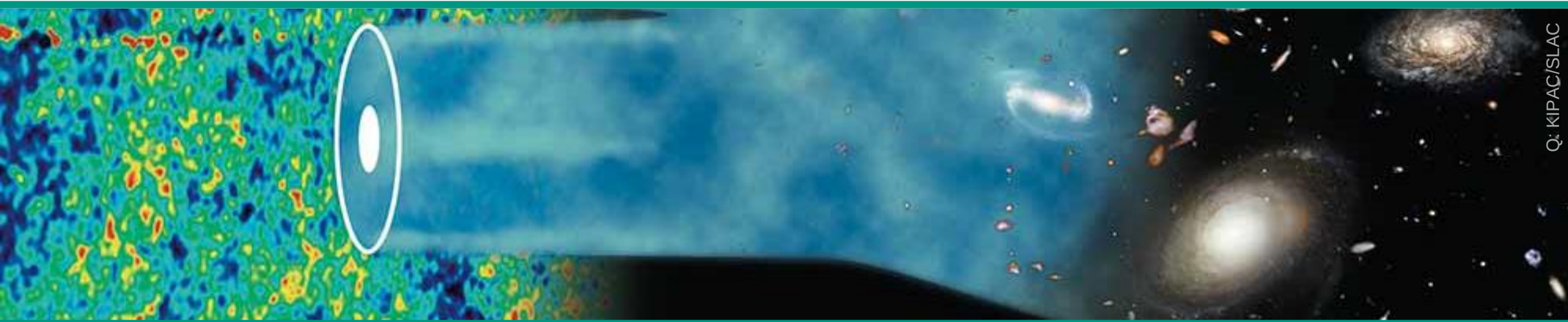


Introduction to Cosmology

WS22/23 Organisation

Oct. 25, 2022



Q: KIPAC/SLAC

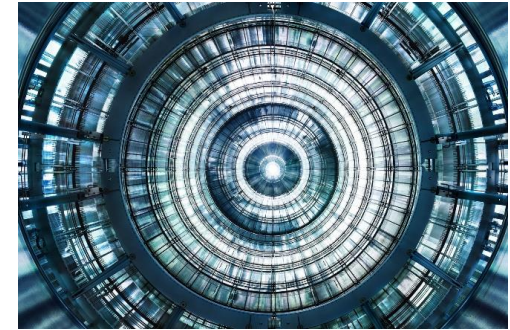
Cosmology – your team

■ Lecturer (4022021): Guido Drexlin

Professor for particle astrophysics

Institute of Experimental Particle Physics (ETP)

areas of research: **neutrinos** (KATRIN), **dark matter** (DARWIN)



■ further information (writing an email is faster than regular office hours)

guido.drexlin@kit.edu

Tel.: 0721-608 23534

admin support:

marion.behechti@kit.edu

office at CN:

Building 402 room 212

office at CS:

Building 30.22 room F2-34



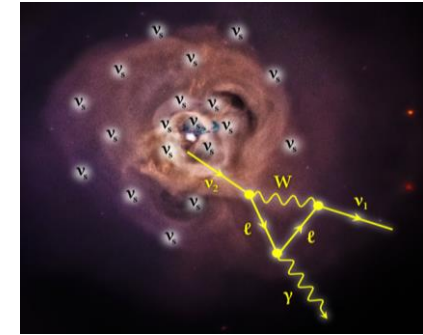
Cosmology – your team

- Main tutor / organiser (4022021): **Anton Huber**

researcher on KATRIN/TRISTAN

Institute for Astroparticle Physics (IAP)

areas of research: **neutrinos** (KATRIN), **detectors** (TRISTAN)



- further information

anton.huber@kit.edu

Tel.: 0721-608 26708

office at CN:

Building 402 room 214



Cosmology – your team

■ Tutors (4022021): **Alexey** Elykov & Hiu-Sze **Vera** Wu



researchers on direct dark matter searches

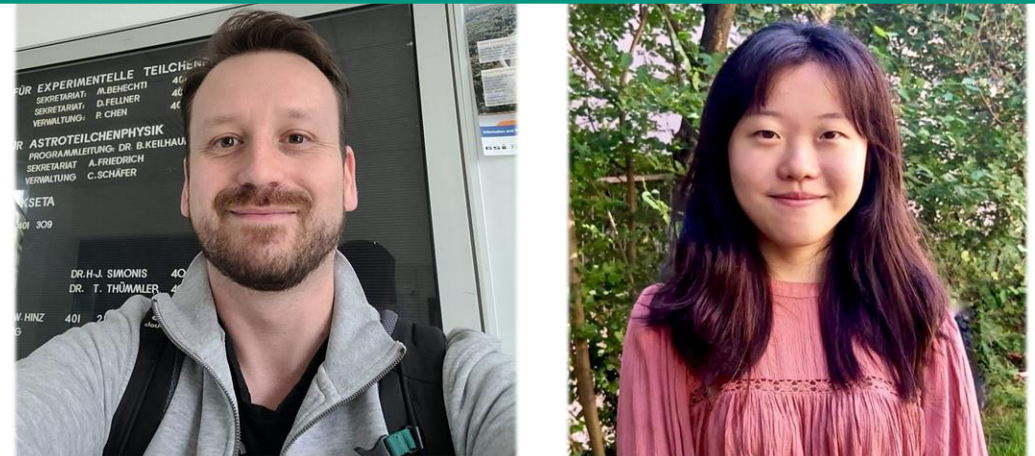
Institute for Astroparticle Physics (IAP), Campus Nord

areas of research: **dark matter** (XENON), **detectors** (DARWIN)

