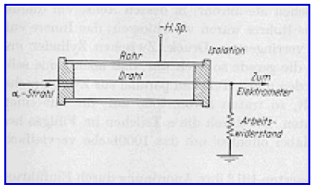
WP13 – JRA 1

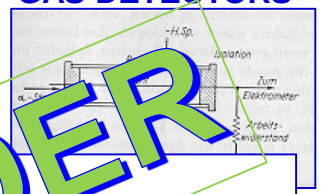


WP13 = JRA1 = Innovative gas detectors

WP COORDINATORS:

Silvia Dalla Torre, Imad Laktineh

WP13, SCIENTIFIC ASPECTS

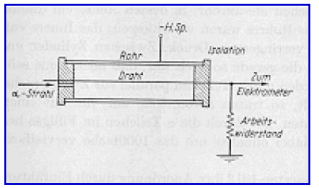


REMINDER

- **2 TECHNOLOGIES: the future of GAS DETECTORS**
  - **RPCs**
  - **MPGDs**
- **TASKs grouped in 3 major sectors**
  - ***Advanced detector developments*, namely detector R&D:**
    - **TASK 13.2, including 5 activities**
  - ***Tools to facilitate the detector development*, namely technological R&D oriented to detector development by realizing dedicated lab instruments:**
    - **TASK 13.3, including 3 activities**
  - ***Preparation for large series production*, namely establishing techniques and protocols for large size/series construction, QA, production transfer to industry:**
    - **TASK 13.4, including 7 activities**
- **The program is a good balance between**
  - R&D for better and better detector performance matching the requirements of present and future experiments
  - Tool development and TT to ensure the construction of large experimental set-ups (and facilitating applications beyond research)

INSTITUTIONS & ACTIVITIES

GAS DETECTORS

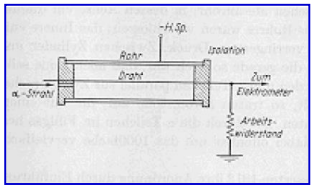


11 beneficiary groups
9 partner groups
In total : 13 Institutions

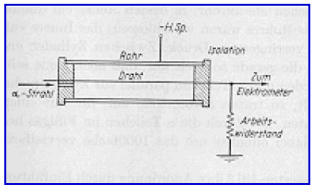
	BENEFICIARIES											PARTNERS						NEW PARTNERS		
Institute	CEA-Saclay	CERN	IN2P3-Lyon	INFN-Bari	INFN-LNF	INFN-TOV	INFN-Trieste	LIP	Lund U	MPI	Wigner	AGH Krakow	BONN U	IN2P3-Clermont-Ferrand	IN2P3-OMEGA	INFN-Bologna	INFN-Torino	GENT	GWNU (Korea)	Dresden
tasks																				
13.1.			■				■													
13.2.1			■	■	■			■						■				■	■	■
13.2.2			■	■										■	■	■		■	■	■
13.2.3	■	■		■	■	■			■	■	■	■	■				■	■	■	■
13.2.4				■	■															
13.2.5							■													
13.3.1		■										■	■							
13.3.2	■	■					■				■									
13.3.3		■							■											
13.4.1	■			■		■				■										
13.4.2	■																			
13.4.3				■	■											■				
13.4.4							■				■									
13.4.5				■	■															
13.4.6			■	■		■		■		■										
13.4.7	■	■																		

RPC MPGD

THIS REPORT

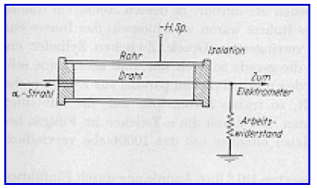


- The focus of the activity report is on
  - last year activity
  - deliverables and milestones expected in the next months
    - 2 DELIVERABLES, M24
    - 4 MILESTONES, M24
    - 1 MILESTONE, M26


Rohr
Draht
Isolation
Zum Elektrometer
Arbeits-widerstand

RPCs

RPCs vs AIDA2020-WP13

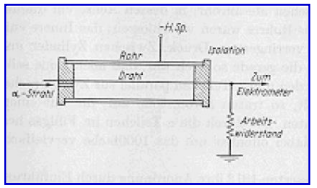


what is strategic and how WP13 answers to the quest

• Low resistivity RPCs for high rates	TASKs 13.2.1, 13.2.3
• Fast timing RPCs	TASK 13.2.2
• Large RPCs	TASKs 13.2.2, 13.4.1
• Eco-friendly gases	TASKs 13.2.3
• Large production	TASK 13.4.6

REMINDER

Low resistance RPCs for high rates

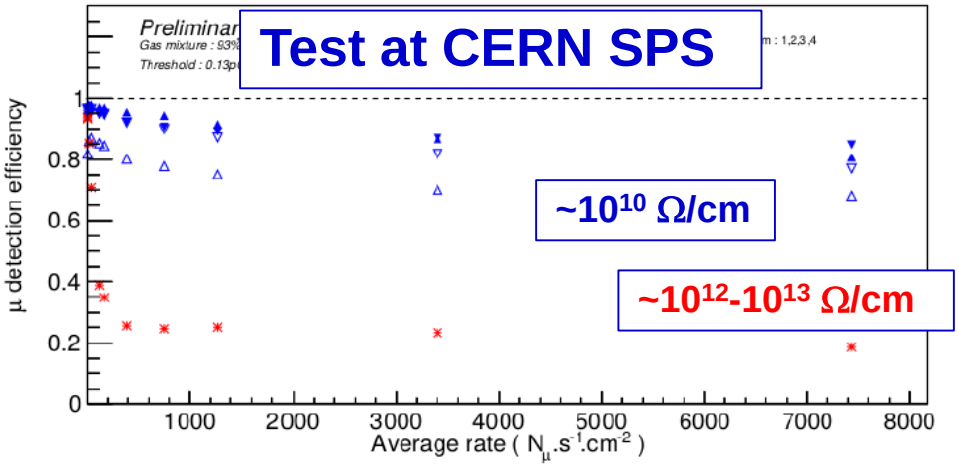


Recent progress in materials

- PVdF+C plate (40x30 cm2) of 2 mm thickness produced by injection ~10e10-11 ohm.cm
- Large KREFINE plate bought, cut and distributed to the participants, ~10e10 ohm.cm
- Pestov glass obtained from GSI, untested so far

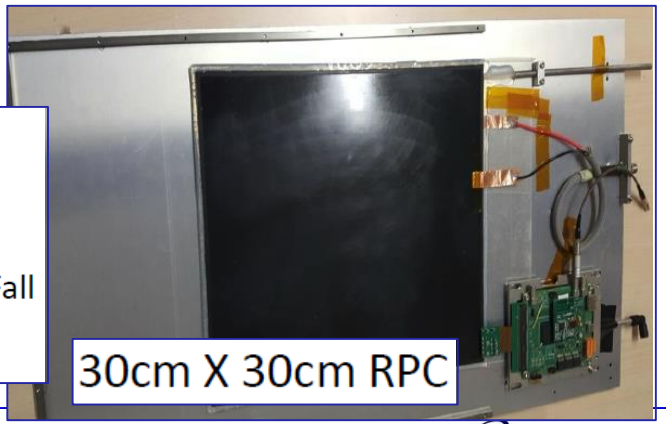
Small tests (in chambers) situation

- High resistivity PVdF+C (Lyon) √
- Ceramics (HZDR) √
- Krefine (LIP) √
- Phosphate glass (Lyon + LIP) √
- Pestov glass (LIP)
- Low resistivity PVdF+C (Lyon)

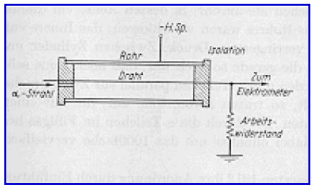


Preparation for beam tests in Fall this year

Foreseen 2 chambers x 3 materials (doped PVdF, Krefine, “chinese glass”) to be tested next Fall at SPS and maybe GIF++.



Low resistance RPCs for high rates



Recent progress in materials

- Fast timing (M)RPC mm thickness produced by injection ~10e10-11 ohm.cm
- Large Krefine plate bought, cut and distributed to the participants, ~10e10 ohm.cm
- Pestov glass obtained from GSI, untested so far

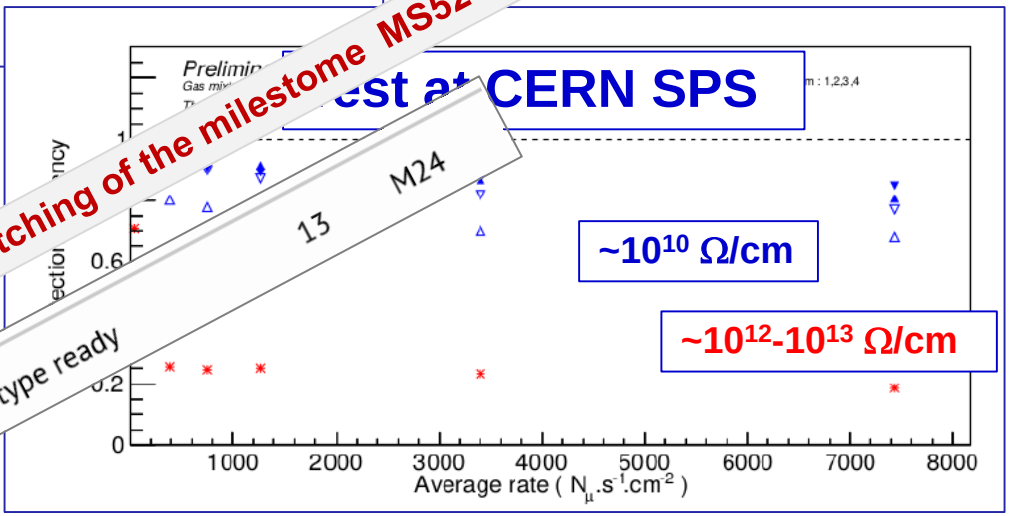
Small tests (in 1 m² chambers) situation

- High resistivity PVdF+C (Lyon) √
- Ceramics (HZDR) √
- Krefine (LIP) √
- Phosphate glass (Lyon + LIP) √
- Pestov glass (LIP)
- Low resistivity PV (Lyon)

This activity results in a fully satisfactory matching of the milestome MS52

MS52 High-rate RPC prototype ready

Test at CERN SPS

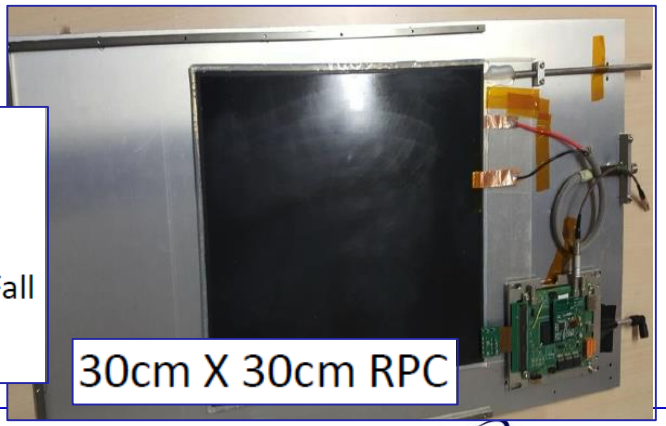


~10^{10} Ω/cm

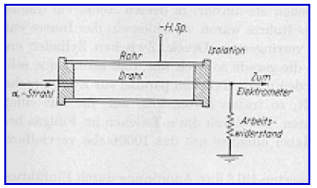
~10^{12}-10^{13} Ω/cm

Preparation for beam tests in Fall this year

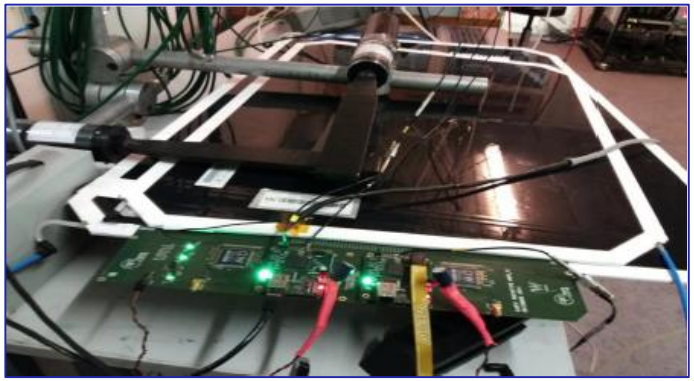
Foreseen 2 chambers x 3 materials (doped PVdF, Krefine, "chinese glass") to be tested next Fall at SPS and maybe GIF++.



Fast timing RPCs



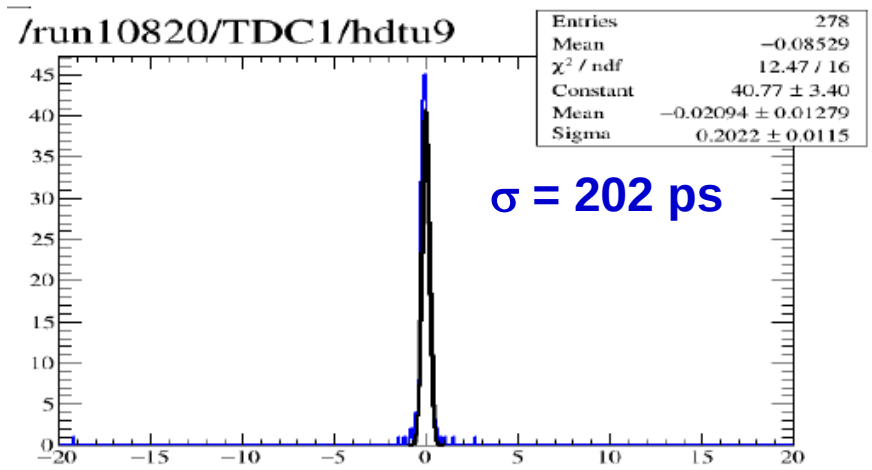
Fast timing (M)RPC



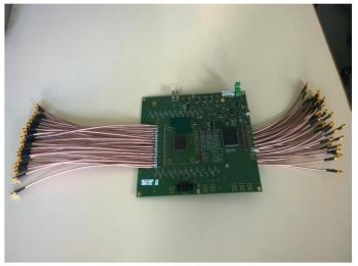
read out by **PETIROC** channels and then **Tsinghua TDC**.

