

# 2nd Baltic School of High-Energy Physics and Accelerator Technologies 2022



Final report by: Erki Kärber, Fjodor Sergejev, Veronika Zadin, Cia-Helena Meldo, Anneliis Tomingas, Margit Meesaar  
at the [10th CERN Baltic Group General Meeting Nov 22, 2022](https://indico.cern.ch/event/1215747) [indico.cern.ch/event/1215747](https://indico.cern.ch/event/1215747)

If you do it twice, and expect it to continue,  
then it's a tradition.

**1st school by RTU**

<https://indico.cern.ch/event/1029085/>

(august 2021)

**2nd school by TalTech**

<https://indico.cern.ch/e/CBG2022>

(august 2022)

**3rd school by KTU**

(2023)



**CERN  
Baltic Group**

# ORGANIZATIONAL TEAM



## TalTech School of Engineering

Fjodor Sergejev

fjodor.sergejev@taltech.ee

leader, management

Erki Kärber

erki.karber@taltech.ee

program, host, outreach event program

Cia-Helena Meldo

cia-helena.meldo@taltech.ee

media, publicity, welcome bag, tags and certificates, photos, outreach

Anneliis Tomingas

anneliis.tomingas@taltech.ee

accommodation, registration, invoices, transport, social, covid safety

Veiko Viil

veiko.viil@taltech.ee

venue, social, outreach event

Merit Kindsigo

merit.kindsigo@taltech.ee

venue, director

## MATTER.ee at Tartu University

Veronika Zadin

veronika.zadin@ut.ee

leader, management

Margit Meiesaar

margit.meiesaar@ut.ee

meals, lecturer travels

**MATTER**



# Media

## BEFORE the event

- **Posters** at CBG member buildings ⇒
- **Website** (indico): [indico.cern.ch/event/CBG2022](https://indico.cern.ch/event/CBG2022)
- **Local radio** (7 June 2022)  
[kadi.ee/jarelkuulamine/keskpaev-07-06-22/](https://kadi.ee/jarelkuulamine/keskpaev-07-06-22/)
- **Local newspaper** (2 June 2022)  
[saartehaal.postimees.ee/7536898/kuressaare-kolledz-voorustab-augustis-maailmatippfuusikuid](https://saartehaal.postimees.ee/7536898/kuressaare-kolledz-voorustab-augustis-maailmatippfuusikuid)

## AFTER the event

- **TalTech news**  
[taltech.ee/uudised/cern-balti-grupi-suvekool-toi-saaremaale-insenerifuusika-tipud](https://taltech.ee/uudised/cern-balti-grupi-suvekool-toi-saaremaale-insenerifuusika-tipud)



# LECTURERS

## Old-timers from 1st Baltic school of HEP & AT

- Prof. Dr. Jonathan Richard Ellis
- Prof. Dr. Yuri Dokshitzer
- Dr. Maurizio Vretenar



## Newcomers

- Dr. Walter Wuensch
- Dr. Andi Hektor
- Dr. Flyura Djurabekova
- Prof. Leonid Rivkin
- Prof. Heikki Junninen
- Rebecca Louise Taylor, PhD candidate



