



RIGA TECHNICAL  
UNIVERSITY

Inventory and map of existing  
situation/expertise in the particle physics and  
accelerators technologies in the Latvia: –  
Relevant study programs and courses –  
Individuals with appropriate expertise – Labs  
and research groups

2nd CERN Baltic Group Meeting

Kalvis Kravalis

Deputy director of RTU HEP and AT Center

28.05.2018. Geneva, CERN

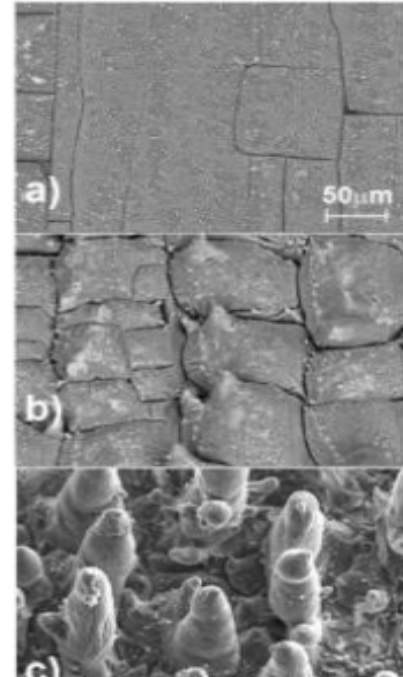
# Content

- Relevant Labs and individuals
- Expertise
- Their relevance to CERN thematic
- Manpower
- Current achievements
- Previous collaboration with CERN
- Relevant study programs and courses

# RTU

## Institute of Technical Physics

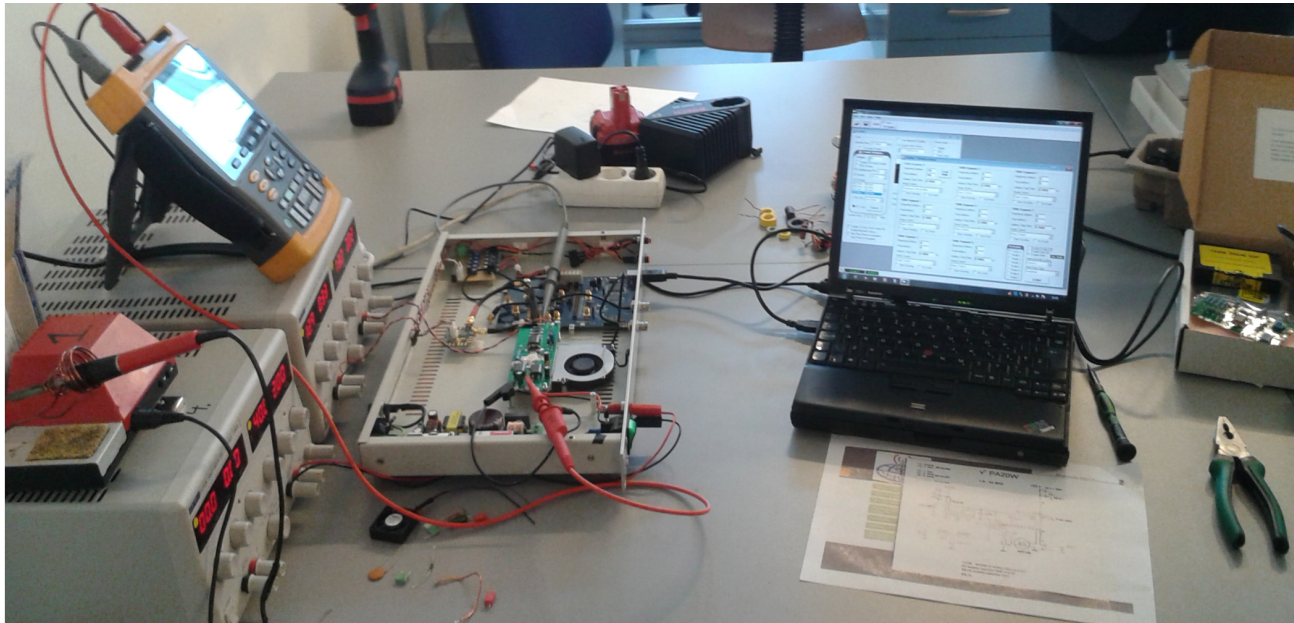
- Collaboration within ARIES project
  - Nb micro layer laser treatment
- Research directions
  - Solid state physics
  - Material physics
  - Physics of disordered materials
  - Physics of glass
  - Holography
  - Responsible researcher – Dr. Arturs Medvids