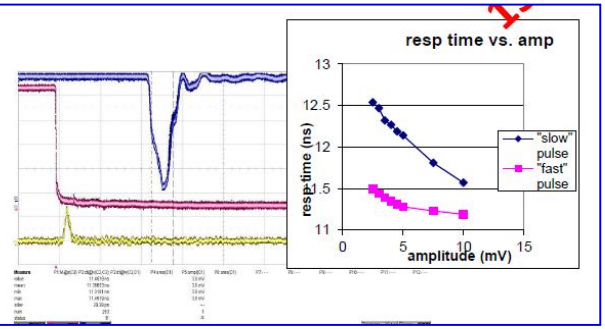
Reading out the strips at the 2 ends

1. Resolution includes ~ 1.1 cm error from the scintillator (~80 ps quadratically)
2. No cluster analysis, it should also improves the resolution (to be divided by sqrt(C))

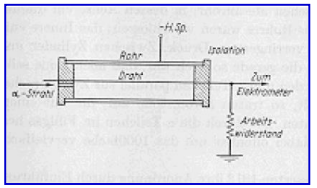


Evaluation of the PETIROC ASIC

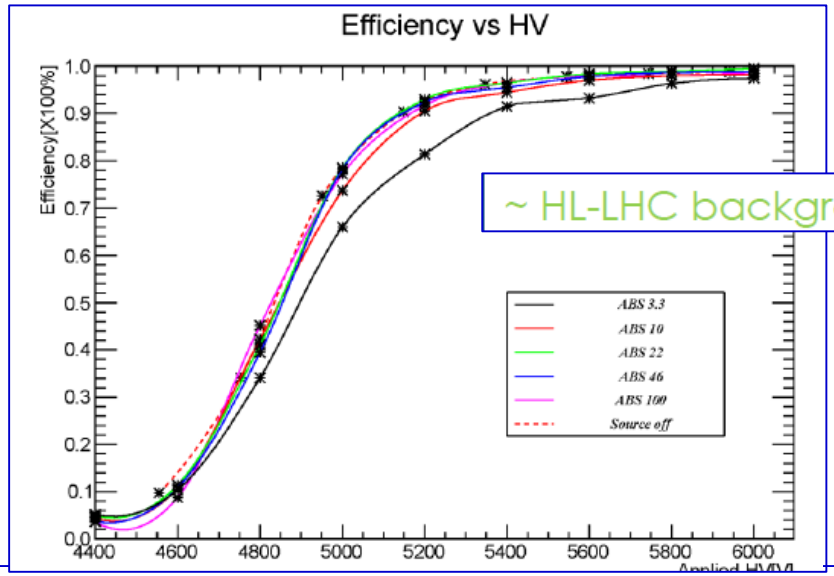




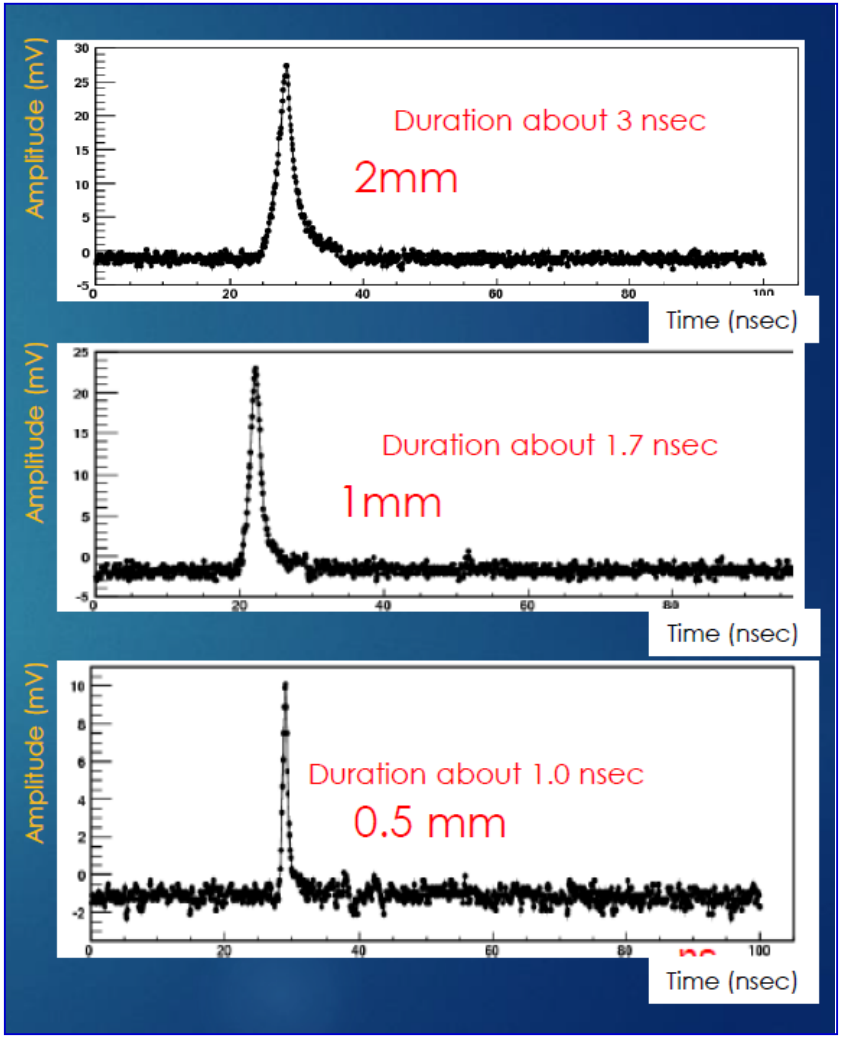
ANOTHER INGREDIENT TOWARDS HIGH RATES



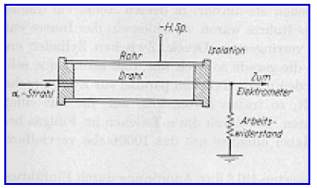
- Thinner gas gaps for higher rate and time resolution →
  - Tested 1.2 mm and 0.8 mm
  - New materials for the electrodes under study (phenolic glass)



~ HL-LHC background

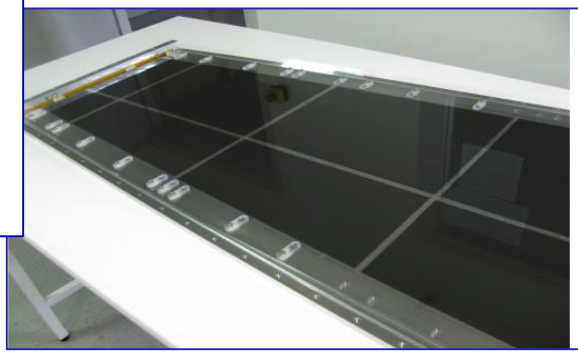


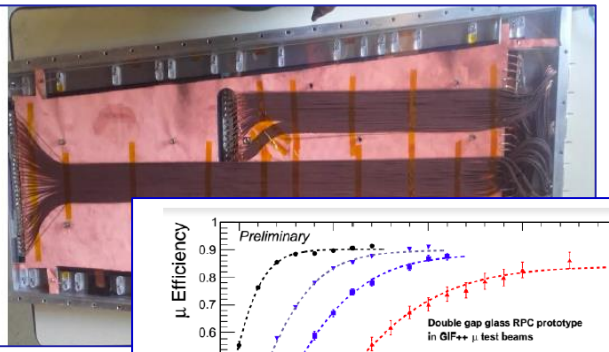
LARGE SIZE RPCs

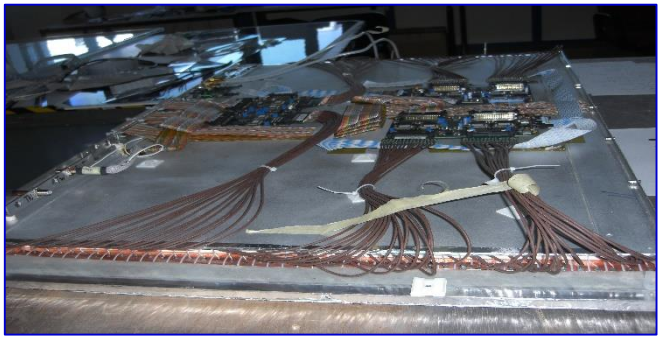


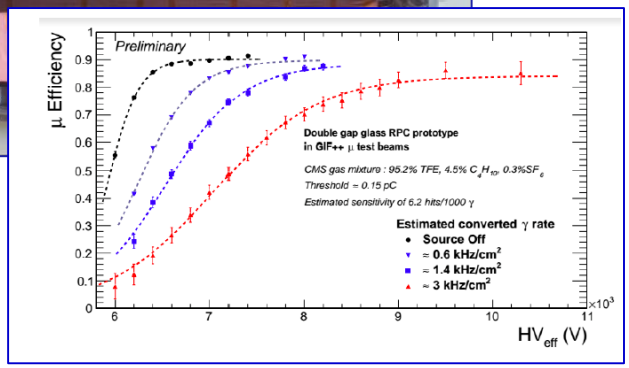
Towards large size also with new low R materials:

- **Enginering mosaic-type layers (gas tight!)**

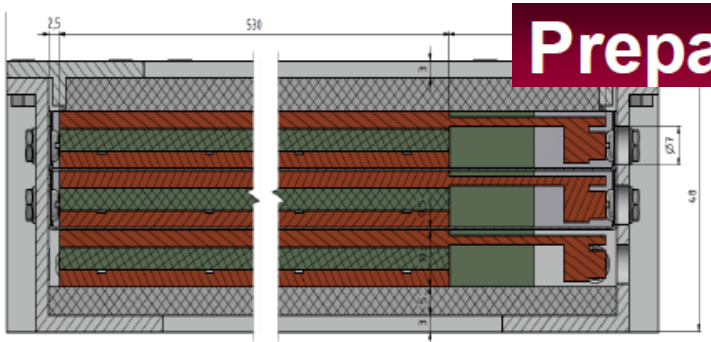








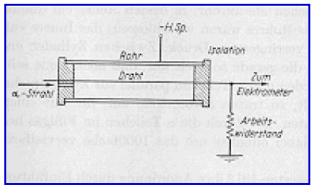
Preparation for Assembly of Large Chambers



Triplet of new RPCs with 1mm gas gap in support frame and Faraday cage of 48 mm overall thickness → fits into assigned 50 mm envelope.

Dedicated large-size clean room with specific equipment

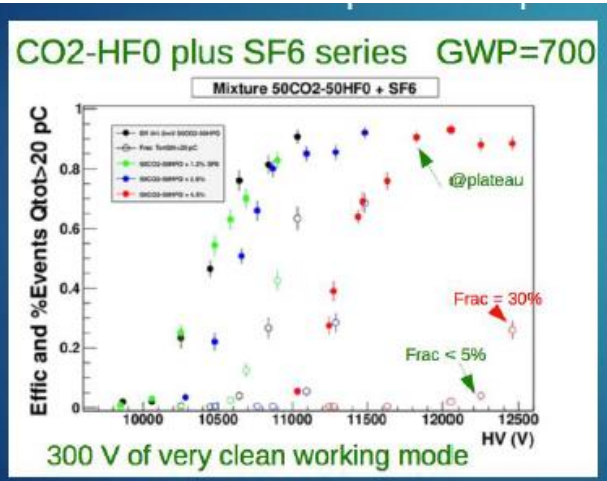
ECO-FRIENDLY GASSES



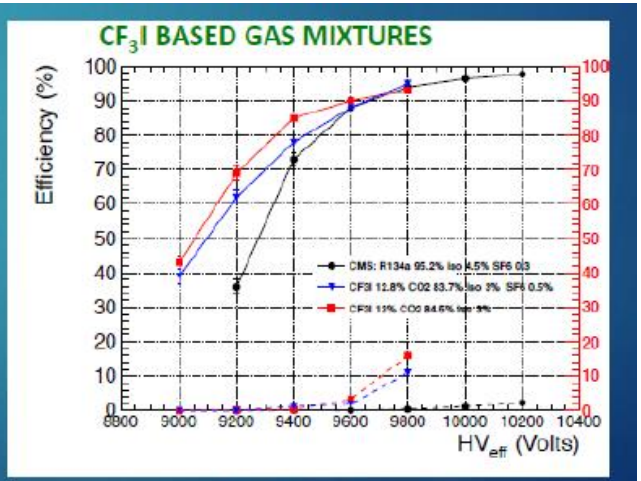
Problem: GWP is too high for R134A (1300) and SF6(24000). CO2 GWP is 1

State of the art:

- "new RPC gas mixtures for large area apparatuses" Presented at RPC14 workshop by B. Liberti and Published on JINST: R. Cardarelli et al. JINST 9 C11003 doi:10.1088/1748-0221/9/11/C11003
- "A study of HFO-1234ze (1,3,3,-Tetrafluoropropene) as an eco-friendly replacement in RPC detectors. : L.Benussi et al. http://arxiv.org/abs/1505.01648



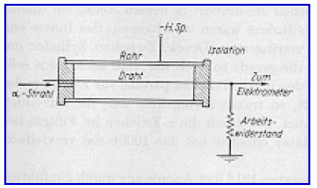
B. Liberti et al.