■ further information

alexey.elykov@kit.edu

hiu-sze.wu@kit.edu



Cosmology – your lecture dates

■ Lecture series (in presence at kl. KS A, Physik HS Nr. 3)

- zoom channel for those who cannot attend in person

<https://zoom.us/j/8364874316>

Tuesday **11:30 – 13:00** (each week, dates see below)

14 lectures
(2 SWS):

25.10.

08.11. / 15.11. / 22.11. / 29.11. /

06.12. / 13.12. / 20.12. /

10.01. / 17.01. / 24.01. / 31.01.

07.02. / 14.02. /

2022

2023

Cosmology – your tutorial & sheet handout dates

■ Tutorials / tasks sheets

6 task sheets: ~ each second week

Thursday 14:00 – 15:30 @ kl. HS A

17.11. / 01.12. / 15.12.

Vera

11.01. / 25.01. / 08.02

Alexey

■ Distribution of task sheets

6 task sheets: distributed each second week, directly after the lecture via ILIAS

i.e. you have one week to work on it before the actual tutorial

Cosmology – tutorials

■ Tutorials: from the basics up to the details

- please sign up via [ILIAS](#) (hub for distribution of task sheets)
- we expect you to be present at [all tutorials](#) (Physik HS Nr. 3, kl. HS A)
- no credits in case of unexcused absence
- two (sub-) blocks of tutorials: [Sheets 1 – 3](#) & [Sheets 5 – 7](#)
- we expect you to have worked on a **fraction of 60%** of all problems in each the two sub-blocks ‘in earnest’
- we expect you to have presented the solution to at least 1 task at the board

Cosmology – ILIAS

■ **central hub** for all relevant materials, discussions, topical events...



4022021 – Einführung in die Kosmologie

Die Vc lück in die Entwicklungsphasen des Universums, beginnend vom Big Bang aus, bis zum heutigen Universum dominiert von Dunkler Materie und Dunkler Energie. Vorlesungssprache ist D oder GB.

ILIAS

Inhalt Info Einstellungen Mitglieder Lernfortschritt Metadaten Export Rechte Voransicht als Mitglied aktivieren >

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Neues Objekt hinzufügen ▾

Seite gestalten

Inhalt



Discussion Forum / Diskussionsforum

Beiträge (Ungelesen): 0 (0)



Exercises & Tutorials / Übungen

Here you find all task sheets / Hier finden sie alle Übungsblätter



Lectures / Vorlesungen

Here you find the pdf-copies of all lectures / Hier finden sie die pdf-Kopien aller Vorlesungen

Introduction to **Cosmology**

Winter term 22/23

Lecture 1

Oct. 25, 2022



the master curriculum at KIT

■ **exp. astroparticle physics** is an ideal topic for your master studies

Sem	Physikalisches Schwerpunktfach und Masterarbeit	Physikalisches Er- gänzungsfach	Physikalisches Ne- benfach	Praktika	Nichtphysik. Wahlpfl.fach	Überfachliche Quali- fikationen	LP
1	Module des Physik. Schwerpunktfachs 8	Module des Physik. Ergänzungsfachs 8	Module des Physik. Nebenfachs* 8	Fortgeschrittenen- praktikum* P4 6			30
2	Module des Physik. Schwerpunktfachs 12	Module des Physik. Ergänzungsfachs 6			Module des Nicht- physik. Wahlpfl.fachs* 8	ÜQ - überfachl. Qua- lifikationen* 4	30
3	Spezialisierungs- phase 15 Einf. wiss. Arbeiten 15	participate in world-leading ATP-experiments: KATRIN, XENON-nT, IceCube, Auger,... future: DARWIN, ET					30
4	Masterarbeit 30						30

**Modulhandbuch
Physik Master 2015 (Master of Science)**
SPO 2015
Wintersemester 2022/23
Stand 16.08.2022

KIT-FAKULTÄT FÜR PHYSIK



KIT – Die Forschungsuniversität in der Helmholtz-Gemeinschaft

www.kit.edu

AstroParticlePhysics – the master curriculum

■ the curriculum of ATP at KIT: my lecture programme

Astroparticle Physics – I

Winter term (WS22/23)

Introduction & Overview,
Cosmic Rays, Gammas,
Neutrinos, **Dark Matter**



ATP – II: Particles & Stars

Summer term (SS23)