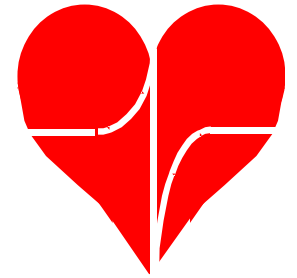
# RTU

## Department of Industrial Electronics and Electrical Technologies

- Expertise (most relevant)
  - Electron beam modulator control and power supply scheme for ARIES
- Senior Researcher Dr. P. Apse-Apsitis with team



# Biomedical Engineering and Nanotechnologies Institute



- Expertise
  - Nanodosimetry - weak electron emission spectroscopy to identify quality of materials surface for accelerators ,etc.
  - Quality assurance for X-ray beams - Program for day to day X-beam quality identification trend
- Study subjects
- Physics and engineering of medical imaging
- Medical imaging radiation protection and safety
- Key researcher - Prof. Jurijs Dehtjars

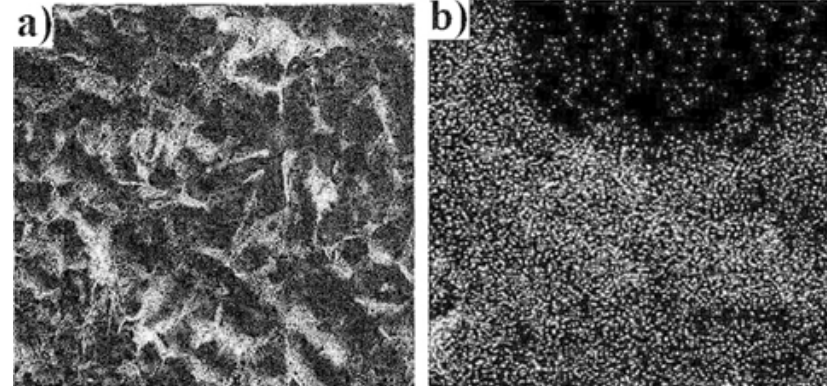
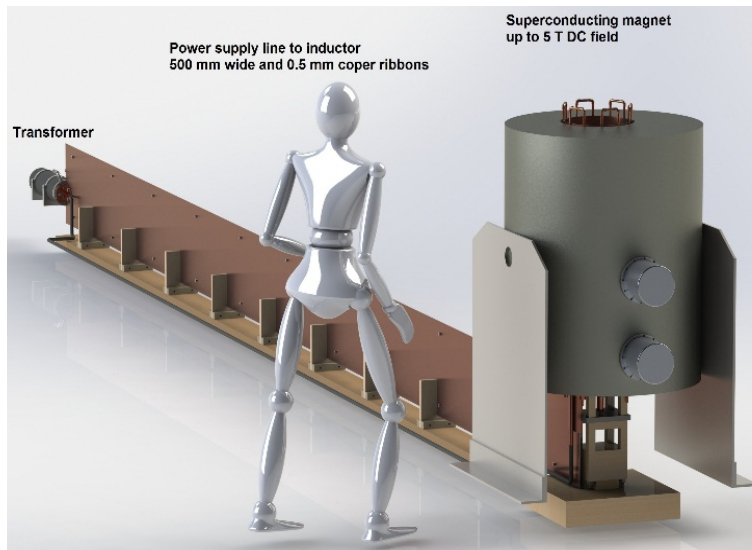
# University of Latvia Institute of Physics

- Expertise
  - Laboratory of physical hydromechanics
- Expertise
  - Liquid metal systems, components, processes, measurements, MagnetoHydroDynamic problem investigation
- Collaboration with CERN
  - EURISOL project – creation of windowless proton beam target for multi megawatt target facility
  - Project: Liquid Lead Bismuth Target for EURISOL - LIEBE
- LIEBE pump design, testing for installation at ISOLDE
- Dedicated staff of 8 scientist team + assistants, technicians
- Future collaboration possibilities – LIEBE 2





# University of Latvia Institute of Physics



- Laboratory of Applied hydromechanics
- Expertise –
  - electromagnetic devices, pumps, mixers for metallurgy
  - Electromagnetic influence on metal casting, solidification
  - Semi levitation and levitation of metals during processing
- Staff – 5 scientists + assistants, technicians
- No former collaboration with CERN
- Possibility for collaboration - Material research for steels enhanced by nanoparticle introduction



## The Institute of Mathematics and Computer Science

- Expertise
  - Large data processing and storage
  - Data safety competence – official body on IT security in Latvia
  - Complex systems modeling languages and tools development
- Staff - 100 scientists
- No previous collaboration with CERN

