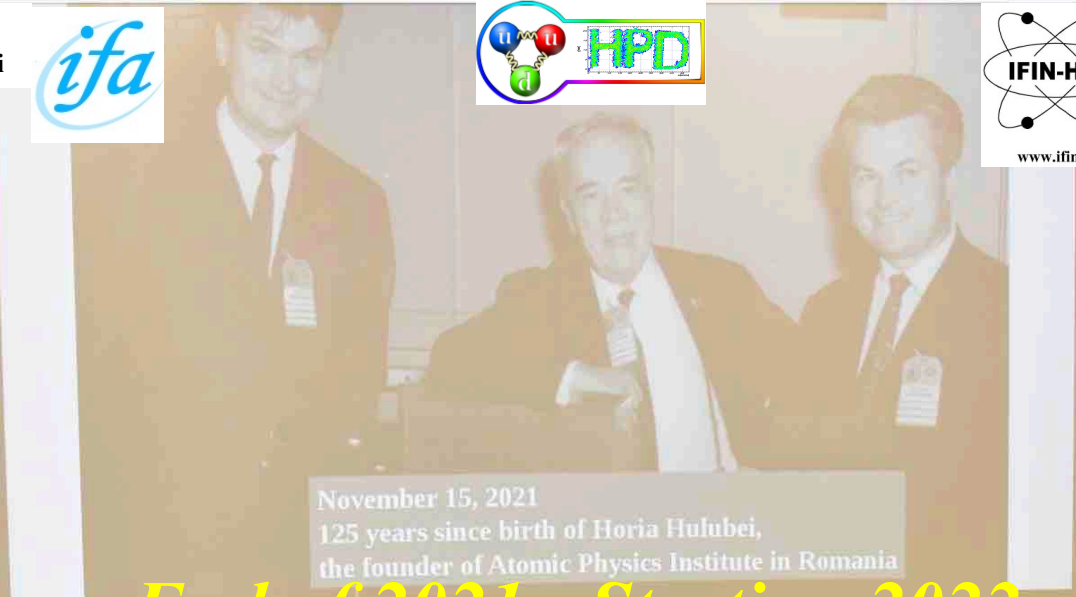
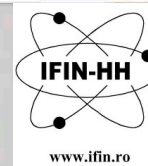
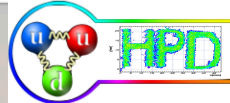




Ministerul Cercetării,
Inovării și Digitalizării



November 15, 2021
125 years since birth of Horia Hulubei,
the founder of Atomic Physics Institute in Romania

End of 2021 - Starting 2022



Hadron Physics Department

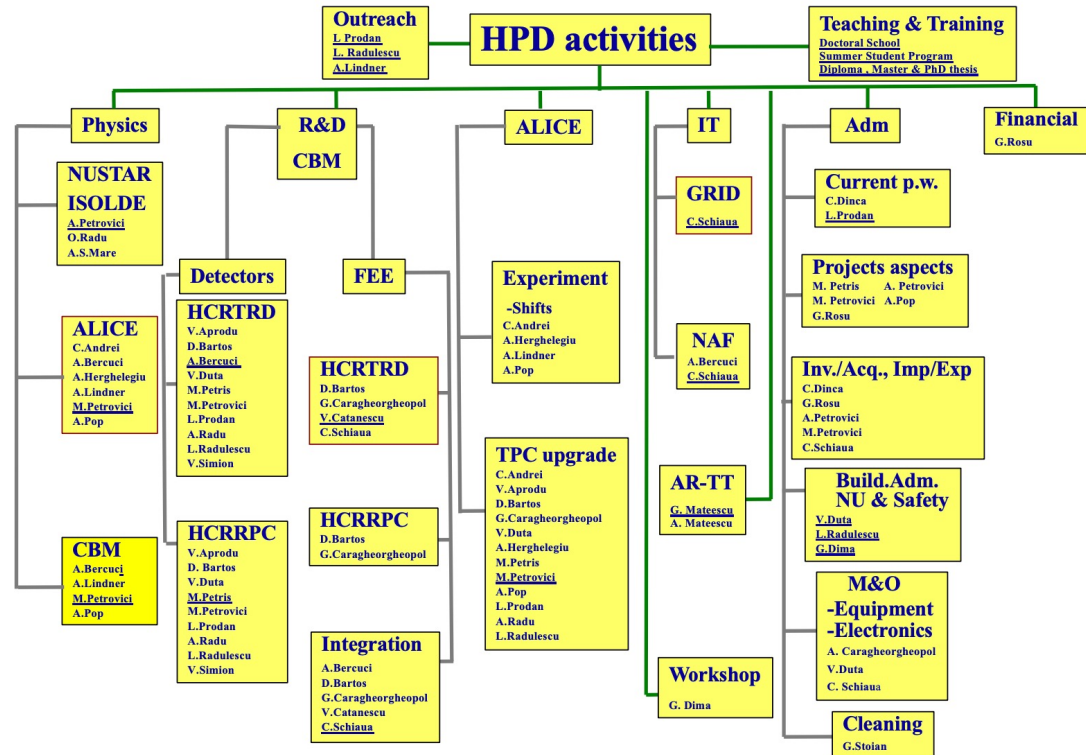
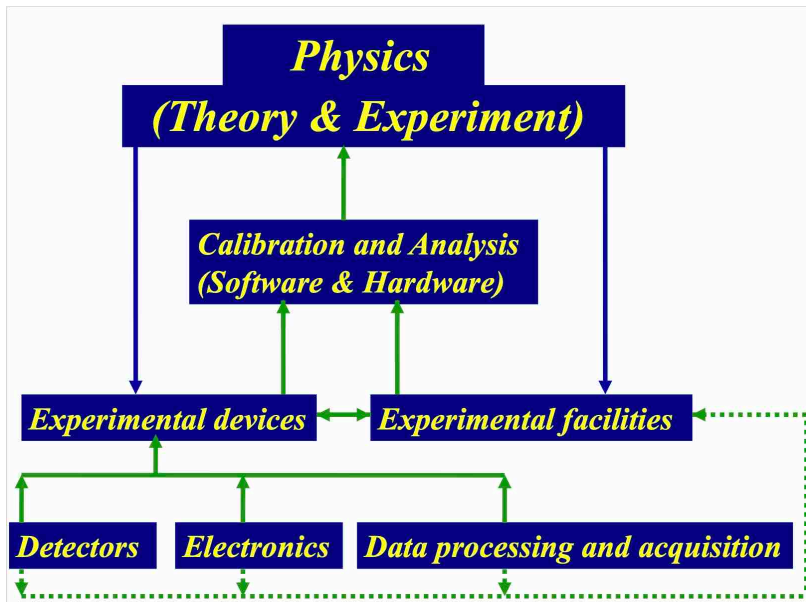
January 10, 2022

2021 achievements

Outlook

- *Physics*
- *R&D related to the CBM Experiment at FAIR*
- *Applied Physics & Technological Transfer*
- *Training & Teaching*
- *Financial aspects*
- *A critical review of our planning*
- *Final considerations*

Organizational chart of Hadron Physics Department



Nuclear Structure and Dynamics

Nuclear Structure and Dynamics

Studied of the isospin mixing on:

- **Coulomb energy differences (CED)**
- **mirror energy differences (MED),**
- **triplet energy differences (TED)**
- **super-allowed Fermi β^+ -decay**

in the $A = 62$ (Ge Ga Zn) isovector triplet

in the yrast states up to spin 4^+ of these nuclei and

the Fermi -decay of the ground states of

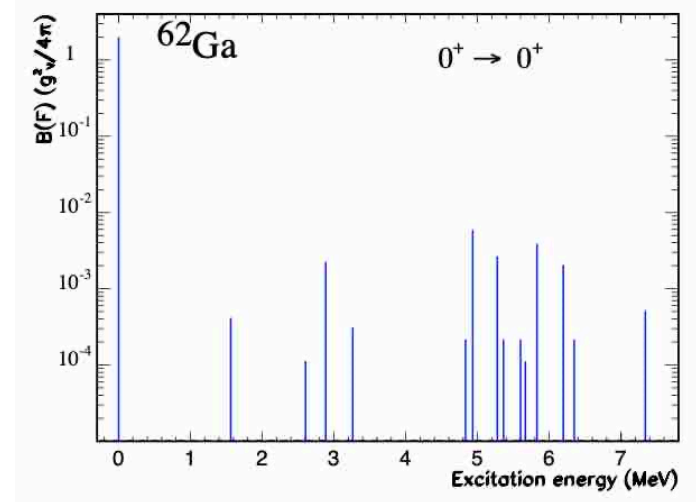
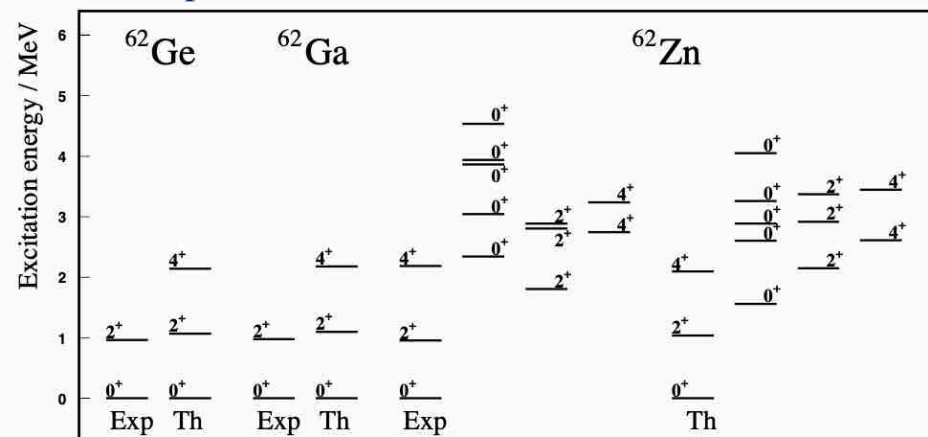
^{62}Ge and ^{62}Ga in the framework of the complex

Excited VAMPIR (EXVAM) model using an effective

interaction obtained from a G-matrix renormalised for the

$A \approx 70$ mass region starting from the charge-dependent

Bonn CD potential.



