The FTD facility at Bonn

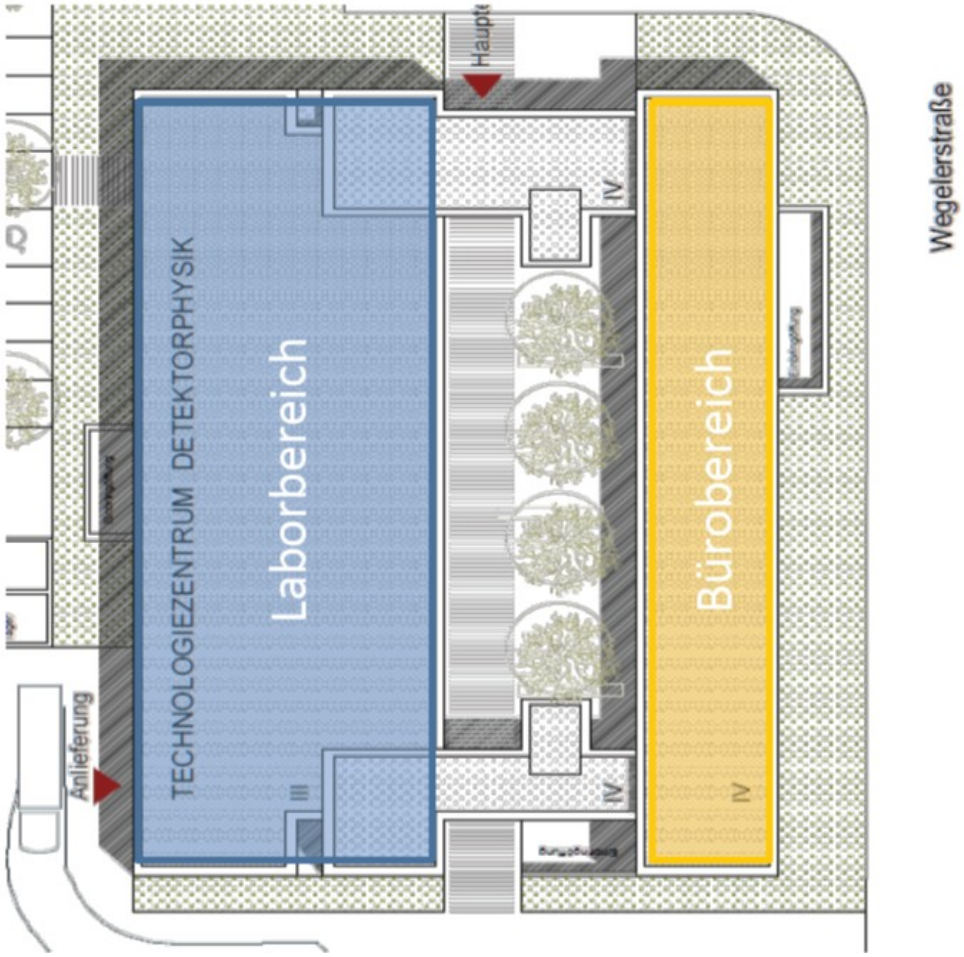
Markus Ball

Overview

- From plan to reality the history of the FTD
- The new concept of common infrastructure (e.g. clean room facilities and what we intend to do with it)
- The core facility

The FTD

FTD is short for Forschungs- und Technologiezentrum Detektorphysik (FTD) at the university of Bonn



WR
WISSENSCHAFTSRAT

Research buildings

With the German Federalism Reform, the joint task of university construction, including university medical schools, was abolished on 31 December 2006 and general university construction transferred to the sole responsibility of the states (Länder). At the same time, the Federal Government and the states created a jointly financed instrument for investments in the higher education sector with the funding of supra-regionally important research buildings, including large-scale equipment.

Since 2007, the German Science and Humanities Council (Wissenschaftsrat, WR) has been implementing the Research Buildings Programme on behalf of the Federal Government and the states (Länder). It provides funding for investment projects that are "distinguished by excellent scientific quality and national significance". The aim is to improve the conditions for German universities as successful players within the field of national and international competition in research.


Ministerium für Innovation, Wissenschaft und Forschung des Landes Nordrhein-Westfalen

universitätbonn

Forschungsbauten an Hochschulen · Antrag · Förderphase 2013

Forschungs- und Technologiezentrum Detektorphysik

Rheinische Friedrich-Wilhelms-Universität Bonn

Prof. Dr. Jürgen Fohrmann
Rektor der Universität
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53113 Bonn
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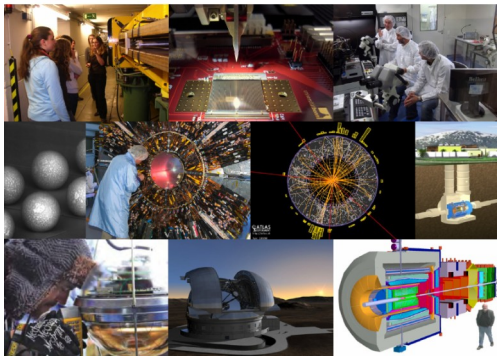
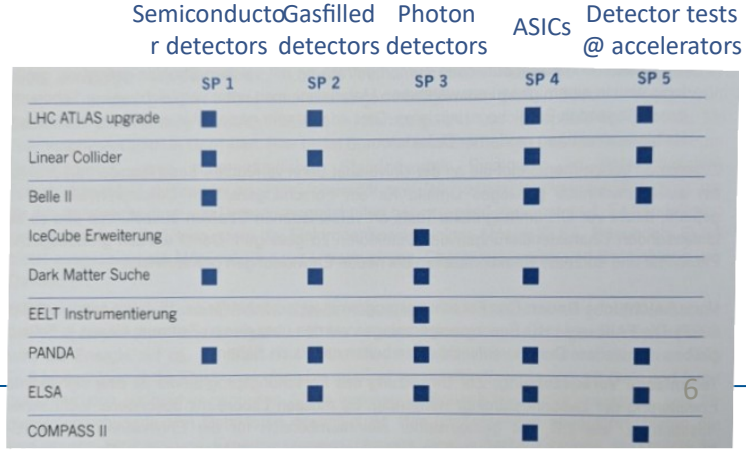




- 2-stage proposal (pre-proposal, full proposal)
  - Full proposal submitted: March 2012
  - **Final positive decision**: July 2012
- **Financing volume**: Proposed: 40 MEUR
- Granted: 33 MEUR
- Real Cost 55 MEUR
- **Planned start of operation: July 2016**
- **FTD spokespersons since 2015:**

  J. Dingfelder, B. Ketzer

Pictures from the Construction Side

Pictures from the Construction Side

Pictures from the Construction Side

Pictures from the Construction Side

GEFÖRDERT VOM
Bundesministerium für Bildung und Forschung

universitätbonn

BLB NRW
Bau- und Liegenschaftsbetrieb NRW
Köln

Ich lade Sie herzlich ein zur

Grundsteinlegung

für den Neubau
Technologiezentrum Detektorphysik
für die Rheinische Friedrich-Wilhelms-Universität Bonn
Kreuzbergweg 26 / Ecke Wegelerstraße in 53115 Bonn

am 02. November 2016 um 10:30 Uhr

Martin Brans

Dr. Martin Brans
Leiter der Niederlassung Köln des Bau- und Liegenschaftsbetrieb (BLB) NRW

Programm

Begrüßung Dr. Martin Brans
Leiter der Niederlassung Köln des BLB NRW

Grußworte Ashok Sridharan
Oberbürgermeister der Bundesstadt Bonn

Svenja Schulze
Ministerin für Innovation, Wissenschaft und Forschung des Landes Nordrhein-Westfalen

Thomas Rachel
Parlamentarischer Staatssekretär bei der Bundesministerin für Bildung und Forschung

Prof. Dr. Michael Hoch
Rektor der Rheinischen Friedrich-Wilhelms-Universität Bonn

Dr. Martin Chaumet
Geschäftsführer des BLB NRW

Im Anschluss laden wir Sie zu einem Imbiss ein.

02.11.2016

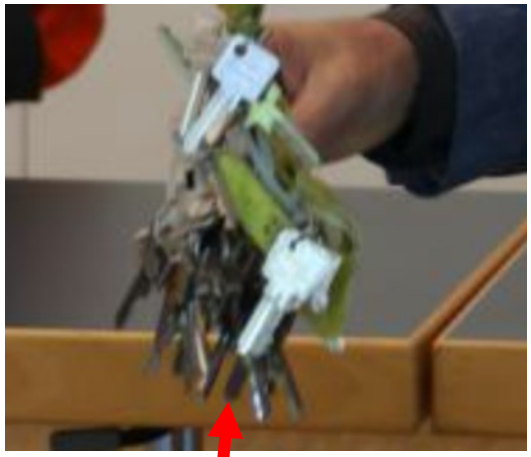
Pictures from the Construction Side

Pictures from the Construction Side

Pictures from the Construction Side

Pictures from the Construction Side

Hand Over



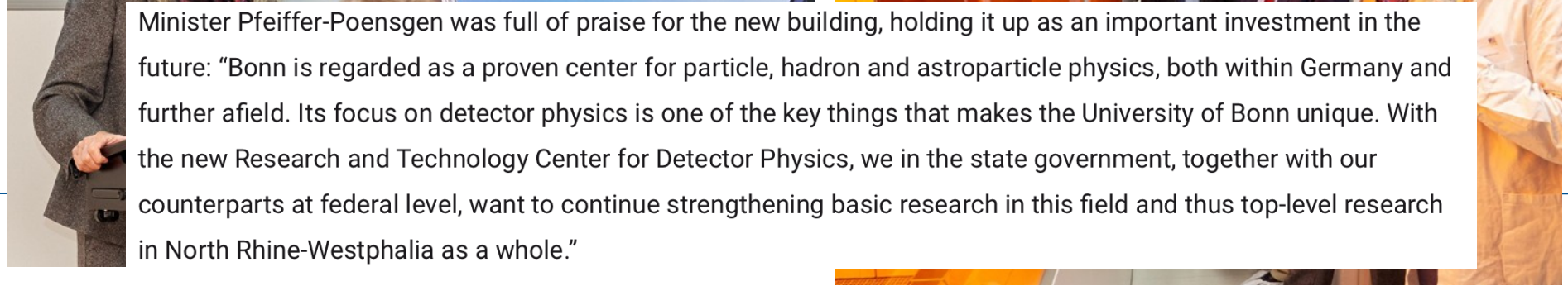
15.07.2021

Visit of Secretary of Science

08.11.2021

Over 32,000 More Square Feet for Top-Level Research

University of Bonn's Research and Technology Center for Detector Physics gets ceremonial opening



Minister Pfeiffer-Poensgen was full of praise for the new building, holding it up as an important investment in the future: "Bonn is regarded as a proven center for particle, hadron and astroparticle physics, both within Germany and further afield. Its focus on detector physics is one of the key things that makes the University of Bonn unique. With the new Research and Technology Center for Detector Physics, we in the state government, together with our counterparts at federal level, want to continue strengthening basic research in this field and thus top-level research in North Rhine-Westphalia as a whole."

