

Hilbert space splitting: $H_v \otimes H_s$

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Surface states: U(1) Chern-Simons theory over a punctured sphere

Spin network pierces the horizon at punctures

Punctures carry some quantum labels satisfying

$$\sum_i m_i = 0$$

(projection constraint)

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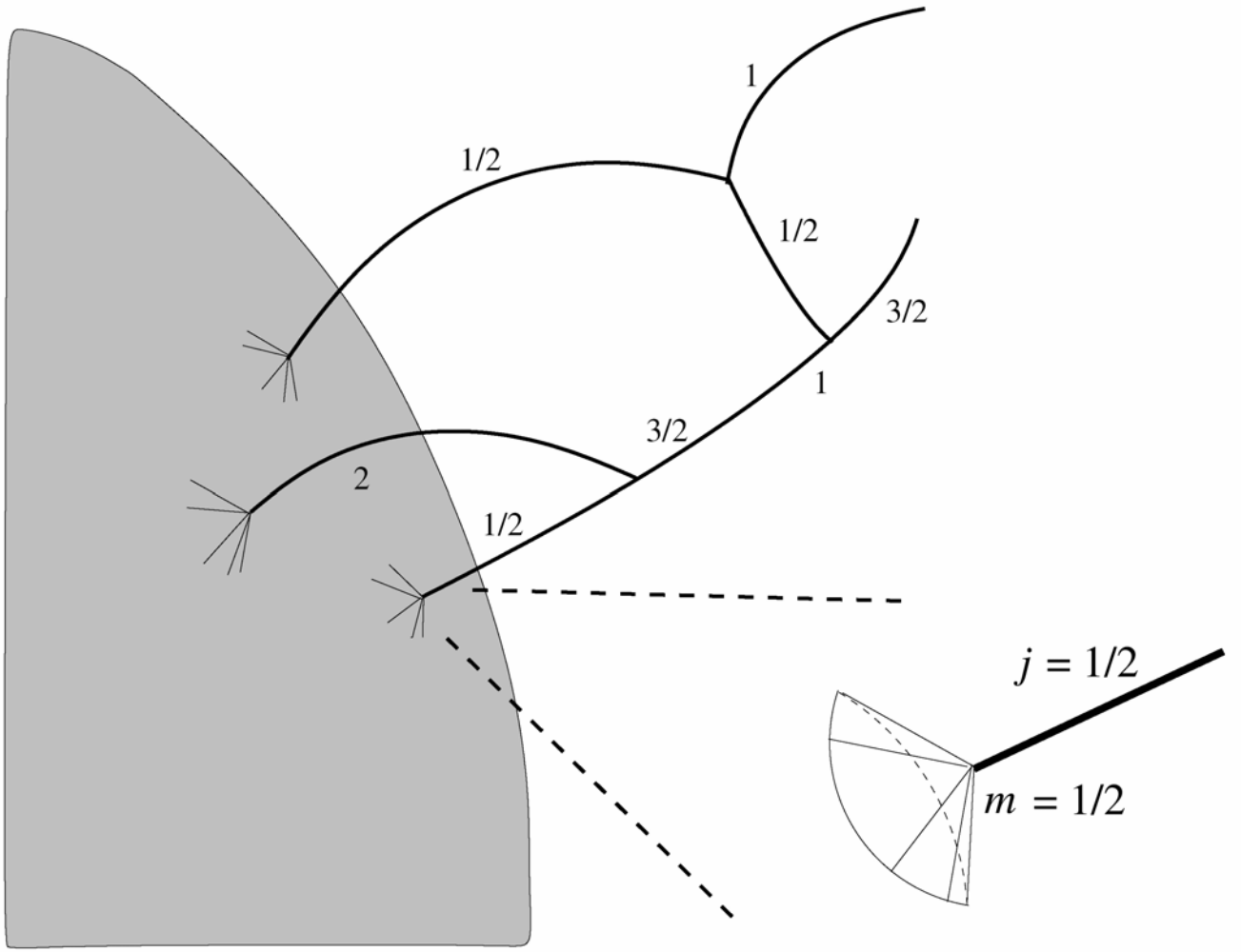

BLACK HOLE ENTROPY

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Entropy arises from the surface degrees of freedom

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Count all possible combinations of labels

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Result: $$S = \frac{1}{4} A - \frac{1}{2} \ln A$$ up to γ.