We have found that the **depletion of the ground-to-ground transition** amounts to 0.74% for the ^{62}Ge and 0.75% for the ^{62}Ga ground-state decay and **the missing strength is distributed over many 0^+ excited states**

- 3 papers in collaboration with experimentalists - 2 sent for publication, 1 in progress

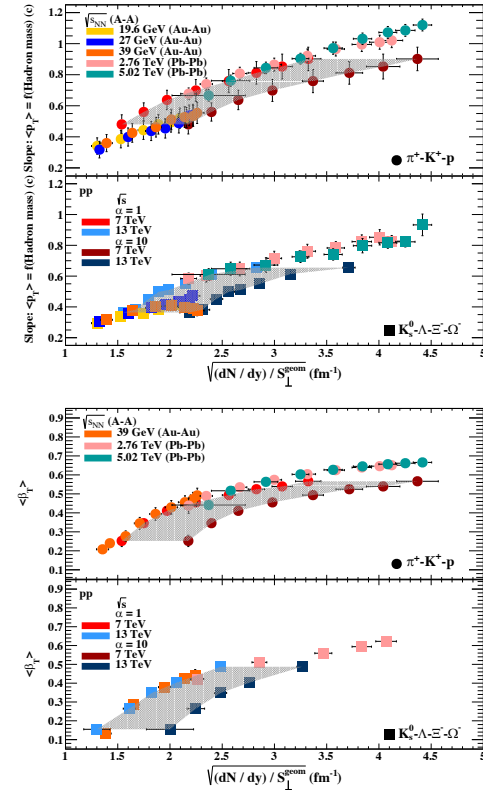
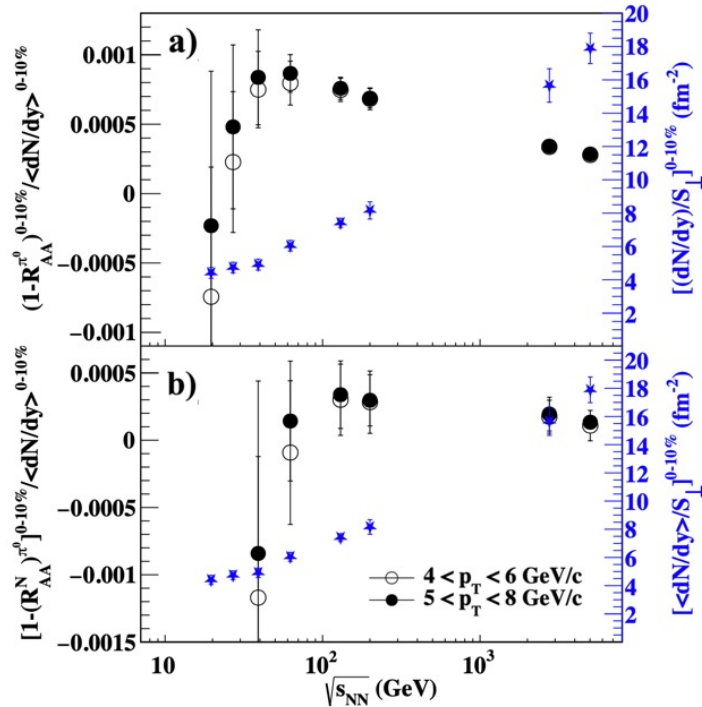
- 1 oral presentation at CSS - 2021

Strongly Interacting Matter

Strongly Interacting Matter - ALICE Physics

The trends in the experimental data suggest a change in the properties of the deconfined matter from RHIC to LHC energies.

Geometrical scaling for strange and multi-strange hadrons



Phys. Rev. C 103(2021)034903

Poster at EPS-HEP2021

<https://indico.desy.de/event/28202/contributions/105848/>

Oral presentation at the 22nd Conference - PANIC 2021

<https://indico.lip.pt/event/592/contributions/3315/>

PoS(PANIC2021)197

Strongly Interacting Matter - ALICE Physics

PhD Thesis

UNIVERSITY OF BUCHAREST

PH.D. THESIS

**Study of collective type phenomena in
p+p collisions at the highest energy
accessible at LHC using the ALICE
experimental set-up**

Author:

Mădălina-Gabriela TĂRZILĂ

Supervisor:

Prof. Dr. Mihai PETROVICI

*This thesis fulfils the requirements for the degree of Doctor in Philosophy of
Physics Faculty, University of Bucharest*

It was carried out in the "ALICE" group

of Hadron Physics Department

*of the National Institute for Physics and Nuclear Engineering-Horia Hulubei,
Bucharest, Romania*

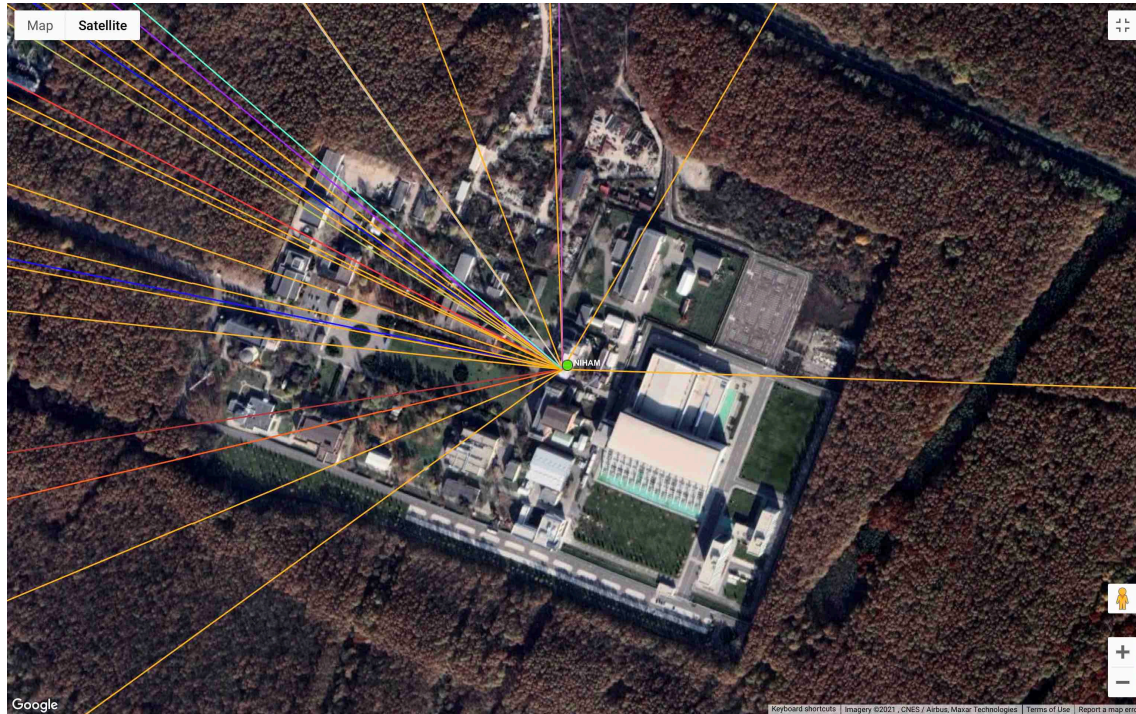
Hadron Physics Department

Bucharest, 2021

- Charged particle transverse momentum spectra as a function of unfolded charged particle multiplicity, event sphericity and azimuthal angle relative to the leading particle in pp collisions at $\sqrt{s} = 7$ TeV
 - Spectra weekly meeting, 5 July 2021
<https://indico.cern.ch/event/1056062/>
 - Spectra weekly meeting, 26 July 2021
<https://indico.cern.ch/event/1060729/>
 - *Internal Note*
 - *Paper proposal*

- Studies of two charged particles correlations as a function of multiplicity and sphericity in pp collisions at $\sqrt{s} = 7$ TeV.
 - *Internal Note ready*
 - *Systematic errors estimate - in progress*

Strongly Interacting Matter - ALICE GRID



Contribution to ALICE GRID

Done jobs - NIHAM:

- $5.4 \cdot 10^6$
- 6.1 % of total Tier2 ALICE contribution

CPU:

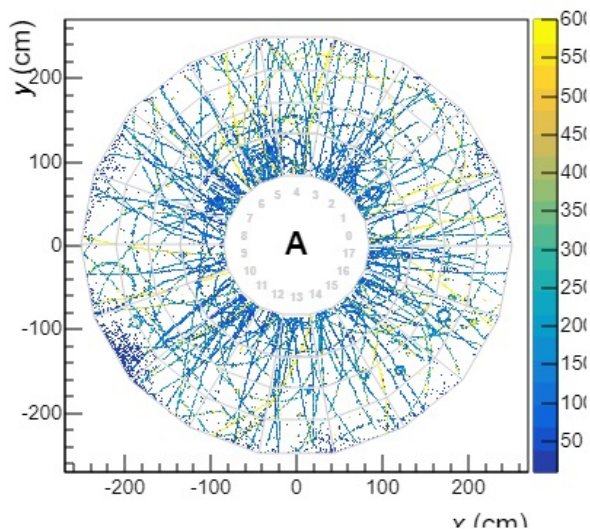
- 8.7 Mhours
- 3.3 % of total Tier2 ALICE contribution

