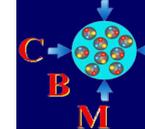
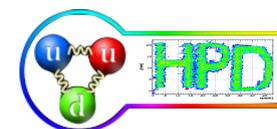




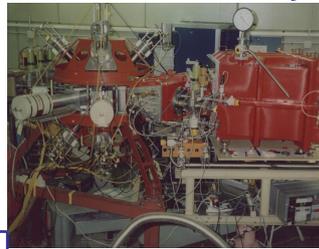
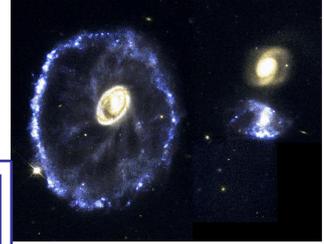
MINISTERUL
EDUCAȚIEI
NAȚIONALE



HPD-NIPNE achievements within CBM Collaboration @ FAIR



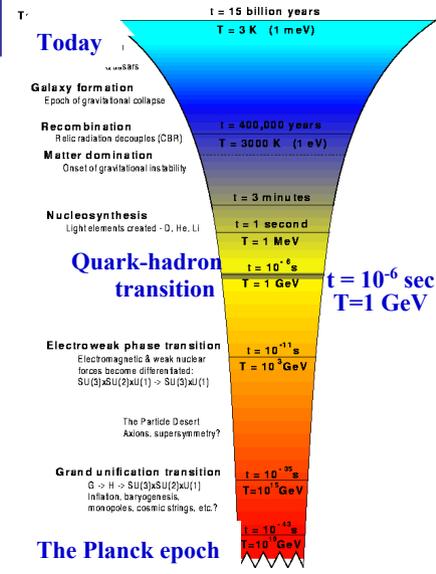
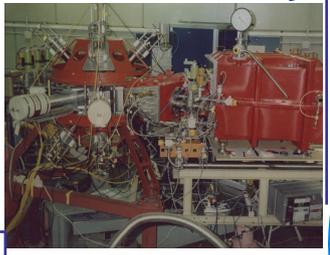
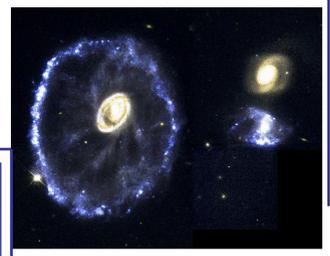
Is it fair



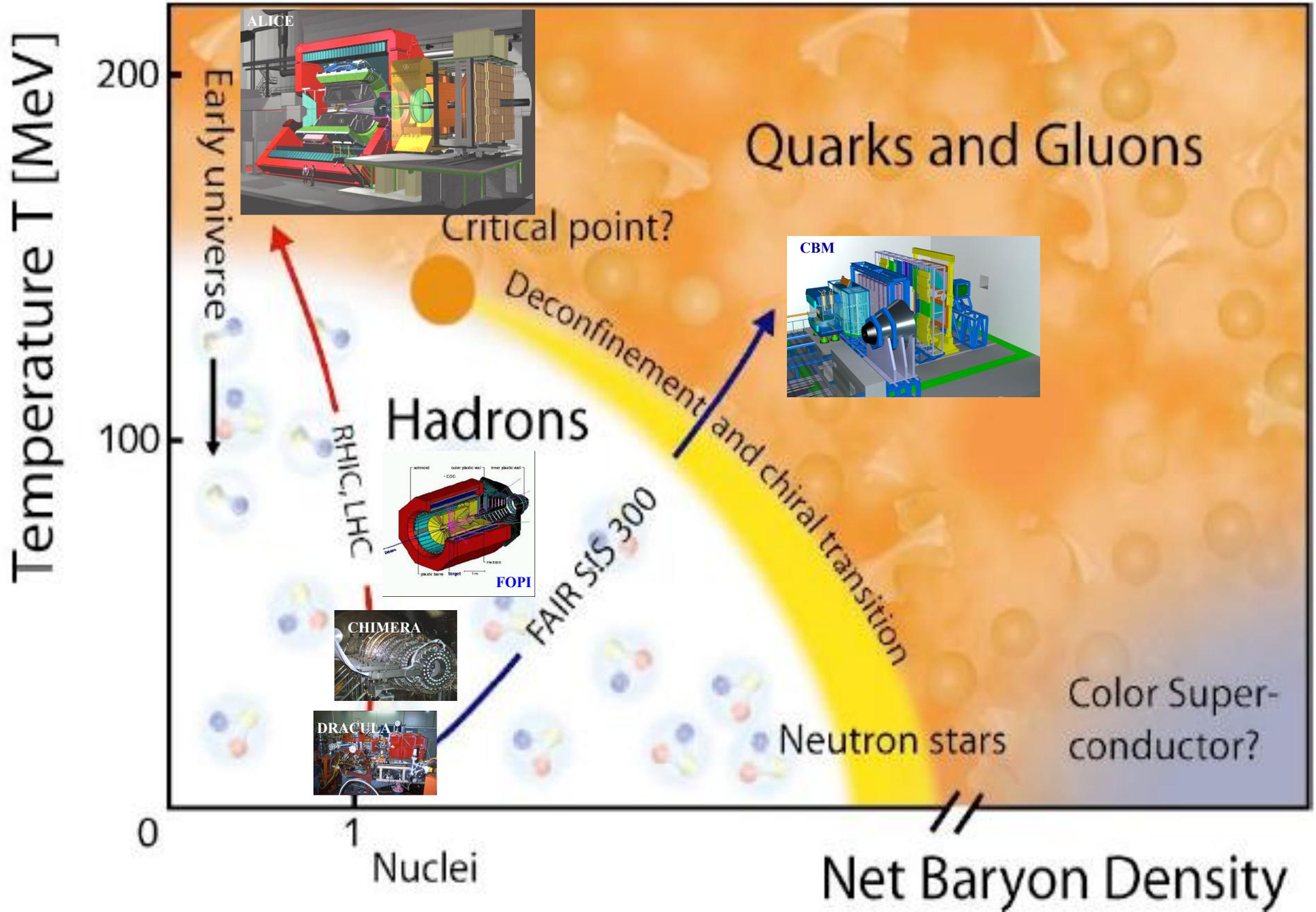
to be in

FAIR ?

“The philosophies and religions of the planet Earth will come and go, but the ultimate questions will be always alive and relevant”
James Leonard Park



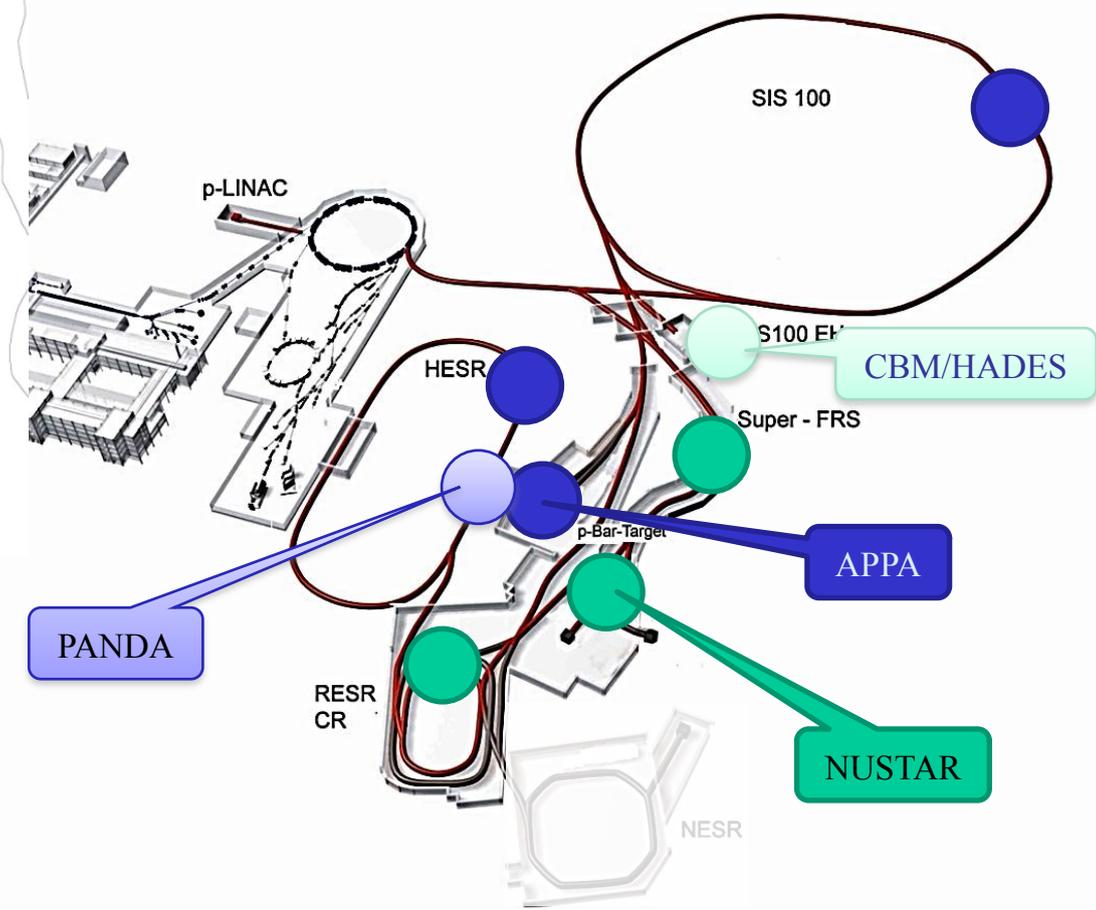
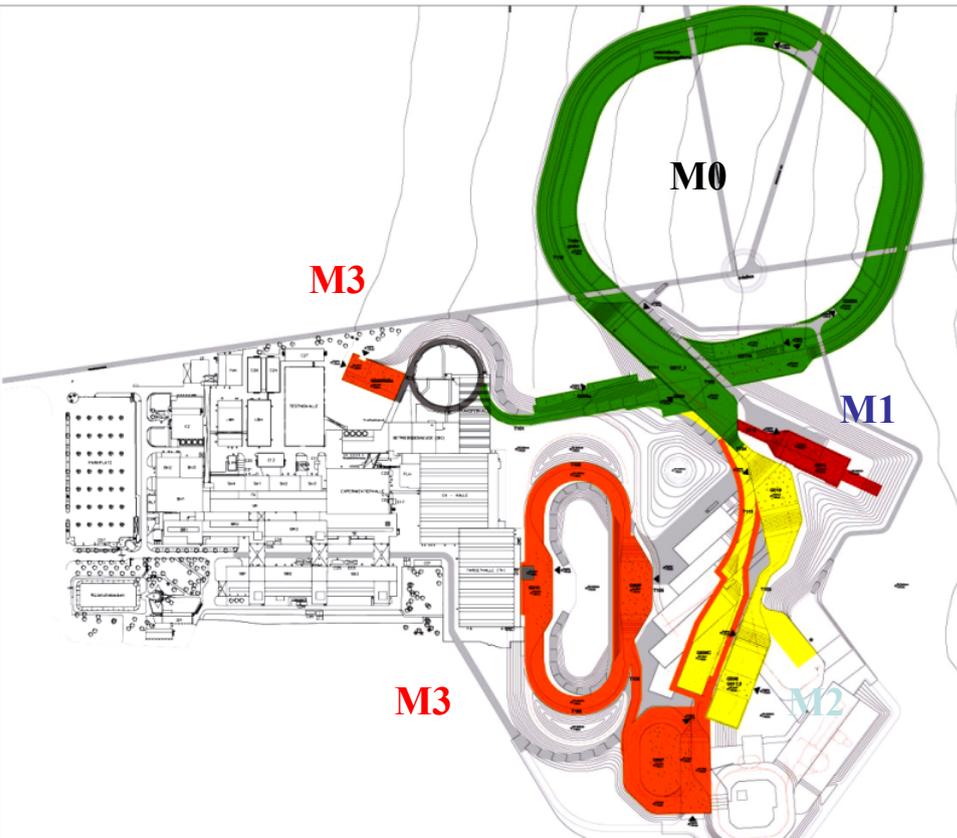
Physics Motivation



Modularised Start Version (MSV)

Downscaling with the MSV

Cost about 1.6 billion by 2018
(1 billion 2005 Euros)



Modules

- M0:** SIS100
- M1:** APPA
- M1:** CBM/HADES
- M2:** NUSTAR
- M3:** PANDA, NuSTAR, APPA

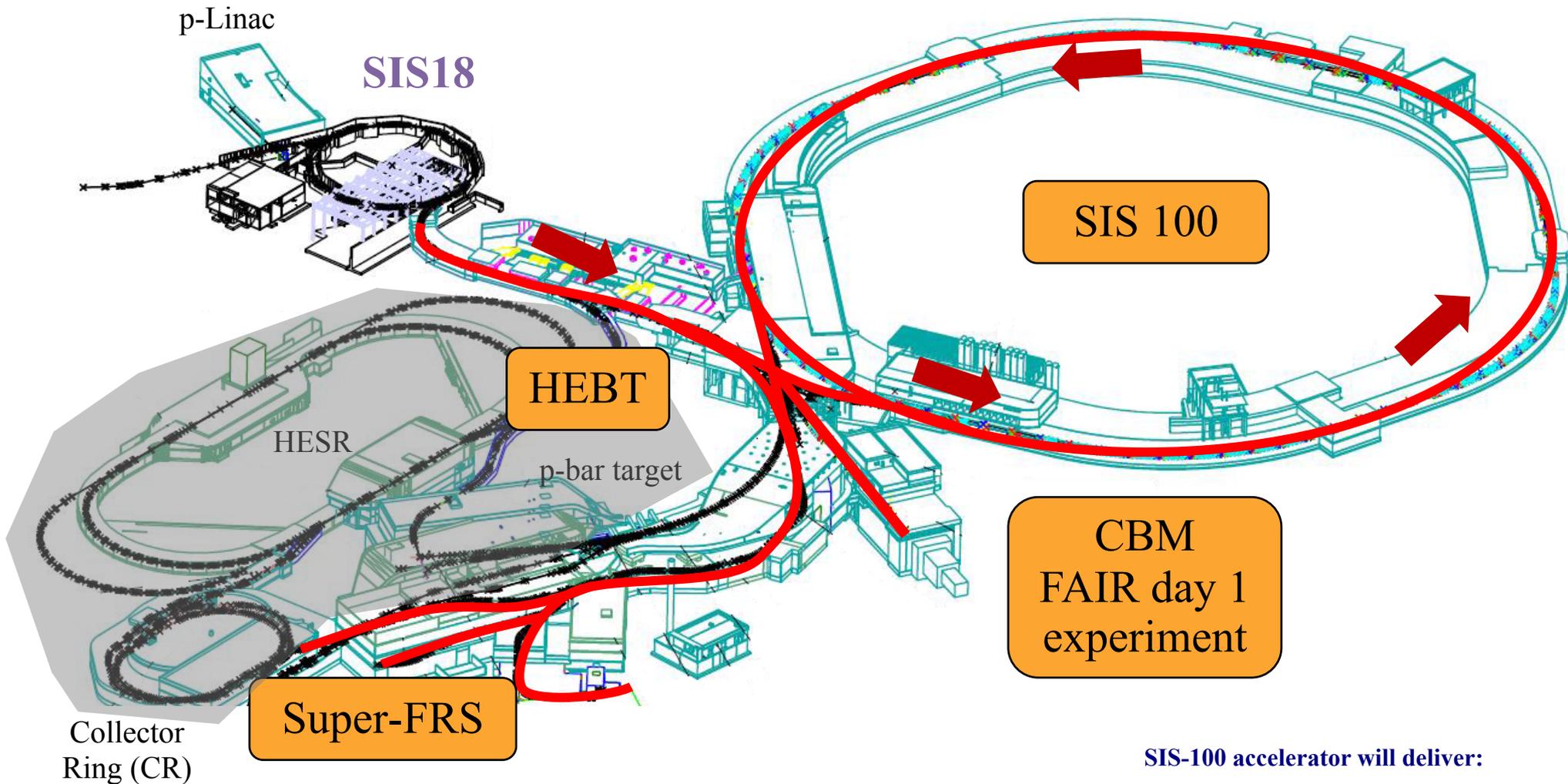
*Presented by Boris Sharkov
@ 26th CBM Meeting, September 2015, Prague*

