

ACTIVITIES AT IMID

Josef Pouzar, Ing.

Institute of Machine and Industrial Design

Faculty of Mechanical Engineering

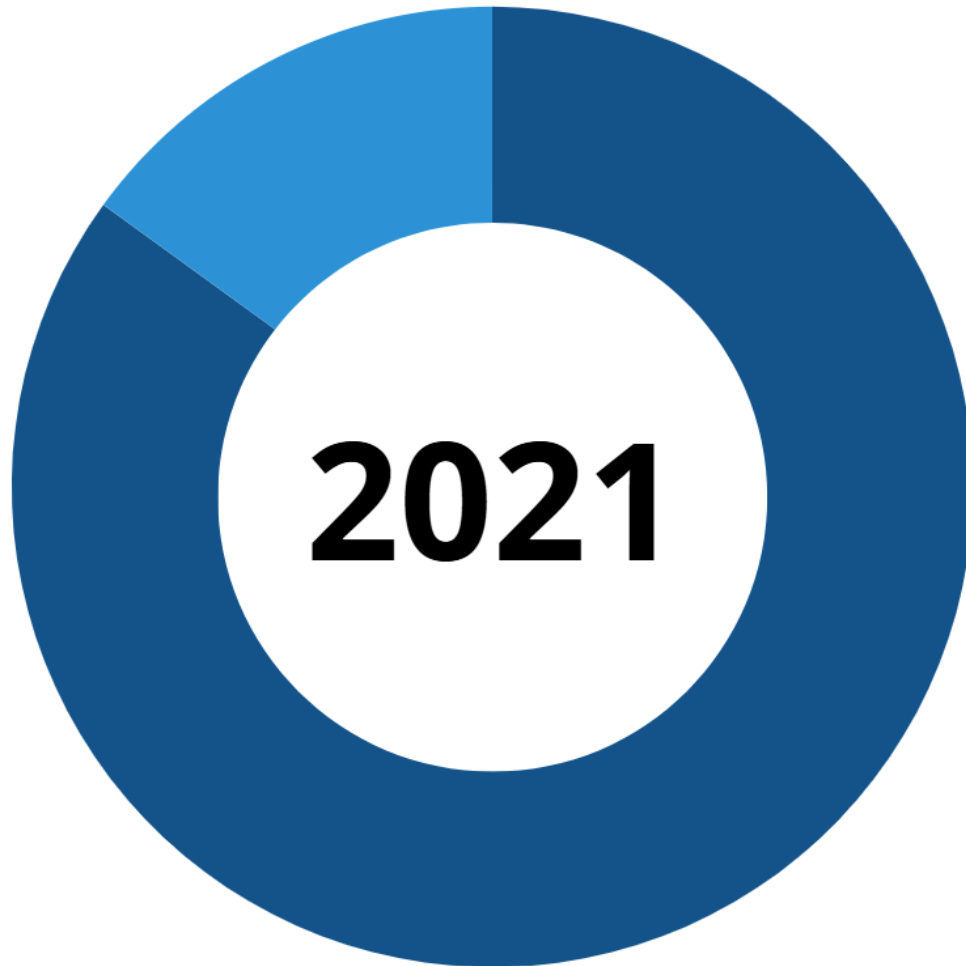
Brno University of Technology

Brno 09/04/2025

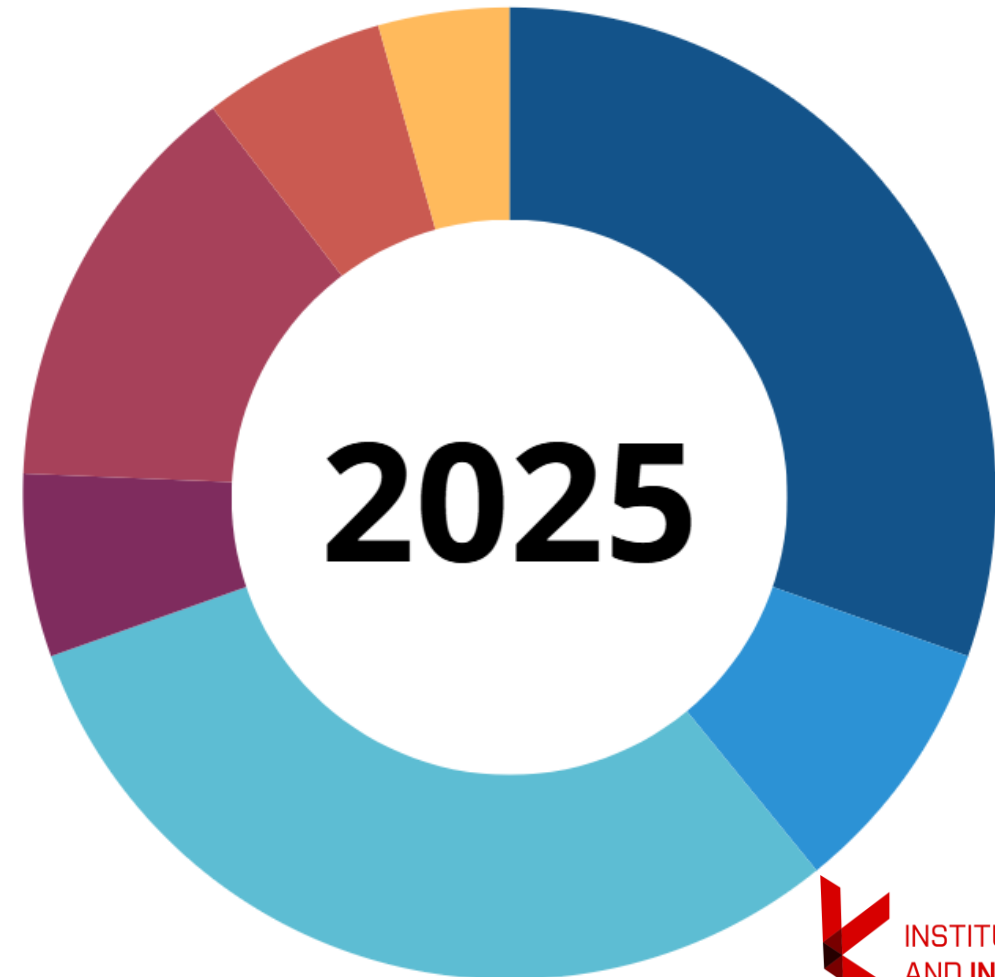


LIFE AT IMID

● PhD Study ● Teaching



● PhD Study & Research ● Project Management
● Other Projects ● Supervising ● Teaching
● PR & Lectures ● BUT FME Senate

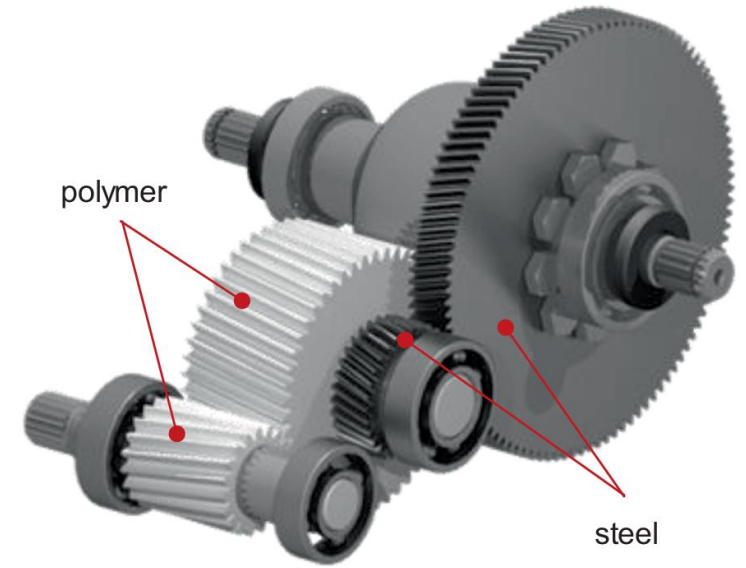


2021

PHD STUDY & RESEARCH

PhD study topic

- Polymer gears in space applications



PHD STUDY & RESEARCH

PhD study topic

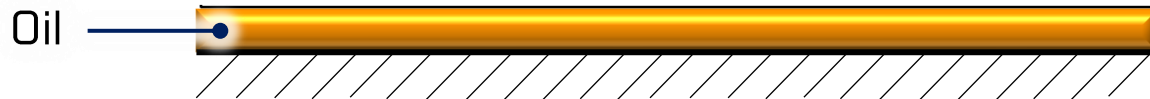
• Polymer gears in space applications

- Liquid lubricant evaporation in space applications



Vacuum —————

• Molecular flow

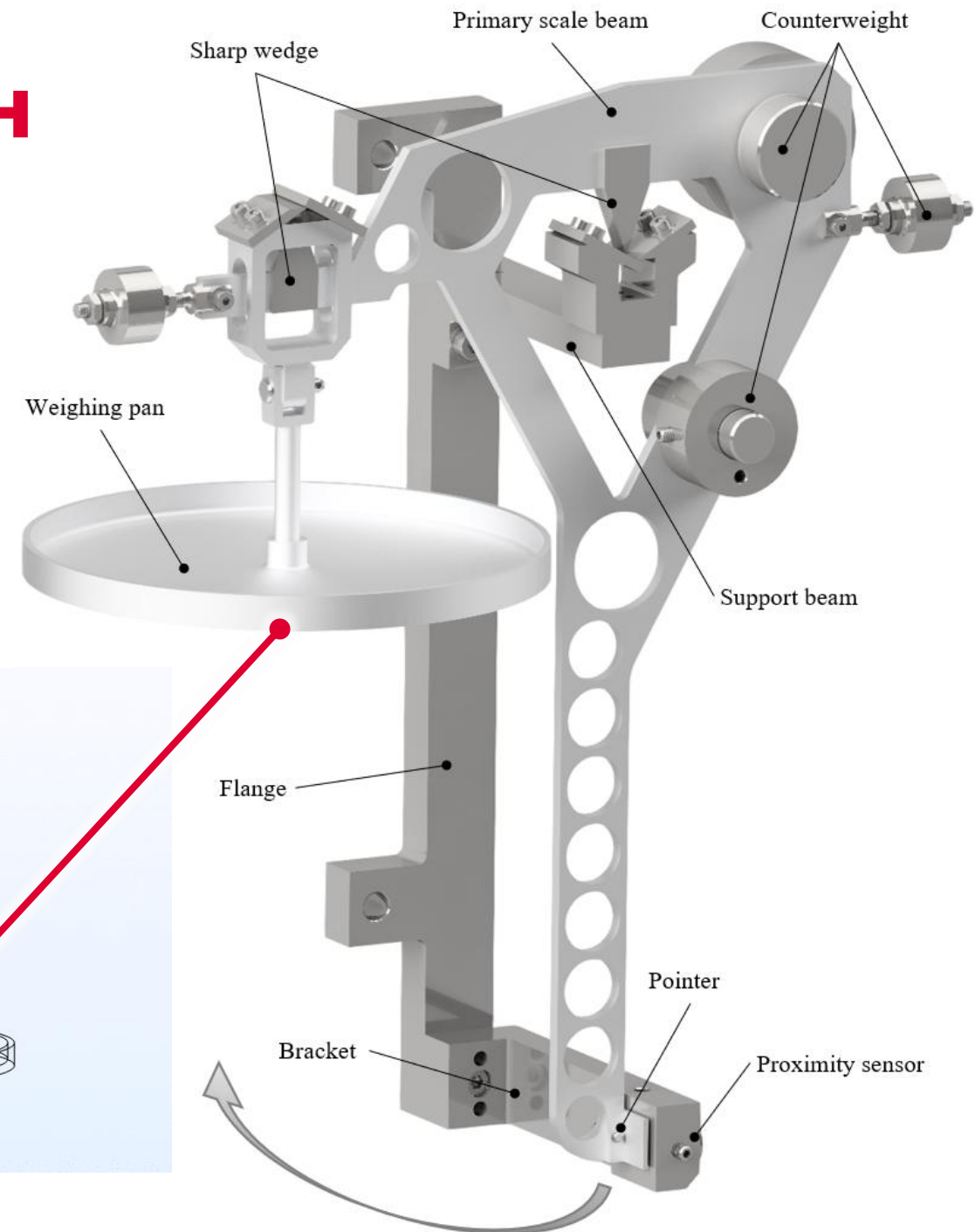
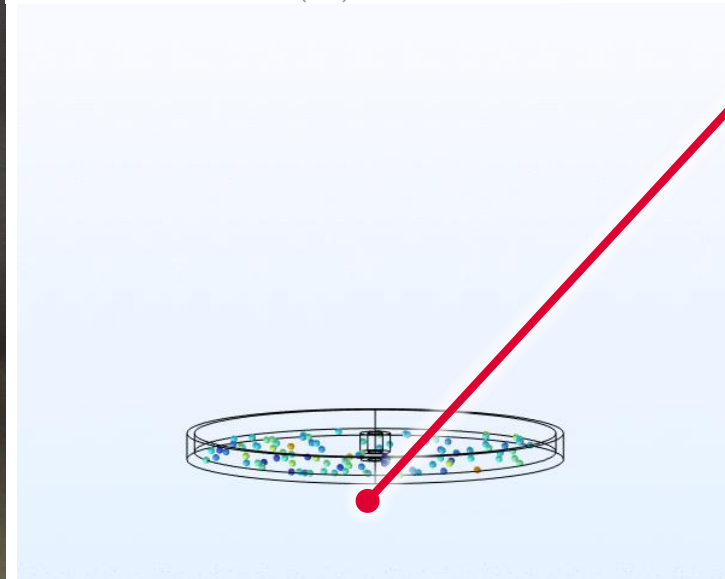
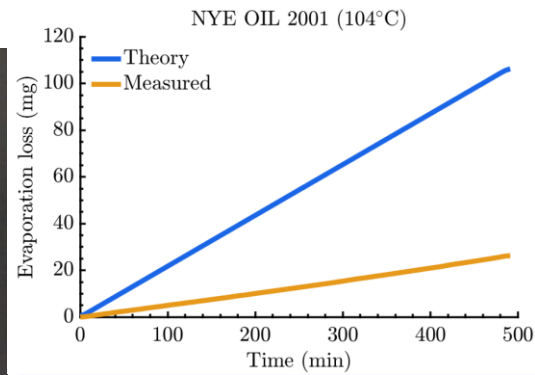
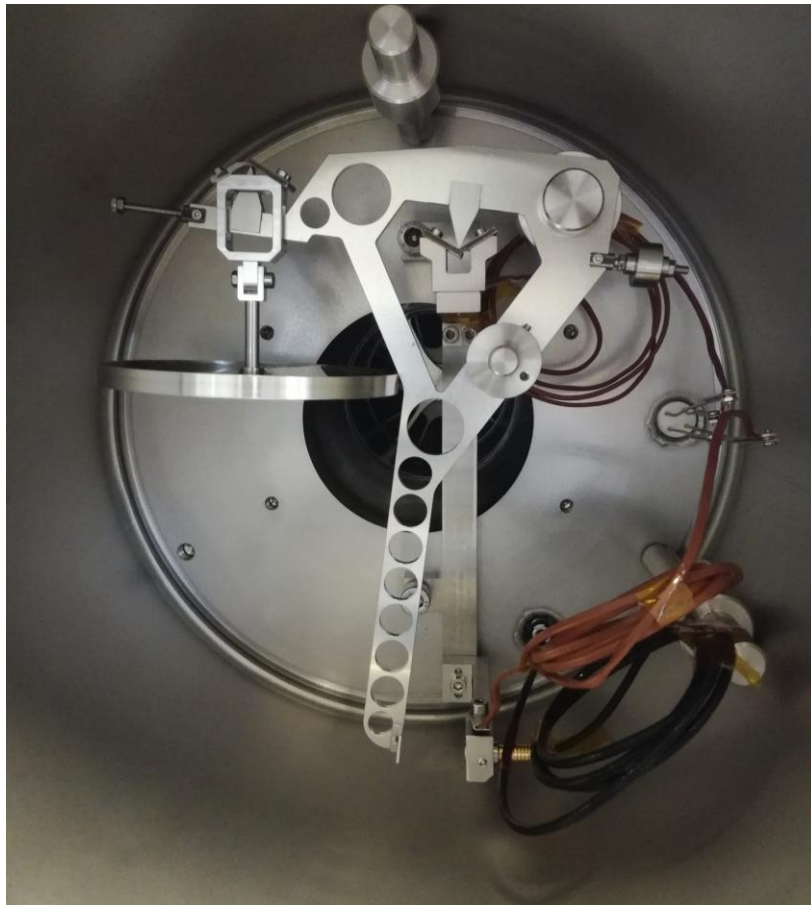