COMPUTATIONAL COUNTING

A.Corichi, E.Fernandez-Borja, J.D. [Class. Quantum Grav. **24**, 243 (2007)]

In order to make an exact counting we use an explicit enumeration algorithm

Computer generates all possible combinations of labels and counts only those satisfying the required conditions

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ABCK framework formulated for large area limit

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But linear dependence and logarithmic correction are obtained $\Rightarrow$ some confidence

DISCRETIZATION

A.Corichi, E.Fernandez-Borja, J.D. [Phys. Rev. Lett. **98**, 181301 (2007)]

Surprising new behaviour of entropy as an area function: stair-like structure

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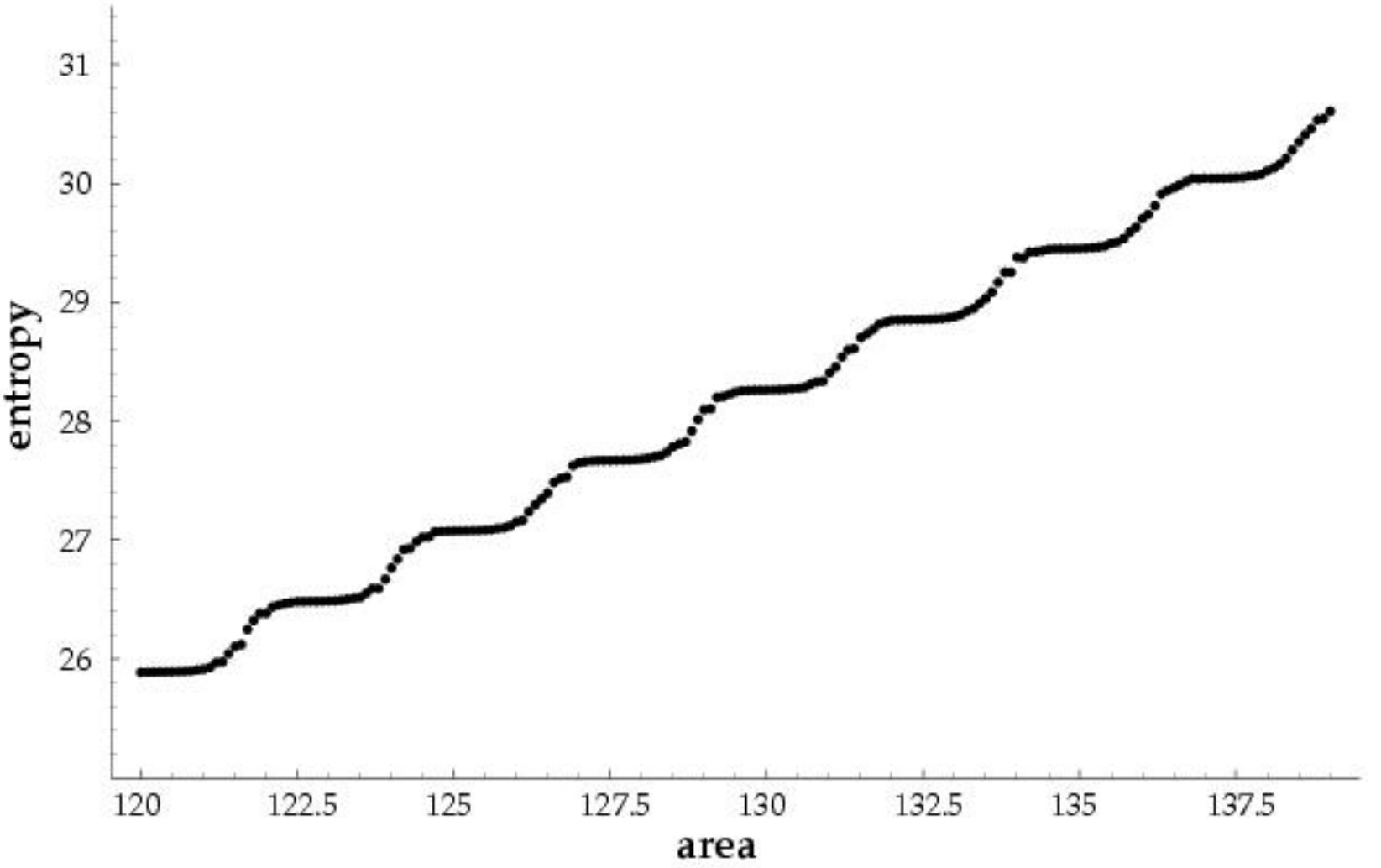

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Where this behaviour comes from?