# SCHEDULE

Mon 8 Aug		Tue 9 Aug		Wed 10 Aug		Thu 11 Aug		Fri 12 Aug	
		7.30 - 10.00	Breakfast at hotel	Breakfast at hotel	Breakfast at hotel	Breakfast at hotel	Breakfast at hotel		
	Physics	9.30 - 10.30	Standard Model	Basics of QFT + QCD	Asymptotic Freedom and partons	Jets and QCD radiophysics			
		10.30 - 11.00	Discussion + Break	Discussion + Break	Discussion + Break	Discussion + Break		Coffee	
11.00 - 11.30	Welcome snack / Registration	11.00 - 12.00	Early Cosmology	Dark Matter	Gravit. Waves	Beyond Standard Model / New Physics			
11.30 - 12.00	Intro / Briefing	12.00 - 12.30	Discussion + Break	Discussion + Break	Discussion + Break	Discussion + Break	Organizers: Goodbye		
12.00 - 12.30	CERN Project Manager at EAS - Enterprise Estonia	12.30 - 13.30	Lunch break	Lunch break	Lunch break	Lunch break	Lunch break	Lunch	
12.30 - 13.00	Discussion + Break								
13.00 - 14.00	CLOUD experiment	13.30 - 14.30	Accelerators for society, medicine, and more - PART II	Multiscale-physics simulations for accelerator technologies. PART II	Accelerator science and technology PART II	Accelerator science and technology PART II			
14.00 - 14.30	Discussion + Break	14.30 - 15.00	Discussion + Break	Discussion + Break	Discussion + Break	Discussion + Break			
14.30 - 15.00	Evolution of CBG 2018-2022, and outlook.	15.00 - 16.00	Cosmic ray tomography. Principles. Developm. of prototype. (GScan)	High-gradient accelerator development and applications. PART I	High-gradient accelerator development and applications. PART II	High-gradient accelerator development and applications. PART II			
15.00 - 15.30	Discussion + Break	16.00 - 16.30	Discussion + Break	Discussion + Break	Discussion + Break	Discussion + Break		Coffee	
15.30 - 16.30	Accelerators for society, medicine, and more - PART I	16.30 - 17.30	Multiscale-physics simulations for accelerator technologies. PART I	Accelerator science and technology PART I	Experimental talk, and CBG doctoral study programme	Experimental talk, and CBG doctoral study programme			
16.30 - 17.00	Discussion	17.30 - 18.00	Discussion	Discussion + Break	Discussion	Discussion			
		19.00 - 22.00	Event dinner (Hoppet sailing boat)	18.00-18.30	Developments of hadron therapy accelerators in the UK	18.00 ... 20.00	Trip to Kuressaare Castle		
				18.30-19.00	Challenges of accelerator injection & extraction				
				Discussion + Break					
				19.30	Setting up the cloud chamber				

17.00 BAFF introduction for students by Evelyn Mürsepp

17.30 - 21.30 outreach event (Õhtuülikool) in Estonian only. <https://taltech.ee/sundmused/ohhtuylikool> <https://fb.me/e/1Cc4LY2J>

Prof. Yuri Dokshitzer
Prof. Jonathan Ellis
Dr. Maurizio Vretenar
Prof. Flyura Djurabekova
Prof. Leonid Rivkin
Dr. Andi Hektor
Dr. Walter Wuensch
Robert Aare - CERN Project Manager at EAS - Enterprise Estonia
Prof. Heikki Junninen. University of Tartu. Estonian partner in the CLOUD experiment
Prof. Toms Torims. Riga Technical University. Chairman of the CERN Baltic Group 2018-2022
Ants Koel - Chairman of the CERN Baltic Group as of 2022
Dr. Kārlis Dreimanis. Director of the RTU Centre of High-Energy Physics and Accelerator Technologies and the Team Leader of the CMS Latvia Group at CERN
Rebecca Louise Taylor, PhD candidate, Imperial College London, Medical Physics

# STUDENTS

## SUMMARY:

Initial applications:

33 (Estonia - 14; Latvia – 9; Lithuania – 5; Finland – 2; UK – 2; Hungary – 1).

Approved applications:

31 (Estonia - 12; Latvia – 9; Lithuania – 5; Finland – 2; UK – 2; Hungary – 1).

Cancellations:

4 (Estonia – 2; Lithuania – 1; Hungary - 1)

Total attendance:

27 (Estonia - 10; Latvia – 9; Lithuania – 4; Finland – 2; UK – 2).

