# WP8 – Improvement and equipment of irradiation beam lines

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# WP8 – Task overview

- WP8 – tasks and task leaders

| | | | |
|---|---|---|---|
| **8.1.** | **Coordination and Communication** | Co-leader: **Giovanni Mazzitelli (INFN LNF)**<br>**Michael Moll (CERN)** | **(gm)**<br>**(mm)** |
| **8.2.** | **Test beams infrastructure at CERN and Frascati**<br>*8.2.1. CERN*<br>*8.2.2. Frascati* | <br>Leader: **Ilias Efthymiopoulos (CERN)**<br>Leader: **Giovanni Mazitelli (INFN-LNF)** | <br>**(gm)**<br>**(gm)** |
| **8.3.** | **Upgrade of PS proton and neutron irradiation facilities at CERN**<br>*8.3.1. Improvement of irradiation facilities and evaluation of upgrade proposals*<br>*8.3.2. Common infrastructure for the facilities* | Leader: **Michael Moll (CERN)** | **(mm)** |
| **8.4.** | **Qualification of components and common database**<br>*8.4.1. Review existing data and experience from LHC, define test program*<br>*8.4.2. Define test procedures and conduct tests on selected components*<br>*8.4.3. Set-up and publish a WEB database compiling the information above* | Leader: **Simon Canfer (STFC)** | **(mm)** |
| **8.5.** | **General infrastructure for test beam and irradiation lines**<br>*8.5.1.* Commission and operate beam tracking telescope<br>*8.5.2. TASD and MIND*<br>*8.5.3 .GIF++ user infrastructure* | <br>Leader: **Ingrid Gregor (DESY)**<br>Leader: **Paul Soler (STFC)**<br>Leader: **Davide Boscherini (INFN Bologna)** | <br>**(gm)**<br>**(gm)**<br>**(mm)** |
| **8.6.** | **Coordination of combined beam tests and common DAQ**<br>*8.6.1.* Common test beam experiments at CERN and DESY<br>*8.6.2. Common DAQ* | <br>Leader: **Ties Behnke (DESY)**<br>Leader: **David Cussans (Uni Bristol)** | <br>**(mm)**<br>**(WP9)** |

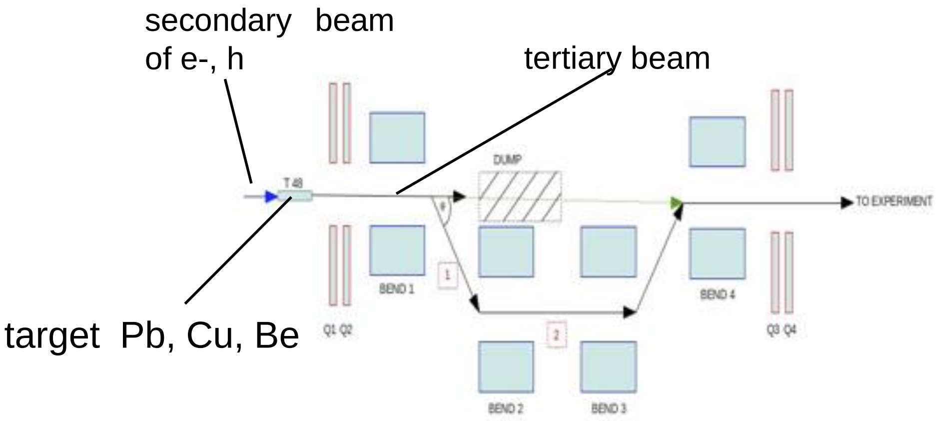
Test beams infrastructure at CERN and Frascati

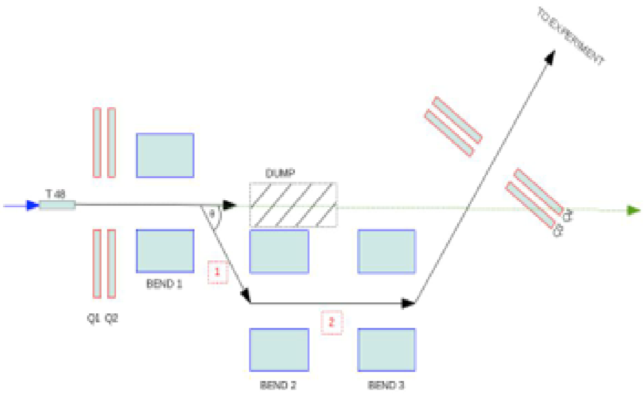
# Task 8.2

8.2.1 CERN

8.2.2 Frascati

- Design of a low-energy (1-9 GeV/c) muon, pion and electron beam in the H8 beamline, for neutrino detector R&D
  - Design of the optics for the very low energy muon, pion and electron beam.
  - Maximize the ratio at the experiment for the muon beam.
  - Maximize the acceptance of the beamline.
  - Minimize the background (unwanted particles from halo + decay) at
  - the experiment.
  - Adapt to the layout constraints in the building; use of the large Morpurgo magnet.



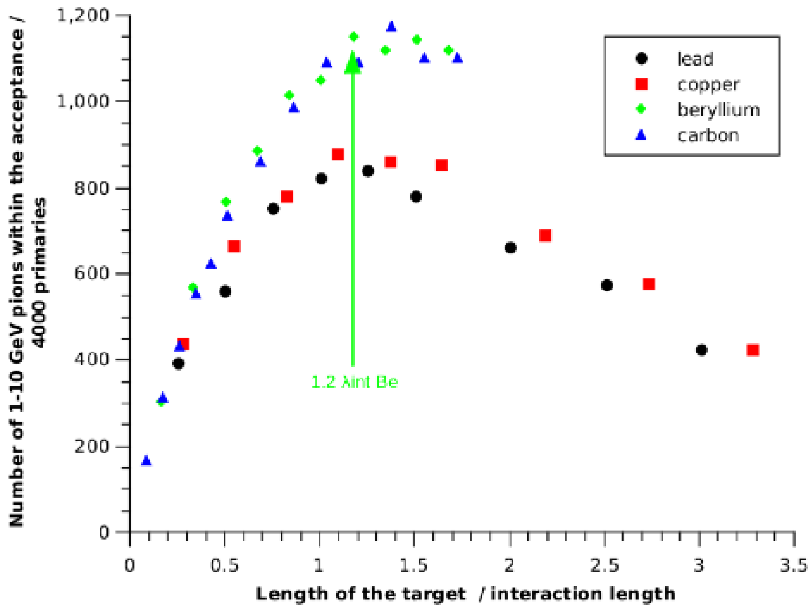




Both layouts have advantages and disadvantages that are under evaluation and would depend on the detector technology and test setup.

# Optimization Studies: Target

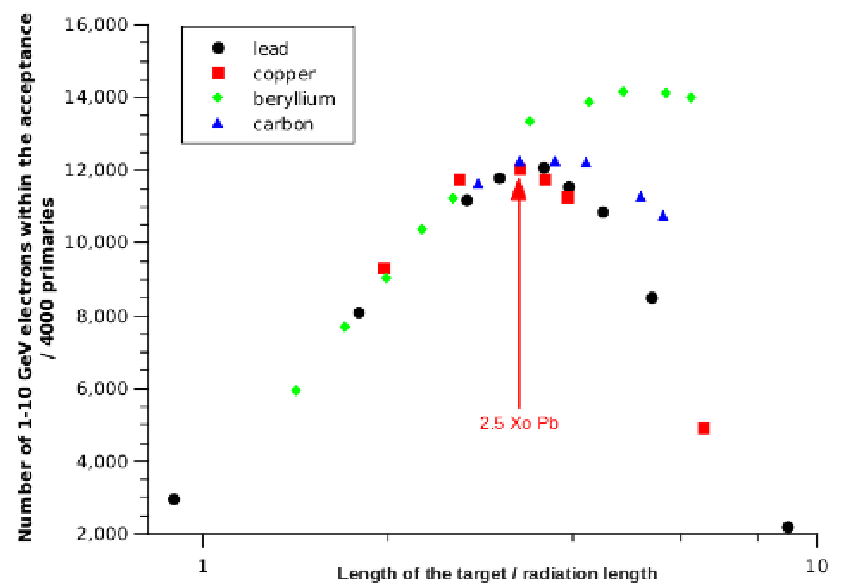
Produced pions and electrons within the right momentum range (1 - 9 GeV/c) and the beamline acceptance.

## Pions




An 80 GeV (50 % proton, 50 % pion) beam hitting the target with a diameter of ⌀5 cm.

## Electrons

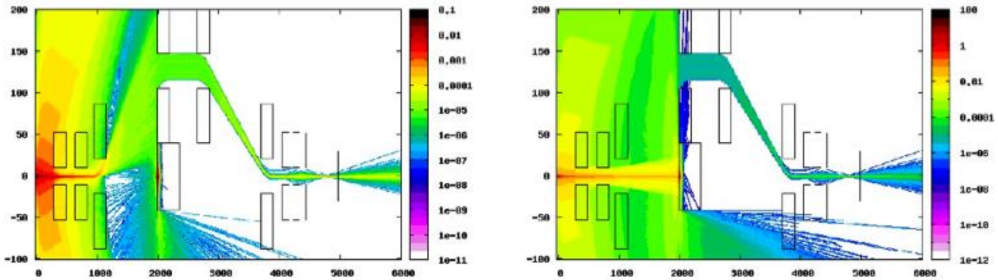



An 80 GeV electron beam hitting the target with a diameter of ⌀1 cm.

