



*Graduate Program on Physics for the Universe
(GP-PU)*

宇宙創成物理学 高度実験 GP-PU experimental course

ニュートリノ科学研究センター

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2024/04/09

GPPU optional compulsory course (2 credits)

Advanced Lecture
on Physics for the Universe II
(宇宙創成物理学特殊講義II)

or

Advanced experiments
on Physics for the Universe
(宇宙創成物理学高度実験)

高度実験課題の単位取得(How to get credits)

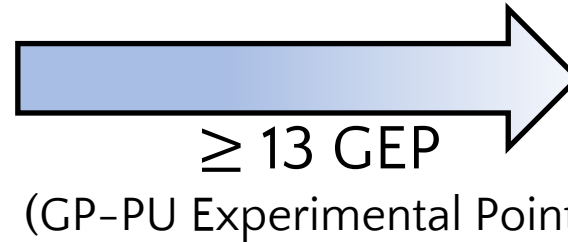
素粒子物理 (-4課題)
Particle phys. (-4 exps)

原子核物理 (-3課題)
Nuclear phys. (-3 exps)

天文 (-4課題)
Astronomy (-4 exps)

Take -4 or more experiments during your doctoral program.

Grade for each experiment
(S/A/B/C/D)



2 credits

先行(先々行)履修も可能です!
We also welcome you to take experiments in advance (M1,M2).

Giving an award to the high achiever students!!

GPPU excellent student award
2024



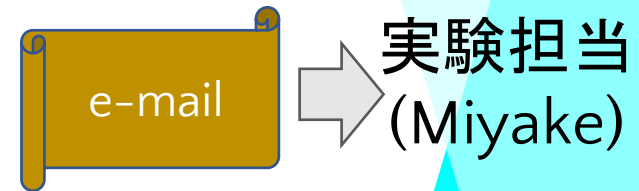
List of Experiments

Exp. No.	Instructor	Title	GEP	Period (days)	#of students	comment
P1	池田	Geant4 simulation science	3	3-4	~5	休止（2025年度は未定）
P3	石徹白	Superconducting detector	4	4	~2	Odd# years
P4	清水	Scintillation detector development	4	4	2~4	Even# years
P5	市川, Lukas	Towards an observation of decoherence of entangled-photons	4	4	1~4	
P6	岸本	Microwave technology for particle and astroparticle physics	4	4	1~3	
P7	石徹白	FPGA training course 2 (SoC for data taking and DSP)	4	4	1	Even# years
N1	石徹白 三輪	FPGA training course	3	2-3	~20	
N2	三輪	Scintillator hodoscope array read by multi-pixel photon sensor (MPPC)	4	4	~4	
N3	金田	Basic of Data Acquisition, Detector Technique, and Data Analysis	4	4	~6	
A1	秋山	Measurements of optical wavefront by assembling an optical system	4	4	~4	
A2	服部	Measurements of complex dielectric constants of samples in millimeter wave bands using MP-FTS with high sensitive Millimeter-wave bolometers	4	4	~3	
A3	服部	Measure CMB with BS antenna	4	4	1-2	
A4	秋山	Parallel computing for science data analysis	3	3	~5	

Registration

Registration of experiments

Registration (by sending e-mail) is required every year to take experiments.



Course registration

Registration is required only for **the final year (D3)** for credits.

⚠ D2以前にGEP取得見込みでも成績がつくのはD3になります。

学務情報システム / Student Affairs Information System

GP-PU homepage

<http://gp-pu.tohoku.ac.jp/>



GP-PU experimental course homepage

<http://lambda.phys.tohoku.ac.jp/gppu/exp/>



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Syllabus

<http://lambda.phys.tohoku.ac.jp/gppu/exp/syllabus.html>

GP-PU Exp.
Course Syllabus

HOME PARTICLE physics NUCLEAR physics
ASTRONOMY

Syllabus 2024

In the Japanese fiscal year of 2024, there are eleven courses that you can select,

- A1 (Dr. Akiyama, March 2025)
- A2 (Dr. Hattori, Summer 2024)
- A3 (Dr. Hattori, Second semester)
- A4 (Dr. Akiyama, Summer 2024)
- N1 (Drs. Ishidoshiro and Miwa, November 2024)
- N2 (Dr. Miwa, Summer 2024)
- N3 (Dr. Kaneta, Second semester)
- P4 (Dr. Shimizu, Summer 2024)
- P5 (Drs. Ichikawa and Berns, Summer 2024)
- P6 (Dr. Kishimoto, Summer 2024)
- P7 (Dr. Ishidoshiro, Winter 2025)

Archive:

2023 , 2022 , 2021 , 2020 , 2019

Syllabuses can be downloaded below:

Particle Physics

P1 (GEP=3): Geant4 simulation science
Instructor: Dr. Haruo Ikeda (ikeda_at_awa.tohoku.ac.jp, RCNS Annex I 03 room 122)

It will be not held in this year.