<https://belgo-bearings.com/en/bearing-lubrication/>

2021

PHD STUDY & RESEARCH

Evaporation Test Rig (ETR)

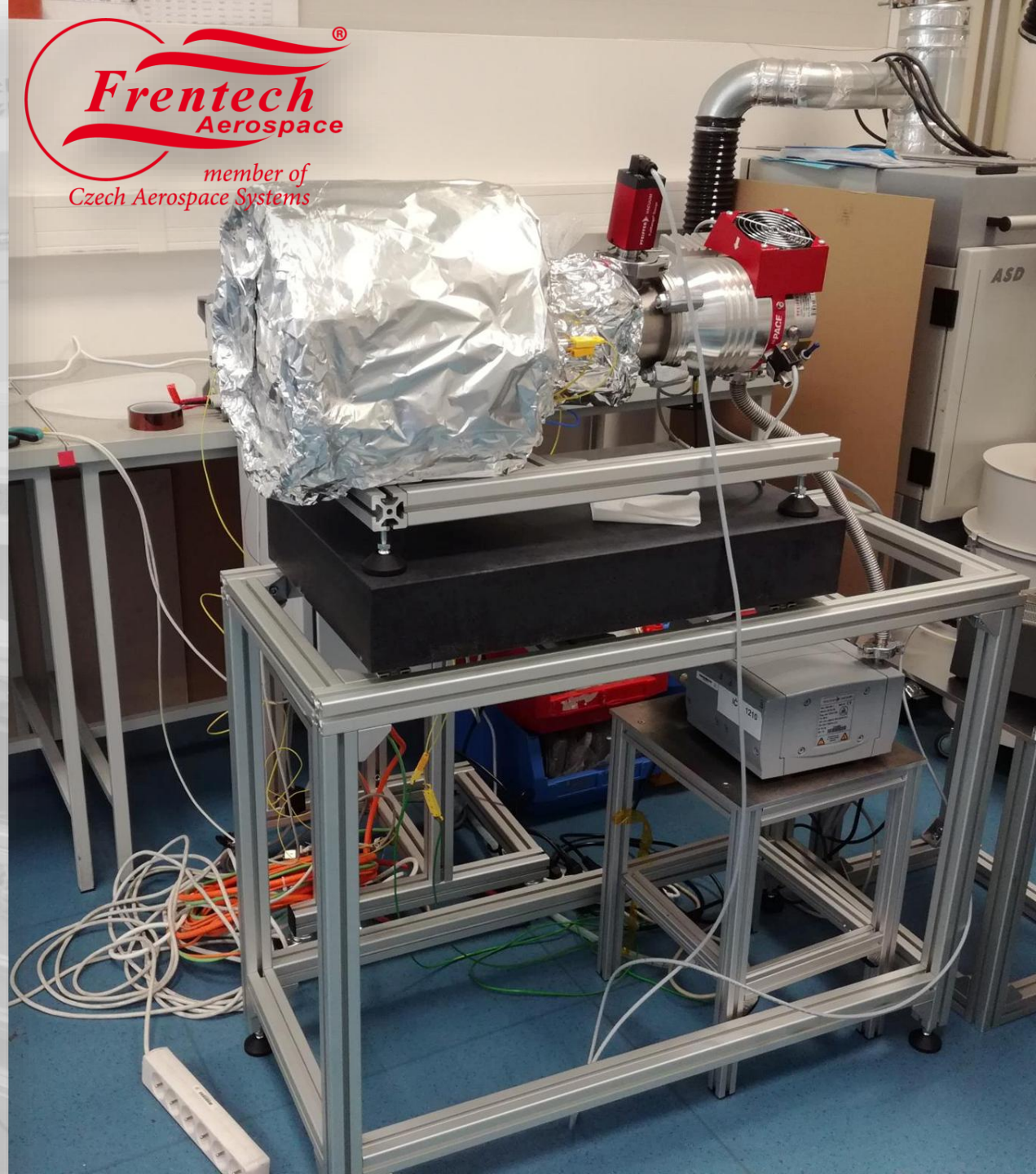


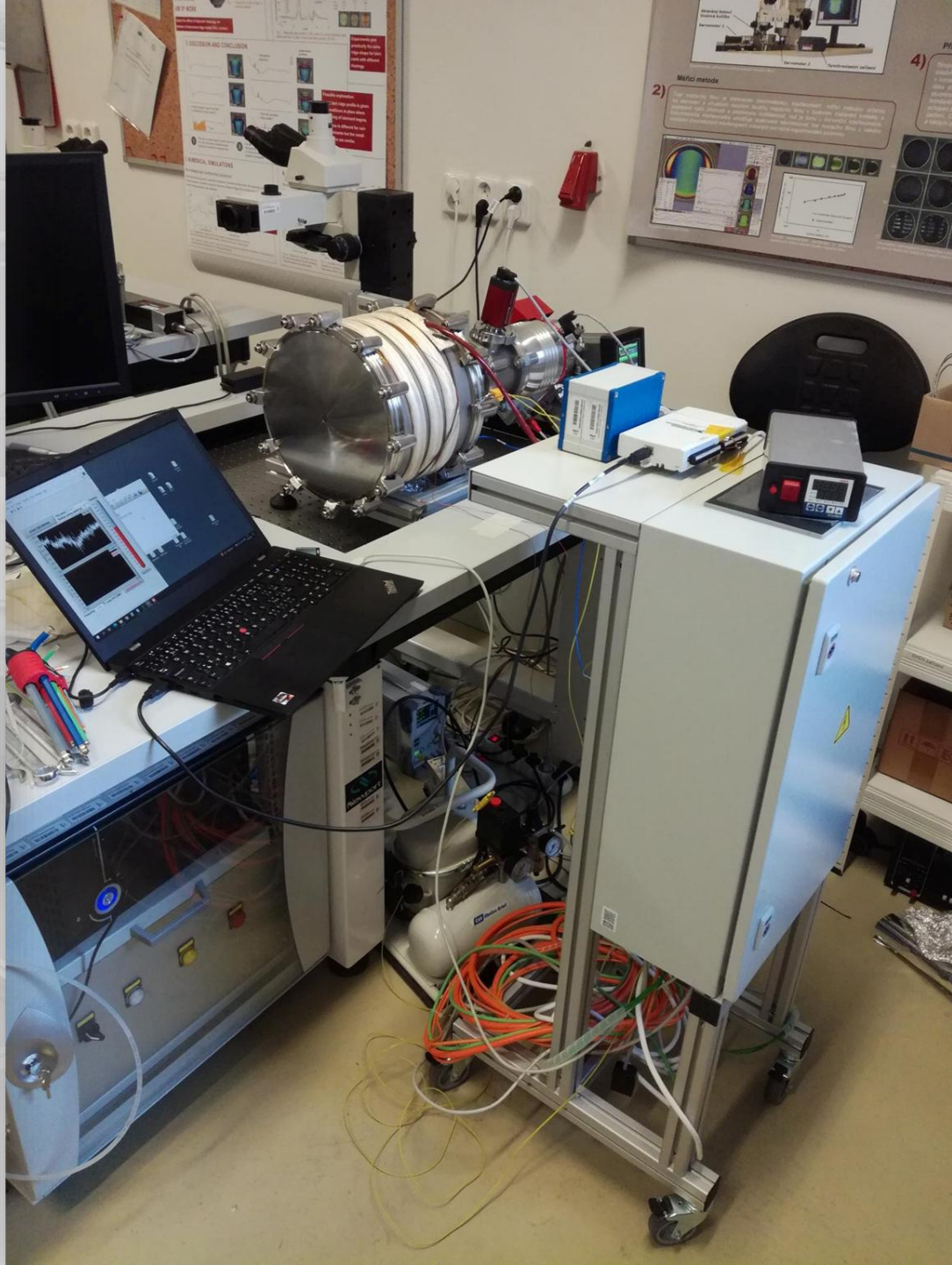


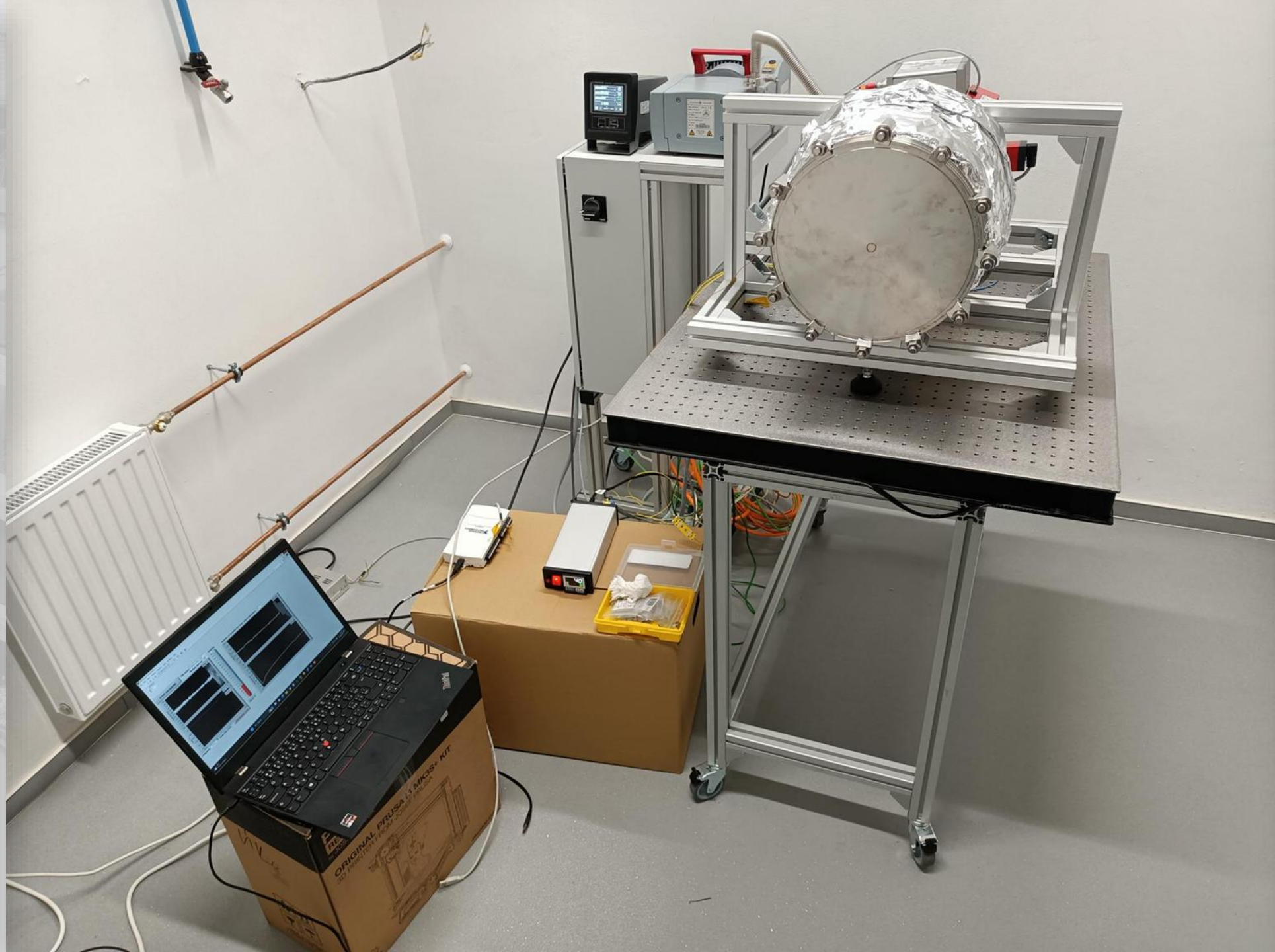
Frentech
Aerospace[®]
member of
Czech Aerospace Systems

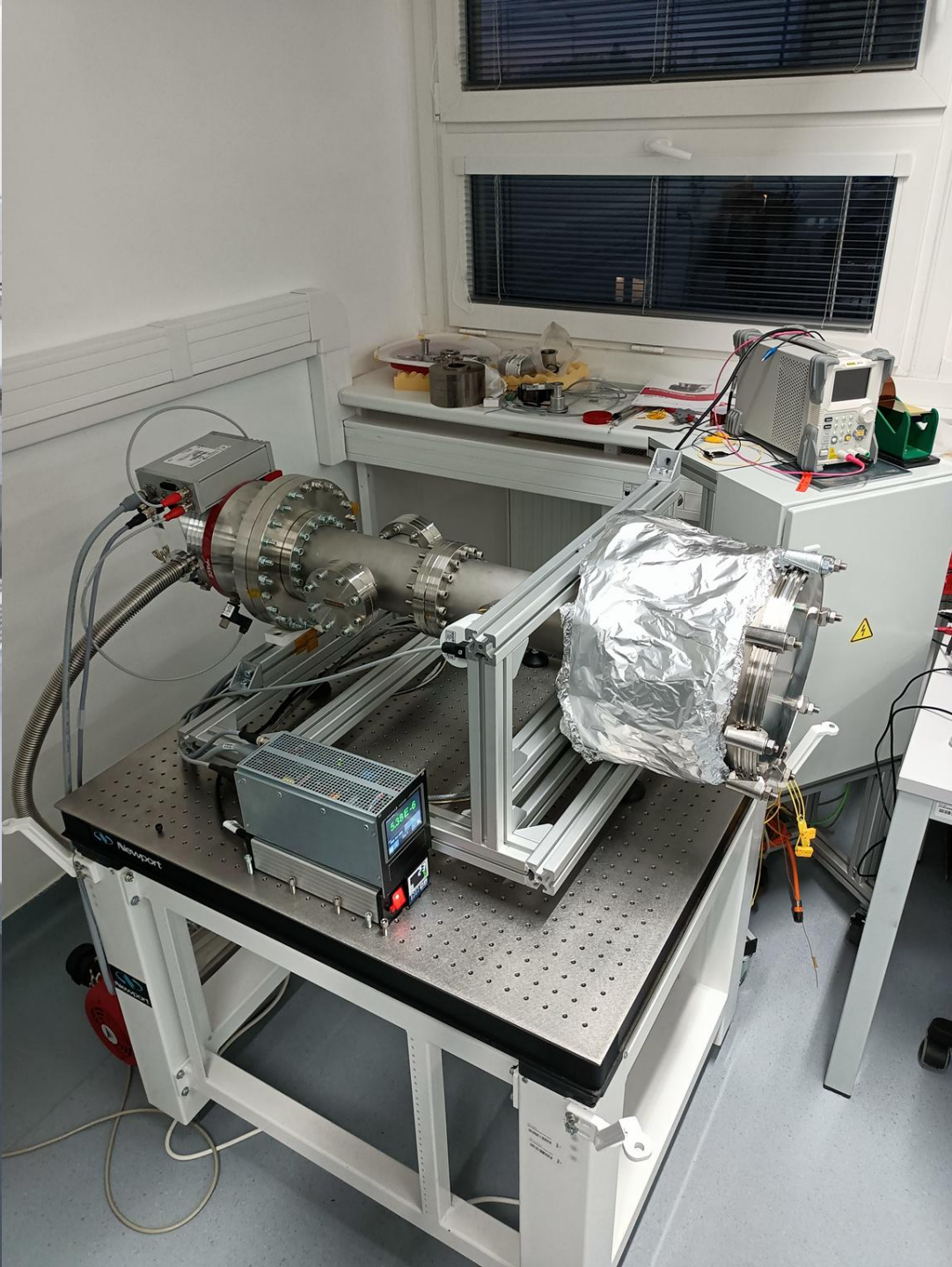


Frentech
Aerospace[®]
member of
