



Izglītības un zinātnes
ministrija

Latvia - CERN: state-of-play

Prof. Toms TORIMS

CERN National Contact Point



Outline

1. Latvia – CERN strategy
2. Scientific / research portfolio – emphasis on HEP and AT
3. Latvia @CERN and related research
4. Institute of Particle Physics and Accelerator Technologies
5. Doctoral Programme in HEP and AT
6. Participation in CERN related outreach activities
7. Communication activities
8. Latvia CERN Stakeholders Group
9. Geneva/CERN based ILO
10. Relevant Government decisions and financial framework



Ministry of
Education and Science
Republic of Latvia

Latvia – CERN Strategy

**Latvia is reliable and
honest partner of CERN**

**Tangible contribution to
the CERN scientific
programme**



researchLatvia*
Value Through Knowledge





Latvia - CERN strategy

Government approved – consensus based - stakeholders and ministries

Overarching goals:

- 1. Meaningful and coordinated** participation of Latvia at CERN in the **Associate Member** state status
- 2. To become Full Member** state within **2-3 years**

Available on Indico: <https://indico.cern.ch/event/1181586/>



Meaningful and coordinated participation of Latvia at CERN

Tasks for associate membership

1. To benefit from the **opportunities** at CERN – in the best possible way and at all levels
2. To provide sustainable contribution in attaining the **State priorities** in education, science, economic development and R&D
3. To foster environment of the **scientific excellence and industrial leadership**
4. To concentrate available and to attract new **human resources** / to use strategically available **financial instruments**
5. Within the next years to achieve “**well balanced country**” status and to ensure **60/40 proportion** for scientific HR / industrial return



Scientific/research portfolio

Based on the bottom-up initiatives / balance & diversity / strategic approach

CERN based experiments and collaborations

- **CMS** as a **HEP flagship** project (RTU+LU)
- **MEDICIS** (RTU+LU)
- AEGIS (LU)
- *ISOLDE/LIEBE (LU)*
- *Crystal Clear Collaboration (LU)*

Development of new projects and technologies at CERN

- Accelerator & Technology Sector /ATS-DO
- Engineering and Technology Departments
- Future Circular Collider study (FCC)
- International Muon Collider Collaboration

EU funded projects CERN coordinated/associated

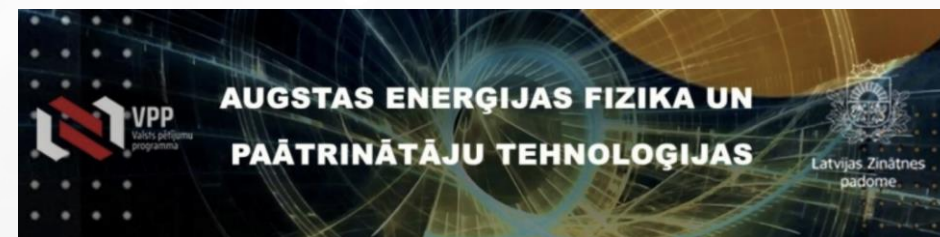
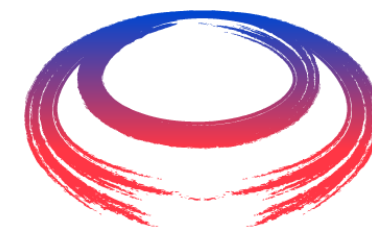
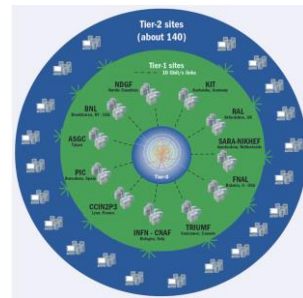
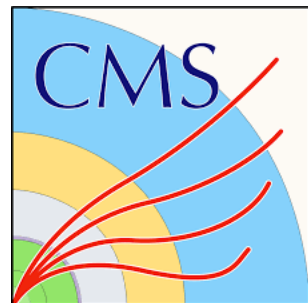
Riga Technical University (RTU)

- I.FAST
- HITRIplus
- NIMMS
- HERTIS
- COST

University of Latvia (UL)

- PRISMAP
- QuantHEP

CERN related projects and collaborations



Latvia @ CERN

Personal based long term @CERN: USER, COAS, PJAS, DOCT, FELL, GRAD
- snapshot at 25/08/2023