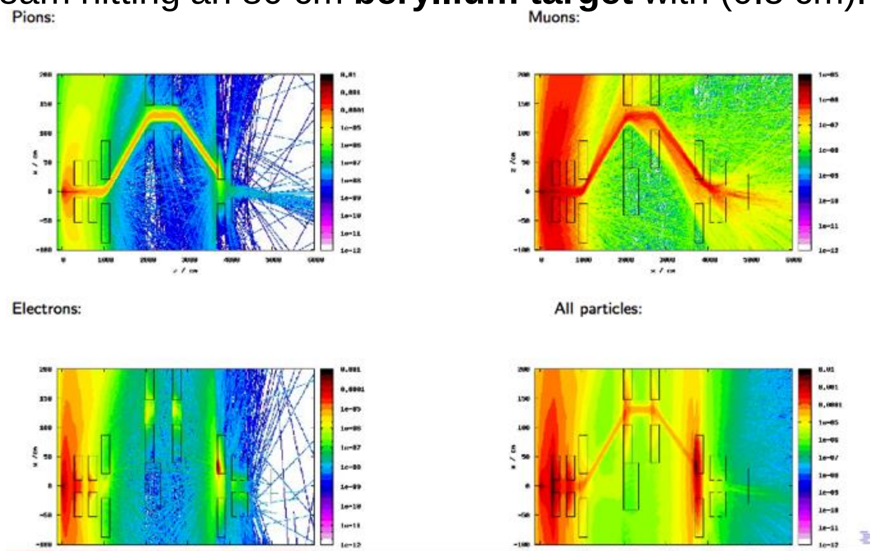
Lead: to produce low-energy electrons by bremsstrahlung from a secondary **electron** beam
Copper or Lead or Beryllium: to produce low-energy **pion** beam from a secondary pion beam

# FLUKA Sim

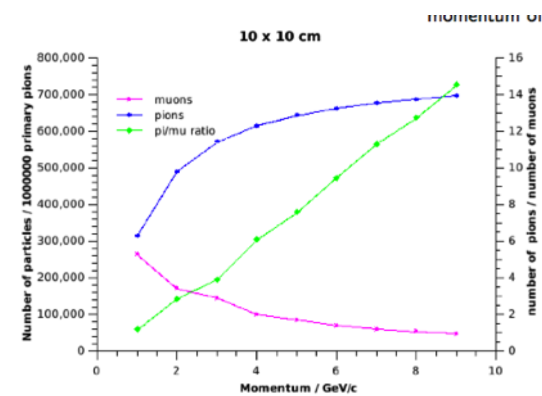
simulation of an **80 GeV electron pencil** beam hitting an 0.5 cm **lead target** with (1 cm).

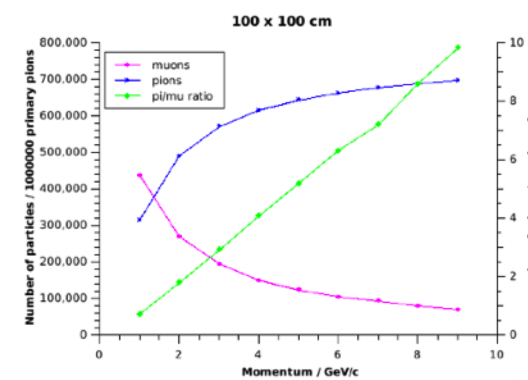


simulation of an **80 GeV 50% proton 50% pion pencil** beam hitting an 80 cm **beryllium target** with (0.5 cm).




Number of pions and number of muons arriving in a 10 by 10 cm and 100 by 100 cm area as a function of the selection momentum of the beamline

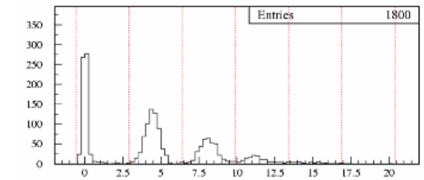


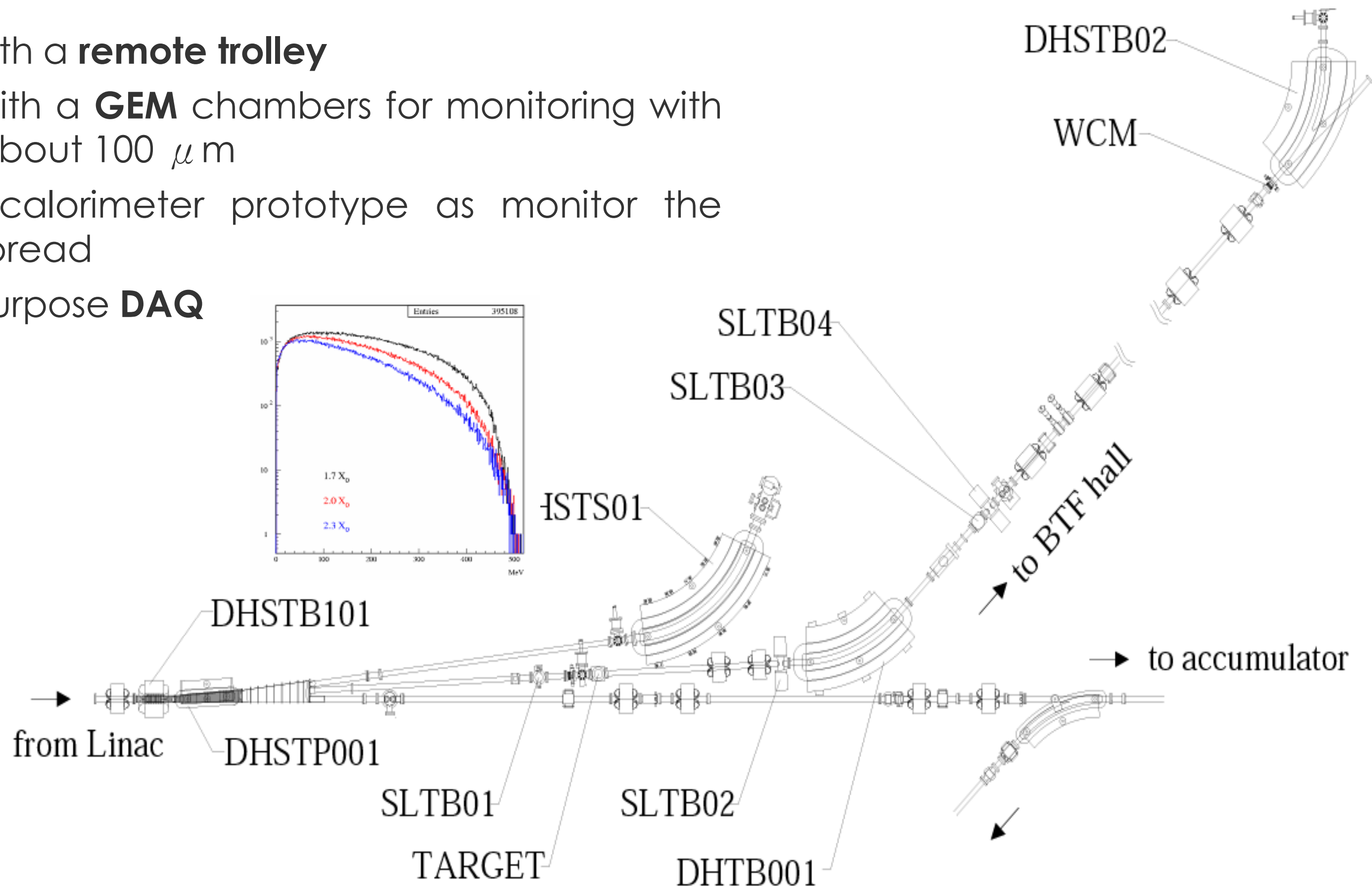



# Task 8.2.1 conclusion

- Conclusion and actual status
  - finalize the beam design
  - produce full beamline simulation with Fluka
  - produce table with expected rates for the experiment
  - final report by end of June 2013
- Milestone/deliverable status
  - D8.2(month 26) is delayed; expected in June 2013 (3 months delay)

- Upgrade of the Beam Test Facility:
  - equip the BTF with a **remote trolley**
  - equip the BTF with a **GEM** chambers for monitoring with a resolution of about 100 $\mu$m
  - use the **LYSO** calorimeter prototype as monitor the beam energy spread
  - improve multi purpose **DAQ**




The Frascati **Beam Test Facility** infrastructure is a beam extraction line optimized to produce **electrons**, **positrons**, **photons** and **neutrons** mainly for HEP detector **calibration** purpose. The quality of the beam, energy and intensity is also of interest for **experiments** (~ 20% of the users) studying the **electromagnetic interaction with matter**

# BTF Operations

During 2012 the Frascati Beam Test Facility (BTF) allocated **316 days** of shift dedicated to HEP detectors test and calibration, and study of electromagnetic interaction (see http://www.lnf.infn.it/acceleratori/btf/ for details).

Part of the beam time has been dedicated also to the **improvement of the facility and equipment, test of neutron beam line** and diagnostics detectors for the beam quality monitor.

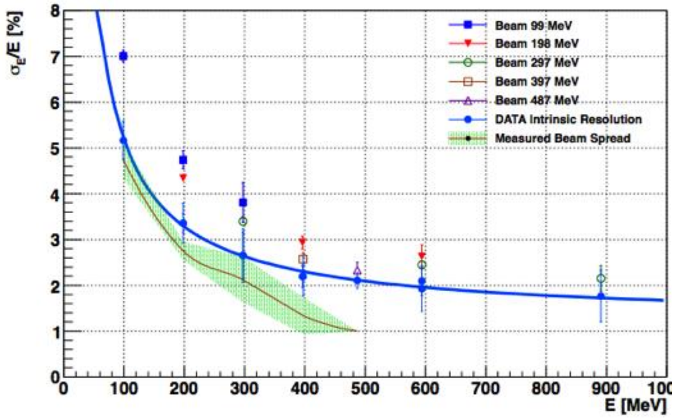
The BTF has been shutdown for Christmas due to DAFNE and LINAC systems exceptional maintenance and is expect to **restart in summer 2013**

# TPC GEM tracker

- ✓ A prototype for a 3D track system, consisting of a compact TPC with 4 cm drift and the final read out electronics, **has been tested in three different runs at the BTF.**
- ✓ A specific run has been done to determine the future operating modes of the GEM and we started and completed the tests in July. The **instrument seems appropriate to the specific experimental beam parameters in the three axes**.
- ✓ It means, however, another series of tests for the **integration of the readout with the DAQ BTF**, to study a data link between the old DAQ to the GEM dedicated DAQ software. This is very relevant especially for timing purposes.
- ○ The test of two profile chamber prototypes in **high intensity beam** foreseen in past year has been delayed to the forthcoming BTF run.
- ○ All the GEM layers, electronics and acquisition boards of the **final track detectors have been committed and will be installed in 2013**.

# LYSO Calorimeter

✓ **Analysis** of the data collected during the test beam has been performed. A reasonable **agreement between data and Monte Carlo** has been obtained. But we **decided to investigate more deeply the discrepancy observed**.




