# Status Report

## Work Package 1

Provide general report, impact & constraints assessment on EP/DT activities based on demolition of buildings 25 / 70 / 155 / 166 / 187.

Submitted By :

S. Auerbach (EP-AGS-SI), D. Barney (EP-CMX), J. Cachet (EP-AGS-SE) E. Dho (EP-DI-SO), N. Dixon (EP-DT-CO), F. Merlet (EP-DT-FS), K. Pommès (EP-AGS-SI), Carlos Solans Sanchez (EP-ADE)

### Foreword

This report was prepared by the EP Building 140 Working Group Members along with EP/DT facilities managers and engineers.

The information contained within are correct as of December 2020. The overall conditions of the facilities are ever-changing due to the evolution of the activities, mainly for the phase II upgrade of the LHC Experiments.

Due to the timing the assessment of EP/DT activities, the WP1 completion time-line was considerably short, less than 3 weeks.

The following data are for assisting the Working Group, the EP/DT responsibles and EP Management in making further decisions needed to achieve short and long-term facility goals.

**Introduction**

Within the investment secured for the period of 2021-2025 for the rehabilitation of the site buildings identified in the Masterplan, a new large complex called building 140 will be constructed to replace all the former constructions constituted of buildings 25 / 70 / 155 / 166 / 187 and 102.

However, the presence of critical EP/DT activities induces strong technical constraints in their resettlement before any demolition of the buildings.

In order to realise the construction project of this building, a working group has been created (see mandate) and organised in several work packages (WP).

> WP1: Provide general report, impact & constraints assessment on EP/DT activities based on demolition of the buildings 25 / 70 / 155 / 166 / 187.
>
> WP2: Inspect and assess sites that can be considered as part of the reshuffle process and estimate financial costs.
>
> WP3: Propose the purpose and objectives of the new building by: creating a statement of needs; preparing a first strategic project brief.
>
> WP4: Propose different reorganization scenarios of EP/DT activities, highlight potential (space) savings and synergies and set them up as potential relocation options. Estimate the needed support and financial costs to manage the re-installation of the activities and persons.
>
> Starting from consultations with SMB, additional work packages will be defined at a later stage for the design and construction phase of Building 140.

The purpose of this report is to conclude the WP1 by providing a general report impact & constraints assessment on EP/DT activities based on demolition of the buildings 25 / 70 / 155 / 166 / 187.

**Methodology**

To perform the assessment of the activities located in these buildings, the EP Building 140 Working Group Members completed the following tasks : Prepare a detailed list of Labs / Workshops / Clean Room / storage to be assessed ; Prepare a template to assess the facilities; Assess a building for template validation; Start building assessment; Prepare a detailed list of offices / open space occupants; Provide final status report.

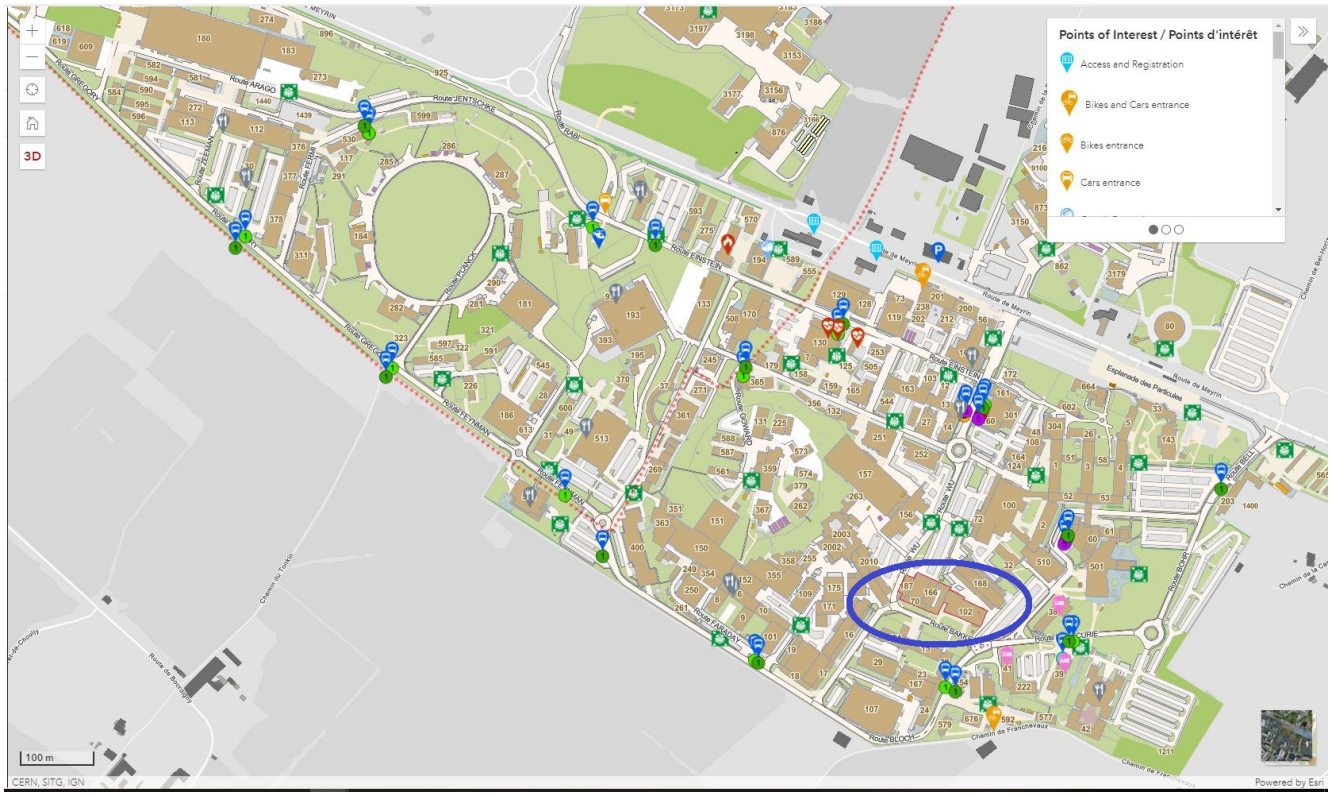
**Table of contents**

**General overview**

The EP-DT group is involved in several detector projects for LHC and non-LHC Experiments, and Research & Development for future projects. It offers a wide range of expertise and facilities in many different domains, spread over several buildings across the Meyrin site.
*(see Annex I: Matrix of activities and buildings)*

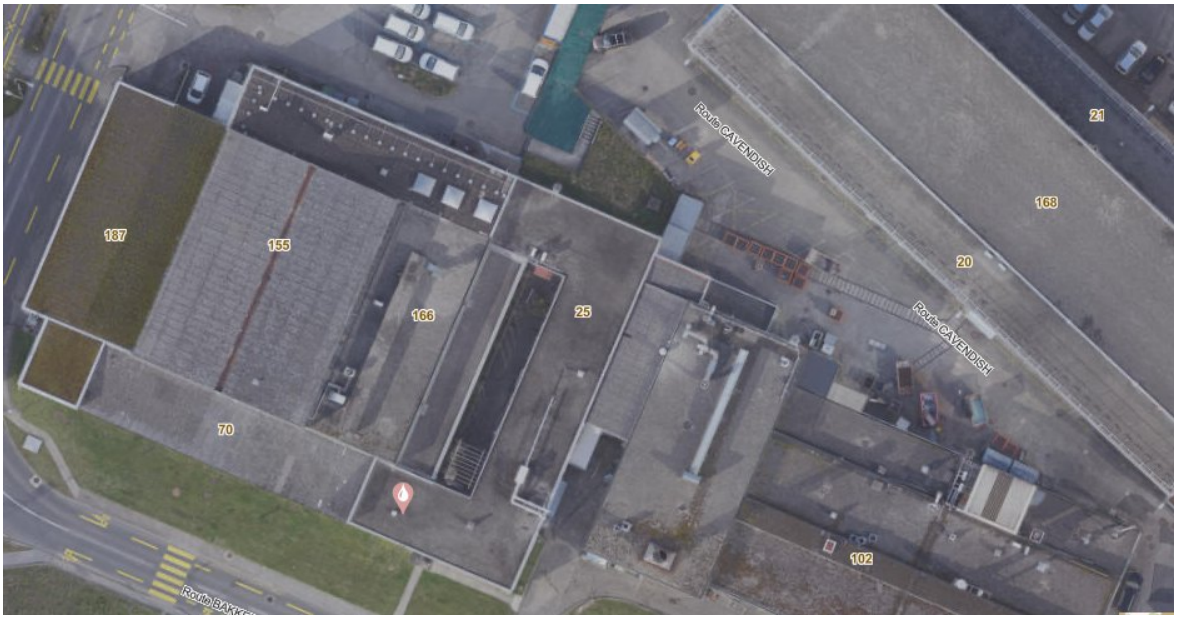
This assessment will only cover the former constructions constituted of buildings 25 / 70 / 155 / 166 / 187 : however other buildings may be affected by any relocation.