Czech Aerospace Systems









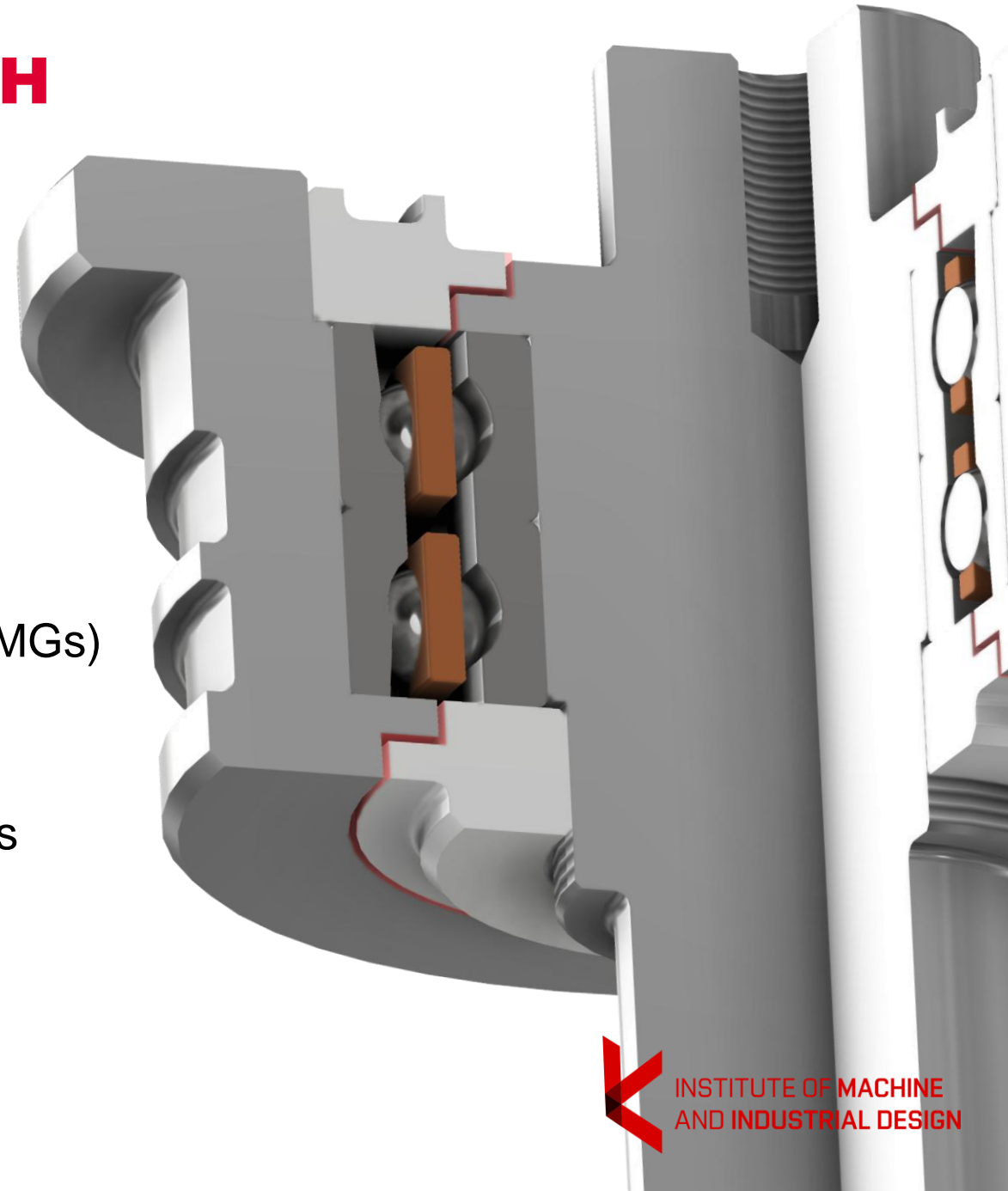
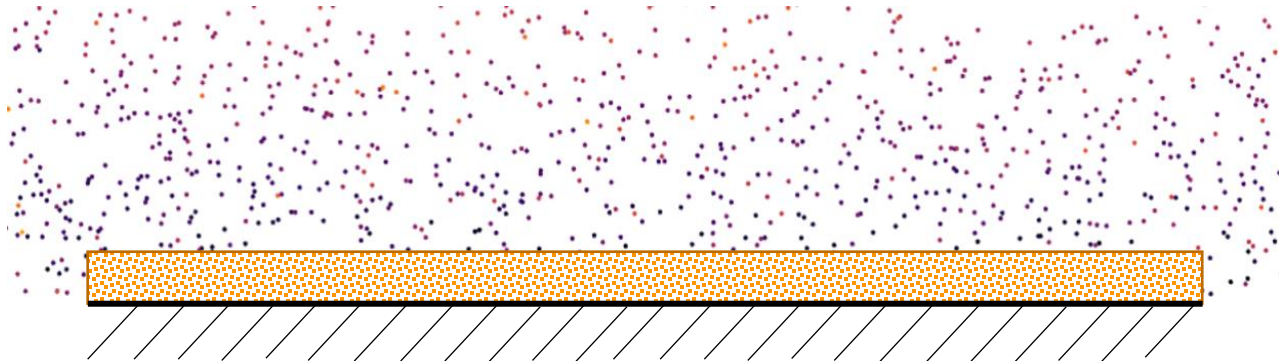
PHD STUDY & RESEARCH

Labyrinth seals

- Prevention of lubricant evaporation
- Reduction of contamination levels

Applications considered

- Reaction wheels & Control Moment Gyroscopes (CMGs)
- Solar array drive mechanisms
- Coarse Pointing Assemblies – optical/laser terminals