Timeline

Vollantrag 15.11.2011

Antragsskizze Art 91b GG

Beginn Tiefbau 15.03.2012

Grundsteinlegung 04.11.2014

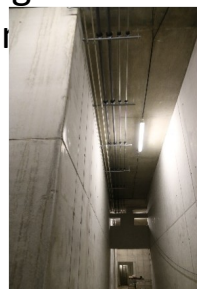
Hüllenschluss 02.10.2015

Übernahme durch Uni 04.04.2016

Abriss Alte Pharmazie 15.03.2012

Beginn Rohbau 02.11.2016

Beginn In



Einbau Reinraum 14.03.2017

Einweihung 28.02.2018

05.07.2018 05.07.2021 08.11.2021

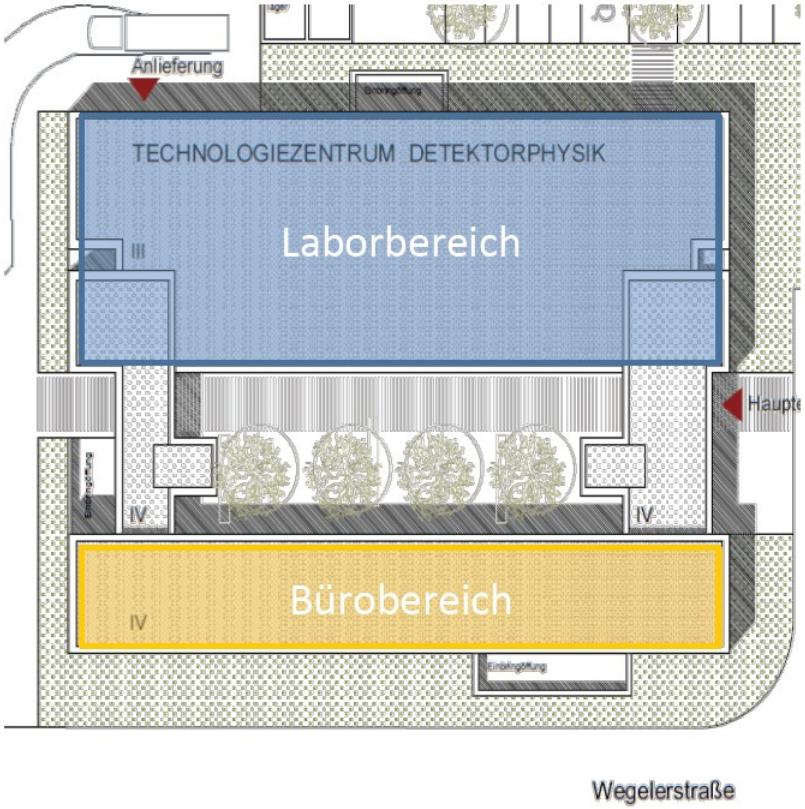
The FTD

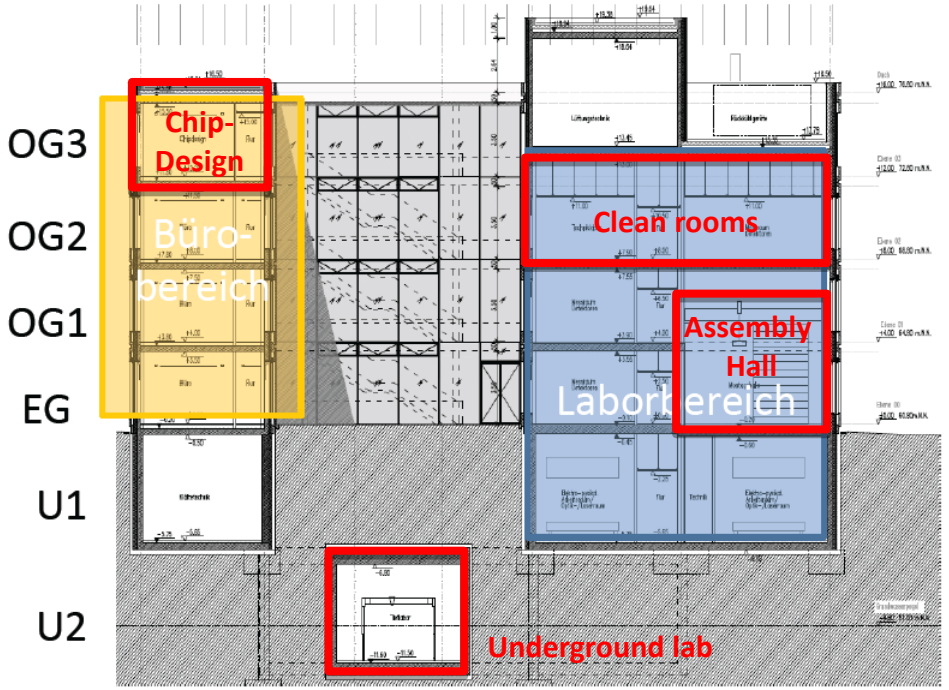
Office space:

- 880 m²
- 4 Floors

Lab space

- 2010 m²
- 4 Levels + Underground Laboratory
- 360 m² clean rooms (ISO 5, 6, 7)





Common Infrastructure

The Personel

Technical Coordinator
Dr. Markus Ball
mball@uni-bonn.de

Secretary
Workshops, Guests, Web, Kommunikation, Outreach
Sarah Conee

IT
N.N.

Head of Cleanroom
Dr. Yevgen Bylevich
bilevych@uni-bonn.de

Head of Elektronic-development
Dr. Marco Vogt
mvogt2@uni-bonn.de

Detectordesign & -integration
Dr. Dmitri Schaab
dima@uni-bonn.de

Janitor
Richard Lagemann

Technician
Gases, Chemicals
N.N.

Cleanroom-Technician
Jerome Laubner

Construction, CAD
N.N.

Common Electronic-Laboratory
Walter Honerbach
Martin Kerp
Alexander Ochs
Katharina Rosenthal
Candas Tezel
Michael Henseler

Radiation Protection Service
Dr. Christoph Wendel
Dr. Fabian Hügging
Dr. Stefan Görtz
Dr. Marcus Grüner
Dr. Markus Ball

Laser Protection Service
Dr. Andrea Bergschneider

Enginers + Technicans
of the working groups

Common Infrastructure

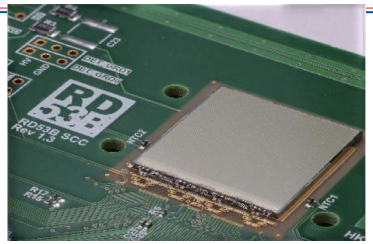
The idea of a Common Infrastructure

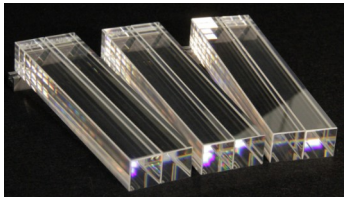
- FTD will try to get the best from two worlds (univerity & laboratory)
- Working Groups will have there own laboratory space to work on their specific projects & research
- Common infrastructure is maintained and operated by the FTD staff. The infrastructure is too big to be operated by one group alone
- Space in the Common Infrastructure is not assigned to a group, but will be used according to the need of running projects
- Staff is there to provide and maintain knowledge and expertise, but ressources for projects has also to come from the working groups

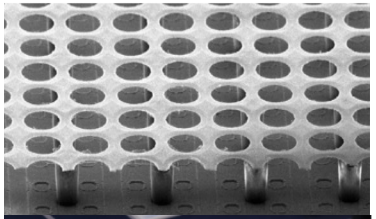
Projects of the FTD

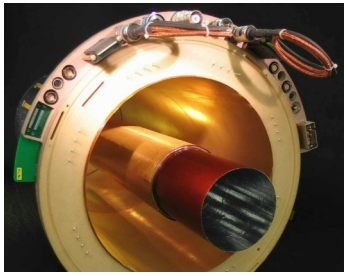
UNIVERSITÄT BONN FTD

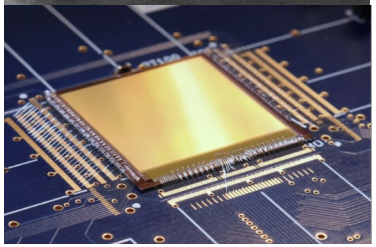
- ATLAS (CERN): Inner Tracker Upgrade: 13m² Hybrid Pixel detector
- Belle II (KEK): DEPFET Pixel detector and upgrade with monolithic CMOS detectors
- ALICE (CERN): Upgrade of Time Projection Chamber with GEM detectors, 50m², new readout electronics
- AMBER (CERN): Planar GEM detectors with triggerless readout
- PANDA (FAIR): high-resolution electromagnetic calorimeter (20'000 crystals)
- IAXO (axion search at DESY/CERN): InGrid detectors
- ILC: TPC readout with pixelized gaseous detectors
- ELSA:
  - hadron physics: upgrade with charged-particle tracking and forward detectors
  - Lohengrin: dark photon search
  - Bethe-Heitler experiment: form factors
- Nanodetectors for photonics
- Chip design for readout and control of detectors
- Generic R&D on detectors: semiconductors, micropattern gaseous detectors
- Electronics for particle detectors
- Connection to Quantum Optics: Fibre Lab
- Cooperations with external partners