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Structure of the horizon area eigenstate degeneracy when introducing the "projection constraint"

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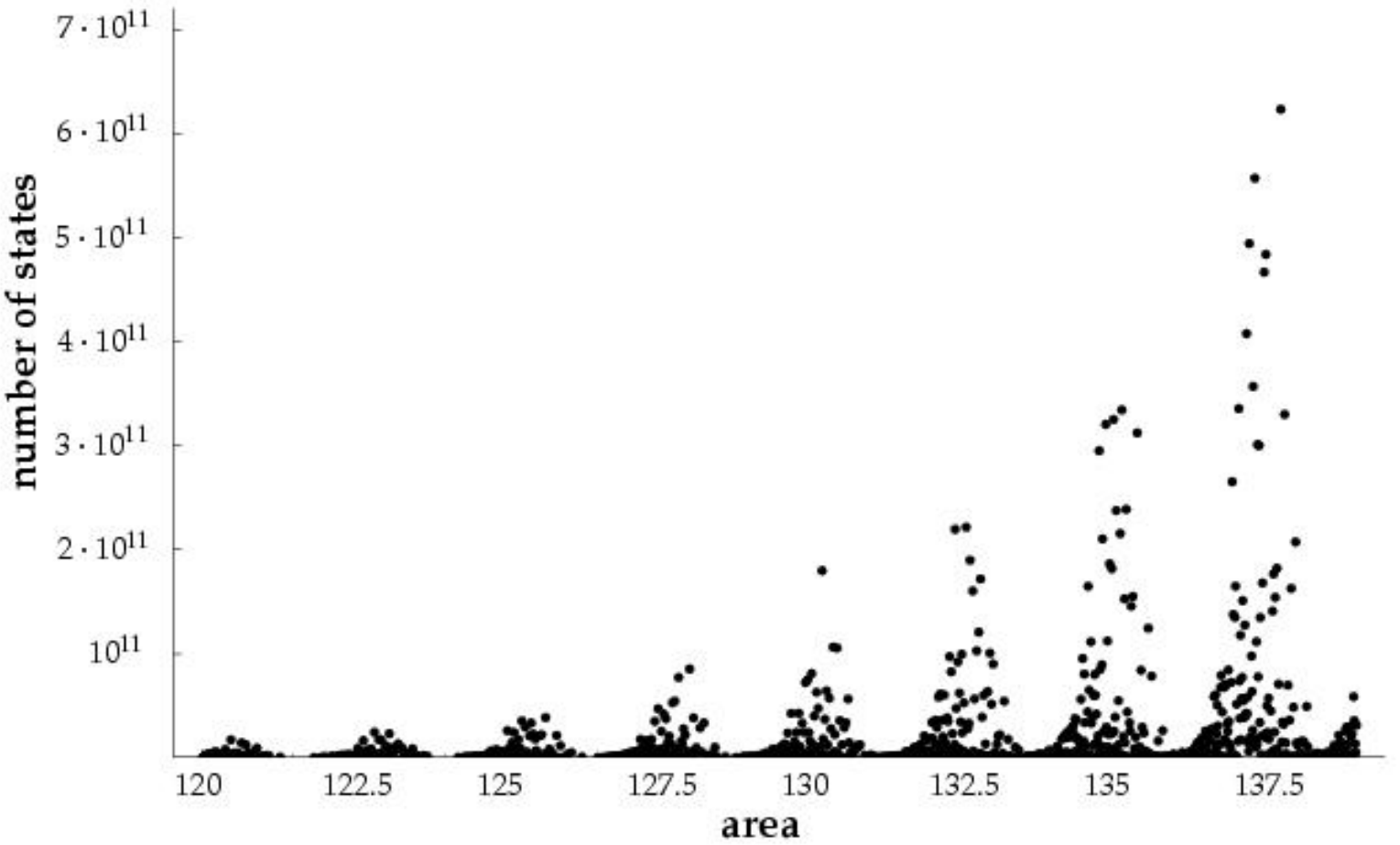

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Structure with "bands" or peaks of degeneracy

Degeneracy at the peaks several orders of magnitude higher than the rest of the spectrum

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- Implications in spectroscopy

Consider all possible transitions regardless of the concrete quantum configuration (unknown dynamics)