Candidates 33 → 2 rejected  
**Approved** **31** → 30 newcomers

• County	Signed up	Cancellations	Affiliation	Arrived
• Estonia	12	2 cancelled	UT – 7, NICBP/UT joint – 2, TalTech – 1	10
• Latvia	9		RTU – 3, UL – 1, UL/RTU joint – 1, Daugavpils – 4	9
• Lithuania	5	1 cancelled (covid)	KTU – 2, LEI – 1, UV – 1	4
• Finland	2		Univ. Helsinki – 2	2
• UK	2		Imp. College London – 1, Univ. Edinburgh – 1	2
• Hungary	1	1 cancelled (expired ID)		-

**Arrived to School** **27 students** +2 as 'externs' (senior staff) = **29 total**

# COSTS

## TalTech School of Engineering

Accommodation & breakfast for students, lecturers and organizers	10 320 EUR
Dinner at Hoppet sailing boat	1 700 EUR + sponsor 500 EUR (GScan)
Other costs	≈ 2 300* EUR
<b>TOTAL</b>	<b>14 320 EUR</b> (staff salary not included)

## Matter.ee

Lunch and coffee breaks	4 360 EUR
Kuressaare castle visit	350 EUR
Lecturers Transport of lecturers + stopover at Tallinn	2 851 EUR + 1 302 EUR
Other costs	1 130 EUR
<b>TOTAL</b>	<b>8 692 EUR</b> (staff salary not included)

## Saaremaa Development Center (Sasak.ee)

Outreach for public (room rental + and coffee break/snacks for ca 80 people).	2 106 EUR
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## Student contribution

Commitment fee per student 40eur*27persons	1 080 EUR
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- Students organized and paid for their own travel.

# TAL TECH

GSCAN

MATTER

TalTech + Tartu expenses → **23k EUR**  
(same as RTU costs for school of 2021)



Euroopa Liit  
Euroopa  
Regionaalarengu Fond



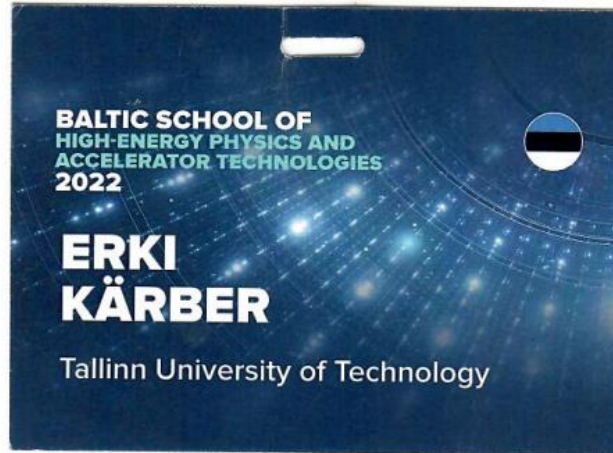
Eesti  
tuleviku heaks



# POSTER



# NAME TAG



# CERTIFICATE



# GOODY BAG



Download poster at <https://indico.cern.ch/event/CBG2022>

# STUDENT FEEDBACK 1

1. Where did you hear about the school?

6 responses

From my supervisor

At the office

From RTU

From Veronika Zadin

University

# STUDENT FEEDBACK

2

2. Was there a sufficient amount of organizational information for fluent planning of your stay (signing up, payment, arrival, accommodation etc.)? Was there anything critical that was missing, for example - on our website?

6 responses

There was enough information

There was enough information available and organizers were open to questions. To some extent I'd wish to have some of the information (such as the acceptance, at what time we are expected to be there) a bit earlier.

Everything was amazing. There is just a small comment that could lead to total perfection: the possibility of checking in to the hotel night before the beginning of school since the school was starting at noon so it was quite hard to get on time in Saaremaa if the person wasn't already in Baltic a day before. Otherwise, everything was very well planned and organized.

Everything was very clear and comfortable to plan

Nothing important was missing.