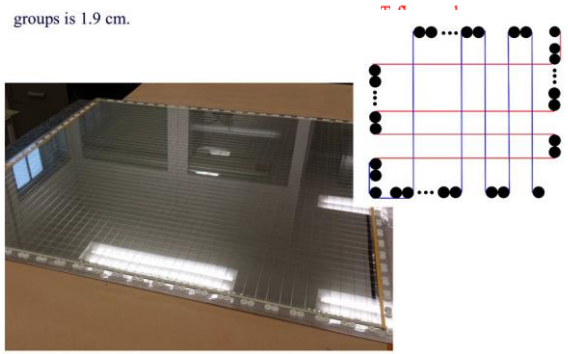
D. Piccolo et al.

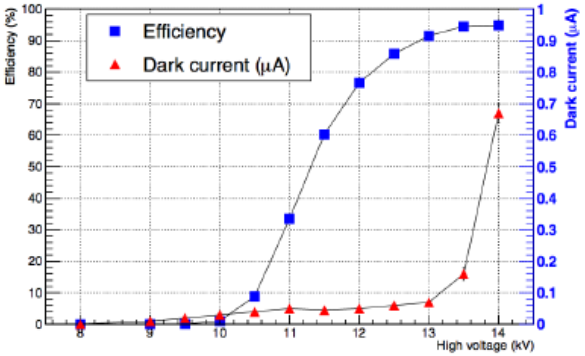
HFO=1234ze (1,3,3,3-Tetrafluoropropene) has been identified as a possible choice

LARGE PRODUCTION, ENGINEERING PHASE

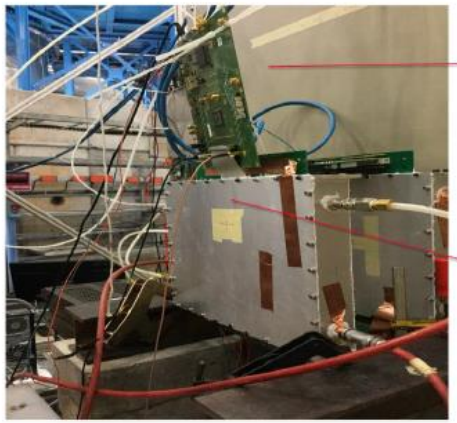


Several Multi-gap detectors were designed and built . Excellent efficiency when tested with HARDROC ASICs

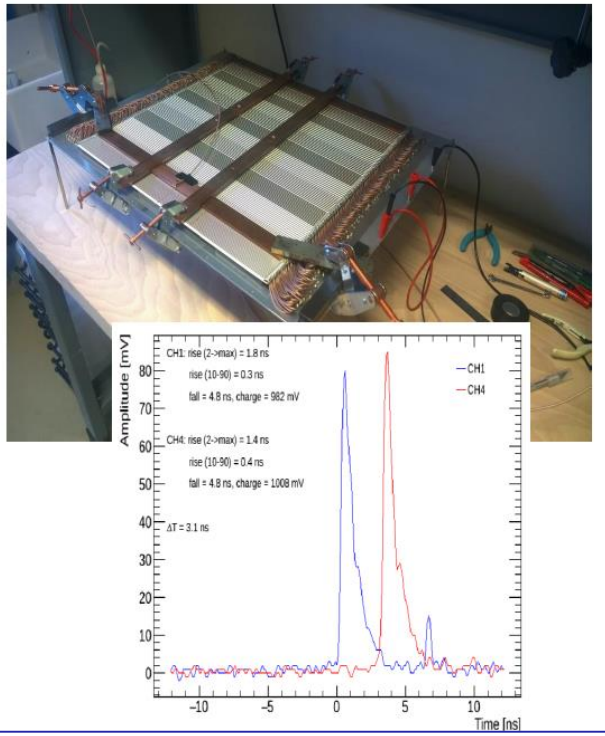




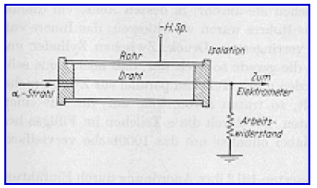
A new PCB with pickup pads read out with PETIROC was developed and used to test timing of small MRPC



Strip readout PCB – signal propagation study

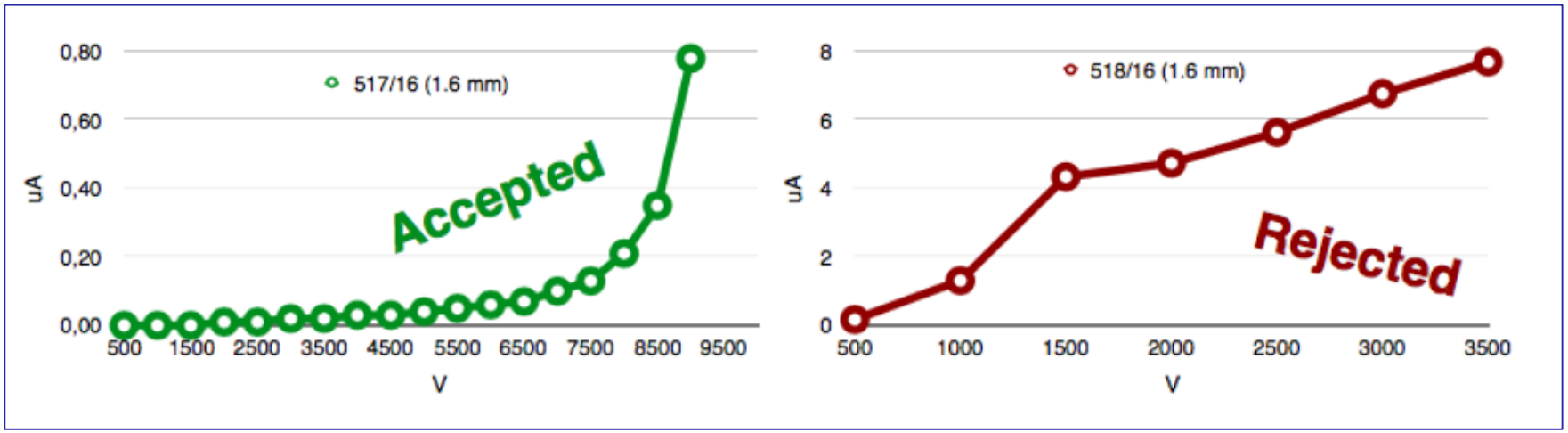


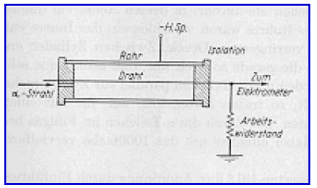
LARGE PRODUCTION, QC



Detector quality control:

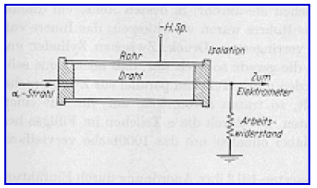
- **Measurements of the electrode resistivity**
- **Control of the gap production**




Rohr
Isolation
Draht
Zum Elektrometer
Arbeits-widerstand

MPGDs

MPGDs vs AIDA2020-WP13



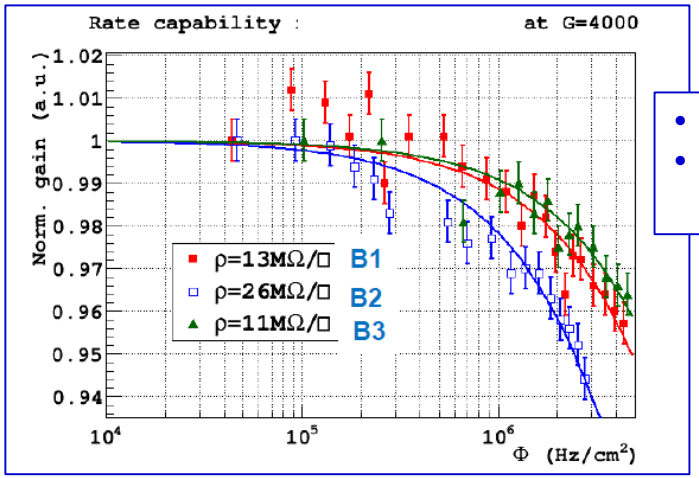
what is strategic and how WP13 answers to the quest

REMINDER

- **Novel architectures** — **TASKs 1.2.4, 1.2.5**
  - Finer time resolution
  - Finer space resolution
  - Higher gain
  - Higher rate capability
  - Simplified construction
- **Tools for lab and experiments** — **TASKs 1.3.1, 1.3.2, 1.3.3**
- **Quality Control** — **TASKs 1.4.3, 1.4.4, 1.4.5**
- **Large production and TT** — **TASKs 1.4.2, 1.4.7**
- **Applications beyond science** — **TASKs 1.2.4, 1.2.5, 1.4.3, 1.4.4, 1.4.5, 1.4.2, 1.4.7**

µR-WELL

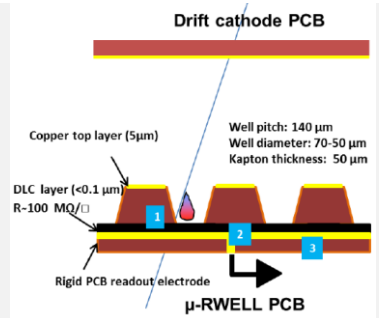
study & implementation of the resistive layer segmentation *vs* rate capability



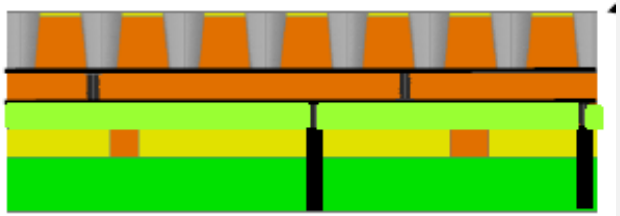
- local high rate, so far
- large area irradiation at test beam, next June

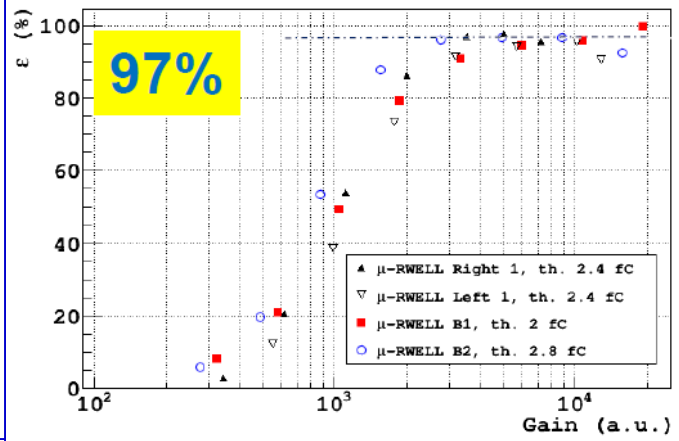
REMINDER

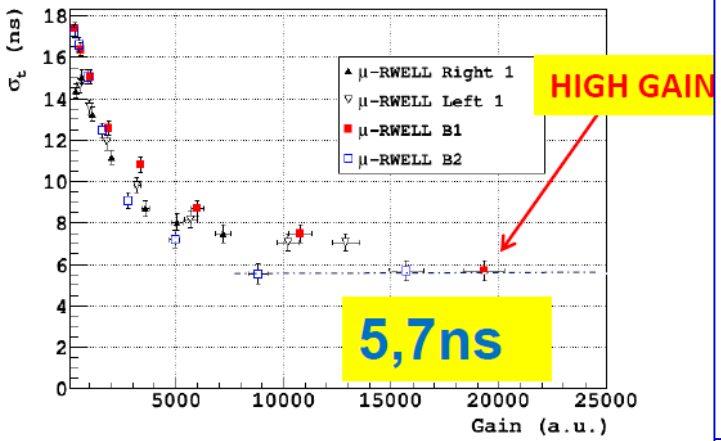
µ-RWELL architecture



µ-RWELL_PCB for High Rate

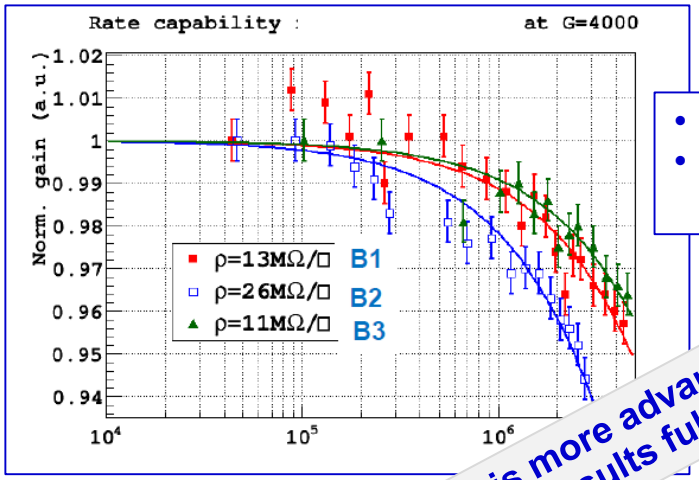






µR-WELL

study & implementation of the resistive layer segmentation *vs* rate capability

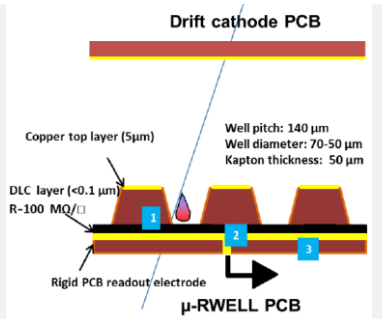


- local high rate, so far
- large area irradiatio
  test beam, nex

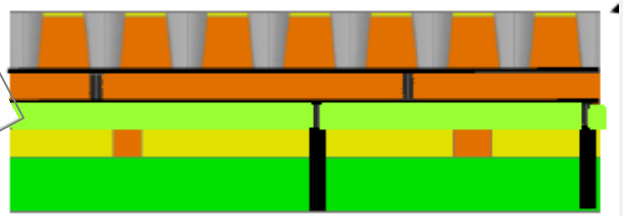
This recent activity is more advanced respect to the milestone MS53.
Previously presented results fully match of the milestome MS53.