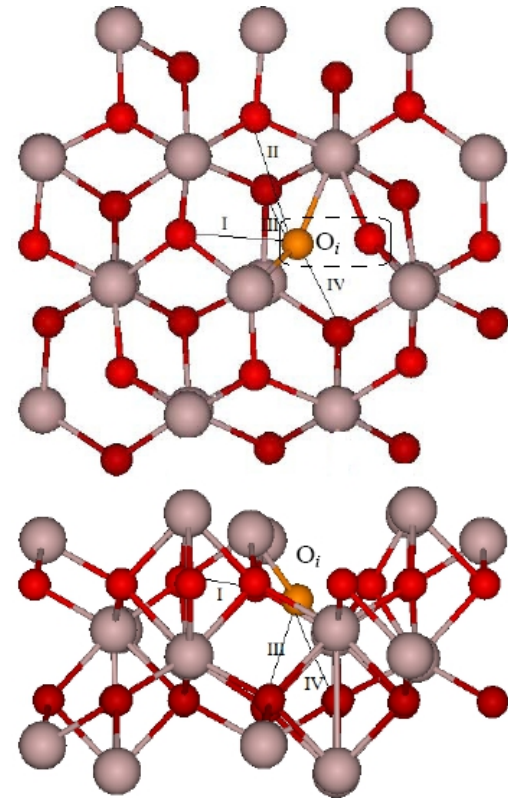


# University of Latvia

## Institute of Solid State Physics



- Expertise
  - solid state physics
  - material physics
  - physics of disordered materials
  - physics of glass
  - holography
- Their relevance to CERN thematic
- Staff – 77 scientists
- Previous collaboration with CERN
  - Crystal Clear Collaboration

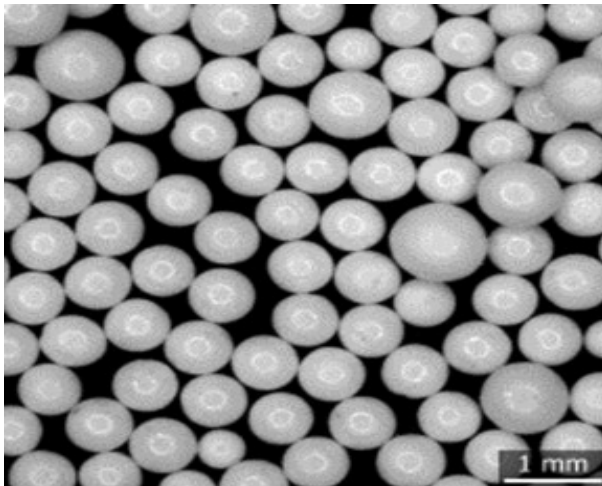


The energy curves for migration paths I, II, III and IV of  $O_i$  atom in  $\alpha\text{-Al}_2\text{O}_3$

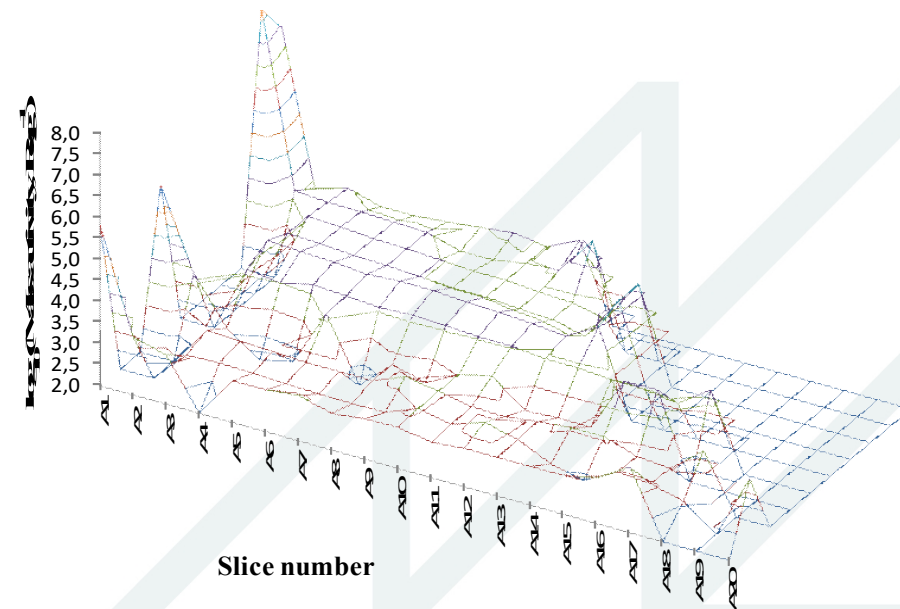
# Institute of Chemical Physics

- Expertise

- Electron accelerator laboratory
- Electronic component integral scheme behavior under radiation
- Nano-structured, radiation sensitive materials for nuclear-medical and border protection applications
- Tritium release



