



## DYNAMICAL SYSTEMS TECHNIQUES IN COSMOLOGY. AN EXAMPLE: LQC AND THE EINSTEIN STATIC UNIVERSE\*

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**Abstract.** Dynamical Systems theory is a valuable tool in the study of Cosmology, indeed qualitative methods allow to characterize cosmological solutions on the basis of their relevant physical features (e.g., stability and asymptotic behaviour). Here we briefly review some well established results for cosmological models in the framework of General Relativity. Then we consider a family of modified cosmological models which are gaining more and more relevance, namely Loop Quantum Cosmologies. In particular we analyze the geometrical structure and dynamical properties of the model presented in [13].

### 1. Introduction

We consider the application of dynamical systems theory to mathematical models from classical and semiclassical Cosmology. In particular, the Einstein Static (ES) universe in General Relativity (GR) is reviewed along with its stability properties. Then static solutions of the so called semiclassical Loop Quantum Cosmology (LQC) modified equations for homogeneous and isotropic closed cosmological models ( $K = 1$ ) with a cosmological constant  $\Lambda$  are considered.

The paper is structured as follows. In the first section we review some basic notions about Cosmology which will be helpful for the following discussion. In the second section we introduce some standard definitions from Dynamical Systems

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\*Reprinted from JGSP **14** (2009) 67–83.