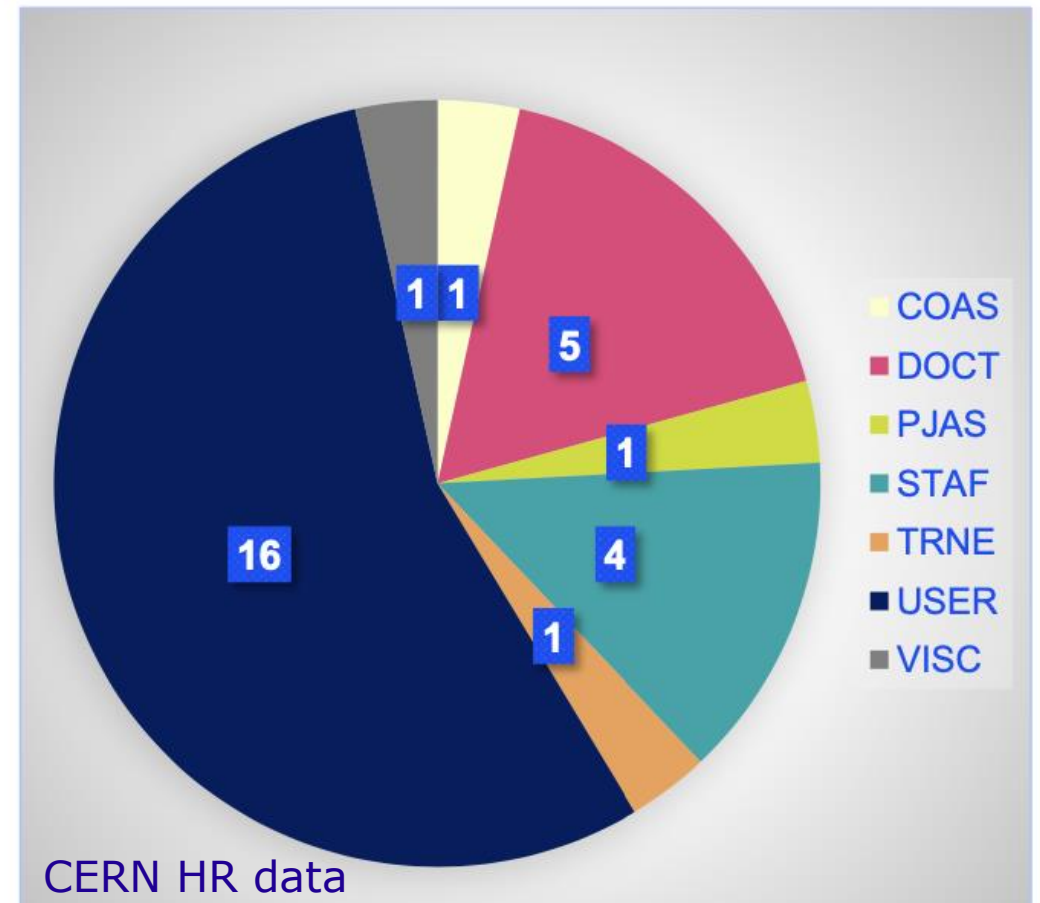
Latvian Members of Personnel: 29

- CMS-Latvia HEP Group
- Latvia Accelerator Technology Group
- Antihydrogen Experiment - AEGIS
- MEDICIS

Benefiting from:

- *CERN-Latvia doctoral programme*
- *CERN Doctoral Programme*
- *Summer Student programme*
- *Technical Student programme*
- ...

+ numerous short (2-3 months) term stays @CERN
paid from the Latvian budget





CERN research in Latvia

Other institutes carrying out CERN related research and projects

University of Latvia

1. Institute of Chemical Physics – Prof. Elina Pajuste group - **CMS** and **MEDICIS**
2. Faculty of Physics, Mathematics and Optometry - Prof. Mārcis Auziņš group – **AEgIS**
3. Faculty of Medicine – Prof. Maija Radziņa group – **MEDICIS/PRISMAP**
4. Institute of the Solid State Physics – Dr. Anatoli Popov group- **Crystal Clear Collaboration**
5. Institute of Physics – Dr. Kalvis Kravalis group – **ISOLDE / LIEBE**
6. Quantum Computing group of Prof. Andris Ambainis - **QuantHEP**

Riga Technical University

1. Institute of Particle Physics and Accelerator Technology
2. High Performance Computing (HPC) Centre – **Tier2** project at **CMS**
3. Department of artificial intelligence and systems engineering - Prof. Agris Nikitenko group – **I.FAST**
4. Institute of technical Physics – Prof. Arturs Medvids group – **I.FAST**
5. Students of Institute of Mechanics and Mechanical Engineering - **I.FAST** and **HITRIplus**



To continue capacity and competency building in HEP and AT

To maintain strong CERN related scientific institute with multidisciplinary research team and presence at CERN

Faculty of Materials Science and Applied Chemistry

100% CERN related senior research

Elected academic staff

1. Prof. Yuri Dokshitzer - **HEP**
2. Asoc.prof. Kārlis Dreimanis – **HEP**
3. Dr. Markus Seidel – **HEP** lecturer, PhD supervisor
4. Dr. Andris Ratkus - AT
5. Prof. Toms Torims - AT

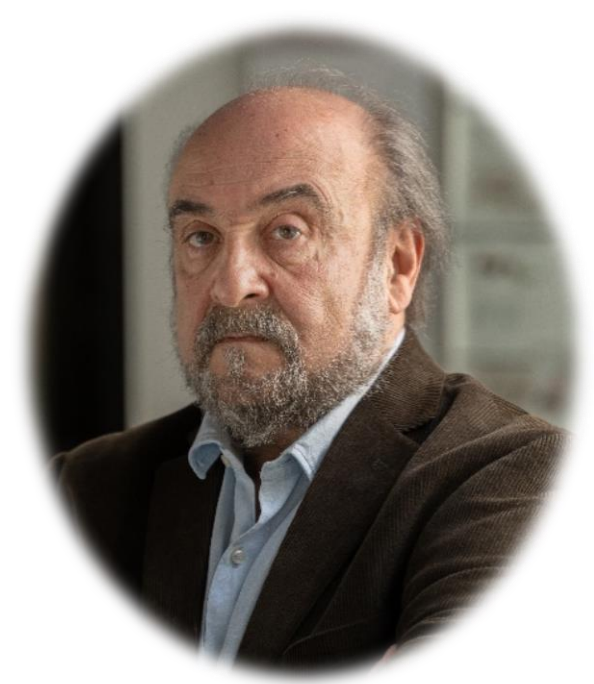
Research staff

Elected HEP and AT Senior researchers /
researchers / scientific assistants - **15 in total**

+ admin staff

- Leading and running **CMS-Latvia HEP group**
- Executing **State Research Programme** in HEP and AT
- Running **Doctoral Programme** (jointly with University of Latvia) in HEP and AT
- Institutional partner of **CMS, FCC, Muon Collider**
- Collaborator and contributor to **I.FAST, HITRIplus** and **NIMMS** projects
- Leader of CMS **Tier2 center** project
- Representing RTU in **CERN Baltic Group**
- + Supervisory role of **HEP and AT students** at CERN

Prof. Yuri Dokshitzer



- Professor of particle physics, born in Riga
- **World-class authority** / active educator
- Now employed by RTU
@ Institute of Particle Physics and Accelerator Technologies
- *1999 - Director of Research-II, LPT-Orsay University Paris-XI and at LPTHE Jussieu, University Paris VI-VII, Paris,*
- *2003 - CNRS Director of Research-I, LPTHE, Jussieu;*
- *2013 - CNRS Director of Research of Exceptional Class;*
- *2015 - CNRS Director of Research of Exceptional Class;*
- *2016 - CNRS Director of Research Emeritus.*

Prof. Yuri Dokshitzer

2015 HIGH ENERGY AND PARTICLE PHYSICS PRIZE

European Physical Society.