Modified  $\text{Li}_4\text{SiO}_4\text{-Li}_2\text{TiO}_3$  pebbles



Tritium accumulation profile (mapping)

## Institute of Chemical Physics

- Expertise
  - Multilayer silicon Nano capacitor with improved dielectric layers
  - Tritium accumulation profiles and release
  - Tritium breeding ceramics, its defects, advanced lithium metasilicate, lithium metatitanate
  - Fusion technology - Blanket zone materials, Plasma facing materials
- No previous collaboration with CERN
- 35 scientists divided in 6 teams
- Lecture course
  - Radiation protection in small, middle sized devices, low and medium radiation sources, irradiated scrap metal, handling of open irradiated matter

# University of Latvia

## Laser Center



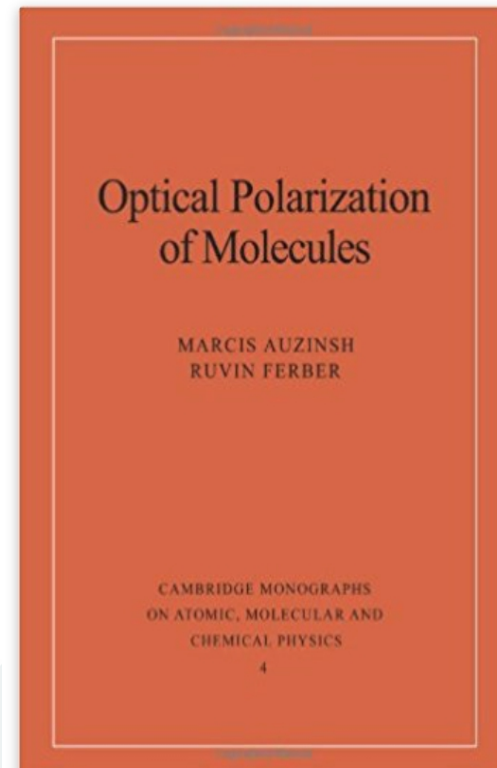
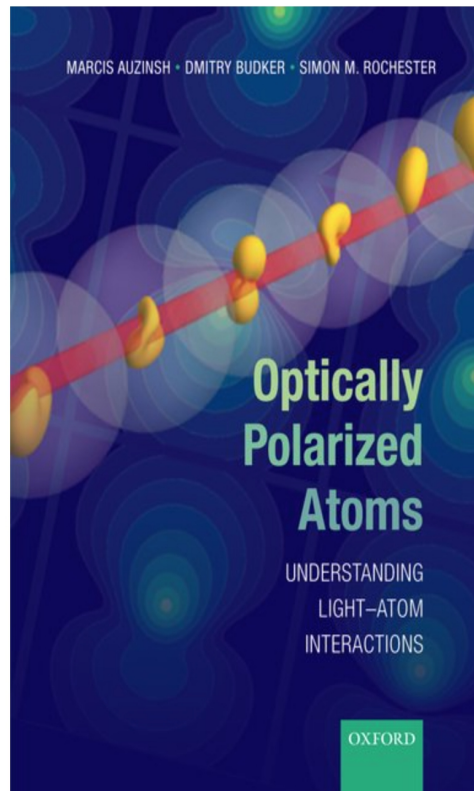
- Expertise
  - Magnetic field sensors based on magneto optical effects in atomic vapor
  - Nitrogen vacancy centers in diamond crystals for magnetometry with potential applications
  - Hydrogen measurements
  - Laser usage for irradiation
  - Relevant for Accelerator technologies for
    - the Cosmic Axion Spin Precession Experiment (CASPER) and the Global Network of Optical Magnetometers for Exotic physics searches (GNOME).
  - Coherent laser spectroscopy methods for high precision determination of atomic properties
  - Relevant for:
    - ALPHA, ASACUSA and other antimatter experiments

# University of Latvia Laser Center

Three laboratories



- Atomic and Molecular Physics Laboratory (Prof. M. Auzinsh)
- Molecule Optical Polarization Laboratory (Prof. R. Ferber)
- Laboratory of Astrospectroscopy (Dr. L. Zacs)
- No previous collaboration with CERN



# University of Latvia

## Faculty of Physics and Mathematics

- Study subjects
  - Standart Model of Elementary Particles
  - Non-relativistic Quantum Mechanics
  - Contemporary Problems of Quantum Physics
  - Data Processing, Mathematics, Numerical Analysis
- Key Lecturers
  - Dr. Phys. M. Auziņš
  - Dr. Phys. V. Kasčejevs



**Thank you!**  
**Questions?**