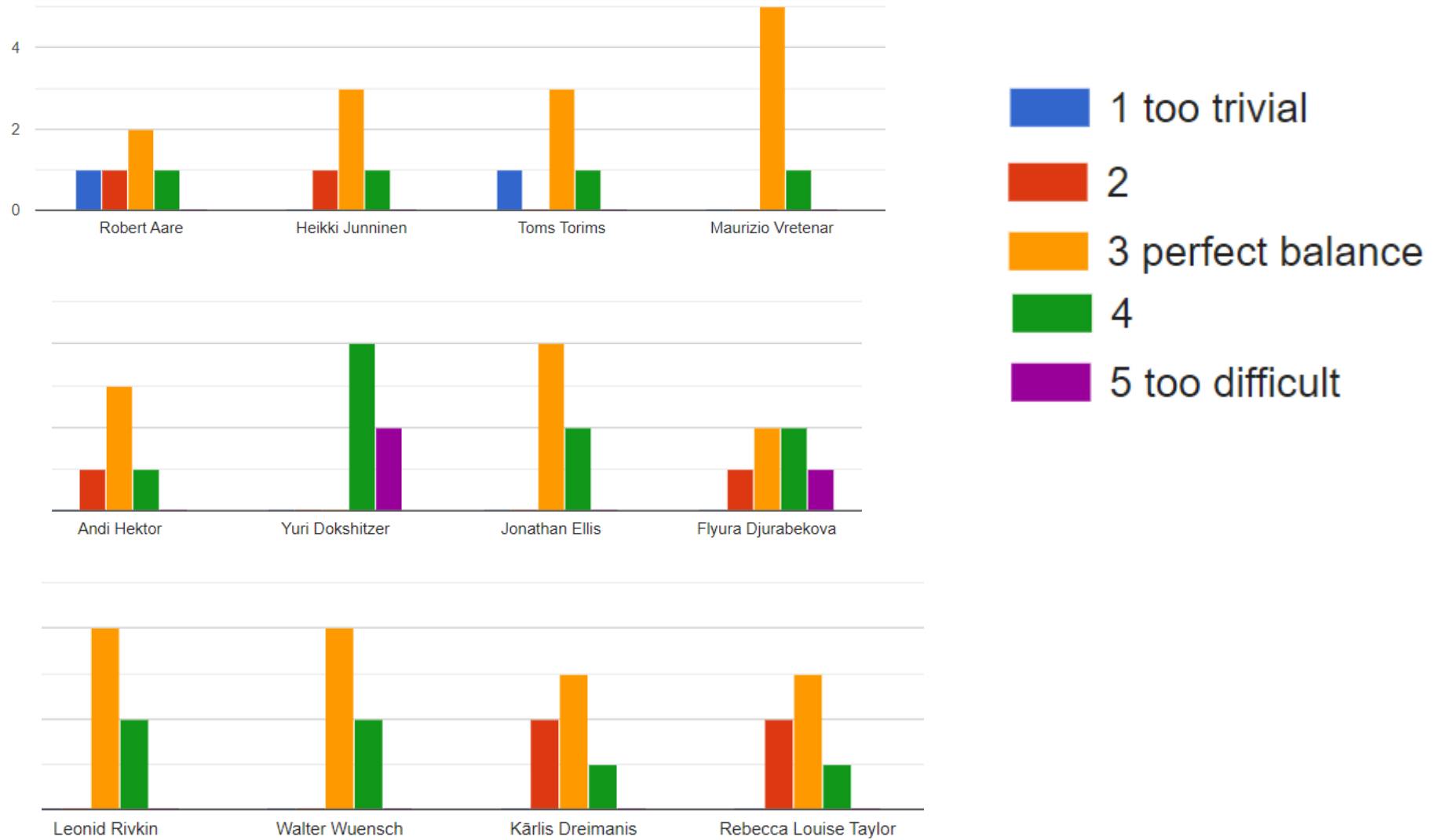
Yes

# Rating of lectures

# STUDENT FEEDBACK

3

Nr. of votes



# STUDENT FEEDBACK 4

Please add further comments about lecturers here if you wish.

3 responses

Jonathan Ellis was fabulous, so was also Yuri Dokshitzer, yet his lessons felt more rushed, perhaps he should have had more time/ lessons planned. Karlis Dreimanis lecture was spot on and motivating.

Overall, all lectures were well structured.

Thank you all. It was a nice experience full of knowledge and good vibe.

# STUDENT FEEDBACK 5

What is the one thing, if any, that you were not happy about in the school?

5 responses

I missed workshops! Hands on experience. Also, it would have been beneficial to have had a dedicated hour on Mondays morning to meet and greet everyone, to go around in a circle, who I am, what are my research interests, what I expect from the school etc. And then to break out into smaller groups to chit chat before the beginning of the lectures.

There was nothing worth mentioning in this regard. As I said before it was very well organized.

