

# Cosmological Evidences of Dark Matter through the CMB

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## 1 Introduction

-[1] brief thermal history of the universe and how to get to the cmb and what is it?  
-practical Motivation for studying the cmb: nice spectrum black body spectrum: physics well known, very intense radiation  
which info can we get from the cmb: Big bang, matter and energy content of the universe—dark matter is a big part of the matter content it influenced the spectrum of the CMB — so it played a role.  
-structure of the paper

## 2 From the Discovery of the CMB to the Planck mission

[2] -discovery of the cmb  
-filtering of the images  
-different missions

## 3 Content of the Universe

- Assumptions: working with the  $\Lambda$ CDM model
- General relativity
- Friedmann equations

## 4 CMB theoretical analysis

- hydrodynamics [3] page 14 eq 49 to page 17 eq 71  
skip doppler effect

- gravito acoustic oscillations page 19 up to eq 82 , justify briefly constant potential in page 20
- page 20 and 21 up to eq92 important comment
- baryonic effect

hydrodynamics



Figure 1: The Universe

## 5 Conclusion

nn [4]

## References

- [1] Wayne Hu. <http://background.uchicago.edu/~whu/index.html>.
- [2] Martin Bucher. Physics of the cosmic microwave background anisotropy. January 2015.
- [3] Wayne Hu. Lecture Notes on CMB Theory: From Nucleosynthesis to Recombination. *arXiv:0802.3688 [astro-ph]*, February 2008.
- [4] Nikhil Padmanabhan and Douglas P. Finkbeiner. Detecting Dark Matter Annihilation with CMB Polarization : Signatures and Experimental Prospects. *Physical Review D*, 72(2), July 2005.