Project Plan

February 23, 2017

1 Project Plan - Lithium Problem

During the initial satges of the Big Bang besides nucleosynthesis, nuclear reactions were also taking place due to the high temperatures. The abundance of helium and hydrogen as calculated from the hot Big Bang Theory fits nicely with the observational data. Things gets ugly when we estimate the amount of lithium. The expected amount of lithium is three times than that observed. This is referred to as the lithium problem.

Recently researchers from China have published a paper that may have solved the puzzle. They argued that the assumption of the Big Bang Theory that the universe was in thermodynamic equilibrium may be wrong and thus we cannot apply Maxwell-Boltzmann distribution as it applies for ideal gases only and we deal with real gases which behave differently.

The authors have used non-extensive statistics to solve the problem. This does not directly gives the abundance of lithium but it predicts the amount of beryllium that can then be used to calculate the amount of lithium.

The goals of our project are:-

- To study Maxwell-Boltzmann Distribution and how is it applied in the Big Bang Theory to explain the abundances of various elements.
- To study how the data gathered by WMAP is incorporated into the Big Bang theory - We will study how WMAP data helps us in finding out the baryonic number and some other cosmological cnstants that were needed to fully describe the Big Bang Theory
- Study about non-extensive statistics.
- To apply non-extensive statistics to explain how it could be used to overcome the shortcomings of Big Bang Theory in explaining the lithium abundances.
- Explore other theories about the explanation of lithium problem

The other theories that we intend to explore are:-

- Diffusion Theory
- Presence of BBNCRs
- Due to incomplete nuclear physics input for the BBN calculations