Basics of PERTURBATIVE QCD

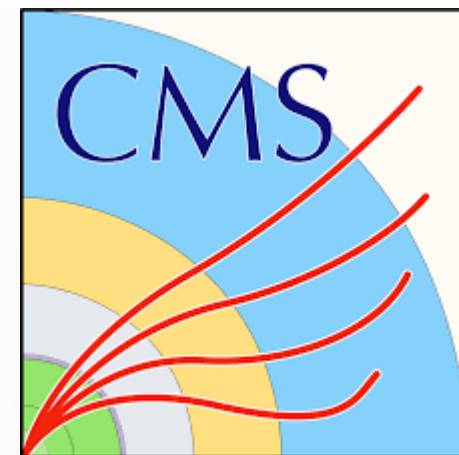
Yu. L. Dokshitzer, V. A. Khoze
A. H. Mueller and S. I. Troyan



EDITIONS
FRONTIERES

Asoc.prof. Kārlis Dreimanis

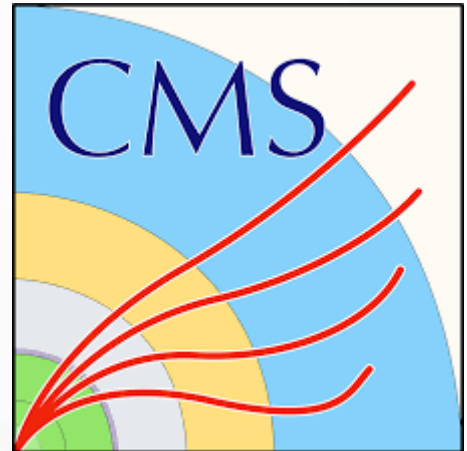
- **Bright and talented** Liverpool graduated particle physicist
- Director of the Institute of Particle Physics and Accelerator Technologies
- Latvia CMS Group Leader
- Director of Study Programme
- Leads State Research Programme
- **453** publications, h-index: **66**





Dr. Markus Zeidels

- *Markus Seidel* – PhD in HEP from University of Hamburg, very **experienced at CERN / CMS**
- Previously University of Maryland
- Now Senior Researcher of the Institute of Particle Physics and Accelerator Technologies
- Leading doctoral students
- **1037** publications, h-index: **108**





Dr. Andris Ratkus

- PhD in mechanical engineering
- Previously worked in industry
- Accelerator Technology Group Leader
- Leads RTU participation in I.FAST, HITRIplus un NIMMS projects based at CERN
- Senior Researcher of the Institute of Particle Physics and Accelerator Technologies
- **Dynamic and talented**, leads many international collaborations





Dedicated doctoral programme

- In collaboration with CERN Baltic Group – **designed by CBG** Study Programme Working Group
- # of PhD students: 4th y – **1**; 3rd y **6**; 2st y **4**; 1st y **3**;
- Students are **co-supervised by CERN** staff
- Strong presence of **international students**
- Executed in Latvia with mandatory **term at CERN**
- **World class** lecturers: Latvia, CBG, CERN, PSI
- Balance between **HEP** and **AT**
- [International Study Program Council](#)
- Relevant **master programme** is being developed

- RTU, together with the CERN Baltic Group partners, aims to develop a new interdisciplinary master's study programme targeting both high-energy physics and its instrumentation, including accelerator technologies.
- Clearly identified by ECFA as a critical need for the future of the field of HEP [see R&D roadmap document: <https://cds.cern.ch/record/2784893>];
- **RTU was awarded 55 kEur from the Erasmus+ call Erasmus Mundus Design Measures in October 2022; Aim: *creation of a consortium and common tools for an international study programme in the Baltics.***
- Initial consortium created by five universities within the CBG:
 - Riga Technical University [LV, lead];
 - University of Latvia [LV];
 - University of Tartu [EE];
 - Kaunas University of Technology [LT];
 - Vilnius University [LT].
- Work ongoing; aim to submit an Erasmus Mundus Joint Master's project proposal in February 2024 or 2025.
- Subsequently, intake of the first cohort would be the academic year of 2025/26 or 2026/27.



- **Physics group consists of 11 active personnel:**

- Senior research personnel: 4 (+1 theory supervision, Y. Dokshitzer);
- PhD students: 6 (+2, October 2023);
- Summer student: 1;

- **Additionally (for physics):**

- 2 PhD students have been recruited for 2023;
- 1 bachelors student will work towards theirs thesis in HEP;
- 1 high-school student to write their scientific project on MTD.

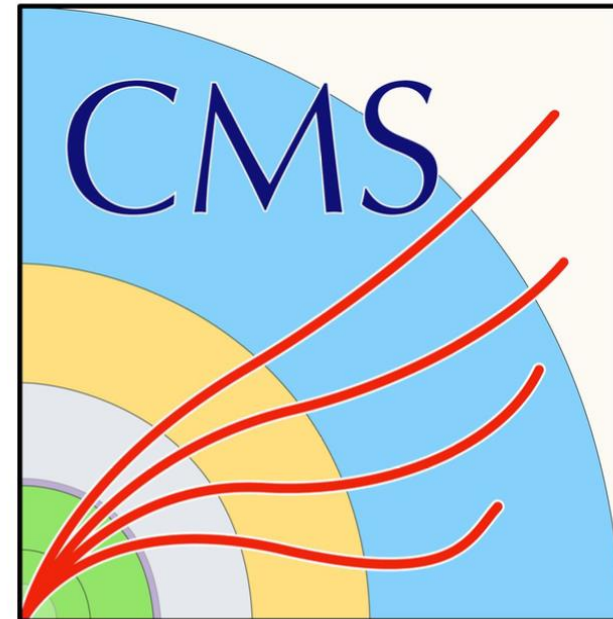
- **Engineering group consists of 2 active personnel;**

- **Computing group consists of 4 active personnel:**

- Senior personnel: 3;
- Summer student: 1;

- **Additionally (other Latvian involvement in CMS):**

- The group at the UL Institute of Solid-State Physics (under Dr Popov) are working on scintillating material studies, including studies of the crystal components for the MTD sub-system;
- Computing team at RTU HPC are involved in an exascale computing project within CoE RAISE project at CMS.



