



**Vilnius
universitetas**



High-energy proton collision analysis group activities

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History: Project „Physics of subatomic particles at CERN CMS experiment“ (2013-2022)

- Dr. A. Juodagalvis was the leader of the project „Physics of subatomic particles at CERN CMS experiment“ (2013-2022)
- The research group was split into two groups in 2022:
 - „High-energy proton collision analysis group“ (HEPCA), leader dr. A. Juodagalvis
 - „Particle physics theory group“ (PPTG), leader dr. D. Jurčiukonis
- The main areas of activities:
 - Analysis of the CMS experimental data (the Drell-Yan process, and a few other attempts with CMS OpenData)
 - Contribution to the LHC Electroweak „V+jets“ working group
 - data-MC comparison in preparation for the intrinsic-kT-dependent parton-distribution functions (DESY)
 - analysis of published experimental particle physics data (still on-going)
 - Contribution to the CMS sub-detector group activities (HCAL, GEM, and eventually Tracker)
 - Execution of CMS M&O activities (central shifts at P5 or remote, CMS paper institutional review)
 - Study of theoretical models (focusing on the Grimus-Neufeld model, many other published studies)
 - Involvement in COST Action CA16201 “Unravelling new physics at the LHC through the precision frontier (ParticleFace)” during 2019-2021
 - Student involvement for exploratory tasks or thesis works
 - Support of the Experimental Nuclear and Particle Physics Center

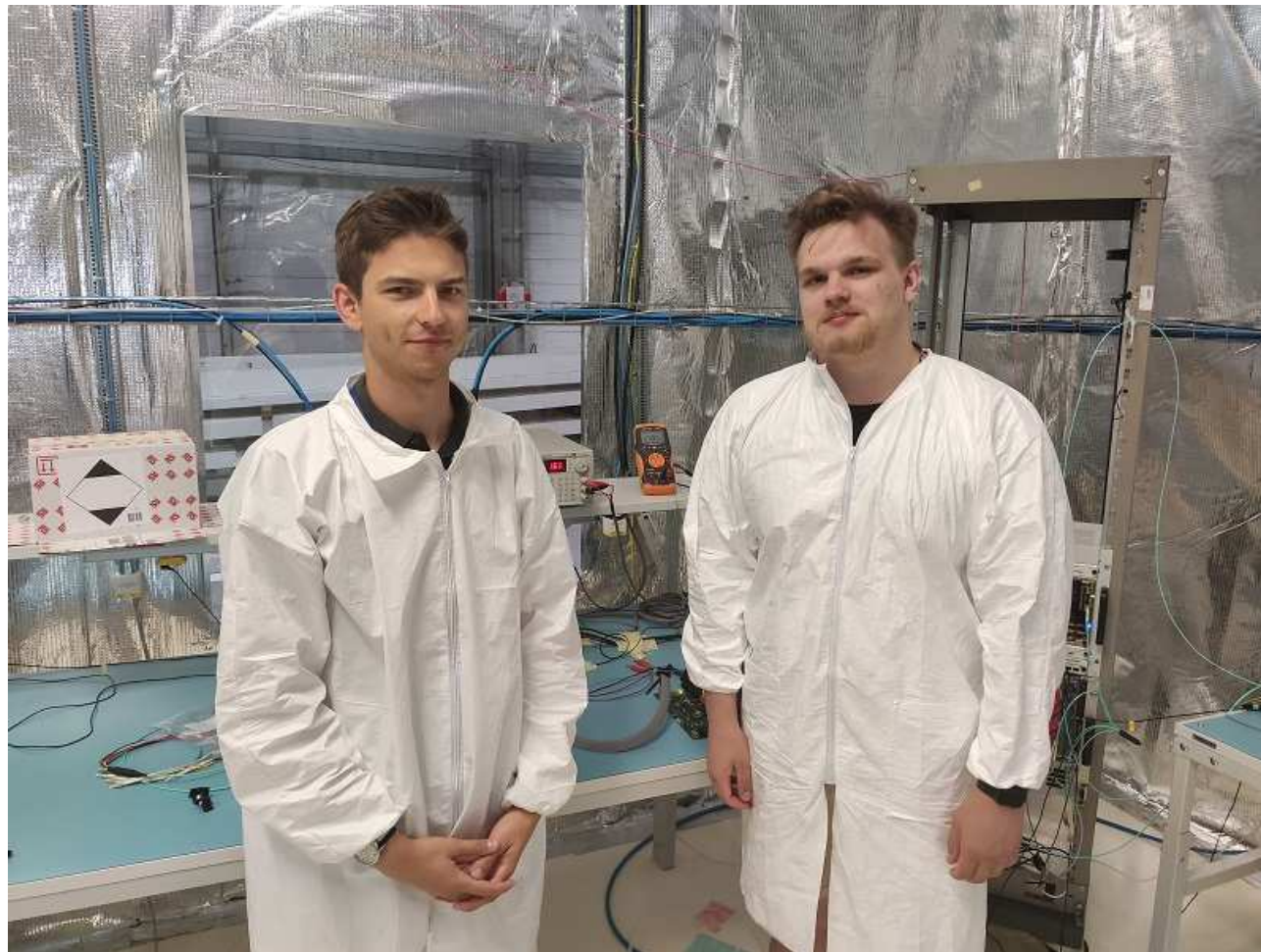
High-energy proton collision analysis (HEPCA) group