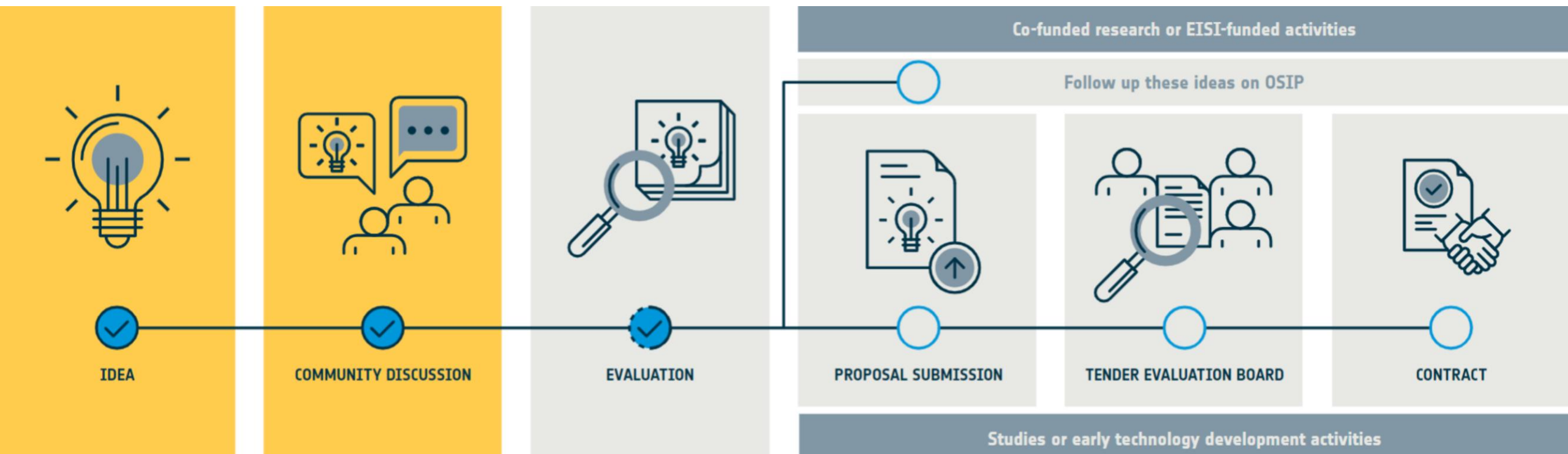
2022

PHD STUDY & RESEARCH



ESA co-funded research for PhD student (max 50%, 90k€)

- Duration of the selection procedure – 8.5 months
- **Round Nr.1** (Evaluation) – **36.4%** Success rate
- **Round Nr.2** (Tender Evaluation Board) – **19.2%** Success rate



ACTIVITY

EFFECT OF LOCAL GEOMETRICAL CHANGES AND POLARIZATION OF LABYRINTH SEAL SURFACES ON THE EVAPORATION RATE OF LIQUID LUBRICANTS IN SPACE APPLICATIONS

Overview Events Reports Evaluation Forum Members History Approval workflow Milestone Payment Plan

RUNNING

Prime contractor
Brno University of Technology

Organisational
Unit
TEC-SF

Implementation
progress

10%

START(commitment date)

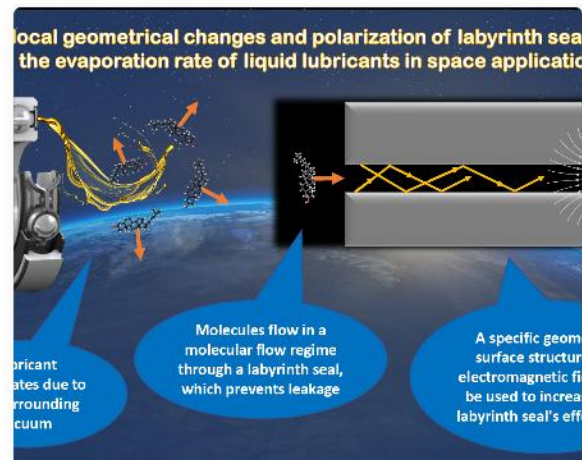
01 January 2023

ESTIMATED END

01 January 2026

DURATION: 36 MONTHS

Activity Type
co-sponsored
Research



Programme
Discovery

Activity Id
EISI_I-2022-02888

OSIP Idea Id
I-2022-01498

OSIP Proposal Id
I-2022-02888

Related OSIP Campaign
Open Discovery Ideas Channel

Main application area
Generic for multiple space applications



Budget

80900€

Zero Space Debris

<https://activities.esa.int/4000139889>

2023

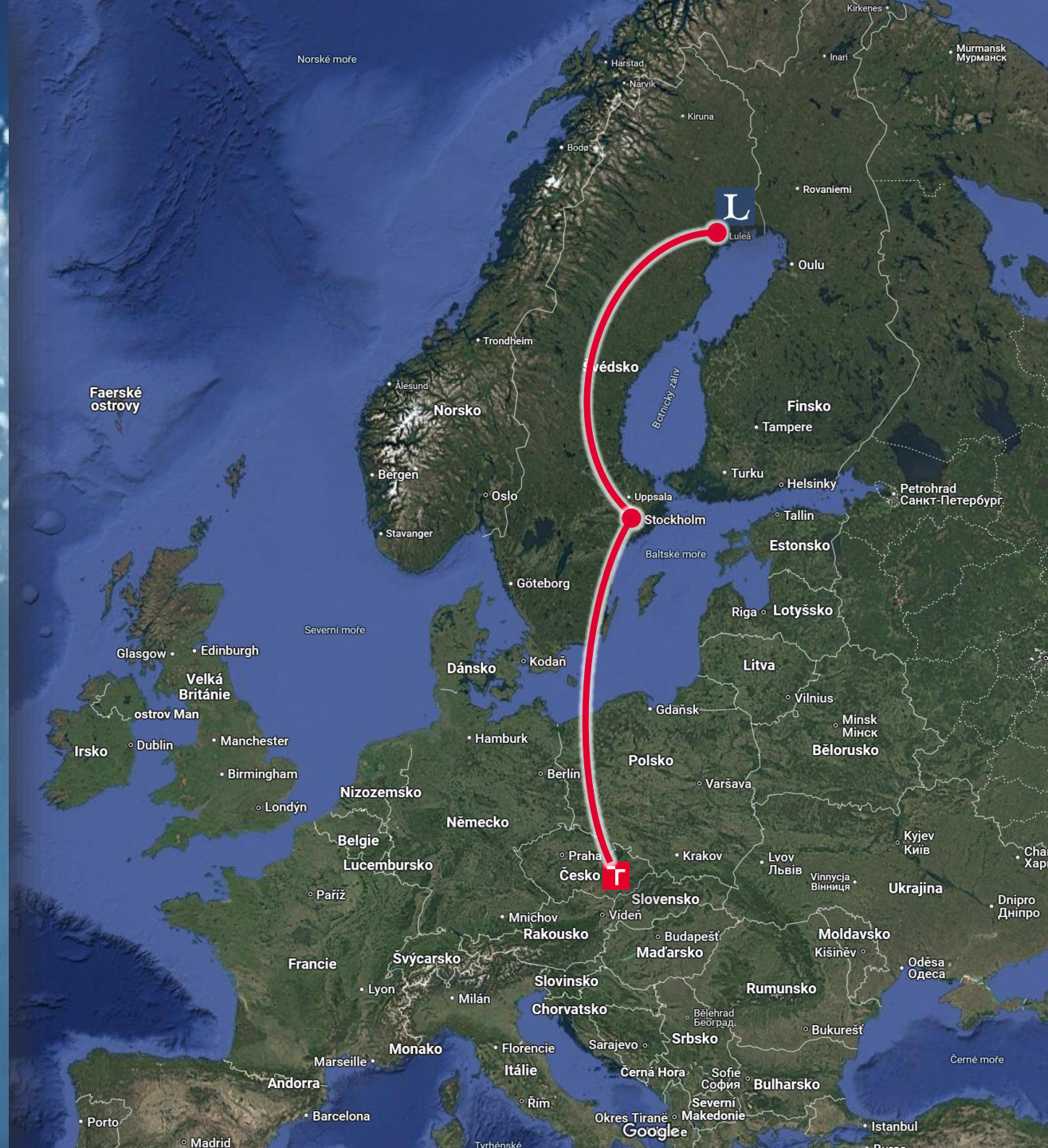
INTERNSHIP

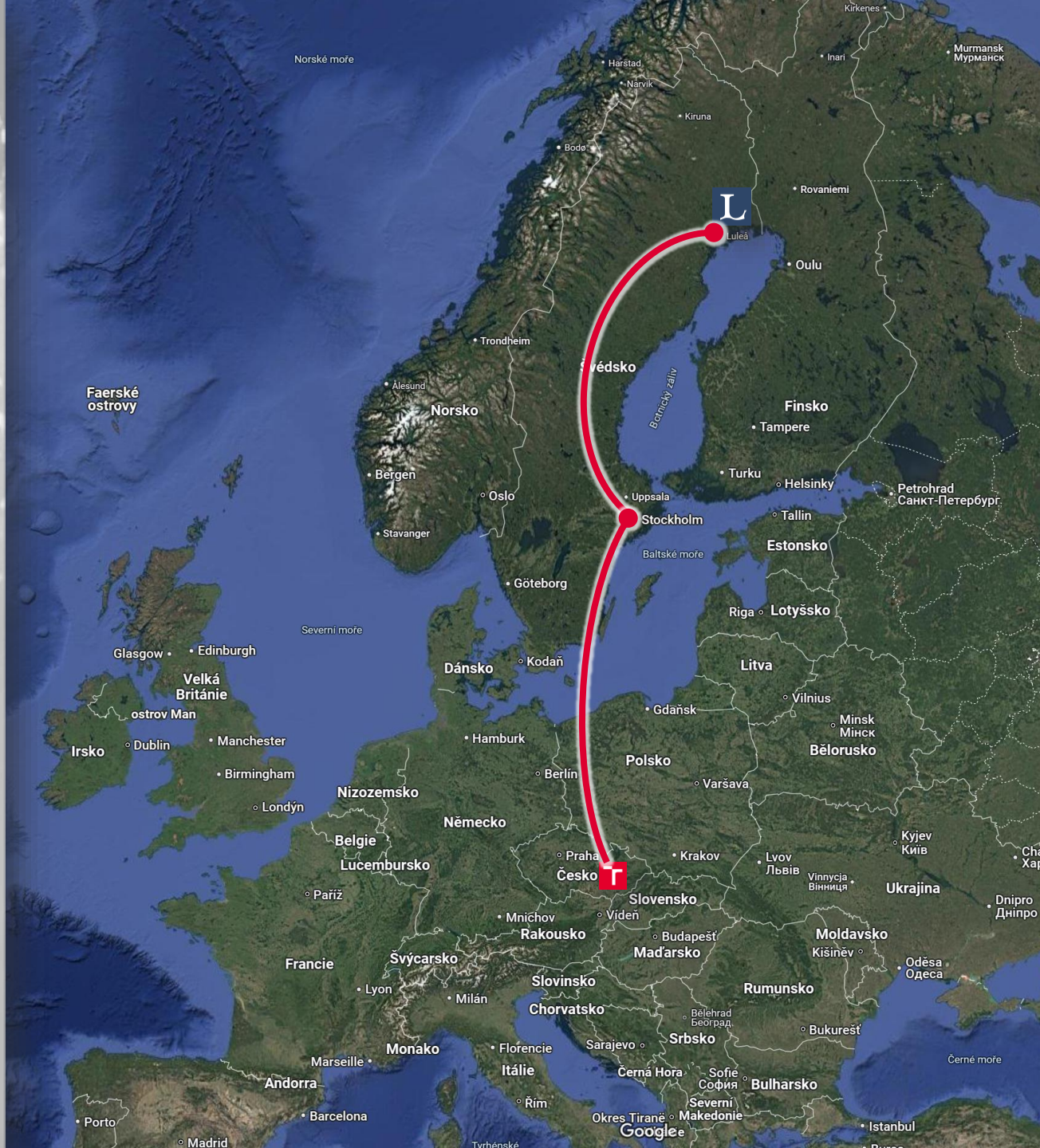
Luleå University of Technology (LTU)

- ERASMUS+ Internship
- 07/05/2023 – 27/05/2023
- **Supervisor:**
 - Prof. Lars-Göran Westerberg
 - Dr. Erik Nyberg
- **Research topic:**
 - Molecular flow simulations
 - MolFlow+, COMSOL Multiphysics



