

Vilnius University and CMS



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Presented at the 1st Baltic CERN Group meeting in Riga, Latvia

- ▶ Administrative structure of Lithuanian cooperation with CERN and CMS
- ▶ Vilnius University collaboration with CMS
 - ▶ IT participation
 - ▶ Physics participation in
 - ▶ Detector performance groups (DPG)
 - Past (HCAL), current (GEM) and prospect (MIP PTD or HGAL?)
 - ▶ Physics data analysis
 - ▶ Institutional reviews of physics papers
 - ▶ Experimental physics responsibilities (EPR) and shifts@P5
- ▶ Students @ CERN
 - ▶ most of them are at CMS
- ▶ Outreach activities



Lithuanian-CERN agreement nominated the Lithuanian Academy of Sciences to represent Lithuania

Lithuanian Institutions in CMS collaboration

1. Lithuanian Academy of Sciences
(administrative)

The Lithuanian Team Leader dr. A. Bernotas

2. Vilnius University

Deputies: prof. A. Juozapavičius and dr. L. Bukauskas
(both from Faculty of Mathematics and Informatics)



Faculty of Mathematics and Informatics

- ▶ Very active participant



Faculty of Physics

1. Experimental Nuclear and Particle Physics Centre
 - ▶ New since 2017. Coordination of collaboration
2. Institute of Theoretical Physics and Astronomy
 - ▶ Active participant. ("TFAI" in Lithuanian)
3. Institute of Photonics and Nanotechnology
 - ▶ Since 2017. Former Institute of Applied Research + Department of Semiconductors

- ▶ **Info from:** <http://www.ff.vu.lt/en/cern/researchers-teams/>
- ▶ Team leader: **prof. Algimantas Juozapavičius**
- ▶ **Current research activities**
 - ▶ LHC CMS Data Acquisition Systems (DAQ)
 - ▶ LHC CMS databases and tools for Detector configuration, calibration and alignment
 - ▶ LHC CMS Data Monitoring and Physics Data Certification
 - ▶ LHC CMS Run Coordination
- ▶ **Field of interest within the Center?**
 - ▶ LHC CMS Data Acquisition Systems (DAQ)
 - ▶ LHC CMS Data Monitoring and Physics Data Certification
 - ▶ Data Science and Machine learning methods at HEP
- ▶ **Available resources (Instrumentation, irradiation facilities etc.)**
 - ▶ 3x low-end desktop computers
 - ▶ Virtual server infrastructure within FMI

Several Lithuanians work at CERN on CMS DAQ, PPD/PdmV, CMSSW, etc. Not necessarily associated to Vilnius University.

D.Abdurachmanov, D.Bugelskis, A.Norkus, D.Šimelevičius, M.Stankevičius, and others



- ▶ **Focus: Collaboration-wide development and support**

V.Rapševičius info

- ▶ **CMS Online Monitoring System**

Development was initiated by CMS Run Coordination in the fall of 2016.

Since 2018 the project leadership is taken over by CMS DAQ group.

Deployment to production is planned in 2018.

Team of 2 researchers and 1 programmer from VU FMI works on the presentation layer.

- ▶ **CMS Central Data Certification support system (Run Registry)**

Set of applications were developed and are supported since 2009.

VU FMI supports the tool and is **looking for possibilities to proceed with upgrade in 2018**.

VU FMI researcher and doctoral student are involved in Data Certification Machine Learning effort.

- ▶ **CMS Detector Databases and Applications**

Since 2011, developed and supported by VU FMI.

Used by many sub-detectors at CMS: HCAL, Pixel, GEM, HGAL, Tracker, others about to join.

Working in close cooperation with FNAL (U.P.Joshi).