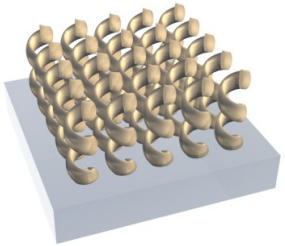










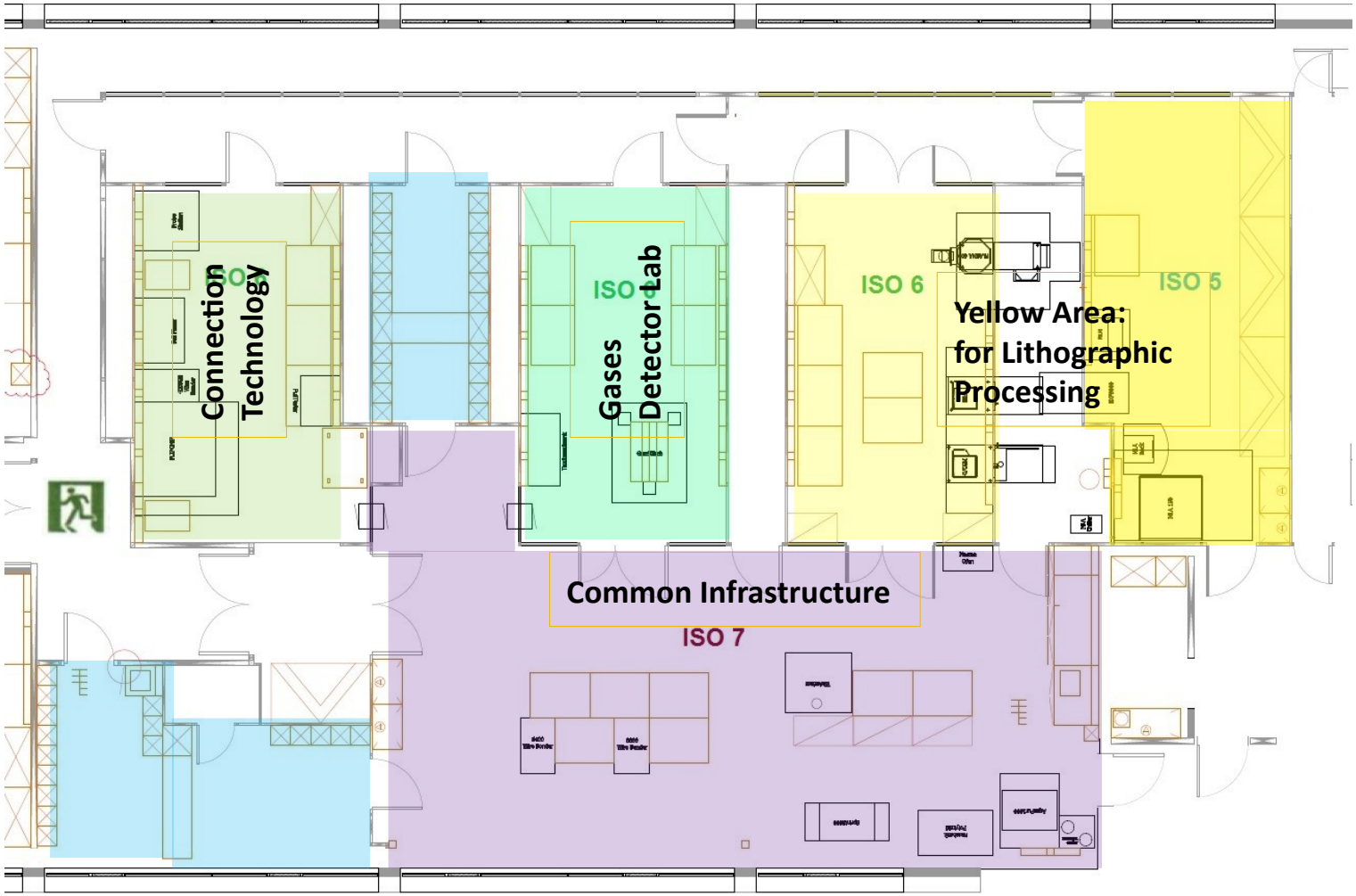


The clean room

The clean room

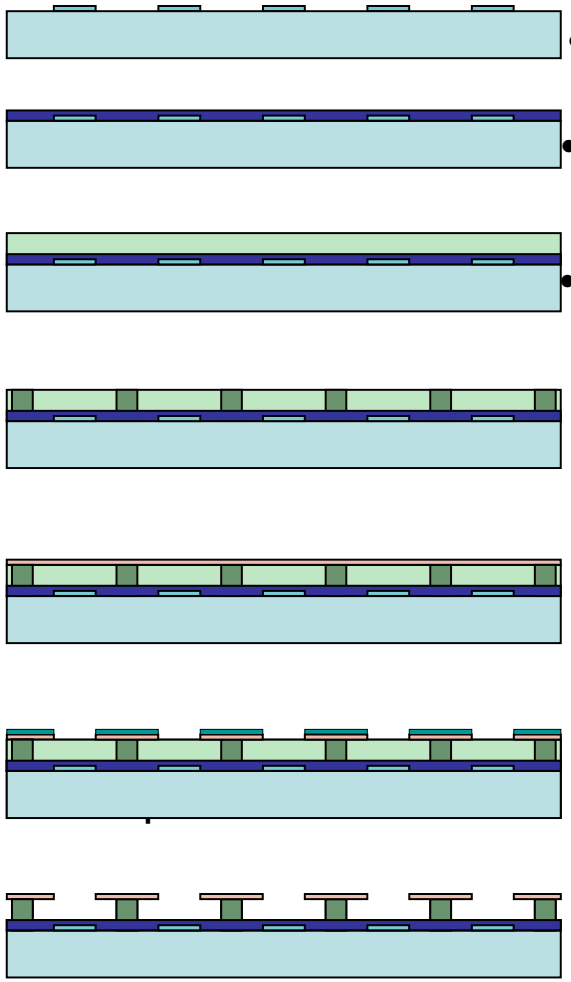
Cleanroom area – about 360 m2 for Nano- and Microstructuring

5 Labs – ISO-7, 3 ISO-6, ISO-5



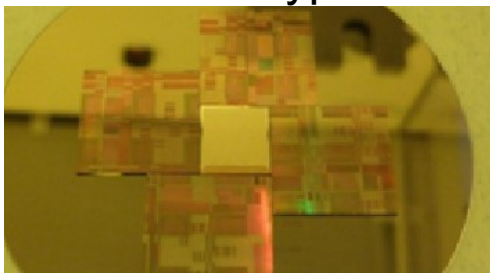
Two Processes for MPGD - InGrid

Courtesy of Y. Bilevych

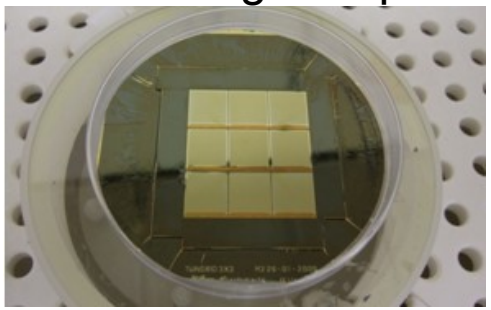


- 1. Surface preparation
- 2. Protection layer (SixNy)
- 3. Spacer layer (SU-8)
- 4. Patterning of SU-8
- 5. Deposition of Al
- 6. Grid formation
- 7. Detector releasing