LULEÅ TEKNISKA UNIVERSITET

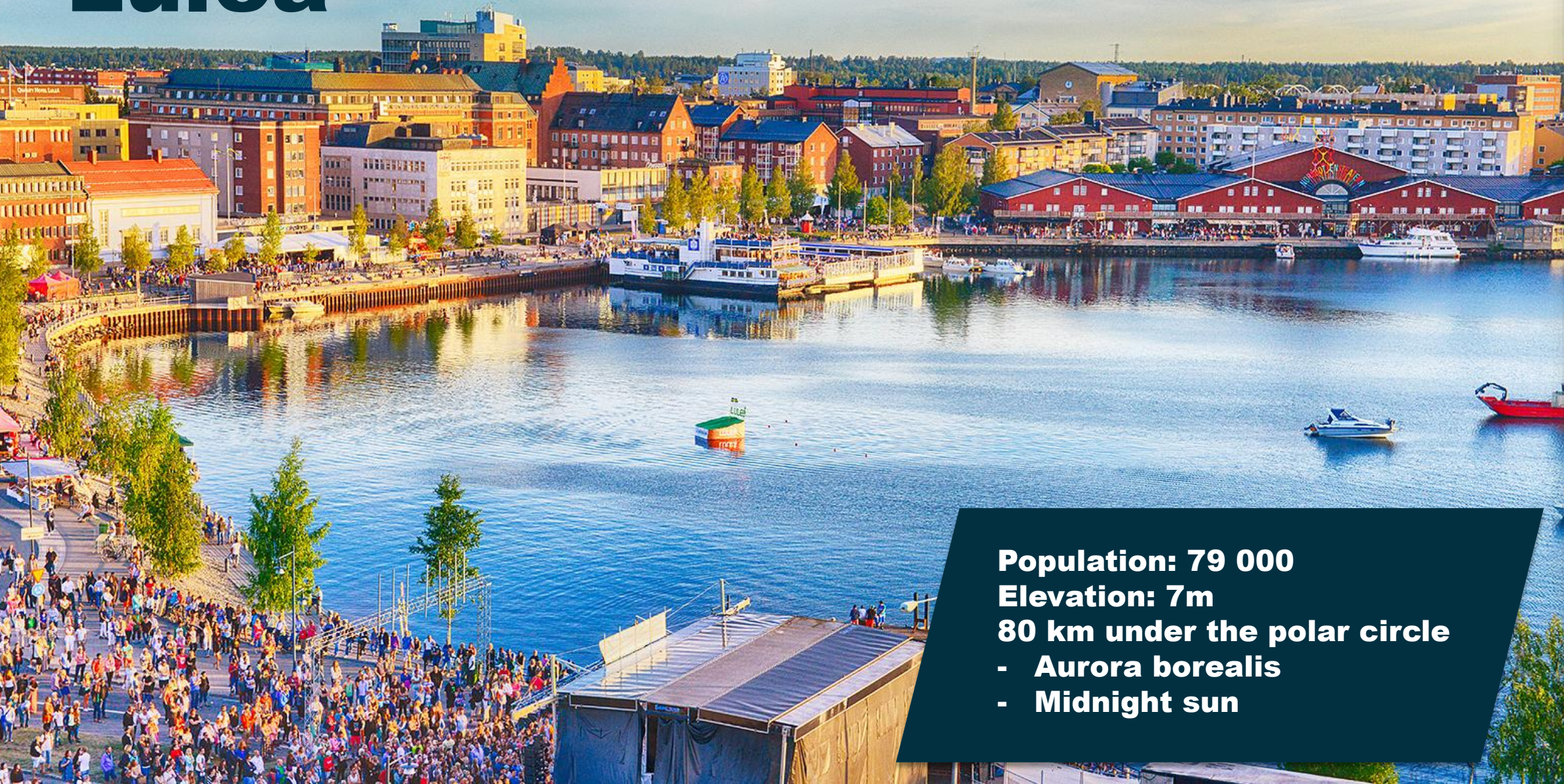








Luleå



Population: 79 000

Elevation: 7m

80 km under the polar circle

- **Aurora borealis**

- **Midnight sun**





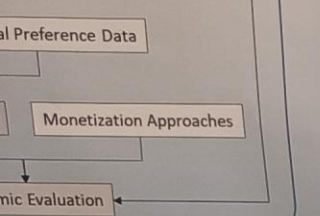






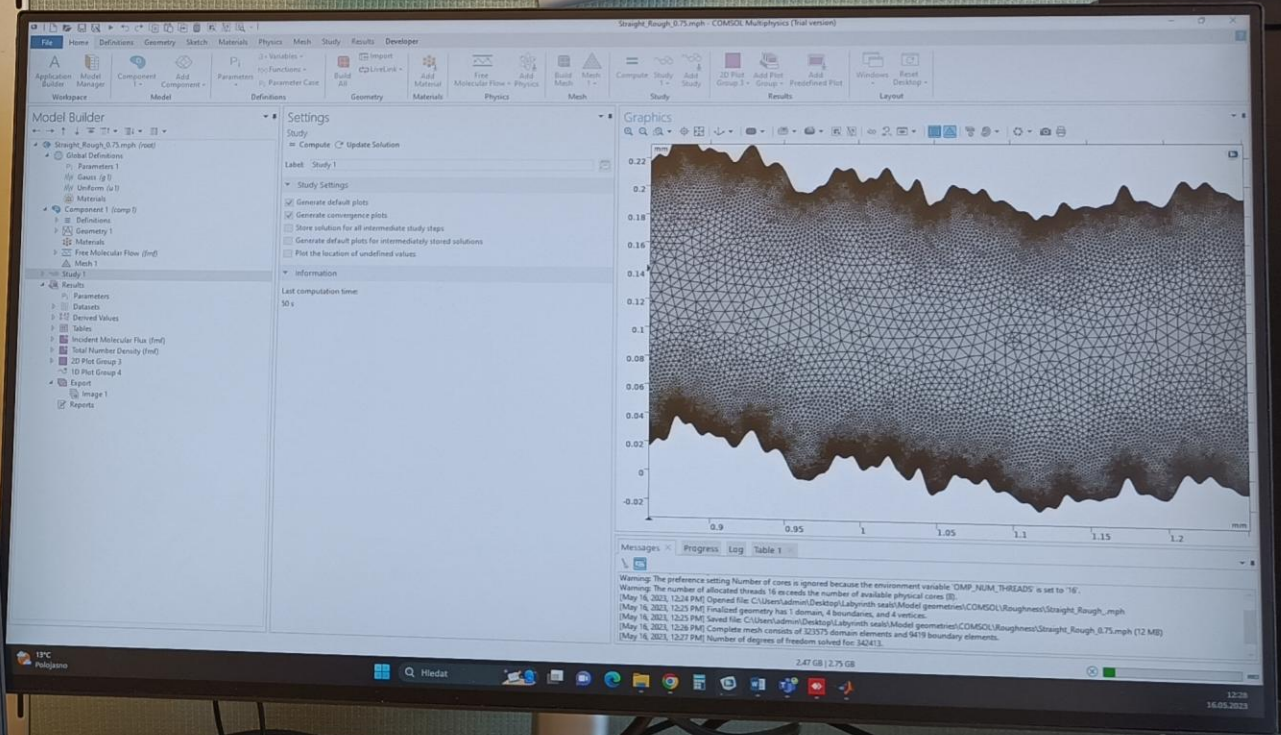






Effects
Mitigation measures

the framework of the
social and economic
Transitions, SU



Hee-RIS filter
in Jukla not
checked entirely
idea -> investigation?

Bastian Höller
Luleå University of Technology

DHA3D Workshop
Good! Right?



JAG
SPRINGER
en live show
NORRÖTTENTHEATERN

MARSVINS
NÄTTER
NORRÖTTENTHEATERN

SYSTER
NORRÖTTENTHEATERN

Tag 14 till sommaren!
NORRÖTTENTHEATERN

Informational poster with a heart icon and text in Swedish.

Informational poster with a QR code and text in Swedish.

Lärare!
Förbättra kunskapen
på dina inlämnade
förslagningar
2023
2024

Informational screen displaying a coffee cup and text.

Informational screen displaying a coffee cup and text.

FOUR O'CLOCK
EARL GREY
PICKWICK
REFRESH
BALANCE
Lipton
YELLOW LABEL















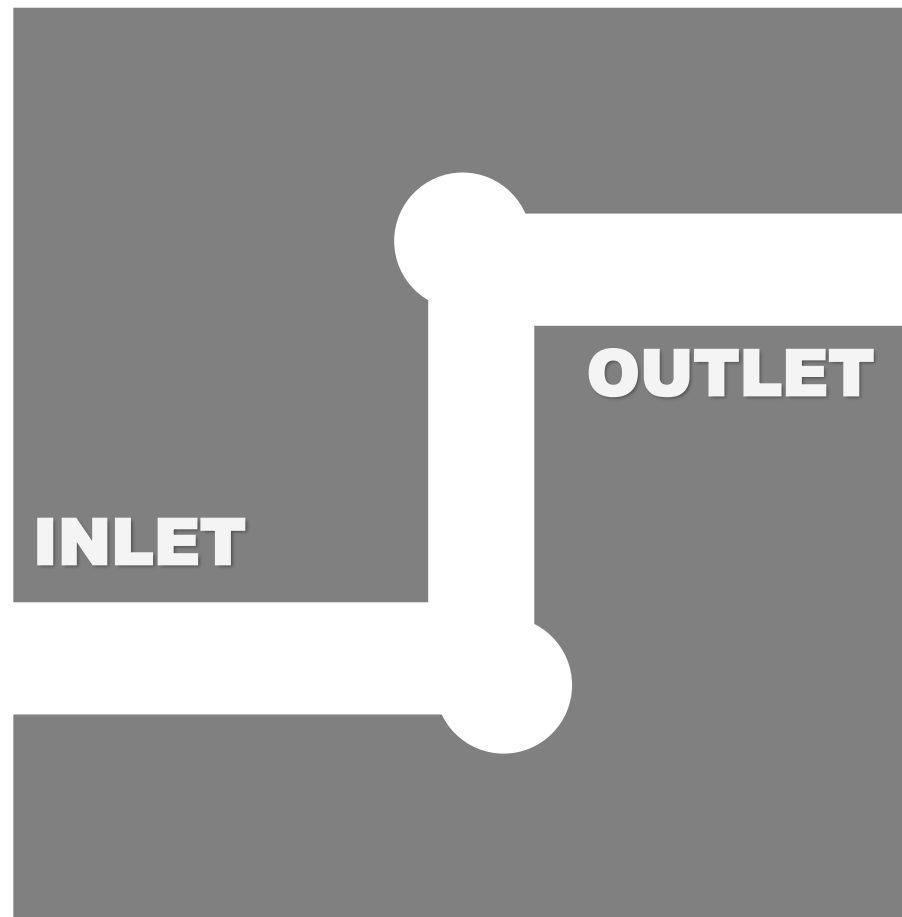
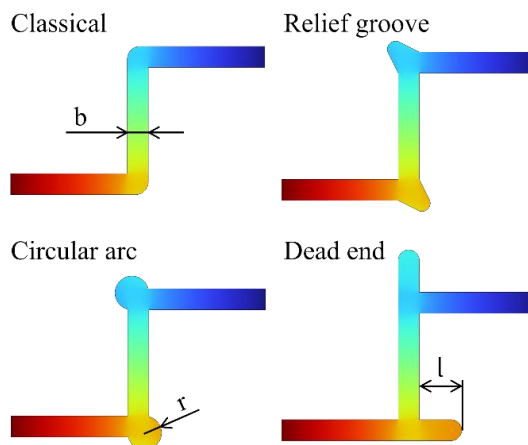
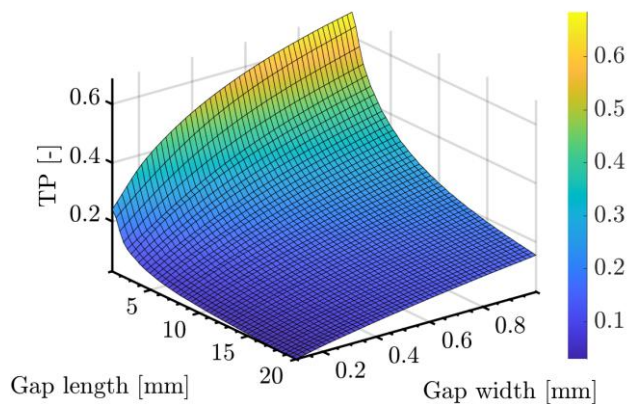
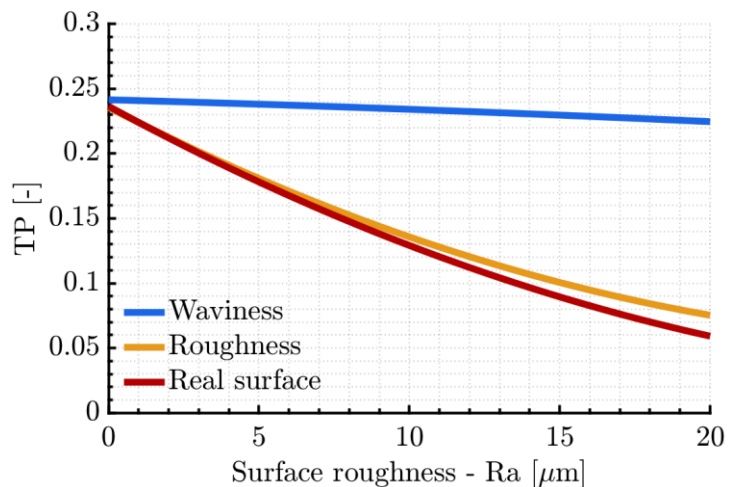
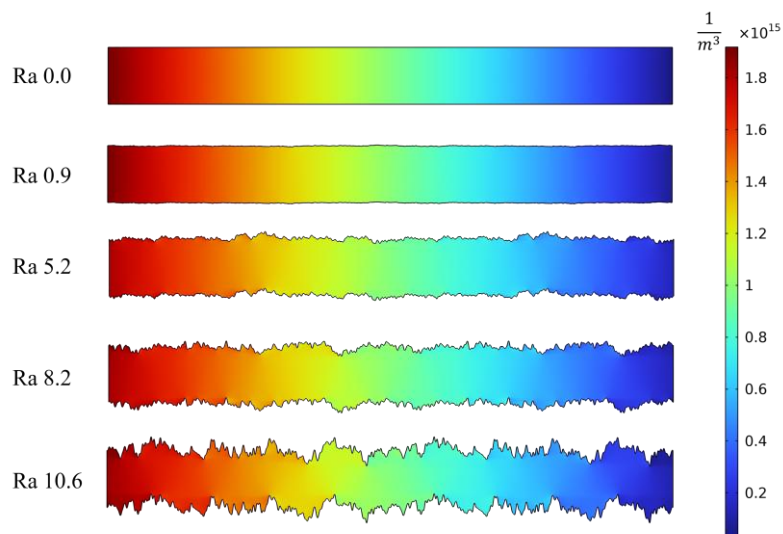