Location of buildings

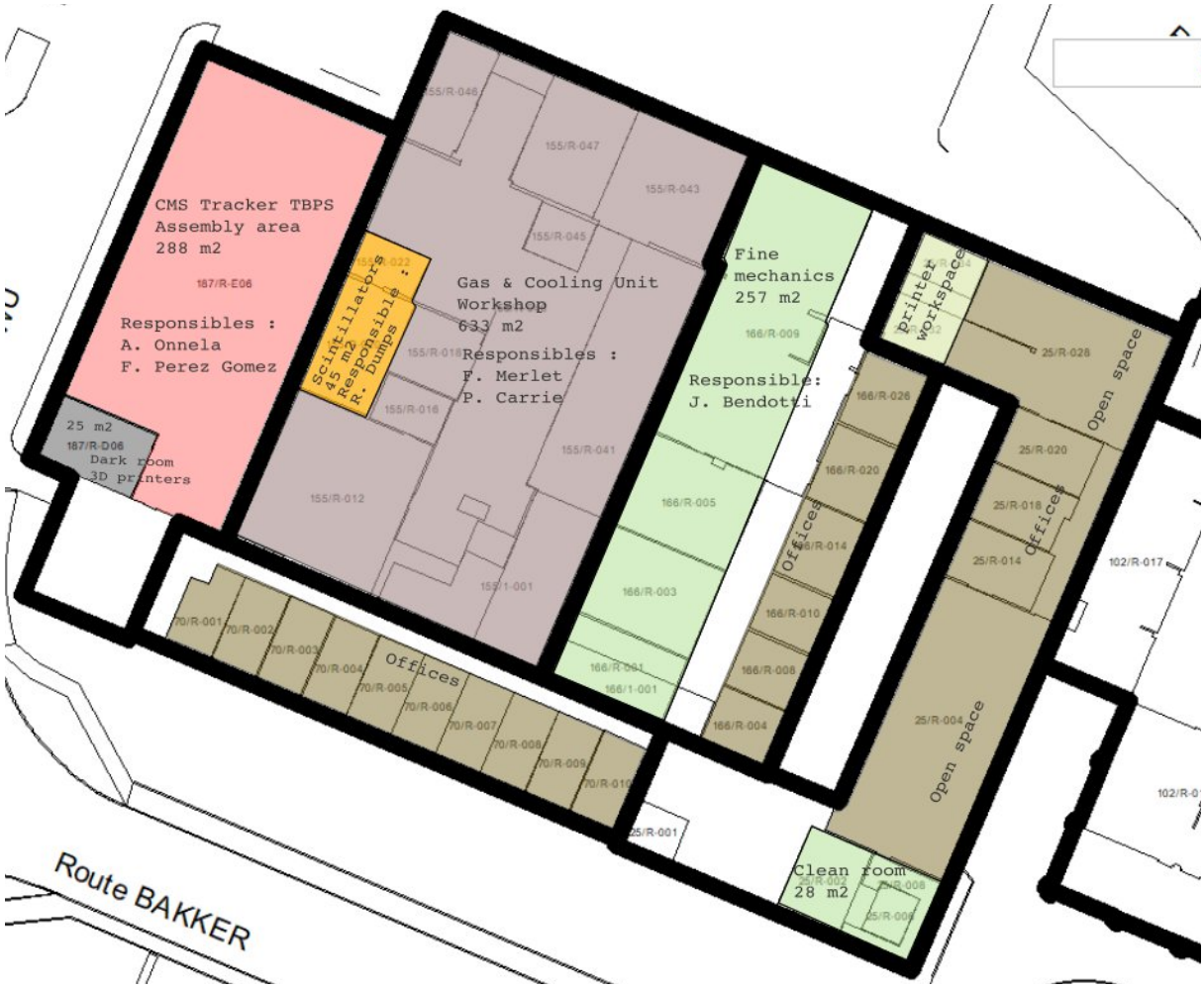



The average age of the concerned buildings is 60 years old with the first building constructed in 1955.

Aerial view of the site



Facilities of the site : footprint 2’165 m$^2$




| Building | Facilities / Area (m2) | Total (m2) |
|---|---|---|
| 25 | Open space - offices / 276 m2<br>Small Assembly - Clean room / 44.5 m2<br>Workspace - Printer / 25 m2 | 345,5 |
| 166 | Offices / 97 m2<br>Workshop - Lab / 279 m2<br>Storage cabinets in corridors / 50 m2 | 426 |
| 70 | offices / 154 m2 | 154 |
| 155 | offices / 22 m2<br>Meeting room / 38 m2<br>Workshops / 610 m2 | 670 |
| 187 | Assembly area / 288 m2<br>Dark room / 25 m2 | 313 |

**Occupants**

There are currently 55 full time members occupying these buildings. The workforce is made up of different categories (management, engineers, physicists, technicians, FSU, students and users) dedicated to various projects and activities. (see Annex VI). The organization is built around projects rather than on organisational functions. Most of staff contribute to several Experiments and/or services activities in parallel.

| | | Names |
|---|---|---|
| Management (Group Leader, Section leaders) B.166/70 | 5 | B. Schmidt, P. Riedler, A. Catinaccio, A. Onnela,H. Danielsson |
| Secretary - B.166 | 1 | V. Wedlake |
| Project Responsible - B.25/70/155 | 4 | C. Gargiulo, L. Ropelewski, F. Perez, P.Carrie |
| Open space for the engineering office - B.25 | 8 | D. Alvarez, J. Batista, D. Bault, J. Degrange, J. Esala, P.Lenoir, P. Perez, R. Tavares |
| Open space - B.25 | | |
| General (COAS, TECH) | 2 | K. Cichy, M. Molina |
| CMS (User,Tech,Doct, Fell) | 5 | M. Barinoff, M. Dudek, A.Filenius, G.Reales, P. Rose |
| ATLAS (User, PJAS) | 3 | P. Favre, S. Kompogiannis, K.Sliwa |
| ALICE (Staff) | 4 | A. Lafuente, G. Ledey, J.Secouet, E. Laudi |
| Engineering office (Staff) | 1 | F. Boyer |
| Offices - B.70 | | |
| Technology & Physics | 2 | P.Wertelaers, N.Pacifico |
| Detector Constructions | 6 | L. Kottelat, J. Bendotti, V. Akhnazarov, N. Dixon, I. Krasin, G. Lahu, O. Piazza |
| Detector Development | 1 | M. Jaekel |
| Fluidic systems | 1 | L. Robin |
| R&D (Alice, RD51) | 5 | M. Angeletti, L.Teofili, M. Hracek, D. Pfeiffer, J. Samarati |
| FSU - B.155 | 7 | J. Dumollard, C. Cot, C. Landraud, F. Morgadinho, H. Martinati, E. Thabuis, A. Laassiri |

Building 25 is divided into two (2) Open spaces that are linked by the project or section leaders offices.

The first open space houses CERN staff, whereas the second space is dedicated to fellows, users, students and additional CERN staff due to a lack of space in the engineering office. Changing room/Kitchenette in B.25.

Building 166 is centrally located in the complex and houses 6 offices. It allows a very tight link between the Fine Mechanics Workshop/Laboratory and the Engineering office, as well as the project leaders that are geographically close by.

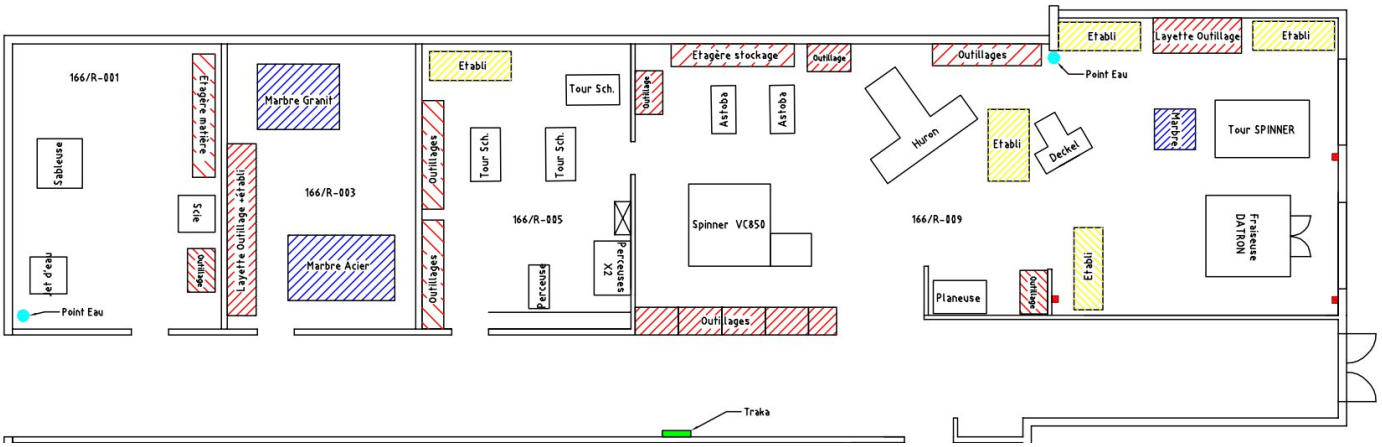
Building 70 is composed of ten (10) separate offices located in a wooden building. The location provides direct access to the mechanical laboratory, Engineering Office and supervisors.

Building 155 is occupied by the FSU and the supervisors of the control workshop. Changing room and kitchenette are also provided for the FSU.

# Fine Mechanics Workshop/Laboratory B.166

| | |
|---|---|
| **Assessment Completed with :** Jérôme Bendotti | **Date :** 3 December 2020 |
| **Location :** 166 / R-001 / R-003 / R-005 / R-009 | **Type :** Workshop - Laboratory |

**Layout Picture :** Area of 279 $m^2$




**Fine Mechanics Workshop/Laboratory pictures**

**Responsible Name : Jérôme Bendotti (EP-DT-CO)**

**Persons Concerned**

| Name | Location | Type | Status |
|---|---|---|---|
| Valery Akhnazarov | 70/R-004 | office | User |
| Jérôme Bendotti | 166/R-026 | office/lab | Staff |
| Neil Dixon | 70/R-005 | office | Staff |
| Luc Kottelat | 166/R-020 | office | Staff |
| Amandine Millet | 20/1-014 | office | Staff |
| Jan Mladek | 70/R-004 | office | User |
| Francisco Perez | 70/R-001 | office | Staff |
| Quentin Piazza | 70/R-007 | office | Staff |

**Description of the facility :**

Pole of expertise : Detector Prototyping Construction / Training of operators for detector building / Transfer of technology to institutes

The Fine Mechanics Workshop/Laboratory 166 is a full service providing machining, development of prototypes and their components and performing the manufacture of complex one-off parts.

Centrally located, the machine operators of laboratory 166 work closely with the engineering office to support upgrade of LHC Experiments and commitments with non-LHC experiments.
In addition, with an extensive experience in the machining of simple to complex parts, they assist and support researchers (Staff, Users, Fellow and students ..) to develop their ideas into complete systems.

The laboratory is divided into 5 areas :

- 166/R-009 & 166/R-005 (190m$^2$):The main part which operates the computer-numerical control (CNC) machines and conventional machines; both types of machines are complementary, and are matched for research and development needs.

- 166/R-003 (39m$^2$): Dedicated for small assembly, Metrology (3D and laser scan) and 3D print room. R-003 currently stores machines that could not be re-installed due to a lack of space.

- 166/R-001 (50 m$^2$): wet room for abrasive water jet cutting machine, saw and storage of raw materials. Additional overhead platform of 14m2 for storage.

- 25/R-002 & 25/R-006 (28m$^2$), 187/R-D06 (25m$^2$): clean room and 3D printers(see assessment).

- Between B.25 & B.102 (15m$^2$): external storage area for raw materials.