Not enough free time to explore saaremaa

There was too little time to see Saaremaa/Kuressaare. The schedule was too tightly packed.

Everything was nice.

# STUDENT FEEDBACK 6

The event was sponsored, except for the transport and the commitment fee. Was the amount of the commitment fee acceptable?  
(40€ per person)

6 responses

- Yes
- yes
- Yes, it was acceptable.
- yes
- The fee was acceptable
- 50-100 euro. I think it was ok for all that you offer.

# STUDENT FEEDBACK 7

If there would not have been sufficient sponsoring, what would have been the maximum fee that you would consider paying to attend the school?

6 responses

- 300 eur
- 100 eur
- This is a very hard question to answer. First of all, a place where school took a place is very attractive to visit. Secondly, you provided very good lectures with an outstanding selection of lectures. And thirdly all events outside of class that you have offered were very good and pleasant. Hence, the fee would be expected to be around 500 euros.
- 120 euro
- 100 eur
- 150 euro max.



# STUDENT FEEDBACK

8

What made your stay and trip memorable?

4 responses

I enjoyed very much the people met

The answer to this question is written in the previous one.

The beautiful Saaremaa nature

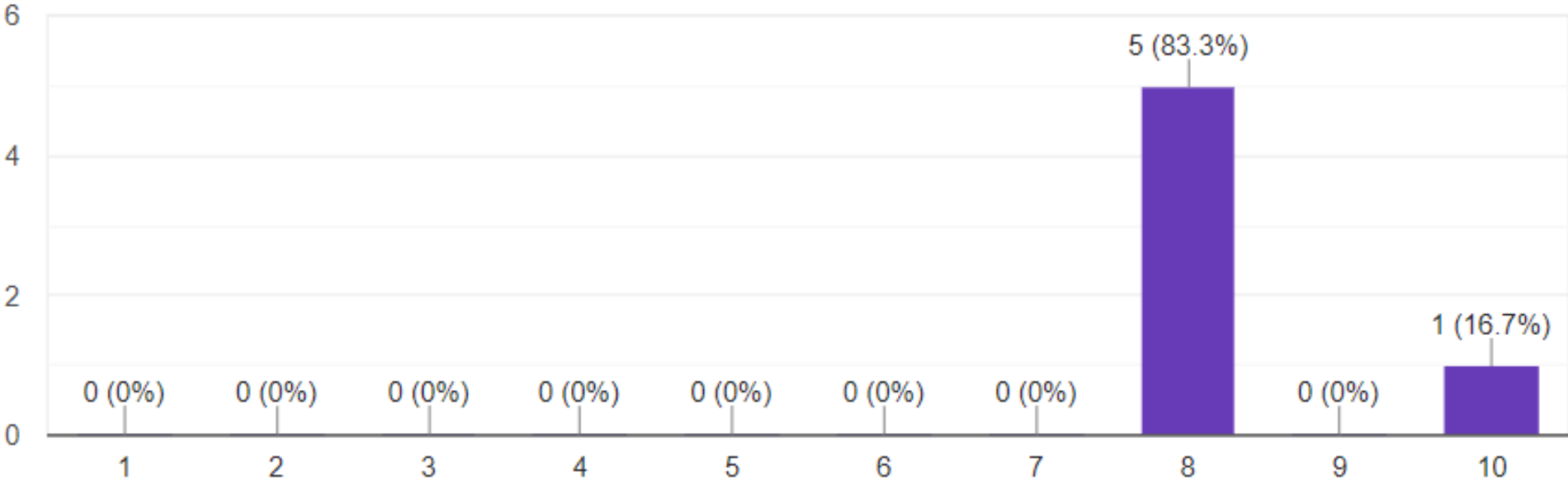
The lectures and people.

# STUDENT FEEDBACK

9

Did you learn new things that are likely to become useful in your studies or research?

