

AIDA2 Kick-Off Meeting

WP13 Task 13.3.2

WP13 Task 13.3.3

Development of cheap, standard MPGD
dedicated laboratory instruments

[Tools to facilitate the detector development]

Scientific and technological aspects

Growing up of the number of groups involved in accurate and precise measurements on Micro Pattern Gas Detector:

- R&D for new detectors and developments,
- new application,
- upgrades,
- QA measurements
- ...

Access to proper instrumentation is mandatory for the community to preserve accurate, precise and reliable measurements.

The aim of this task is supporting the developments of MPGD-specific laboratory instrumentation with easy access for the full community.

Portability of the instrumentation will be considered as a key point in the developments.

Scientific and technological aspects

Development Steps:

- Collection of requirements
- Design
- Prototyping
- Prototype testing
- Final engineering
- Validation of the instruments

Instr.1: Compact HV [Deliverable – M24]
Instr2: Low current measurements (float)
Instr3: Signal Processing
Instr4: Monitoring & Control system
Instr5: Regeneration Gas System

The AIDA2020 support will be used to finalize projects started in the framework of the RD51 collaboration and new developments.

Highest priority will be given to the High Voltage Power supply for MPGDs being the deliverable of the task [M24].

Scientific and technological aspects

Instrumentation (1)

- Compact High Voltage Power Supply for MPGDs
 - Compact
 - Compliant with requirements of mm, GEM, THGEM mpgd technologies
 - High stability, low noise, good current resolution
 - Remotely controllable

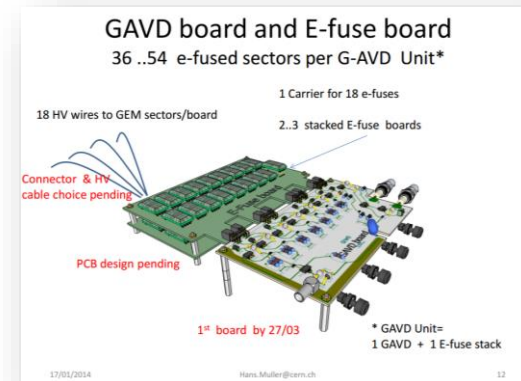
Subtask Deliverable [M24]

Support from **AIDA2020**

Possible implementation:

- miniaturization
- portability

- for ongoing projects: RD51 Active voltage Divider with e-fuse
- for new developments



Scientific and technological aspects

Instrumentation (2)

- Low Current Measurements
 - femto-pico current resolution.
 - floating
 - bipolar
 - digital output

Femtometer V 1.3



4 Modes of operation

- V/I (Femto-Ampere) current measurement** based on the logarithmic linear V/I characteristics of a calibrated and temperature-compensated Si Diode
- V/Q (CSA)** charge-sensitive feedback configuration, thus the output voltage corresponds to the input charge Q measured over 0.5pF, or 2mV per femto-Coulomb.
- V/V (electrometer)** presents a very high impedance O(Tera-OHMS) at the input of a gain-1 amplifier and thus allows measurement of very high impedance voltage sources. The output voltage corresponds to the input charge measured over the input capacitance (incl. cable) i.e. very high impedance measurements may take a few seconds to charge up.
- V/I*R (Trans-Impedance TIA)** represents measurement of small currents I over a user-defined resistor R in real time. The output voltage is $V=I *R$. The internal 5 GOHM resistor can be used to measure currents of the order 20 pA (100mV) and to monitor them in real time.

Support from **AIDA2020**

for ongoing projects:

RD51 femto-meter

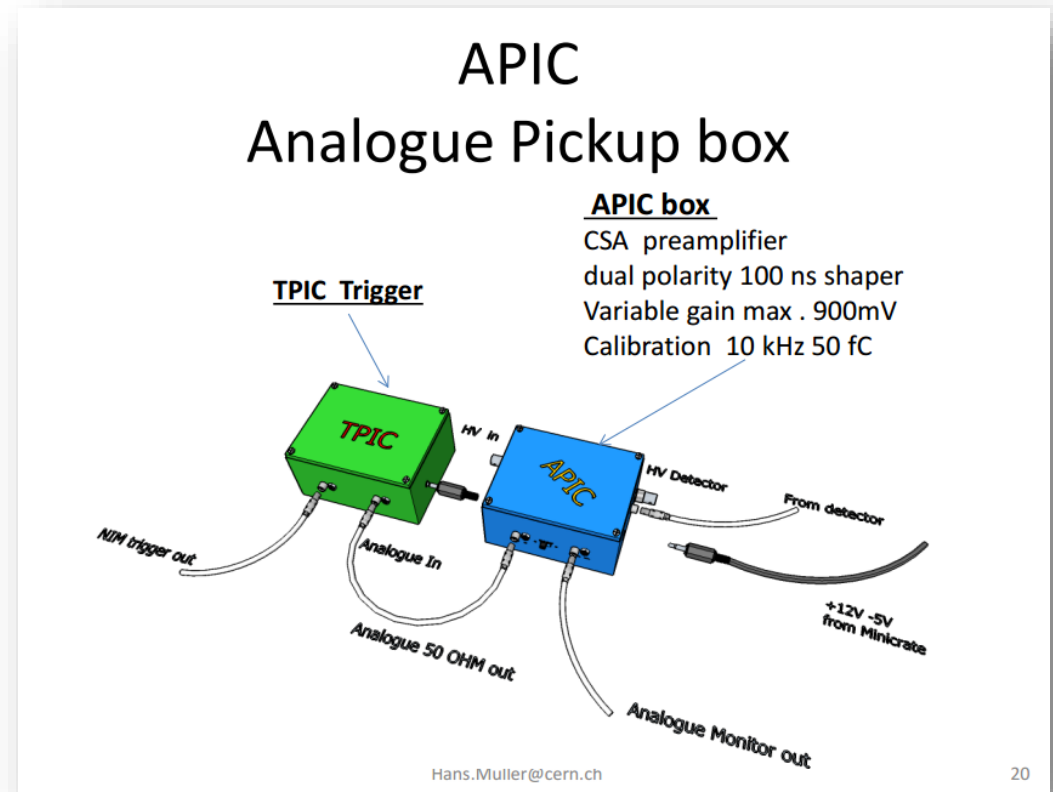
INFN Trieste floating pico-ammeter

Scientific and technological aspects

Instrumentation (3)

- Signal Processing
 - preamplifier - shaper
 - triggering modules (discrim)
 - fast preamplifiers

Support from **AIDA2020**



- for ongoing projects: RD51 Analog and Trigger Pick-Up box, fast amplifier
- for new developments

Scientific and technological aspects

Instrumentation (4)

- Multi-Channel monitoring and control system
- Remotely accessible
- Wide compatibility with actuator and sensor



Instrumentation (5)

- Regeneration Gas System

Support from **AIDA2020**

- for extending the capabilities of existing projects: MoCoS monitoring and control system.
- for new developments

Partners

CERN [Hans Muller, E. Oliveri]

INFN Trieste [Silvia Della Torre]

Wigner [Dezso VARGA]

CEA [Paul Colas]

4y Planning (& milestones)

Subtask Deliverable [M24]

	0-12	12-24	24-36	36-48
Instr.1	Prototype finalization & testing ← New Developments: Design & Prototype →	Final Engineering and validation ← Engineering and Validation →	Possible implementations	
Instr.2	Prototype finalization & testing ← New Developments: Design & Prototype →	Final Engineering and validation ← Engineering and Validation →		Possible implementations
Instr.3	Prototype finalization & testing ← New Developments: Design & Prototype →	Final Engineering and validation ← Engineering and Validation →		Possible implementations
Instr. 4	Prototype finalization & testing ← New Developments: Design & Prototype →	Final Engineering and validation ← Engineering and Validation →	Possible implementations	
Instr. 5	New Developments: Design & Prototype ← Engineering and Validation →			

- Instr.1: Compact HV [Deliverable – M24]
- Instr2: Low current measurements (float)
- Instr3: Signal Porcessing
- Instr4: Monitoring & Control system
- Instr5: Regeneration Gas System

RED: Finalization of existing projects
 [Granted - Delivered in the AIDA2020 4y (HV@M24)]

BLUE: New developments [feasibility in accordance to partners and resources used by the existing projects]

1sty Detailed Planning

Compact HV

– Prototype Finalization and Testing

Low current measurements

– Prototype Finalization

Signal Porcessing

– Prototypes Finalization

Monitoring & Control System

– Prototype Finalization and Testing

Budget

AIDA 2 - WPFrontier Gas Detectors - Task 12.3.2: Tools to ease the detector progress: development of cheap, standard MPGD dedicated lab								
For input data, only fill the white areas below								
Please fill out the Beneficiary and Institute short name columns (see example below for CERN and INFN)								
Beneficiary short name*	Institute	Person - months	Monthly personnel costs	Personnel direct costs	Travel direct costs	Equipment and consumables	Other direct costs	Sub-contracting costs
CERN		11.00	7,300.00	80,300.00	10,000.00	20,000.00		
Total		11.00	7,300.00	80,300.00	10,000.00	20,000.00	0.00	0.00

Laboratory instruments					Description of Partner Contribution to the Task
Material direct costs	Total direct costs	Total indirect costs**	Total costs (direct + indirect)	EC requested funding	
30,000.00	110,300.00	27,575.00	137,875.00	70,000.00	task responsibility and coordination (4 institutes in total)
30,000.00	110,300.00	27,575.00	137,875.00	70,000.00	