Main involvements in Projects:

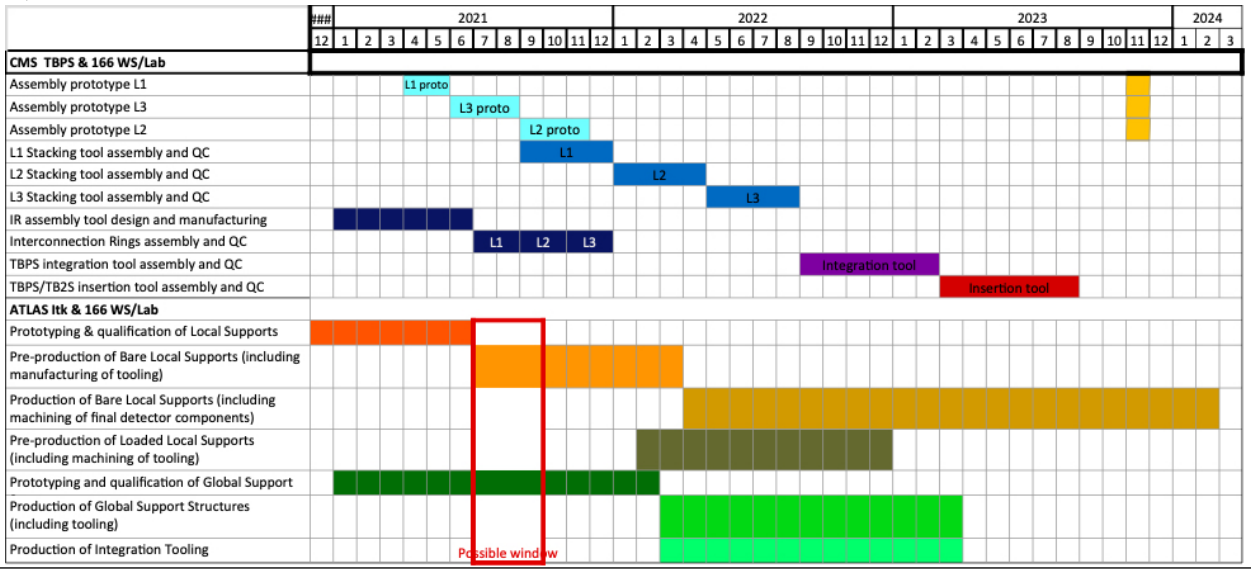
*ATLAS ITk: Pixel Outer Barrel (A. Catinaccio, D.Alvarez Feito)*

The engineering office plays an important role in the ATLAS Phase II Pixel Upgrade on the design prototyping and coordination aspects of the Outer Barrel (OB). The revised mechanical concept of the local supports, the global structures and the overall integration scheme rely heavily on the Fine Mechanics Workshop/Laboratory (B.166), the large mechanics Workshop (B.108) and the orbital welding facility (B.155).

The Fine Mechanics Workshop/Laboratory is involved in the manufacture of precision moulds for the composite lab, gluing tools, machining of carbon composite parts, forming tools.

*CMS 'Tilted' Tracker Barrel with PS modules (A. Onnela, F. Perez Gomez)*

DT plays a central role in the design, development, manufacture of assembly tooling along with the manufacture/cooling of the 90 ring carrier frames of the 'tilted' section of the CMS TBPS (Tracker Barrel with PS modules). This is a contribution fully on CERN for the CMS Phase II upgrade Tracker. (more detailed in assessment B.187).



The mechanical processing implies mainly CNC machines and the full capabilities of the Fine Mechanics Workshop/Laboratory for the manufacture high precision of work pieces.

Any delay in Workshop/Laboratory activities translates one to one in delays to the ATLAS and CMS phase II upgrade schedules.

| Infrastructure | Openings | Facilities |
|---|---|---|
| Floor : Resin<br>Wall: Concrete<br>Ceiling Height : 4,30<br>Ventilation : Yes<br>Heating : Radiator<br>Chilled water system : No<br>Water system : Yes<br>Special Light : Specific frequency range | Windows : 15<br>Glass Doors : 1<br>width : 2m80<br>Sectional Door : No<br>Skydome : 3 | Crane : 2 - Load (t) : 0.5<br>Temperature control : Yes<br>T° : 20<br>Air-conditioning System : 2<br>Hygrometry control : No<br>Class ISO : No Norm : No<br>Waste disposal : metal chips |

**Safety** (EDMS 2448108)

| Domain | | Specific systems / equipment | Existing mitigation measures |
|---|---|---|---|
| Mechanical Safety | ☑ | Compressed air circuit<br>Lifting equipment (hoist) | |
| Cryogenic Safety | ☐ | | |
| Structural Safety | ☑ | Platform for storage (mezzanine R-001)5.0kn/m2 - 30m3 | |
| Electrical Safety | ☑ | | ☑ AUG ☑ AUL ☑ AUE |
| Chemical safety | ☑ | Storage of chemical products | ☑ Flammable liquid storage cabinet |
| Biological Safety | ☐ | | |
| Non-ionising radiation Safety | ☐ | | |
| Ionising radiation safety | ☐ | | |
| Fire Safety | ☑ | | ☑ Extinguisher - Type CO2<br>☑ Skydomes (3) |
| Environment | ☑ | Waste generation | ☑ Metal waste containers (Cu, Al, steel) |
| Workplace | ☑ | Lighting constraints linked to the use of machines<br>Ventilation / extraction | ☑ 1000 Lx |
| Security | ☑ | Access | ☑ TRAKA Box System |

**Evolution / Adaptability :**

The Fine Mechanics Workshop/Laboratory is suffering from a lack of space and would need to be expanded to offer an improve workplace and optimise facilities.

The facilities should meet the following expectations :

- Main workshop / laboratory : An appropriate air-conditioning system for the CNC machines should be provided.

- The integration of the composites workshop currently located in building 153. Composites are very dependent on the 166 laboratory for pre and post processing.

- A reorganization of the assembly and metrology into one area (moving of the granite tables and measuring tools currently located in building 154)and an appropriate lighting installation.

- A wet room complying with the acoustic standards, providing drain connection and an integration of the vapour blaster (presently in building 154).

- A dedicated storage space for raw materials.

These facilities are interlinked and the closeness of the machines need to be maintained.

**Visibility: Student training, Visit, Exhibition/Demonstration**

The laboratory offers training/supervision for technical students, fellows, Users and consultancy visits on detector construction and assembly techniques.

Much effort has been injected in the Fine Mechanics Workshop/Laboratory, as technology evolved, equipment is being updated. This benefits when welcoming outside users and visitors.

The CNC machines are of great interest for their visual aspects, improved safety and operator ergonomy, and they represent new technologies in the field of mechanical engineering.

# Small Assembly area & Clean Room B.25

| | |
|---|---|
| | Date :09.12.2020 |
| Location : 25/R-008 /R-266 /R-006 / R-002 | Type : small assembly / Lab. / Clean room |

**Layout Picture** : Total Area of 44.5 $m^2$


**Responsible Name** : Jérôme Bendotti (EP-DT-CO)

**Persons Concerned**

| Name | Location | Type | Status |
|---|---|---|---|
| Jérôme Bendotti | 166/R-026 | office/lab | Staff |
| Miranda Van Stenis | 3/R-009 | office/lab | Staff |

**Description of the facility:**

Used by various sections in the group, when clean conditions are required.

4 areas are defined :

BAT 25/R-002 (21m2) Lab work small assembly area. Characterisation of composites. Ultra sonic baths. Granit flat top table.
BAT 25/R-008 (1.6m2) and BAT 25/R-266 (2.7m2) Clean room access corridor.
BAT 25/R-006 (7.2m2) Clean Room

R-002 Extractor Hood

R-006 clean room

Transfer of parts from R-006 to R-002

| Infrastructure | Openings | Facilities |
|---|---|---|
| Floor : Glass and plastic floor tiles<br>Wall: Concrete, + glass<br>Ceiling Height : 2.5m<br>Ventilation : Yes extractor and A/C R-002. Controlled air in clean room R-006<br>Heating : Heater<br>Chilled water system :No<br>Water system : Yes<br>Special Light : No<br>Compressed air: R-002<br>Plumbed vacuum system R-002 | Windows:<br>R-002 : 3 windows<br>R-006 : 6 windows<br>Doors :One double door<br>Glass Doors : No<br>Sectional Door : No<br>Skydome : No | Crane : No - Load (t) :<br>Temperature control : in clean room<br>T° : 22<br>Δ(T) :TBA<br>Hygrometry control : No<br>Class ISO : No Norm : TBA<br>Waste disposal : none |

**Safety** (EDMS 2448108)

| Domain | | Specific systems / equipment | Existing mitigation measures |
|---|---|---|---|
| Mechanical Safety | ☑ | Ventilation system (ducts in offices, air conditioning in chemical lab R-002)<br>Clean room/ isolated work area | |
| Cryogenic Safety | ☐ | N/A | |
| Structural Safety | ☐ | | |
| Electrical Safety | ☑ | Emergency lighting, AUL in in flammable lab | ☑ AUG ☑ AUL ☐ AUE |
| Chemical safety | ☑ | Fume cupboard, acid store, positive pressure/sealed work area | ☑ Fume Cupboard (R-002)<br>☑ Chemical (acid) cabinet<br>☑ Clean Room |
| Biological Safety | ☐ | N/A | ☐ |
| Non-ionising radiation Safety | ☐ | N/A | ☐ |
| Ionising radiation safety | ☐ | N/A | ☐ |
| Fire Safety | ☐ | | ☑ Extinguisher - Type CO2<br>☐ Smoke dampers |
| Environment | ☑ | Offices - 500 lux, metalic film window blinds (design office) office areas/chemical lab | ☑ 500 lux (offices)<br>☑ Special window blinds |
| Workplace | ☐ | | ☐ |
| Security | ☑ | | ☑ Restricted access to clean room lab (key) |

**Evolution / Adaptability :**

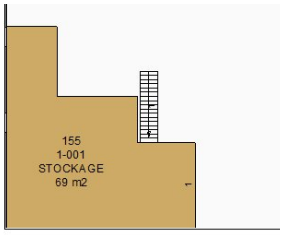
R-006 Used for the assembly and repair of small detectors.
Used by gas detectors
NMX (made for ISS) Lund University
Upgrade for COMPASS GEM detectors
General small modifications and repair for GDD (gas detector group)
NMSNMXR-002 assembly of small detectors, and characterisation of composite materials (use of air extraction system)

