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## **Non-decoupling of heavy scalars in cosmology**

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### **Citation**

Hardeman, A. R. (2012, June 8). *Non-decoupling of heavy scalars in cosmology. Casimir PhD Series*. Retrieved from <https://hdl.handle.net/1887/19062>

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**Author:** Hardeman, Sjoerd Reimer

**Title:** Non-decoupling of heavy scalars in cosmology

**Date:** 2012-06-08

# **Non-decoupling of heavy scalars in cosmology**

PROEFSCHRIFT

ter verkrijging van  
de graad van Doctor aan de Universiteit Leiden,  
op gezag van Rector Magnificus prof. mr P. F. van der Heijden,  
volgens besluit van het College voor Promoties  
te verdedigen op vrijdag 8 juni 2012  
klokke 12:00

door

**Sjoerd Reimer Hardeman**

geboren te Hengelo (Overijssel), Nederland in 1982

## **Promotiecommissie**

Promotor: prof. dr. A. Achúcarro  
Co-Promotor: dr. K. E. Schalm  
Overige leden: prof. dr. J. W. van Holten  
dr. D. Roest  
prof. dr. J. M. van Ruitenbeek  
dr. B. J. W. van Tent

The background image is the Hubble ultra deep field, an image of an estimated 10,000 galaxies in the constellation Fornax. These galaxies were formed from the density perturbations that were created during inflation and are best studied from the cosmic microwave background radiation. The image of this radiation is used as a background for the letters on the cover. Finally, a curved inflaton trajectory is depicted, which will make features in the power spectrum that might be possible to study using late time cosmology.

'Lieve hart mijn boek is af, mijn boek is af!' - Multatuli



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