

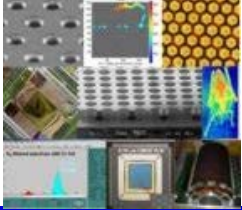
PROPOSTA DI ESPERIMENTO

DI CSN V

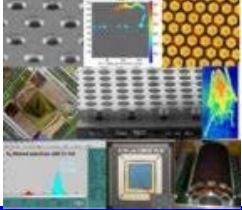
MPGD-NEXT

S. Dalla Torre

CONTEXT



- ***MicroPattern Gas Detectors (MPGD)*** are ideal tools for
 - *fundamental research contributing to the excellence in science (present and future use in LHC experiments)*
 - *applications beyond science (better society).*
- **relevant recent progress, still a long way to go towards :**
 - high-characteristics performance
 - simplified construction procedures
- **in this context, in INFN :**
 - expertise
 - dedicated infrastructures
- ***MPGD-NEXT:***
 - *Selected R&D in the field of MPGDs*
 - *Technical complements*



MPGD-NEXT, STRUCTURE

- **3-year project** **2016-2018**
- **PI:** **S. Dalla Torre, INFN TS**

| INFN | unit | components | MPGD-NEXT | AIDA2020 | TOTAL |
|--------------|----------------------|------------|------------|------------|------------|
| unit | coordinator | | FTE (%) | FTE (%) | FTE (%) |
| Bari | Ranieri Antonio | 10 | 230 | 0 | 230 |
| LNF | Bencivenni Giovanni | 7 | 170 | 110 | 280 |
| Napoli | Della Pietra Massimo | 4 | 80 | 0 | 80 |
| Roma3 | Iodice Mauro | 3 | 50 | 0 | 50 |
| Trieste | Dalla Torre Silvia | 7 | 125 | 50 | 175 |
| total | | 31 | 655 | 160 | 815 |

**Novel
MPGD
architectures**

**Technical
complements**

| TASK | TITLE | TASK RESPONSIBLE | CONTRIBUTING INFN UNITS | NON INFN PARTICIPANTS |
|------|---|------------------|-------------------------|-----------------------|
| 1 | The Resistive-WELL detector (R-WELL) | G. Bencivenni | LNF | |
| 2 | Fully resistive pattern detectors | M. Maggi | BA | CERN |
| 3 | High performance MICROMEAS | M.Iodice | RM3, NA | |
| 4 | High-gain hybrid MPGD | F. Tessarotto | TS | |
| 5 | FE developments for high space and time resolution MPGD | A. Ranieri | BA, LNF | |
| 6 | MPGD-dedicated HV system | S. Levorato | TS | |

TASKs

| TASK | TITLE | TASK RESPONSIBLE | CONTRIBUTING INFN UNITS | NON INFN PARTICIPANTS |
|------|---|------------------|-------------------------|-----------------------|
| 1 | The Resistive-WELL detector (R-WELL) | G. Bencivenni | LNF | |
| 2 | Fully resistive pattern detectors | M. Maggi | BA | CERN |
| 3 | High performance MICROMEAS | M. Iodice | RM3, NA | |
| 4 | High-gain hybrid MPGD | F. Tassarotto | TS | |
| 5 | FE developments for high space and time resolution MPGD | A. Ranieri | BA, LNF | |
| 6 | MPGD-dedicated HV system | S. Levorato | TS | |

- **High space, time res. + high rates: tasks 1, 2, 3 (main target: HEP, by products applications)**
 - **Task 1:** GEM derived, well structure, great simplicity in construction and assembly
 - **Task 2:** GEM and MM derived, multiple measurements for t res. O(100ps)
 - **Task 3:** resistive MM derived, from strips to pads
- **High-gains (PMT-like) (HEP, liquid cryogenic exp.s, applications)**
 - **Task 4:** hybrid structure including THGEM layers and an MM multiplication stage

TS

TASKs, cont.

| TASK | TITLE | TASK RESPONSIBLE | CONTRIBUTING INFN UNITS | NON INFN PARTICIPANTS |
|------|---|------------------|-------------------------|-----------------------|
| 1 | The Resistive-WELL detector (R-WELL) | G. Bencivenni | LNF | |
| 2 | Fully resistive pattern detectors | M. Maggi | BA | CERN |
| 3 | High performance MICROMEAS | M. Iodice | RM3, NA | |
| 4 | High-gain hybrid MPGD | F. Tassarotto | TS | |
| 5 | FE developments for high space and time resolution MPGD | A. Ranieri | BA, LNF | |
| 6 | MPGD-dedicated HV system | S. Levorato | TS | |

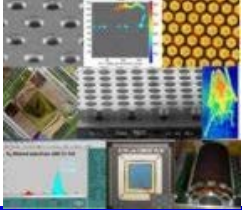
- **MPGD-dedicated FE:**

- **Task 5:** time resolution < 1 ns, t and a processing on-chip
 - Test bench: R-WELL

- **MPGD-dedicated HV system for MPGD development and extended systems**

- **Task 6:** HV system with characteristics not available in commercial devices, in particular concerning fast control and monitoring





MPGD-NEXT, SINERGIE

- **RD51** : networking mondiale sui MPGD 2015
 - I proponenti MPGD-NEXT sono membri RD51
 - Il networking e' seguito dalla CSN I
 - Referaggio
 - Oneri finanziari (modesti) del networking
 - 10 gruppi, per il 2015: 32 keuro per collaboration fee e meeting collaborazione

- **AIDA2020** - progetto RIA finanziato da UE
 - Alcuni proponenti MPGD-NEXT sono membri AIDA2020
 - WP13: Innovative Gas Detectors
 - In totale 134 keuro su 4 anni : MANPOWER
 - Sara' impiegato per lavorare su MPGD-NEXT
 - Va rendicontato AIDA2020