# Construction, Upgrade and Prototypes Workshop for Fluidic Systems B.155

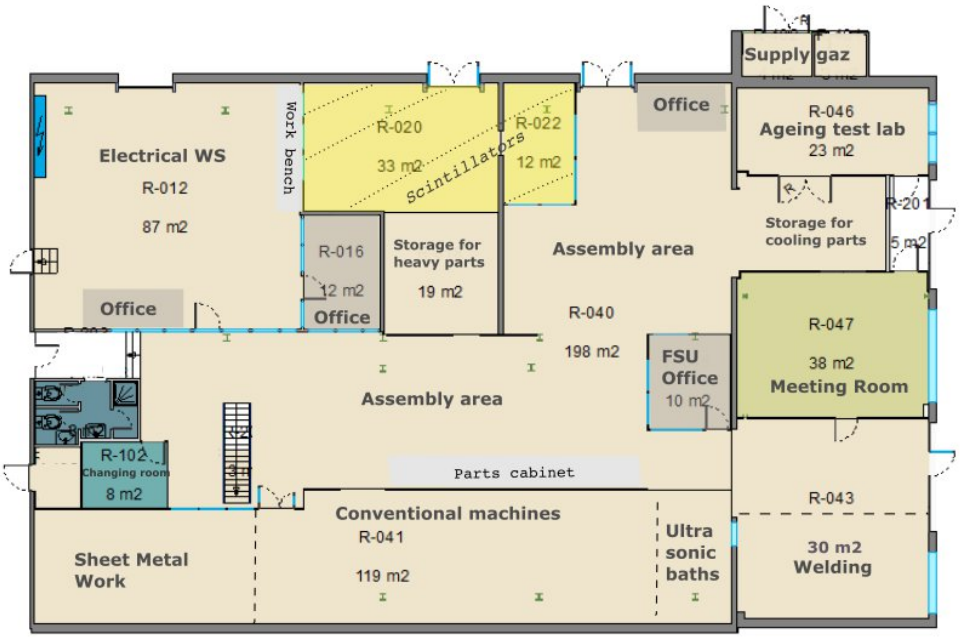
| | |
|---|---|
| **Assessment Completed with** : Patrick Carrie | **Date** : 10 December 2020 |
| **Location** : 155/R-012-016-040-041-043-045-046-047-201-202-401-402-Mezzanine | **Type** : Workshop |

**Layout Picture** : Area of 625 m$^2$

First Floor :




Ground Floor :




B.155/R-040 and R-041


B.155/R-012

B.155/R-040

**Responsible Name : Frédéric MERLET (EP-DT-FS)**

**Persons Involved**

| Name | Location | Type | Presence in facility B.155 | Status |
|---|---|---|---|---|
| Patrick CARRIE | 155/R-016 | Office | 80% | Staff |
| Jonathan DUMOLLARD | 155/R-012 | Office/Lab | 70% | FSU |
| Loris ROBIN | 155/R-012 | Office/Lab | 80% | Staff |
| Cyril COT | 155/R-012 | Office/Lab | 70% | FSU |
| Cédric LANDRAUD | 155/R-041 | Office/Lab | 60% | FSU |
| Franck MORGADINHO | 155/R-043 | Office/Lab | 70% | FSU |
| Hervé MARTINATI | 155/R-041 | Office/Lab | 80% | FSU |
| Eric THABUIS | 155/R-041 | Office/Lab | 70% | FSU |
| Abdelmajid LAASSIRI | 155/R-043 | Office/Lab | 70% | FSU |
| Frédéric MERLET | 21/1-011 | Office | 30% | Staff |
| Michal Zimny | 21/1-011 | Office | 10% | Staff |
| Roberto GUIDA | 21/1-017 | Office | 20% | Staff |
| Béatrice MANDELLI | 21/1-017 | Office | 20% | Staff |
| Andréa D'AURIA | 21/1-023 | Office | 20% | Staff |
| Léonardo NESTI | 21/1-023 | Office | 30% | Staff |
| Kacper KAPUSNIAK | 21/1-027 | Office | 40% | Staff |
| Louis-Philippe DE MENEZES | 21/1-027 | Office | 40% | Staff |
| Fabio BORDON | 21/1-029 | Office | 50% | Staff |
| Mara CORBETTA | 21/1-035 | Office | 20% | Staff |
| Gianluca RIGOLETTI | 21/1-035 | Office | 20% | Staff |
| Demetrio MAGATTI | 21/1-035 | Office | 20% | Staff |

**Description of the facility :**

Construction, Upgrade and Prototypes of all the gas systems and cooling unit of the 4 LHC experiments + the smaller experiments of CERN

- Engineering (drawing and schematics by the people in office BAT 21 & 155.
- Mechanical assembly (machining, installation of the components)
- Piping and welding of stainless steel pipes. (Bending)
- Cabling (Electrical chassis, electrical cupboard, racks,…)
- Functional test of all the elements (Pressure transmitter, analyser,…)
- Leak test with Helium
- Installation on site + test and commissioning of the systems.

The laboratory is divided into 8 areas :

- 155/R-012 & R-016 (99$m^2$): The electrical workshop for the construction and upgrade of fluidic systems; metrology (air conditioning in the room to keep a stable t°.
- 155/R-040 & R-020 (217$m^2$): Dedicated for the assembly. Due to lack of space, we store our racks inside B.187. (gas supply panel)
- 155/R-041 (119$m^2$): Mechanical workshop with milling machine, lathe, bending machine, sheet metal machine.
- 155/R-043 (30$m^2$): Welding area with smoke extraction (gas supply panel) and dedicated power supply.
- 155/R-047 (38$m^2$): Meeting room (air conditioning)
- 155/R-046 (23$m^2$): Laboratory for ageing test; presence of a source ;(fire detection and air conditioning)
- Mezzanine (69$m^2$): Storage area for construction parts
- 155/R-102 (8$m^2$) & R-045 (10m2) : Changing room for the workshop and office (FSU)
- 155/R-401 & R-402 (12$m^2$): Supply gas for bottles

Main involvements in Projects:

- Gas systems of the LHC 4 experiments (ATLAS, CMS, ALICE, LHCb)
- NA-62

- GIF++ (EHN1)
- NA-61
- LINAC 4
- CLOUD
- DEMO CO2 cooling project for ATLAS and CMS : this development is on the critical path for both experiments, for multiple sub-systems. For example, in CMS the Tracker, HGCAL and MIP-timing detector (about 90% of the phase-2 upgrade projects) rely upon the success of the DEMO.
- LHCb VELO & UT cooling systems

| Infrastructure | Openings | Facilities |
|---|---|---|
| Floor : Resin<br>Wall: Concrete<br>Ceiling Height : 5 m<br>Ventilation : Yes<br>Heating : Force air<br>Chilled water system : No<br>Water system : Yes | Windows :<br>Sectional Door : 1 with windows<br>Windows on the top of the building | Crane : 3 (5T, 1T, 0.5T)<br>Extraction : welding smoke<br>Air-conditioning System : Yes (R-012)<br>Hygrometry control : No<br>Class ISO : No Norm : No<br>Waste disposal : metal chips and pieces of tubes |

**Safety** (EDMS 2448108)

| Domain | | Specific systems / equipment | Existing mitigation measures |
|---|---|---|---|
| Mechanical Safety | ☑ | Gantry crane/host 5T<br>Compressed air circuit<br>Temperature controlled in R012 | ☑ Traka box |
| Cryogenic Safety | ☐ | | ☐ ODH ☐ |
| Structural Safety | ☑ | Storage platform | ☐ |
| Electrical Safety | ☑ | | ☑ AUG ☑ AUL ☑ AUE(few equipments) |
| Chemical safety | ☑ | Gas distribution - wall mounted, no visible detection (TBC)<br>External gas point<br>Use of Argon, Azote, CO2, Helium | ☑ Cupboards with Acetone, white spirit, chemical solid<br>☑ Presence of exhaust ventilation systems in R-043<br>☐ Detector - Type … |
| Biological Safety | ☐ | | ☐ |
| Non-ionising radiation Safety | ☐ | | ☐ |
| Ionising radiation safety | ☑ | Fe55 4925RP 3.3 GBq (2018)<br>Fe55 4605RP 1.35 GBq(2018)<br>Fe55 4606RP 1.35 GBq(2018) | |
| Fire Safety | ☑ | | ☑ Extinguisher - Type CO2 |
| Environment | ☑ | ☑ Waste generation | ☑ Metal waste containers |
| Workplace | ☑ | Changing room/locker room | ☑ 750 - 1000 Lx |
| Security | ☑ | | ☑ TRAKA box system |

**Evolution / Adaptability :**

The workshop is suffering from a lack of space and would need to be expanded to offer an improved workplace and optimised facilities.

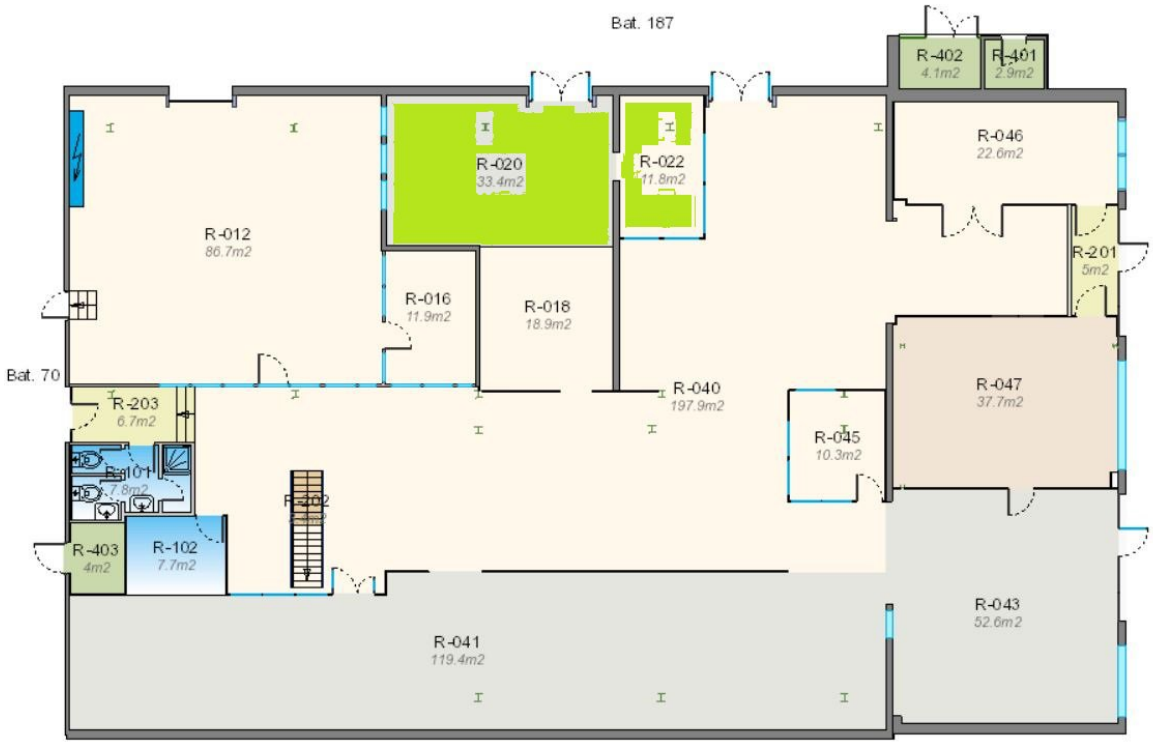
The facilities should meet the following expectations :

- overhead crane for the handling of large parts (min 5T)
- a dedicated space for raw materials and components.
- a dedicated space to make leak test (large volume because of the safety for gas usage)
- a dedicated space for welding (noisy and dusty)
- a dedicated space for FSU (kitchenette area and changing room)

# Scintillator Workshop B.155

| Assessment Completed with : R. Dumps | Date :09.12.2020 |
|---|---|
| Location :B.155/R-020 B.155/R-022 | Type : Workshop |

**Layout Picture** : Total Area of 45.2 m$^2$




**Responsible Name** : Raphael Dumps (EP-DT-CO)

**Persons Concerned**

| Name | Location | Type | Status |
|---|---|---|---|
| Raphael Dumps | B.21/1-003 | Lab/workshop | Staff |

**Description of the facility :**

The Scintillator workshop provides, within the available resources, technical support in building scintillation counters including light guides (fish tail, adiabatic, WLS bars & fibres).