confirmed

*by Joerg Blaurock
@ 27th CBM Meeting, April 2016, GSI*

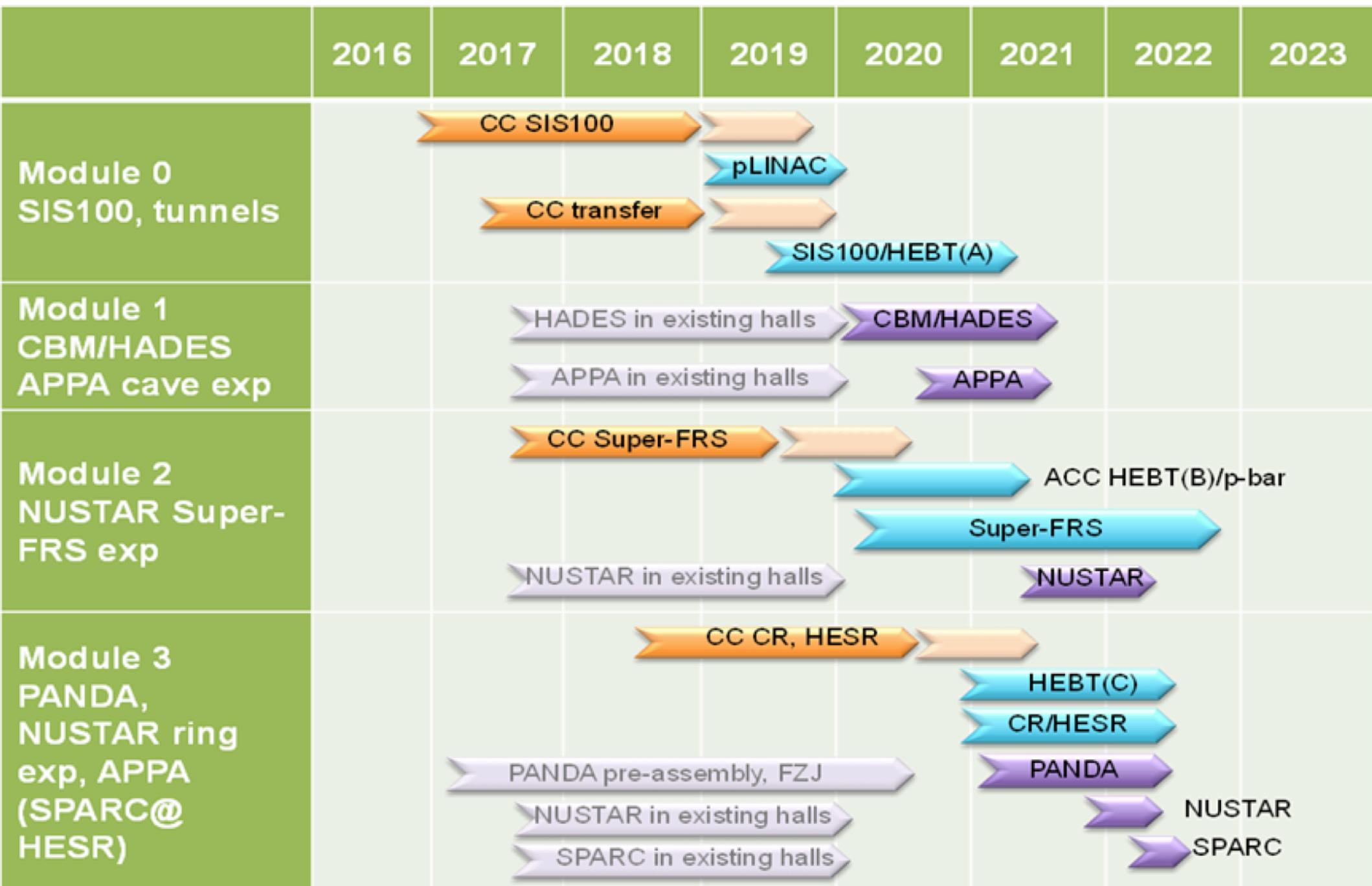
GSI/FAIR strategy:

Staged realization along the beam towards MSV



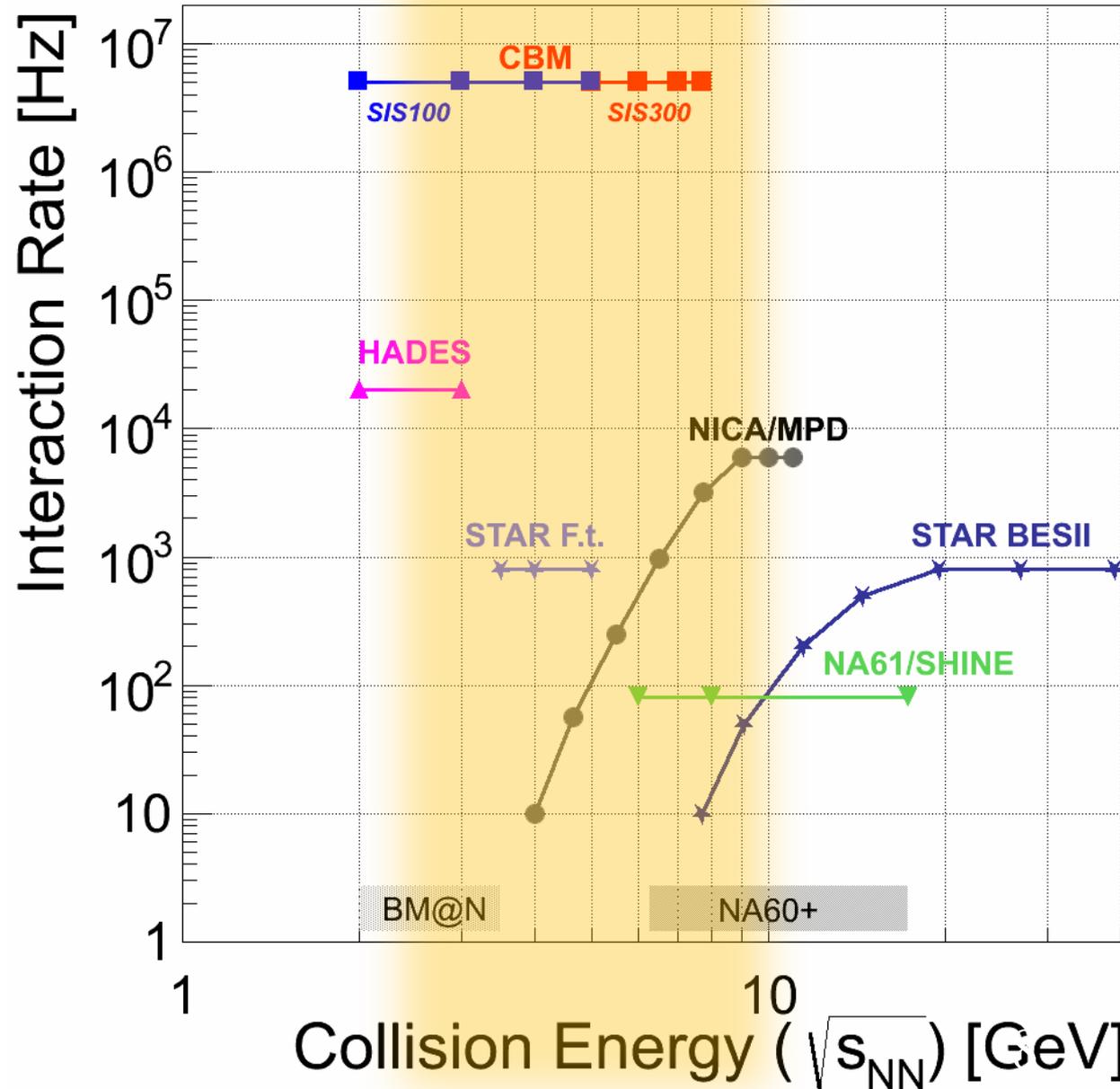
SIS-100 accelerator will deliver:

- heavy ions (Au) up to 11A GeV
 $\sqrt{s_{NN}} = 4.7$ GeV
- light ions (e.g. Ca) up to 14A GeV
 $\sqrt{s_{NN}} = 5.3$ GeV
- protons up to 29 GeV
 $\sqrt{s_{NN}} = 7.5$ GeV)

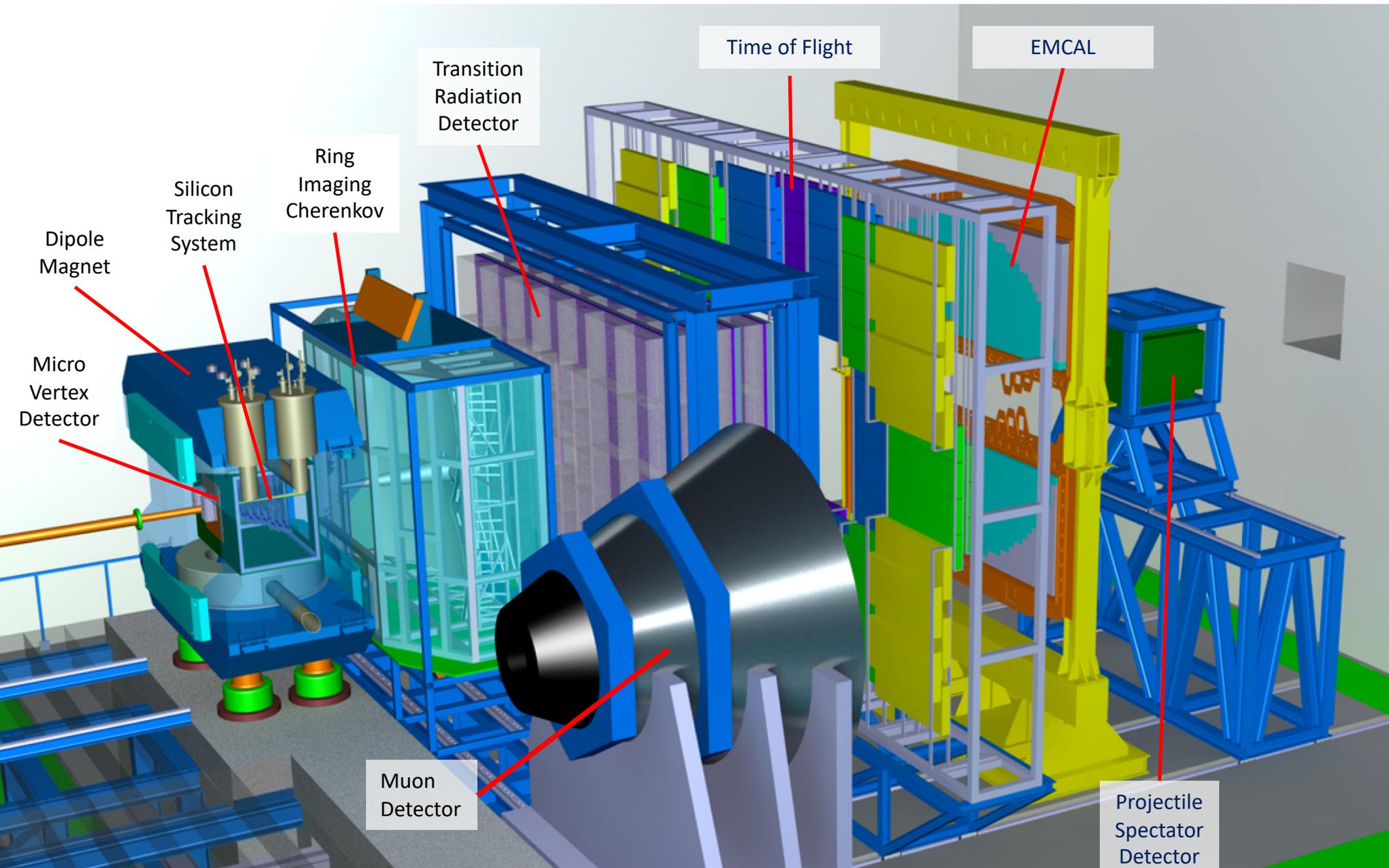


Experiments exploring dense QCD matter

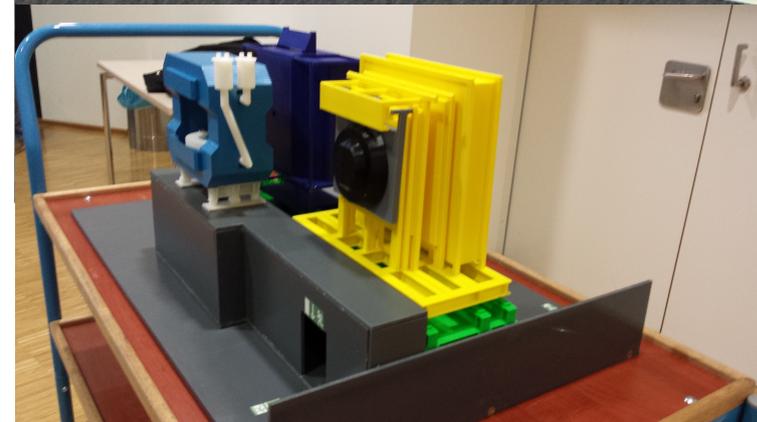
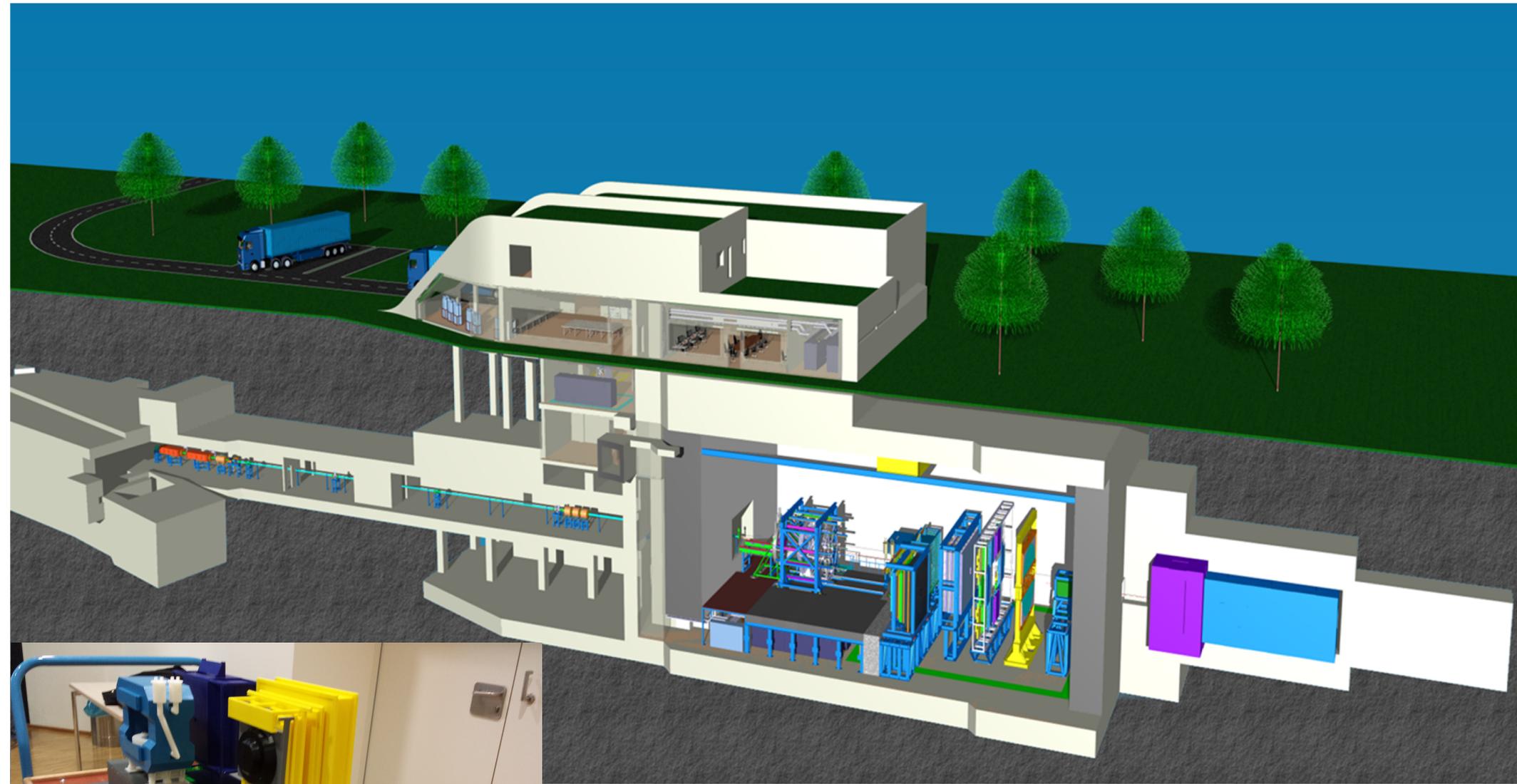
high
net-baryon
densities



CBM at SIS 100



CBM – Experiment @ FAIR



CBM requirements & challenges

Requirements:

Tracking: STS, TRD

Vertexing: STS

Hadron ID : TOF

Electron ID: RICH, TRD, ECAL

γ , n: ECAL

The Challenges:

- very rare probes in Au+Au
at reaction rates up to 10^7 events/sec

- Rates from 1 kHz/cm^2 (27°) to $20 - 100 \text{ kHz/cm}^2$ (3°)
at the detector level