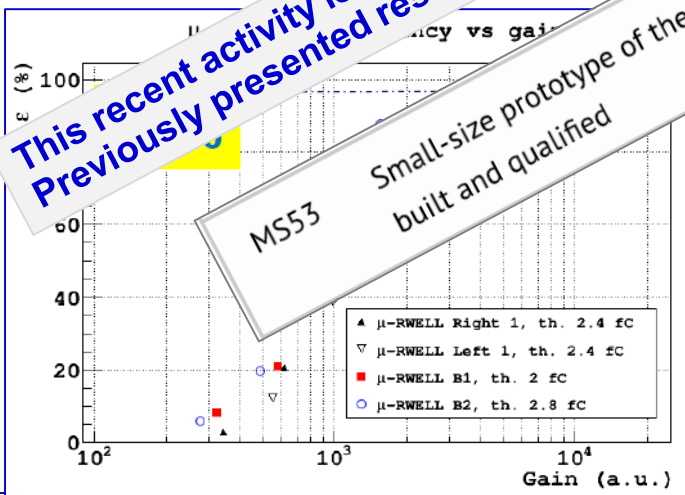
MS53 Small-size prototype of the R-WGEM built and qualified 13 M24

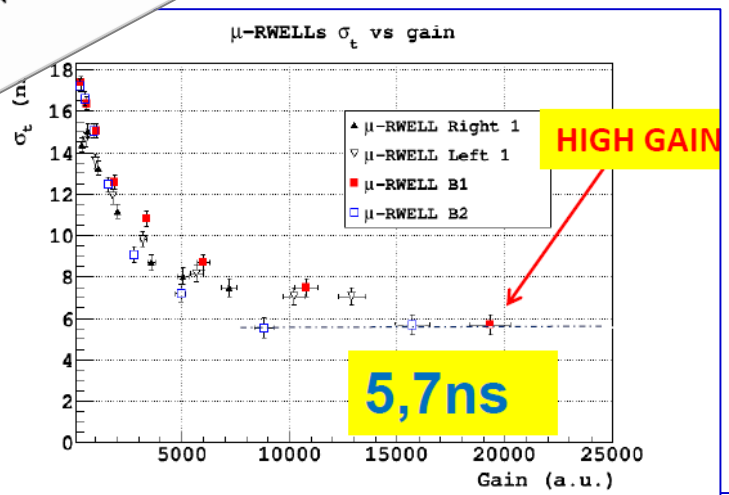
µ-RWELL architecture



µ-RWELL_PCB for High Rate







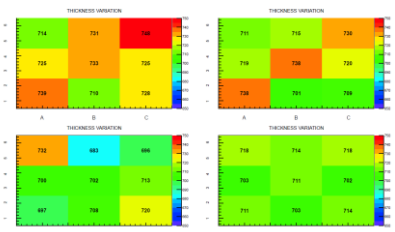
HIGH GAIN MPGD

THGEMS by Permaglas ME730

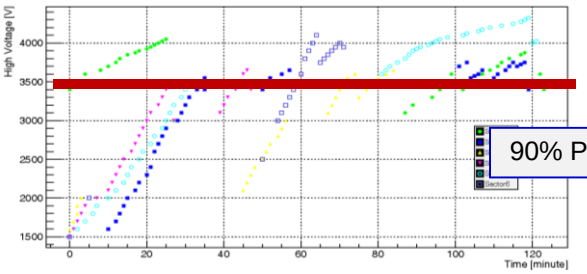
by RESARM Engineering Plastics SA

- Raw material characterization

  Nominal thickness 0.7 mm
  $I\Delta I < 4\%$; $\sigma < 2\%$
  Nominal thickness 1 mm
  $I\Delta I < 2\%$; $\sigma < 1\%$

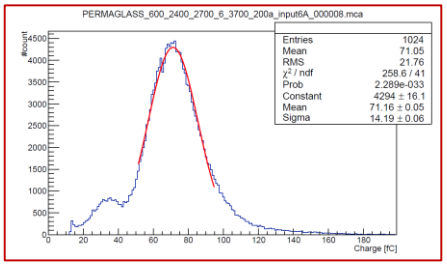


- Electrostatic properties by Paschen test



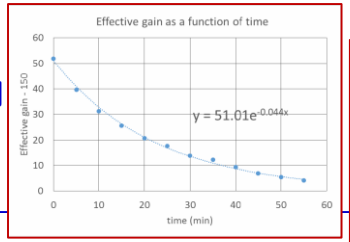
90% PASCHEN limit

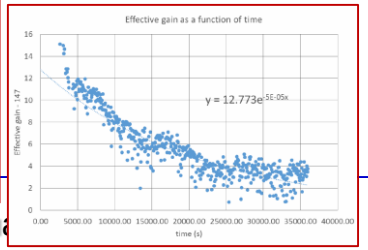
- GAIN UNIFORMITY SCAN: σ: 13%



- ENERGY RESOLUTION:20 %

- GAIN vs TIME
  - Charging-up
  - Ion motion in the bulk material

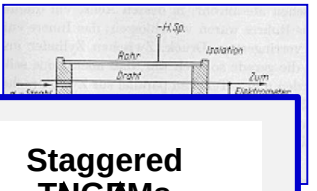




Conclusions:

- Robust material, remarkable uniformity performance
- Easy to operate and limited gain dependence vs time
- Good potentialities for high gain multilayer devices
- Interesting as a replacement for THGEM by etchableglass approaches: much cheaper !

HIGH GAIN MPGD



THGEMS by Permaglas ME730

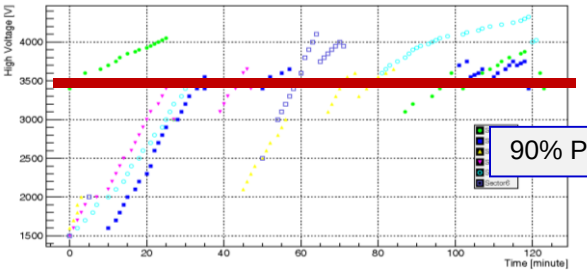
by RESARM Engineering Plastics SA

- **Raw material characterization**
  - Nominal thickness 0.7 mm
    - $\Delta l / l < 4\%$; $\sigma < 2\%$
  - Nominal thickness 1 mm
    - $\Delta l / l < 2\%$; $\sigma < 1\%$
- **Electrostatic properties by P…**
- **GAIN UNIFORMITY …**
- **ENERG… RESOLUTION**
- **GAIN vs TIME**
  - Charging-up
  - Ion motion in the bulk material

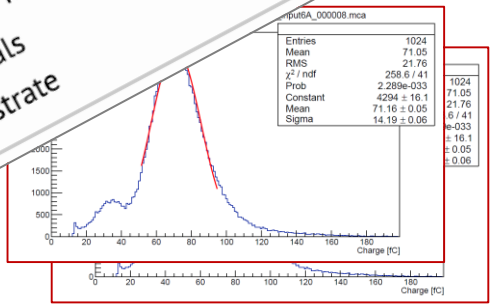
REMINDER

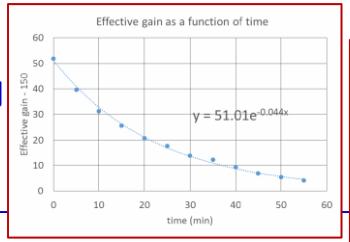
This activity results in a fully satisfactory matching of the milestome MS61

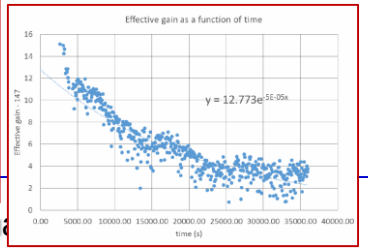
MS61 Qualification of the new candidate materials for THGEM substrate



90% PASCHEN limit





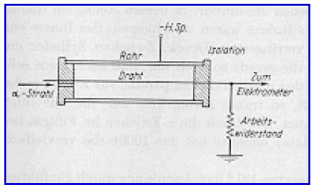


Conclusions:

- Robust material, remarkable uniformity performance
- Easy to operate and limited gain dependence vs time
- Good potentialities for high gain multilayer devices
- Interesting as a replacement for THGEM by etchableglass approaches: much cheaper !

INTEGRATION OF FE-chips IN SRS

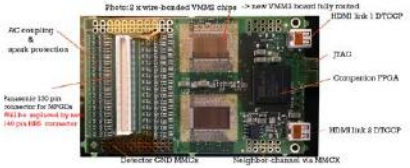
GAS DETECTORS



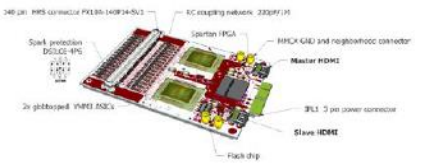
AIDA2020 in the VMM&SRS integration.

Support for the RD51 hybrid (wire bonded) VMM

- *VMM2 done*
- *VMM3 ongoing*



RD51 VMM2 Hybrid done (@CERN) and tested



RD51 VMM3 Hybrid at the bonding lab (@CERN) - 20th March 2017

First Timepix3 ASIC has been bonded on chip carrier provided by Nikhef.

SPIDR readout for cross checks is available

Support for the development of a new powering and connectivity schema

- *New Development*
- *Prototype tested*
- *PCB design started*

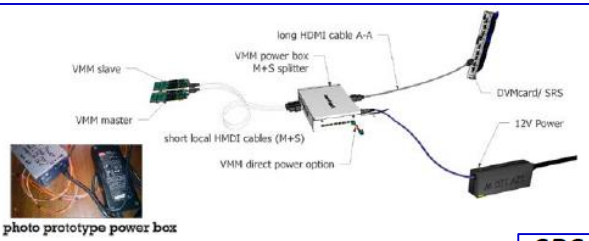
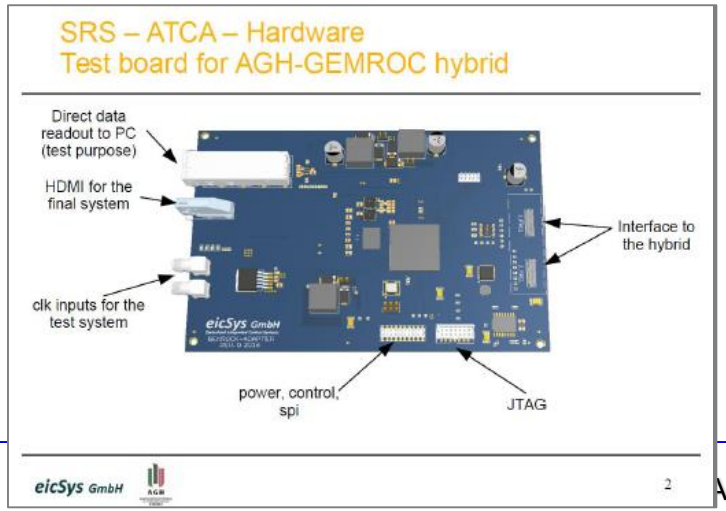


photo prototype power box



SRS/FE ASICs Summary

VMM

- RD51 wire bonded hybrid (VMM2 done/tested, VMM3 ongoing – probably done at the day of the meeting).
- Digital Interface Card DCARD (new design done and ready for production).
- Alternative powering/connectivity schema.
- Industrialization/Commercialization process.