- New UPS stations - installed

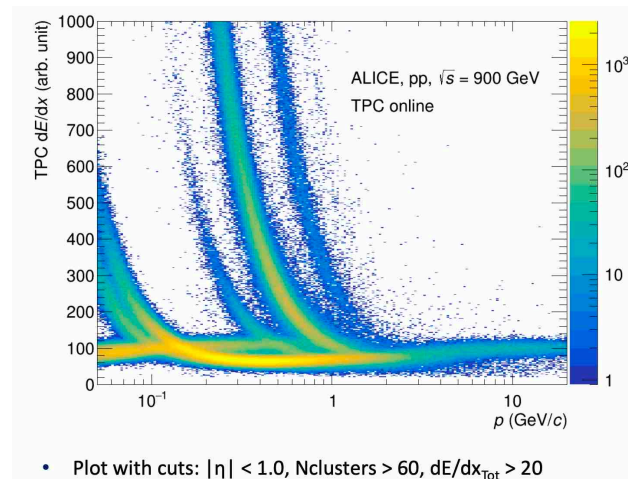
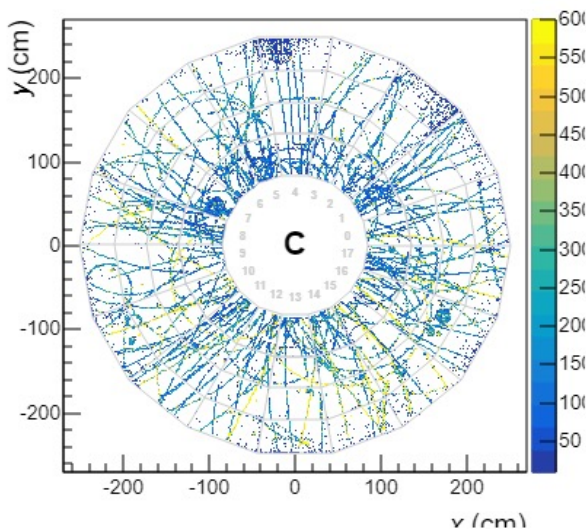
- A new cooling station - in progress

Strongly Interacting Matter - ALICE upgraded TPC

Q Tot (A-Side)



Q Tot (C-Side)



*After close to 3 years of LS2, yesterday, Wednesday, October 27, 9:20 a.m.
first stable beam in LHC, injected from SPS, was obtained.*

A screen shot from very first tracks recorded with the upgraded ALICE-TPC.

*Worth mentioning that 50% of the Outer Read Out Chambers (OROCs) of ALICE-TPC,
based on GEM technology, delivering the information on which such reconstructed
tracks are obtained, were assembled and tested in the Hadron Physics Department*

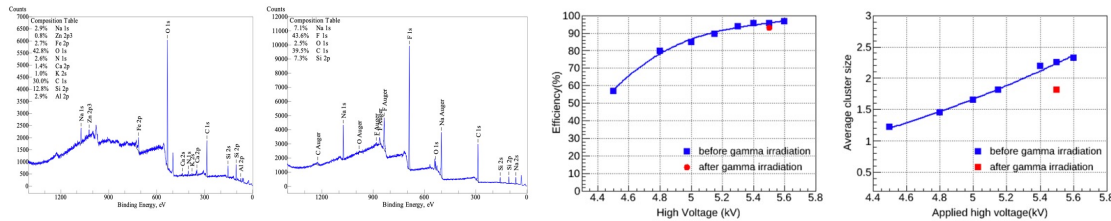
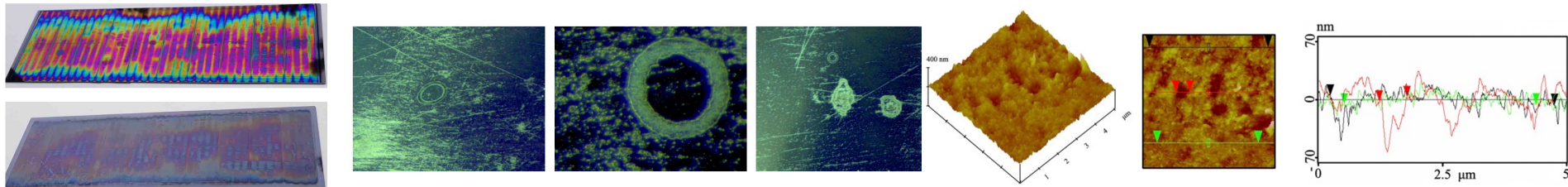
JINST 16 (2021) P03022

*R&D Activities
&
Steps towards construction & tests
of
CBM ToF & TRD subdetectors
for
CBM Experiment @ FAIR*

Strongly Interacting Matter - R&D

CBM-ToF

Studies of the irradiation hardness of
Multi Strip Multi Gap Resistive plate Counters
using Multipurpose Irradiation Facility of IFIN-HH



Probe	R_V ($G\Omega \cdot cm$)	R_S ($G\Omega/\square$)
irradiated cathode surface	67.4	20.0
irradiated anode surface	61.5	21.1
non-irradiated glass	65.2	20.2

Nuclear Inst. and Methods in Physics Research, A 1024 (2022) 166122



Contents lists available at ScienceDirect

Nuclear Inst. and Methods in Physics Research, A

journal homepage: www.elsevier.com/locate/nima



Ageing studies of Multi-Strip Multi-Gap Resistive Plate Counters based on low resistivity glass electrodes in high irradiation dose

D. Bartos^a, C. Burducea^c, I. Burducea^c, G. Carageorghopol^a, F. Constantin^c, L. Craciun^c, D. Dorobantu^a, M. Ghena^e, D. Iancu^c, A. Marcu^e, G. Mateescu^a, P. Mereuta^c, V. Moise^b, C. Negri^d, D. Negut^b, M. Petris^a, M. Petrovici^{a,*}, L. Radulescu^a, V. Aprodu^a, L. Prodan^a, A. Radu^a, G. Stoian^a

^a Hadron Physics Department, National Institute for Physics and Nuclear Engineering - IFIN-HH, P.O. Box MG-6, Bucharest-Magurele, Romania

^b Multipurpose Irradiation Centre, National Institute for Physics and Nuclear Engineering - IFIN-HH, P.O. Box MG-6, Bucharest-Magurele, Romania

^c Applied Nuclear Physics Department, National Institute for Physics and Nuclear Engineering - IFIN-HH, P.O. Box MG-6, Bucharest-Magurele, Romania

^d National Institute of Materials Physics, INCDPM, P.O. Box MG-7, Bucharest-Magurele, Romania

^e Institute for Laser, Plasma and Radiation Physics - INFLPR, P.O. Box MG-36, Bucharest-Magurele, Romania



Diploma Work



UNIVERSITATEA DIN
BUCUREȘTI



FACULTATEA DE FIZICĂ

TITLUL TEZEI

LUCRARE DE LICENȚĂ

Absolvent
Daniel-Ioan DOROBANȚU

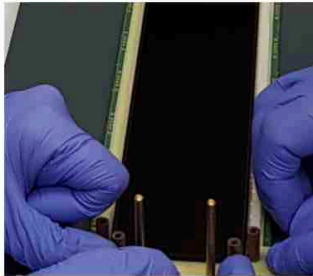
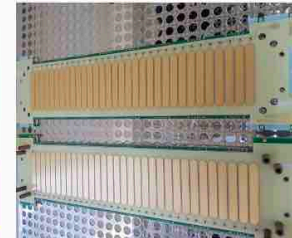
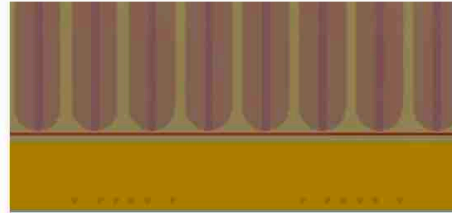
Conducător științific
Prof. dr. Mihail PETROVICI
CS II dr. Mariana PETRIȘ
Prof. dr. Alexandru JIPA

Strongly Interacting Matter - R&D

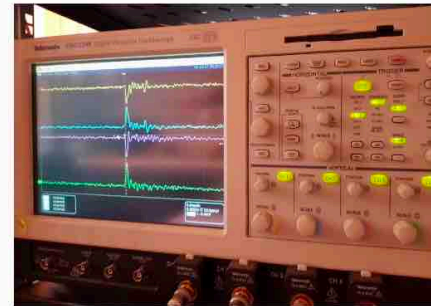
CBM-ToF

First prototype with a directed flow - design consideration and assembling -

- Directed gas flow through the gas gaps.
- 5.6 cm strip length instead of 6 cm (previous ones).
- Spacers run across the strips, not along the strips, as for previous counters.
- Spacers positioned outside the electric field area.