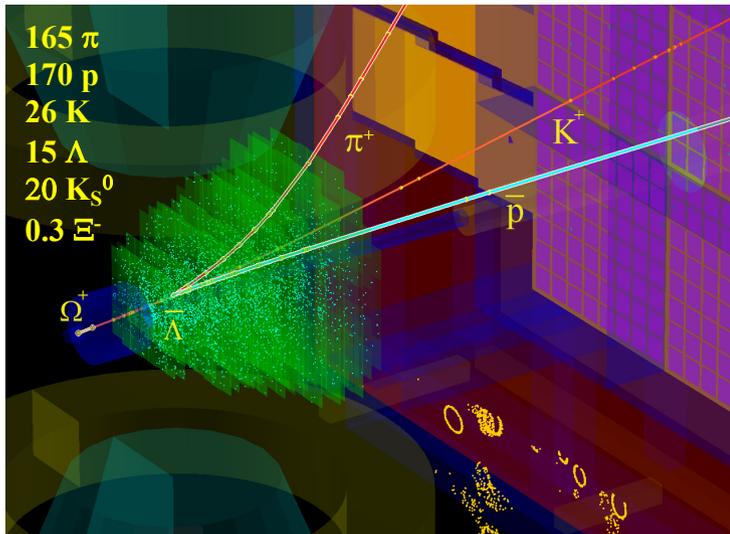
- ~ 1000 charged particles/event

- Hit density from $6 \cdot 10^{-2}/\text{dm}^2$ to $1/\text{cm}^2$

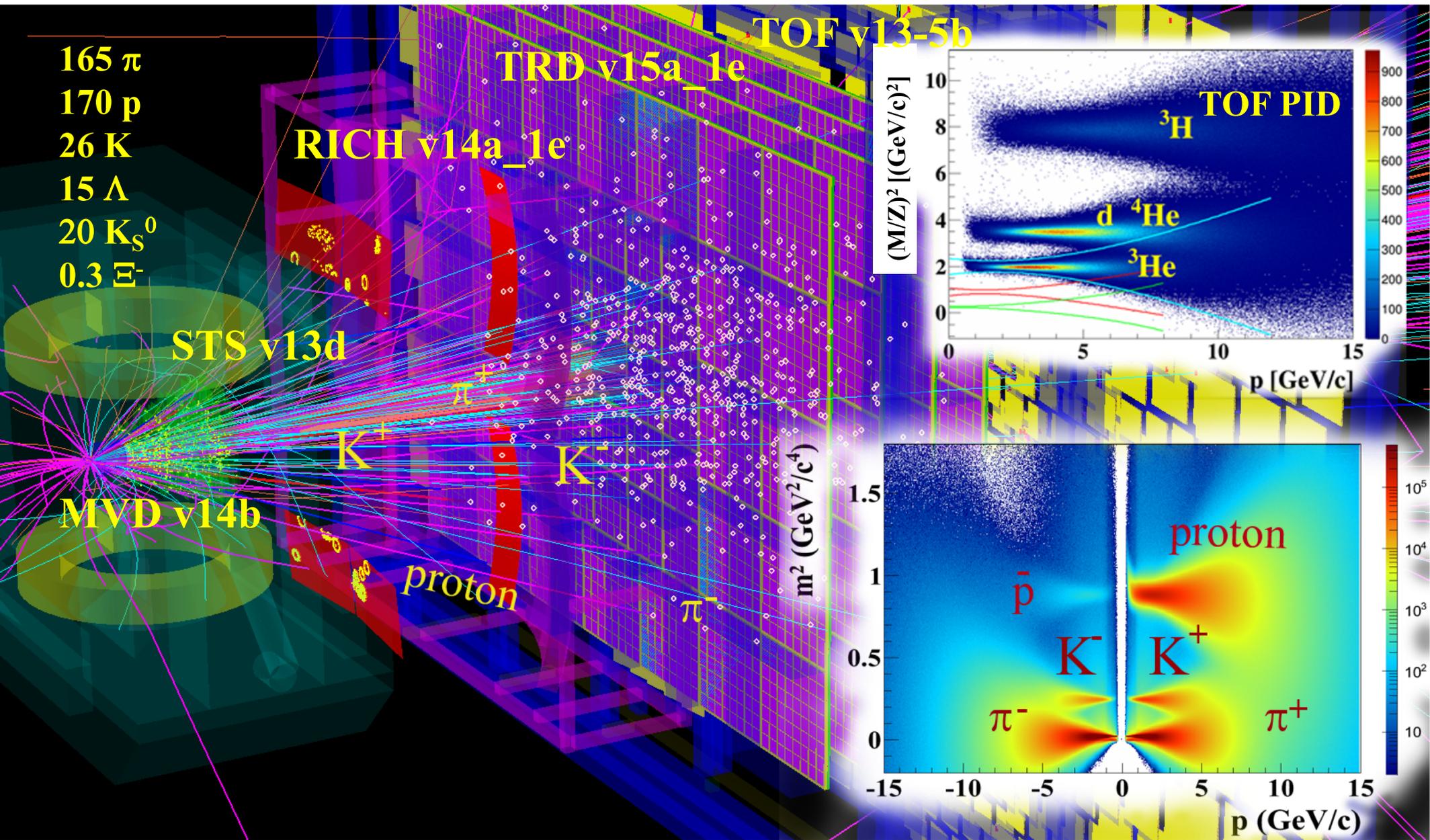
- fast and radiation hard detectors

- free-streaming readout electronics

- online event selection



KF Particle Finder with ToF particle ID: *Au+Au @ 10AGeV SIS100*



*Do we have the prerequisites to aim for
a visible and competitive contribution?*

i.e.:

- Physics Motivation

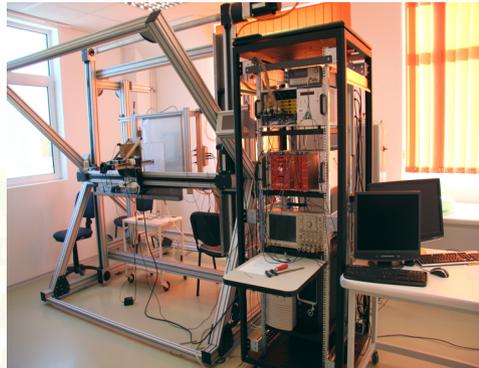
- Infrastructure

- Know how

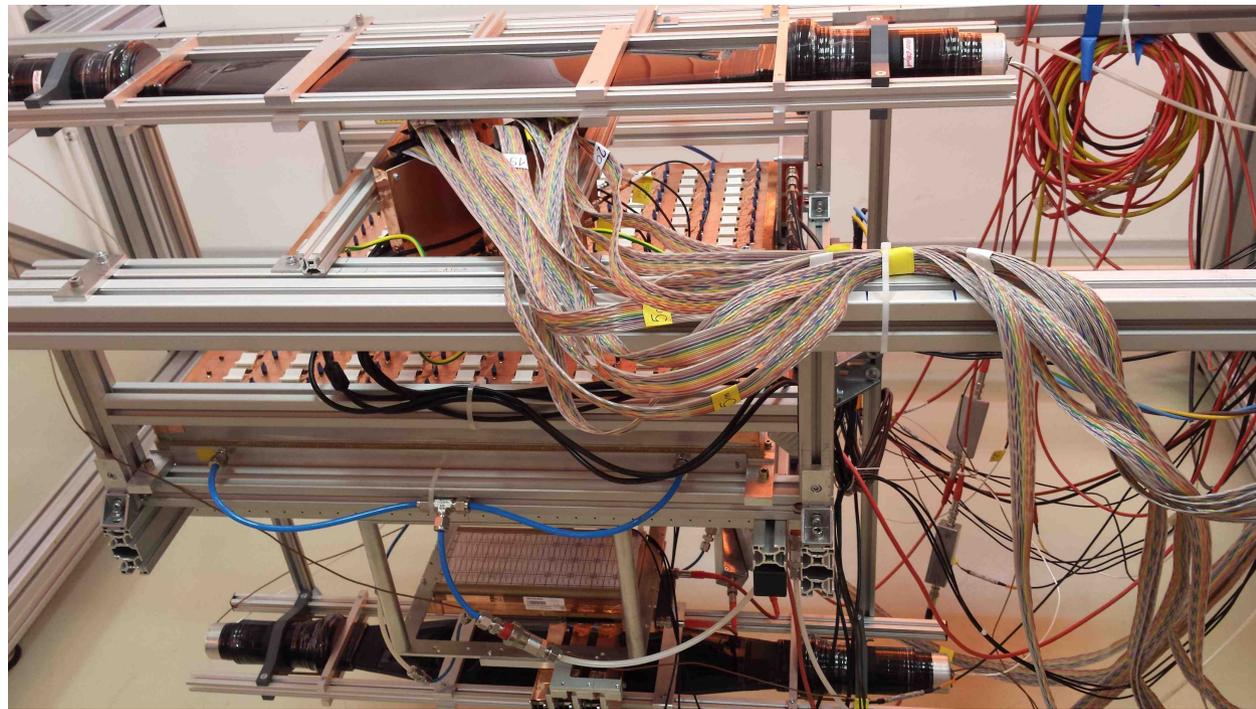
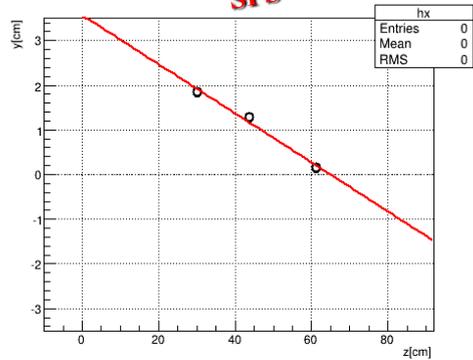
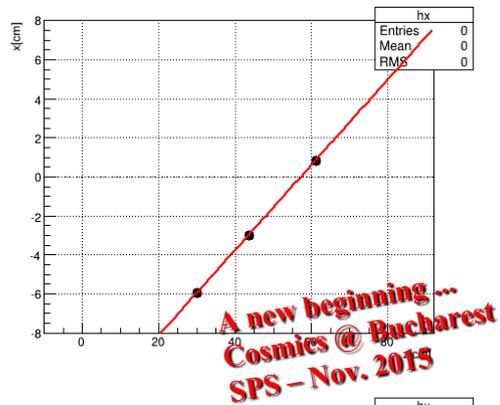
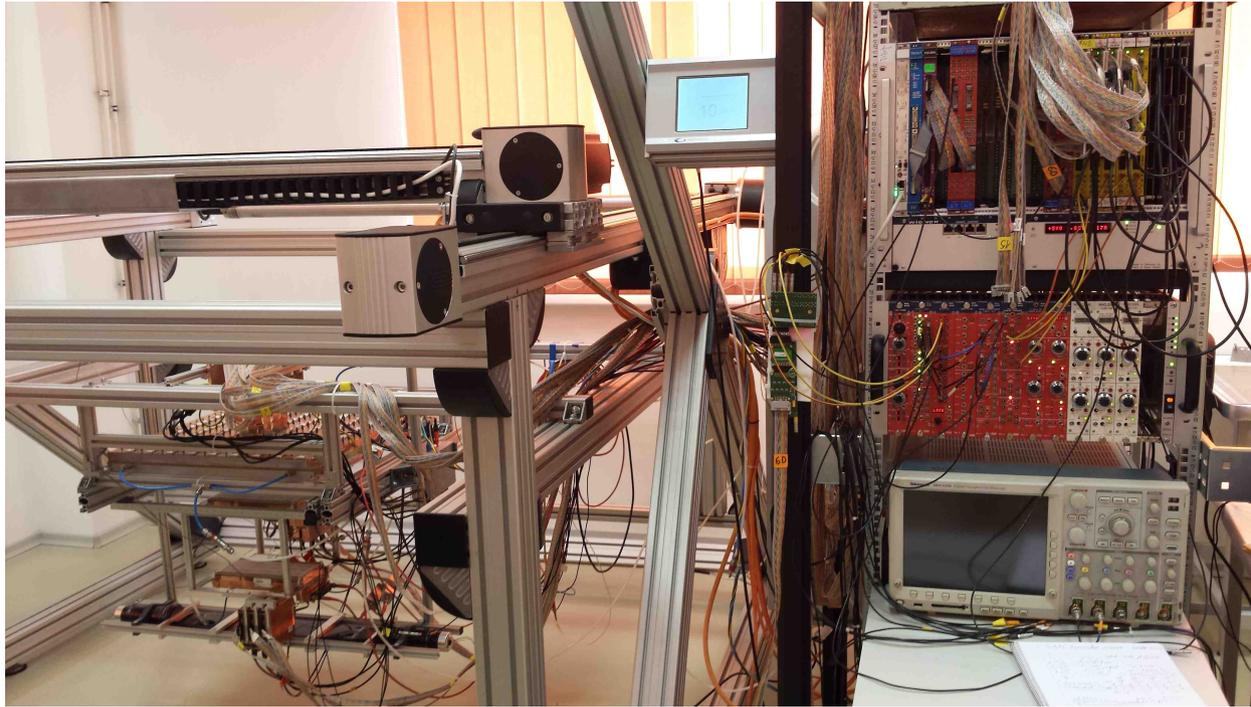
- Manpower

- Experience in such enterprise

Infrastructure



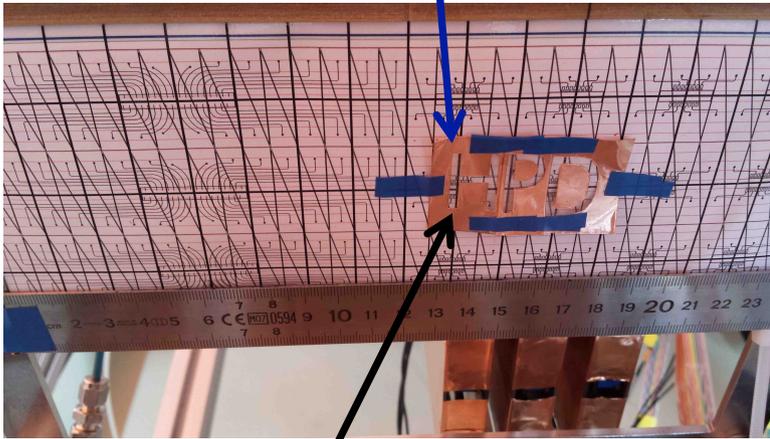
TRD in-house test set-up ~ with the one for in-beam tests



TRD in-house test set-up ~ the one for in-beam tests

The Photo of the Week

Copper foil - absorber



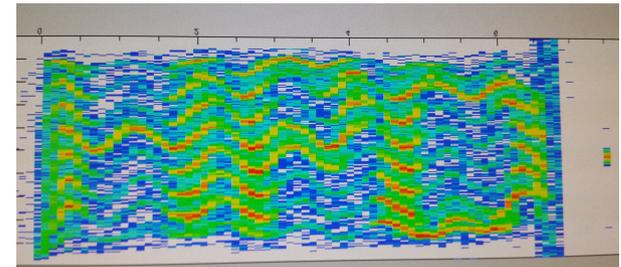
Letters cut on a Copper foil

Glued on the two-dimensional position sensitive TRD exposed to a uniform flux of ^{55}Fe source

On-line result without any corrections or image processing software

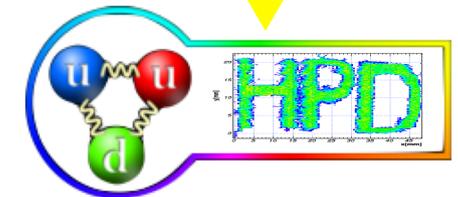
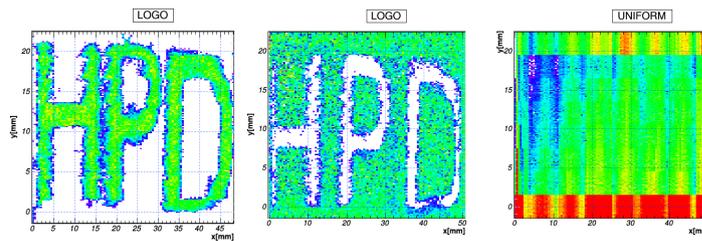


x-y position plot based on the calibration and reconstruction worked-out by Alexandru Bercuci

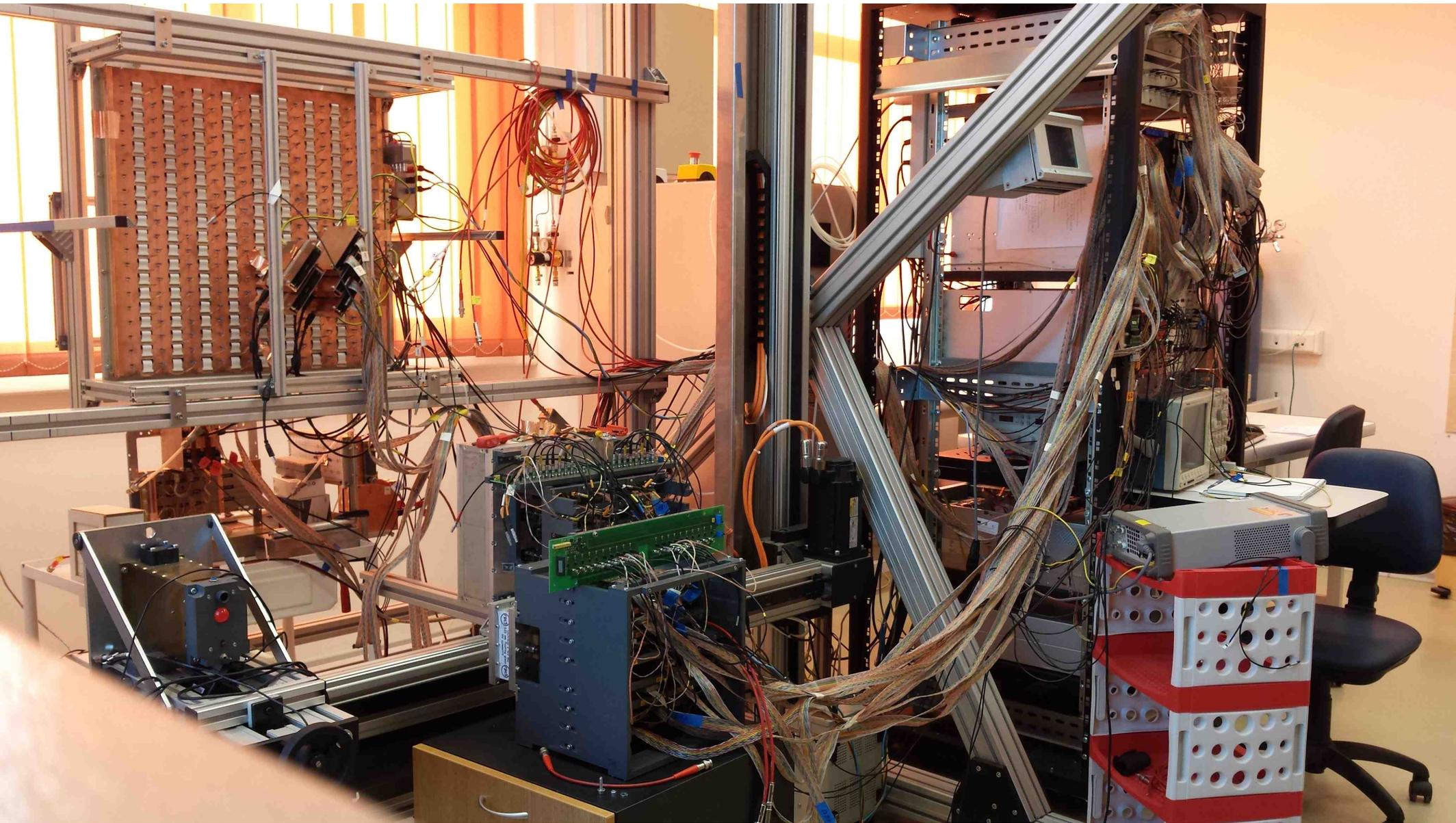


A photo of the DAQ display taken by a handy

After calibration



Typical preparations for in-beam tests



In-beam tests @ SPS-CERN, Nov.2015

Gate for equipment delivery
Space for pre-mounting the
Counting room

Detail of Hall EHN1
SPS North Experimental Area

ALICE, ILC

N/A49

CMS

GLAST, DREAM, AMS,...