- LYSO matrix resolution

$$\frac{\sigma_E}{E} = \frac{1.1\%}{\sqrt{E(GeV}} \oplus \frac{0.4\%}{E(GeV)} \oplus 1.2\%$$

○ Due to the very low light yield of the pure CsI crystal another possibility is trying to use Silicon Photomultipliers (SiPM) as photodetectors for the readout. **New devices reading in the UV part of the spectrum are under prototype version**.

Next year (2013-2014) activity will be the study of **the possibility of using such kind of photodetectors in order to have a better signal** to noise.

AIDA

# DAQ improvements

- ✓ During last year the job on DAQ has been dedicated to **optimize the data format, improving time correction routines and testing** it in various triggering and experimental conditions.
- ✓ time has been spent to develop, **test and debug of the standalone diagnostics: user-friendly BTF environmental** sensors (temperature, pressure, humidity, screen monitor, etc), radioactive BTF control room background detector (manufactured by Berthold), synchronous CCD dedicated to the YAG flag placed on the straight BTF beam line.

- A workaround start on **virtual machines** (both of Linux and Windows OS ' s) aimed to **centralize the DAQ/Diagnostic** software based on Ethernet bus. The target will be to separately include BTF standalone diagnostics (and the multipurpose DAQ) in **!CHAOS framework**.

!CHAOS

# Task 8.2.2 conclusion

- Conclusion and actual status
  - **remote trolley**
  - ✓ **done**
  - equip the BTF with a **GEM** chambers for monitoring with a resolution of about 100 $\mu$m
  - ○ **in progress: two tests performed in 2012 showing good agreement whit the expected performance; integration in the BTF DAQ in progress**
  - equip the BTF with **LYSO** calorimeter as monitor the beam energy
  - ○ **in progress: LYSO resolution data normalized by energy beam spread are now fitting optimally the montecarlo data; SiPM UV optimized are under test to reduce SNR.**
  - multi purpose **DAQ** system
  - ○ **in progress: neutron detectors, environmental detectors, and beam diagnostic detectors has been implemented**
- Milestone/deliverable status:
  - On schedule (D8.8 - 48 months)

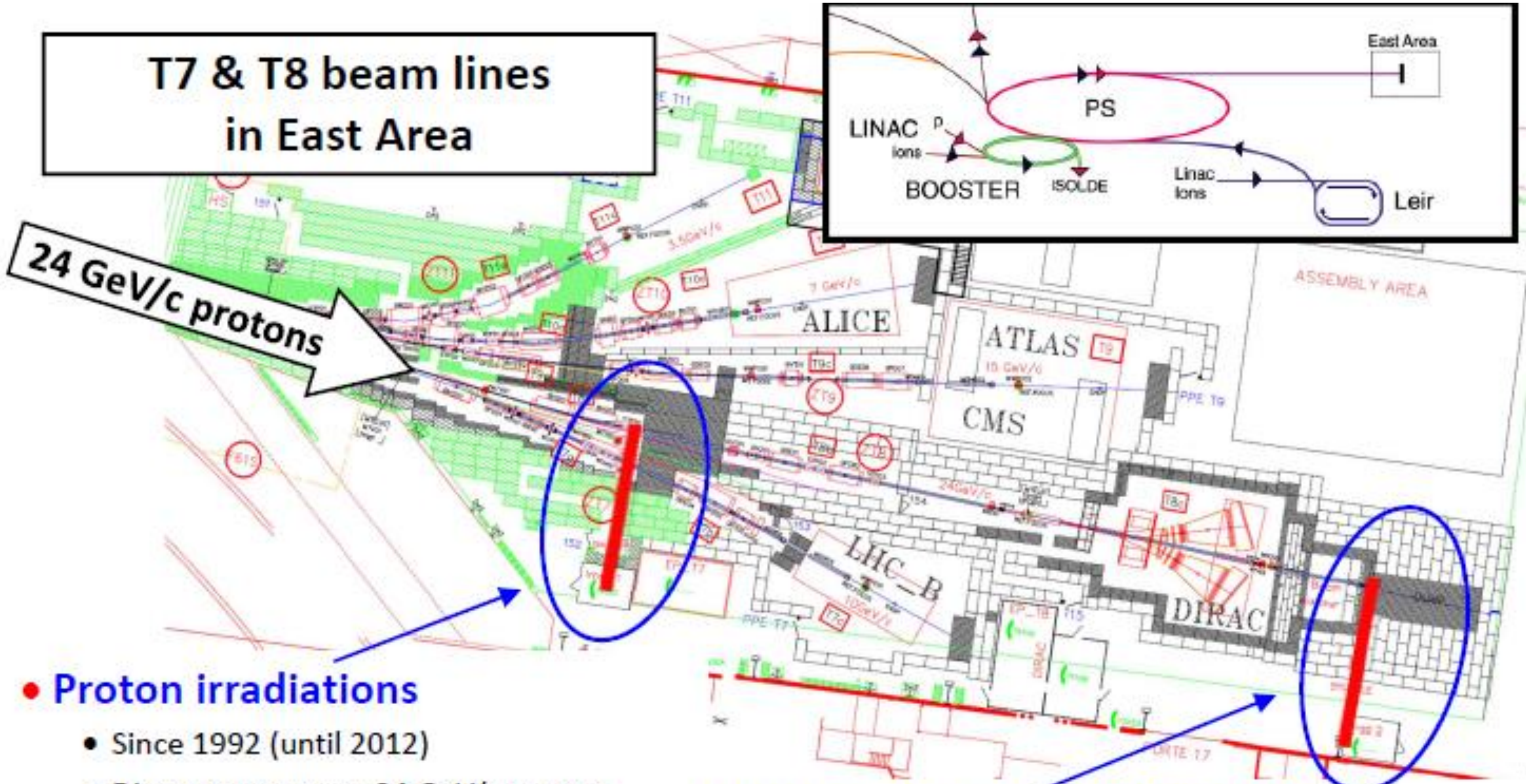
**Upgrade of PS proton and neutron irradiation facilities at CERN**

# Task 8.3

8.3.1. Improvement of existing irradiation facilities and evaluation of upgrade proposals

8.3.2. Common infrastructure for the facilities

# 8.3. Upgrade of proton and mixed field irradiation facilities at CERN




- **Proton irradiations**
  - Since 1992 (until 2012)
  - Direct exposure to 24 GeV/c protons (IRRAD1, IRRAD3, IRRAD5)
  - Low intensity radiation field of backscattered particles (SEU and Dosimeter testing) (IRRAD6)

- **Neutron (mixed field) irradiations**
  - Mixed field produced in cavity after carbon (50cm) iron (30cm) lead (5cm) 'target' (IRRAD2)

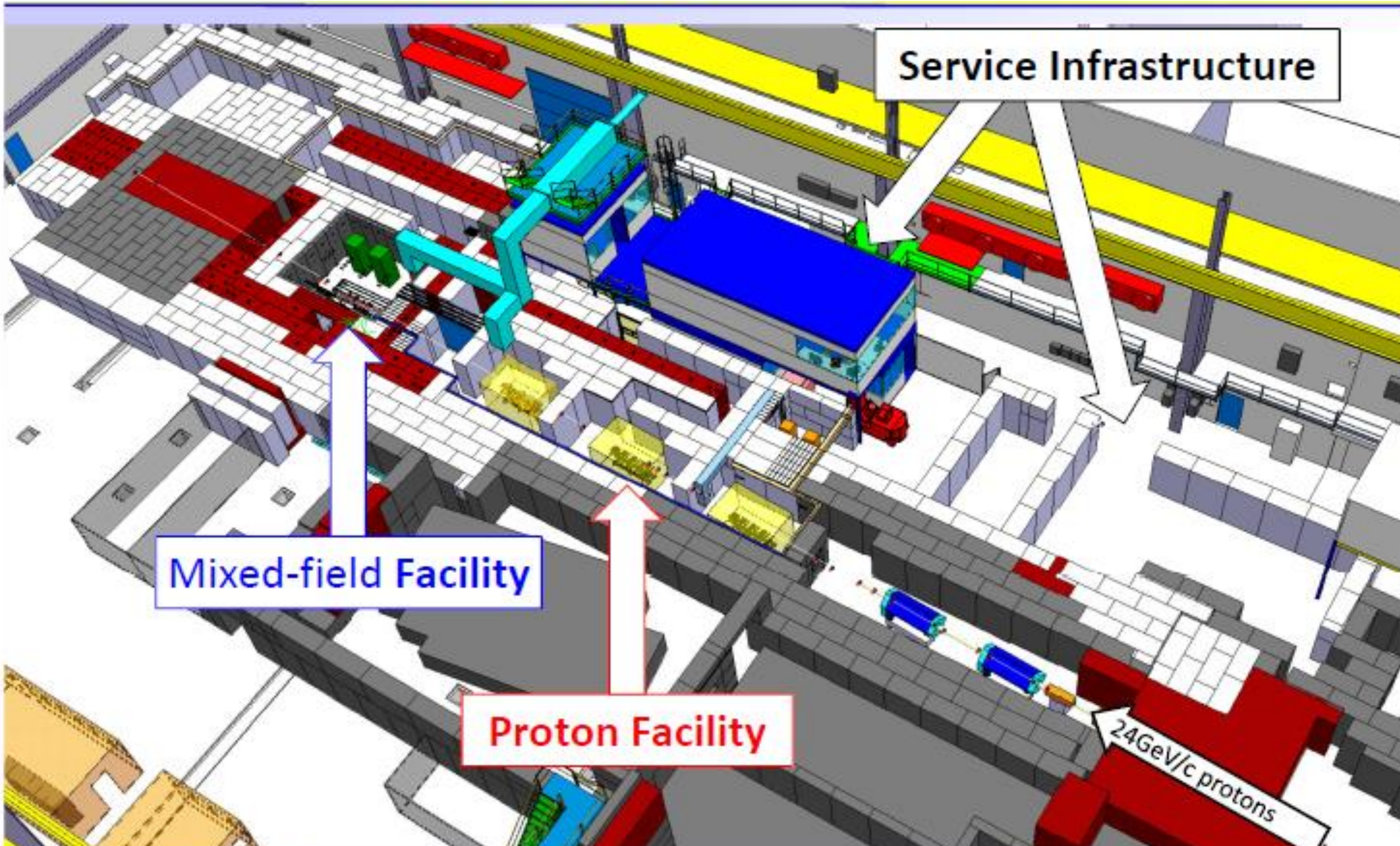
# 8.3.1 Improvement of existing irradiation facilities and upgrade scenarios