2023

INTERNSHIP

Luleå University of Technology (LTU)

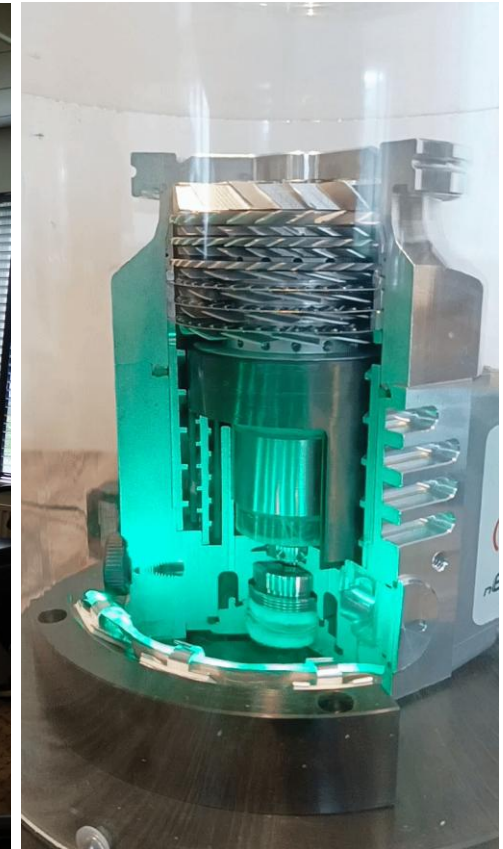


2023

PHD STUDY & RESEARCH

Vacuum System Design and Maintenance Course

- Chester (UK), 20–23 June 2023
- dr. Oleg Malyshev, et. al.



2023

PHD STUDY & RESEARCH

Space Tribology Course (ESMATS 2023)

- Warsaw (PL), 18–19 September 2023
- ESTL – European Space Tribology Laboratory



2023

PHD STUDY & RESEARCH

ITC Fukuoka 2023

- 1st Conference – Oral presentation
- Space Lubricant Evaporation in UHV Environment

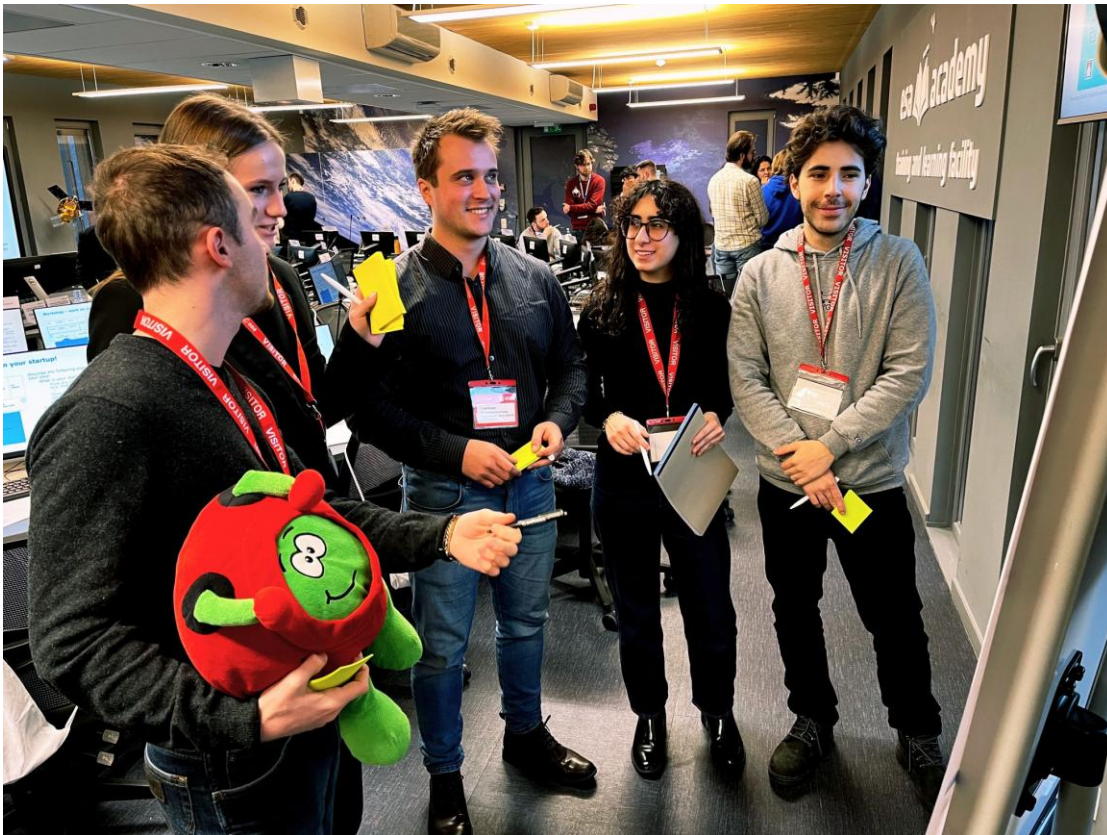


2024

PHD STUDY & RESEARCH

ESA Academy 2024

- Technology Transfer, Application & Innovation
- ESEC Galaxia (BE), 22/01–27/01/2024









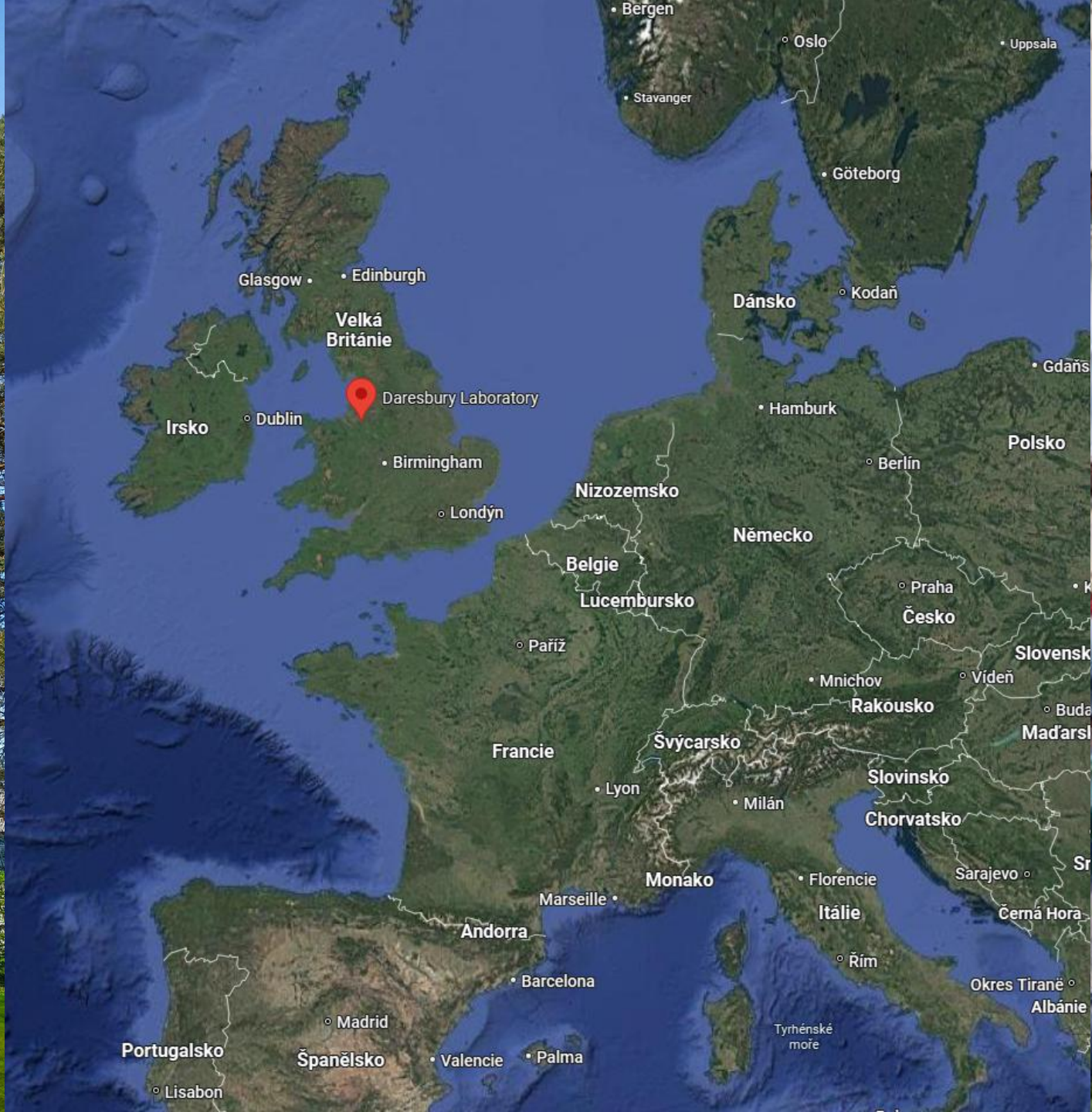
2024

INTERNSHIP

Daresbury Laboratory (UK)

- Freemover Internship
- 22/04/2024 – 22/05/2024
- **Supervisor:**
 - Dr. Oleg Malyshev
- **Research topic:**
 - Molecular flow simulations
 - Molecular monolayers
 - MolFlow+ software





Warrington

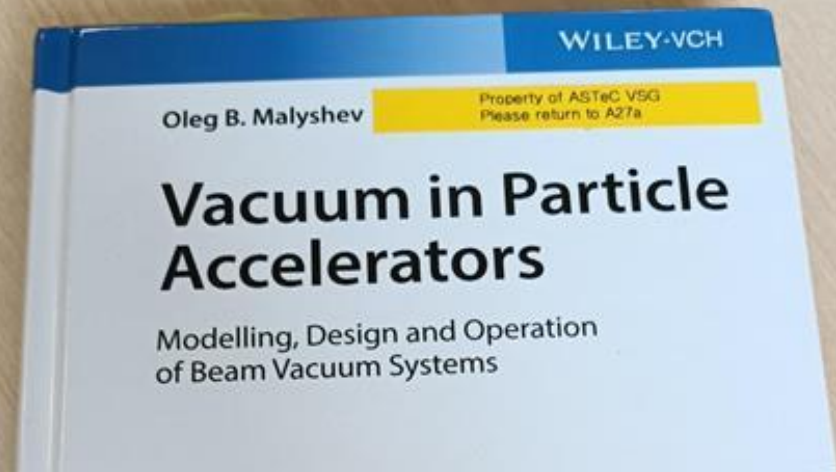
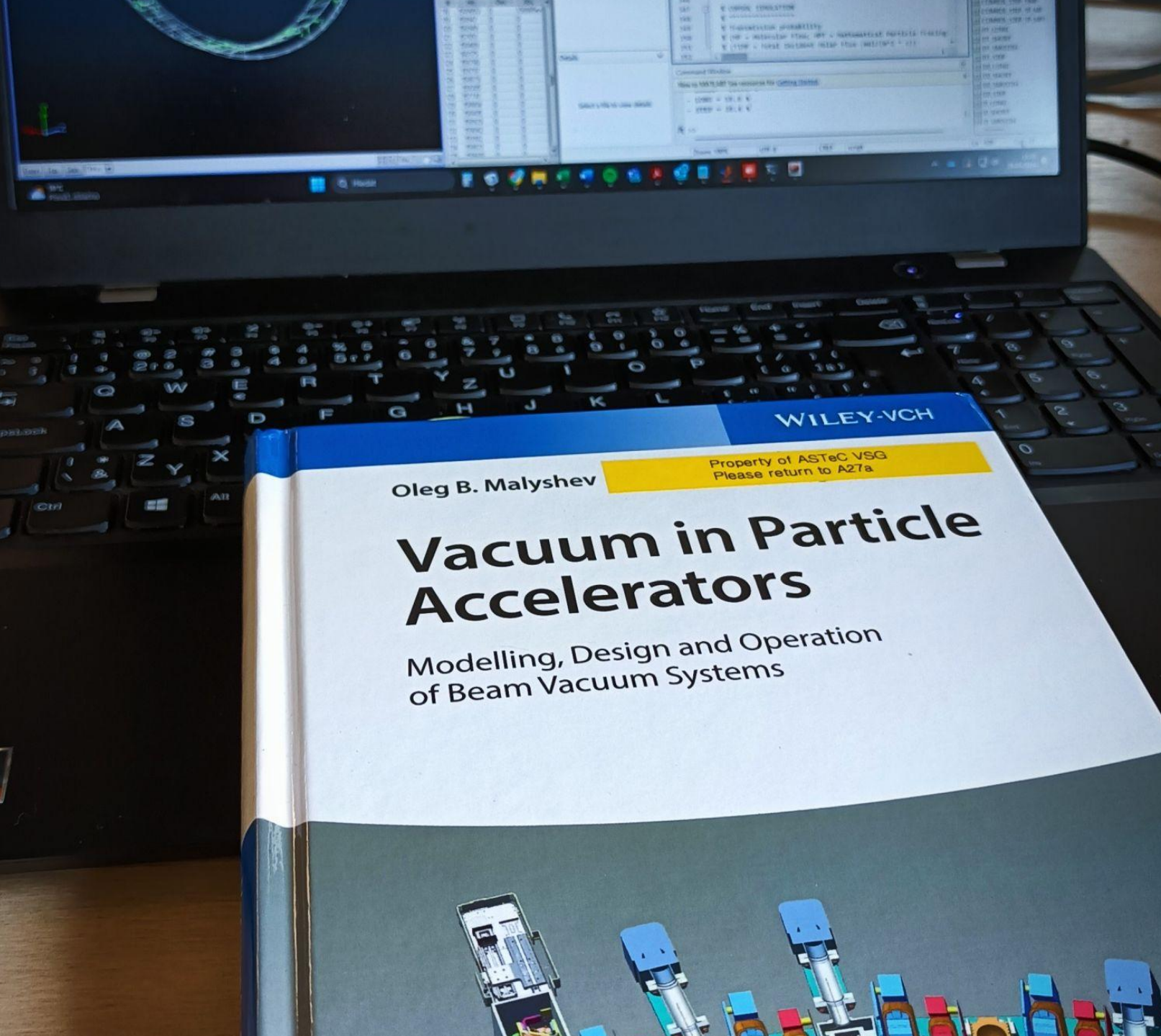