- The main overarching physics topics covered by the CMS-Latvia group:

- Top quark physics [primary activity];
- MIP Timing Detector (MTD); [primary activity];
- Higgs boson physics;
- Standard Model Physics (vector bosons).



- Specific expertise developed (physics analyses):

- Jet energy corrections;
- Jet flavour response;
- Low- p_T lepton reconstruction at CMS.



- Specific expertise developed (detector development):

- Mechanics and integration;
- Cooling performance studies;
- Detector Control and Safety Systems (DCS & DSS).



- Working towards establishing further specific expertise within the Higgs PAG, targeting the HZZ sub-group.
- Working towards establishing the DCS/DSS of the MTD as a long-term institutional responsibility task for Latvia!

- CMS-Latvia has major involvement in the MTD project for Phase-2 upgrade of CMS:

Main:

- MTD BTL MAI co-coordinator (K.Dreimanis, RTU);
- MTD DCS & DSS main developer (A.Gaile, RTU);
- MTD cooling & service ch. design (G.Pikurs, J.Vilcāns, RTU);
- MTD cooling performance studies (K.Dreimanis, A. Gaile, *M.Berdigāne**, RTU)

Secondary:

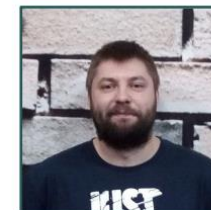
- MTD CMSSW integration (N.Strautnieks, UL);
- Scintillating crystal studies (A.Popov's group, UL ISSP):

- Latvia's Phase-2 upgrade contributions

- BTL cooling manifolds [accepted];
- BTL DCS & DSS electronics equipment [potential];

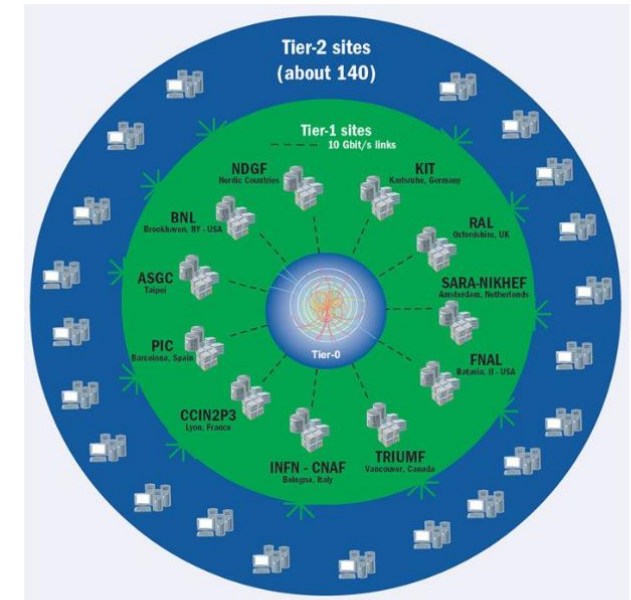
- Significant involvement in CMS Technical Integration (engineering):

- 2PCAL vibration dampening studies (G.Pikurs, RTU);
- HGCal transport support structure design (J.Vilcāns, RTU);
- HF *garage* door automation design and installation (G.Pikurs, RTU).



* M.Berdigāne is a high-school student working on her scientific project, studying cooling performance data from the TIF lab. (b.186).

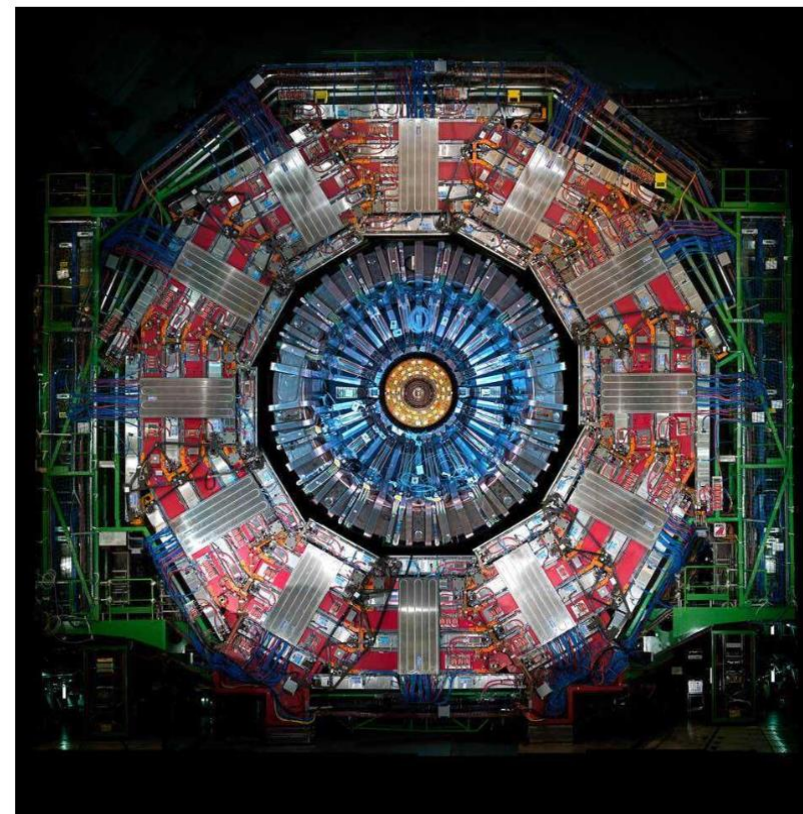
- Latvia is building a unique, **federated CMS Tier-2 site**:
 - Minimum performance requirements met by the lead partner (RTU) at all times;
 - Additional nodes distributed to partners in Latvia (and the Baltics!);
 - Students involved in the development of the site:
 - Dimitrios Sidiropoulos Kontos [PhD, RTU];
 - Ričards Pauls Remess [masters, RTU].
- Aim to contribute to CMS computing needs starting 2023.
- Ideal scenario for CMS-Latvia PhD students:
 - Local storage space for Grid jobs (part of Tier-2);
 - Local batch setup/queue on idle cores (potential).
- Local industry expertise involvement in Cloud computing services;
- **RTU HPC researcher team** participating in the **CoE RAISE initiative project**:
"Research on AI- and Simulation-Based Engineering at Exascale"
 using data from the CMS collaboration!