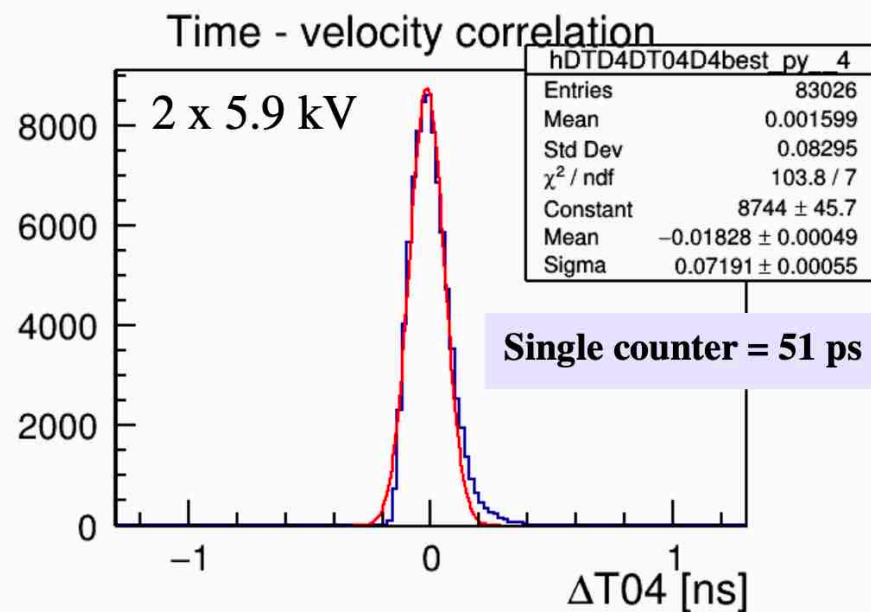
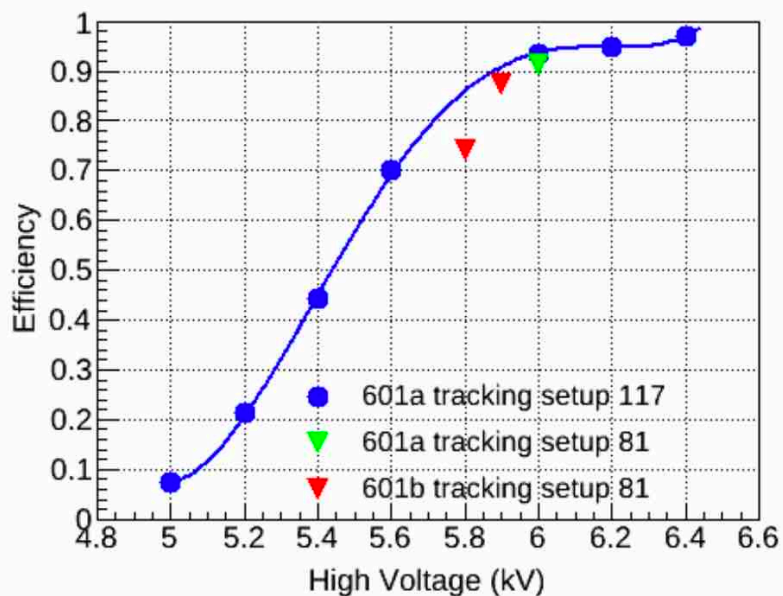
HV conditioning & first signals



Strongly Interacting Matter - R&D

CBM-ToF

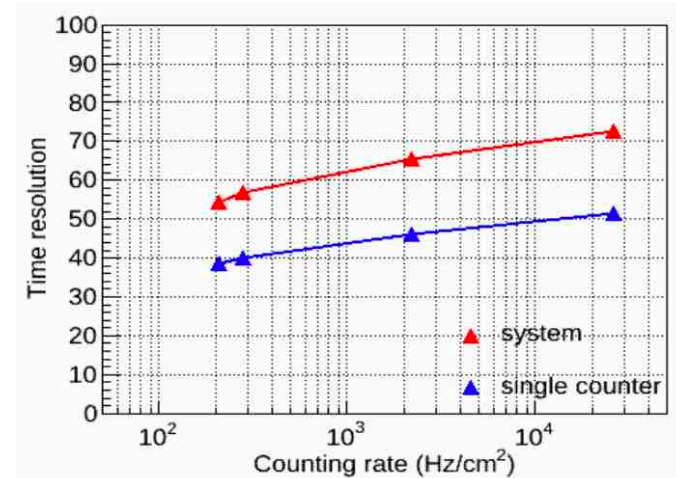
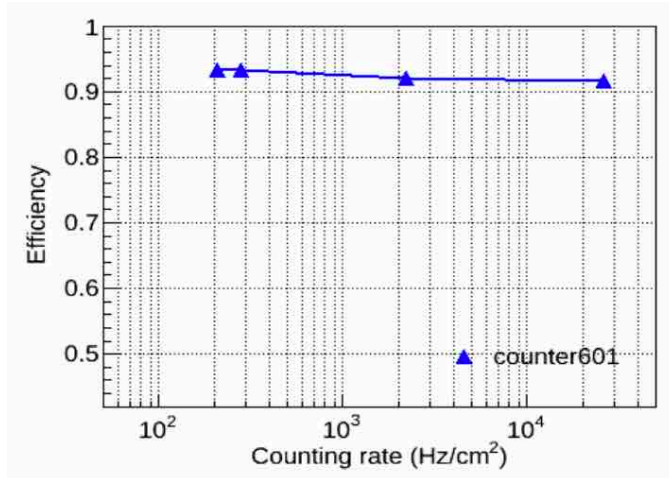
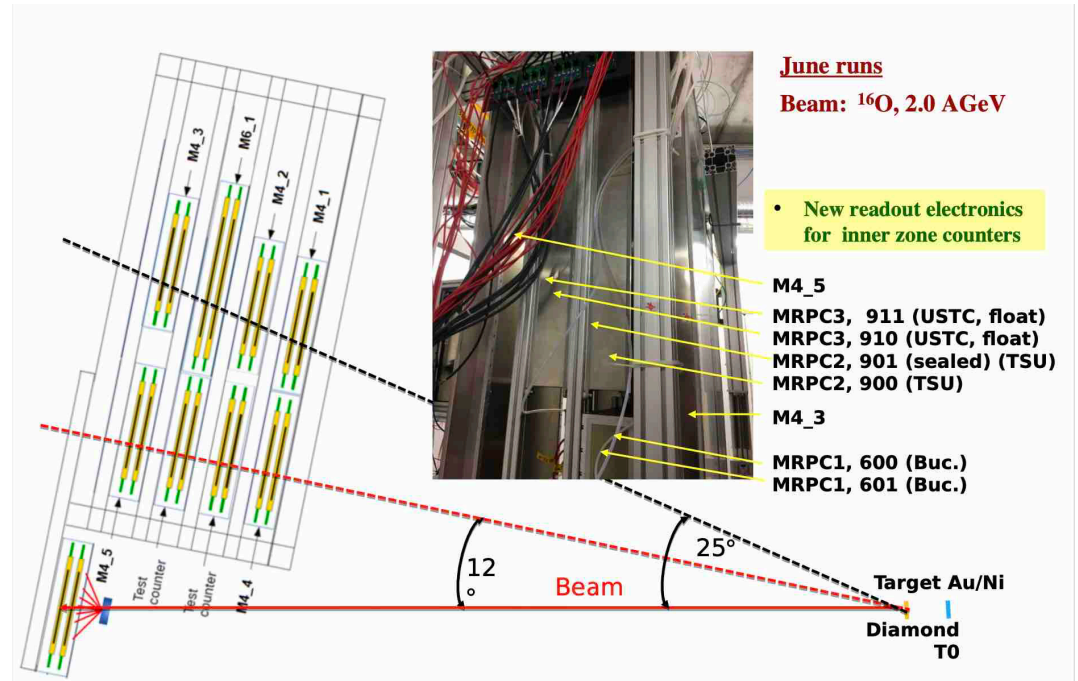
July mCBM@SIS18 beam - test → preliminary results



Strongly Interacting Matter - R&D

CBM-ToF

High counting rate tests in mCBM - 2021

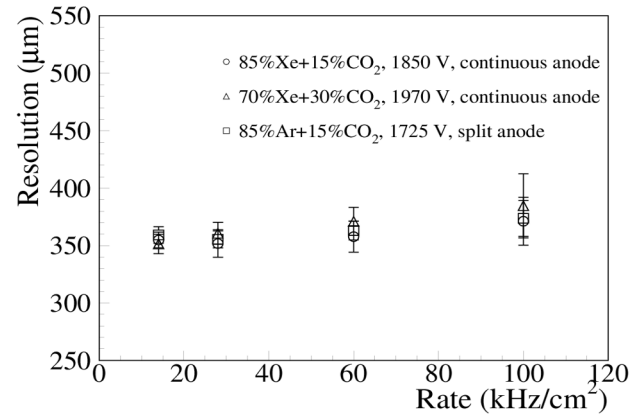
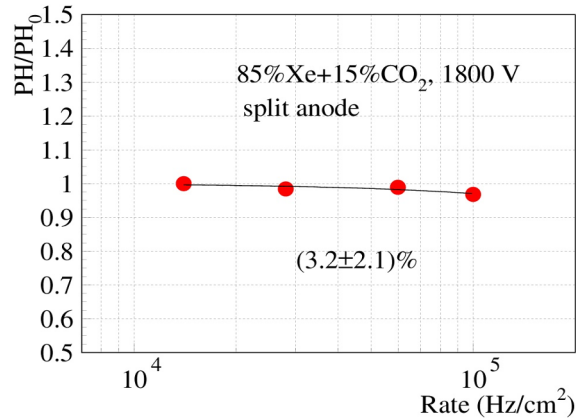
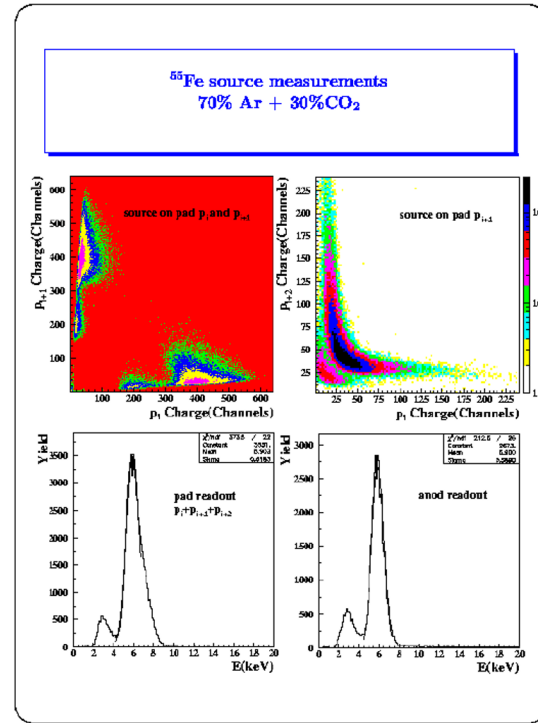
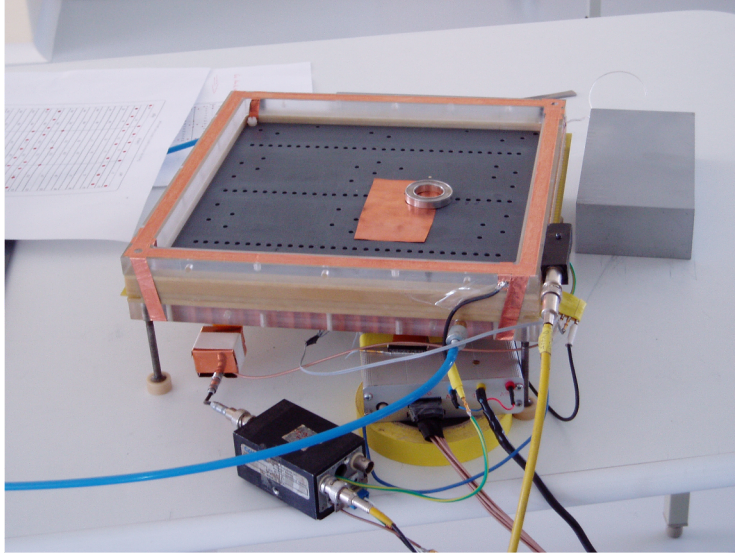


