

# Discharge Consortium

## next steps



# MPGD Stability workshop at TUM

<https://indico.cern.ch/event/709670/timetable/#20180621.detailed>

- The workshop showed there is a great interest in further studies on MPGD stability
- MPGDs are well established technology used since >20 years
- But we are reaching new extremes:
  - Gain
  - Size
  - Rates
- Discharge stability, mitigation, effects → still hot topics

# Ongoing R&Ds

- Physics  
(primary, secondary discharges, theoretical models)
- Detector limits (GEM, THGEM, MM,  $\mu$ RWELL + gases)
- How to mitigate/protect, what kills us?
- New measurement techniques  
(antennas, 1Mfps cameras)
- New structures  
(streamer-less detectors, embedded R)
- Large-areas!
  
- Measurements, development and simulations  
should continue in parallel

<b>Discharge phenomena in gaseous detectors</b>	Vladimir Peskov
Faculty Club, Technical University of Munich	09:00 - 09:40
<b>Simulations of discharge phenomena</b>	Paulo Forte
Faculty Club, Technical University of Munich	09:40 - 10:20
<b>Effects of space charge in GEM-based detectors</b>	Filippo Resnati
Faculty Club, Technical University of Munich	10:50 - 11:15
<b>Secondary/Propagated discharge phenomena in GEM detectors</b>	Alexander Deisting
Faculty Club, Technical University of Munich	11:15 - 11:40
<b>Usage of single hole THGEM foil for delayed discharge propagation analysis</b>	Antonija Utrobicic
Faculty Club, Technical University of Munich	11:40 - 12:05
<b>Secondary discharge mitigation by HV scheme optimisation</b>	Lukas Lauthner
Faculty Club, Technical University of Munich	12:05 - 12:30
<b>Single-hole discharges in GEMs</b>	Dr Jeremie Alexandre Merlin
Faculty Club, Technical University of Munich	14:00 - 14:25
<b>Measurements with inductively coupled PCB antennas</b>	Patrik Thuiener
Faculty Club, Technical University of Munich	14:25 - 14:50
<b>Status of the R&amp;D on micro-RWELL technology</b>	Dr Giovanni Bencivenni
Faculty Club, Technical University of Munich	14:50 - 15:15
<b>Stability of THGEMs</b>	Fulvio Tessarotto
Faculty Club, Technical University of Munich	15:15 - 15:40
<b>Discharge probability studies with 3x3 cm<sup>2</sup> THGEM</b>	Berkin Ulukutlu
Faculty Club, Technical University of Munich	15:40 - 16:00
<b>Spark quenching with embedded resistors, first 55Fe tests with ~50x50 cm<sup>2</sup> Micromegas prototypes</b>	Maximilien Chefdeville
<b>HV stability of large area resistive strip Micromegas detectors</b>	Ralf Hertenberger
Faculty Club, Technical University of Munich	16:55 - 17:20
<b>Discharge protection of CMOS pixel chips in Micromegas MPGDs</b>	Harry Van Der Graaf
Faculty Club, Technical University of Munich	17:20 - 17:45

# DISCO initiative

## 1. Platform to share experience, results, know-how:

- a list of currently running R&D projects
- an overview of the existing infrastructure and expertise
- identify overlaps, complementary studies
- recognize common needs
- new contributions invited (measurements, simulations)
  
- organize dedicated workshops (e.g. School of simulations) ...
- ... and regular meetings (Vidyo, sessions during the RD51 weeks)
- identify possible synergy with other projects (e.g. plasma physics)

# DISCO initiative

## 2. Way to do something together

- discuss a possible common project
- identify a need for a common project meant as an R&D topic where several sites contribute together sharing their resources.
- discuss possibility of applying for extra funding (topic, funding program, etc.)

