1072-60-242 **Eric Y Akkermans*** (eric@physics.technion.ac.il), Physics Department, Technion Israel Institute, 32000 Haifa, Israel. *Statistical mechanics and quantum field theory on fractal structures. Application to quantum optics and superfluidity.* Preliminary report.

Fractals define a new and interesting realm for a discussion of basic phenomena in QED and quantum optics and their implementation. This interest results from specific properties of fractals, e.g., their dilatation symmetry as opposed to the translation symmetry of Euclidean space and the corresponding absence of Fourier mode decomposition. Moreover, the existence of a set of distinct (usually non integer) dimensions characterizing the physical properties (spatial or spectral) of fractals make them a useful testing ground for dimensionality dependent physical problems.

We shall start by noting that the absence of Fourier transform on a fractal implies necessarily different notions of volume in direct and reciprocal spaces and thus the need to modify the Heisenberg uncertainty principle. Implications for field quantization and the definition of the notion of photon on a fractal will be further addressed.

These ideas will find interesting applications in quantum optics of fractal cavities. We shall then turn to the case of massive bosons and discuss the nature of Bose-Einstein condensation and the onset of superfluidity in fractal structures. (Received June 29, 2011)