- **General information**
 - Established in 2022, separating experimentalists from theorists
 - Currently 3 members (dr. A.Juodagalvis – leader, PhD student M.Ambrozas, undergraduate N.Eimutis)
 - Activities are coordinated with the Experimental Nuclear and Particle Physics Center (A. Rinkevičius)
 - M. Ambrozas mentored 4 students of the Center during (2019-2022), he also organizes common „high-energy physics group meeting“ attended by ENPP Center, HEPCAG, and PPTG
- **The main areas of activities:**
 - Analysis of the CMS experimental data
 - the Drell-Yan process differential cross section measurement at $\sqrt{s}=13\text{TeV}$
 - contribution is focused on the background estimation using data-driven methods using the “ultra-legacy processing” data collected during 2016-2018
 - probed the use of the CMS Scouting data at $\sqrt{s}=13\text{TeV}$ for the low-invariant-mass Drell-Yan measurement
 - Contribution to LHC EW WG V+jets activities
 - analysis of published experimental particle physics data (inclusive jet cross section measurement at $\sqrt{s}=13\text{TeV}$ at ATLAS and CMS) with the focus on uncertainty correlation description and its presentation
 - Contribution to the CMS Pixel Phase-II upgrade activities
 - M. Ambrozas develops chip testing and calibration software and tests it remotely on a test stand at CERN
 - The group aims at having a local test stand and cooperates with VU Institute of Photonics and Nanotechnologies and the Experimental Nuclear and Particle Physics Center
 - Execution of CMS M&O activities (central shifts at P5 or remote, CMS paper institutional review)
 - Outreach

M. Ambrozas at CERN

Student internships at CERN to work on Pixel Phase-II Upgrade under supervision of S. Mersi:

- 2 months in 2019, 1 month in 2022, 0,5 month planned in 2023



M. Ambrozas and K. Silius at CERN in 2022

Thank you !

Back-up slides

Future plans: testing lab

1. PhD student Marijus Ambrozas currently works on **characterization and calibration of the RD53B CMS chip**
 - He has contributed to the development of the Ph2_ACF software and is involved in testing its latest features. Having remote access to a test stand at CERN, he uses Ph2_ACF and own scripts to test chip performance and calibration
 - This is a part of his PhD thesis work
 - We plan on creating a **test stand site** at Vilnius University in 2023-2024. This would allow to involve undergraduate students
 - With the allocation of additional experienced researchers (including a certified rad-worker), there is a possibility to use X-ray or radioactive sources for testing and calibration purposes
 - The details will be worked out as time goes