6 responses

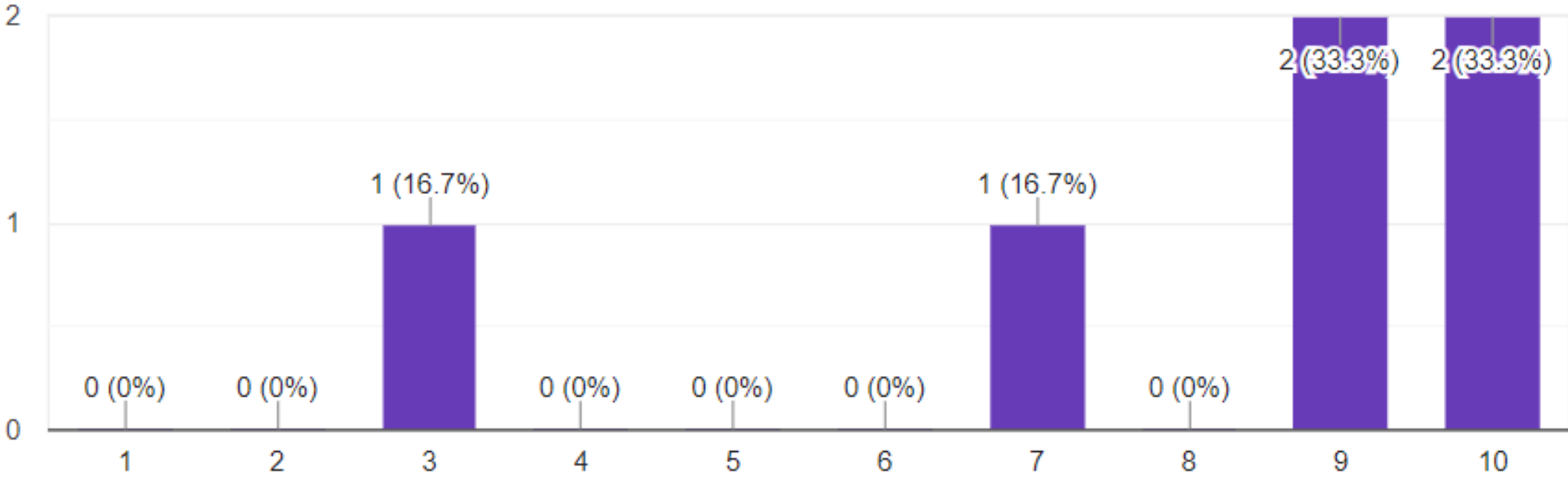


# STUDENT FEEDBACK

10

Did you feel that the school allowed you to expand your network in a way that is likely to become useful to you?

6 responses



# STUDENT FEEDBACK

11

Would you likely recommend the school to others in the upcoming years?

6 responses

- Yes
- Yes, I would!
- Definitely yes.
- yes
- Yes
- Yes

# STUDENT FEEDBACK

12

How can we make the school better, suggestions?

4 responses

I would have organised an ice-breaker activity for the students (also the lecturers) to foster networking

Include a meet-and-greet circle at the very beginning to quicker break the ice!

I don't have any major comments on this question.

I liked the location. The conferences were just next to the hotel.

# STUDENT FEEDBACK

13

Is there anything else you'd like to add?

3 responses

Thank you for organizing the school and making us feel welcome!

I have written pretty much everything that I had to write.

Thank you, I think this school should have more advertisement to students.

# SATELLITE EVENT: popularization for general public

- Monday 8th Aug, Thule Koda, 17.30-22.00 (~5h)
- 15 short-talks, ~80 participants
- Topics: medicine, genetics, materials science, cosmology, energy etc.

TAL TECH TALLINNA TEHNIKALIIKOOOL TASUTA

8. AUGUSTIL KELL 17.30-21.30

## ÕHTUÜLIKOOOL

KURESSAARES THULE KOJAS

### PÕNEVAD LÜHILOENGUD INIMESE JA TEADUSE TEEMADEL

- antiainega haiguste vastu?
- HOONETE TERVIS - KUIHU KAOB MEIE ENERGIA?
- KURESSAARENA KAS TUALES PETUB VÕLUJÕUD?
- NÄHTAMATU? - hoonete tervis - kuhu kaob meie energia? kuidas saha kas materjalide väik pürib arengut?
- MIS TOIMUB MEREPIINNA ALL?