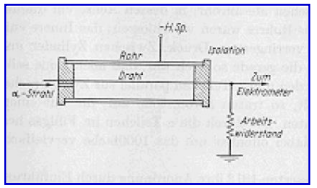
GEMROC

- AGH Hybrid in eicSys.
- Adapater card finalized, ready for production, test planned for spring 2017.
- Adapter considered as final final solution for the ACTA-SRS/GEMROC readout

Timepix3

- Timepix3 bonded in BONN
- SPIDR readout ready for cross check studies
- SRS Integration (frame-based) to cope with large number of hybrids (high rate readout not envisioned)

DEVELOPMENT OF MPGD-dedicated ELECTRONIC TOOLS



	Task 13.3.2
Deliverable [M24]	High Voltage Power Supply for MPGD

High Voltage for MPGDs: AIDA2020 Deliverable [M24]

***Compact MPGD HV power supply**: The desktop AVD is a remotely controllable, compact HV power supply for the operation of MPGD based detectors with up to nine user-defined fields. Specially designed for the operation of gaseous detectors, this supply includes active field stabilizers to compensate for dynamic loads and circuitry to protect from short circuits and sparking. The embedded control and monitoring system supervises all parameters and, associated with online Labview software, records and displays trending data of all HV channels. The front panel controls, combined with a status display, allow for local operation. The NIM-AVD unit will be fully contained within a dual-sized NIM module and, via a power adapter, it can be operated as desktop MPGD supply without NIM crate.*


AIDA 2020

Grant Agreement No: 654168

AIDA-2020

Advanced European Infrastructures for Detectors at Accelerators

Horizon 2020 Research Infrastructures project AIDA-2020

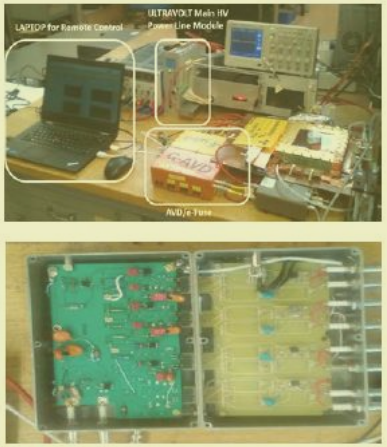
DELIVERABLE REPORT

MINIATURISED HV POWER SUPPLY

MILESTONE: D13.6

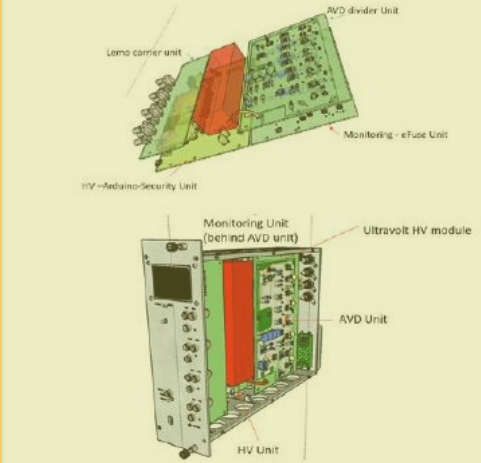
From Active Voltage Divider design..

LAST YEAR



.. To demonstrator..

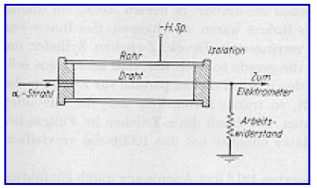
NOW



.. In view of indust./commerc. version

NEXT STEP

DEVELOPMENT OF MPGD-dedicated ELECTRONIC TOOLS



	Task 13.3.2
Deliverable [M24]	High Voltage Power Supply for MPGD

High Voltage for MPGDs: AIDA2020 Deliverable [M24]

Compact MPGD HV power supply: *The desktop AVD is a remotely controllable, com… …ver supply… …MPGD based detectors with up to nine user-defined fields. Specially designed for the oper… …eous det… …ades active field stabilizers to compensate for dynamic loads and circuitry to protect from s… …s and spark… …ontrol and monitoring system supervises all parameters and, associated with online Labview… …records a… …ta of all HV channels. The front panel controls, combined with a status display, allow for lo… …. The NIM… …ontained within a dual-sized NIM module and, via a power adapter, it can be operated as des… …supply with…*

From Active Voltage Divider design..

LAST YEAR

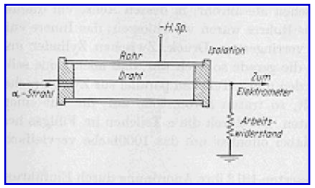
.. To demonstrator..

NOW

.. In view of indust./commerc. version

NEXT STEP

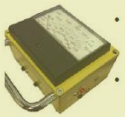
DEVELOPMENT OF MPGD-dedicated ELECTRONIC TOOLS



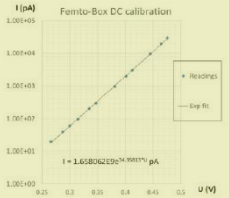
	Task 13.3.2
Deliverable [M24]	High Voltage Power Supply for MPGD
	(Floating) Pico ammeter
	Signal Processing
	Monitoring and Control Unit

FemtoBox: femto-ammeter

Calibration and stability

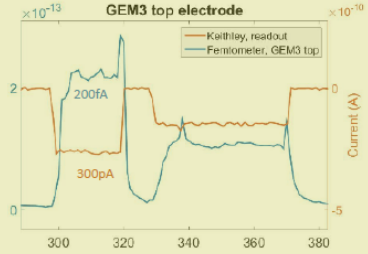


- Optimization of the readout schema for fast response and double polarity readout done
- Real-time measurement @ GND
- Real-time measurement floating



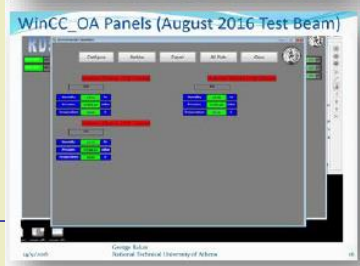
Floating Operation,
preliminary tests: Electrons and ions (floating readout) currents on top/bottom GEM3 electrodes (shuttered source)

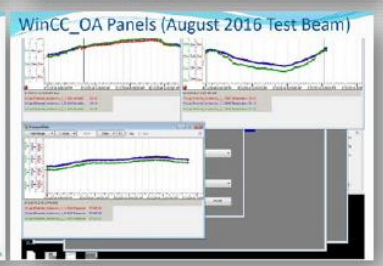
ner Student Project



Microcontroller of environmental parameters:

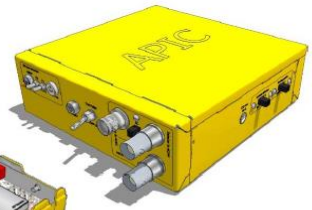
Present version WIN_CC OA
Next version: Raspberry Pi





APIC: Charge Preamplifier – Shaper Amplifier Chain

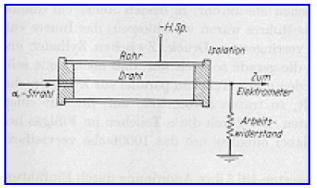
Prototyping completed (all components commercially available – nothing custom), Ready for industrialization/commercialization



- 50 OHM outputs: Preamplifier and 2 x Shaper (+)/(-)
- Spark protection: 0-failure since > 1 year in experiments
- Preamplifier gain 2mV/fC
- AC Input coupling from HV planes (SHV) or DC from strips/pads (BNC)
- SHV input for detector Bias Voltage (RF filter included)
- Gain trimmer 1-1000 (max +/-1.5V)
- Baseline selection fixed (0V) or tunable +/- 1.5V
- Input rates up 4 MHz rates with 20 ns shaper
- MPGD version: shaper 20ns/400 ns
- MPPC version: shaper 4000/8000ns

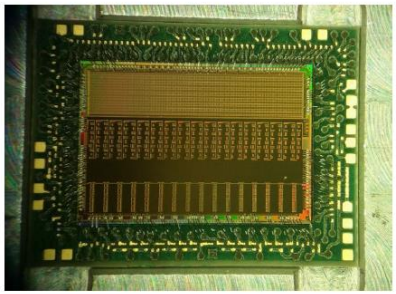
Chips commercially available

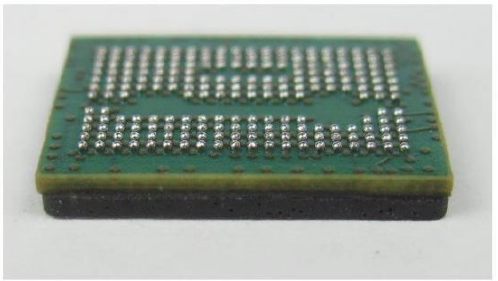
Development of a general purpose readout electronics for MPGDs



Chip SALTRO16 ASIC

⇒ Develop a carrier board (Lund) onto which the die could be mounted.

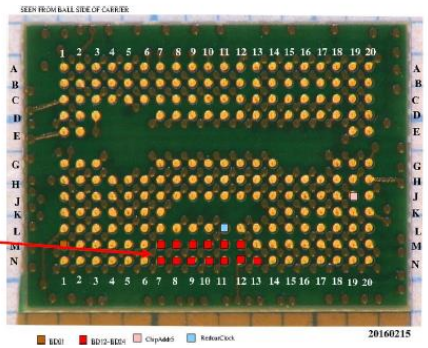


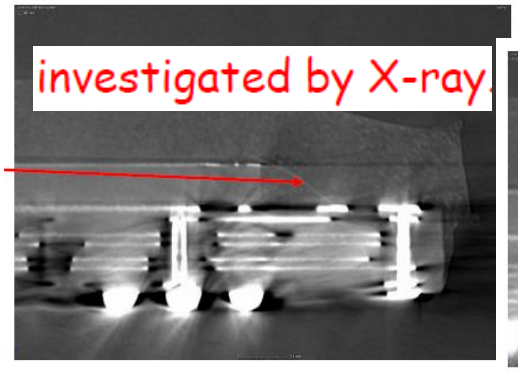


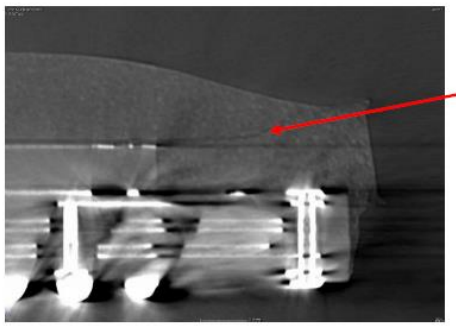
Status summary

- The packaging of the SALTRO16 ASIC:s is underway.
- Delivery expected mid June.
- The design of the Development Board is ready
- A first version of the DAQ system enables readout of data

- After bonding of the die tests were performed and all connections were there.
- After application of the epoxy glob and the tin balls the connections were tested again and everything was ok.
- After soldering onto an adaptor board, for characterization, some connections were lost.



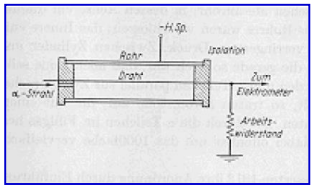




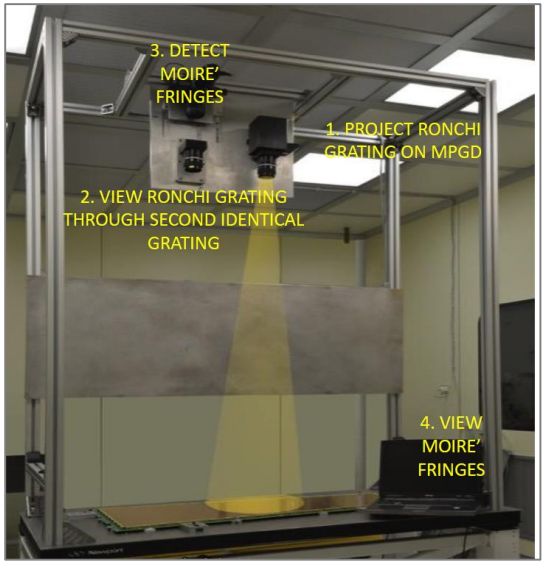
Cracks in the epoxy (red arrows) and air bubbles (green arrows).

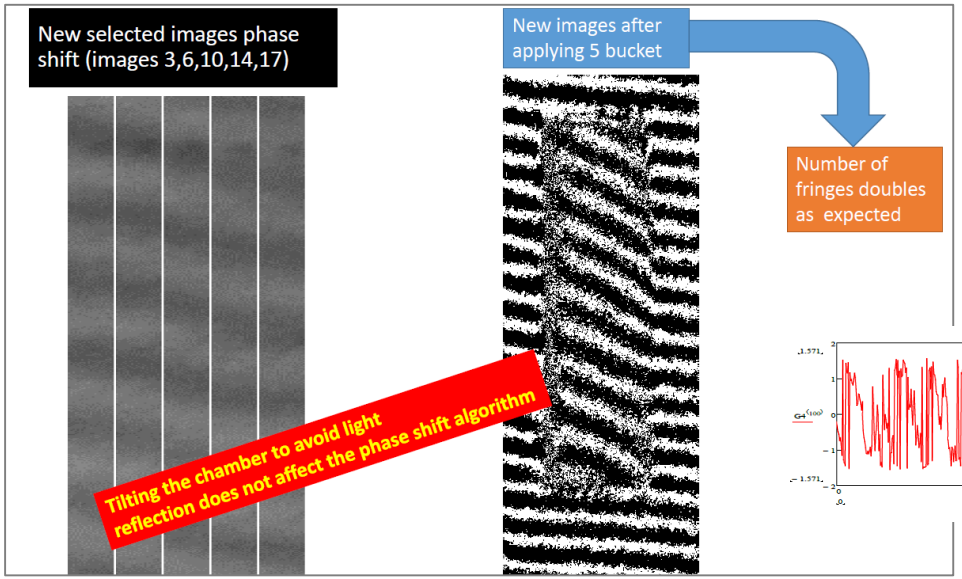
NOW smaller packing possible
To avoid carrier difficulties:
Chips at NOVAPACK