B.155/R-020 (33.4m2) Machining of scintillators
B.155/R-022 (11.8m2) Polishing of scintillators

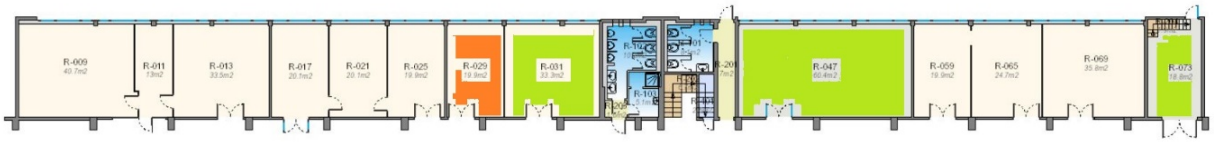
| Infrastructure | Openings | Facilities |
|---|---|---|
| Floor : Paint<br>Wall: Concrete, + aluminium partition<br>Ceiling Height : More than 3m<br>Ventilation : Extractor for polishing area<br>Heating : from 155 main<br>Chilled water system : No<br>Water system : Yes, for polishing<br>Special Light :No | Windows : N/A<br>Doors :One double door<br>Glass Doors : No<br>Sectional Door :No<br>Skydome :No | Crane : No - Load (t) :<br>Temperature control : No<br>T° :<br>$\Delta$(T) :<br>Hygrometry control : No<br>Class ISO : Norm :<br>Waste disposal : none |

**Safety (EDMS 2448108) – Covered by B.155 Safety summary**

| Domain | | Hazards | Existing mitigation measures |
|---|---|---|---|
| Mechanical Safety | ☐ | | ☐ |
| Cryogenic Safety | ☐ | N/A | ☐ ODH ☐ |
| Structural Safety | ☐ | N/A | ☐ |
| Electrical Safety | ☐ | Yes | ☑ AUG ☐ AUL. ☐ AUE |
| Chemical safety | ☐ | N/A | ☐ Detector - Type ……. |
| Biological Safety | ☐ | N/A | ☐ |
| Non-ionising radiation Safety | ☐ | N/A | ☐ |
| Ionising radiation safety | ☐ | N/A | ☐ |
| Fire Safety | ☐ | | ☐ Extinguisher Type …<br>☐ Smoke dampers |
| Environment | ☐ | | ☐ |
| Workplace | ☐ | | ☐ |
| Security | ☐ | | ☐ |

**Evolution / Adaptability :**

Building 21: Ground floor




This Laboratory could be consolidated, to improve efficiency:

21/R-047 (60.4m2) in which the "Deckel" machine from 155/R-20 could be installed. Workshop /scintillators

21/R-031 (33.3m2) current laboratory.

21/R-029 (19.9m2) currently an unused office, but could be returned to a scintillator laboratory, and combined with R-031 once the partition is removed.

21/R-073 (18.8m2) Needs to have the polishing machines installed.

This consolidation frees 33.4 + 11.8 = 45.2 m2 from B.155.

This consolidation gives a total laboratory and workshop space in B.21 of: 60.4+33.3+19.9+18.8 = 132.4 m2.

**Visibility : Student training, Visit, Exhibition/Demonstration**

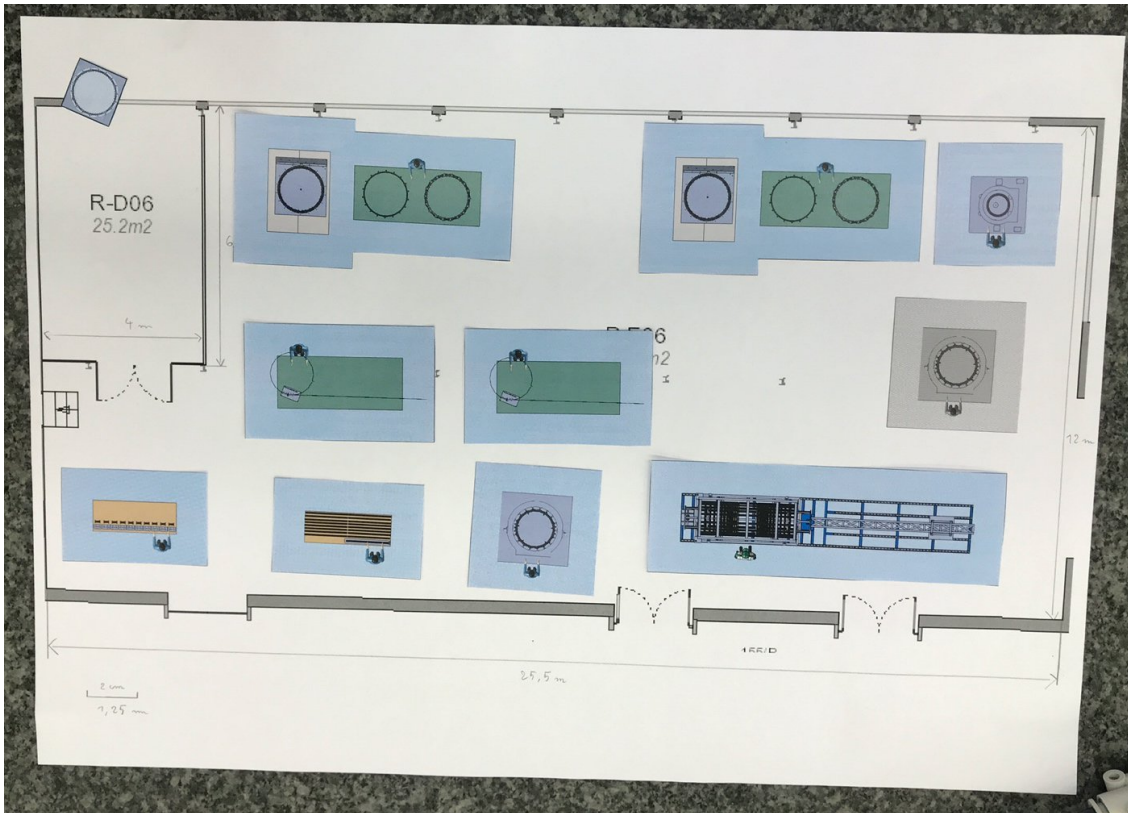
Scintillator parts exhibition, currently in B.187. Remote from the area described above. Fits in one standard cupboard with a transparent front

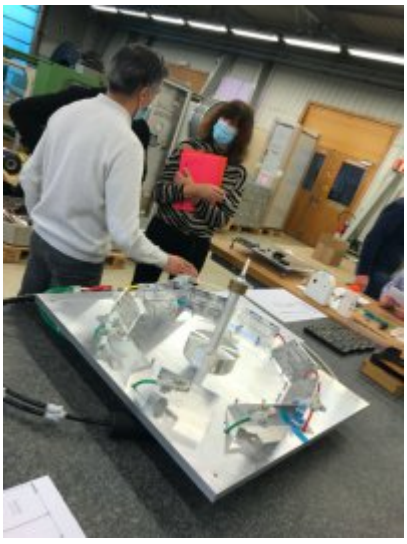
# Modular Assembly area : CMS Tracker TBPS B.187

| | |
|---|---|
| Assessment Completed with : Antti Onnela, Francisco Perez | Date :09.12.2020 |
| Location :BAT 187 | Type : Assembly facility |

**Layout Picture** : Area of 288 $m^2$

Image here shows its projected use (in basic terms) for the future CMS Tracker TBPS mechanical assembly, due to start in Spring 2021, as its current state (including storage and COVID-19 activities) is not representative of its critical future use.



The two photos show a prototype carbon-fibre ring of the TBPS, as well as one of the toolings required for its assembly.

**Responsible Name** : Antti Onnela (EP-DT-CO)

It is a large climate-controlled (+/-1 degree) area, but is deliberately not a clean room, due to the mechanical work necessary (sanding, some grinding etc. of prototype pieces, both of the detector mechanics and assembly tooling). A large fraction of the area is currently used for storage, but a majority of the items (large mockups, some machines) are scheduled for removal in the first months of 2021. A part of the area has also been used extensively – and to excellent effect – by EP-DT during the COVID-19 pandemic, for the fabrication and assembly of face shields. Again, this area will be cleared at the beginning of 2021.

The main activity for the coming years is the assembly of the individual rings of the 2.5m-long, 1.1m-diameter TBPS, together with all of the parts required for the assembly of rings into three concentric layers.

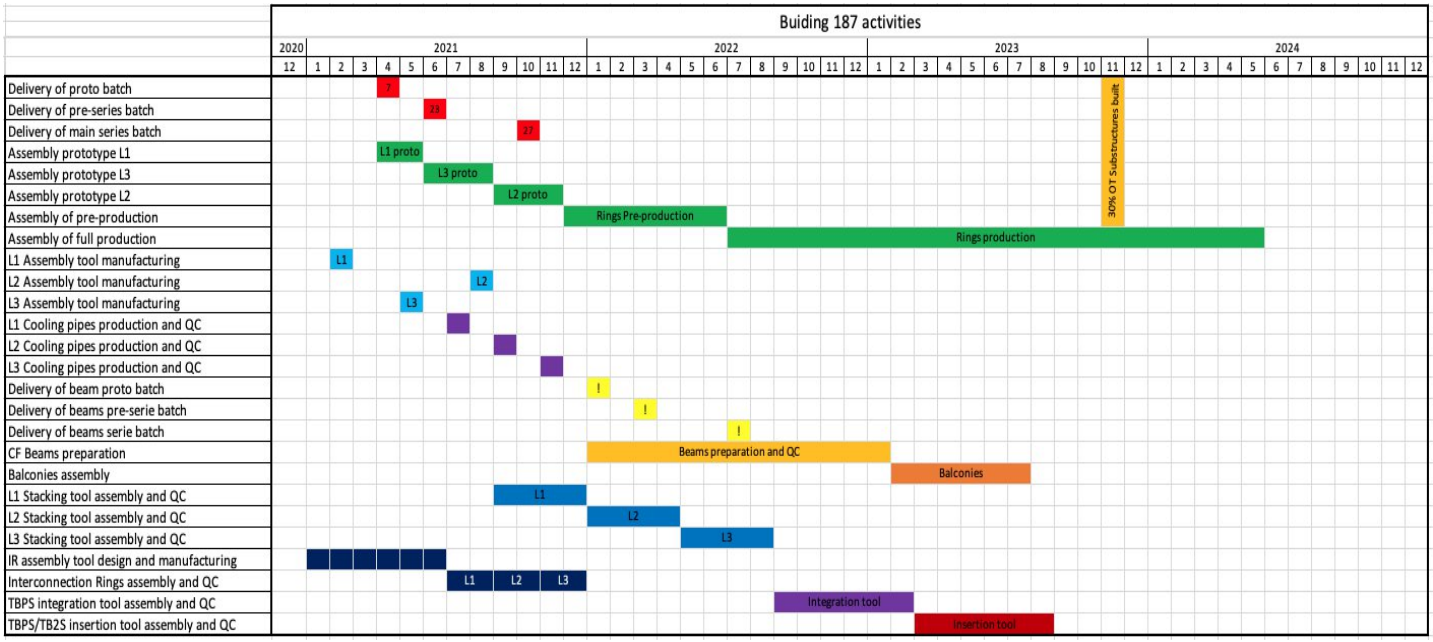
Parts for the carbon-fibre structures that form the rings, and that are used to support the silicon-sensor modules, are fabricated in industry and come to CERN for high-precision gluing assembly.