- Prototypes



- Single chip

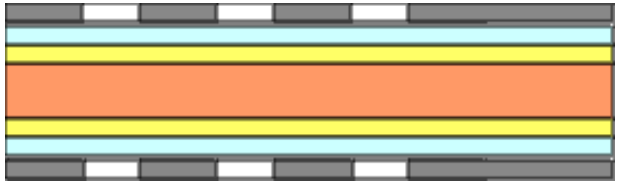


- 3x3 square

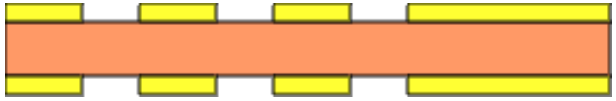
Two Processes for MPGD - GEM

50 µm Kapton
5 µm Cu both sides

Photoresist coating, masking and exposure to UV light

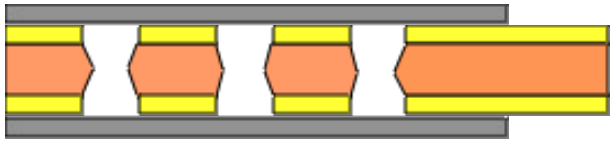


Metal chemical etching



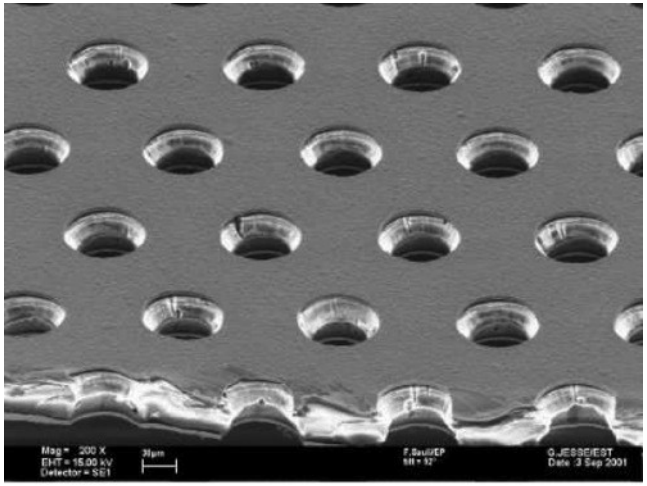
Kapton chemical etching