Strongly Interacting Matter - R&D

CBM-TRD

A 17 years R&D period ...

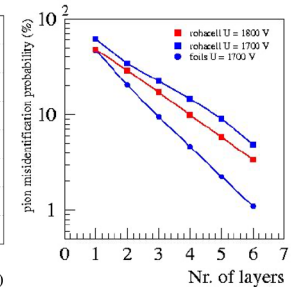
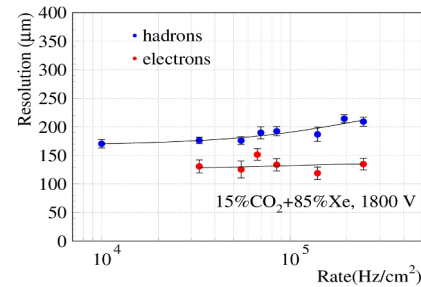
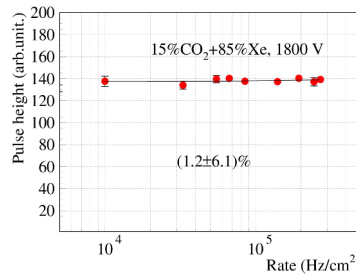
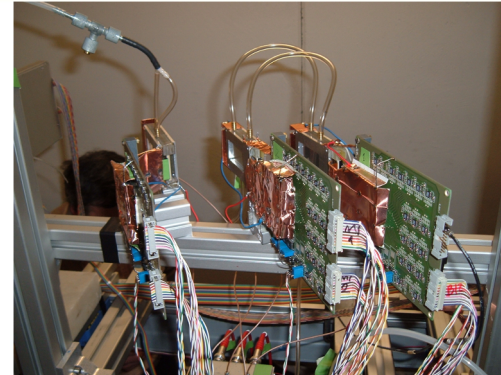
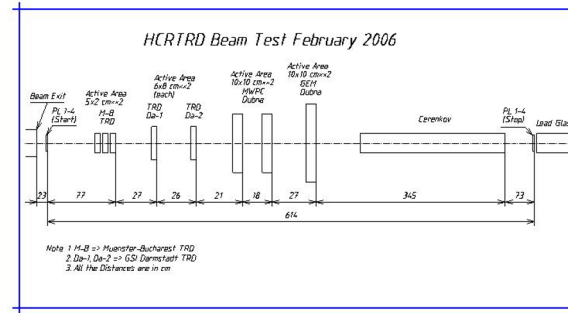
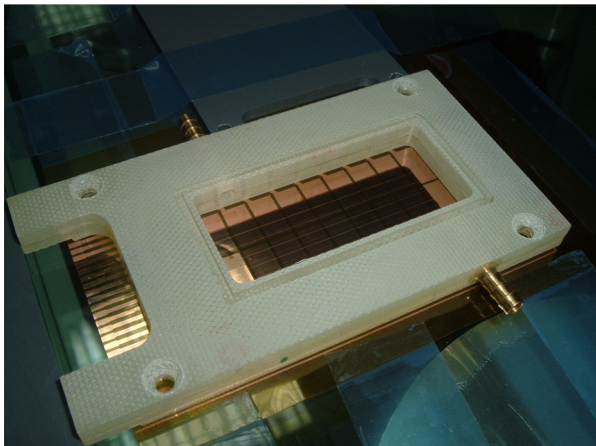
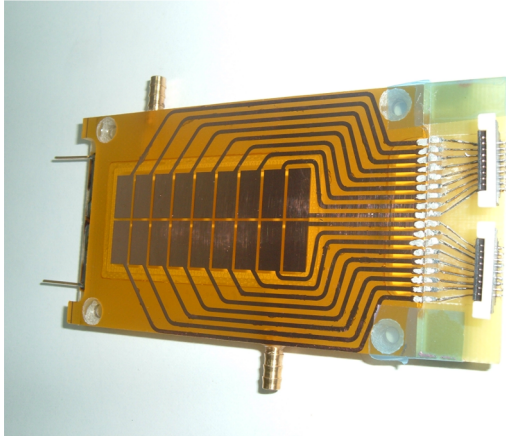
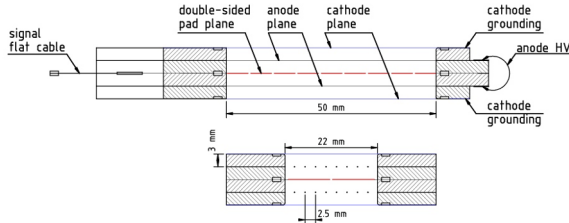
2004 - very first prototype