LEKTORID: TEADURID, PROFESSORID, DIREKTORID, POPULARISEERIJAD JA ENTHUSIASTID TALLINNA TEHNIKALIIKOOLOIST, TARTU ÜLIKOOLOIST, KURESSAARE HAIGLAST, OSGANIST, GEENIVARAMUST, EASIST.

ÕHTUÜLIKOOOL JÜHIB TÕNIS KIPPER KADI RAADIOST.

KÕIK HUVILISED ON OODATUD, VARASEM KOKKUPUUDU TEEMADEGA EI OLE VAJALIK!

LISAINFO: Taltech.ee/sundmused/ohuulikool

TAL TECH TARTU ÜLIKOOOL CERN Baltic Group SAK



[taltech.ee/uudised/inseneriteaduskond-viis-saaremaale-ohuulikooli](http://taltech.ee/uudised/inseneriteaduskond-viis-saaremaale-ohuulikooli)

[taltech.ee/sundmused/ohuulikool](http://taltech.ee/sundmused/ohuulikool)

[facebook.com/events/821692262147596](https://facebook.com/events/821692262147596)

[kadi.ee/jarelkuulamine/keskpaev-07-06-22/](http://kadi.ee/jarelkuulamine/keskpaev-07-06-22/)

[saarahaal.postimees.ee/7580029/taltech-toob-saaremaale-loengud-inimese-ja-teaduse-teemade](http://saarahaal.postimees.ee/7580029/taltech-toob-saaremaale-loengud-inimese-ja-teaduse-teemade)

# SUMMARY, THOUGHTS, AND RECOMMENDATIONS

- The 2nd summer school by TalTech and Tartu University was a **successful continuation** after the 1st by RTU.
- Baton will now be passed on to **Brigita Abakevičienė (KTU) in charge of the 3rd School.**
- Success: **couple the school with an outreach** event for public.
- Suggestion:  
employ students of 1st and the 2nd school to advertise the 3rd School.
- Could be improved: School council was difficult to reach. The board members have to be motivated and **responsive** to be serve the purpose and be fruitful to CBG.



# SUPPLEMENT:

# Photos of the School

(photos by Cia-Helena, and Fjodor Sergejev)

# Venue – Kuressaare College



# Venue – Kuressaare College



# LECTURES

**How is ART different to X-Ray?**

ART	X-Ray
100% safe with no ionising radiation	Emits radiation harmful to humans and foods
No safety exclusion required	Requires exclusion zone or shielding
No moving parts	Many moving parts to maintain
3D Image with automatic detection and material classification	Produces 2D gray image only
Software subscription updates only	High physical maintenance schedule required
Can penetrate over 2400mm steel	Penetration limited to ~400mm
Can penetrate through liquids	Cannot penetrate liquids

What are we?  
Where do we come from?  
Where are we going?

The aim of particle physics:  
What is matter in the Universe made of?

*John Ellis*  
*Klaus Hahn*

**Accelerators for medicine**

Total: ~16'000 particle accelerators worldwide operating for medicine

Beam Type	Applications	Number of Accelerators
Primary beam	protons (proton therapy), ions (ion therapy)	~75 (Hadron therapy)
Secondary beam	electrons (low en), electrons (high en)	>300 (Radiation Therapy)
Secondary beam	X-rays, neutrons	14 000 (Radiation Therapy)
Radioscopes	imaging (PET, Positron Emission Tomography), therapy (Targeted Alpha Therapy, etc.)	~1 500 (PET, Positron Emission Tomography)

**Synchrotron Light,  
Electron Dynamics  
and  
Light Sources**

Lenny Rivkin

Paul Scherrer Institute (PSI)  
and  
Swiss Federal Institute of Technology Lausanne (EPFL)

EPFL — Accelerator based Proton Sources, L. Rivkin, Saaremaa, Estonia, Baltic School of Physics, August 10, 2022

# CULTURE TRIP– Kuressaare Castle



# CULTURE TRIP – Kuressaare Castle



# HOPPET BOAT TRIP



# HOPPET BOAT TRIP





# HOPPET BOAT TRIP







SEA U 😊  
next year