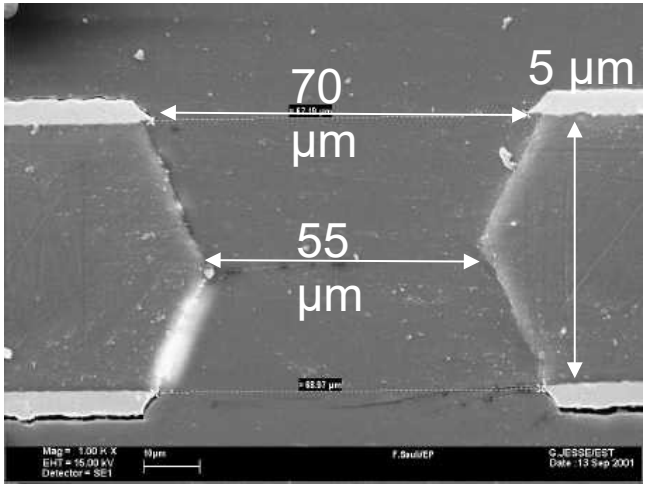
Second masking



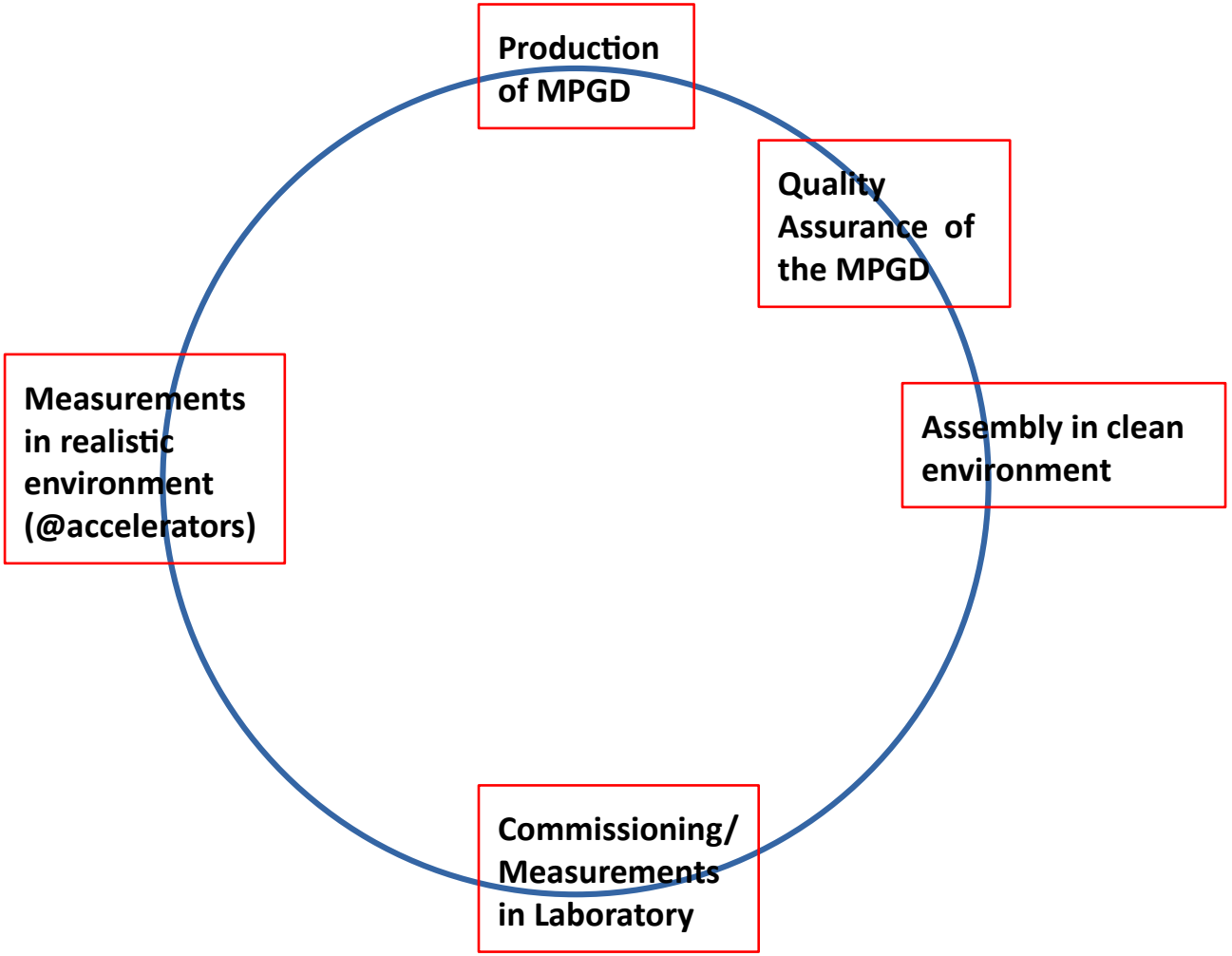
Metal etching, cleaning, passivation

Standard GEM:70 µm Ø at 140 µm pitch

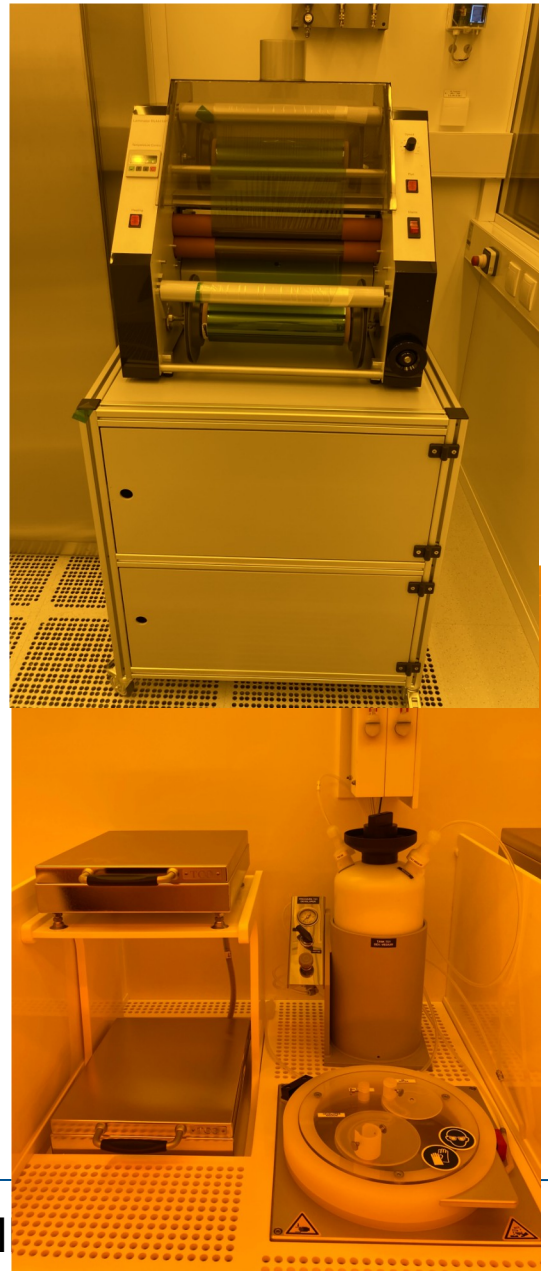


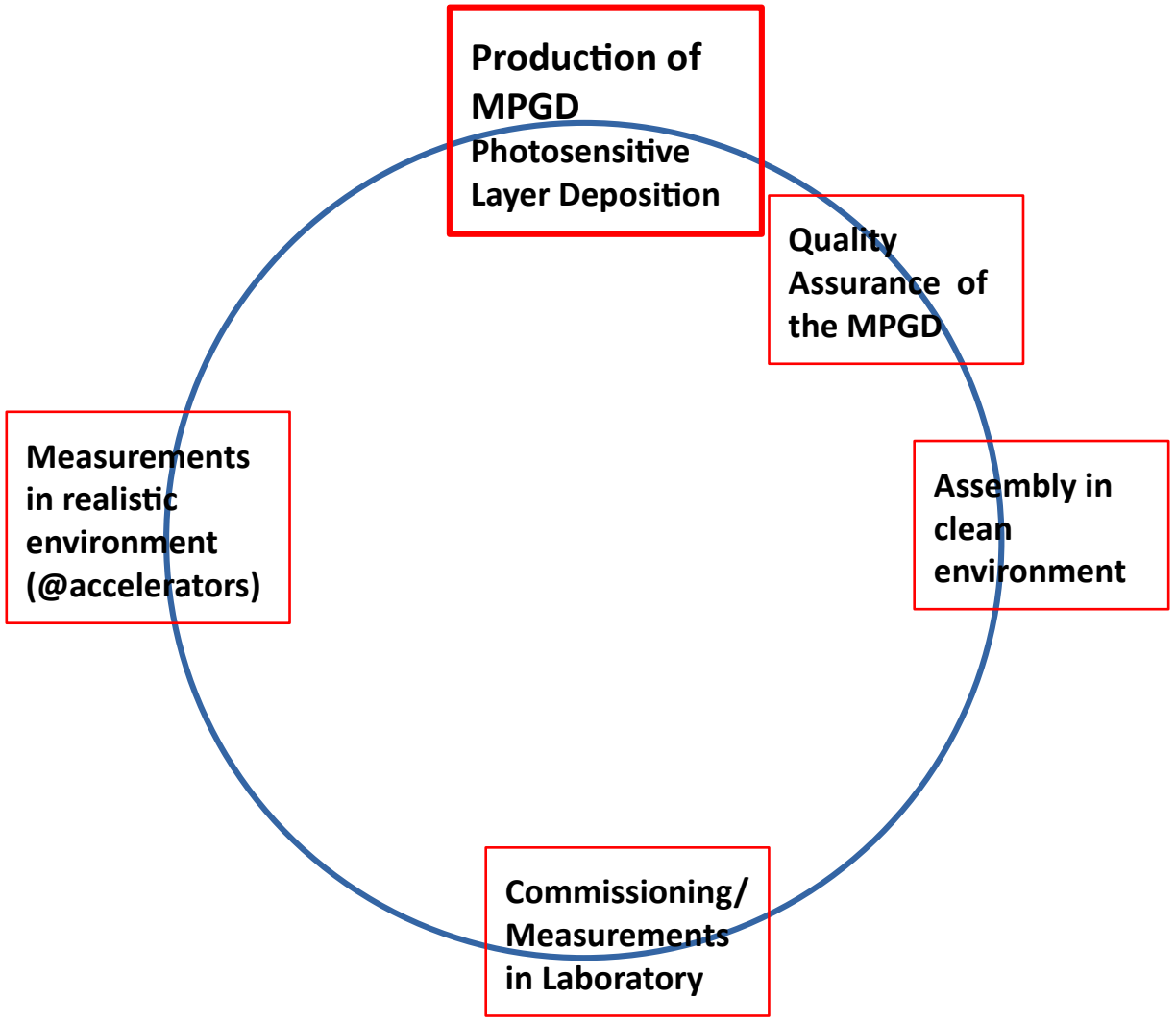


Cycle of the MPGD usage

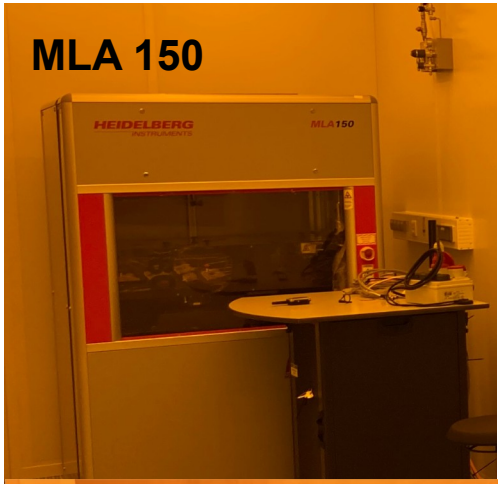


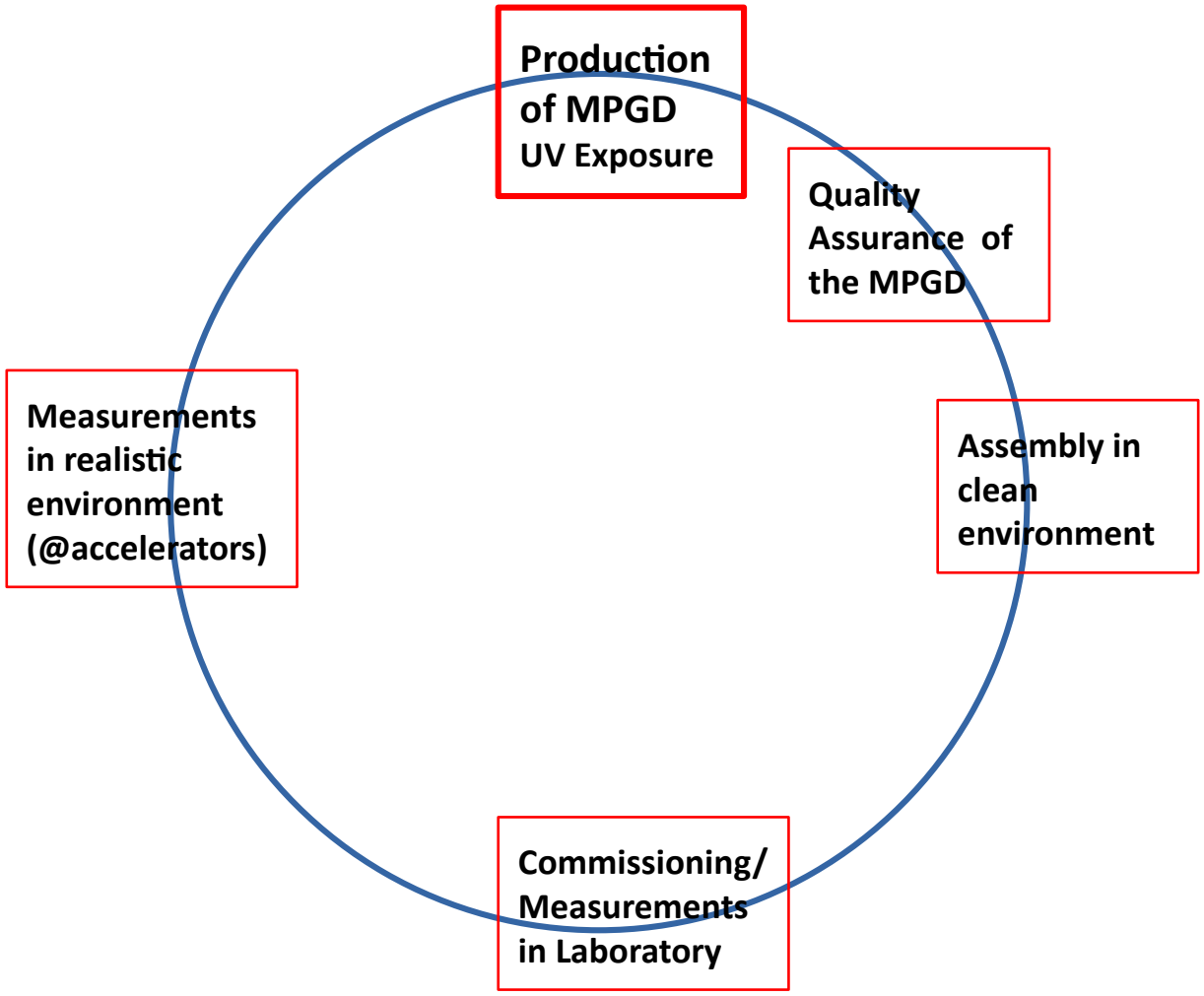
Machines for Photosensitive Layer Deposition