Strongly Interacting Matter - R&D

CBM-TRD

High Counting Rate TRD – second prototype - 2006

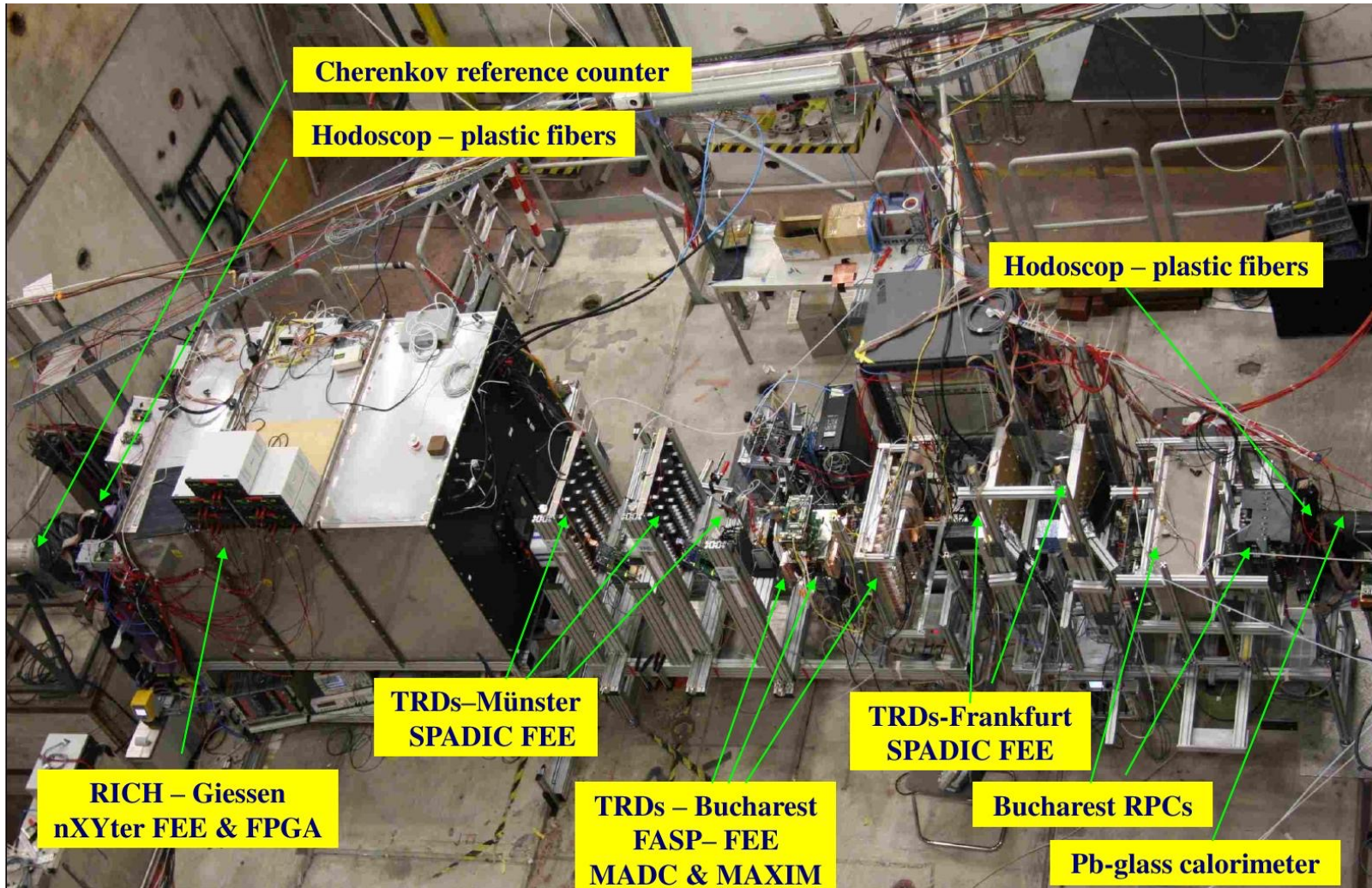


- 4 NIM, 2 Rom. Journal of Phys, int. conferences

Strongly Interacting Matter - R&D

CBM-TRD

In-beam tests @ PS-CERN - 2012



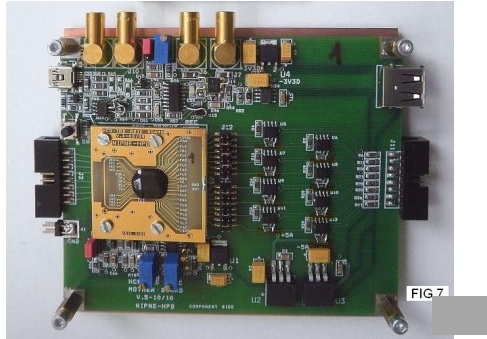
- 4 NIM, 2 Rom. Journal of Phys, int. conferences

Strongly Interacting Matter - R&D

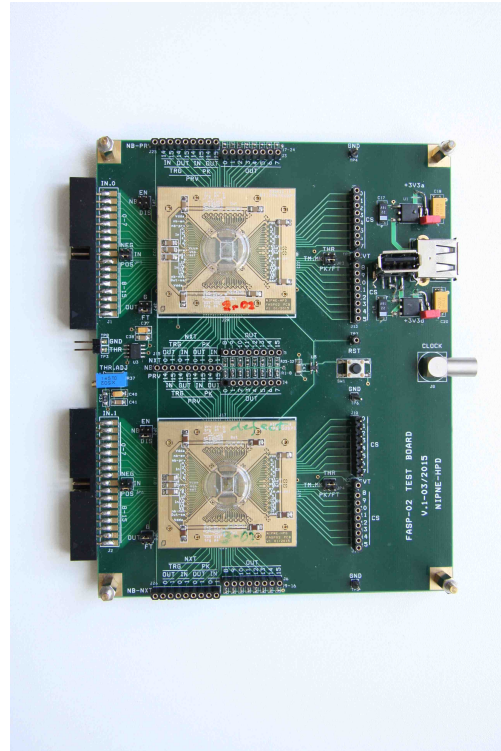
CBM-TRD

FEE - FASP

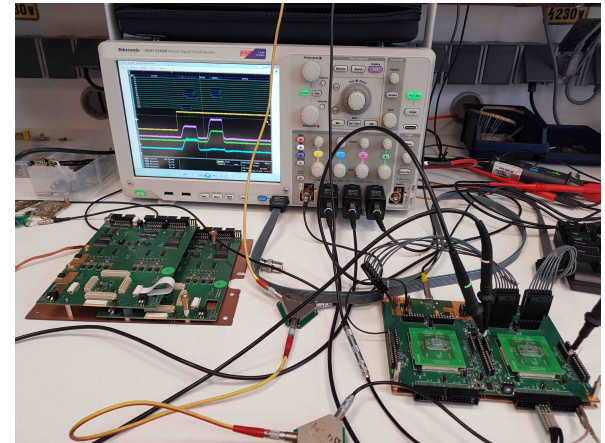
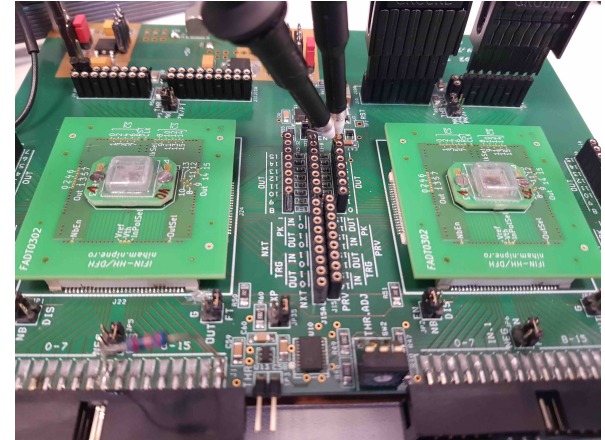
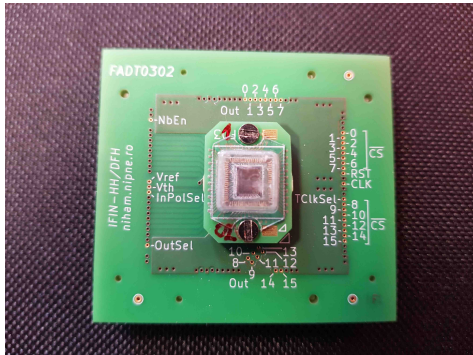
FASP_01



FASP_02



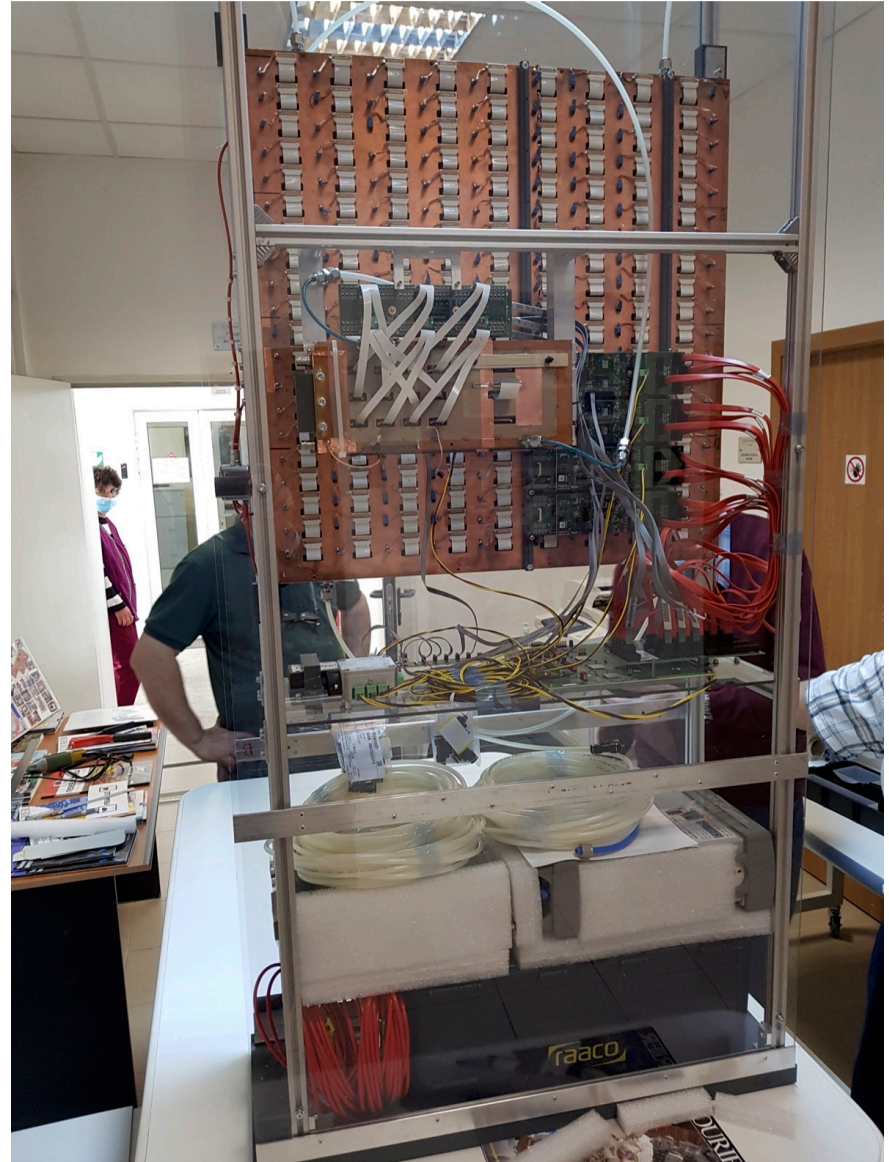
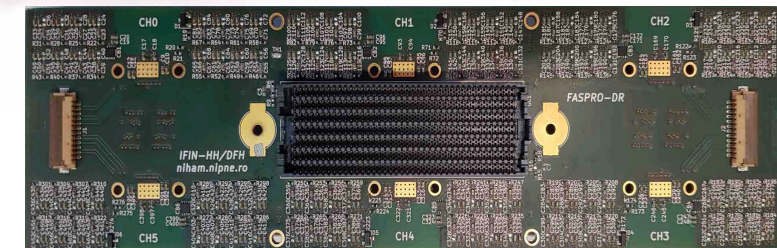
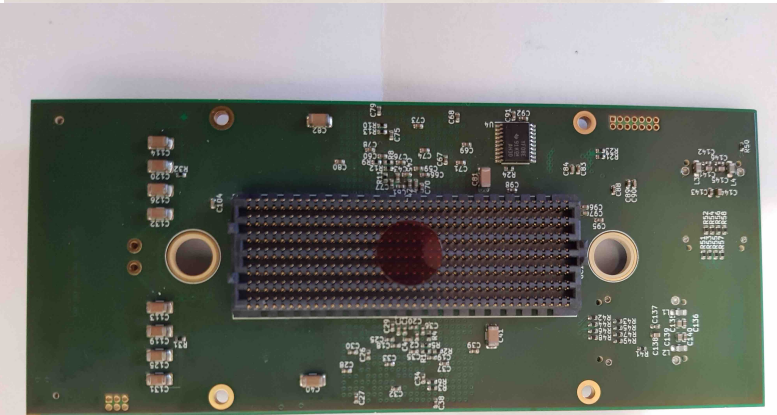
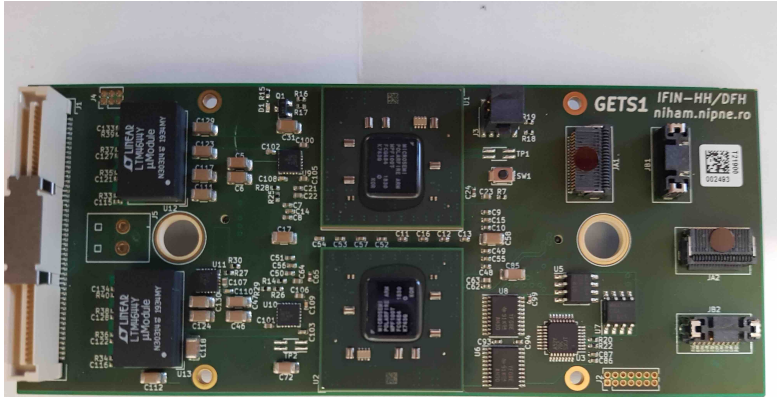
FASP_03