Beam: Pb
Beam energy: 30 A GeV
Beam intensity: about 10^8 / spill
Spill length: 15 s
Beam height: 1.2 m
Target: Pb up to 2 mm thickness
Flux: Not estimated yet

H2

H4

H6

H8

CERF, SC-RP

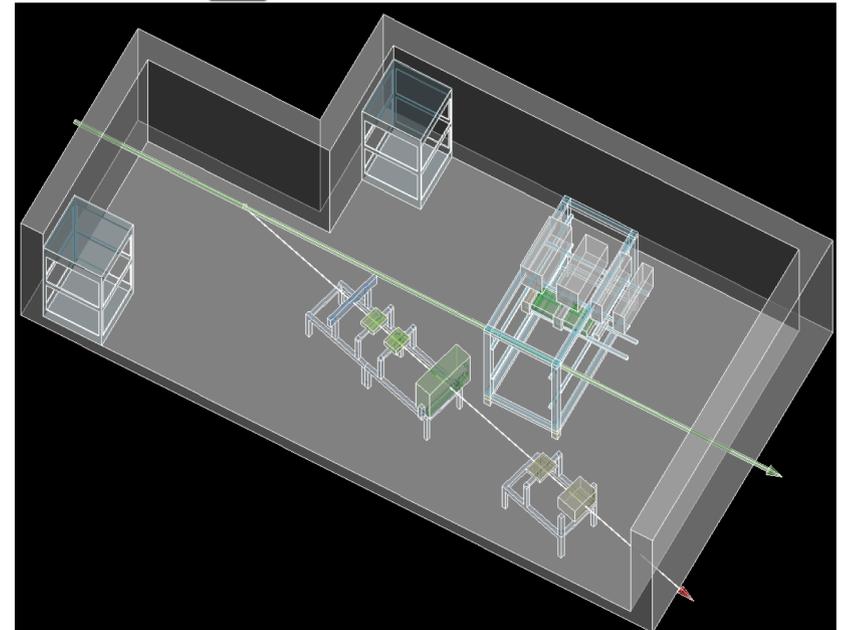
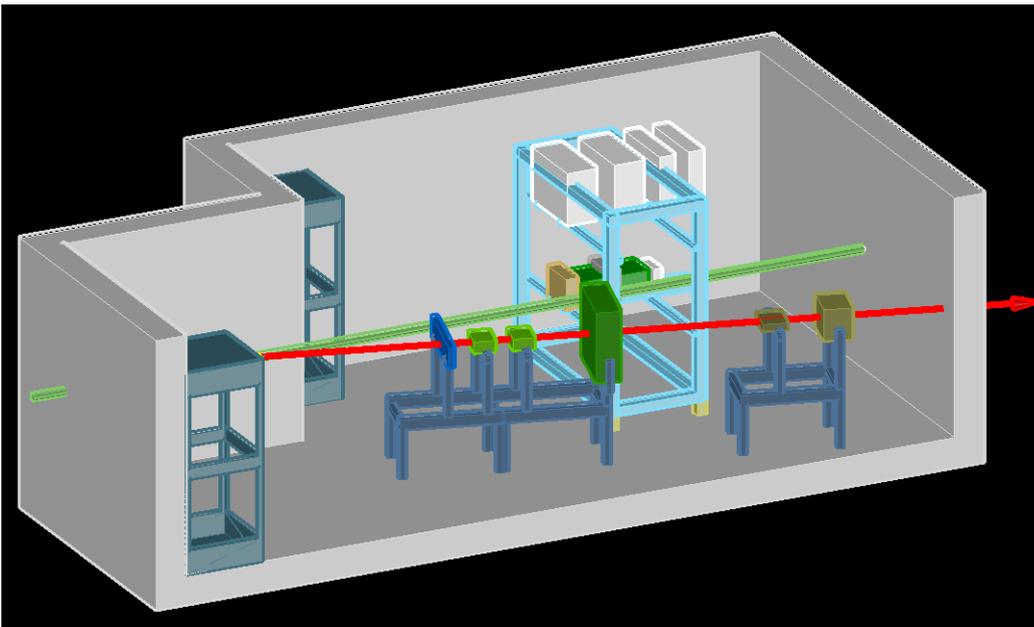
ALICE

CRYSTALS, LHC Coll.

LHCb

ATLAS

TOTEM

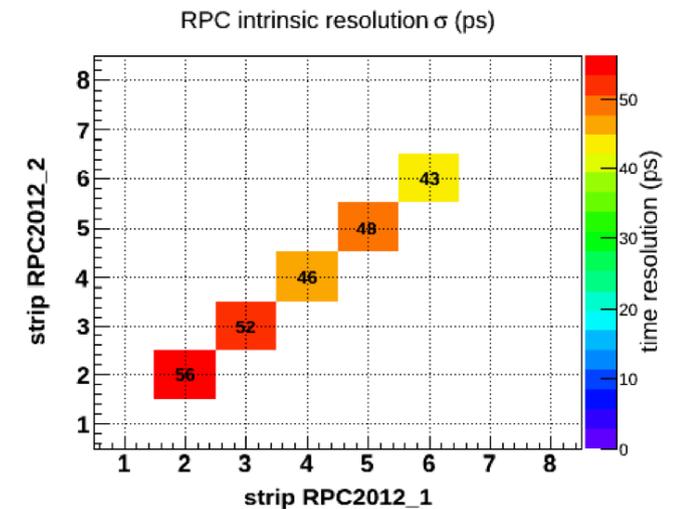
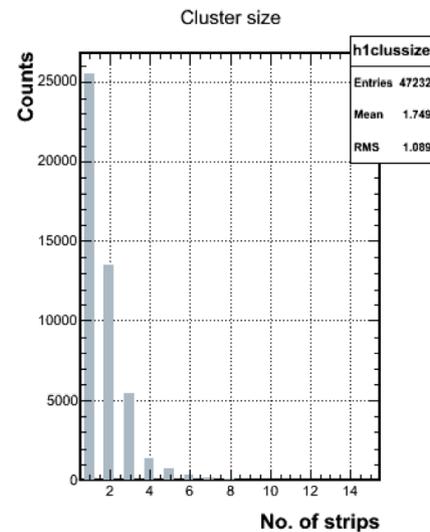
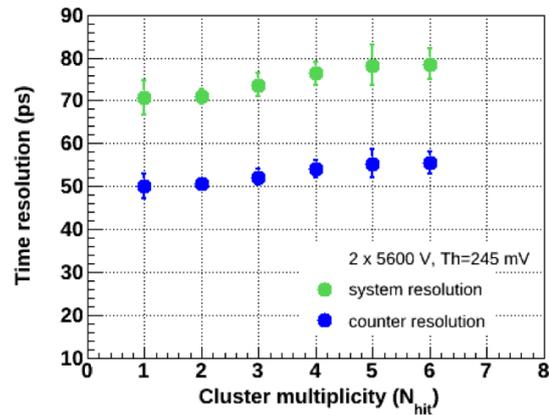
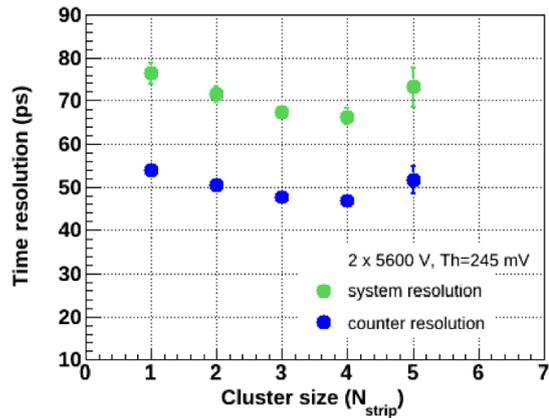
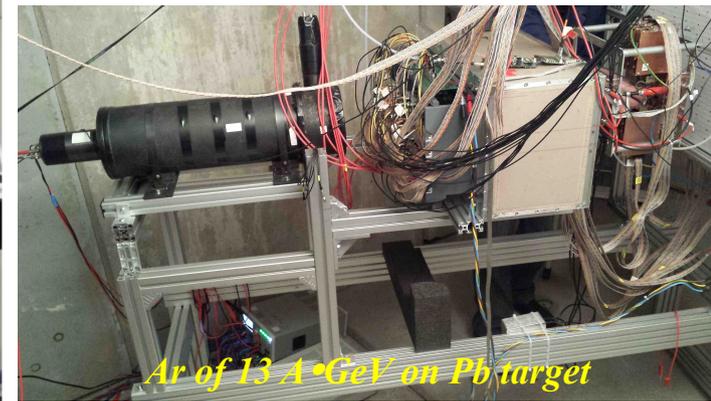
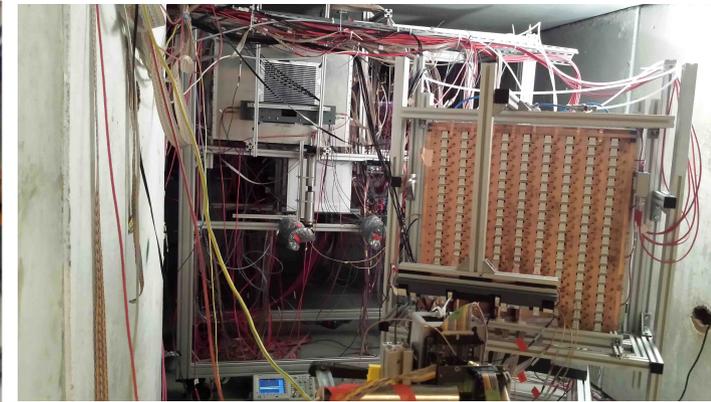
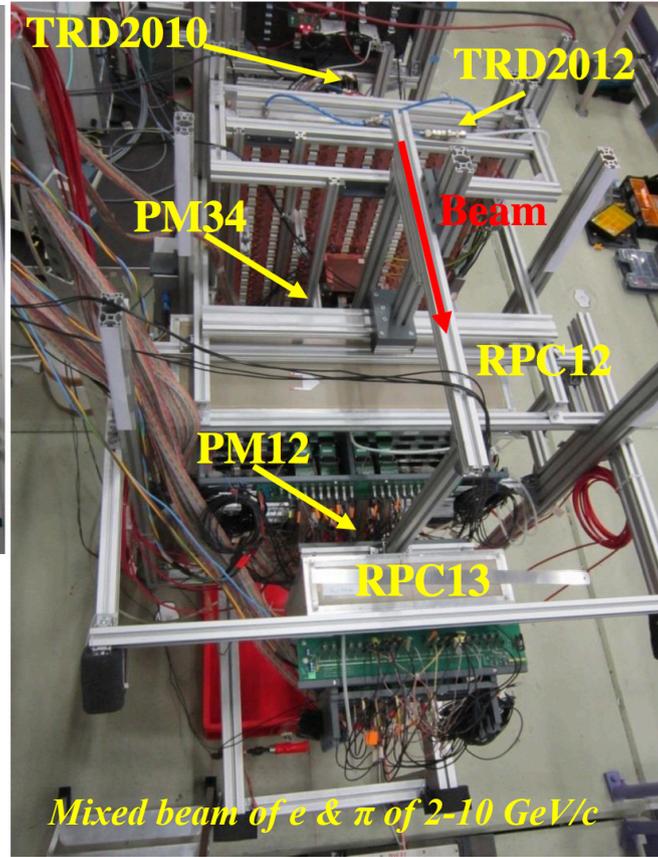


2014-2015 in-beam RPC test results - summary

Oct. 2014 @ SIS18-GSI

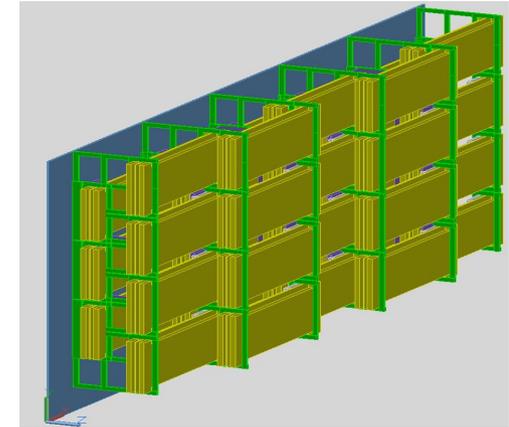
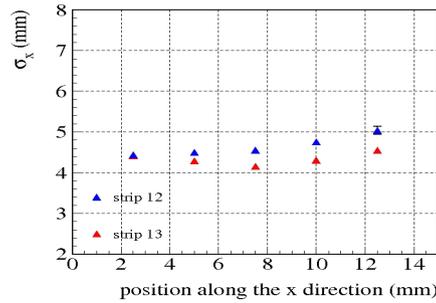
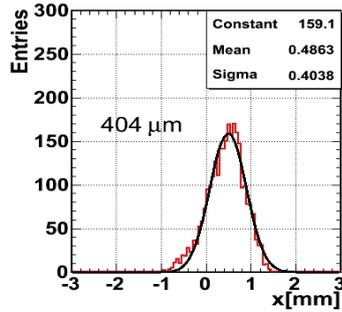
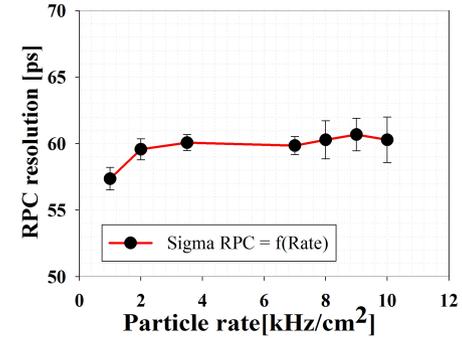
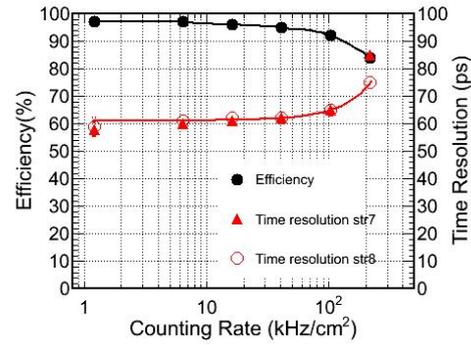
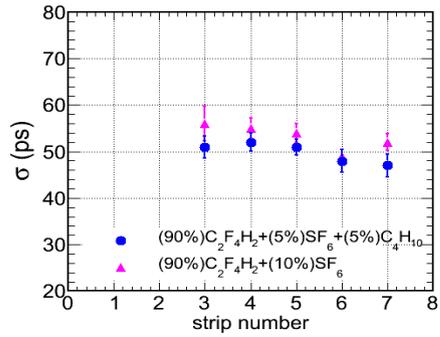
Nov. 2014 @ PS-CERN