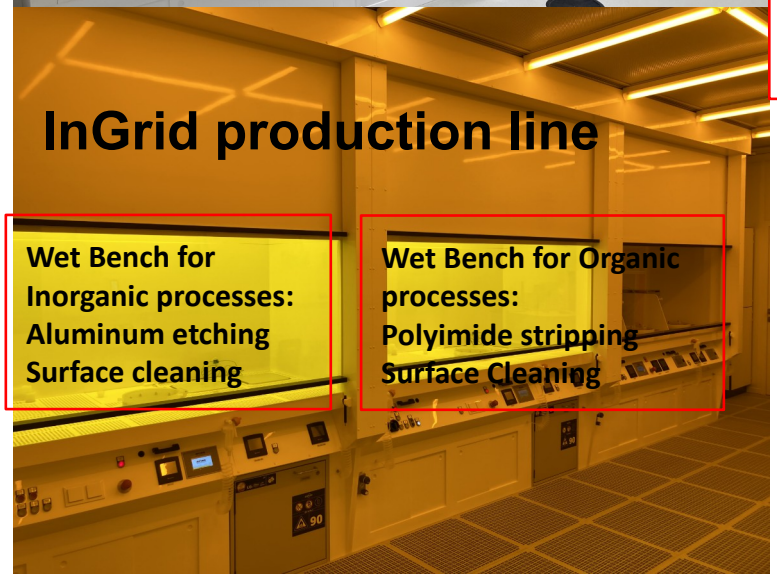
Machines for UV Exposure

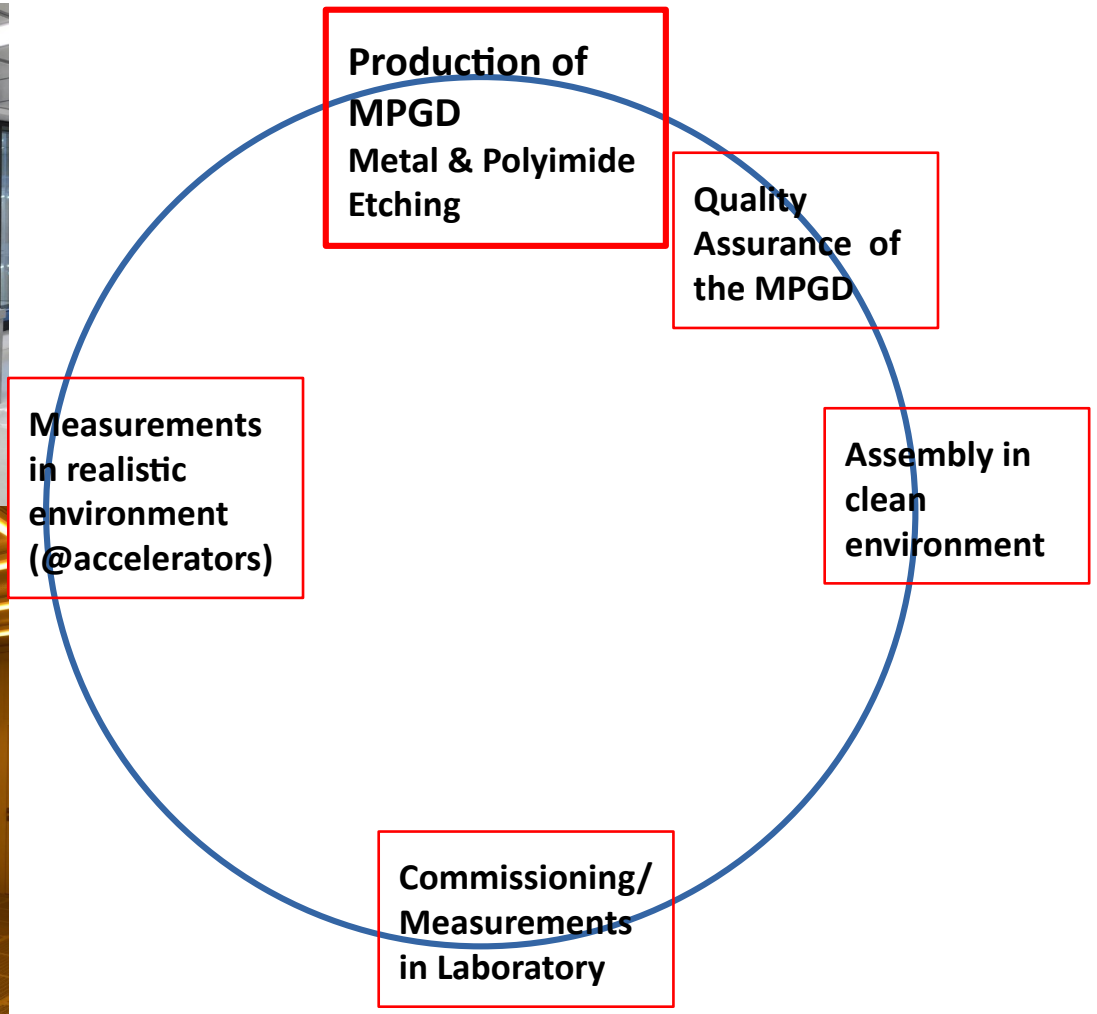


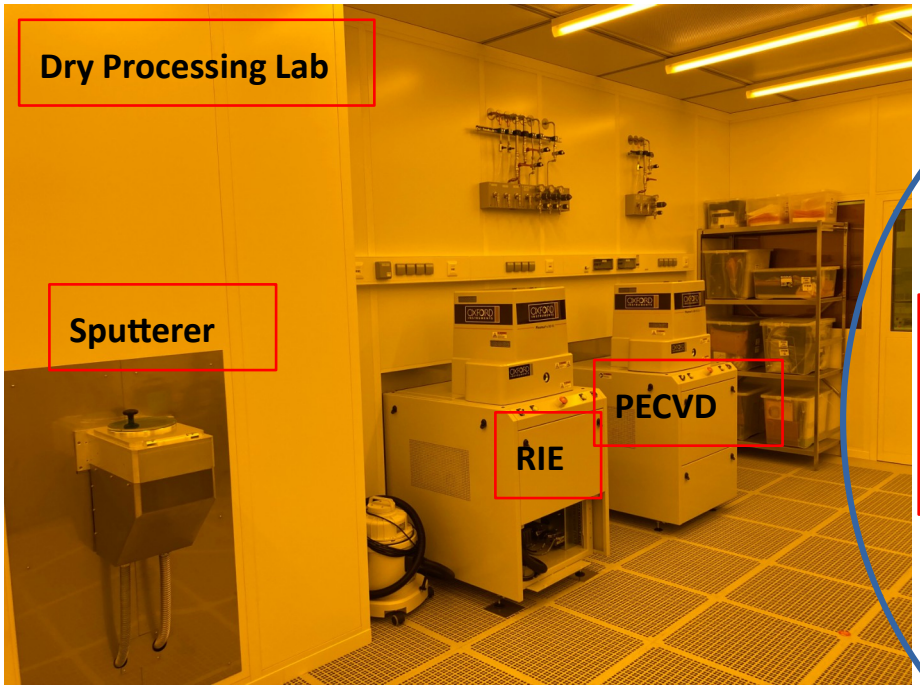


Metal & Polyimide Etching

GEM foils production line







Production of MPGD
Dry Etching

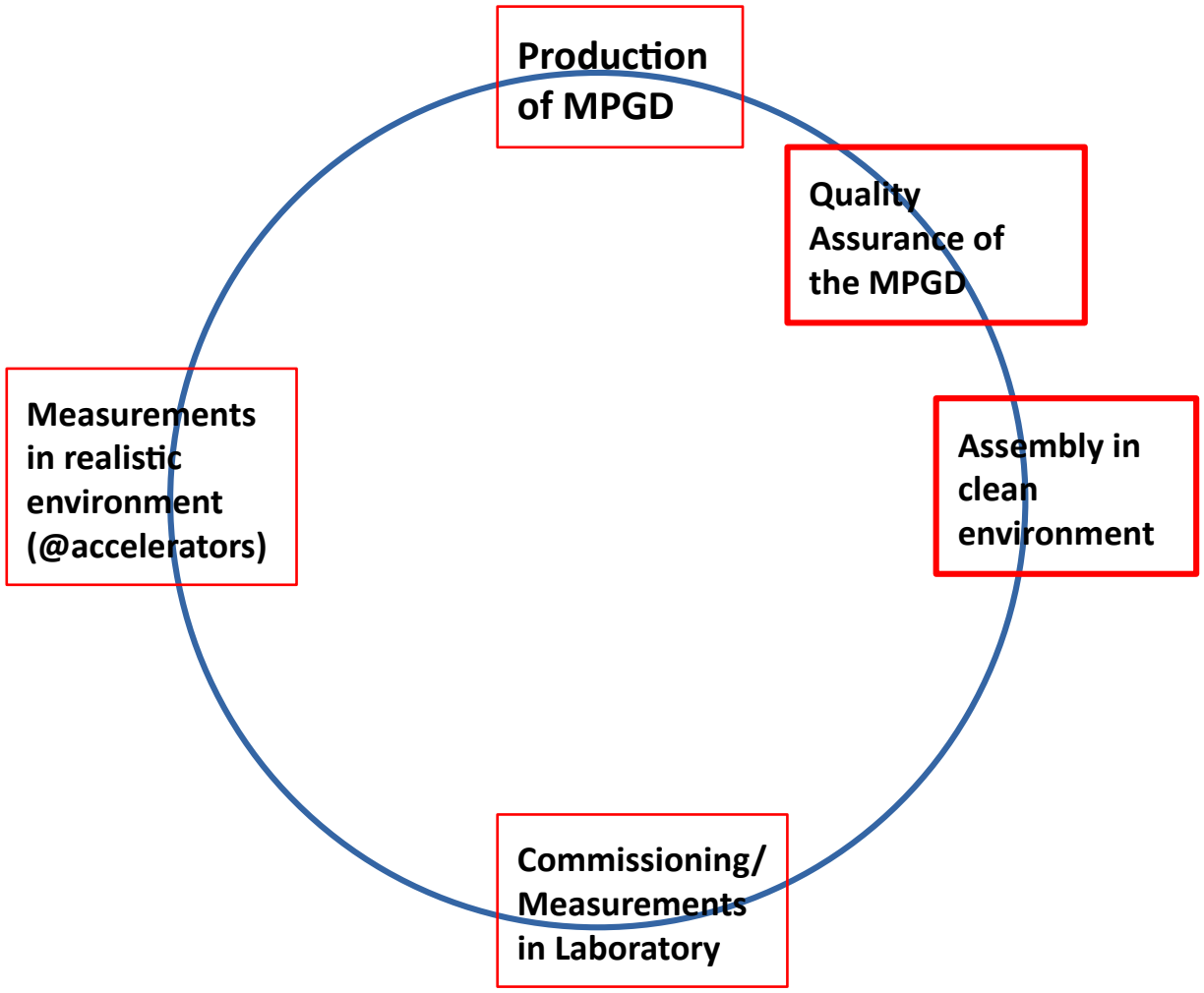
Quality Assurance of the MPGD

Assembly in clean environment

Commissioning/ Measurements in Laboratory

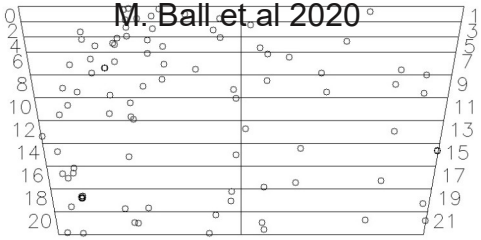
Measurements in realistic environment (@accelerators)