QA: Control of foil/micromesh mechanical tensioning

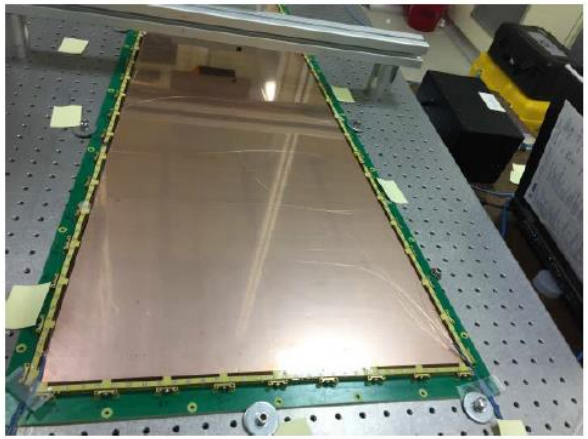


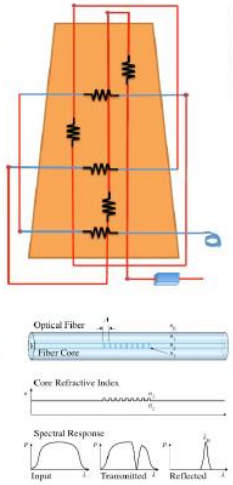
Moiré fringe interferometry ON LARGE SIZE, engineered → resolution: 31 μm

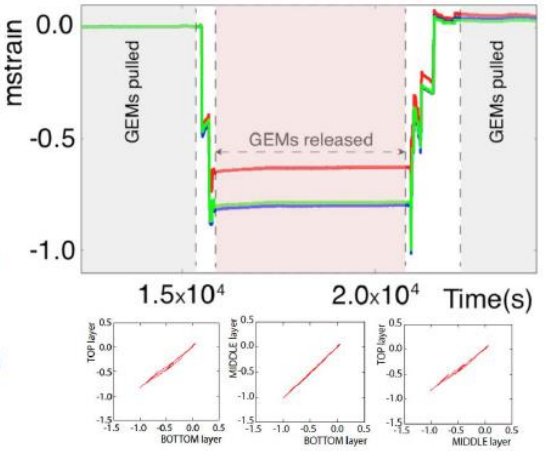




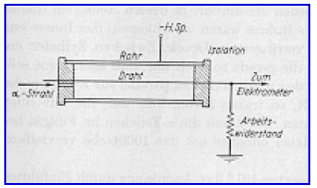
Fiber Brag Grating (FBG) sensors embedded in MPGDs and tested



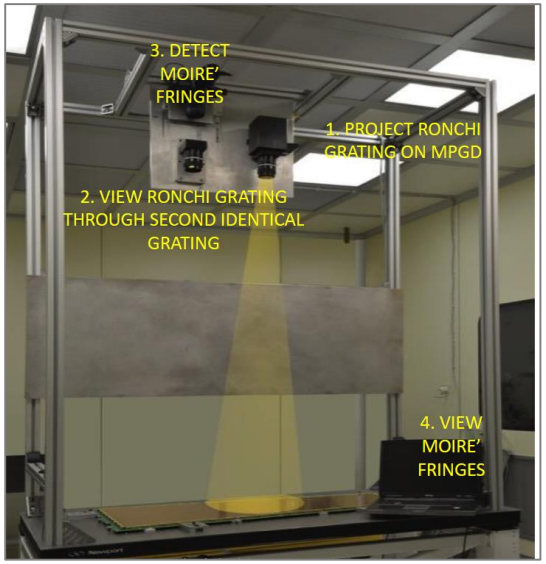


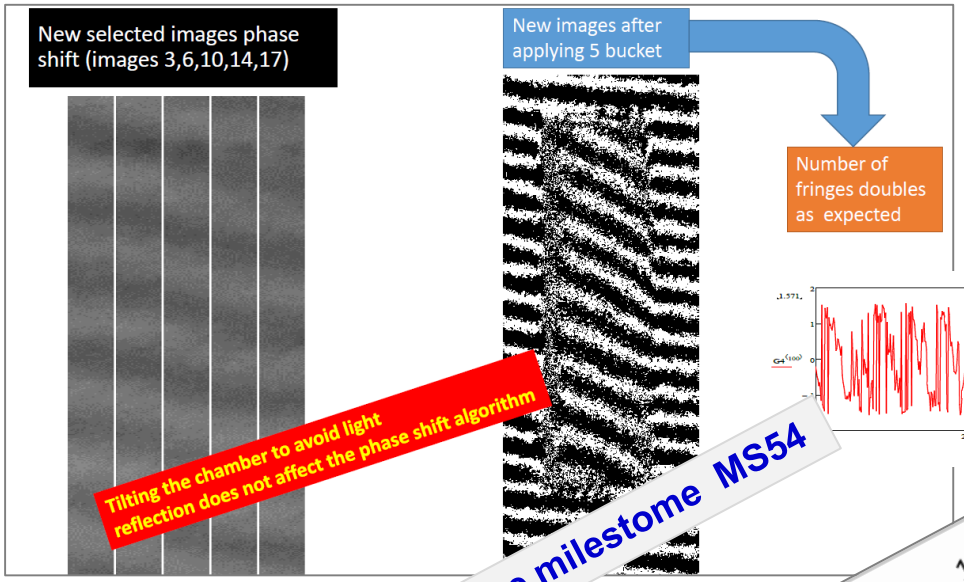


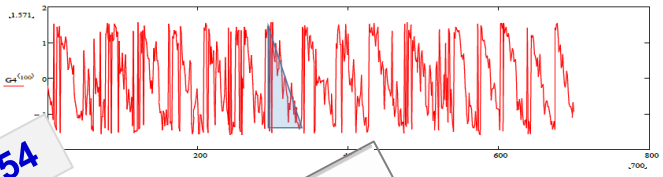
QA: Control of foil/micromesh mechanical tensioning



Moiré fringe interferometry ON LARGE SIZE, engineered → resolution: 31 μm



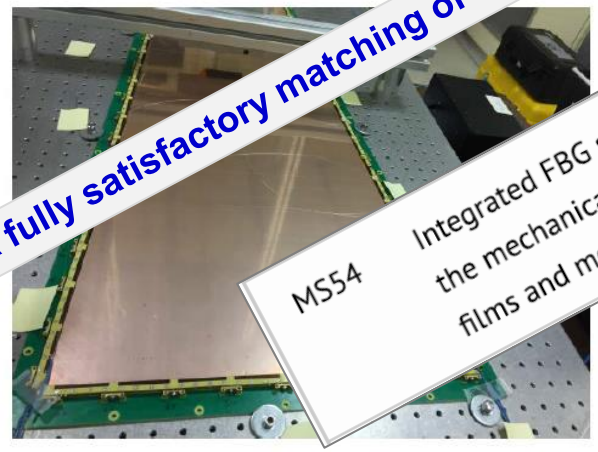


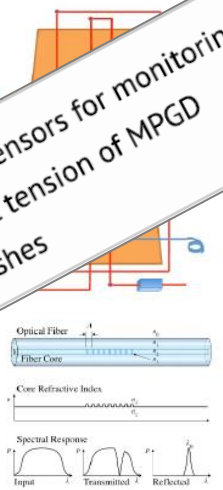


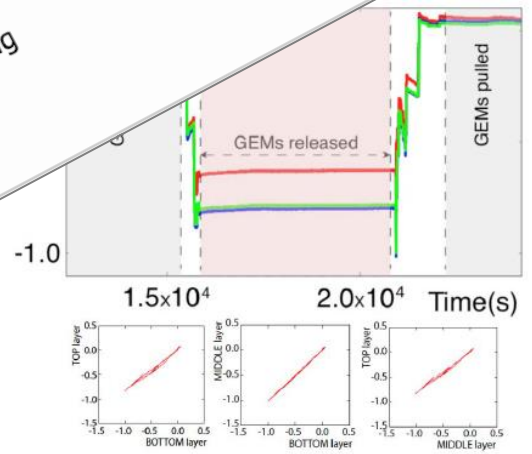
Fiber Brag Grating (FBG) sensors embedded in MPGDs and tested

This activity result in a fully satisfactory matching of the milestome MS54

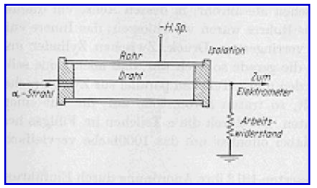
MS54 Integrated FBG sensors for monitoring the mechanical tension of MPGD films and meshes







QA: Leopard scanning system for THGEMs/GEMs

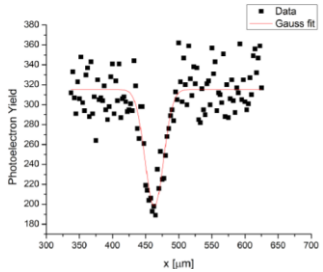


Small size prototype of optical / gain scanning, high resolution

Position resolution

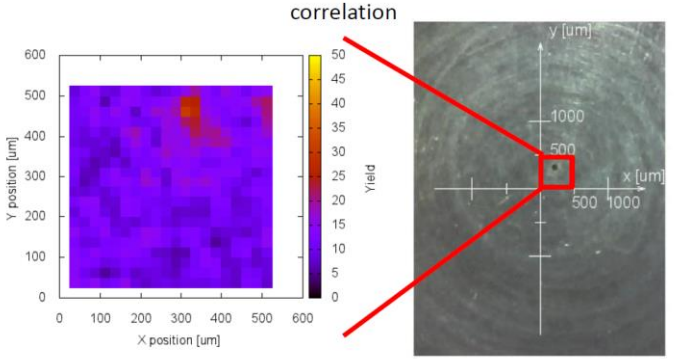
- After considerable upgrade (see backup slides)
- Using a 30 µm pinhole,
- Focusing the light on 25 µm wires,
- FWHM of **32 µm**.

(earlier it was 60 µm)



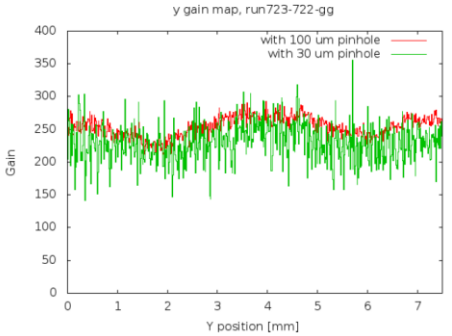
Position stability

Yield map – MC photo correlation



Gain reproductivity

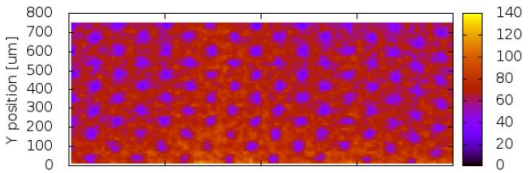
Well reproducible gain over the same area



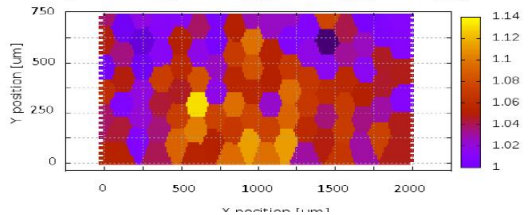
Au GEM scan

- Gold plated normal GEM (140 µm pitch, 60 µm dia. holes, 70 µm thickness)
- Scan time approx. 100 min.

Yield map:



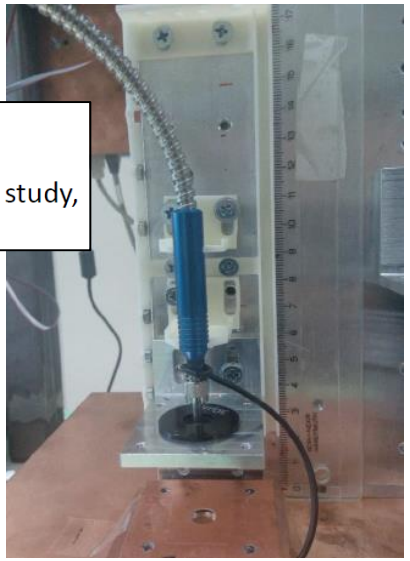
Gain map:



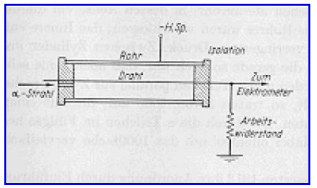
Gabor NYITRAI

Deuterium lamp

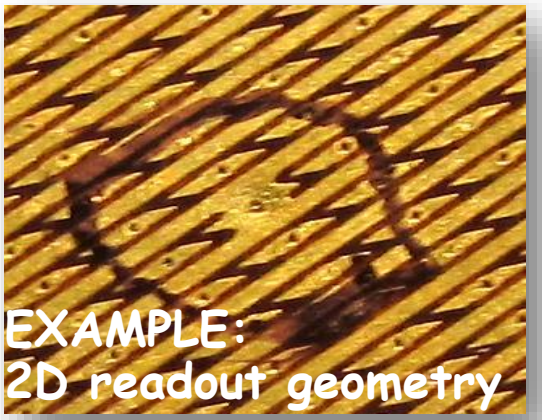
- 30W Newport 68942 Deuterium lamp under study,
- Self-trigger operation implemented.



QA: the electrical integrity of electrode patterns



automatic system to ensure the electrical integrity of electrode patterns by pulse reflection method



A **2nd release of the TDR board has** foreseen **n.4 TDCs per FPGA** , so that **each TDC sequentially read/out n.32 strip channels**. Wrt the previous version, the new board is **more stable** and precise and **doesn't require tedious repeating calibration procedures**, having **solved the problem of thermal instability**.