Feb. 2015 @ SPS-CERN



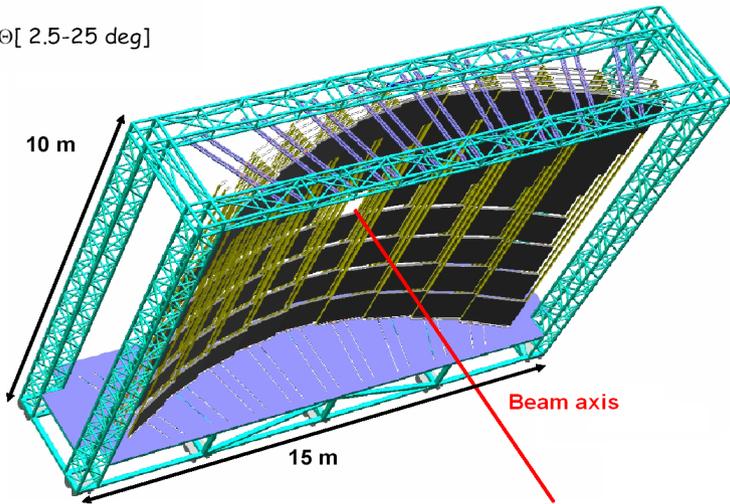
High counting rate RPC

R&D results & the architecture of the inner zone of CBM-TOF

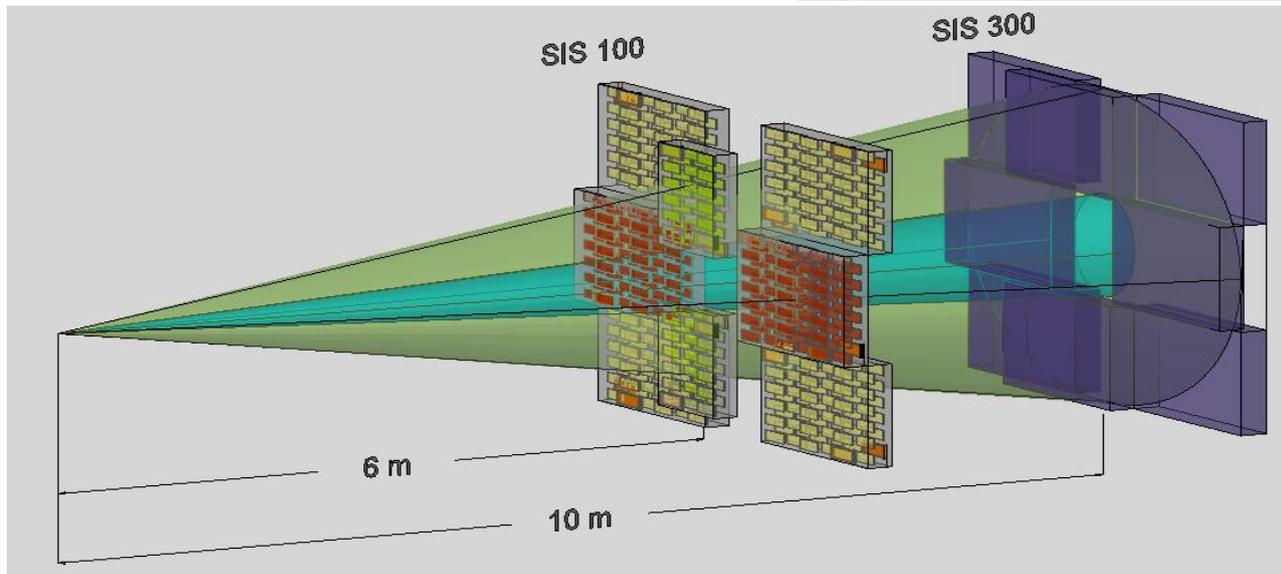


$D_{\text{wall}} = 10 \text{ m}$

$\Theta [2.5-25 \text{ deg}]$



9 columns with 9 supermodules each
 $A_{\text{super-module}} = 1.5 \text{ m} \times 1 \text{ m}$

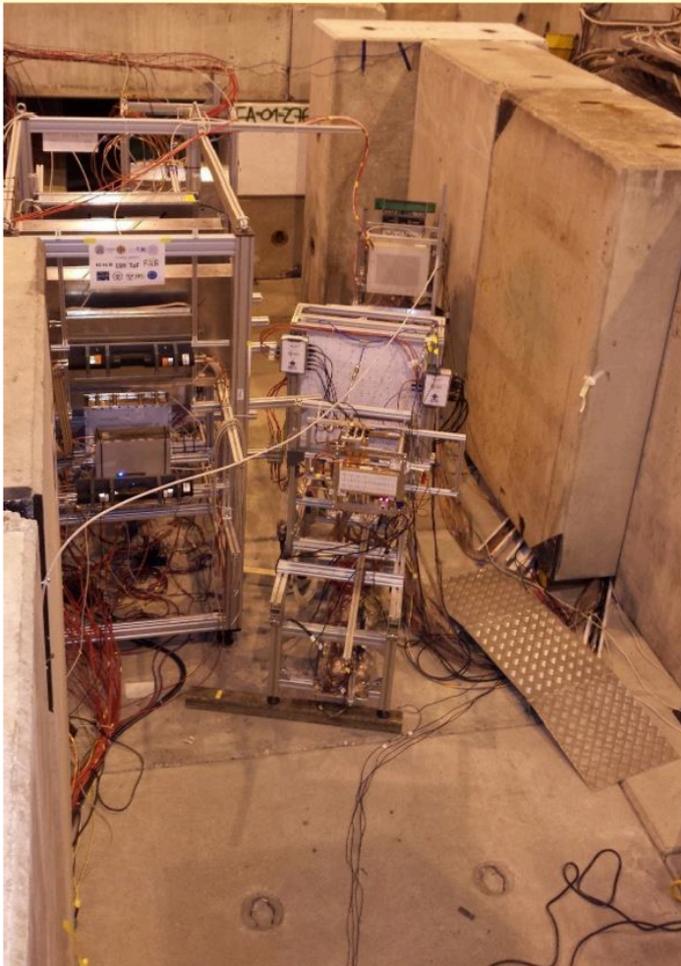


November 2015 CERN - SPS in-beam tests

Pb beam of 30A GeV on a Pb target

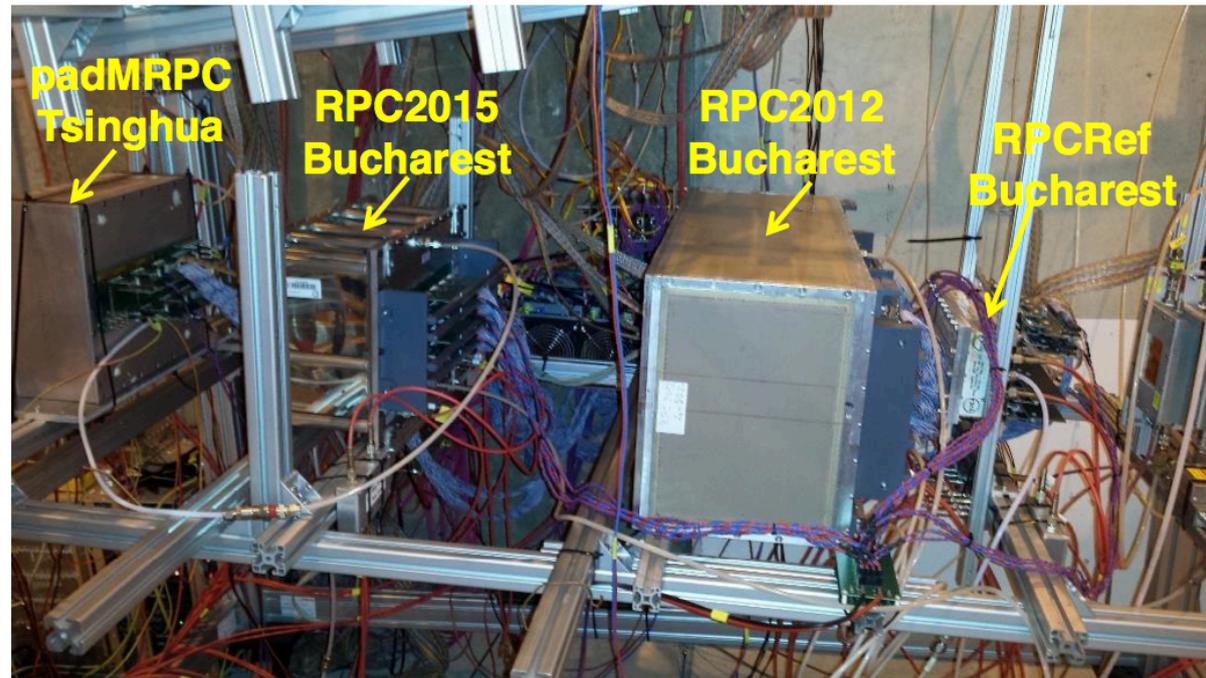
Goal: Tests in real operation conditions:

high counting rate + multi-hit test



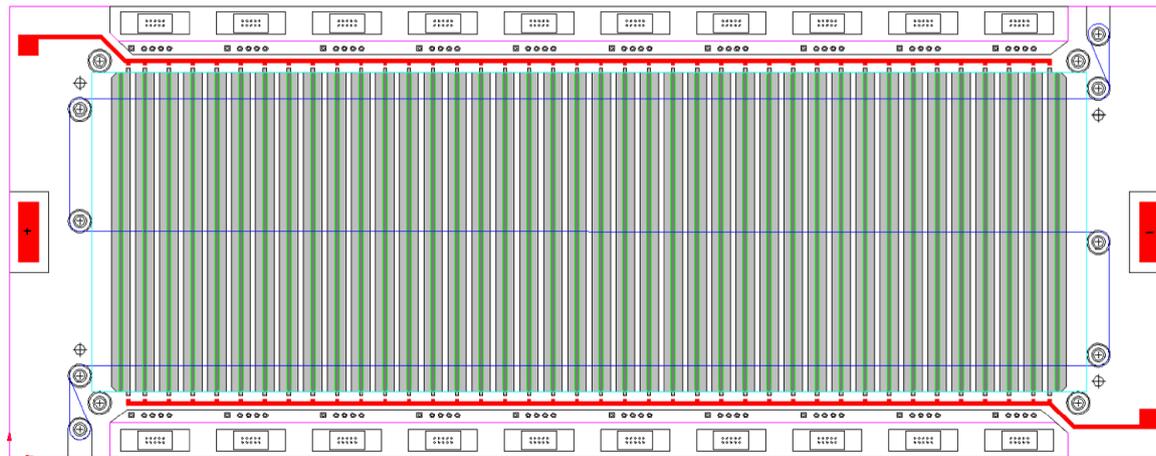
High counting rate experimental set-up

- *RPC Tsinghua University – 3 pad MRPCs*
- *RPC2015 Bucharest – 2 new strip MRPCs*
 - *I. 7.2 mm strip pitch (see next slide)*
 - *II 10.1 mm strip pitch (see next slide)*
- *RPC2012 Bucharest – 4 strip MRPCs*
- *RPCRef – 1 strip MRPC*



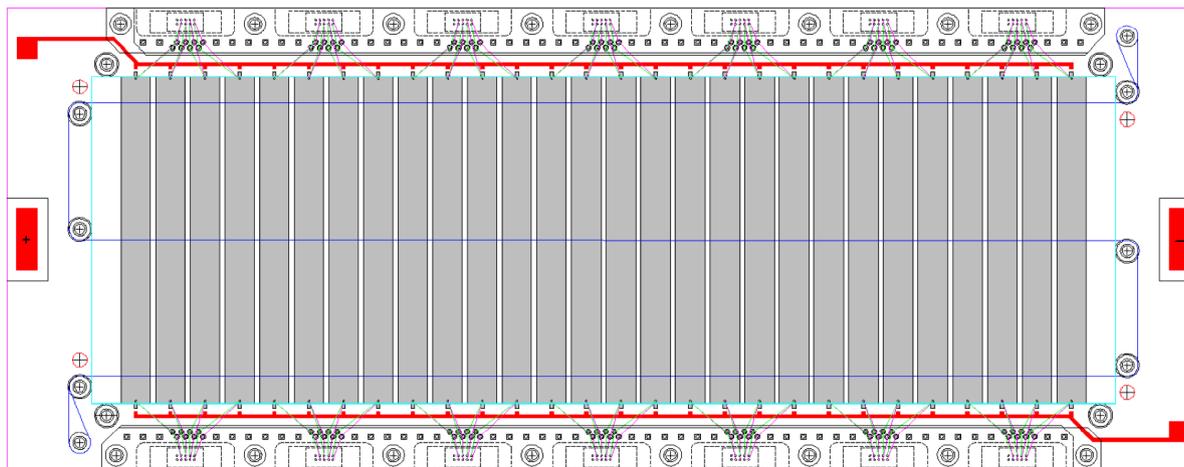
2015 MSMGRPC prototypes for Nov. SPS in-beam test

DS 100 Ω impedance



Readout electrode: 7.2 mm pitch= 1.3 mm width + 5.9 mm gap
High Voltage electrode: 7.2 mm pitch= 5.6 mm width + 1.6 mm gap

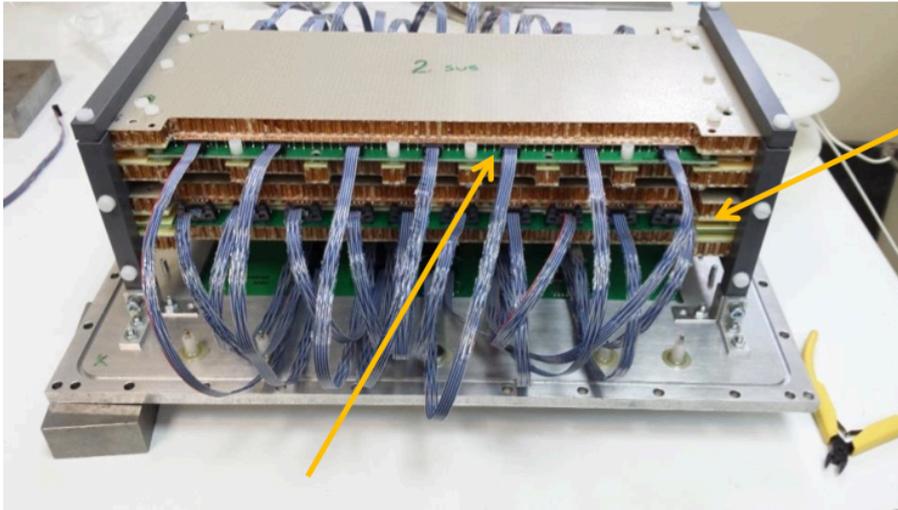
SS 100 Ω impedance



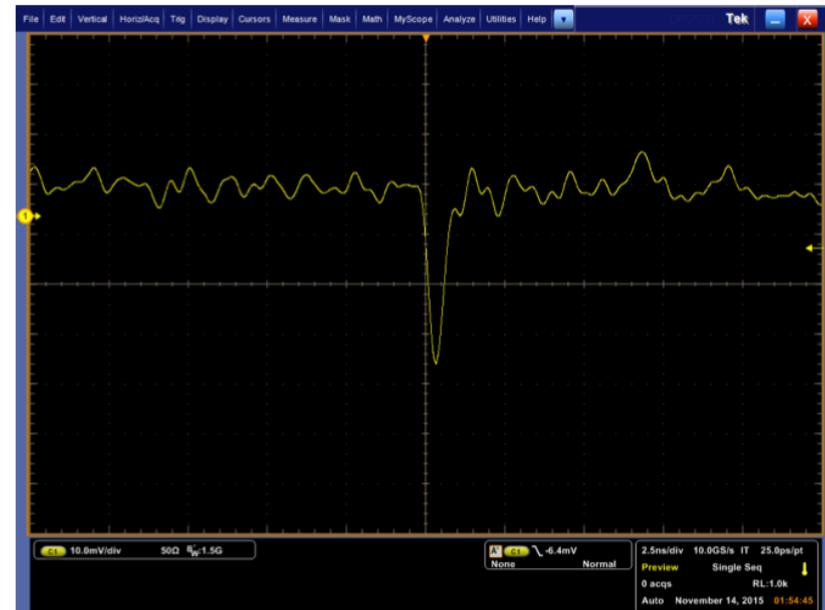
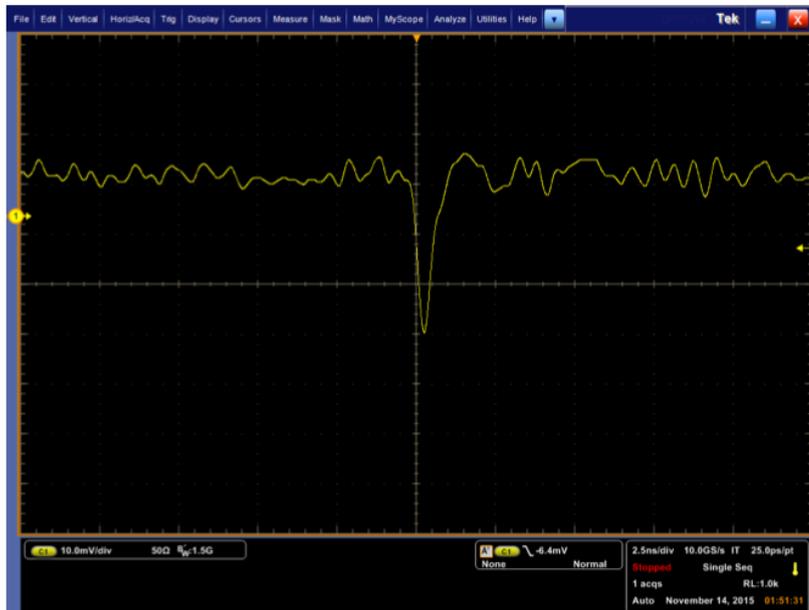
Readout electrode: 10.1 mm pitch= 8.6 mm width + 1.5 mm gap