# Kick-off meeting (27.07.2018)

<https://indico.cern.ch/event/744282/?view=standard>

- Start the initiative, overview of the participating institutes, ideas
  - ongoing projects and plans for the future
  - new ideas, contributions
  - resources (available but also needed)

<b>AM</b>	10:00	Intorduction - Piotr Gasik (Technische Universitaet Muenchen (DE)) ()
	10:10	Discharge studies with MPGD structures - Piotr Gasik (Technische Universitaet Muenchen (DE)) ()
	10:20	The Spark-Detection-System in Bonn - Philip Hauer (University of Bonn (DE)) ()
	10:30	A suggestion to study a feasibility of building spark-less micropattern detectors - Vladimir Peskov (Russian Academy of Sciences (RU)) ()
	10:40	u-RWELL technology. - Marco Poli Lener (INFN e Laboratori Nazionali di Frascati (IT)) Dr Giovanni Bencivenni (INFN e Laboratori Nazionali di Frascati (IT)) ()
	10:50	Scintillation in admixtures based on noble gases - Diego Gonzalez Diaz (Universidade de Santiago de Compostela (ES)) ()

- Further contributions welcome (also today!)
  - send e-mails with your contributions including points discussed today
  - spread the info around, join e-group (<https://e-groups.cern.ch/e-groups/EgroupsSubscription.do?egroupName=disco-users>)

# Kick-off summary (+workshop, +today)

- **Good overview of the ongoing activities around RD51**
  - Update on the individual R&D results → RD51-WG2
  - Dedicated meetings (a'la Discharge Workshop) to be organized according to our needs
  - Vidyo meetings according if needed (discuss and share new results)
  
- Interesting discussions which can trigger common projects or activities coordinated by the consortium
  1. MPGD QA
  2. Spark-less detectors

# 1. MPGD QA

- Presentation of the Spark-Detection-System (Uni Bonn, see update today by Markus Ball) triggered the discussion about a possibility of establishing common QA procedures, tools, limits for the GEM users (also MM and other MPGDs)
- Currently 2 large GEM productions are ongoing: ALICE TPC upgrade, CMS Muon System upgrade
- A lot of work and effort to develop QA scheme in these two projects could be used to establish a recommended list of tests and tools for the future projects
  - $I_{\text{leak}}$  measurement, sparking rate, defect maps, optical scanning, transportation
- Discuss with the producers a possibility of expanding list of tests at the production side (time!)
- Worth considering!



## 2. Common R&D project


- There is a common interest in continuation of stability studies of different structures for different applications
- Common stability setup in GDD from 2019
  - uRWELL measurements
  - Discharge limits as a function of a gas mixture, water content, etc.
  - Waiting for your ideas!
- **Development of the Spark-Less structures**
  - Measurements at CERN and/or your institute
  - Simulations

# Spark-Less structures

- Development and testing of new resistive coatings
- Development of new MPGD structures
- Hybrids (resistive coating + new structures)
- Simulations (2D-, 3D-FEM)
  
- Possibility to apply for the Common Project funding at RD51 during the next call
  - Please contact us if you are interested
  
- Currently we also consider to apply for the ATTRACT funds (V. Peskov, PG, ...)
  - 1 year project
  - Search for PhD student for simulations (05.2019-05.2020)

# Today

- Overview on the discharge-related R&D
  - Current activities in stability studies, existing infrastructure and expertise
  - Future plans, prospects, resources and needs (lab, manpower)
  - Common project: ideas, resources, requests.
- Next steps, Common Project discussion

<b>Kick-off meeting summary</b>	<i>Piotr Gasik</i>
31-3-004 - IT Amphitheatre, CERN	16:30 - 16:40
<b>Why are multi-MPGD stuctures better?</b>	<i>Fabio Sauli</i>
31-3-004 - IT Amphitheatre, CERN	16:40 - 17:00
<b>Spark Detection System development (GEM QA)</b>	<i>Markus Ball et al.</i> 
31-3-004 - IT Amphitheatre, CERN	17:00 - 17:15
<b>R&amp;D activities in Zagreb</b>	<i>Antonija Utrobicic et al.</i>
31-3-004 - IT Amphitheatre, CERN	17:15 - 17:30
<b>Effects of discharges on the resistive layer</b>	<i>Ourania Sidiropoulou</i> 
31-3-004 - IT Amphitheatre, CERN	17:30 - 17:50
<b>Discharges with resistive layers (ATLAS NSW)</b>	<i>Maxence Vandembroucke</i>
31-3-004 - IT Amphitheatre, CERN	17:50 - 18:05