Population: 211 000
Liverpool (25 km)
Manchester (26 km)













GUINNESS™

ST JAMES'S GATE
DUBLIN, IRELAND



2024

INTERNSHIP

Daresbury Laboratory (UK)

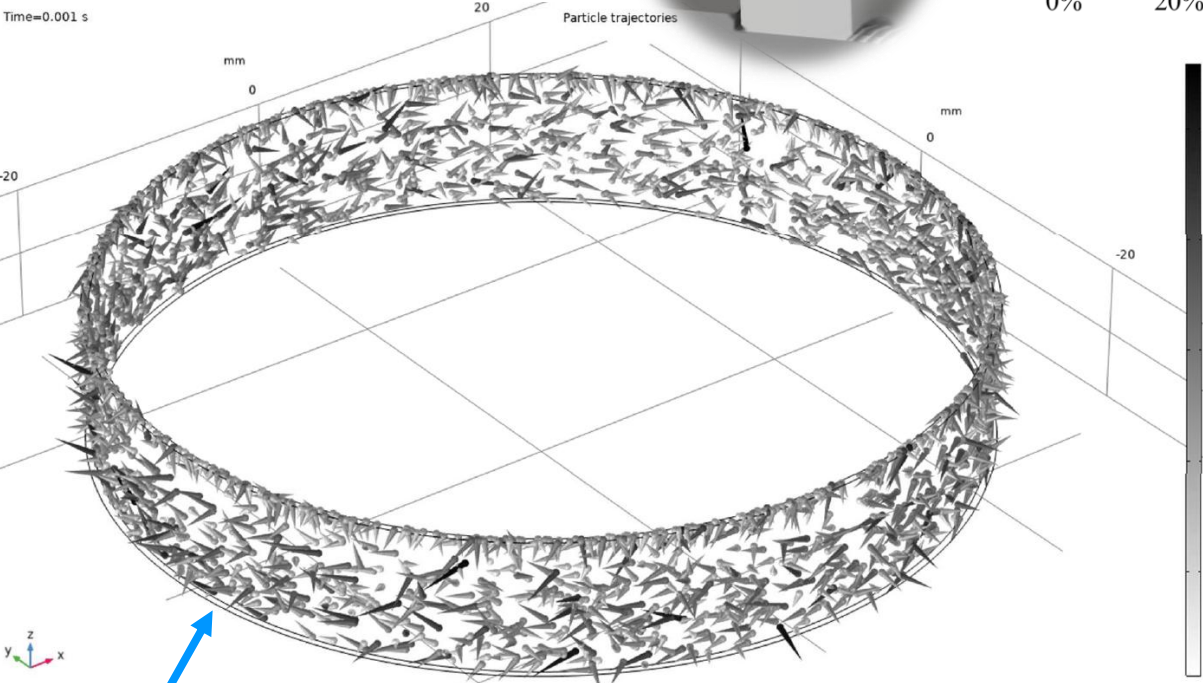
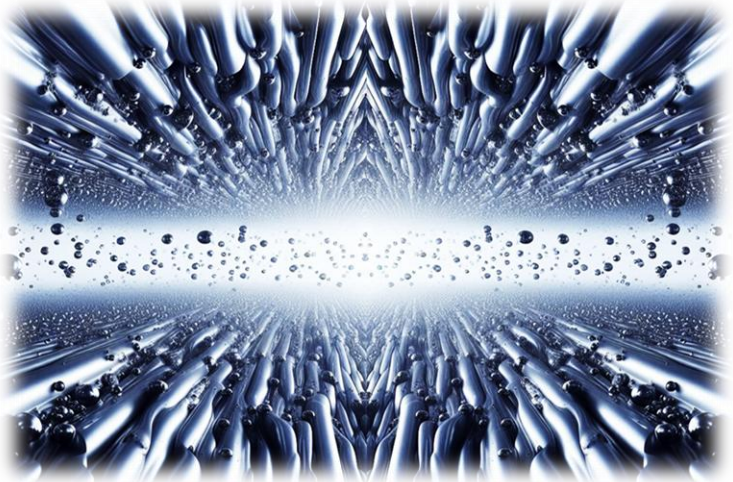
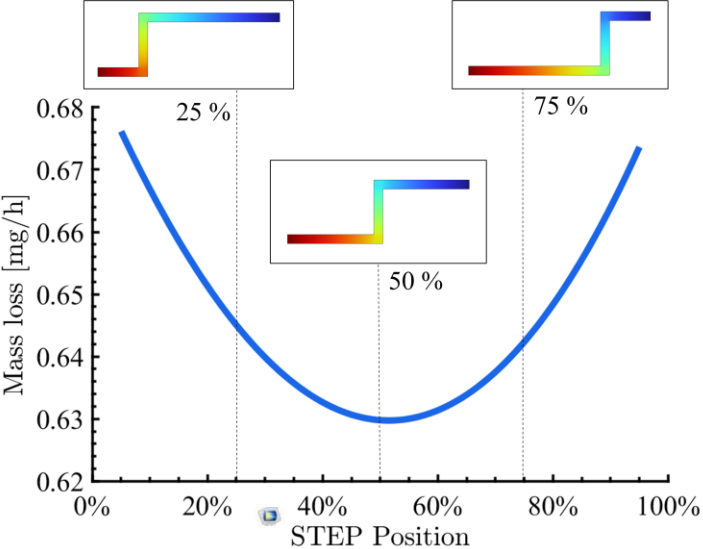
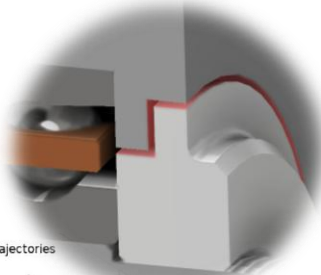


Fig. 3 Particle's gradients (comet tails)



Labyrinth seal gap

PHD STUDY & RESEARCH

Leeds-Lyon Symposium on Tribology

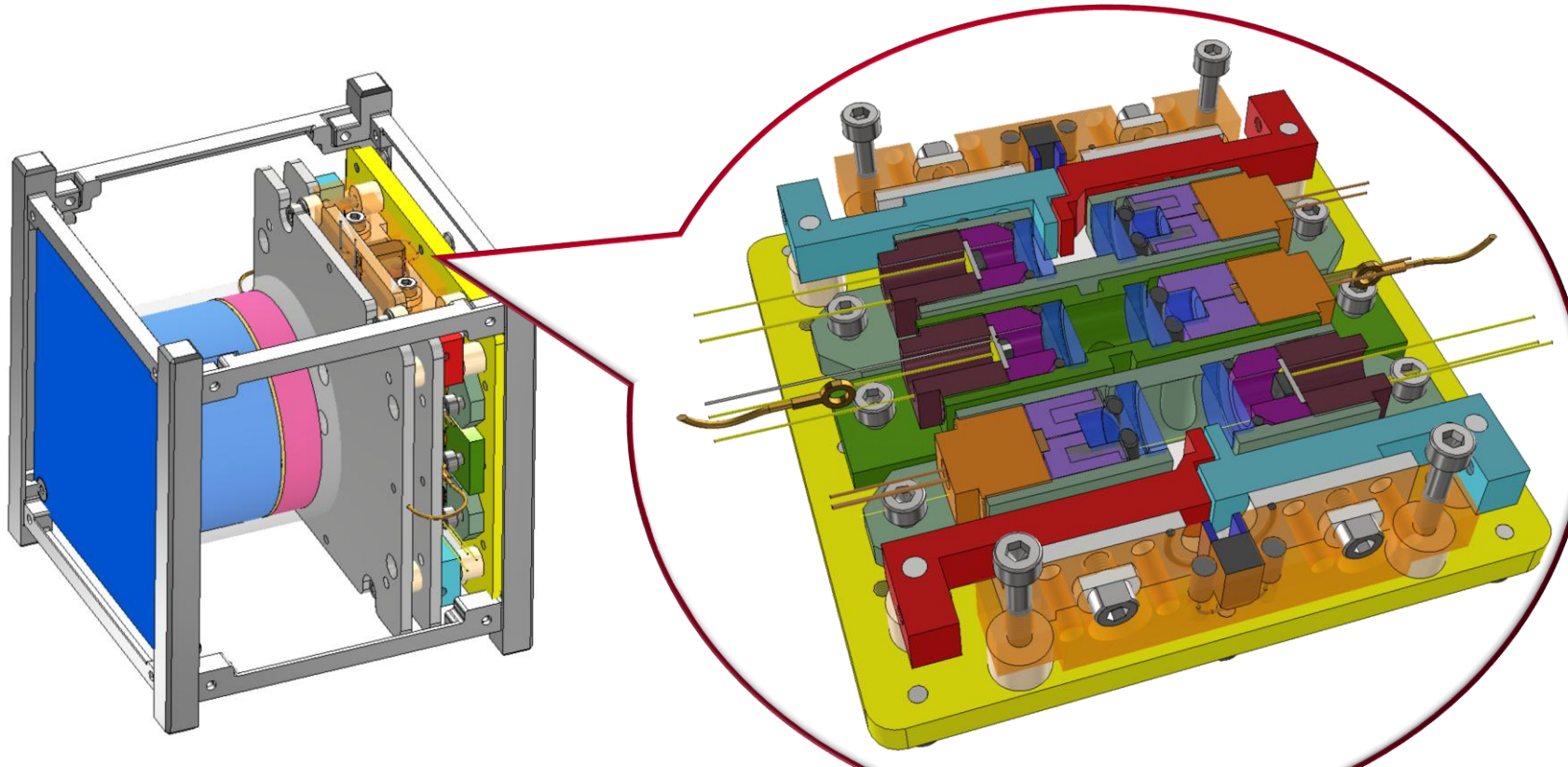
- 2nd Conference – Oral presentation
- Optimizing Labyrinth Seal Geometry to Minimize Liquid Lubricant Evaporation in Space Systems



PHD STUDY & RESEARCH

BrnoSAT – CubeSat mission

- **Initiative of:** Czech Aerospace Research Center, Spacemanic CZ, Brno Observatory
- **BUT** is developing **1U** structure to host two experiments – **laybrinth seals in 0.5U**
- Launch planned for mid-2026 (HSO, 500km)



INTRODUCING
BRNOsat

powered by



SPACEMANIC



INSTITUTE OF MACHINE
AND INDUSTRIAL DESIGN

2025

PHD STUDY & RESEARCH

ESA Final Presentation Days 2025

- ESA/ESTEC, 01/04–05/04/2025
- Organized by ESA Space Mechanisms team
- Oral presentation of outcomes so far