^{60}Co and cosmic rays laboratory tests of the new prototypes

DS-RPC2015



SS-RPC2015



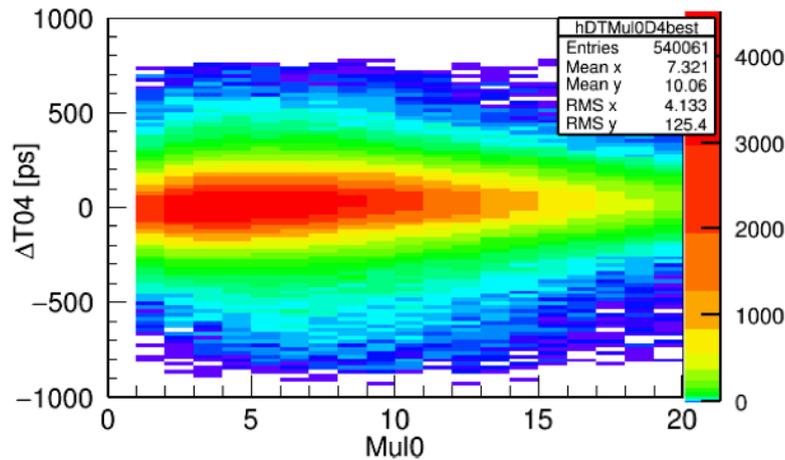
Tested at CERN SPS with a Pb beam (30A GeV) in November 2015: data analysis in progress

Preliminary results of November 2015 in-beam test

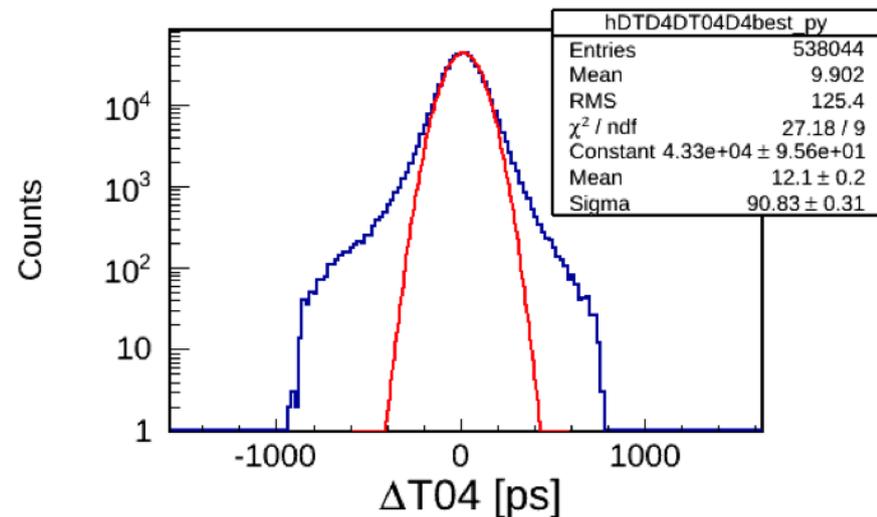
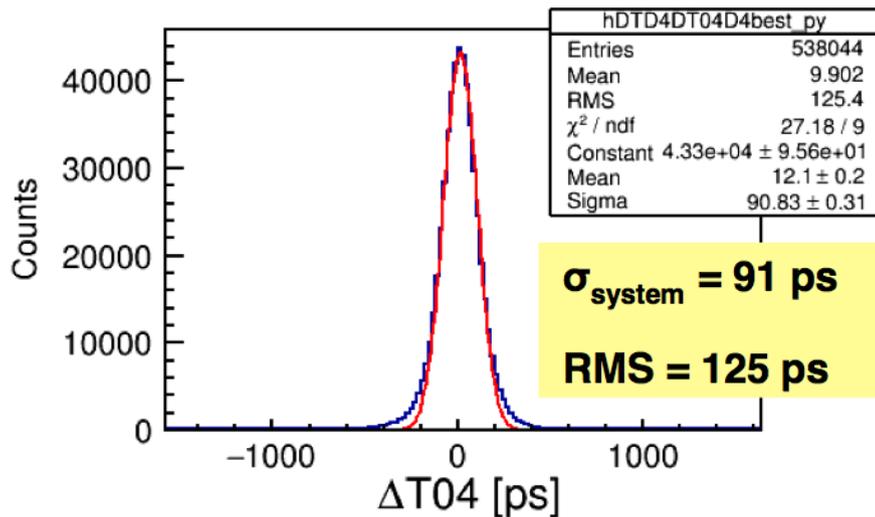
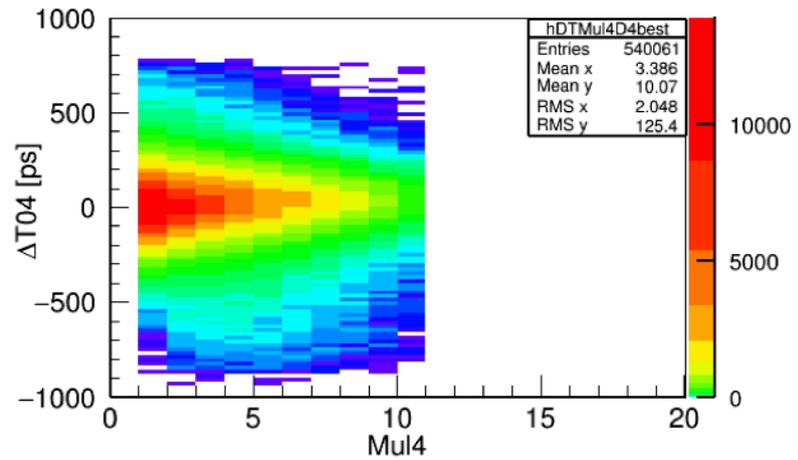
Run CernTofSps_01Dec0225, DUT = SS-RPC2015, Ref=RPCRef, Sel2= DS-RPC2015

HV SS-RPC2015 = +/-9.5 kV, Th = 245 mV, HV RPCRef = +/-5.5 kV, Th = 205 mV,

SS-RPC2015



RPCRef

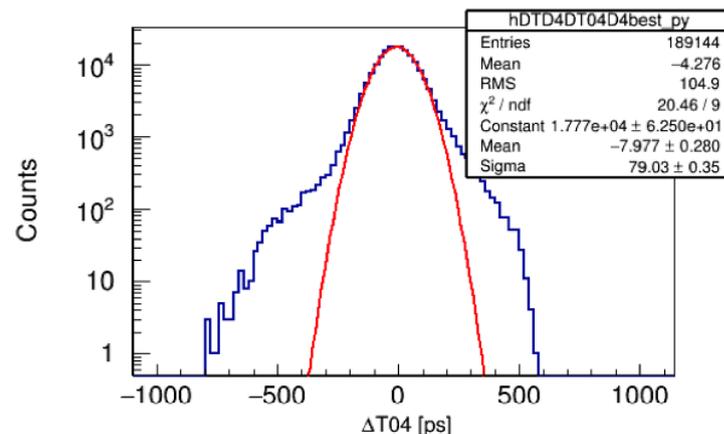
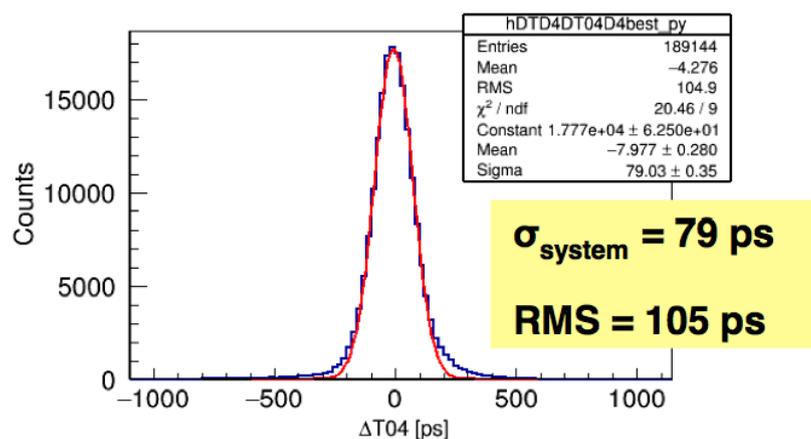


Efficiency = 0.954, Cluster size SS-RPC2015 = 2.4, Cluster size RPCRef = 2.5

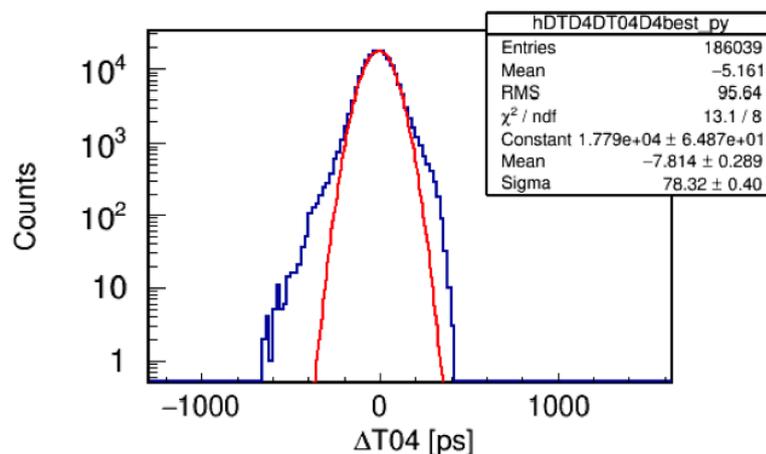
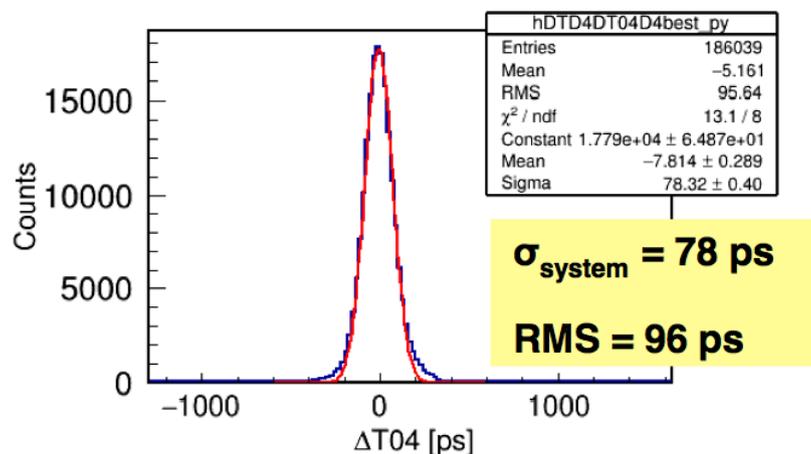
Preliminary results of November 2015 in-beam test

Run CernTofSps_01Dec0225, DUT = DS-RPC2015, Ref=RPCRef, Sel2= SS-RPC2015

HV DS-RPC2015 = +/-9.5 kV, Th = 245 mV, HV RPCRef = +/-5.5 kV, Th = 205 mV,



Efficiency = 0.916, Cluster size DS-RPC2015 = 2.3, Cluster size RPCRef = 2.6

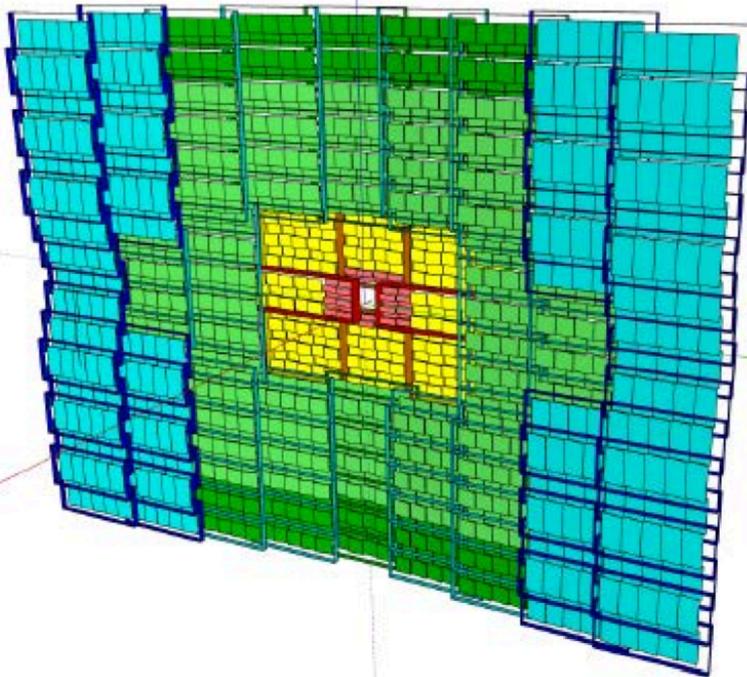


Efficiency = 0.901, Cluster size DS-RPC2015 = 2.3, Cluster size RPCRef = 2.6

Technical Design Report for the CBM

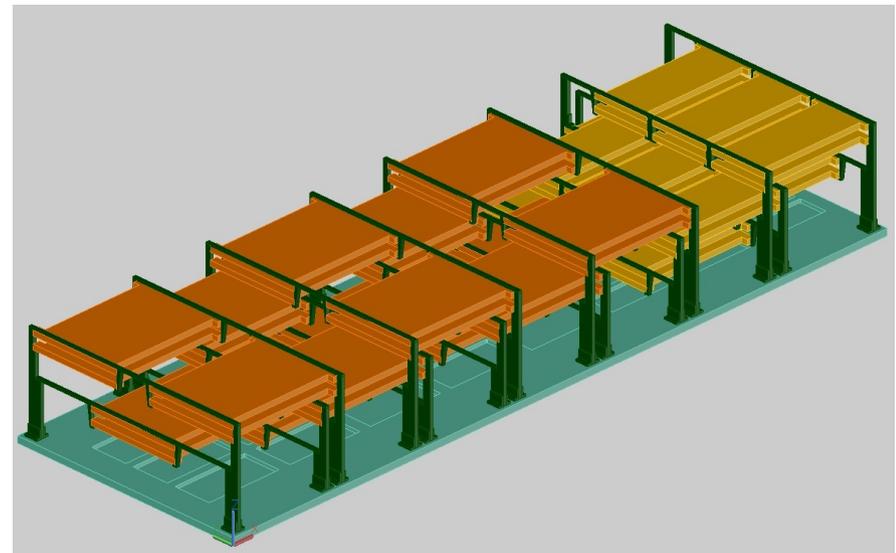
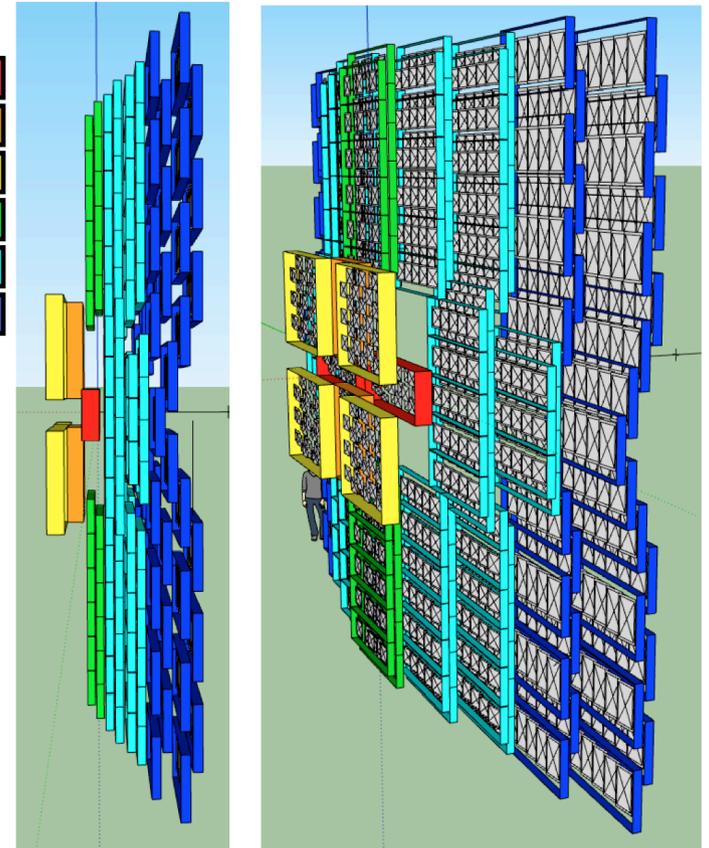
Time – of – Flight System (TOF)