Strongly Interacting Matter - R&D

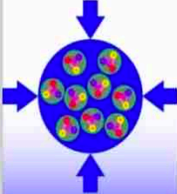
CBM-TRD

Buch. DAQ compatible with CBM



Finalized in:

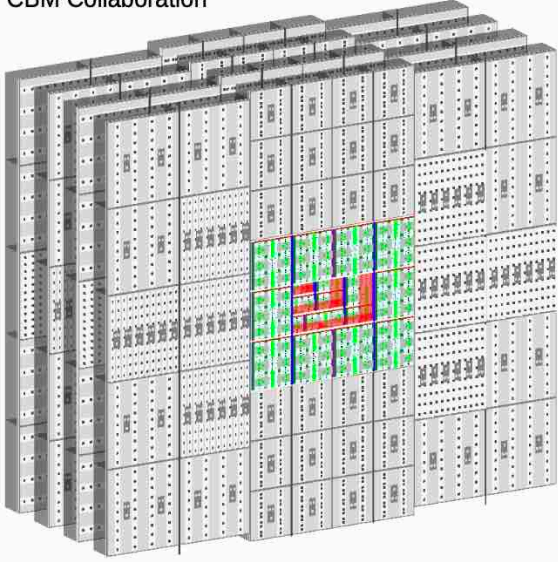
From CBM-TRD TDR alternative solution to CBM-TRD-2D TDR Addendum



**Technical Design Report
for the CBM**

**ADDENDUM
Transition Radiation Detector 2D
(TRD-2D)**

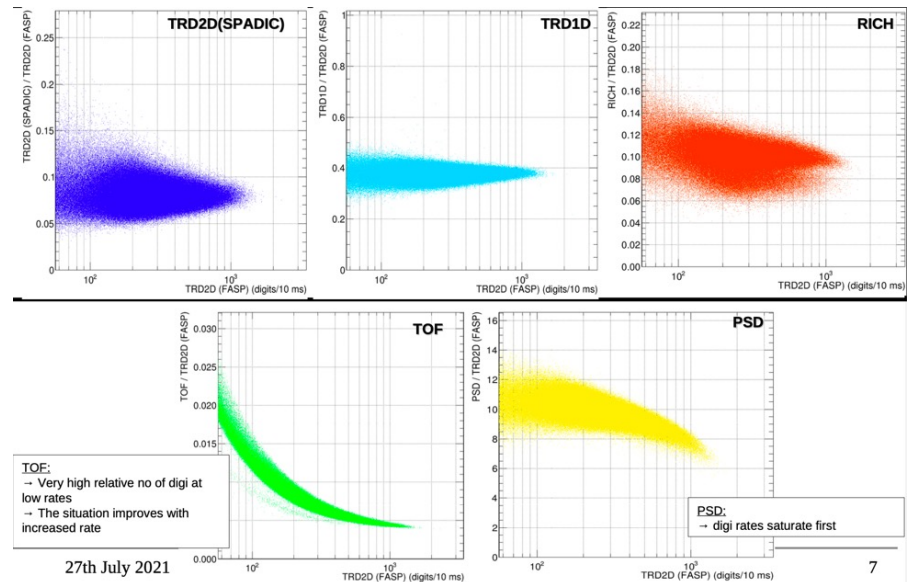
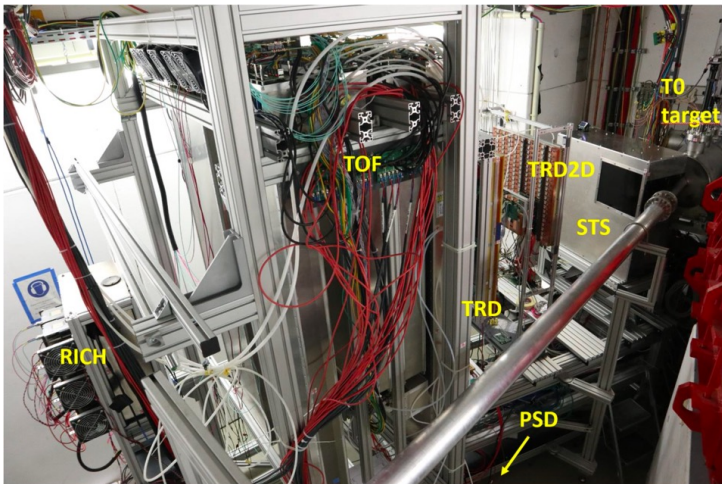
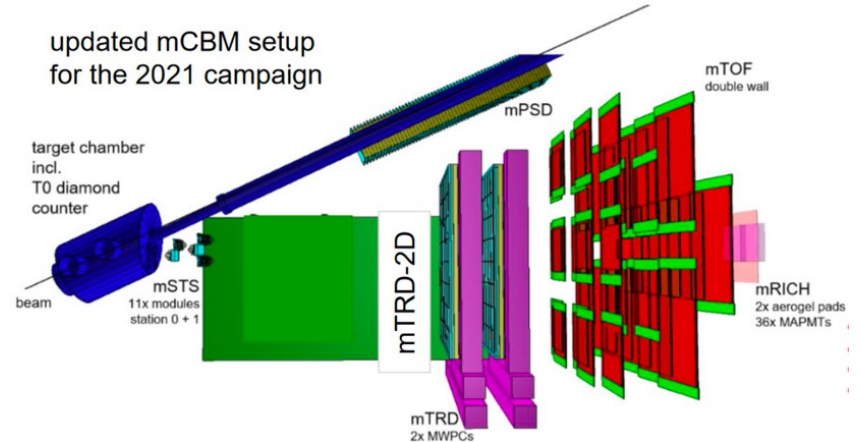
The CBM Collaboration



Compressed Baryonic Matter Experiment

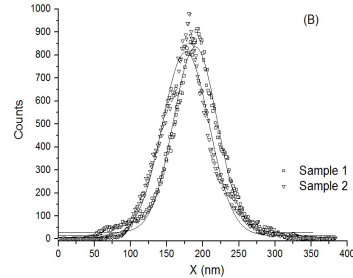
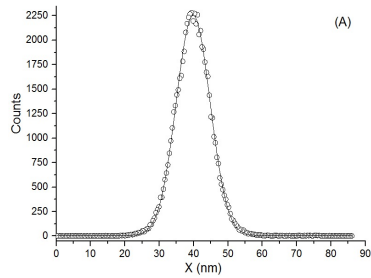
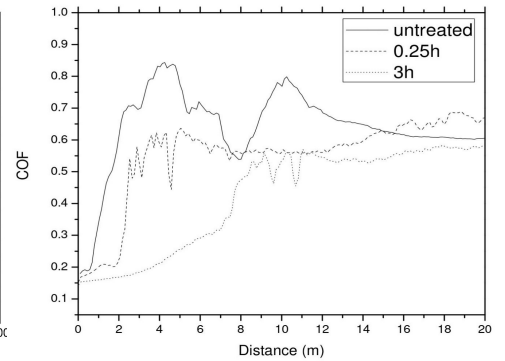
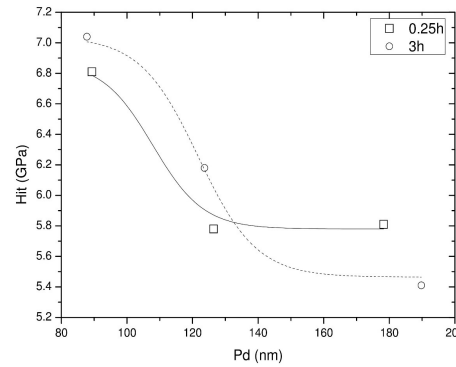
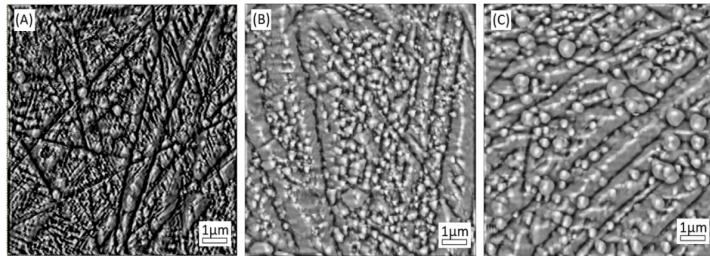
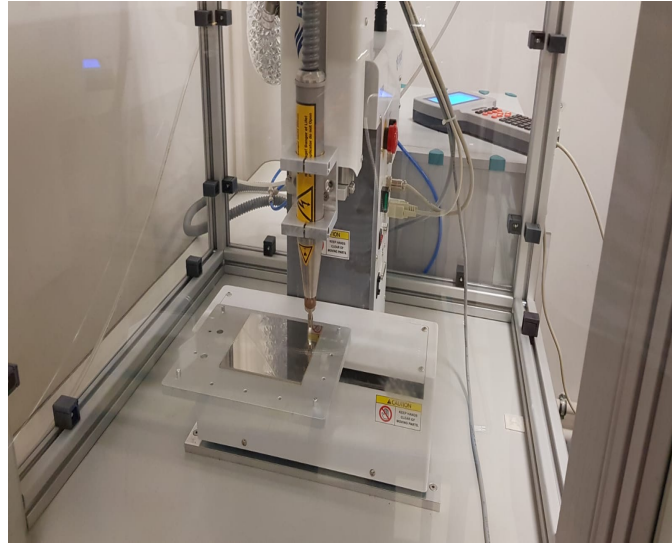
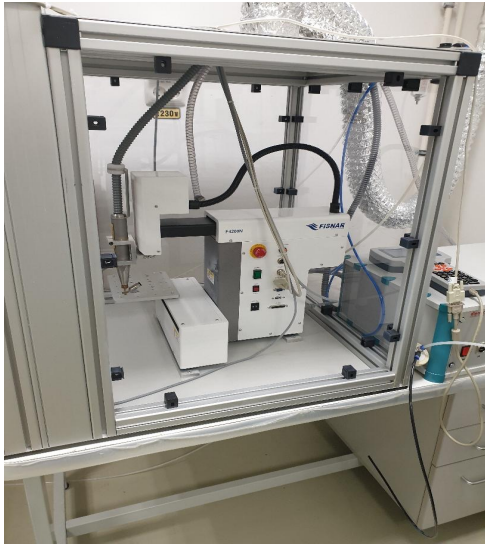
February 2021