**24th – 26th
September
2025**

European Space Mechanisms
and Tribology Symposium

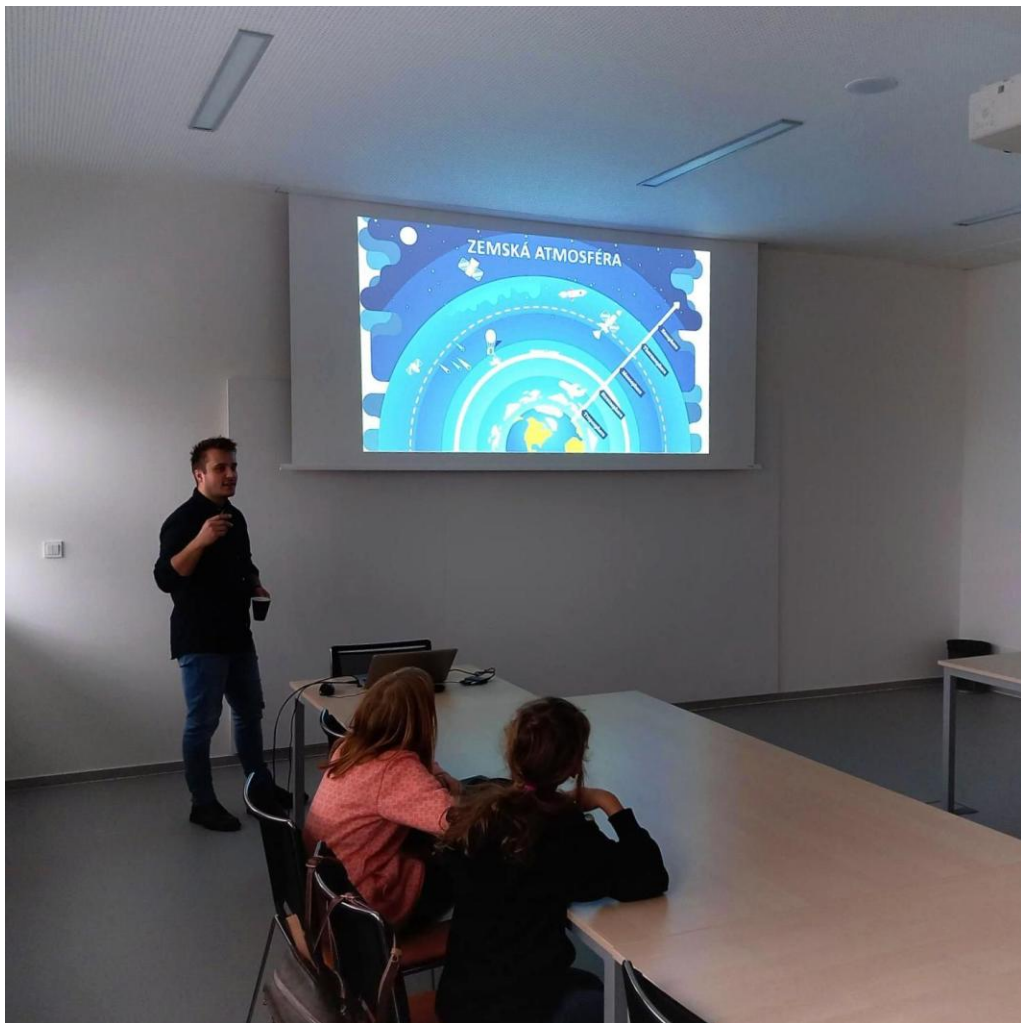
Lausanne | Switzerland

esmat
2025



PR & Lectures

Raketou na Mars!



RAKETOU NA MARS

JOSEF POUZAR

VUT FSI, ÚSTAV KONSTRUOVÁNÍ



SCIENCEANDTECHNOLOGYCLUB



STCBRNO

0:30 / 1:36:08



Josef Pouzar | Raketou na Mars



Science & Technology Club

4,16 tis. odběratelů

Odebírat



136



Sdílet



Stáhnout



Díky



Klip



Uložit



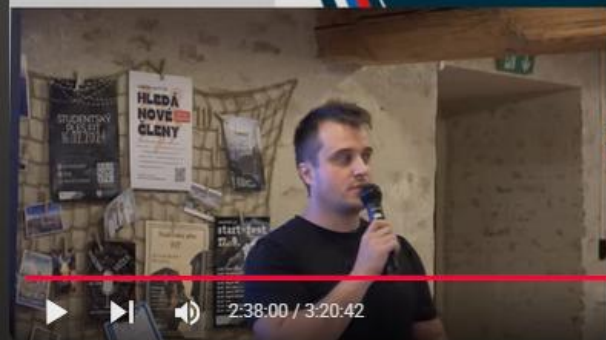
7,6 tis. zhlédnutí před 9 dny FAKULTA STROJNÍHO INŽENÝRSTVÍ - VYSOKÉ UČENÍ TECHNICKÉ V BRNĚ

Třetí přednášku letního semestru povede Josef Pouzar, který působí na Ústavu konstruování FSI, na téma: Raketou na Mars.

Ponořte se do fascinujícího světa kosmické techniky, jejího vývoje skrze poučení se z chyb minulých kosmických misí a možnosti meziplanetárního cestování. Přednáška podrobně rozebírá neúspěchy a selhání prvních pokusů o prozkoumání jiných planet a zdůrazňuje, jak tyto chyby přis...

ESA LAUNCHING CAREERS

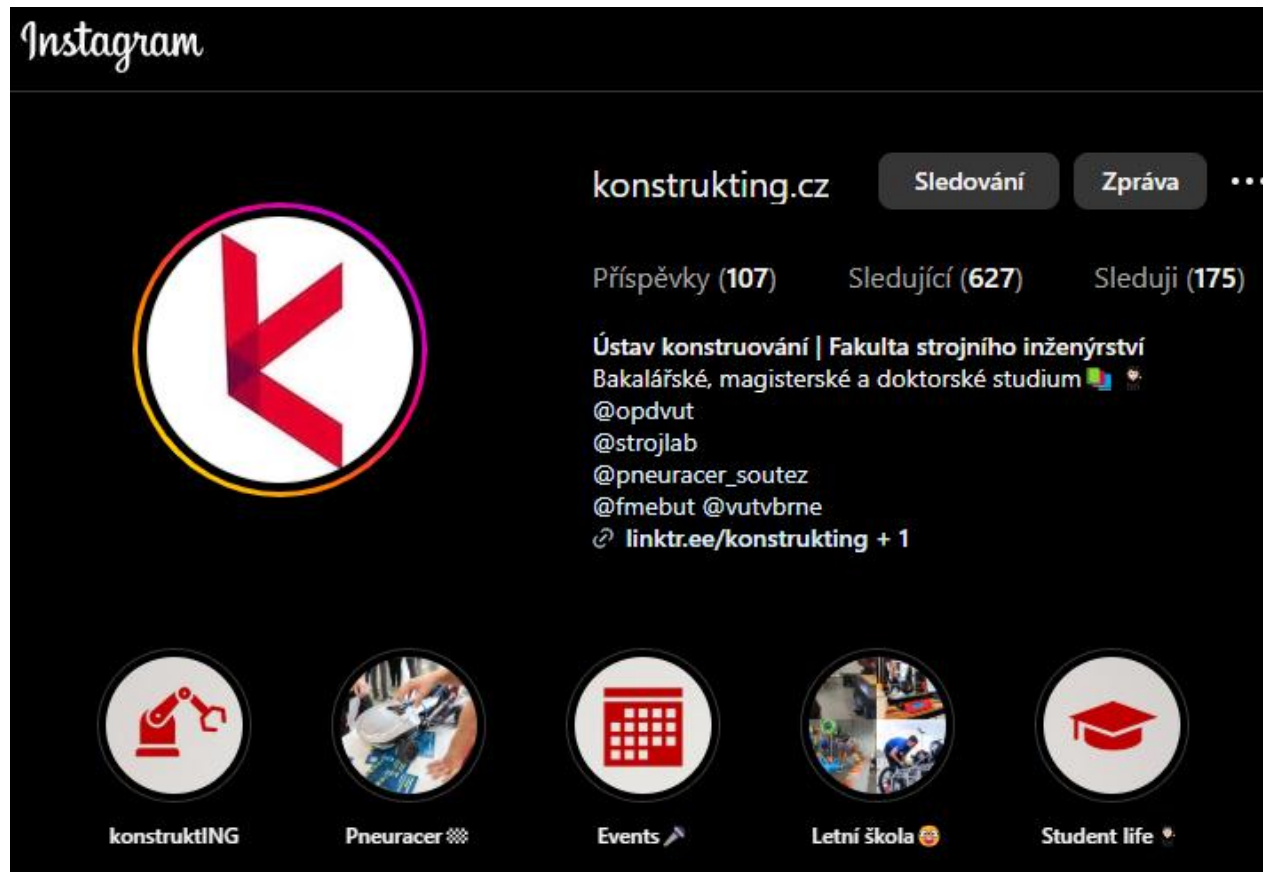
Josef Pouzar



PR & Lectures

BUT FME Open Days

Instagram PR team



COFFEEEEEEEEE...

5TH FLOOR



6TH FLOOR



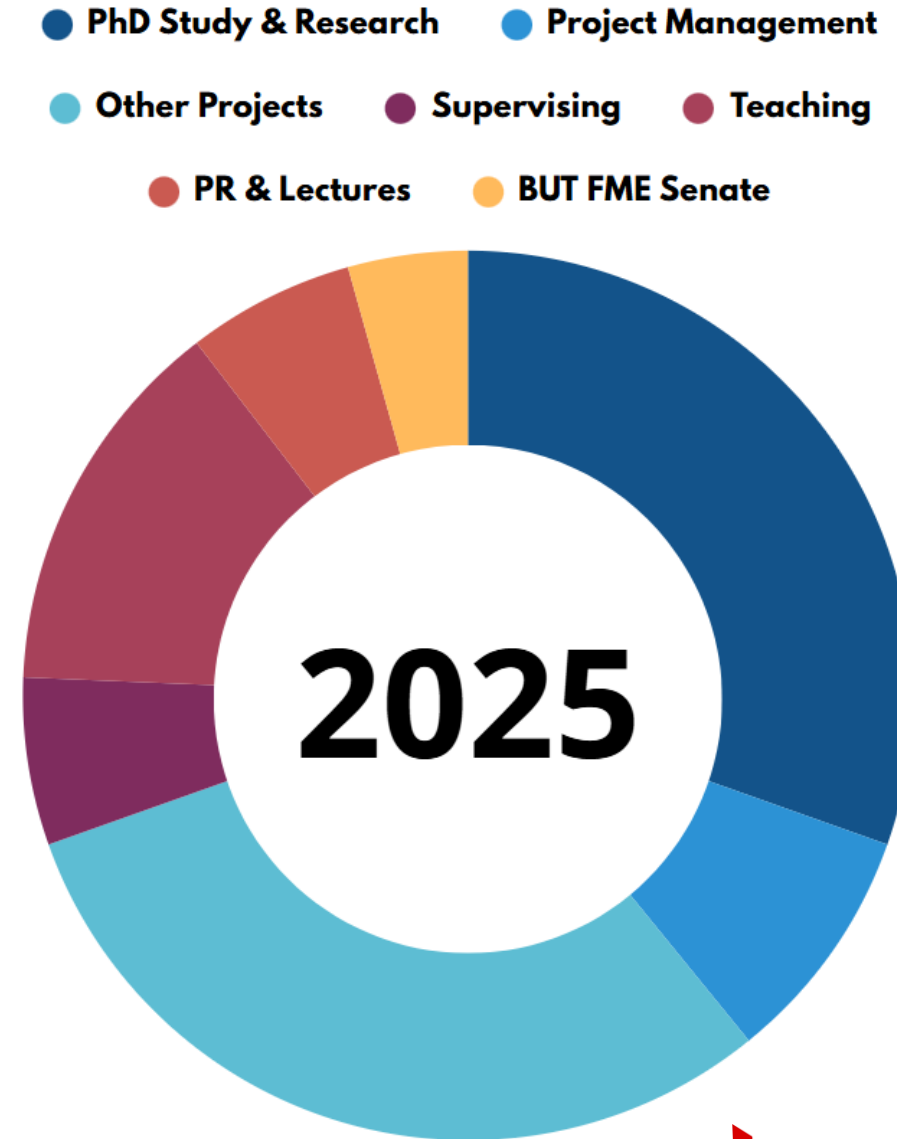
CONCLUSION

Doctoral thesis – 70/100%

Future Conferences

- 05/2025, STLE Annual Meeting (US)
- 09/2025, ESMATS 2025 (CH)

What matters the most is the people...





THANK YOU FOR YOUR ATTENTION

Josef Pouzar, Ing.

Josef.Pouzar@vut.cz



INSTITUTE OF MACHINE
AND INDUSTRIAL DESIGN