- Excellent progress since last annual meeting
  - Facilities construction approved by CERN management (2nd half 2012)
  - Construction of facility treated as project within CERN-EN as part of the EAST AREA renovation plan
- Upgrade project “officially” started in November 2012
  - 19.11.2012: First technical meeting on upgrade
    - Design of proton facility in hands of CERN-PH (AIDA)
    - Design of mixed-field facility in hands of CERN-EN (R2E)
  - Cranes renovation in East Area: Nov.2012 to Jan.2013 (completed)
  - Decommissioning DIRAC Experiment started Jan. 2013
  - Dismounting beam lines infrastructure (including IRRAD) on-going
- Construction and Commissioning of new facilities foreseen from July 2013 to July 2014
  - Plan: Be ready to perform proton irradiations at end of LS1

# Dismantling started

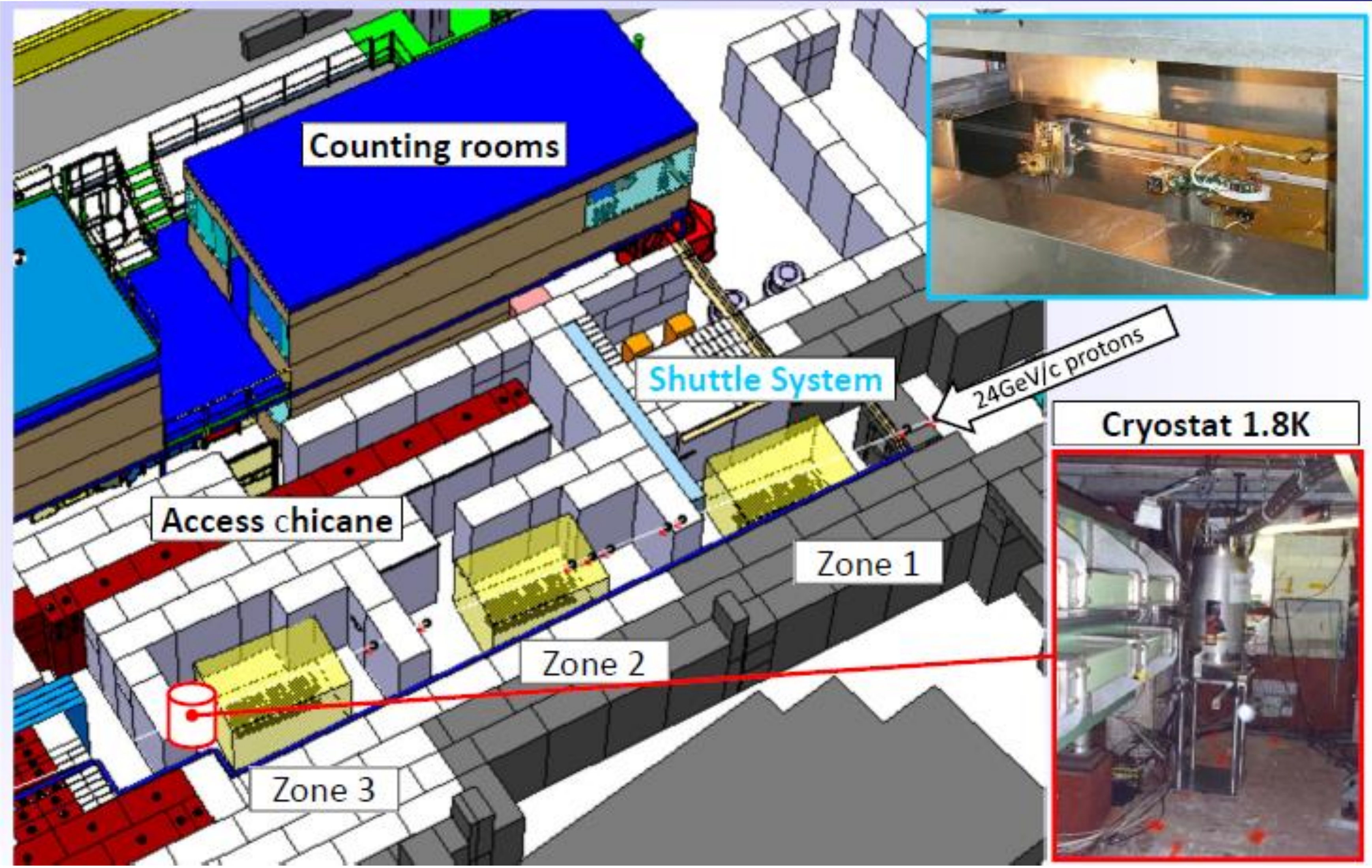
- March 2013:
  - Dismantling of DIRAC and T7 & T8 lines started

# New layout (status 3/2013)

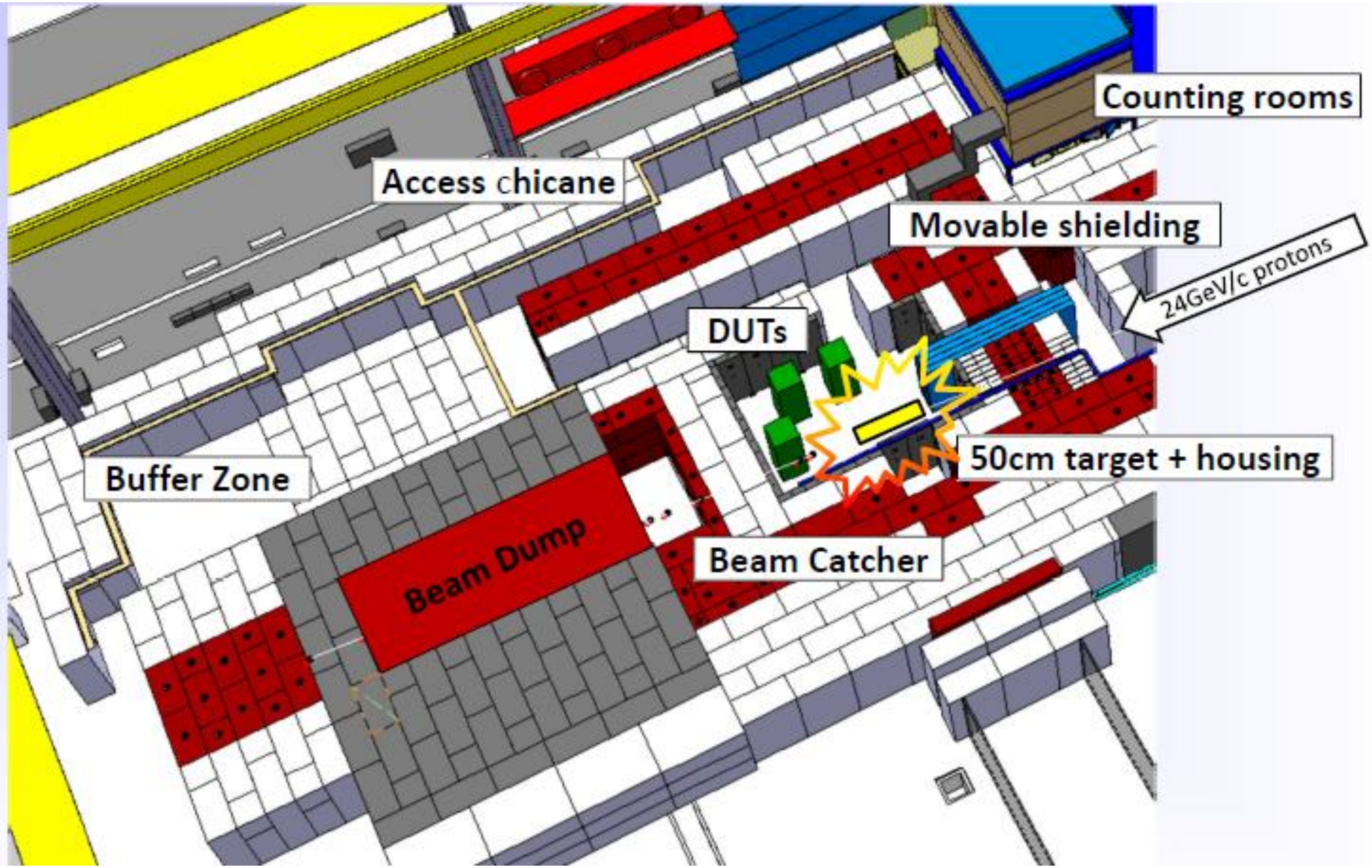



[M. Lazzaroni, D. Brethoux (EN-MEF)]

# Proton irradiation facility

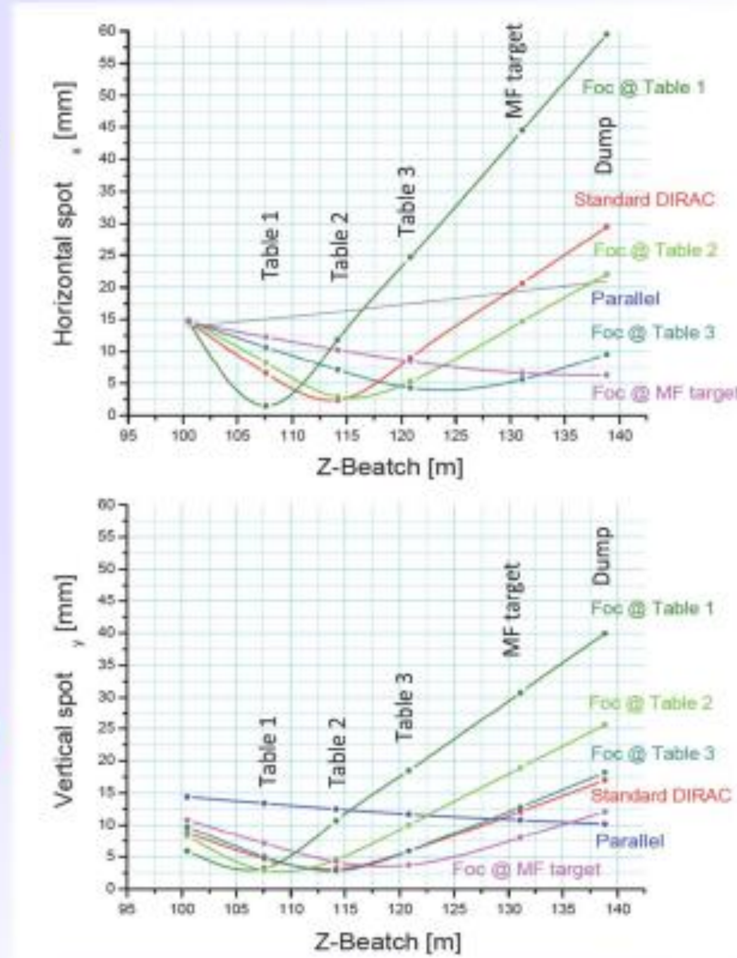


# Mixed field facility



# Beam parameters

- **Beam Dimensions**
  - Several optics variants possible to focus the beam on the Tables/Shuttle
  - Beam spot from 5x5mm$^2$ to 20x20mm$^2$ (FWHM)
  - Standard size: 15x15mm$^2$ (FWHM)
- **Beam Intensity**
  - $p^+$ are delivered in "spills" of ~$5\times10^{11}$ p
  - Number of spills and their frequency depend on the PS super-cycle (CPS), typical: 45.6s
  - Typical figures: 4 spills per CPS
    - ~$1\times10^{16}$ p cm$^{-2}$ 5days$^{-1}$ (15x15mm$^2$ FWHM)
    - ~4x more than the old facilities
  - Design figures (Maximum): 6 spills per CPS
    - ~$1\times10^{17}$ p cm$^{-2}$ 4days$^{-1}$ (5x5mm$^2$ FWHM)



