Übungen zur Astroteilchenphysik 1

Wintersemester 2010/2011

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Blatt 8

26.01.2011

Aufgabe 1: WMAP and the CMB

- Discuss and describe the experimental techniques applied by WMAP to measure the CMB.
- Discuss the main results of WMAP. How have these results improved compared to COBE?

Aufgabe 2: Sachs-Wolfe-Effect

The Sachs-Wolfe-Effect describes the change in energy of photons leaving a gravitational potential. In the early universe there were gravitational fluctuations of strength Φ.

- Calculate the change in energy of the photons by first giving the classical work that has to be"done" to escape the the potential and then by additionally taking into account time dilatation effects. Are the photons shifted towards the red or the blue when leaving the gravitational potential?
- For which scales on the sky does the Sachs-Wolfe-Effect dominate the anisotropies of the CMB? Describe how the presence of this effect in the CMB allows to deduct the existence of Dark Matter.

Übungstermin:
Montag, 31.01.2011, 16 Uhr, E15 Seminarraum.