Current and potential future federative Tier-2 site partners and locations:

- Riga Technical University;
- University of Latvia;
- Ventspils Radio & Astronomy Centre;
- National Library of Latvia;
- Rēzekne Academy of Technologies;
- Kaunas University of Technology [LT];
- University of Tartu [EE].

- | | | |
|-----|-------------------------------|---------------------------|
| 1. | Kārlis Dreimanis | senior; |
| 2. | Markus Seidel; | senior; |
| 3. | Elīna Pajuste | senior; |
| 4. | <i>Toni Ščulac</i> | senior; |
| 5. | Yuri Dokshitzer | theory (no zh access); |
| 6. | Andris Potrebko | PhD; |
| 7. | Antra Gaile | PhD; |
| 8. | Normunds Strautnieks | PhD; |
| 9. | Dace Osīte | PhD; |
| 10. | Conrado Munoz Diaz | PhD; |
| 11. | Dimitrios Sidiropoulos Kontos | PhD; |
| 12. | Robert Pleše | PhD*; |
| 13. | Ojārs Mārtiņš Eberliņš | PhD*; |
| 14. | Valdis Slokenbergs | summer student (leaving); |
| 15. | Ričards Pauls Remess | summer student (staying); |
| 16. | Guntis Pikurs | ENG; |
| 17. | Jānis Vilcāns | ENG; |
| 18. | Jānis Irbe | COMP; |
| 19. | Lauris Cikovskis | COMP; |
| 20. | Aleksandrs Gutcaits | COMP; |
| 21. | Estere Tēberga | bachelor's student; |
| 22. | Marija Berigāne | high-school student. |



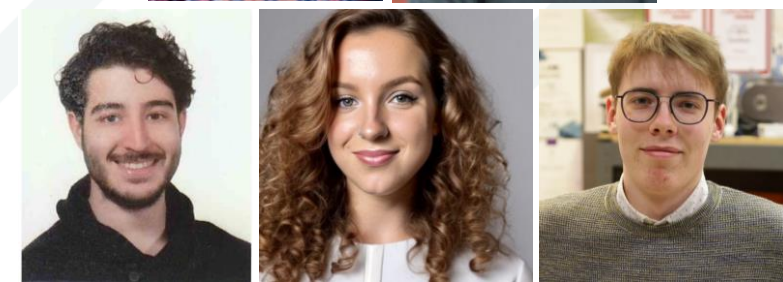
- + RTU HPC team within CoE RAISE initiative;
- + The team of A.Popov at the UL ISSP.

Accelerator Technology Team

- Prof. Toms Torims
- Guntis Pikurs PhD student
- Dr. Andris Ratkus

- Luca Piacentini PhD student*
- Lazar Nikitović PhD student*
- Kristaps Paļskis PhD student*
- Tobia Romano (PoliMi/ RTU) PhD student*

- Vincenzo Alberto Sansipersico PhD student*
- Aurēlija Viņķe Bachelor student
- Dairis Rihards Irbe Bachelor student



- Main financial tool for growth currently - **State research programme:**
“Augstas enerģijas fizika un paātrinātāju tehnoloģijas”
(High-energy physics and accelerator technologies)
- First project call (2020-2022): 24 months, 837 kEur;
- Second project call (2022-2026) 48 months, 1’395 kEur.
- Both project funds awarded to a consortium of:
 - Riga Technical University [lead partner];
 - University of Latvia;
 - UL Institute of Solid-State Physics.
- This tool allowed us to **quadruple** our research capacity in fundamental **HEP** between **2020 and 2022!**
- Independent international review of the first project results marked it as an absolute success!
- **Invaluable tool for continuity**, however, our ability to attract talent is outpacing the current funding!





Outreach activities in Latvia

Integral part of the Latvia – CERN strategy / boosting interest in STEM

Latvian National Library

- permanent CERN exposition and classroom for children and general public – CERN as a centre of excellence for technology and innovation

Latvian Physics Teachers Association

- Participation in events, lectures of Latvian scientists @CERN and CERN staff / selection of teachers for the CERN visits

School of the Young Physicists of Latvia

- Virtual and in-person lectures + events

Job shadowing at CERN

- Every year 4-5 school children come to CERN to shadow Latvian scientists and engineers with preparatory and post-events in Latvia

+ many other events and activities

Outreach activities in Latvia

Latvian National Library

- permanent CERN exposition and classroom for children and the general public
- CERN as a centre of excellence for technology and innovation



Outreach activities

Job shadowing at CERN

- Every year 4-5 school children go to CERN to shadow Latvian scientists and engineers with preparatory and post-events in Latvia



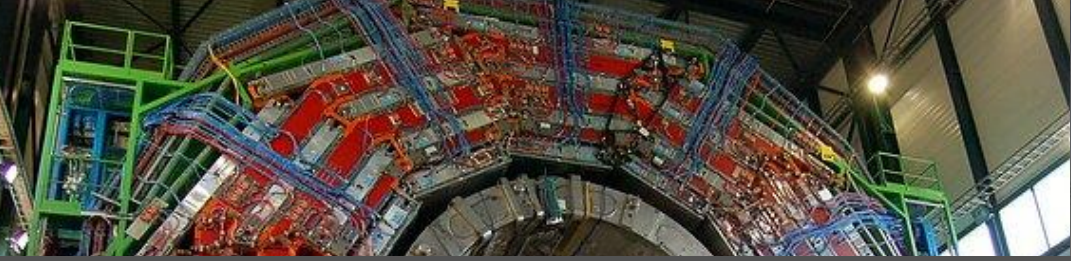
Pirms došanās uz Šveici CERN ēnas – (pirmajā rindā no kreisās) Gustavs Petters, Marija Berdigāne, Elza Mitenberga, Unda Kozlova un Armands Grecis – tikās ar RTU pētniekiem – (otrajā rindā no kreisās) Viesturu Lāci, Andri Potrebko un Artūru Ivanovu –, kuri studiju darbus savulaik ir izstrādājuši CERN un tagad atgriezušies Latvijā, kur turpina studijas un darbu. Foto: Vitālijs Vinogradovs, RTU