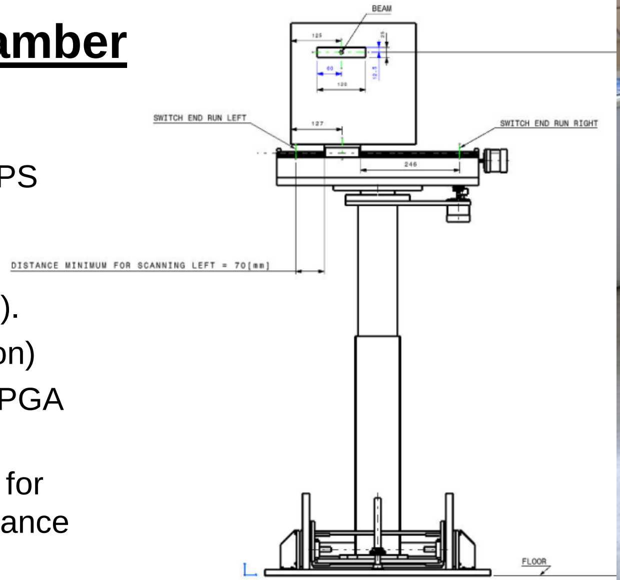

[L. Gatignon, preliminary calculations (EDMS 1270807)]

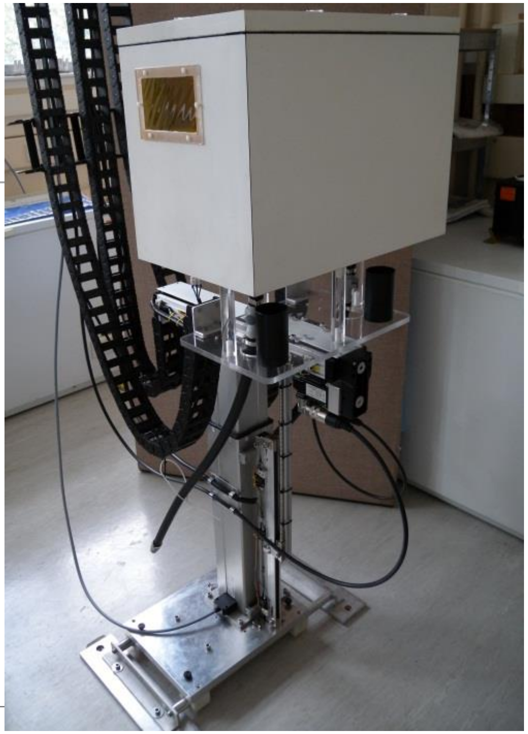
# 8.3.2. Common Infrastructure

- Irradiation tales and boxes for proton irradiations
  - Sheffield, Liverpool, CERN developments
  - Irradiation tables produced and tested
    - at CERN proton irradiation facility (24 GeV/c protons)
    - at Birmingham Cyclotron (up to 40 MeV protons)

**Scanning system + Thermal Chamber**

- Fully portable plug & play scanning system
- Thermal chamber using similar principle to PS irradiation facility CERN (IRRAD 5)
  - -22°C minimum operating temp
  - ~ 480W heat load removal (@ -20°C).
  - Recirculate cold air (forced convection)
- Readout and control system using COTS FPGA based technology
- Networked readout allowing remote access for data analysis and real-time sample performance

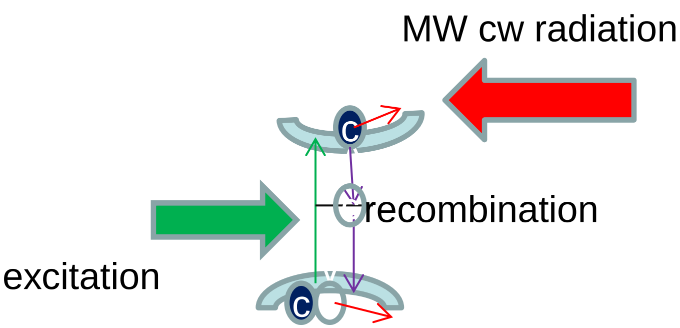


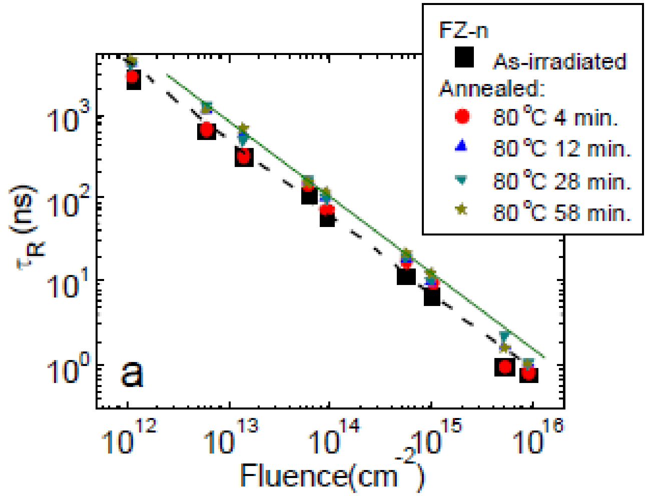



- New beam profile monitors produced (see WP8 session)

# 8.3.2. Common Infrastructure

- Fluence monitoring system using microwave absorption
  - Vilnius University, CERN, Louvain
  - Monitoring based on carrier lifetime measurement in silicon by microwave absorption probed photoconductivity transients




  - System designed and produced in Vilnius
  - System tested at CERN in November 2012
    - Following this measurement campaign it was decided to optimize the system
    - add sample temperature stabilization, include possibility to scan sample

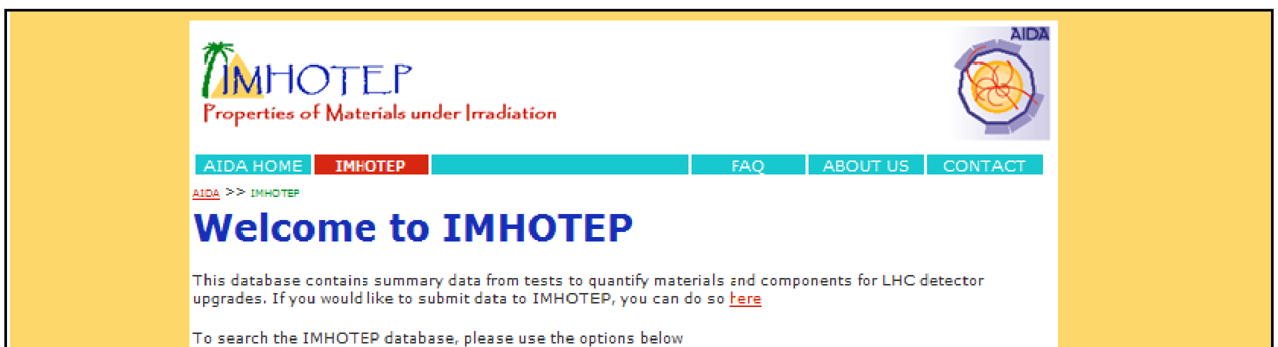
**Qualification of components and common database**

# Task 8.4

8.4.1. Review existing data and experience from LHC, define test program
8.4.2. Define test procedures and conduct tests on selected components
8.4.3. Set-up and publish a WEB database compiling the information above

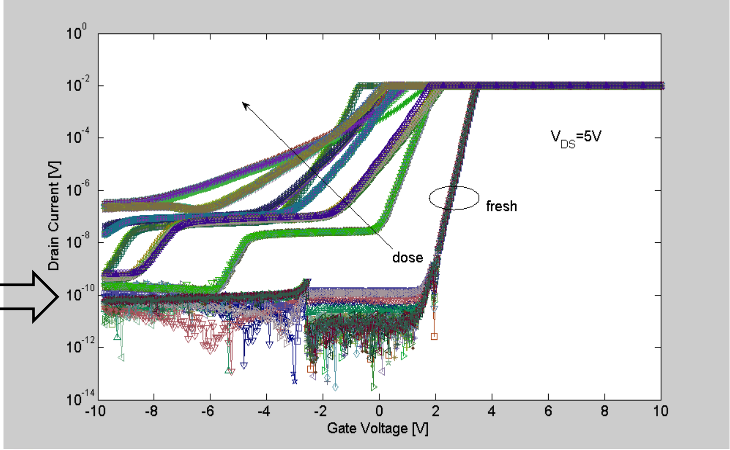
# 8.4. Qualification of components and common database

