High Energy Physics - Theory

Quantum fields in toroidal topology

F.C. Khanna, A.P.C. Malbouisson, J.M.C. Malbouisson, A.E. Santana

(Submitted on 28 Jul 2011)

The standard representation of c*-algebra is used to describe fields in compactified space-time dimensions characterized by topologies of the type $ \Gamma_{D}^{d}=(\mathbb{S}^{1})^{d}\times \mathbb{M}^{D-d}$. The modular operator is generalized to introduce representations of isometry groups. The Poincar\'{e} symmetry is analyzed and then we construct the modular representation by using linear transformations in the field modes, similar to the Bogoliubov transformation. This provides a mechanism for compactification of the Minkowski space-time, that follows as a generalization of the Fourier-integral representation of the propagator at finite temperature. An important result is that the 2×2 representation of the real time formalism is not needed. The end result on calculating observables is described as a condensate in the ground state. We analyze initially the free Klein-Gordon and Dirac fields, and then formulate non-abelian gauge theories in Γ_{D}^{d}. Using the S-matrix, the decay of particles is calculated in order to show the effect of the compactification.

Comments:	34 pages, LATEX, no figures
Subjects:	**High Energy Physics - Theory (hep-th)**; General Relativity and Quantum Cosmology (gr-qc); High Energy Physics - Phenomenology (hep-ph); Mathematical Physics (math-ph)
DOI:	10.1016/j.aop.2011.07.005
Cite as:	**arXiv:1107.5717 [hep-th]**
	(or **arXiv:1107.5717v1 [hep-th]** for this version)

Submission history

From: Adolfo Malbouisson [view email]
[v1] Thu, 28 Jul 2011 13:38:45 GMT (25kb)

Which authors of this paper are endorsers?