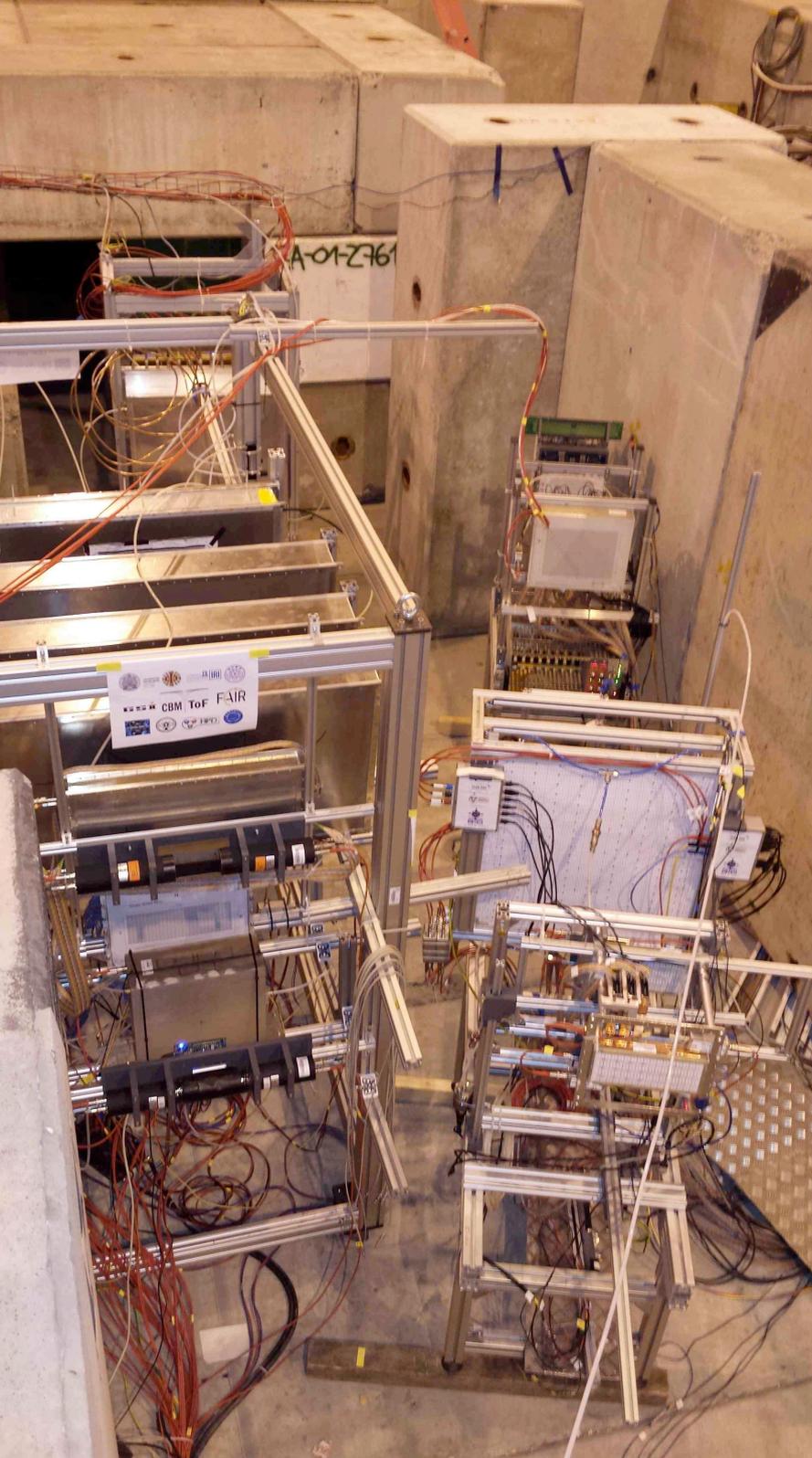
The CBM Collaboration



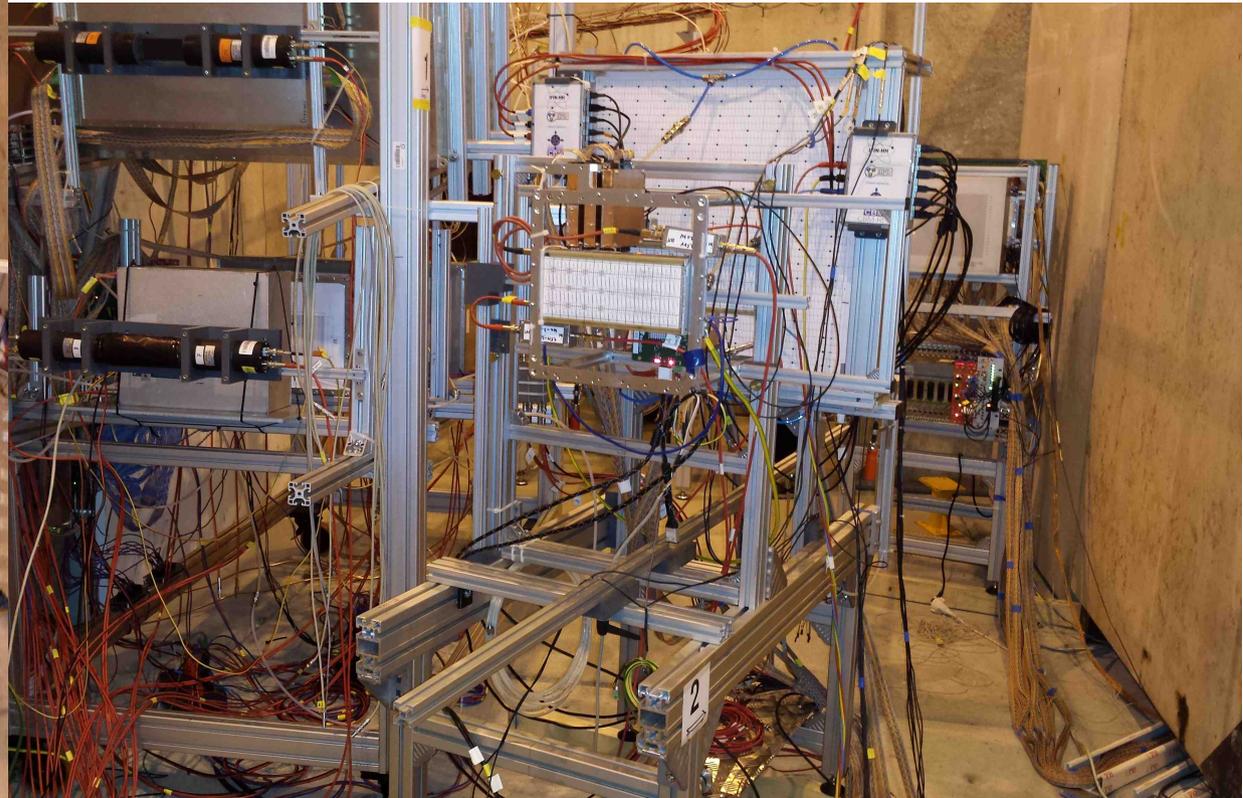
September 2014

- M1
- M2
- M3
- M4
- M5
- M6

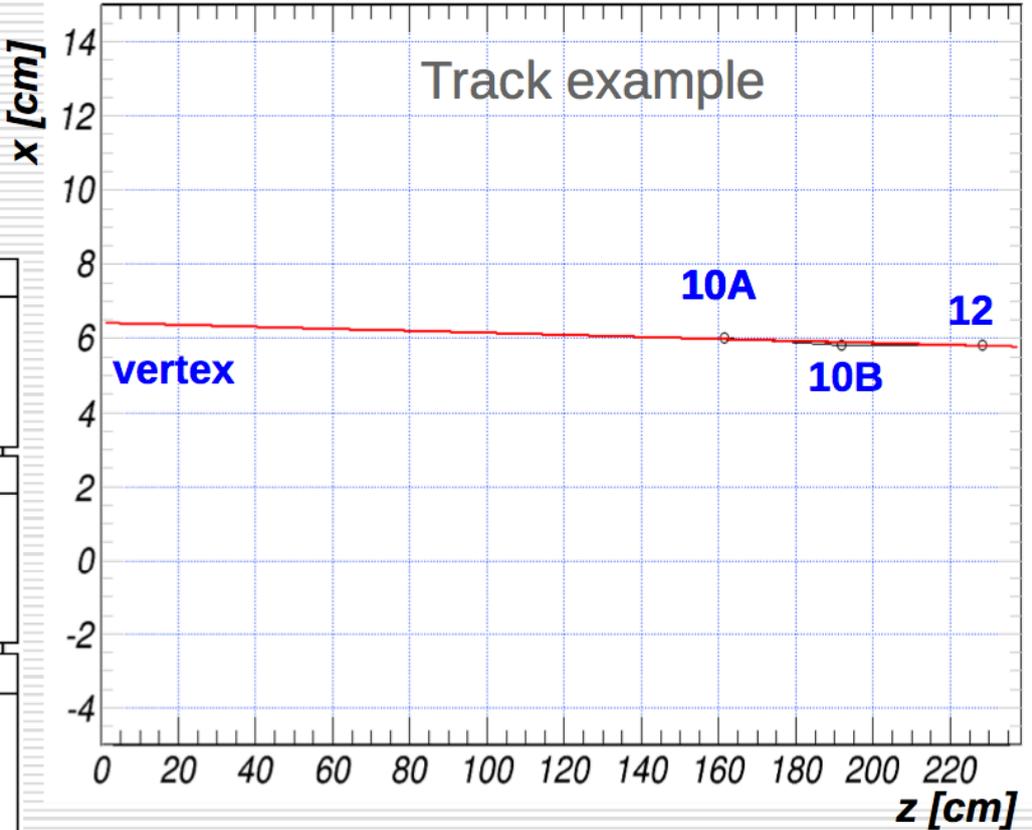
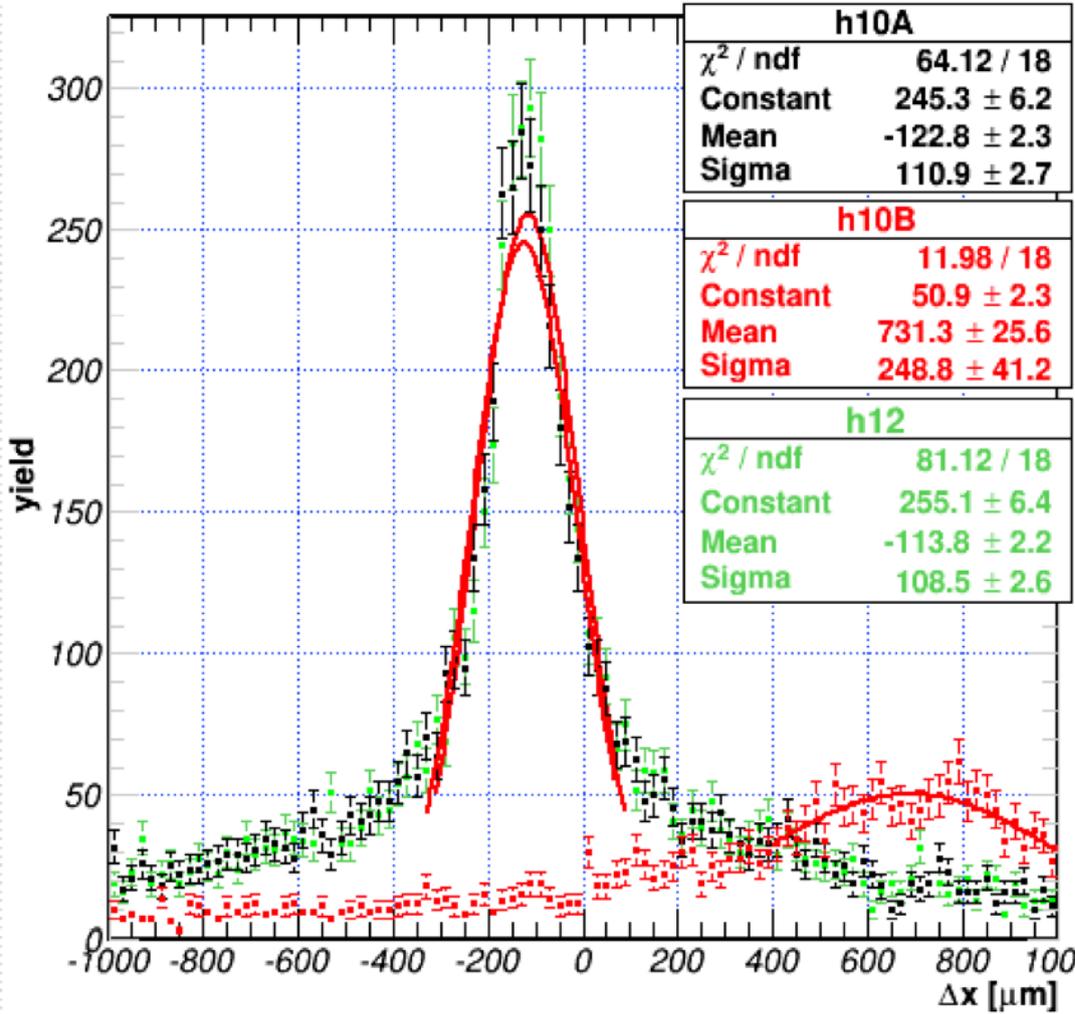




In-beam tests @ SPS, Nov.-Dec. 2015



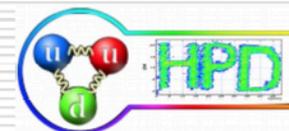
Fit to cluster residuals
(not the proper way to estimate
detector resolution but still ...)



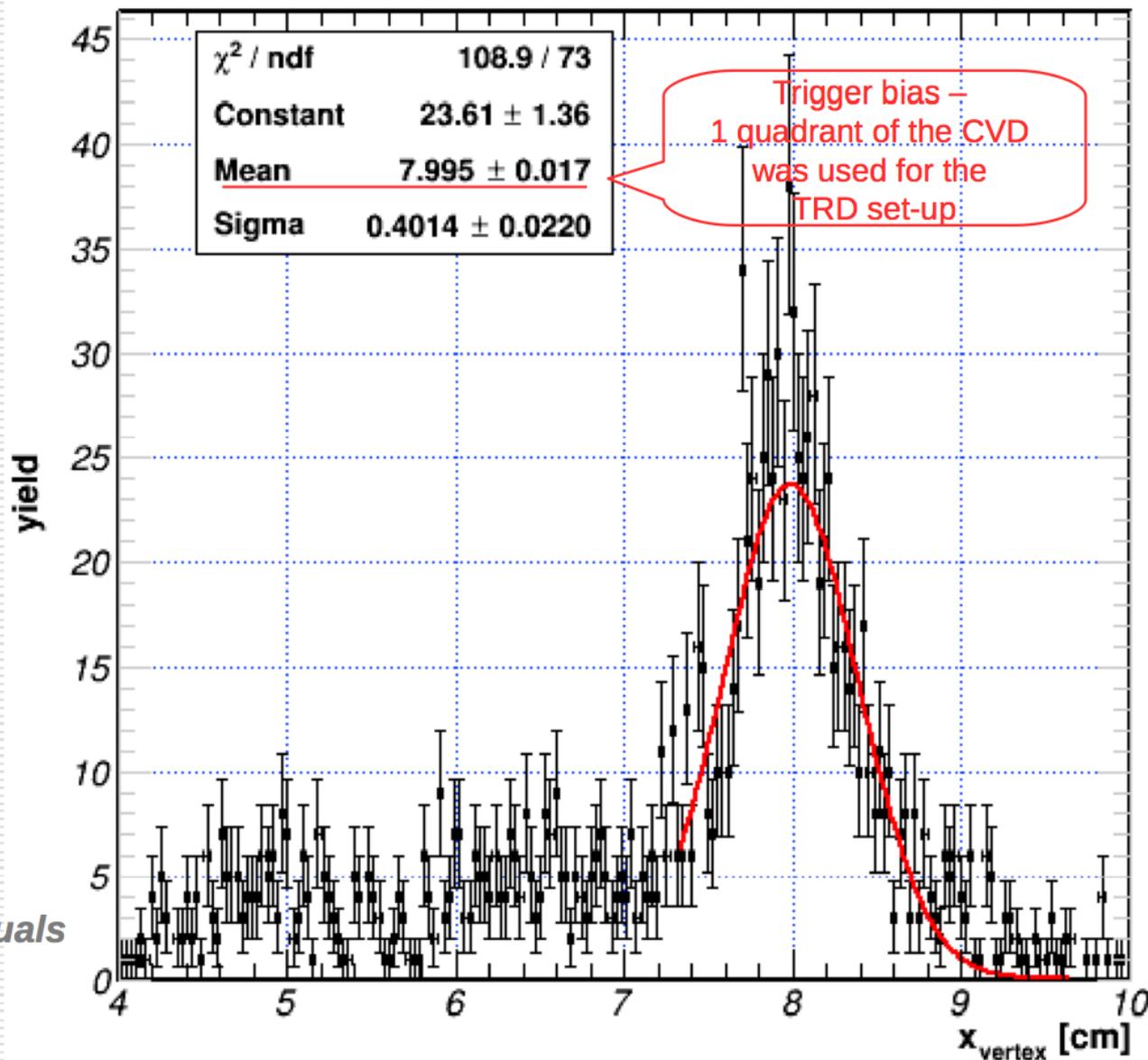
9.7e6 triggered events
7.3e3 single track events