- Participants: INFN (MI, PG,PI), STFC-RAL, UNIGE, ETHZ
  - Leader: Simon Canfer, STFC
- Sub-task:
  - 1. **Review existing data and experience from LHC, define test programme**
    - **Achieved**; See AIDA-D8.1. document on CDS
  - 2. **Define test procedures and conduct tests on selected materials & components**
    - List of tests to be performed within AIDA WP8.4. given in AIDA-MS30 *(examples on next slide)*
  - 3. **Set-up and publish a WEB database compiling the information above**
    - Enquired with potential user community asking for input to database structure (done)
    - Data fields for the prototype database have been defined within WP 8.4. participants
    - Working on implementation of first prototype database (expected for June/July 2012) *Link to present interface layout: (http://imhotep.rl.ac.uk/Mock-Ups/IMH000.html)*

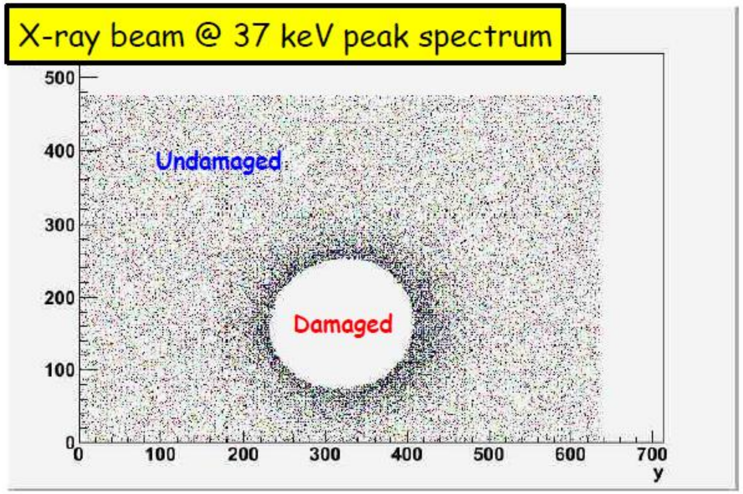


# 8.4. Radiation test plans & results

- Work on electronic components (Milano, Perugia)
  - **Irradiation testing of a series of components foreseen (Milano):** ADCs, MUX, Clock generator, PLLs, FPGA, Power MOSFETs, GaN MOSFETs, DC-DC converter and Point of Loads (POLs)
  - <u>Ongoing work</u>: Proton & Gamma damage study on power MOSFET IRF630
  - <u>Next step</u>: Displacement damage test at TSL on FPGAs, DC-DC converters

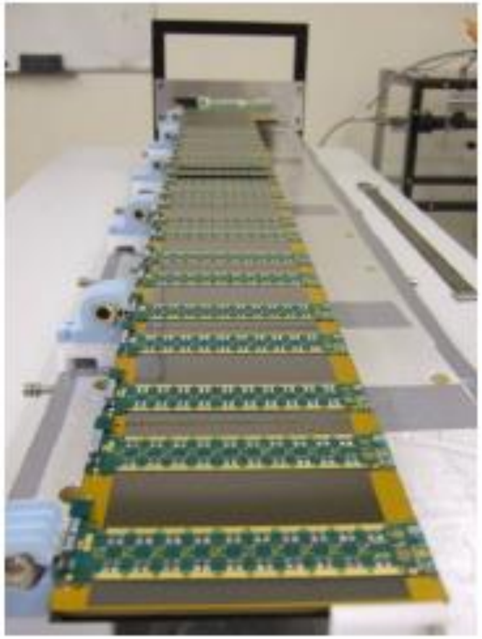



  - Case study performed on the ATLAS Liquid Argon Calorimeter neutron spectra reminded us that radiation facility has to be carefully chosen according to the expected HEP Experiment radiation field!
  - Ongoing work (Perugia):
    **Radiation damage test on MAPS sensors**
    - CMOS Imager from Aptina Imaging
      - very high pixel granularity (> 300000)
      - thin epitaxial layer (~ 2-5 μm)
      - 130 nm technology, - small pixel size ( < 6 μm)
    - Proton irradiation (24 MeV) …. imager after $6 \cdot 10^{13}$ p/cm$^2$

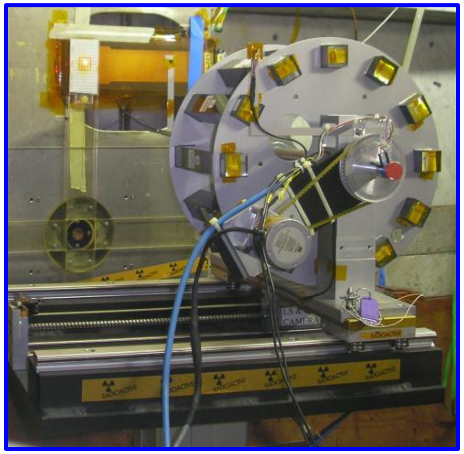


# 8.4. Radiation test plans & results

- Work plan on polymers and composite materials(STFC)
  - Application example: ATLAS stave for tracker upgrade
  - Data exists on rigid, rad-hard epoxies which tend to be highly crosslinked, high modulus and brittle.
  - Focus on characterizing the rad-hardness of more flexible epoxies and silicones
  - A chemical structure-property relationship approach:
    - Test a range of chemistries to understand what changes occur after irradiation
    - FTIR-ATR to detect chemical bond changes (non-destructive), then DMA (Dynamic Mechanical Analyses) to measure modulus, detect thermal transitions (also non-destructive)



- Work on scintillating crystals (ETHZ, Geneva)
  - Several irradiations performed at CERN facility
  - Results to be documented and integrated into database



**General infrastructure for test beam and irradiation lines**

# Task 8.5

*8.5.1.* Commission and operate beam tracking telescope

*8.5.2.TASD and MIND*

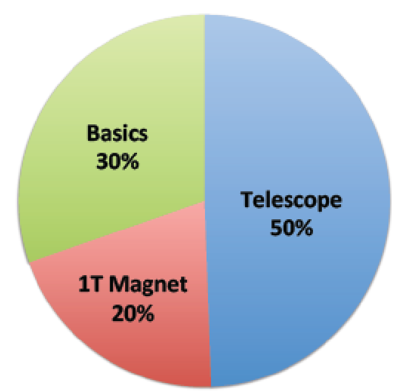
*8.5.3.GIF++ user infrastructure*

# Task 8.5.1

- 8.5.1. Commission and operate beam tracking telescope

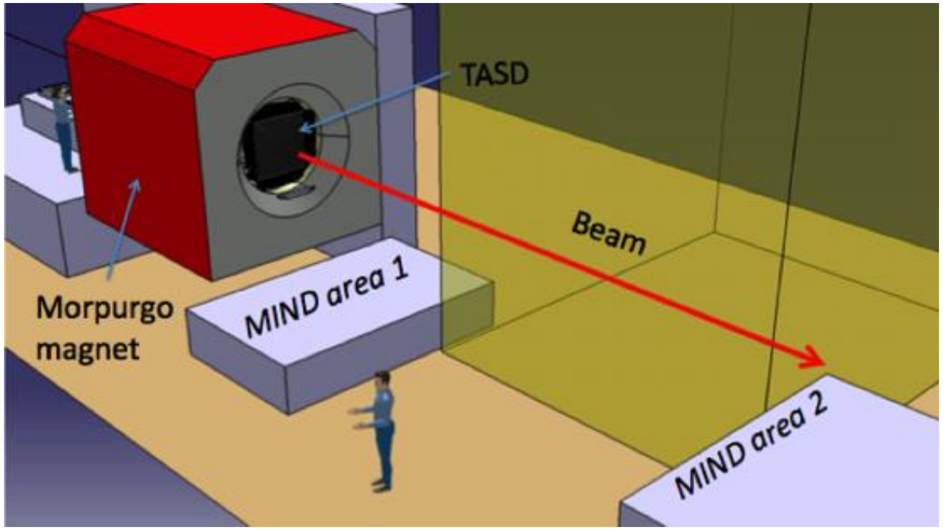
After the end of the SPS test beam period 2012 the basic version of the **EUDET/AIDA telescope was relocated to DESY**. During the extended shutdown of SPS until 2014 the telescope will stay at DESY to be **available for AIDA transnational access users** as well to work on the upgrade of the telescope towards the final AIDA telescope.