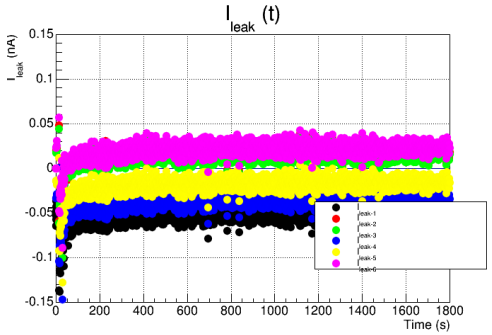
ISO6 Stonehenge



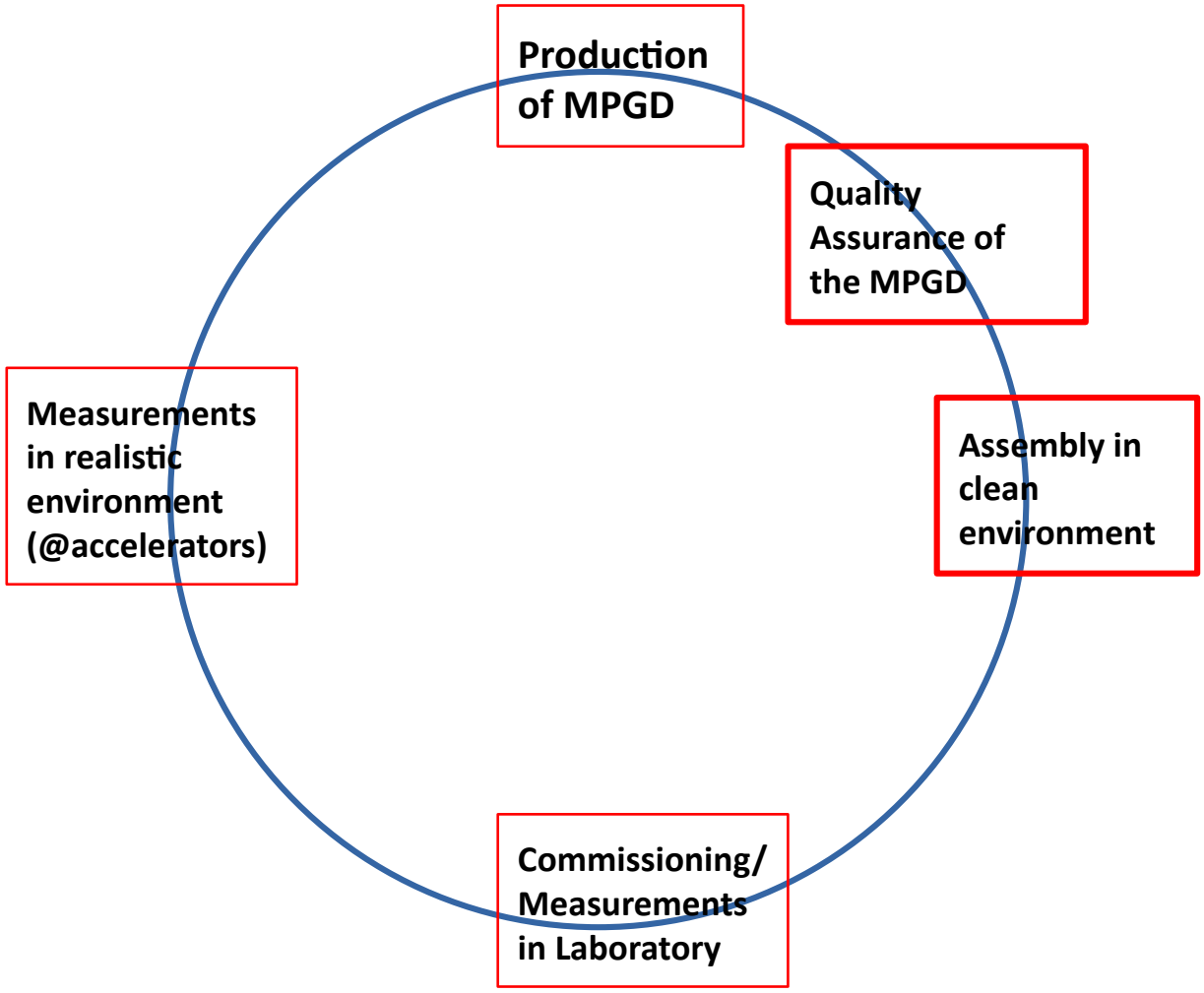
ISO6 Stonehenge

M. Ball et al 2020

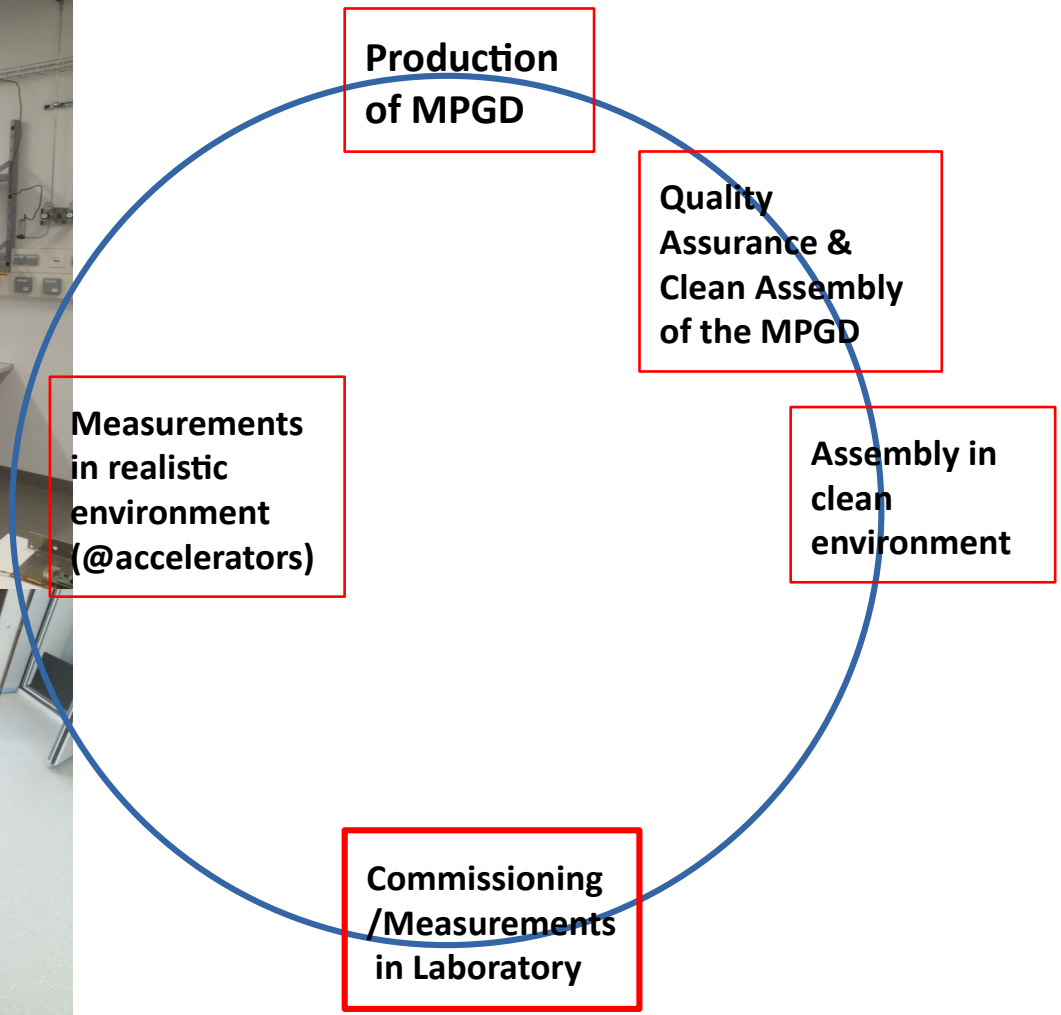




M. Ball et al, JINST Vol. 12 C01081



Lab Infrastructure

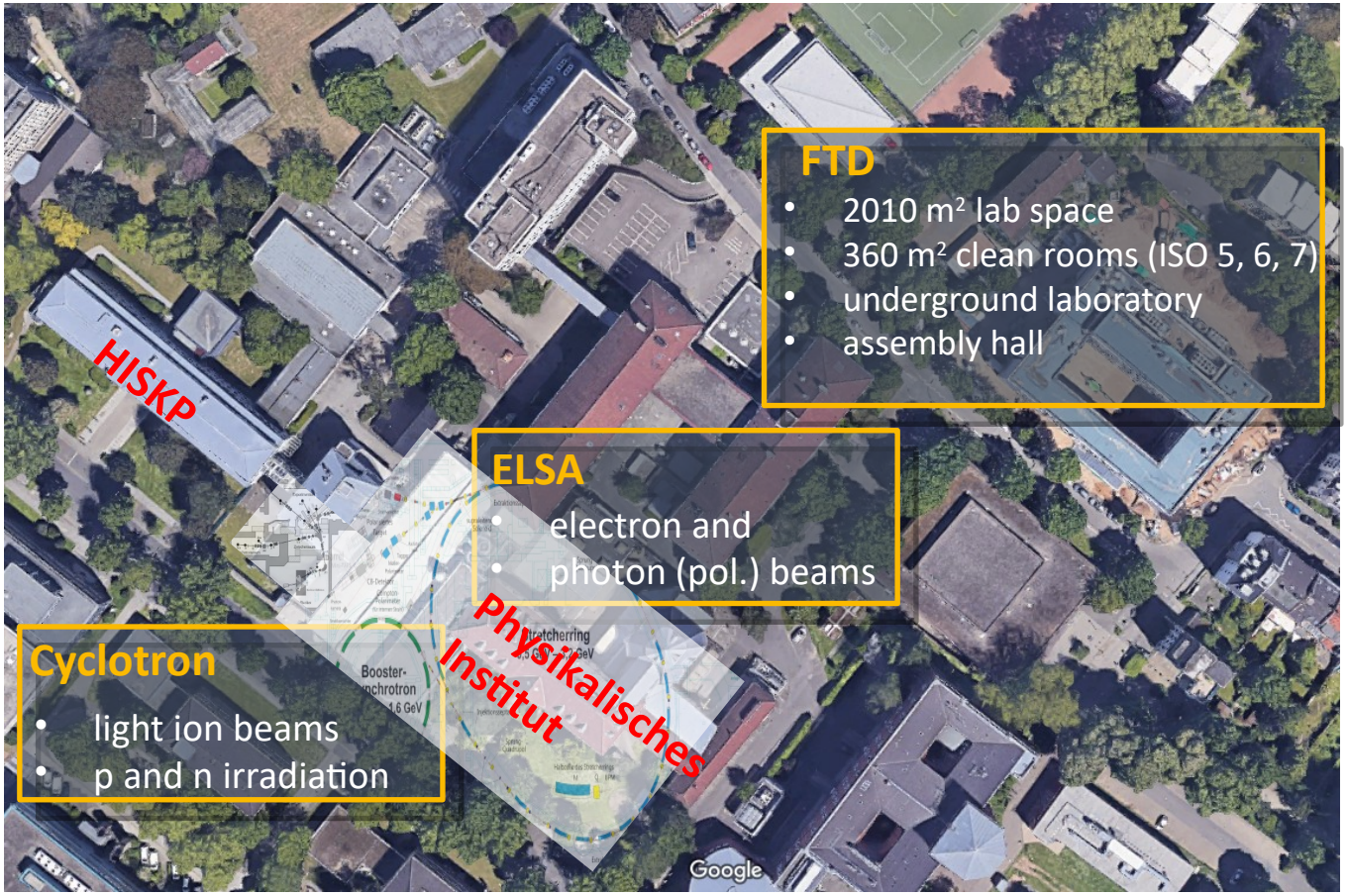


The Core Facility

New **Core Facility**

in preparation:

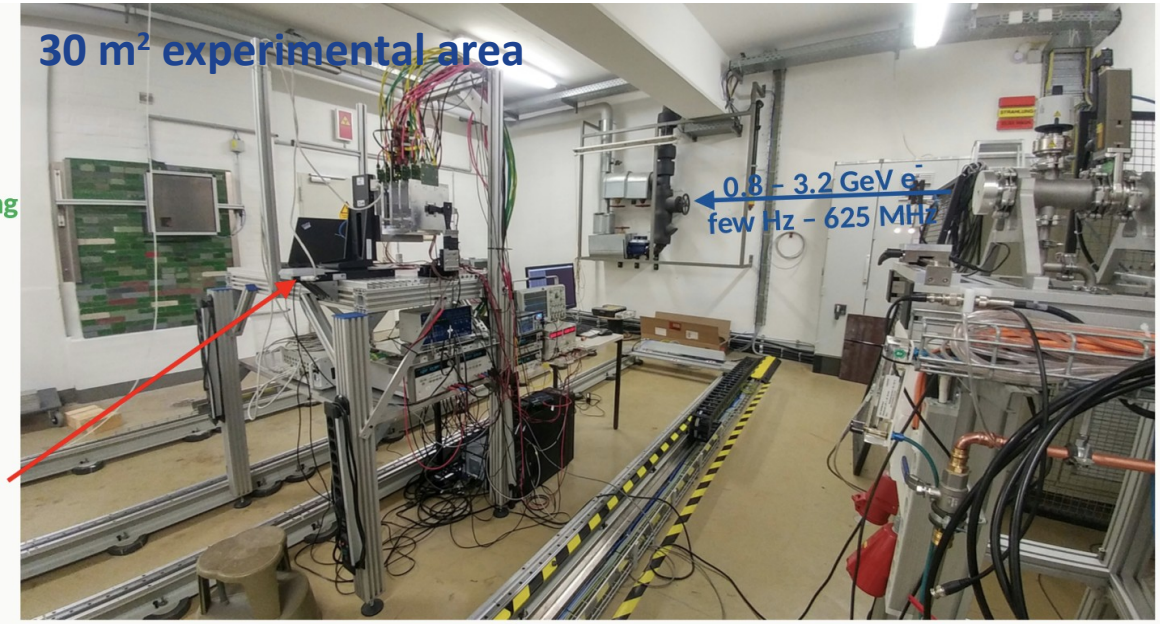
- FTD
- ELSA (Phys. Institut)
- Cyclotron (HISKP)

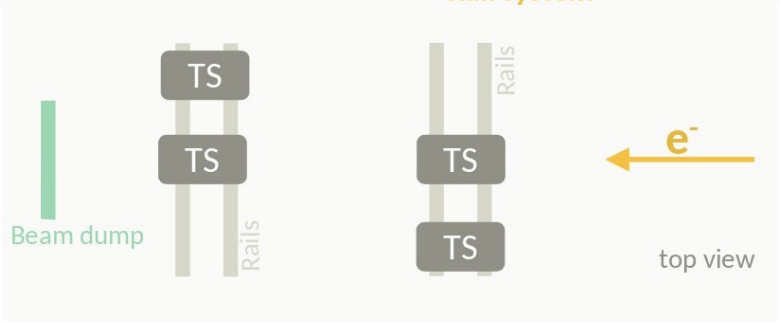


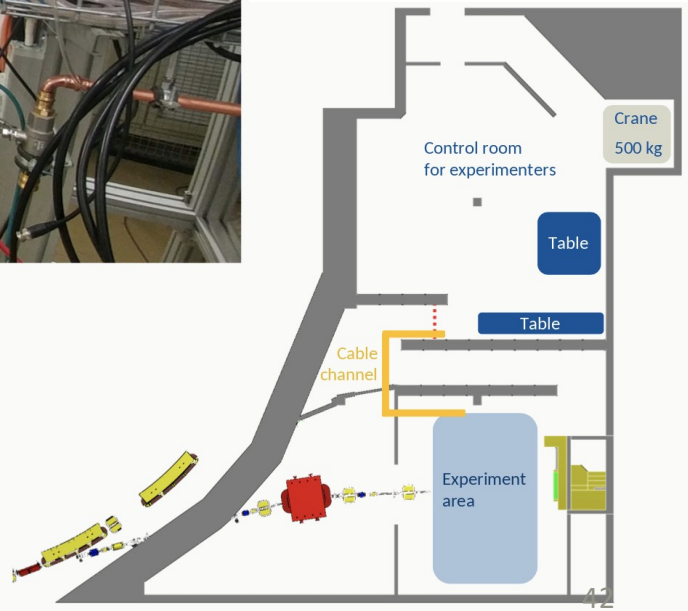
Development of **detector and accelerator technologies** for fundamental physics

- international collaborations
- local experiments
- open for external users through EU-funded transnational access (STRONG-2020)

ELSA Test Stand



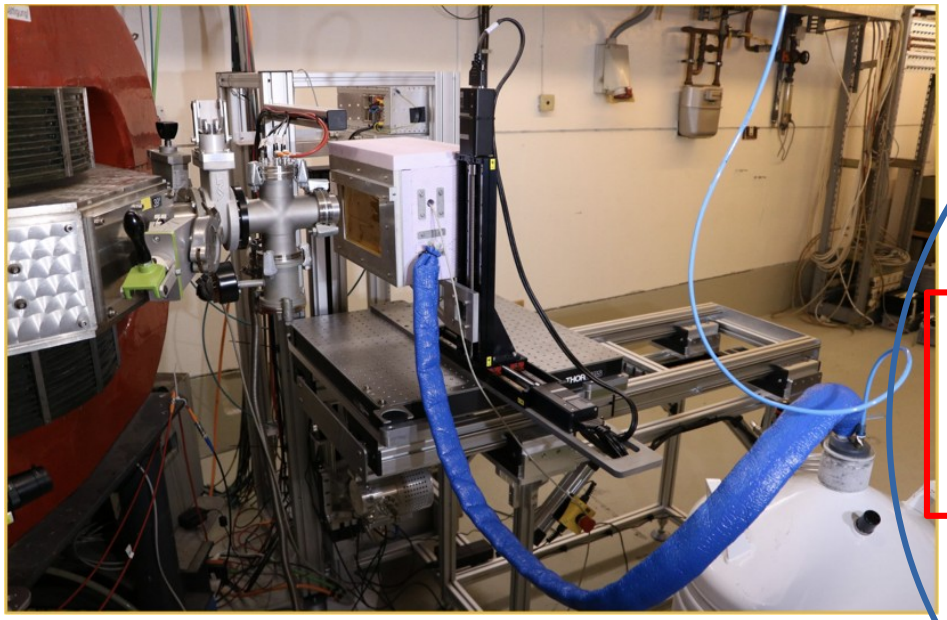


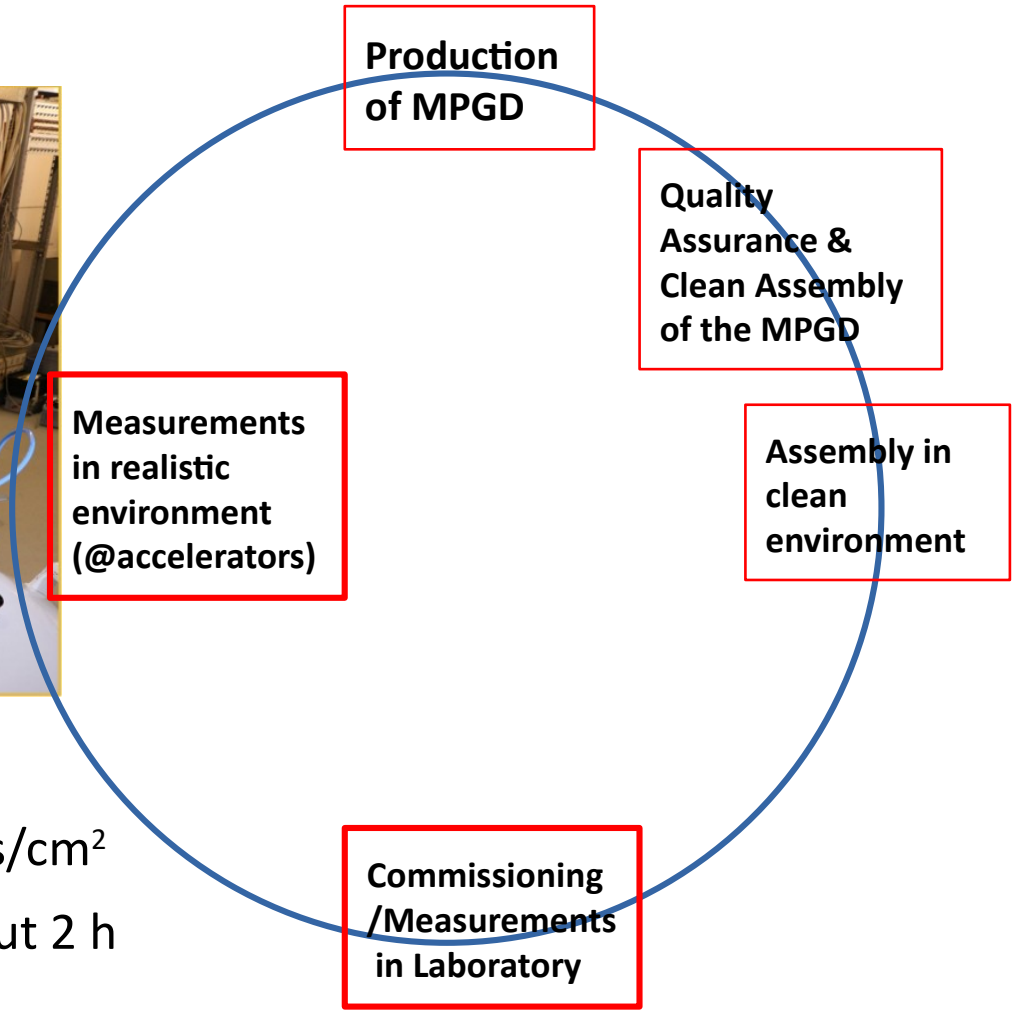


FTD

Cyclotron Test Stand

Irradiation setup





- Proton beam (typical)
  - 14 MeV, 1 μA, $\varnothing_{FWHM}$<1 cm, p/s/cm^2
  - corresponds to n_{eq}/cm^2 in about 2 h
- Neutron irradiation region being prepared
- Future ideas: material investigation using proton and ion micro-beams (e.g. SNAKE)

Conclusion

- The FTD is a new facility that hosts detector groups from University of Bonn, but also external groups are welcome !!!
- The FTD is/will be a unique infrastructure with clean room facility, assembly halls, tools and manpower.
- The FTD offers a unique chance to do research in one hand
- One Possibility of participation is through STRONG-2020 http://www.strong-2020.eu/
- A big thanks to the CERN PCB workshop for all the help then and now

Thanks for your attention