The tooling used for this assembly is designed and built in the close-by EP-DT mechanical workshops – the proximity is a definite advantage as each set of tooling will need fine-tuning throughout the assembly project, as the tooling is modified in several iterations to match the different detector tilt angles. It should be noted that the production of the tooling, and its use in the assembly, will be performed by the same EP-DT technicians.

The use and curing (which takes ~24 hours at room temperature) of the glues requires a stable temperature to ensure the required high precision by minimizing thermal deformations of the aluminum tooling. Preparation of parts and finishing of assembled rings often require sanding to remove burrs etc., which will be performed here. After the gluing of the carbon-fibre pieces, the cooling tubes (to be produced in industry and bent to required geometry in this facility) will be added to the rings.

Finished rings will be sent to Pisa for addition of the silicon-sensor modules. Then the completed rings are returned to CERN for final assembly into cylinders in building 186 (the Tracker Integration Facility), where subsequent testing also takes place.

The ring assembly should begin in Spring 2021 and will last 3-4 years: the present schedule is for the work to be completed in the middle of 2024. This planning assumes the production of one ring per week. The same timescale is relevant for the carbon-fibre pieces and tools (carbon-fibre beams and balconies, stacking tools, carbon-fibre interconnection rings and final TBPS integration tooling) necessary for the assembly of the rings into cylinders, also produced in this facility. Details are given below:



The annex to this document shows a summary of the tooling and assemblies that will be required to be produced and used in this facility. In total there are 43 varieties of ring-assembly tooling to be manufactured and used in this facility, as well as six types of cylinder-assembly tooling and several other pieces/activities.

The diagram above shows the estimated area for the TBPS assembly stations – including space for personnel to move around the stations. The primary work stations are (from top left to bottom right in the first image):

- Ring Inner Assembly
- Ring Outer Assembly
- Layer Stacking Tool Assembly and/or Ring QC station
- Two stations for Cooling Pipe Bending, Joining and Testing
- Material transit (reception and shipping) area close to the large door
- Cooling Plate Assembly
- Beam Assembly
- Layer Stacking Tool Assembly and Services Installation
- TBPS Layer Integration Tool

Not shown in the image are the needed received & ready part storages, tooling storages and the transport boxes (each of the 90 rings to be produced will require an individual storage/transport box for shipping to Pisa and back to CERN).

Additional side-activities to be done in this facility, and partially by the same technical team as the TBPS, include reception and quality control of carbon-fibre C-profiles for the TB2S sub-detector and preparation of services mockups for the TBPS, TB2S and Outer Tracker of the CMS Tracker Upgrade.

The facility does not require heavy-lifting equipment, nor special services (high-power electrical supplies, gases, chemicals etc.).

It is equipped with a high-power air-conditioning unit, pressure air circuitry and wash basin. Lighting is also important: the combination of a large amount of natural light supplemented by fluorescent lighting is excellent for the fine work and rather long hours. The temperature is stable at 21+/-1 degree C at all times of year. This temperature stability and the physical dimensions of the room, coupled with the proximity to the EP-DT workshops (and the CMS Tracker Engineers), are the main conditions needed for this facility.

It currently has a couple of stable marble assembly benches, and is foreseen to be equipped with a couple more in the coming months. Part of the equipment used in the TBPS project (notably high-precision 3D measurement equipment) is shared with DT’s Atlas Tracker upgrade work that happens in the neighboring building 154. Fast and efficient transfer of that equipment is essential for both projects.

In terms of the physical dimensions of the facility, the image above shows a draft plan of the assembly area. It is clear that the area of 288m2 is necessary for the preparation and assembly areas. Not shown in the diagram are the necessary storage facilities for components – carbon-fibre pieces and cooling tubes etc.

The engineers and technicians using the facility (full or part-time during the Tracker production phase) are EP-DT staff, with one or two FSUs, as well as fellows and students from EP-DT, EP-CMX and CMS Tracker. In total about 20 persons.

To be noted that there is a small inner building – 187-R-D06 – that has been used as a dark-room for detector testing work in the past, and is currently used for 3D printing and some other laboratory work. The exact use of this room is still to be defined for the future. It could be dismantled, leaving more space for the TBPS assembly work, if appropriate.

| Infrastructure | Openings | Facilities |
|---|---|---|
| Floor : Lino tiles<br>Wall: Concrete<br>Ceiling Height : ~4m<br>Ventilation : Yes<br>Heating : climate control<br>Chilled water system : No<br>Water system : wash basin<br>Special Light :No, but good mix of natural and artificial light | Windows : 16 + 2 at height<br>Doors : 2<br>Glass Doors : No<br>Sectional Door :Yes<br>Skydome :No | Crane : Yes two, but rarely needed<br>Load (t) : 0,5<br>Temperature control: Yes<br>T° : 21<br>Δ(T) : 1<br>Hygrometry control : No<br>Class ISO: No Norm:No<br>Waste disposal : nothing special |

**Safety** (EDMS 2448108)

| Domain | | Specific systems / equipment | Existing mitigation measures |
|---|---|---|---|
| Mechanical Safety | ☑ | Compressed Air<br>Climate-controlled area (+/-1 degree)<br>Lifting beam + manual holst | ☐ |
| Cryogenic Safety | ☐ | | ☐ ODH ☐ |
| Structural Safety | ☑ | Roof storage area (no access, materials only) | ☐ |
| Electrical Safety | ☑ | Accessile isolators on switchboards (coupure d'urgence). emergencyy lighting | ☑ AUG ☑ AUL ☑ AUE |
| Chemical safety | ☑ | | ☑ Flammable liquid storage cabinet |
| Biological Safety | ☐ | | ☐ |
| Non-ionising radiation Safety | ☐ | | ☐ |
| Ionising radiation safety | ☐ | | ☐ |
| Fire Safety | ☑ | | ☑ Extinguisher Type CO2 |
| Environment | ☑ | | ☑ 1000 Lx |
| Workplace | ☑ | Old ATEX zone (R-006), seems no longer ATEX but still equipped | ☐ |
| Security | ☐ | | ☐ |

**Evolution / Adaptability :**

As with all large-surface-area climate-controlled areas, building 187's use evolves with time and project. The next several years are foreseen for the critical Tracker mechanical assembly. After that, it is likely that it could be used for EP R&D prototyping activities, again benefiting from the proximity to engineers, technicians and workshops. If necessary, the high ceiling could facilitate an internal ISO 8 or 7 clean room – of course this would require significant investment

**Visibility : Student training, Visit, Exhibition/Demonstration**

Given that it is not a clean room, but the construction work foreseen will be highly photogenic and interesting for visitors, it could be envisaged to have a visitor's path for a sub-section of the facility.

# Summary of Findings

The buildings reviewed are:

| | | |
|---|---|---|
| 187 | built 1963 (Age: 57) | footprint 355 m² (Antti Onnella) |
| 70 | built 1955 (Age: 65) | footprint 209 m² (office space) |
| 155 | built 1955 (Age: 65) | footprint 714 m² (Frederic Merlet) |
| 166 | built 1965 (Age: 55) | footprint 449 m² (Jérôme Bendotti) |
| 25 | built 1975 (Age: 45) | footprint 438 m² (office space) |

All of the buildings were visited with local supervisor or representative present.

The following information present a selection of key findings from the assessed facilities.

***Offices and open spaces***

- The geographic proximity between the fellows, students and project/ section leaders is an undeniable asset, as well as the proximity to the engineering office and the Fine Mechanics Workshop and Assembly Laboratory.

***Fine Mechanics Workshop/Laboratory B.166***

- Four (4) separate spaces in which the machine tools of EP/DT are located. A wide variety of complementary machines from conventional to the latest CNC technology, dedicated to prototype, complex parts and tool making.
- Very tight link with the Engineering office, as well as the project leaders.
- Clear lack of space, as the modern workshop has outgrown the antique buildings.
- Strong involvement in LHC phase II upgrades; some are on the critical path.
- Added value of being able to train and transfer technology to users from outside institutes and provide hands-on experience for technical students.

***Small Assembly area & Clean Room B.25***

- Used by various sections when clean conditions are required for repairing small detectors.

***Construction, Upgrade and Prototypes Workshop for Fluidic Systems B.155***

- Present infrastructure to be replicated : stable air-conditioning, an overhead crane of at least 5T, a high ceiling for pipe bending and proximity of conventional machines, the space dedicated to welding is currently too small. B.155/R-012 is temperature controlled for leak test purposes. BAT 155/R-046 contains a radioactive source and active gas systems for ageing tests.

***Scintillator Workshop B.155***

- Workshop to be consolidated, actually split into two buildings (building 155 & 21)

***Modular Assembly area : CMS Tracker TBPS B.187***

- Has served EP/DT in many varied ways. From being the scintillator workshop and evolving into a prototype assembly area, with a future that has a critical role in the Phase II upgrade of CMS.
- Area is climate controlled +- 1 degree C, open space and modular.

- Currently essential and fully allocated until 2024 for the CMS experiment tracker mechanics assembly.

***General comment*** :

- These facilities should remain on the CERN Swiss territory because of the FSU contract.
- We have observed that the infrastructure has a lack of space, the planning and the projects may suffer from this situation. An evolution towards an improved workplace with optimised facilities would be in the interest of all.

