High Energy Physics - Theory

Discrete to continuum transition in multifractal spacetimes

Gianluca Calcagni

(Submitted on 1 Jun 2011 (v1), last revised 5 Sep 2011 (this version, v4))

We outline a field theory on a multifractal spacetime. The measure in the action is characterized by a varying Hausdorff dimension and logarithmic oscillations governed by a fundamental physical length. A fine hierarchy of length scales identifies different regimes, from a microscopic structure with discrete symmetries to an effectively continuum spacetime. Thanks to general arguments from fractal geometry, this scenario explicitly realizes two indirect or conjectured features of most quantum gravity models: a change of effective spacetime dimensionality with the probed scale, and the transition from a fundamentally discrete quantum spacetime to the continuum. It also allows us to probe ultramicroscopic scales where spectral methods based on ordinary geometry typically fail. Consequences for noncommutative field theories are discussed.

Comments:	4 pages; v2: presentation clarified, typos corrected, results unchanged; v3: matches the published version; v4: hyperlinks activated
Subjects:	**High Energy Physics - Theory (hep-th)**; General Relativity and Quantum Cosmology (gr-qc); Mathematical Physics (math-ph)
Journal reference:	Phys.Rev.D84:061501,2011
DOI:	10.1103/PhysRevD.84.061501
Report number:	AEI-2011-030
Cite as:	**arXiv:1106.0295 [hep-th]**
	(or **arXiv:1106.0295v4 [hep-th]** for this version)

Submission history

From: Gianluca Calcagni [view email]
[v1] Wed, 1 Jun 2011 19:59:52 GMT (11kb)
[v2] Sun, 5 Jun 2011 15:56:21 GMT (11kb)
[v3] Fri, 2 Sep 2011 09:47:48 GMT (11kb)
[v4] Mon, 5 Sep 2011 08:58:49 GMT (11kb)

Which authors of this paper are endorsers?

Link back to: arXiv, form interface, contact.

Download:

- PDF
- PostScript
- Other formats

Current browse cont
hep-th
< prev | next >
new | recent | 1106

Change to browse b
gr-qc
math
math-ph

References & Citatio
- INSPIRE HEP
  (refers to | cited by)
- NASA ADS

Bookmark(what is this?)