

Etusivu

763655S Astrohiukkasfysiikka (6 op)

Opintojakson [WebOodi-sivu](#)

Astroparticle physics, course's [WebOodi-page](#)



Astroparticle physics

Lectures 8 x 3h

Note: the lecture times have changed to Wednesday 14-17 o'clock in TÄ219!

Lecture plan

- 19.03.2013 Introduction on the lecture course,
 - Short introduction on astroparticle physics
 - Short introduction on nuclear and particle physics (relevant for the course)
- 26.03.2013 High-energy cosmic rays
- 09.04.2013 High-energy cosmic-ray sources
 - Cosmic-ray experiment EMMA
- 16.04.2013 APP detectors, experimental methods, neutrino beams, LAGUNA
- 23.04.2013 Solar physics and solar neutrinos
- 08.05.2013** Supernovae and sn neutrinos, diffuse sn neutrinos
- 15.05.2013** Geoneutrinos and reactor neutrinos, proton decay, dark matter
- 22.05.2013** Background in underground experiments

Examination

There are two possible dates that the course examination can be done.

The first is on **Monday May 27, 2013 at 10-14 o'clock in Anttilansali**.

The second possibility is on the general examination date of the Physics Department on Tuesday June 11, 2013.

Lecture Notes

- Lecture 1: Intro on the lecture course
- Lecture 1: Intro on Astroparticle physics
- Lecture 1: Intro on Particle physics
- Lecture 2: High-energy cosmic rays
- Lecture 3: Underground CR experiments & EMMA, Sources
- Lecture 4: APP detectors, experimental methods, neutrino beams, LAGUNA
- Lecture 5: Sun and solar neutrinos
- Lecture 6: Supernovae, SN and SN diffuse neutrinos
- Lecture 7: Geoneutrinos, proton decay and dark matter
- Lecture 8: Background in underground experiments

A List of Essay Topics

Small Intro and Essay Topics

Exercises

Exercises are kept on Monday at 10 - 12 o'clock in TÄ219. First exercise is on 25.3.2013. Students are encouraged to work through the exercises before and during the exercise session. In order to gain points the exercises must be given to the assistants before **Wednesdays** at 14.00 (before each lecture). The worked out exercise-papers (with your **name and email!**) can also be left to a denoted box at the hall of the theoretical physics for gaining points. New exercises and the solutions of the previous will appear every Wednesday to this wiki page. For questions, comments or feedback about the exercises you may also contact the assistants.

Exercise 1

Exercise 2

Important note: in Exercise 2 Task 2 part b), λ is given wrong. It should be $37 \text{ g/cm}^2 \cdot \ln(2)$.

Aftermath: [A summary of the questions, answers and discussions of exercise session on Monday 15.4](#) (updated a bit). Thanks to all who came to the session!

Exercise 3

Important note: in Exercise 3 Task 2 part a), the formula given yields centimetres as a result if values plugged in to the formula are given in the specified units.

Important note: in Exercise 3 Task 2 part a), "B is parallel" should be "the magnetic field is parallel".

Aftermath: [A summary of exercise session on Monday 22.4.](#) Thanks for all the questions!

Exercise 4

Hints for task 1: ([link](#)) Thanks to the student who wanted to share the hint with all!

Important note: in Exercise 4 Task 1, when doing the integration over the full solid angle: do the integration over the half-spheres separately and use reason with "+/-" signs! "T" (time) is lacking from the last formula of the assignment 1D).

Important note: in Exercise 4 Task 3, the cross section given is the **total** cross section.

Important note: in Exercise 4 Task 3, we calculated the result over an exposure time of one month. In reality, the exposure times used in the experiment varied, being most typically 2-3 months.

Aftermath: [A summary of exercise session on Monday 6.5.](#) Thanks for participating.

Exercise 5

Exercise 6

Exercise 7

Opintojakso on luennoitu s2009.

Teoreettisen fysiikan opintojaksot ja opetusaikataulut