TRD-2D in mCBM FAIR Phase0 @ SIS18 2021



*Applied Research
&
Technological Transfer*

Open Atmosphere Cold Plasma Surface Treatment



Materials 14(2021)4836

<https://doi.org/10.3390/ma14174836>

Stainless Steel Surface Nitriding

*ISI publications,
Conferences, Reports, Meetings*

- 34 ISI papers
- 9 conferences
- 1 TDR
- 2 ISAB reports
- 36 presentation within ALICE and CBM Collaborations
- 6 research reports for Projects in National Programs
- Reviewers:
 - Phys. Rev. C
 - Nucl. Phys.
 - Eur.J.Phys.
 - Physica Scripta
 - Nucl. Instr. and Meth. A
 - Annalen der Physics
 - Modern. Phys. Lett. A
 - Rom. Jour. of Phys.
 - ALICE Inst. Review.

Training, teaching

- 2 PhD students
- 2 master students

Outreach activities in HPD

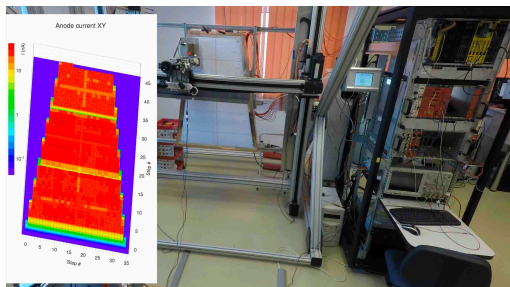


*Charge d'Affaires ad-interim
of American Embassy in Romania*



German students visit

HPD 2022 calendar



ALICE-TPC upgrade movie

<https://www.facebook.com/211078852968333/videos/582740123099895>

HADRON PHYSICS DEPARTMENT
wishes you a succesful and happy 2022 year!

Hadron Physics Department
Horia Hulubei National Institute of Physics and Nuclear Engineering

Past Present Future

UNILAC LNS SIS 18 LHC FAIR

Hadron Physics Department
Horia Hulubei National Institute of Physics and Nuclear Engineering

HPD Courier no.4

CONTENTS

ACHIEVEMENTS

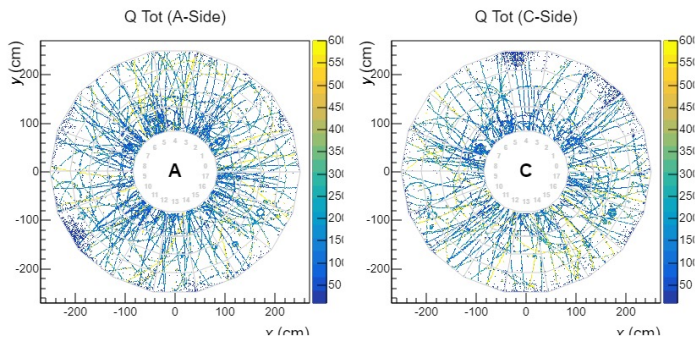
Nuclear Structure and Dynamics 2
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 Strongly Interacting Matter 4
 Charged particles and π^0 suppression in heavy ion collisions
 Geometrical scaling for strange and multi-strange hadrons
 R&D activities 10
 RPC - high counting rate & directed flow
 MSM/GRPC aging tests
 TRD-2D
 TRD-2D DAQ
 Improvement of mechanical, corrosion and wear resistance
 properties of stainless steel by surface nitriding in open
 atmosphere cold plasma

EVENTS

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 Theses
 International events

IN PROGRESS

HPD during COVID-19 13



*After close to 3 years of LS2, yesterday, Wednesday, October 27, 9:20 a.m.
first stable beam in LHC, injected from SPS, was obtained.*

A screen shot from very first tracks recorded with the upgraded ALICE-TPC.

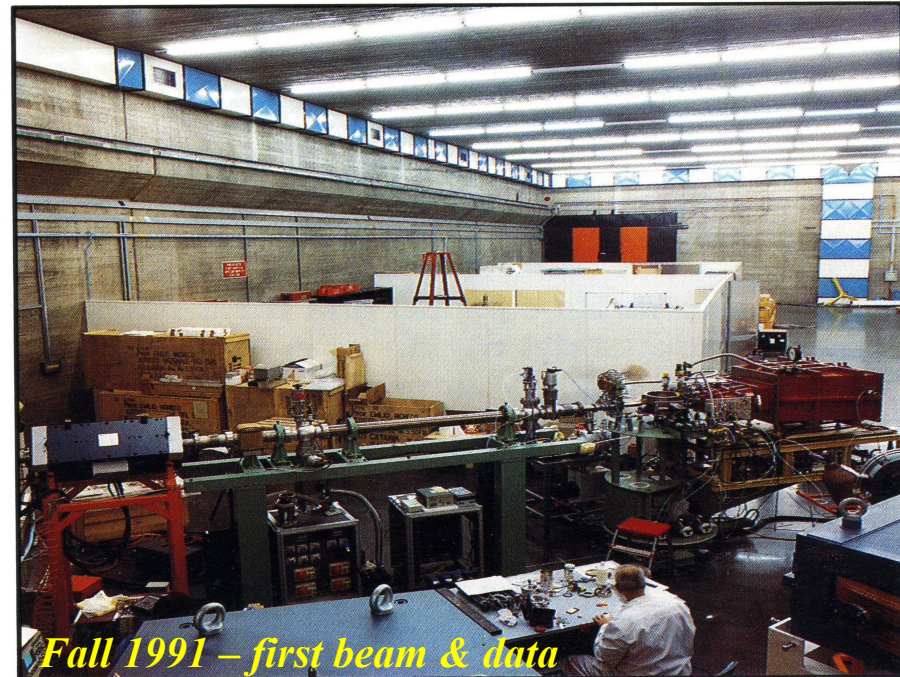
*Worth mentioning that 50% of the Outer Read Out Chambers (OROCs) of ALICE-TPC,
based on GEM technology, delivering the information on which such reconstructed
tracks are obtained, were assembled and tested in the Hadron Physics Department*

*2021 - 30th anniversary of the first experiment
done with DRACULA @ LNS Catania*

A successful story

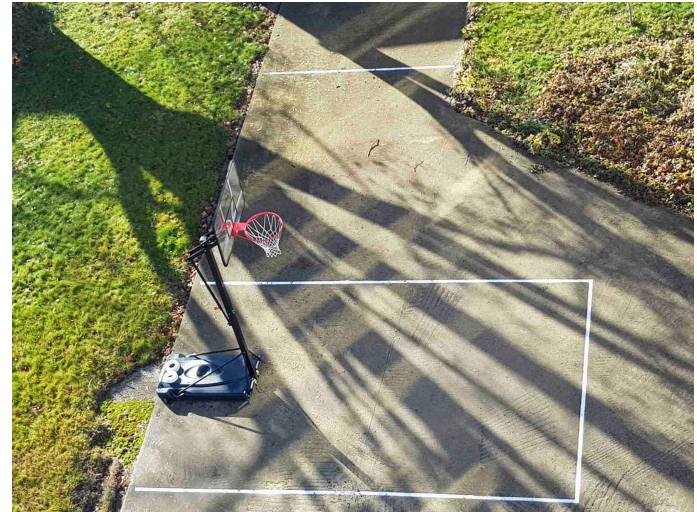


May 1991 – DRACULA assembled @ LNS



Fall 1991 – first beam & data

Social Events



2021



*“Ar trebui ținut un “jurnal de România”.
Unul în care să-ți notezi zi de zi costurile
faptului de a fi roman”
Gabriel Liiceanu*