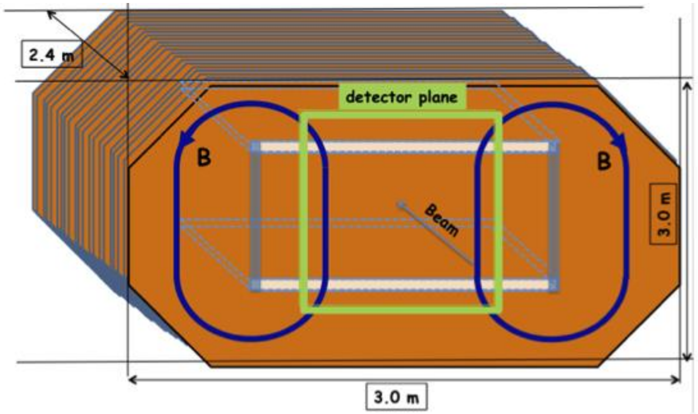
~~EUDET~~ AIDA Telescope

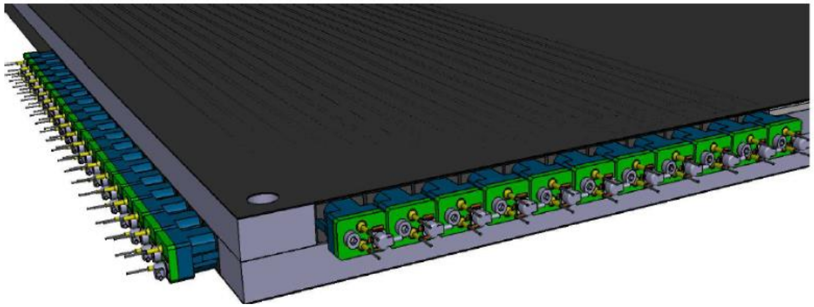


# Task 8.5.2

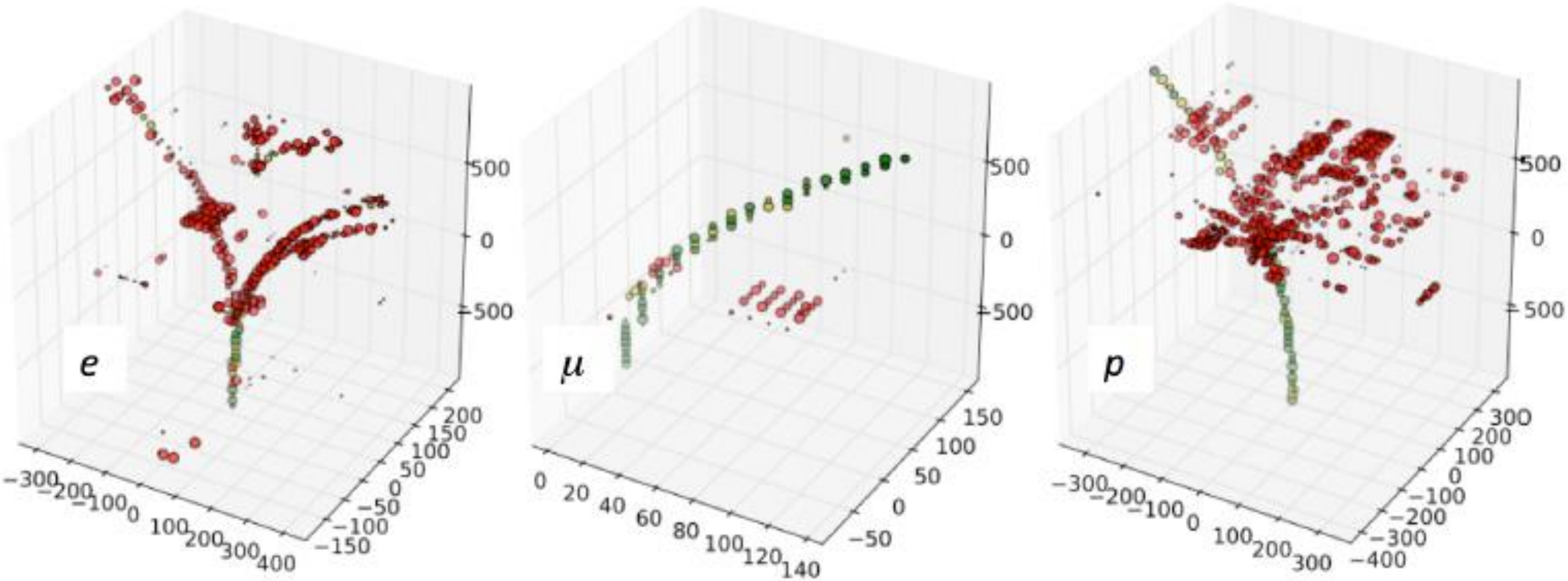
- 8.5.2.TASD and MIND
  - feasibility study of future neutrino detectors:
    - construction of a Totally Active Scintillator Detector (TASD) - electron charge identification
    - construction of a Magnetized Iron Neutrino Detector (MIND) – muon charge identification



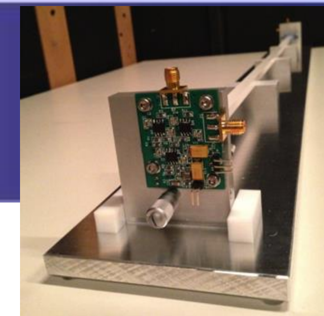



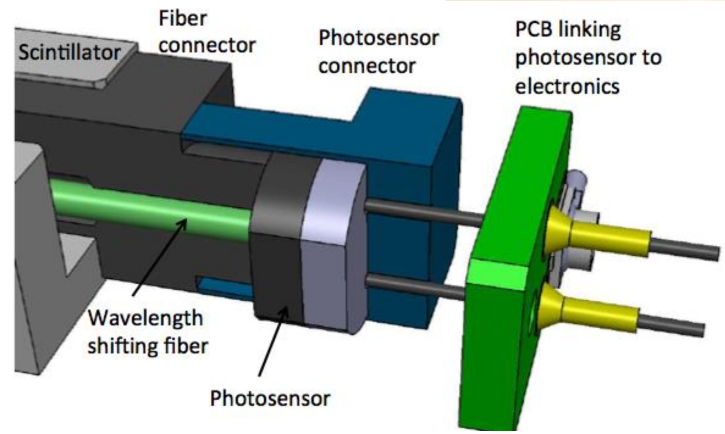
- 8.5.2.TASD simulations

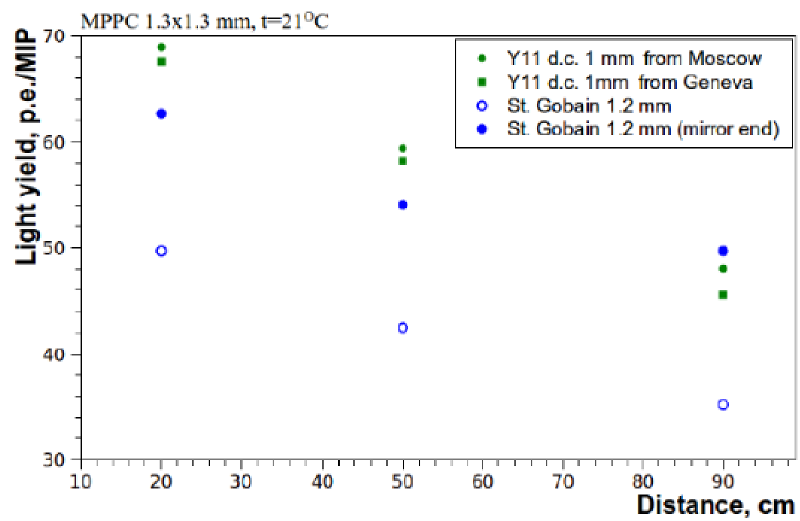


# Task 8.5.2



- Contract placed with company in Russia for the manufacturing of 3000 scintillator bars, the first 250 are ready.
- Detailed studies of **photosensor connector** design are underway to accomodate wavelength shifting fibers and photosensor connectors
- 2 **wavelength shifting** fibers tested: Kuraray Y11 higher light yield then St. Gobain
- 3 **Photosensors** compared: significant efficiency difference were found
- 3 **optical glues** were tested: no significant difference were found
- test on readout electronics: EASIROC chip
- MIND module mechanics are at an early phase of their design.



# Task 8.5.2

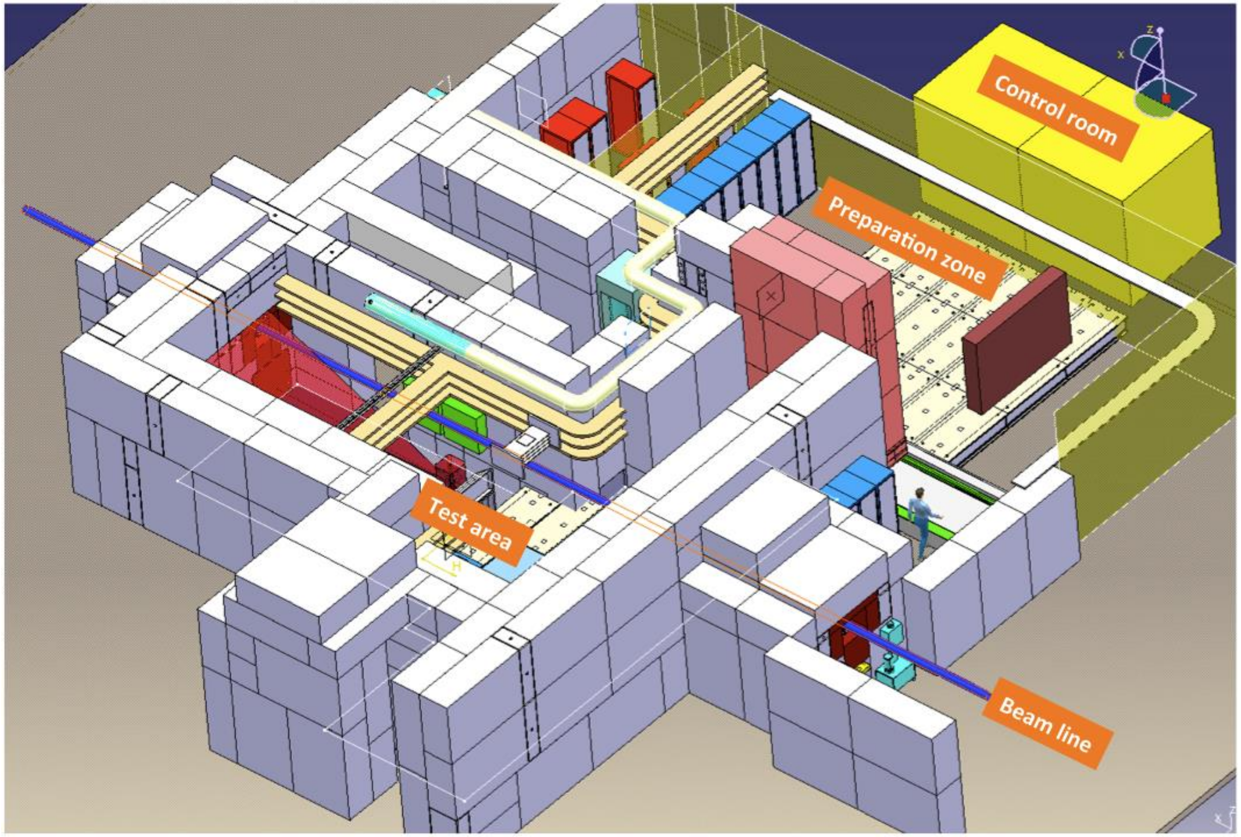
## Summary for 8.5.2:

- Design of MIND and TASD reported in the AIDA Milestone MS28 report, Nov. 2012;
- Several component choices made (plastic scintillator, WLS fiber, optical glue);
- 4th iteration of photosensor connector underway;
- Some progress on electronics, simulations, MIND mechanics;
- Draft SPSC beam request written, see with AIDA management how to proceed w.r.t. SPSC.

Strong need for implementation of low energy beam line as designed in 8.2.1 to test prototype detectors!