Outreach activities

Riga TechGirls at CERN

- visits by Riga TechGirls to CERN to raise young women's interest and involvement in STEM and CERN related scientific areas

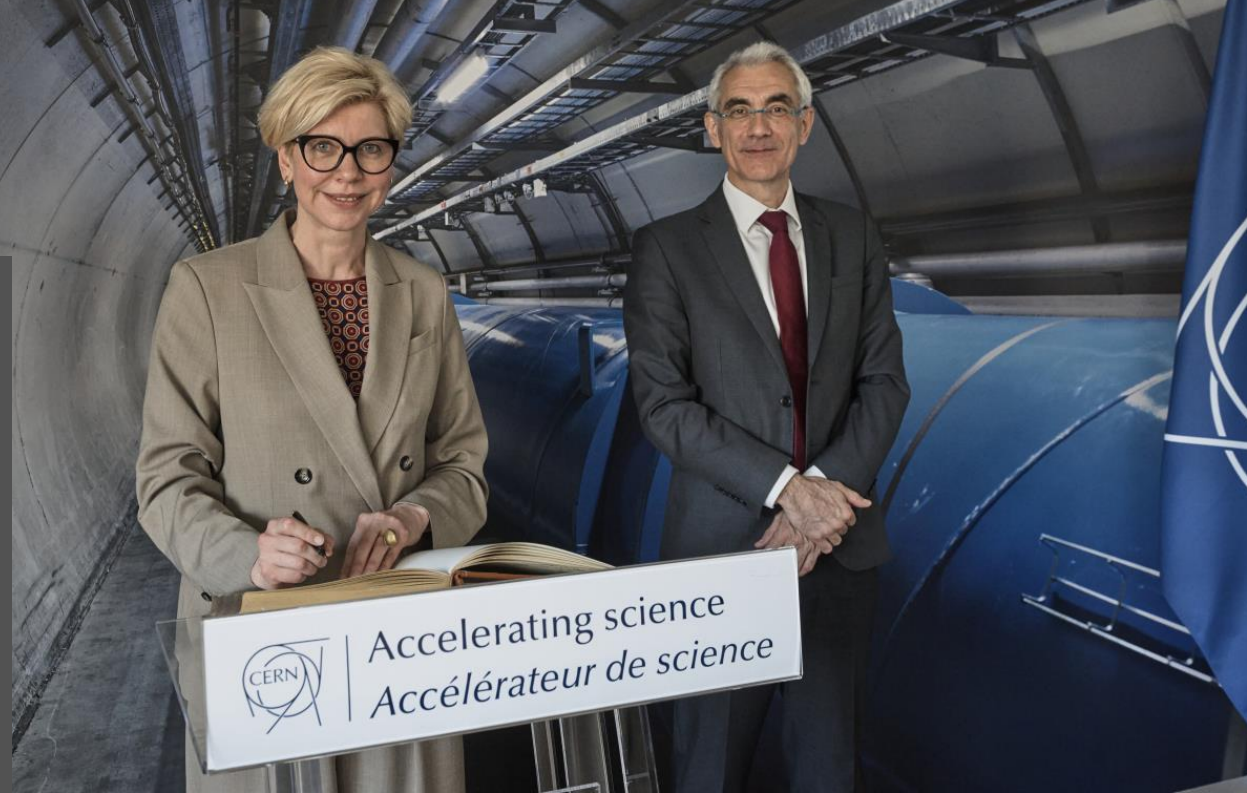




Outreach activities

Latvian Physics Teachers Association

- Participation in events, lectures of Latvian scientists @CERN and CERN staff/selection of teachers for the CERN visits





Communication

- Framework – accepted Communication strategy
- Main objective – to target audiences and inform them about Latvia's cooperation with CERN, as well as opportunities to expand involvement in CERN programmes.
- Channels - conventional and social media (university, institute, contact point)
- Contact Point webpage - <https://www.lzp.gov.lv/en/national-contact-point-cern>
- CERN «ambassadors»
- Use of **#LatvijaCERN**



Latvia - CERN Stakeholders Group

Encompassing all relevant stakeholders - platform for engagement and exchange

<https://indico.cern.ch/category/11669/>

- 12 **regular meetings** since Nov 2019
- Organised by CERN **National Contact point**
- All **relevant** research institutions, business entities and associations, related ministries and agencies, CERN Council Delegates and ILO
- **Informing** stakeholders about the relevant CERN-based and CERN-related activities
- Directly supporting the stakeholders' **engagement** with CERN
- Managing the information **exchange** and **collaboration** vis-à-vis CERN and the stakeholders

Latvia - CERN Stakeholders Group

13. Latvijas CERN darba grupas sanāksme

Friday 13 Oct 2023, 09:45 → 15:00 Europe/Riga

406.telpa (Ekonomikas ministrija)

Toms Torims (Riga Technical University)

Description Regulārā CERN Latvijas grupas klātienes sanāksme.

Registration You are registered for this event.

[Check details](#)

Participants

A Agnese Spustaka A Aldis Gulbis A Alise Pika-Ozola A Anatolijs Zencovs A Andris Jakovics
A Andris Ratkus A Angelina Bekasova A Anna Andersone E Edmunds Skučs E Elina Pajuste
G Gundega Selga Horste G Guntis Pikurs I IGORS UŠAKOVS Janis Irbe J Jevgenijs Eugene Proskurins
K Kristaps Palskis L Lauma Muizniece M Marcis Auzinsh M Maris Kuzminskis T Toms Torims
V Viesturs Lācis

CERN_NKP CERN.NKP@rtu.lv
 26496306

09:45 → 10:00 Dalībnieku reģistrācija

🕒 15m

10:00 → 10:10 Sapulces atklāšana

🕒 10m

Speaker: Mārtiņš Jansons (Ministry of Education and Science)

10:10 → 10:20 Ievads un sapulces mērķi

🕒 10m

Speaker: Prof. Toms Torims (Riga Technical University (LV))



Geneva / CERN based ILO

To ensure meaningful Latvian business participation @CERN

CERN as priority

- ILO KPI's are directly based on industry engagement

Knowledge Transfer

- Technological and knowledge return to Latvia by engaging R&D capable companies

Well-balanced industrial return

- To ensure fulfilment of the current 'quota'
- To prepare industrial portfolio for the full-membership @CERN
- To closely collaborate with Latvian scientific and engineering community at CERN

Geneva / CERN based ILO

The Latvian case

Latvia Industry Engagement from 2021 Q3 – 2023 Q2

- 32 companies in CERN Suppliers database
- 16 companies with supplier status
- **Sectors:** Mechanical engineering, IT, Electronics
- **Status:** poorly balanced country, in 2022 coefficient 0.97, in 2023* 0.63
- 1 Latvian artist Jānis Zāītis who collaborated CERN to create a graphic identity for the science project I-FAST.