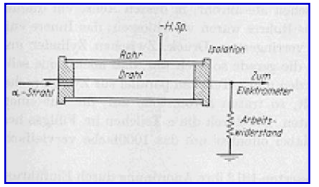
Temperature stability issue solved with new release:

- The only reliable method is to put one TDC/channel
- The new release contains one TDC per channel

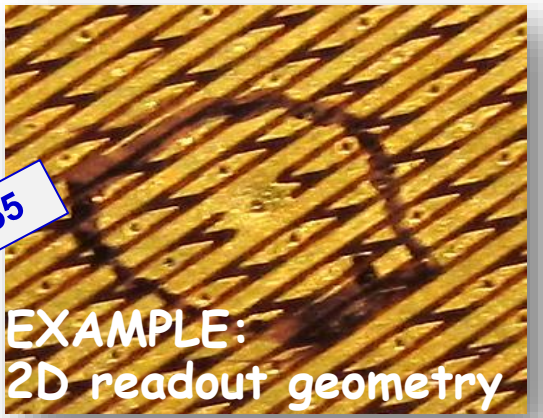
Workbench with 7 TDR modules connected to an anodic sheet under test and through Ethernet to PC for logging and control

2'nd TDR electronics card

QA: the electrical integrity of electrode patterns



automatic system to ensure the electrical integrity of electrode patterns by pulse reflection method



A **2nd release of the TDR board has** foreseen **n.4 TDCs per FPGA** , so that **TDC sequentially read/out n.32 strip channels**. Wrt the previous versio new bo s **more stable** and precise and **doesn't require tedious repeatin ration** having **solved the problem of thermal instability**.

This activity result in a fully satisfactory matching of the milestone MS55

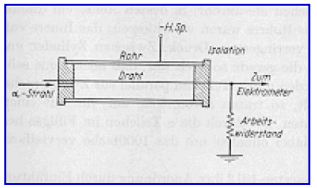
MS55	Quality control system to ensure the electrical integrity of electrode patterns	13	M24

Tem e stabili new
e:
➢ thod is to put
nel
release contains one TDC
channel

2'nd TDR electronics card

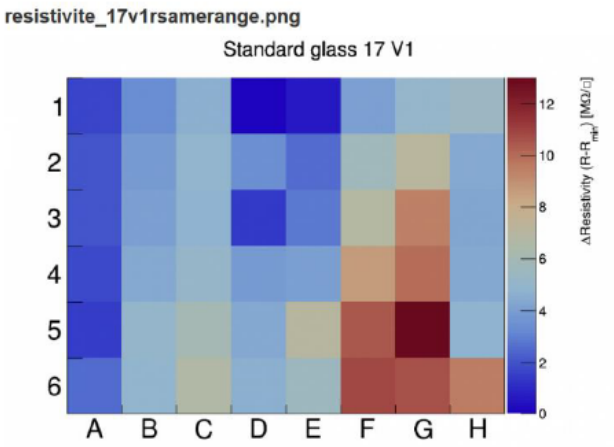
Workbench with 7 TDR modules connected to an anodic sheet under test and through Ethernet to PC for logging and control

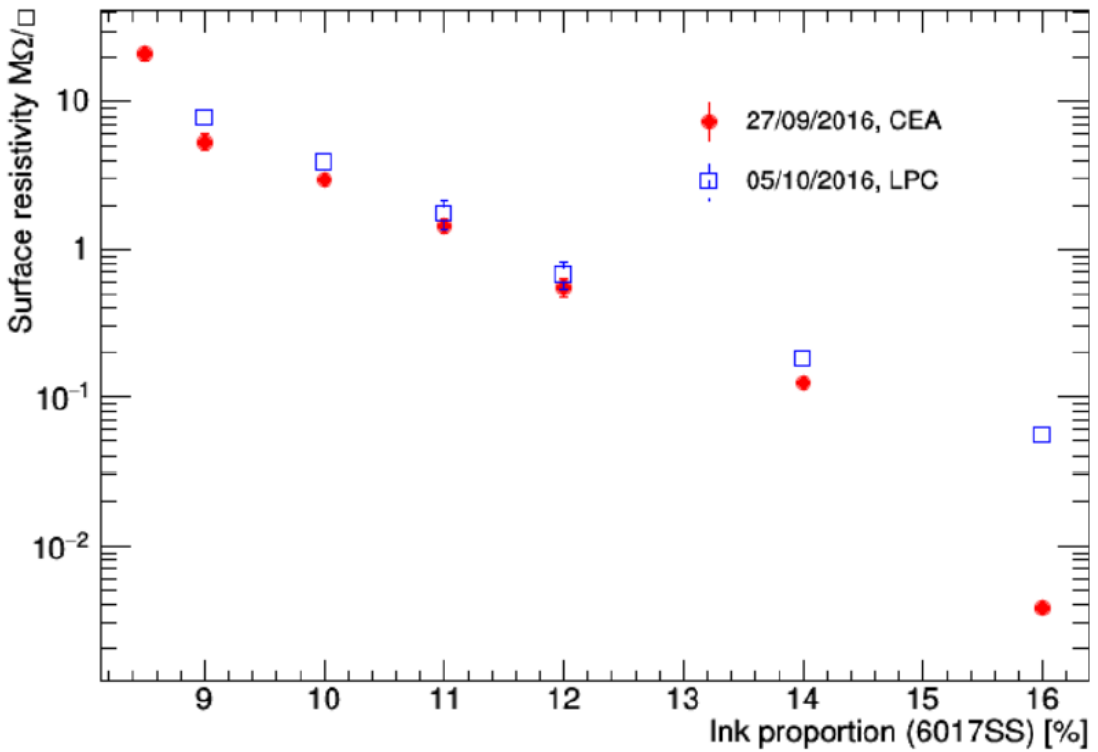
LARGE PRODUCTION: RESISTIVE LAYERS



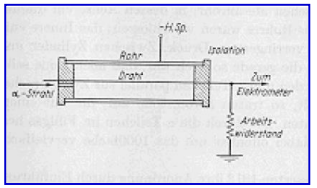
THE BI COMPONENT PASTE (ELECTRODAG 6017SS + PM-404TM) RESISTIVITY CAN BE ADJUSTED.

UNIFORMITY TEST





LARGE PRODUCTION: RESISTIVE LAYERS

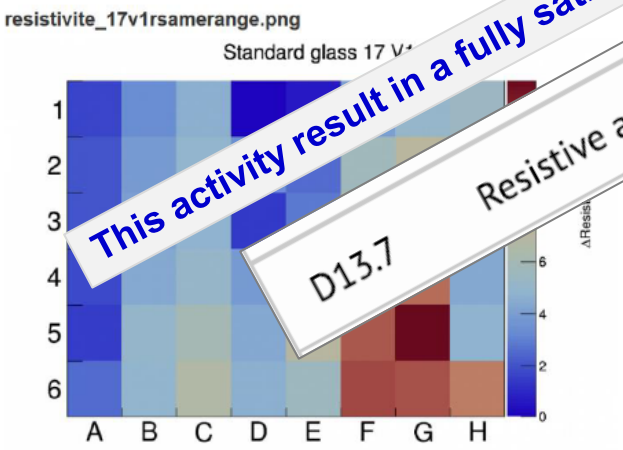


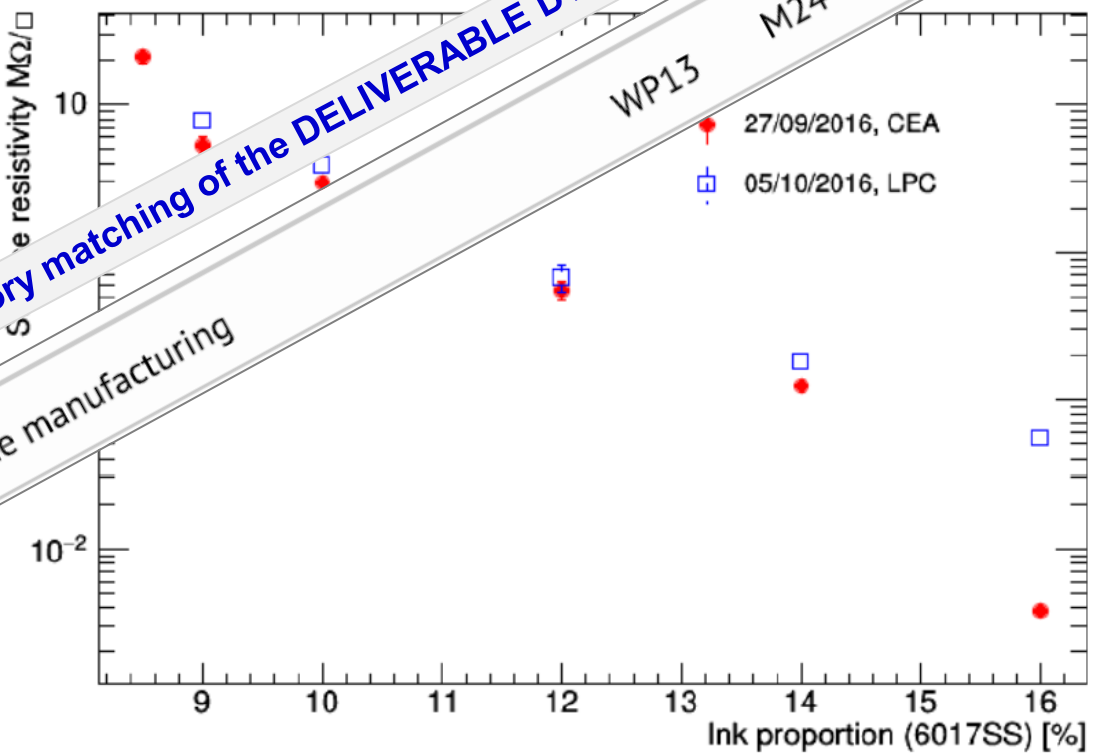
THE BI COMPONENT PASTE (ELECTRODAG 6017SS + PM-404TM) RESISTIVITY CAN BE ADJUSTED.

This activity result in a fully satisfactory matching of the DELIVERABLE D13.7

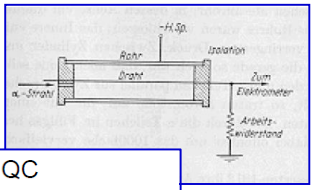
D13.7 Resistive anode manufacturing

UNIFORMITY TEST



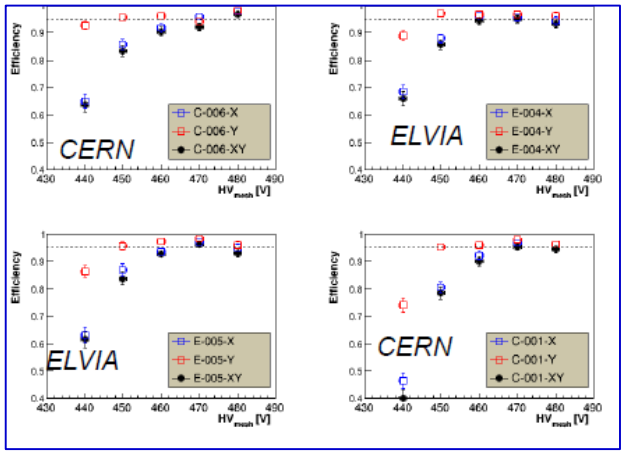


LARGE PRODUCTION: TOWARDS INDUSTRIALIZATION



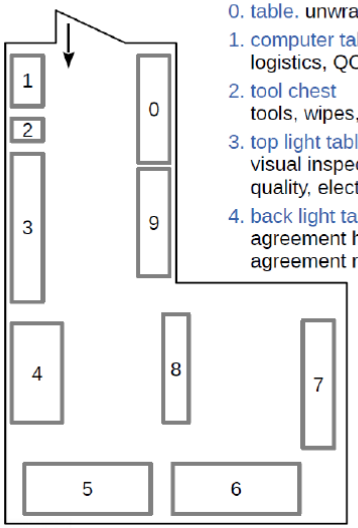
Anode PCB for ATLAS NSW

- Now standard production at ELVIA and ELTOS

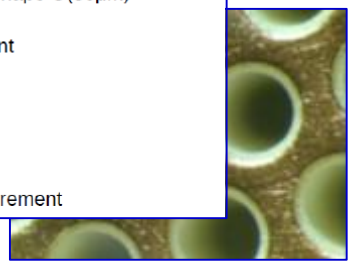


Now ELTOS and ELVIA are doing the production and CERN is doing the QC

Quality Control Workflow – QC Lab in 188



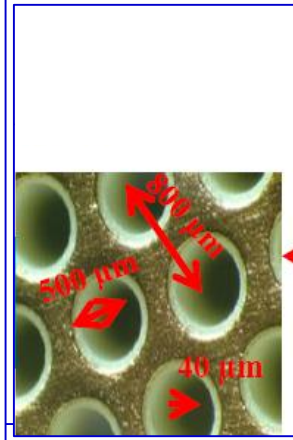
0. table. unwrapping
1. computer table
   logistics, QC form setup, check of supplier report, coffee machine
2. tool chest
   tools, wipes, gloves & chemicals
3. top light table
   visual inspection, pairing of res. foil and board (log db), etching quality, electrical tests
4. back light table
   agreement holes & Cu pattern, edge precision & straightness, agreement resistive & Cu pattern, pillar pattern
5. rasmask granite table
   absolute dimensions & shape O(30µm)
6. granite table
   pillar height measurement
7. table
   resistivity mapping
8. shelf
   final storage
9. table
   strip capacitance measurement

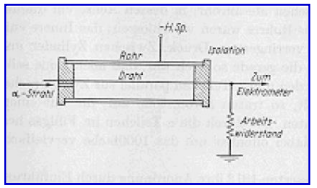


THGEM INDUSTRIAL TRANSFER

First example:
THGEM for COMPASS RICH produced by ELTOS
30x60 cm², thickness 0.4 mm
Hole pitch 800 µm and diameter 400 µm, no rim