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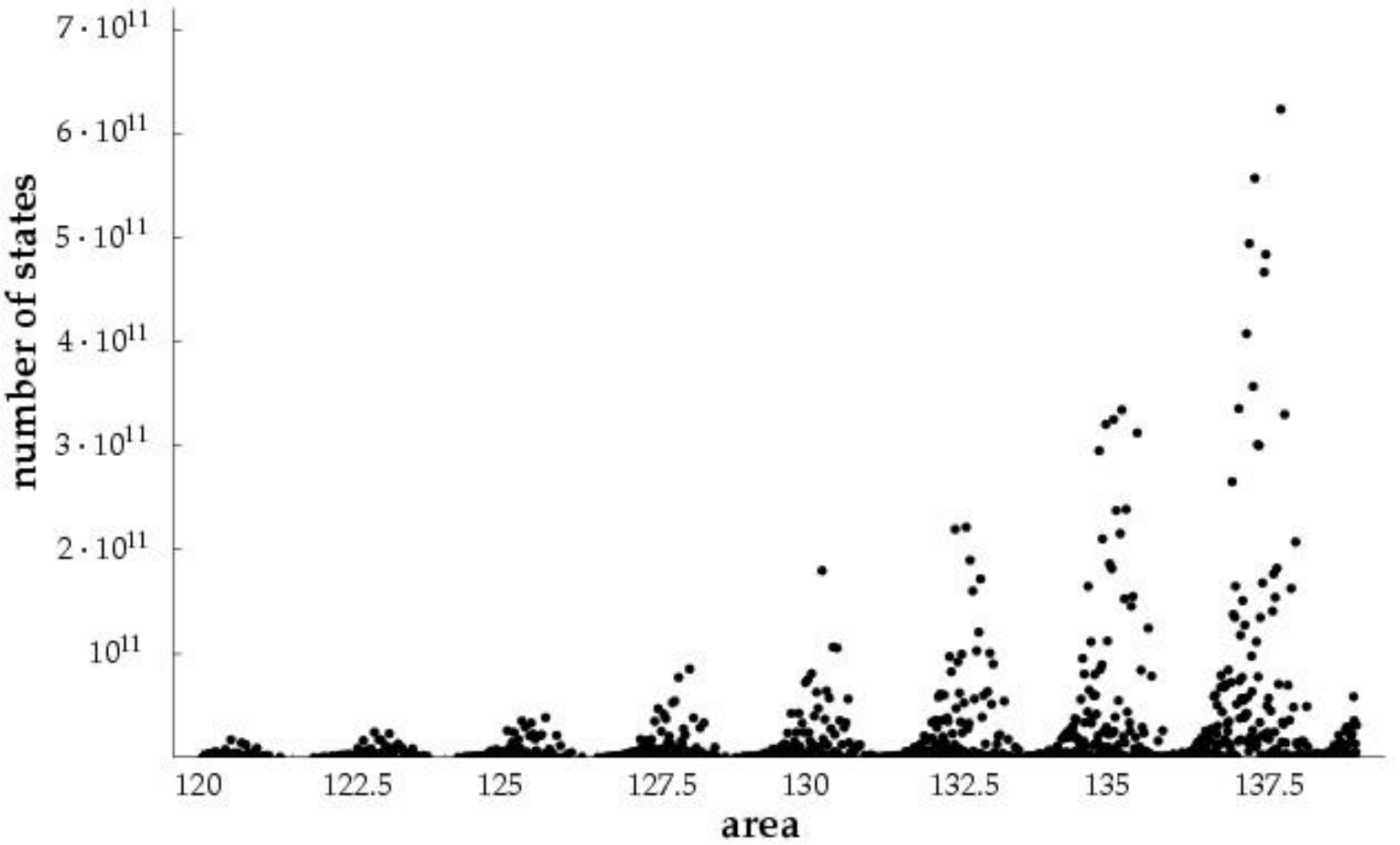

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First approximation: consider only states at the peaks

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Analogous to Bekenstein-Mukhanov picture

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- The spectrum is not discrete
- Statistically preferred frequencies
- Equidistant "brighter" lines sticking out from a continuous background spectrum
- The bands are not narrow $\Rightarrow$ Broadening of the lines

CONCLUSIONS

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Observable qualitative effects in the spectrum

ω_0 proportional to $\gamma \Rightarrow$ hypothetical observational determination (GRB's ???)

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