Figures for Latvia:

- No. of suppliers registered in Affirmantium
- No. of contracts signed in 2022
- No. of contracts awarded in 2022
- No. of firms contacted for IFA supported in 2022
- No. of firms contacted for IT supported in 2022
- No. of firms contacted for PE supported in 2022

IFAST

1862
RĪGAS TEHNISKĀ UNIVERSITĀTE



Ministry of
Education and Science
Republic of Latvia

Latvia – CERN Strategy

Full membership at CERN



researchLatvia^{*}
Value Through Knowledge





Full membership at CERN

Tasks - liaison with decisionmakers and stakeholders

1. To **ensure support** of the CERN Management and Member states
2. To actively **participate** in the work of the CERN Council and its committees – *inter alia* to cultivate **positive attitude** towards Latvia's full membership
3. To **coordinate** Latvia's position at Council meetings and its committees
4. To facilitate coordination among the **Baltic States**: at CERN Baltic Group and Baltic Assembly level – to foster **joint position** vis-à-vis CERN
5. To ensure **continuous support** from the Government, Parliament, scientific community, entrepreneurs, other partners and society at large



Full membership at CERN

Tasks – scientific and technical measures

1. To ensure stable **financial framework** for CERN activities in Latvia – ensuring **50/50 principle** – where proportion of the national funding is gradually exceeding CERN membership
2. To continue **capacity and competency** building in HEP and AT: to maintain strong CERN related **scientific institute** with interdisciplinary research team and presence at CERN; to run master level programme in HEP and AT
3. To facilitate **industrial return** and engagement with CERN; including ILO organised dedicated events in Latvia
4. To cultivate **positive image** of Latvia – CERN cooperation

#LatvijaCERN

Estimated timeline for full membership

2023 2nd half

Application for Associate Member State in the pre-stage to Membership

2024

CERN visit to Latvia, to access compliance with pre-stage

CERN invitation to Latvia

2024/2025

Cabinet of Ministers decision about application


CERN decision

2025

- Signature of pre-stage Agreement
- Saeima ratifies law on Agreement
- Latvia becomes Member State in the pre-stage to Membership of CERN

2027

Completion of the full cycle Latvia becomes Member State of CERN



**To ensure stable financial
framework for CERN activities
in Latvia**



Membership payments

Currency	2023	2024	2025	2026	2027
	Associate Member	Associate member	Associate member in pre-stage to full membership	Associate member in pre-stage to full membership	Full member
CHF	1 024 850	1 066 250	1 793 750	1 793 750	2 494 000
EUR	1 019 553	1 084 665	1 784 423	1 784 423	2 481 032



CERN experiments and programmes

Activity	2023	2024	2025	2026	2027
CMS*	222 084	408 962	360 000	450 000	450 000
MEDICIS	40 000	50 000	80 000	100 000	100 000
Muon Collider		52 320	52 320	52 320	52 320
Teacher programme	12 000	12 000	12 000	12 000	12 000
Student programmes	6 000	6 000	9 000	9 000	9 000
Total EUR	280 084	529 282	461 000	571 000	571 000

* 5 authors; 2->3 students at CERN; 3->4 senior scientists
+ Phase II upgrade



CERN National Contact Point @ Riga Technical university

Activity	2023	2024	2025	2026	2027
Staff and admin costs	88 435	95 139	112 800	112 800	50 400
Network events with CERN	12 500	12 500	12 500	12 500	12 500
Communication & PR	8 000	15 730	15 730	15 730	15 730
Outreach – visits to CERN	20 000	30 000	30 000	30 000	30 000
Total EUR	128 935	153 369	171 030	171 030	108 630