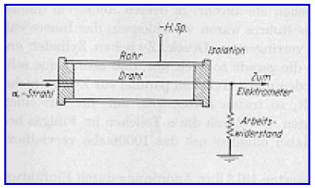
Large production of THGEM (LEM) for WA105,
Both ELTOS and ELVIA production satisfactory





MANAGEMENT & ADMINISTRATIVE ASPECTS

DELIVERABLES, NEXT MONTHS

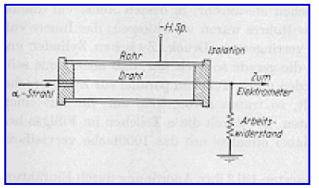


D13.6	Miniaturised HV power supply	WP13	M24
D13.7	Resistive anode manufacturing	WP13	M24

report already submitted to AIDA2020 management

= 30/4/2017

MILESTONES, NEXT MONTHS

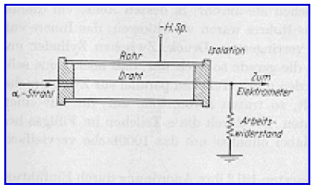


MS52	High-rate RPC prototype ready	13	M24	report already submitted to AIDA2020 management
MS53	Small-size prototype of the R-WGEM built and qualified	13	M24	
MS54	Integrated FBG sensors for monitoring the mechanical tension of MPGD films and meshes	13	M24	= 30/4/2017
MS55	Quality control system to ensure the electrical integrity of electrode patterns	13	M24	report already to be submitted to AIDA2020 management
MS61	Qualification of the new candidate materials for THGEM substrate	13	M26	= 30/6/2017

REMINDER:
Milestone successfully matched (1 May 2016)

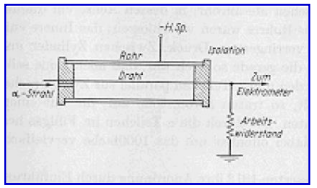
MS13	Specification of systems for highly granular scintillator tests	14	M12	29/04/2016	Achieved	Report (http://cds.cern.ch/record/2153646)

WP13 papers (Dec. 2016)



1	F. Lagarde, M. Gouzevitch, I. Laktineh, V. Buridon, X. Chen et al. High rate, fast timing Glass RPC for the high {\eta} CMS muon detectors XIIIth Workshop on Resistive Plate Chambers and related detectors, Feb 2016, Ghent, Belgium. Journal of Instrumentation, 11, pp.C09006, 2016
2	The μ-RWELL: "A compact, spark protected, single amplification-stage MPGD", Nucl. Instr. & Meth A 824 (2016) 565.
3	M. Alexeev et al., "The gain in Thick GEM multipliers and its time-evolution", 2015 JINST 10 (2015) P03026.
4	M. Alexeev et al., "Status of the Development of Large Area Photon Detectors based on THGEMs and Hybrid MPGD architectures for Cherenkov Imaging Applications", Nucl. Instrum. Meth. A824 (2016) 139.
5	S. Dalla Torre, "The brilliant present and the promising perspectives of the Micropattern Gaseous Detectors", Nuclear Physics News, Vol 26 (2016), no 3.
6	L. Benussi for the CMS GEM collaboration, « A novel application of Fiber Bragg Grating (FBG) sensors in MPGD », arXiv:1512.08529 [physics.ins-det] INFN-15-10-LNF To be published in JINST (http://cds.cern.ch/record/2118619)

SURVEY of RESOURCES

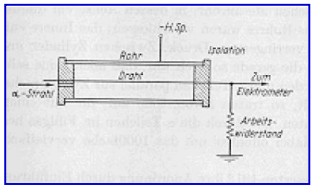


third survey with confirmation of previous indications

(previous surveys on 4/6/15, on 15/6/16)

- **Manpower available for the various activities**
  - **No critical issue detected**
- **Complementary (respect to EC contribution) financial resources for equipment and consumables:**
  - **In general they look available**
- **Laboratory infrastructures**
  - **Adequate labs and related equipment available (all partners)**

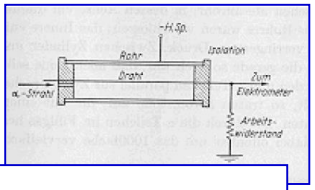
WP13 MANAGEMENT



Coordination strategy and its implementation:

- **Close activity monitoring by regular meetings**
  - **In the last year:** 20/1/2017, 5/4/2017
- **Help line:**
  - **The task coordinators are invited to promptly contact the WP coordinators if difficulties arise (technical, financial, manpower)**
    - **No need in the past year**
- **Facilitate the integration of the community:**
  - **facilitate the implementation of all potential synergies also between the different technologies**
    - **Several appearing: resistivity, screen printing and sputtering, foil planarity, lab equipment, novel eco-friendly gas mixtures, …**
  - **WP13 meetings useful also from this point of view**

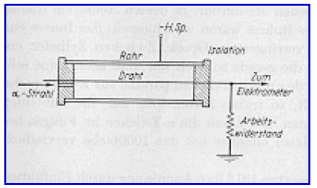
WP13 MANAGEMENT



WP13 within AIDA2020

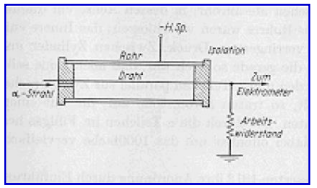
- 2 reports (talks) by WP13 at the AIDA2020 Steering Committee meetings
  - On 23/9/2016
  - On 2/2/2017
- Written periodical reports
  - P1 report (18 months); WP13 contribution sent to management on 5/12/2016
  - WP14 mid term report (2 years): WP13 contribution sent to management on 28/3/2017
- Synergies with WP4 (Micro-electronics)
- Possibility of synergies with WP8 (Large scale cryogenic liquid detectors)
- Arising synergies with WP2 (Innovation and Outreach)
  - related to WP13 dedication to TT

SUMMARIZING



- **WP13 : 20 groups from 13 different Institutions**
  - **AIDA2020-WP13 is cultural common house for the gas detector community in Europe**
- **All the activities (tasks) are progressing well and there is no delay respect to the foreseen planning**
  - **For both technologies: RPCs and MPGDs**
  - **Activity progress also tested by matching DELIVERABLES and MILESTONES:**

    In WP13 so far: 2 deliverables, 6 (1+4+1) milestones
  - **Resources available as required by the work planning**
  - **Some examples of novel investigation domains originally not foreseen: vitality !**
- **Synergies with different WPs within AIDA2020 also present:**
  - **There is space to improve further**



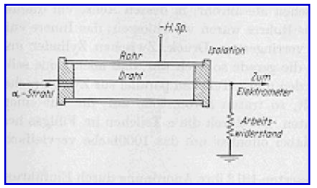
Advertisement :

MPGD2017 – 5th international Conference on MPGDs

- at Temple University (Philadelphia)
- May 2017

It follows:

- MPGD2009, Kolympari-Crete, Greece
- MPGD2011, Kobe, Japan
- MPGD2013, Zaragoza, Spain
- MPGD2015, Trieste, Italy

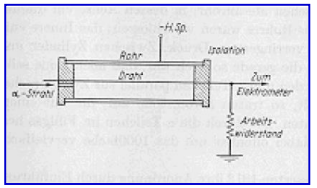

Rohr
Isolation
Draht
Zum Elektrometer
Arbeits-widerstand

BACK-UP

WP13, SCIENTIFIC ASPECTS

2/4

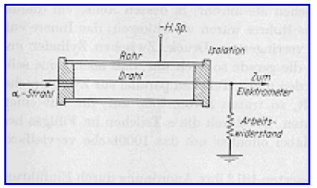
GAS DETECTORS



TASK no	Task 13.2 Advanced detector developments	coordinator	responsible Institution	partner institutions in AIDA2020	other partners	key-words	synergies within WP13	synergies within AIDA2020	external synergies
13.2.1	Establishing new resistive materials for high rate RPCs	Paulo FONTE	LIP	IN2P3-Lyon, INFN-Bari, INFN-LNF, IN2P3-Clermont-Ferrand	GWNU (Korea)	novel low-resistivity materials, high-rates, ageing	**3 other tasks:** 13.2.2,13.2.3, 13.4.6		**LH-LHC**
13.2.2	Development of fast-timing large RPCs	Imad LAKTINEH	IN2P3-Lyon	IN2P3-OMEGA, INFN-Bari, IN2P3-Clermont-Ferrand, INFN-Bologna	GWNU (Korea)	Large-size, time resolution O(100ps), fast FE interfacing	**4 other tasks:** 13.2.1,13.2.3, 13.4.1, 13.4.6	**WP4**	**LH-LHC, muon tomography**
13.2.3	High-rate and fine space resolution RPCs operated with eco-gases	Giulio AIELLO	INFN-TOV	INFN-LNF, CERN, INFN-Bari, MPI, INFN-Torino	GWNU (Korea)	Eco-gasses, fine-space resolution O(100um), high rates	**4 other tasks:** 13.2.1,13.2.3, 13.4.1, 13.4.6		**LH-LHC**
13.2.4	Development of the Resistive-WELL GEM detector (R-WGEM)	Giovanni BENCIVENNI	INFN-LNF	INFN-Bari		High-gain (O(10^5)), resistive read-out plane, high rates, simplified construction technology, fine space and time resolution	**1 other task:** 13.4.5		**RD51, LH-LHC**
13.2.5	Development of high-gain MPGDs based on advanced THGEMs and hybrid MPGDs	Silvia DALLA TORRE	INFN-Trieste			hybrid architecture (THGEM, Micromegas), high-gain **(O(10^6)), THGEM optimization, single photon detection**	**4 other tasks:** 13.3.1, 13.3.2, 13.4.4, 13.4.7	**WP8**	**RD51**

WP13, SCIENTIFIC ASPECTS

3/4



TASK no	Task 13.3 Tools to facilitate the detector development	coordinator	responsible Institution	partner institutions in AIDA2020	other partners	key-words	synergies within WP13	synergies within AIDA2020	external synergies
13.3.1	**Interfacing FE-chips specific to gas detectors to the Scalable Readout System (SRS)**	Eraldo OLIVERI	CERN	AGH Krakow, Bonn U		interfacing FE chips: VMM, GEMROC, Timepix3	**2 other tasks:** 14.2.4, 14.2.5		**RD51, LH-LHC**
13.3.2	**Development of cheap, standard MPGD dedicated laboratory instruments**	Eraldo OLIVERI	CERN	CERN, INFN-Trieste, Wigner, CEA-Saclay		Compact High Voltage Power Supply for MPGDs, fempto-pico ampermeter, singnal processing, regenerationg gas systems	**2 other tasks:** 14.2.4, 14.2.5		**RD51**
13.3.3	**PCB development using HDI-technology and 3D-mounting of chips for MPGD readout**	Leif JOENSSON	LUND U	CERN		HDI (High Density Interconnect) technology for 3D mounting of FE chip (MPGD R-O), high channel density, reduced material budget	**3 other tasks:** 13.2.3, 13.4.2, 13.4.8		**CLIC, ILC**

TASK no	Task 13.4 Preparation for large series production	coordinator	responsible Institution	partner institutions in AIDA2020	other partners	key-words	synergies within WP13	synergies within AIDA2020	external synergies
13.4.1	Large-size RPC detectors preserving mechanical precision	Hubert KROHA	MPI	INFN-TOV, INFN-Bari, CEA-Saclay		mechanical precision for large-size detectors (both technologies)	**2 other tasks:** 13.2.2, 13.2.3		**LH-LHC**
13.4.2	Establishing procedures and tools for large series resistive MICROMEGAS anodes	Paul COLAS	CEA-Saclay			resistive MICROMEGAS by screen printing, sputtering, painting, film lamination, Argon Unostar E printing machine	**2 other tasks:** 13.2.5, 13.4.7		**RD51, LH-LHC**
13.4.3	Control of foil/micromesh mechanical tensioning by optical techniques	Luigi BENUSSI	INFN-LNF	INFN-Bari, INFN-Bologna		flatness of MPGD foils/meshes, assembly, monitoring over years, fiber Bragg grating	**3 other tasks:** 13.2.5, 13.4.2, 13.4.7		**LH-LHC**
13.4.4	Quality control tool for detailed gain maps (hole by hole)	Dezso VARGA	Wigner RCP	INFN-Trieste		high resolution gain maps hole by hole (GEMs, THGEMs); quality control, correlation with optical inspection	**2 other tasks:** 13.2.5, 13.4.7		**RD51, LHC**
13.4.5	Design of a quality control system to ensure the electrical integrity of electrode patterns by pulse reflection method	Antonio Ranieri	INFN-Bari	INFN-LNF		QUALITY CONTROL sYSTEM: ELECTRICAL INTEGRITY OF MPGD READOUT PLANES, FPGA-based system	**2 other tasks:** 13.2.4, 13.4.7		**RD51, LH-LHC**
13.4.6	Production protocols of optimised RPC components for easy technology dissemination	Gabriella PUGLIESE	INFN-Bari	INFN-TOV, IN2P3-Lyon, LIP, MPI		protocol of large series production of RPCs	**3 other tasks:** 13.2.1, 13.2.2, 13.2.3		**HL-LHC, ILC, CBM, applications**
13.4.7	Standard production protocols of optimised MPGD components to facilitate technology dissemination	Paul COLAS	CEA-saclay	CERN		bulk MICROMEGAS, resistive layers, multilayer stacking, read-out schemes	**2 other tasks:** 13.2.5, 13.4.2		**RD51, LH-LHC, ILC, applications**