# Annex I : Matrix of activities and buildings

| | 3 | 108 | 164 | 25 | 155 | 166 | 187 | 153 | 154 | 14 | 157 | 867 | 162 | 167 | 20 | 21 | 168 | 107 | 28 | 186 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mechanical WS | | ATLAS LHCb | WS for Magnet under renov. | | Gas & Cooling System for LHC Ex, CLOUD T2K etc. | ATLAS & CMS Upgr. Office Space | | | | | | | ALICE | | | | | | | |
| Gas system | | | | | LHC Ex CLOUD FT exp T2K | | | | | | | | | | R&D (CEPS) | Office Space | | | | |
| Composite Lab | | | | Office Space | | | | ATLAS CMS ALICE Upgr. | | | | | | | | | | | | |
| Cooling systems | | | | | | | | DEMO project ATLAS CMS Upgr. | | | | | | | Office Space | Office Space | LHC Ex Cool. control systems | | | |
| DSF BondLab QartLab | | | | | | | | | | | | | | | | | | | | LHC Ex EP-ESE R&D |
| Engineering office | | | | LHC Ex NA62 Neutrino Platform | | | | | | | | | | | | | | | | |
| Magnet M&O | | | | | | | | | | | | | | | Office Space | | LHC Ex 20 | | | |
| DAQ DCS Support Cabling WS | | | | | | | | | | | | | | | Office Space | | LHC Ex FT Exp Neutrino Prog. | | | |

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MPT Workshop | | | | | | | | | | | | | | | | | | | MPGDs for the Part. Phys, PCBS | | |
| B-Field measure ments. | | | LHC Ex MPD Dubna sPHENIX | | | | | | | | | | | | | | | LHC Ex MPD Dubna sPHENIX | | | |
| Irrad .Facilities | | | | | | | | | | LHC Ex and other users | LHC Ex and other users | LHC Ex GIF ++ | | | | | | | | | |
| Thin film & Glas lab | LHCb RICH, users (e.g BE Dep | LHCb RICH | | | | | | | | | | | | | | | | | | | |
| Métrologie 3D | | | | | | LHC Ex | | | LHC Ex | | | | | | | | | | | | |
| Detector assembly WS | | | | | | | CMS | | ATLAS | | | | | ALICE | | | | | | | EP/DT for final Integr. |
| Sintillator WS & lab | | | | | LHC Ex incl. FASER, other users | | | | | | | | | | | LHC Ex incl. FASER, other users | | | | | |
| Gas Detector Dev. | | | | | | | | | RD51 | | | | | | | | | | | | |
| Solid State Detector | | | | | | | | | | | | | | | | | | | RD50 | RD50 | |

# AnnExp II : List of machines - Fine Mechanics Workshop / Laboratory 166

| Type | Serial N. CERN | Date of first use | Dimensions lxLxH | Workspace lxL | Weight Kg | Power Supply (Tri / Mono) | Amperage | Additional Service (compressed air, demineralized water,..) | Frequency of use (currently) | Exppected usage (coming years) | Noise level (db) | Other characteristics | Fixing Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***DATRON M10 PRO*** | MFHX 52-465 | 2017 | 2m x 2m x 2,4m | 4m x 5m | 2000 | Triphase | 16A | compressed air | Full year | Full year | 74.5 | Milling by Ethanol | Not Fixed |
| ***SPINNER VC850*** | installation dec.2020 | 2020 | 2m x 2m x 2,5m | 5m x 4m | 4500 | Triphase | 16A | compressed air / water | janv..21 | Full year | coming soon | | Not Fixed |
| ***SPINNER TC400*** | MFHX 52-388 | 2008 | 2,3m x 1,6m x 2,3m | 4m x 3,4m | 3000 | Triphase | 32A | compressed air / water | Full year | Full year | 73.5 | | Not Fixed |
| ***DECKEL FP2*** | MFHX 52-121 | 1990 | 1,5m x 1,3m x 2m | 2,5m x 2,4m | 1000 | Triphase | 16A | compressed air / water | Full year | Full year | 88.5 | | Anchored in Concrete |
| ***HURON MU5*** | MFHX 52-423 | 1960 | 3m x 2,5m x 2,1m | 4,5m x 4m | 4000 | Triphase | 32A/16A | compressed air / water | Full year | Full year | 87.5 | | Anchored in Concrete |
| ***ASTOBA MEYER*** | MFHX 52-117 | 1960 | 0,6m x 1,3m x 1,5m | 2,2m x 2,5m | 200 | Triphase | 16A | compressed air | Full year | Full year | 79 | | Anchored in Concrete |
| ***ASTOBA MEYER*** | MFHX 52-108 | 1960 | 0,6m x 1,3m x 1,5m | 2,2m x 2,5m | 200 | Triphase | 16A | compressed air | Full year | Full year | 79 | | Anchored in Concrete |
| ***SCHAUBLIN 102-NVM*** | MFHX 5-155 | <1990 | 1,5m x 0,9m x 1,5m | 2,3m x 1,6m | 500 | Triphase | 16A | compressed air | Full year | Full year | 74.5 | | Anchored in Concrete |
| ***SCHAUBLIN 102-80*** | MFHX 51-164 | <1990 | 1,5m x 0,9m x 1,5m | 2,3m x 1,6m | 500 | Triphase | 16A | compressed air | Full year | Full year | 74.5 | | Anchored in Concrete |
| ***SCHAUBLIN 102-80*** | MFHX 51-095 | <1990 | 1,5m x 0,9m x 1,5m | 2,3m x 1,6m | 500 | Triphase | 16A | compressed air | Full year | Full year | 74.5 | | Anchored in Concrete |
| ***2 PERCEUSES ACIERA*** | MFHX 54-168/144 | <1990 | 1,4m x 1m x 1,8m | 2,6m x 2m | 150 | Triphase | 16A | compressed air | Full year | Full year | 68.5 | | Not Fixed |
| ***PERCEUSES*** | MFHX 49- | <1990 | 0,5m x | 1,5m x | 150 | Triphase | 16A | compressed | Full | Full | coming | | Not Fixed |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ***ACIERA*** | 410 | | 1,10m x 1,7m | 1,8m | | | | air | year | year | soon | | |
| ***RECTIFIEUSE LIP*** | MFHX 50-013 | <1990 | 1,2m x 1m x 1,6m | 2,2m x 2m | 250 | Triphase | 16A | compressed air / water | 3 weeks | 3 weeks | 72 | | Not Fixed |
| ***2 AFFUTEUSES OFFMAN*** | MFHX 54-146/014 | <1991 | 0,3m x 0,3m x 0,3m | 0,5m x 0,5m | 20 | Triphase | 16A | no | Full year | Full year | Portable machine noise | | Not Fixed |
| ***AFFUTEUSE MEGA POINT*** | MFHX 50-030 | 2008 | 0,5m x 0,4m x 0,5m | 0,8m x 0,8m | 20 | Triphase | 16A | no | Full year | Full year | Portable machine noise | | Not Fixed |
| ***TOURETS MEULE IFANGER*** | MFHX 53-031 | 1972 | 0,6m x 0,4m x 1,2m | 1m x 1m | 50 | Triphase | 16A | no | Full year | Full year | Portable machine noise | | Not Fixed |
| ***TOURETS MEULE MAPE*** | MFHX 53-062 | 1970 | 0,6m x 0,4m x 1,2m | 1m x 1m | 50 | Triphase | 16A | no | Full year | Full year | Portable machine noise | | Not Fixed |
| ***DECOUPE JET D'EAU*** | MFHX 62-012 | 2018 | 1.0m x 1.2m x 1,9m | 2m x 2m | 250 | Triphase | 30A | compressed air / water | Full year | Full year | less 80 | | Not Fixed |
| ***SABLEUSE HUMIDE*** | MFHX ?? | 2019 | 1.2m x 1.1m x 1m | 2m x 2m | 200 | Triphase | 30A | compressed air / water | Full year | Full year | 75 | | Not Fixed |
| ***MARBRE GRANIT*** | NO | 1970 | 1m x 1m x 1.5m | 2m x 2m | 450 | | | | Full year | Full year | | | Not Fixed |
| ***MARBRE GRANIT*** | NO | 1970 | 2m x 1.6m x 0.9m | 3m x 2.6m | 800 | | | | Full year | Full year | | | Not Fixed |
| ***MARBRE ACIER*** | NO | 1970 | 2.6m x 1.6m x 0.9m | 3.6m x 2.6m | 3000 | | | | Full year | Full year | | | Not Fixed |
| ***STOCKAGE MATIERE PLATEFORME*** | NO | 1970 | 6.5m x 2.2m x 2m | | | | | | Full year | Full year | | | Not Fixed |
| ***STOCKAGE MATIERE INSIDE*** | NO | 1971 | 3m x 0.6m x 1.3m | | | | | | Full year | Full year | | | Not Fixed |
| ***STOCKAGE MATIERE OUTSIDE*** | NO | 2018 | 4.7m x 2m x 2.3m | | | | | | Full year | Full year | | | Not Fixed |

| | | | | |
|---|---|---|---|---|
| Numeric command | Conventional command | Manual command | Zone Humide | Marbres |
| Stokages Matières | | | | |

# Annex III : List of machines - Workshop for Fluidic Systems B.155

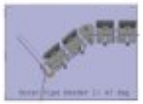
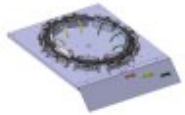
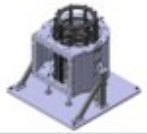
| Serial N. CERN | Type | Dimension/ Workspace | Location | Weight | Power supply | Amperage |
|---|---|---|---|---|---|---|
| MFHX38-355 | PLIEUSE | | 155/R041 | | | |
| MFHX51-168 | TOUR Weiler | | 155/R041 | | | |
| MFHX52-077 | FRAISEUSE | | 155/R041 | | | |
| MFHX53-007 | TOURET A MEULER | | 155/R041 | | | |
| MFHX54-395 | PERCEUSE | | 155/R041 | | | |
| MFHX58-025 | CISAILLE | | 155/R041 | | | |
| MFHX59-244 | SCIE A RUBAN | | 155/R041 | | | |
| MFHX59-295 | SCIE A RUBAN | | 155/R-041 | | | |
| MFHX66-236 | POSITIONNEUR | | 155/R-041 | | | |
| MFHX35-011 | TOURET A BANDE Mape | | 155/R-041 | | | |
| MFHX52-096 | TOUR MEYER & BURGER AG | | 155/R-041 | | | |
| MFHX51-196 | TOUR SCHAUBLIN | | 155/R-041 | | | |
| MFHX60-023 | SCIE KASTO | | 155/R-041 | | | |
| MFHX41-004 | Tubo Bend | Ceiling Height ≈ 5m | 155/R-041 | | | |
| MFHX54-399 | PERCEUSE - FRAISEUSE FEHLMANN | | 155/R-041 | | | |
| 38-352 | Plieuse sur pied JORG | | 155/R-041 | | | |
| 43-217 | Cisaille d'angle JORG | | 155/R-041 | | | |
| 62-004 | CC120 AXXAIR coupe tube | | 155/R-041 | | | |
| 54-053 | Perceuse MFHX | | 155/R-041 | | | |
| | MACHINE POUR SOUDURE ORBITAL | | 155/R-040 | | 220 V | 16 A |
| | MACHINE POUR SOUDURE ORBITAL | | 155/R-040 | | 220 V | 16 A |
| | MACHINE POUR SOUDURE ORBITAL | | 155/R-040 | | 220 V | 16 A |
| | POSTE A SOUDER MANUEL | | 155/R-040 | | 220 V | 16 A |
| | POSTE A SOUDER MANUEL | | 155/R-043 | | 380 V | 32 A |
| | POSTE A SOUDER MANUEL | | 155/R-043 | | 380 V | 32 A |