ν - properties, stellar evolution,
supernovae & compact objects,
gravitational waves



Introduction to Cosmology

Winter term (WS22/23)

Big Bang, cosmological
models, evolution of structure
in the universe, dark universe



AstroParticlePhysics – the master curriculum

■ all courses

Veranstaltungen	WS 22/23	Reg.	SWS	ECTS	SF/EF	NF
Astroteilchenphysik I <i>Astroparticle Physics I</i>	✓	WS	v3u1	8	A	✓
Einführung in die Kosmologie <i>Introduction to Cosmology</i>	✓	WS	v2u1	6	B	✓
Moderne Methoden der Datenanalyse (mit/ohne erw. Übungen)* <i>Modern Methods of Data Analysis (with/without ext. exercises)</i>		SS	v2p4/v2p2	8/6	C	✓
Elektronik für Physiker <i>Electronics for Physicists</i>	✓	WS	v4p4	10	D	✓
Elektronik für Physiker: Analogelektronik <i>Electronics for Physicists: Analog Electronics</i>	✓	WS	v2p2	6	E	✓
Elektronik für Physiker: Digitalelektronik <i>Electronics for Physicists: Digital Electronics</i>	✓	WS	v2p2	6	F	✓
Beschleunigerphysik (mit/ohne erw. Übungen) <i>Accelerator Physics (with/without ext. exercises)</i>	✓	WS	v4u1/v4u0	8/6		✓
Messmethoden und Techniken der Experimentalphysik (mit/ohne erw. Übungen) <i>Measurement Methods and Techniques in Experimental Physics (with/without ext. exercises)</i>			v2u1p2/v2u1	8/6		✓
Detektoren für Teilchen- und Astroteilchenphysik (mit/ohne erw. Übungen) <i>Detectors for Particle and Astroparticle Physics (with/without ext. exercises)</i>	✓	WS	v2p4/v2p2	8/6		✓
weitere Veranstaltungen	WS 22/23	Reg.	SWS	ECTS	SF/EF	NF
Astroteilchenphysik II – Kosmische Strahlung (mit/ohne erw. Übungen) <i>Astroparticle Physics II – Cosmic Rays (with/without ext. exercises)</i>	✓	WS	v2u2/v2u1	8/6	G	✓
Astroteilchenphysik II – Gamma Rays and Neutrinos (mit/ohne erw. Übungen) <i>Astroparticle Physics II – Gamma Rays and Neutrinos (with/without ext. exercises)</i>		SS	v2u2/v2u1	8/6	H	✓
Astroteilchenphysik II – Teilchen und Sterne (mit/ohne erw. Übungen) <i>Astroparticle Physics II – Particles and Stars (with/without ext. exercises)</i>		SS	v2u2/v2u1	8/6	I	✓
Allgemeine Relativitätstheorie <i>General Relativity</i>			v3u2	10 (T)		✓
Computational Methods for Particle Physics and Cosmology <i>Computational Methods for Particle Physics and Cosmology</i>	✓		v2u1	6 (T)	J	✓
Moderne Methoden der Spektroskopie: Anwendungen in der Astroteilchenphysik** <i>Modern Methods of Spektroskopy: Applications in Astroparticle Physics</i>	✓	WS SS	5 Tage Blockpraktikum	2		✓

AstroParticlePhysics – join our advanced seminar

- deepen your presentation skills with a 45 min. seminar on ATP in D, GB...
 - topics focused on **experimental astroparticle physics** & **cosmology**:
 - neutrino properties (mass), evidences & direct searches for dark matter, ...
 - cosmic rays, neutrino astronomy, gravitational waves, ...
 - CMB, compact objects,...
 - a **one-week block seminar at CN (IAP, B401)** (end of semester)
 - **3 talks/day**, plus discussions, coffee breaks,...
 - plus: preparation of **posters** (win a poster prize!)



AstroParticlePhysics – the master curriculum

■ the curriculum of ATP at KIT: SPF or EF

- **Schwerpunktfach (SPF)** / **Ergänzungsfach (EF)**
[major/main subject] [supplementary subject]

20 ECTS

12 ECTS

- also possible: subsidiary subject (Nebenfach)
- mandatory courses for SPF/EF:

either/ **Astroparticle Physics I (Astroteilchenphysik I)**
or **Introduction to Cosmology (Kosmologie)**

AstroParticlePhysics – the master curriculum

■ the curriculum of ATP at KIT: SPF or EF

- Schwerpunktfach (SPF) [major/main subject]	/	Ergänzungsfach (EF) [supplementary subject]
		
20 ECTS		12 ECTS

■ Major subject (Schwerpunktfach, SPF) / suppl. Subject (EF)

- oral examination ~ **45-50 min.** / ~30-45 min.
- cross-module topics (modulübergreifend)
- 2nd examiner can be selected from specific lecture you have attended (e.g. electronics, detectors,...)