MPGD-NEXT

■ Profilo finanziario delle richieste (~ finale)

| INFN unit | consumables | | | | equipments | | | | travelling | | | | total per year | | | GRAND TOTAL |
|--------------------|-------------|--------------|--------------|------------|------------|----------|----------|-----------|------------|-----------|-----------|-----------|----------------|--------------|--------------|-------------|
| | 2016 | 2017 | 2018 | total | 2016 | 2017 | 2018 | total | 2016 | 2017 | 2018 | total | 2016 | 2017 | 2018 | |
| BA | 49 | 38 | 48 | 135 | | | | | 3 | 5 | 11 | 19 | 52 | 43 | 59 | 154 |
| LNF | 19 | 22 | 20 | 61 | | | | | 10 | 10 | 10 | 30 | 29 | 32 | 30 | 91 |
| NA | 10 | 19 | 24 | 53 | | | | | 2 | 5 | 5 | 12 | 12 | 24 | 29 | 65 |
| RM3 | 4 | 8 | 10 | 22 | 10 | | | 10 | 1 | 3 | 4 | 8 | 15 | 11 | 14 | 40 |
| TS | 33 | 43.5 | 36.5 | 113 | | | | | 3 | 3 | 11 | 17 | 36 | 46.5 | 47.5 | 130 |
| GRAND TOTAL | 115 | 130.5 | 138.5 | 384 | 10 | 0 | 0 | 10 | 19 | 26 | 41 | 86 | 144 | 156.5 | 179.5 | 480 |

MPGD-NEXT & TRIESTE

Task 4 - High-gain hybrid MPGD

Applications:

- single/multiple photon detection;
- active elements in hadron sampling calorimetry;
- read-out elements in huge noble liquid detectors;
- neutron detection;

extended systems for environmental monitoring .

Activity

- Discharge studies
- Novel THGEM material and production process
- Fully Resistive MICROMEAS
- Powering schemes
- THGEN geometry details (edges, optimised segmentation)

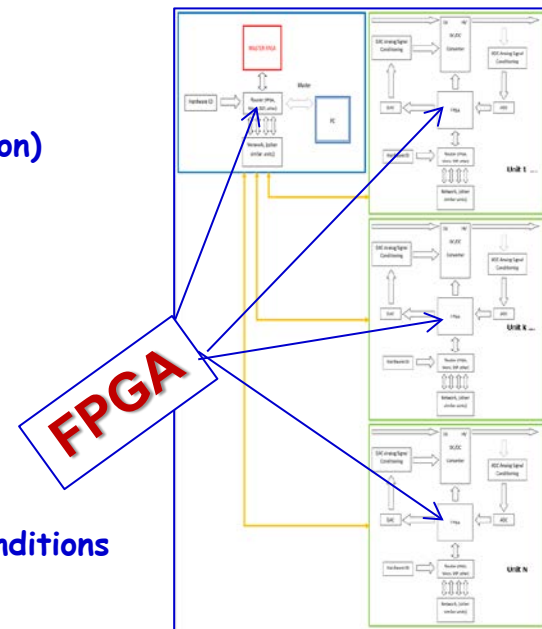
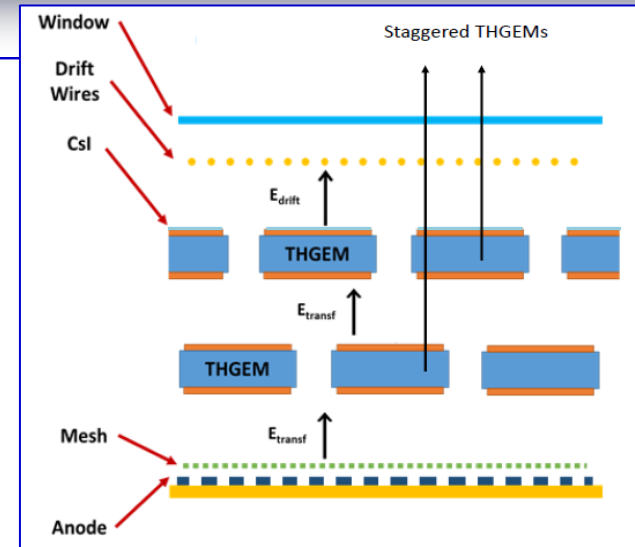
TASK 6 - MPGD-dedicated HV system

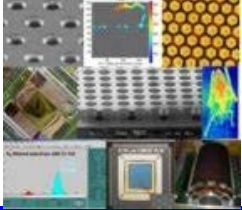
Applications:

- Better handle for MPGD characterization in R&D studies;
- Powering of large MPGD set

Main characteristics

- true V, I real-time monitoring,
- fast control,
- Fast feedback protocols in case of pre-breakdown conditions
- Modularity, scalability
- Reduced size: HV generated at the detector





MPGD-NEXT & TRIESTE

- **FTE (1.75 in total):**

| | | MPGD-NEXT | AIDA2020 |
|-----------------------------|---|-----------|----------|
| | | FTE (%) | FTE (%) |
| Dalla Torre Silvia | 1 | 25 | |
| Dasgupta Shuddha Shankar | 1 | 20 | |
| Fernandes Dos Santos Carlos | 1 | 20 | |
| Gobbo Benigno | 1 | 20 | |
| Hamar Gergo | 1 | 0 | 50 |
| Levorato Stefano | 1 | 20 | |
| Tessarotto Fulvio | 1 | 20 | |
| | 7 | 125 | 50 |

- **Richieste ai servizi**
 - 4 m.u. elettronica e rivelatori
 - 3 m.u. officina meccanica