# Annex IV : List of machines - Scintillators Workshop B.155

| Type | Serial N. | Date of first use | Dimensions | Work space | Weight | Power Supply (Tri / Mono) | Amperage | Additional Service (compressed air, demineralized water,..) | Frequency of use (currently) | Expected usage (coming years) | Noise level (db) | Other characteristics | Fixing Method |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **POLISSEUSE** | MFHX36-014 | | | | | | | | | YES | | | BOLTED TO FLOOR |
| **EXTRACTEUR POUR POLISSEUSE** | | | | | | | | | | YES | | | BOLTED TO FLOOR |
| **FRAISEUSE** | MFHX52-064 | | | | | | | | | NO | | ASTOBA | |
| **PERCEUSE** | MFHX54-260 | | | | | | | | | NO | | ACIERA | BOLTED TO BENCH |
| **FRAISEUSE** | MFHX52-327 | | | | | | | | | YES | | DECKEL | |
| **TOUR** | MFHX51-156 | | | | | | | | | NO | | WEILER | |

# Annex V : list of toolings etc. to produce for CMS Tracker TBPS

**Tilted TBPS Manufacturing and Assembly Tooling**

| Description | Quantity | Comments | Design |
|---|---|---|---|
| Cooling Plate Assembly | **8** | 1 per Ring type |  |
| Inner Cooling Pipe Bending | **8** | 1 per Ring Type |  |
| Outer Cooling Pipe Bending | **8** | 1 per Ring Type |  |
| Ring Inner Assembly | **3** (with 8 variants) | 1 per Layer |  |
| Ring Outer Assembly | **3** (with 8 variants) | 1 per Layer |  |
| Beam Assembly | **3** | 1 per Layer |  |
| Tilted section Stacking Assembly | **6** | 2 per Layer (Z+ and Z-) |  |
| TBPS Layer Assembly | **1** | |  |
| Ring Carrier Frame | **90** | 30 per Layer |  |

# Annex VI : List of offices / open space occupants

***Building 25 :*** Engineering office

| Room | (m2) | Prs | Pct | Name | Stat | Org. Unit | Experiment(s) |
|---|---|---|---|---|---|---|---|
| R-020 | 21 | 1 | 100 | CATINACCIO ANDREA | STAF | EP-DT-EO | ATLAS,NA62 |
| R-028 | 90 | 8 | 100 | ALVAREZ FEITO DIEGO | STAF | EP-DT-EO | ATLAS |
| | | | 100 | BATISTA LOPES JOAO CARLO | STAF | EP-DT-EO | LHCb, CMS |
| | | | 100 | BAULT CHRISTOPHE DANIEL | STAF | EP-DT-EO | ATLAS |
| | | | 100 | DEGRANGE JORDAN | STAF | EP-DT-EO | NA62, ATLAS |
| | | | 100 | ESALA JAAKKO JOHANNES | FELL | EP-DT-EO | ATLAS Neutrinos |
| | | | 100 | LENOIR PHILIPPE | STAF | EP-DT-EO | CMS |
| | | | 100 | PEREZ ALEXANDRE PASCAL | STAF | EP-DT-EO | ATLAS CMS |
| | | | | TAVARES REGO RICARDO | FELL | EP-DT-EO | ATLAS CMS |

Open space

| Room | (m2) | Prs | Pct | Name | Stat | Org. Unit | Experiment(s) |
|---|---|---|---|---|---|---|---|
| R-004 | 123 | 14 | 100 | BARINOFF MIKKO TAPANI | TECH | EP-DT-CO | CMS |
| | | | 100 | BOYER FRANCOIS | STAF | EP-DT-EO | Composite Lab responsible ATLAS, CMS… |
| | | | 100 | CICHY KAMIL NORBERT | COAS | EP-DT | PDM-PLM,3D orienting,CAD, support |
| | | | 100 | DUDEK MACIEJ | TECH | EP-DT-CO | CMS |
| | | | 100 | FAVRE PHILIPPE JOHN | USER | EP-UAT | ATLAS |
| | | | 100 | FILENIUS AXEL JAN WALDEM | USER | EP-UCM | CMS |
| | | | 100 | KOMPOGIANNIS SPYRIDON | PJAS | EP-ADE-TK | ATLAS |
| | | | 100 | LAFUENTE MAZUECOS ANTONI | STAF | EP-AIO | ALICE |
| | | | 100 | LEDEY GAEL | STAF | EP-AIO | ALICE |
| | | | 100 | MOLINA GONZALEZ MARIA SO | TECH | EP-DT-EO | EP R&D |
| | | | 100 | REALES GUTIERREZ GUILLER | DOCT | EP-CMX-DA | CMS |
| | | | 100 | ROSE PIERRE | FELL | EP-DT-CO | CMS |
| | | | 100 | SECOUET PASCAL JEAN | STAF | EP-AIO | ALICE |
| | | | 100 | SLIWA KRZYSZTOF | PJAS | EP-DT-EO | ATLAS |

Offices

| Room | (m2) | Prs | Pct | Name | Stat | Org. Unit | Experiment(s) |
|---|---|---|---|---|---|---|---|
| R-014 | 22 | 2 | 100 | GARGIULO CORRADO | STAF | EP-DT-EO | ALICE Leader AMS |
| | | | 100 | LAUDI ELISA | STAF | EP-DT-EO | ALICE AMS |
| R-018 | 20 | 1 | 100 | WERTELAERS PIET | STAF | EP-DT-TP | SHIP, NA62 |

***Building 166 :*** Offices

| Room | (m2) | Prs | Pct | Name | Stat | Org. Unit | Experiment(s) |
|---|---|---|---|---|---|---|---|
| R-004 | 13.6 | 1 | 100 | ONNELA ANTTI TERO OLAVI | STAF | EP-DT-CO | Section Leader CMS,PS215, Cloud |
| R-008 | 13.8 | 1 | 100 | DANIELSSON HANS OLOF | STAF | EP-DT-EF | Section Leader, ATLAS,NA62 |
| R-010 | 13.8 | 6 | 100 | WEDLAKE VERONIQUE | STAF | EP-AGS-SE | Group secretary |
| R-014 | 18.6 | 1 | 100 | SCHMIDT BURKHARD | STAF | EP-DT | Group Leader, LHCB |
| R-020 | 18.6 | 1 | 100 | KOTTELAT LUC-JOSEPH | STAF | EP-DT-CO | ATLAS machine laboratory |
| R-026 | 18.4 | 1 | 100 | BENDOTTI JEROME | STAF | EP-DT-CO | ATLAS, CMS |

***Building 70 :*** Offices

| Room | (m2) | Prs | Pct | Name | Stat | Org. Unit | Experiment(s) |
|---|---|---|---|---|---|---|---|
| R-001 | 14.8 | 1 | 100 | PEREZ GOMEZ FRANCISCO | STAF | EP-DT-CO | CMS, ATLAS,NA62 |
| R-002 | 15.5 | 1 | 100 | JAEKEL MARTIN RICHARD | STAF | EP-DT-DD | ATLAS, CMS, GIF++ |
| R-003 | 15.5 | 2 | 10 | BRESKIN AMOS | USER | EP-URD | RD51 |
| | | | 100 | ROPELEWSKI LESZEK | STAF | EP-DT-DD | GAS DETECTORS Development RD51 |
| R-004 | 15.5 | 1 | 100 | AKHNAZAROV VALERY | USER | EP-UAT | ATLAS |
| R-005 | 15.5 | 1 | 100 | DIXON NEIL DAVID | STAF | EP-DT-CO | ATLAS |
| R-006 | 15.5 | 1 | 100 | LAHU GREGORY | STAF | EP-DT-CO | ALICE |
| R-007 | 15.5 | 2 | 100 | ANGELETTI MASSIMO | DOCT | EP-DT-EO | ALICE PhD R&D |
| | | | 100 | PIAZZA QUENTIN OLIVIER | FELL | EP-DT-CO | ATLAS CMS |
| R-008 | 15.5 | 2 | 100 | PACIFICO NICOLA | STAF | EP-DT-TP | ATLAS, Magnetic measurements, Irradiation |
| | | | 100 | TEOFILI LORENZO | FELL | EP-DT-EO | R and D |
| R-009 | 15.5 | 1 | 100 | RIEDLER PETRA | STAF | EP-DT-DD | Section Leader, ATLAS |
| R-010 | 15.8 | 5 | 10 | DOLENC KITTELMANN IRENA | USER | EP-URD | RD51 |
| | | | 100 | HRACEK MAREK | USER | EP-URD | RD51 |
| | | | 100 | PFEIFFER DOROTHEA | USER | EP-URD | RD51 |
| | | | 100 | SAMARATI JEROME | USER | EP-URD | RD51 |
| | | | 15 | TAUREG HANS | USER | EP-URD | RD51 |

***Building 155 :*** Offices

| Room | (m2) | Prs | Pct | Nom Prenom | Stat | Org. Unit | Experiment (s) |
|---|---|---|---|---|---|---|---|
| R-012 | 87 | 3 | 100 | ROBIN LORIS | STAF | EP-DT-FS | Gas & cooling systems service |
| | | | 100 | COT CYRIL | ENTC | EP-DT-FS | Gas & cooling systems service |
| | | | 100 | DUMOLLARD JONATHAN | ENTC | EP-DT-FS | Gas & cooling systems service |
| R-016 | 12 | 1 | 100 | CARRIE PATRICK | STAF | EP-DT-FS | Gas & cooling systems service |
| R-040 | 119 | 3 | 100 | THABUIS ERIC | ENTC | EP-DT-FS | Gas & cooling systems service |
| | | | 100 | MORGADINHO FRANCK | ENTC | EP-DT-FS | Gas & cooling systems service |
| | | | 100 | LAASSIRI ABDELMAJID | ENTC | EP-DT-FS | Gas & cooling systems service |
| R-045 | 10 | 2 | 100 | LANDRAUD CEDRIC | ENTC | EP-DT-FS | Gas & cooling systems service |
| | | | 100 | MARTINATI HERVE | ENTC | EP-DT-FS | Gas & cooling systems service |