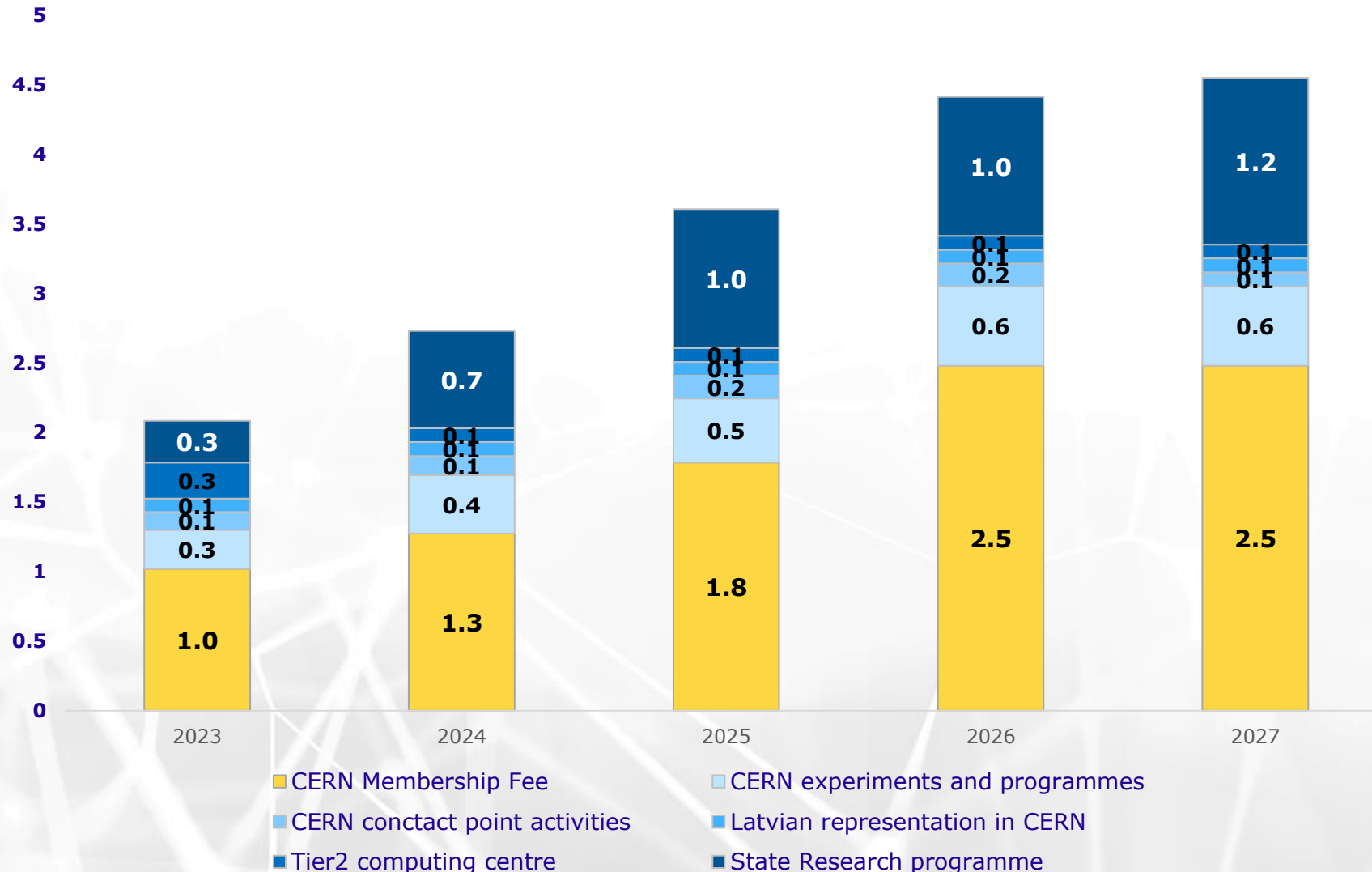


National CERN activities

	2023	2024	2025	2026	2027
State Research Prog. in HEP and AT	300 000	700 000	1 000 000	1 000 000	1 200 000
Tier 2 Site	260 000	100 000	100 000	100 000	100 000
Total EUR	560 000	800 000	1 100 000	1 100 000	1 300 000

Proposed Latvia - CERN budget until 2027

Latvia - CERN budget (in million euros)



Ensuring 50/50 principle – where proportion of the national funding is gradually exceeding CERN membership



Full membership at CERN

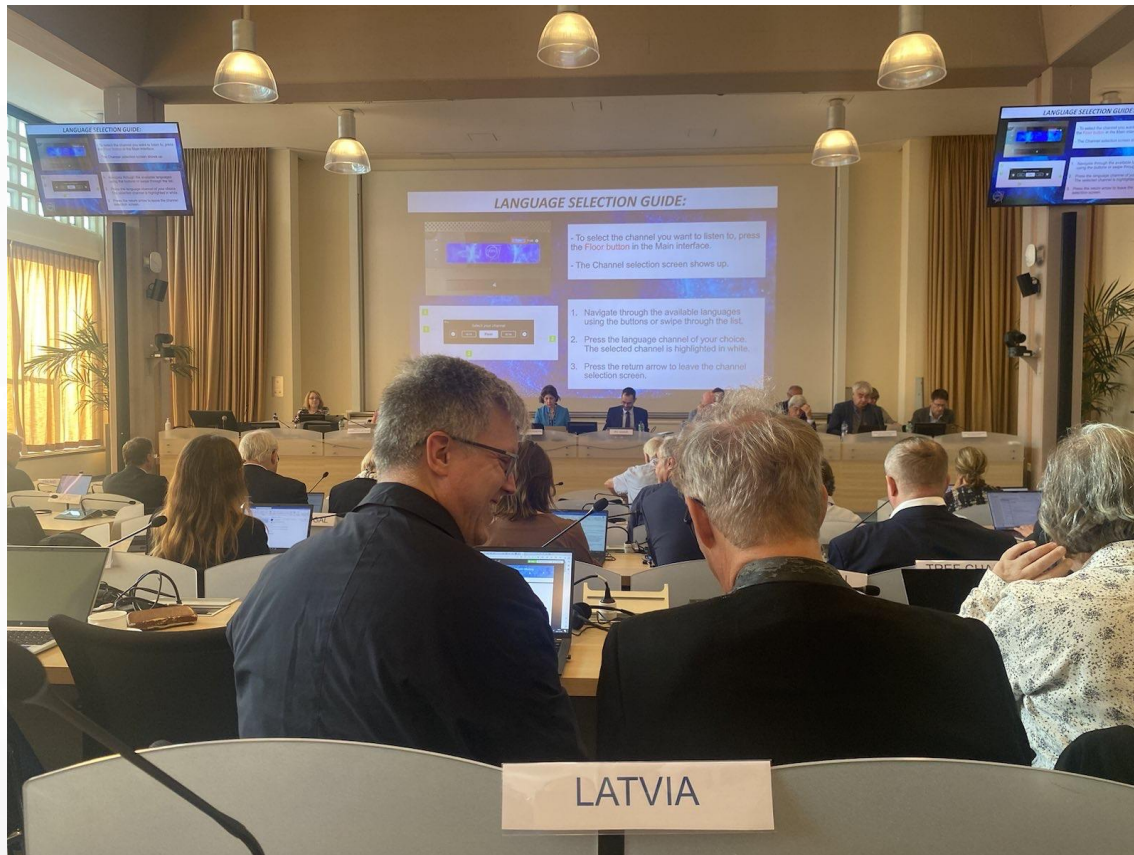
Full membership at CERN

Latvia – CERN liaison committee: outcome



Full membership at CERN

Activities at CERN Council level – science diplomacy
New Latvian representatives



Full membership at CERN

Science Gateway opening @ CERN



Thank you!