P3 (GEP=4): Superconducting detector
Instructor: Dr. Koji Ishidoshiro (koji_at_awa.tohoku.ac.jp, RCNS Annex 221)

It will be not held in this

P4 (GEP=4): Scintillation detector development
Instructor: Dr. Itaru Shimizu (shimizu_at_awa.tohoku.ac.jp, Research Center for Neutrino Science, room 205, 022-795-6724)

GPPU Experimental Course

P4 (GEP=4)

Scintillation detector development

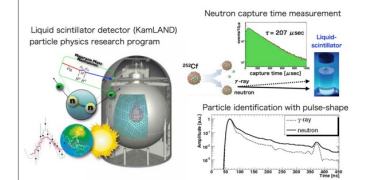
Instructor: Itaru Shimizu (shimizu@awa.tohoku.ac.jp, Research Center for Neutrino Science, room 205, 022-795-6724)
GPPU Experimental Point (GEP): 4

Goal of Study

This course aims to provide broad knowledge and experience of the scintillation detection with fundamental techniques necessary for advanced experiments in particle and nuclear physics research through your work on the liquid scintillator measurement and data analysis.

Contents

The scintillation detection is a widely-used technique in foremost large-scale experiments in the world, relatively cost-effective and multipurpose, so there has been made ongoing efforts on various developments to improve the experimental sensitivities. Actually, a large liquid scintillator detector (KamLAND) has established a new world record in the neutrino mass sensitivity utilizing a unique low-background technique developed in Tohoku University. In this experiment, you will learn the principal and the device design of the scintillation detection in lectures and experiments, and master the practical technique adaptable to the particle and nuclear physics experiments in the future. This course consists of lectures and experiments in 4 days, containing the following items, understanding of light-output and transfer mechanism, particle identification, measurement of neutron capture time, data acquisition and analysis.



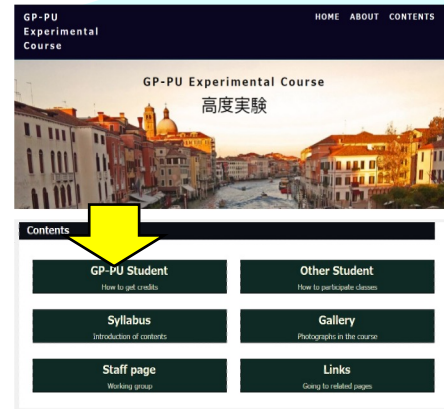
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How to register for the course

<http://lambda.phys.tohoku.ac.jp/gppu/exp/students.html>

Please send an e-mail to Miyake.

(miyake@awa.tohoku.ac.jp)



Example

Title: GP-PU Experimental Course (*Your name*)

Text: 1st semester(2, A1, N1, P1, N2), 2nd semester(1, P3, N3, A2, P4)

Order of your choice (until 4th)

of experiments you would like to take in the semester

Please register by **mid-May** every year.

This year's deadline is 5/8.

Notes

- 希望者が多い場合, 抽選となる場合がある.
- 実験実施日程の詳細は担当教員と後日相談.
- (日程調整後のキャンセルは極力しないように!)
- **D2末までには, 13 GEP以上を取得する.**
- 毎年度コンスタントに課題を履修する.
- M2 (M1): 先(先)行履修可能.

Pictures

We hope that you will learn advanced experimental technologies and comprehensive view.

A1: 観測光学系の収差測定実験



A2: ミリ波フーリエ分光



N2: MPPCを用いたシンチレータの読み出し

P2: ASIC講習



2024年度 GPPUオリエンテーション

P4: シンチレーション測定器





backup

Notes on GP-PU experiment

- ❑ If the number of applicants exceeds the capacity, we decide who take which experiments randomly.
- ❑ Each instructor of the experiment will contact (send an e-mail) to discuss details of the experiment (schedule etc.).
- ❑ **Please get 13 GEP or more by the end of D2.**
- ❑ Please take at least one experiment every year.
- ❑ Experiments in advance (M1, M2) are welcome !!