Vertex



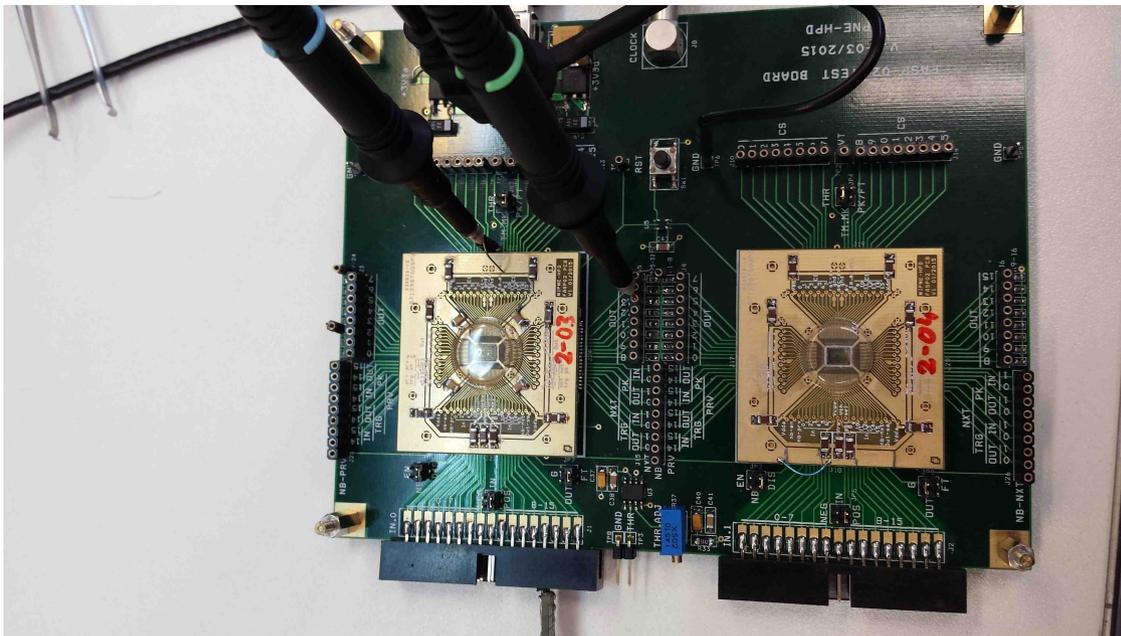
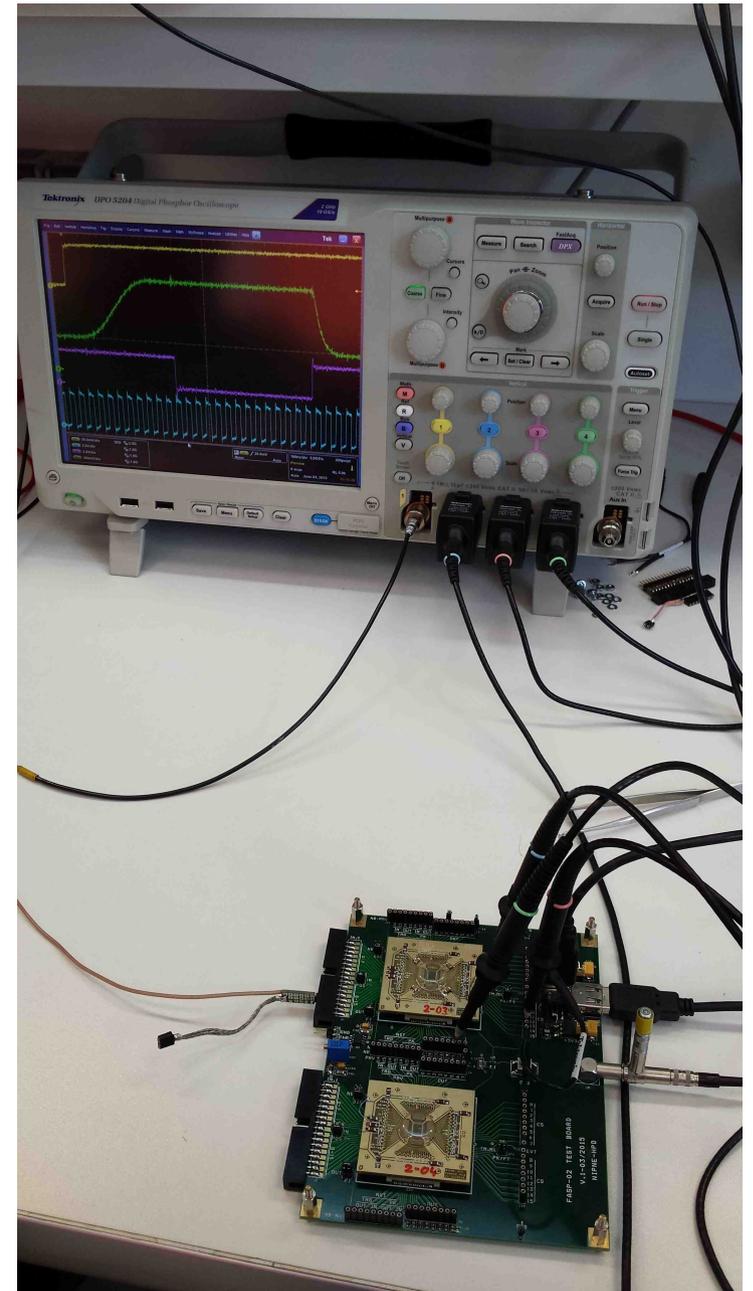
1.6e3 vertex events
 1.e3 for vertex definition

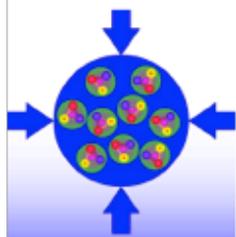


Fri Apr 8 13:15:28 2016

*Definition :: vertex track
 Track in single track event with all residuals
 in the +/- resolution range*

FASP-02 electronic tests



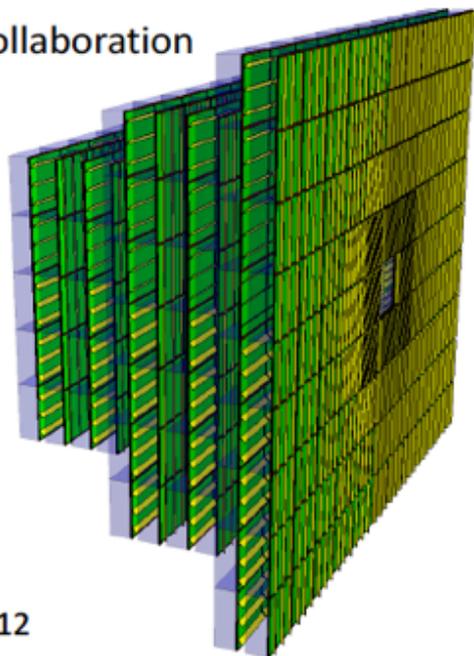


Compressed Baryonic Matter Experiment

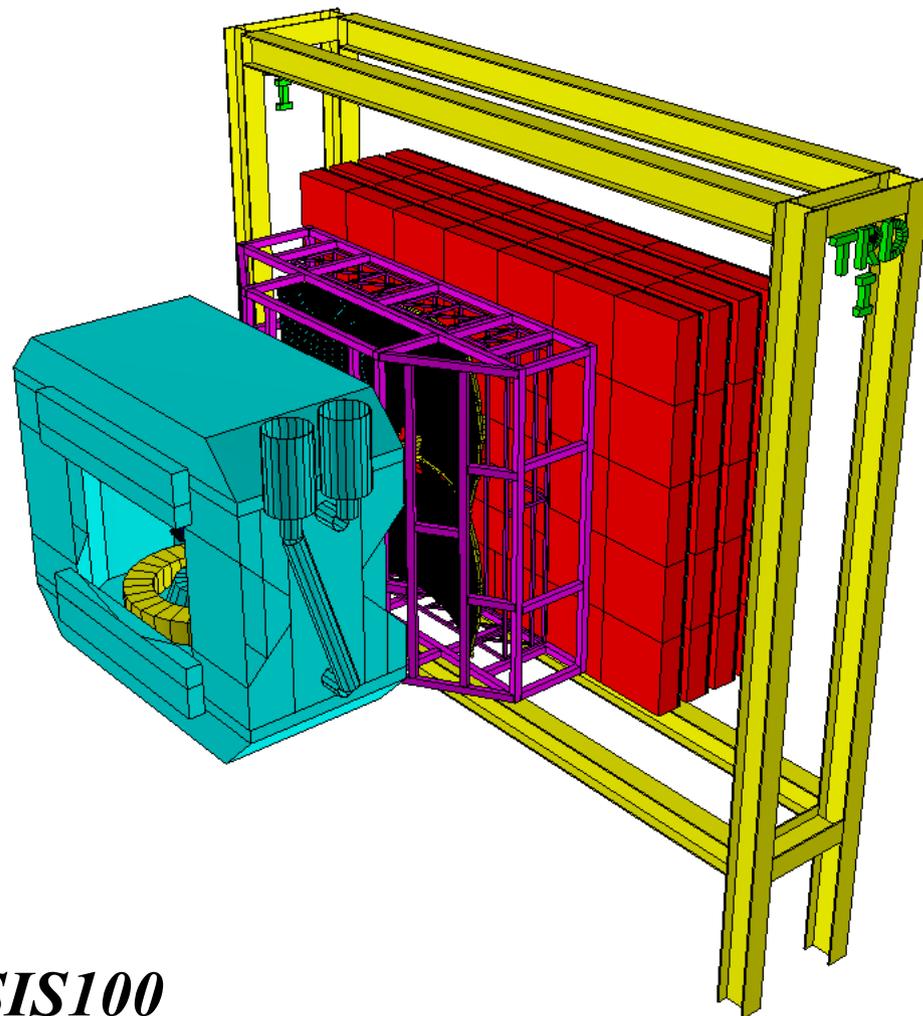
Technical Design Report for the CBM

Transition Radiation Detector (TRD)

The CBM Collaboration



November 2012



SIS100

CBM time line

1.1.1 CBM Experiment

M11 Ready for beam

1.1.1.1 Micro Vertex Detector (MVD)

Prototyping and Engineering design

M3 TDR approved

Pre-production

M8 Production Readiness Review

Production

M10 Ready for Installation

Installation

M11 Ready for beam

1.1.1.2 Silicon Tracking System (STS)

Prototyping and Engineering design

M3 TDR approved

Pre-production

M8 Production Readiness Review

Production

M10 Ready for Installation

Installation

M11 Ready for beam

1.1.1.3 Lepton ID Detector

1.1.1.3.1 Ring Imaging Cherenkov Detector (RICH)

Prototyping and Engineering design

M3 TDR approved

Pre-production

M8 Production Readiness Review

Production

M10 Ready for Installation

Installation

M11 Ready for beam

1.1.1.3.2 Muon Detector (MUCH)

Prototyping and Engineering design

M3 TDR approved

Pre-production

M8 Production Readiness Review (prototype testing done)

Production

M10 Ready for Installation

Installation

M11 Ready for beam

1.1.1.4 Transition Radiation Detector (TRD)

Prototyping and Engineering design

M3 TDR approved

Pre-production

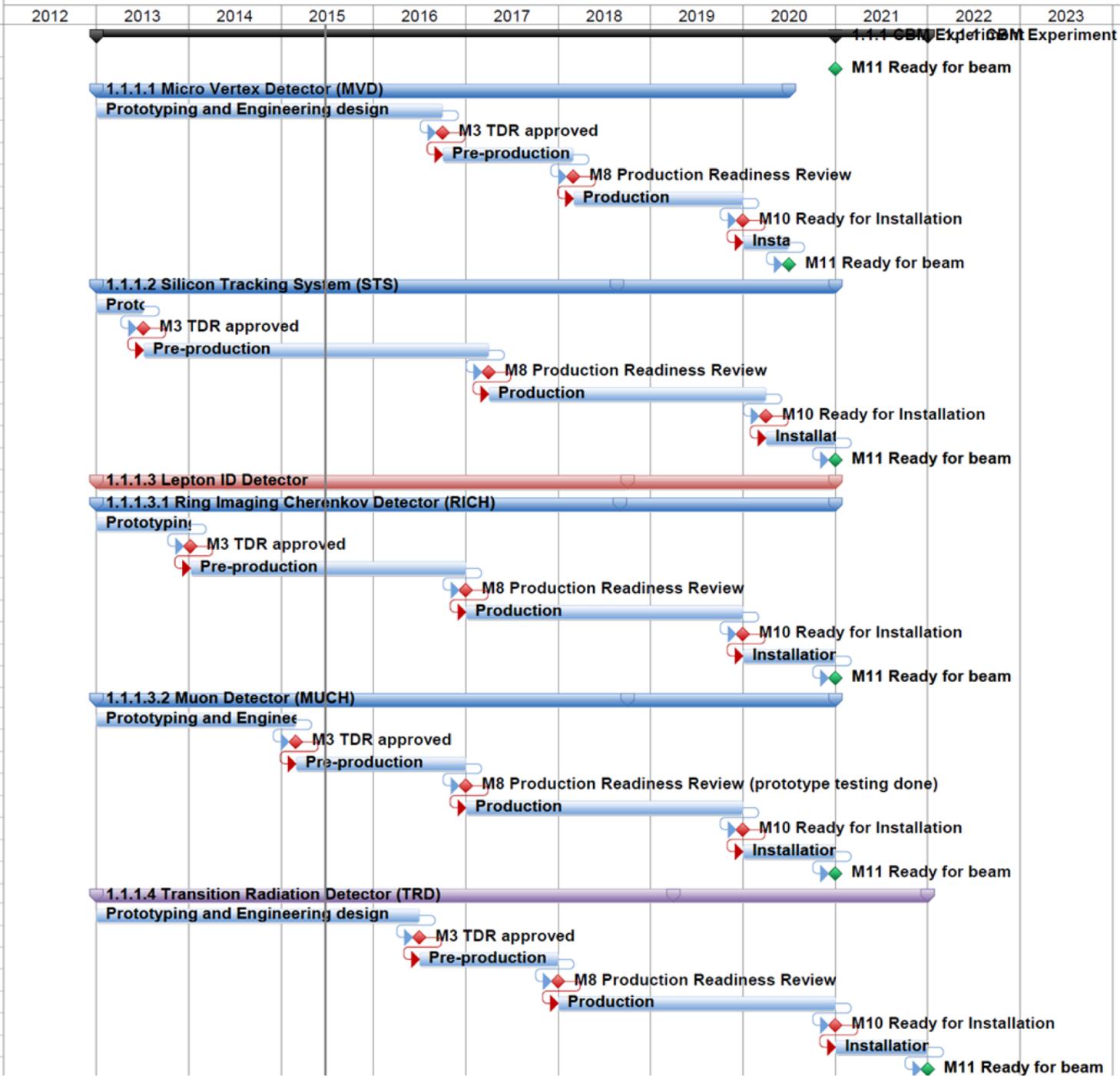
M8 Production Readiness Review

Production

M10 Ready for Installation

Installation

M11 Ready for beam



Training & teaching

A three weeks experience in the "crazy" world of scientific research ...

Exploring the world of research

Authors: **Mihai PUSCAS, Cristi SCHIRIAC, Filip PUICEA, Dorin CONONENCO**

Exploring the world of research

IFIN-HH **Second edition** DFH

Hadron Physics internship

2012

IFIN-HH DFH FSA

You are all invited

DFH building

Friday, 23 12:00

STUDENT SUMMER PARTY!

Team building break, bring the fun we cover the rest:

Barbeque, drinks, and a great time.

IFIN-HH DFH

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Reconstruction

TRD (Transition Radiation Detector)

RPC (Resistive Plate Chamber)

"The masterminds behind hadronics"

MBS (Main Branch System)

Hadrons

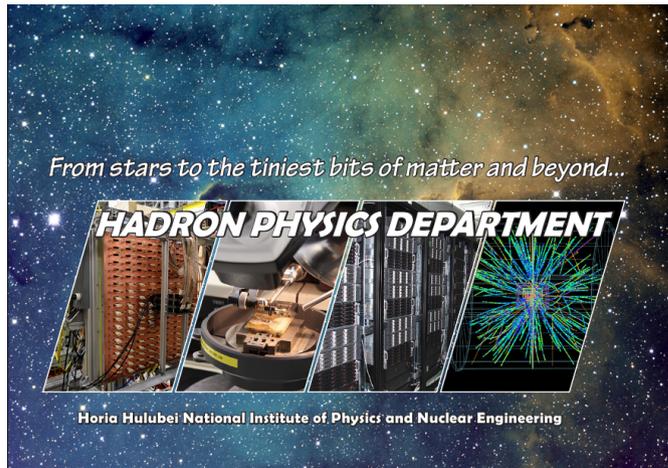
A few weeks in the world of research

ALICE experiment

IFIN-HH

Outreach

Booklet



Magic cubes



Movie



2014

- The 65th anniversary of IFA-IFIN-HH
- The 60th anniversary of CERN
- The 15th anniversary of ALICE membership
- The 10th anniversary of CBM membership
- The 10th anniversary of DetLab of HPD



- Numerous visits of students, local and foreign delegations

On the occasion of CERN 60th anniversary, IFIN 65th anniversary:

- Presentation at special events organized on the occasion of CERN 60th anniversary

July 19, 2014 – Sinaia - with the participation of Rolf Heuer - CERN DG

- Presentation - September 26 – Bucharest - with the participation of Livio Mapelli, head of Physics Division at CERN

- Posters

- Update of HPD web page - <http://niham.nipne.ro>

Visibility & competitiveness @ international level

- > 52 presentations @ 22 CBM Collaboration Meetings
- 2 presentations @ International Workshop on Resistive Plate Chambers – 2010, 2012
- 2 presentations at Vienna Conference on Instrumentation – 2011, 2013
- 1 presentation @ IEEE Conference – Dresda 2008
- > 22 contributions to the Annual CBM Scientific Report
- 1 plenary talk & 1 in parallel sessions @ EuNPC 2012
- 2014 JINST 9 C10014
- Nuclear Theory, Vol. 33 (2014), p.152, ISSN 1313-2822 (Proceedings of the 33-rd International Workshop on Nuclear Theory (IWNT-33), Rila Mountains 2014)
- Journal of Physics: Conference Series, Volume 533, 012009, 2014
- Varna Summer School - lecture - 2015
- 7 NIM & 2 Rom. Journal of Physics papers
- 7 diploma thesis
- 2 master degrees
- I3HP - FP6, HadronPhysics2 and HadronPhysics3 – FP7
- 2 brevets
- 2 silver medals @ Geneva salon of inventions
- 4 editions of Summer Student Program in HPD
- 2 International events: - Workshop - Cheile Gradistei – 2005
 - CBM Meeting - Mamaia – 2010
- CBM Collaboration Chairman – 2 mandates (elaboration of the CBM Constitution)
- Member of the Management Board & Technical Board
- Co - convener of CBM-TRD subgroup

They are the main actors !



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