- ▶ Participation in **Detector Performance Groups** (VU representative in IB – A.Juodagalvis)
 - ▶ Hadron calorimeter (HCAL) 2014-2015 (officially not withdrawn)
 - ▶ FMI was involved in DB (they started earlier)
 - ▶ DPG task: Detector calibration using physics processes (A.Juodagalvis)
 - ▶ Gas electron multipliers (GEM) since December 2015
 - ▶ FMI was involved in DB (they started earlier)
 - Including help with online visualization tools
 - ▶ DPG tasks:
 - CMSSW interface between DCS, DAQ and DB, relation to AICaDB (A.Juodagalvis)
 - Optimization of gas composition for muon detectors (J.Tamulienė)
- ▶ Possible future involvements:
 - ▶ HGCal (since it contains Si, VU has experts on semiconductors) or
 - ▶ MIP Precision timing detector (fast scintillators, prof.G.Tamulaitis team)



- ▶ Participation in **CMS physics data analysis**
 - ▶ Standard-model physics Drell-Yan process differential cross-section measurement
 - ▶ Precision measurement of the dilepton $d\sigma/dm$, $d^2\sigma/dm \cdot dy$, with 2016 data maybe $d^3\sigma/dm \cdot dy \cdot dp_T$
 - ▶ Current cooperation with Seoul National University (Korea), University of Nebraska (USA), Panjab University (India), others
 - ▶ Since 2017, a BSc student M.Ambrozas learns the $e\mu$ method
 - ▶ A.Juodagalvis contributes since 2010
 - ▶ Earlier contributions:
 - ▶ Work on data/MC event efficiency scale factors in the electron channel (endorsed by EGammaWG)
 - ▶ Analysis of H and WH decays in the τ and/or μ channel (BSc and MSc student work)
- ▶ A.Juodagalvis, Th.Gajdosik and V.Dūdėnas perform **VU institutional reviews of the CMS physics papers**



- ▶ Points of experimental physics responsibility (EPR) by members of Vilnius University are obtained by performing DPG tasks
- ▶ Shifts at P5 are carried out since 2015
 - ▶ Pictures of A.Juodagalvis at DAQ and D.Jurčiukonis at DCS workplace below
 - ▶ Other IT students and specialists are also contributing. "It's a kind of magic..." (i.e. fun)



- ▶ Most students are working for CMS. Many Lithuanian students have foreign affiliations
- ▶ Each year **1 physics student** from VU participates in CERN Summer school since 2013
- ▶ **Many IT students** go to CERN by ERASMUS programme to carry out different tasks
- ▶ CMS maintains a special Twiki page
<https://twiki.cern.ch/twiki/bin/viewauth/CMS/LithuanianStudentsProgramme>
to present proposed projects for IT students from VU

Twiki >  CMS Web > WebPreferences > LithuanianStudentsProgramme (2017-12-01, AndreasPfeiffer)

 Edit  Attach  PDF

↓ [Project pages](#)

↓ [Guidelines for Requestors](#)

Lithuanian students come to CERN for 3 month periods and are well prepared for technical software and computing projects. They are assigned by Professor Algimantas Juozapavicius, Vilnius University director of the Digital Science and Computing Center to the projects proposed based on the best match to the students skills and interests. Usually we get highly motivated and highly skilled students.



- ▶ Everyone being in contact with CERN can belong to Lithuanians@CERN community
- ▶ **The community**
 - ▶ has a dedicated mailing list
 - ▶ has own Facebook page <https://www.facebook.com/pg/lithuanians.at.cern/>
 - ▶ organizes semi-regular meetings <https://indico.cern.ch/event/700914/>
 - ▶ Practice students present their final work at the meeting before they leave CERN
 - ▶ plans to have a separate web-page with useful information for newcomer students
- ▶ It organized “CERN/CMS Computing and Technology Workshop” in Vilnius in 2016
 - ▶ <https://indico.cern.ch/event/587426/>



- ▶ **CMS virtual visits**

- ▶ Last event was during CERN Researcher's night
<https://www.facebook.com/events/1835572136756930/>

- ▶ In March the first **CMS Physics MasterClass** event will be hosted by Vilnius University

- ▶ March 23, 2018 is the day!

- ▶ Collaboration with a commercial news portal "Lithuanian News" Izinios.lt to put information about the upcoming events

- ▶ e.g. announcement before the last CMS virtual visit

[https://www.izinius.lt/izinius/Mokslas-ir-svietimas/tyreju-nakties-renginiuose-virtualus-
cern-vizitas/250206](https://www.izinius.lt/izinius/Mokslas-ir-svietimas/tyreju-nakties-renginiuose-virtualus-cern-vizitas/250206)





Thank you for your attention!