# 8.5.3 GIF++ user infrastructure

- **Leader**: Davide Boscherini (INFN Bologna)
- **Participants:** *Bulgaria:* INRNE; *Greece:* NTUA, AUTh, Demokritos, NCUA; *Israel:* Weizmann,Technion; *Italy:* INFN-Bari, -Bologna, -LNF, -Naples, -Rome2
- **Deliverable:** Infrastructure for the GIF++ Facility
- **Good news** : Construction of GIF++ **approved** at CERN; strong CERN-EN & PH teams involved!
- **Location:** H4 line in SPS North Area 100GeV muons, 10x10cm$^2$
- **Size:** 170m$^2$ (2xGIF)
- **Source:** $^{137}$Cs, 16.65 TBq (~3 Gy/h at 50 cm) 662 KeV, $\tau_{1/2}$= 30y



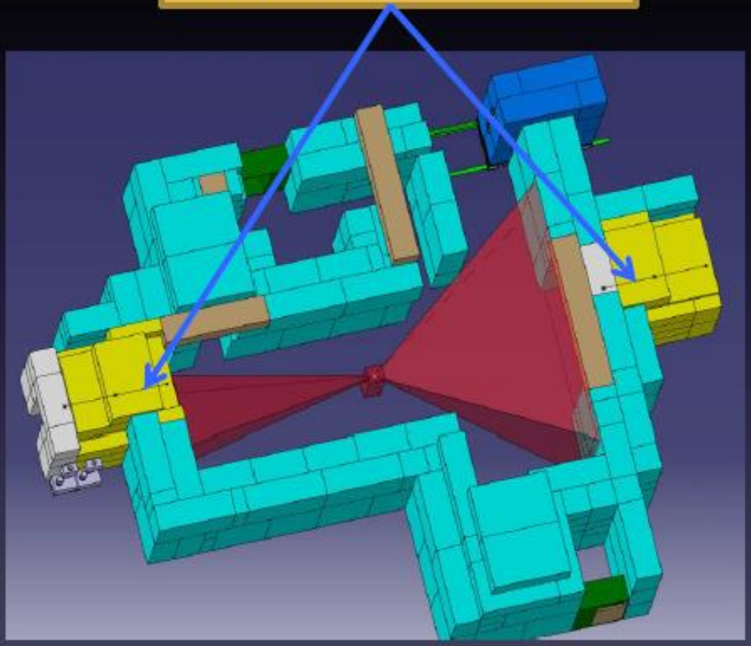
# 8.5.3 GIF++ user infrastructure

- **Beam Tracker Detectors**

| | | |
|---|---|---|
| Detector + mechanics + cables | Weizmann | G.Mikenberg |
| Front-end electronics | Technion Weizmann | S.Tarem |
| Gas system | Technion Weizmann | G.Mikenberg |
| DCS | Technion | S.Tarem |

- Technology used: **Thin Gap Chambers**
- 2 quadruplets ready since last year
- Their position and angular resolution were determined by comparing with a small tube MDT in tests at H8:
  - angular resolution: ~0.3 mRad
  - position resolution: ~65 µm
- electronics to equip the full detector being developed

expected location of the beam-position detectors



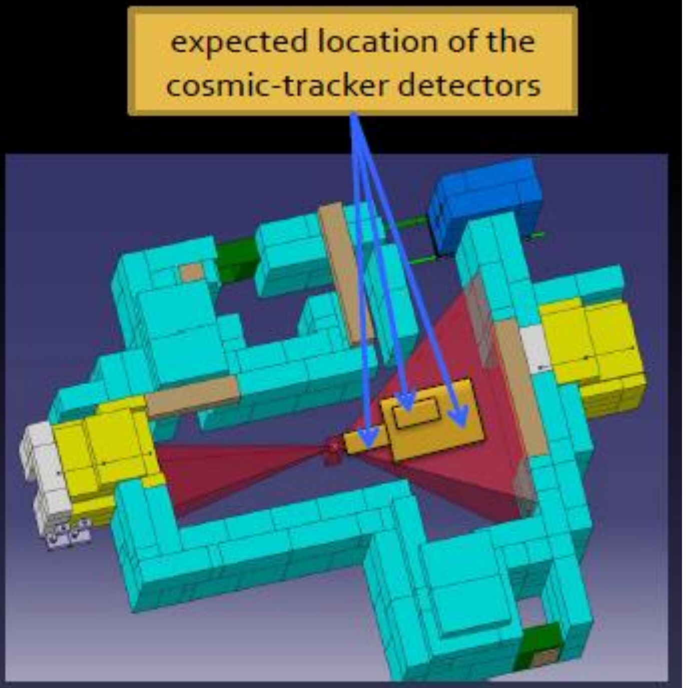
# 8.5.3 GIF++ user infrastructure

- **Cosmic Ray Tracker**

| | | |
|---|---|---|
| Detector | INFN-BO<br>INFN-RM2 | G.Aielli |
| Front-end electronics | INFN-RM2 | R.Cardarelli |
| Power-supplies + cables | INFN-NA<br>INRNE | S.Buontempo |
| Gas system | INFN-BA<br>INFN-LNF | S.Bianco |
| DCS | INFN-BO<br>INFN-RM2 | A.Polini |

- **Roof tracking trigger**
- **Floor tracker**
- **fine trackers (floor/roof)**
- **confirm plate**

- Needed to ensure test operation when no beam is available (large part of the year) covering a large area to accommodate several users
- Setup with a small size tracker faced to a large protected confirm plane (reduce number of readout channels)
- Excellent time resolution to simplify triggering
- Sustain high rates: ~20kHz/cm$^2$
- Technology used: Resistive Plate Chambers



# 8.5.3 GIF++ user infrastructure

- **Status**

  - **Detectors**
    - setup for beam and cosmic trackers done
    - detectors for beam tracker already constructed
    - detector for cosmic tracker to be constructed within this year
    - electronics for all detectors being developed

  - **DCS** *(INFN-BO, A.Polini; NTUA; Technion)*
    - baseline design available *(CAEN Easy, other ; PVSS; GUI following RD51 or ATLAS)*
    - main issue is the cost

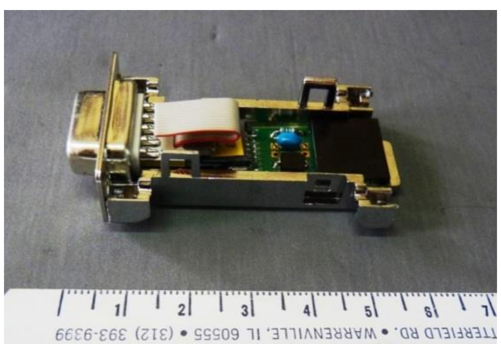
  - **DAQ** *(Weizmann; D.Lellouch)*
    - several systems are being considered
    - solution to adopt to be decided

- **GIF++ project progressing well: Facility expected to be ready by the end of 2014**

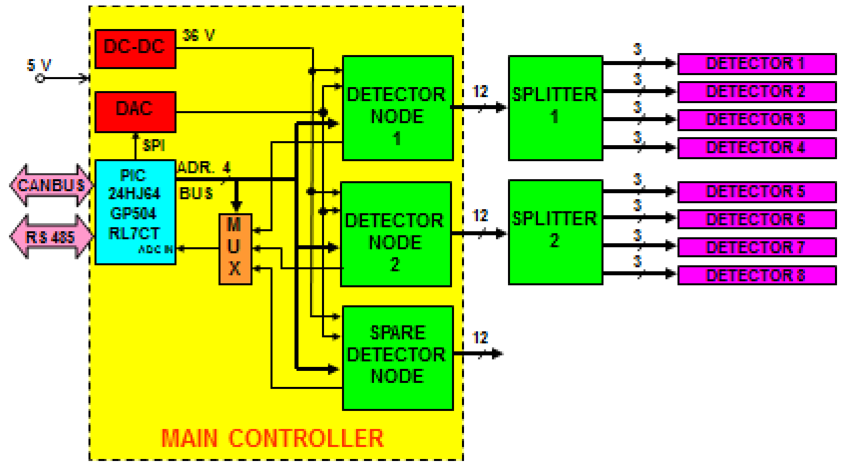
# 8.5.3 Gif++ user infrastructure

- Radiation sensors for GIF++ *(INRNE, Sofia)*
  - Dose measurement based on RADMON (RADFET) sensors
  - Sensors tested at Gif facility in June 2012 (AIDA-Note 2012-04)
    - Calibration: signal vs. cumulated dose obtained for two types of RADFETs
  - Readout boards
    - under development:

**DOSIMETRIC SYSTEM**
**BLOCK DIAGRAM**



Sensor Head



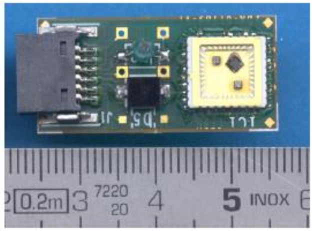
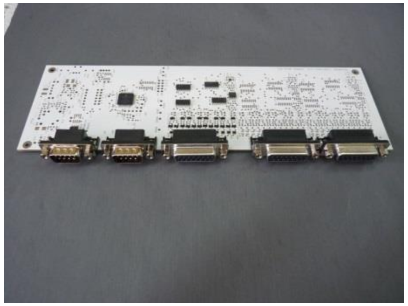



Fig. 3: Integrated Sensor Carrier (ISC)

Sensor board



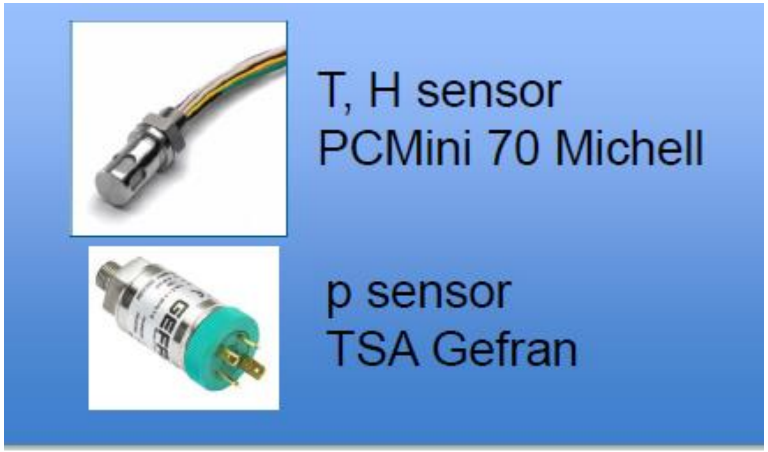
Main controller

  - Installation and cabling plans
    - First plans provided

# 8.5.3 Gif++ user infrastructure

- Environmental Sensors (INFN: LNF Frascati, Napoli)
  - Functionality:
    Monitoring for atmosphere and gases
    - **P**ressure
    - **T**emperature
    - Relative **H**umidity

CAEN ADC 3801



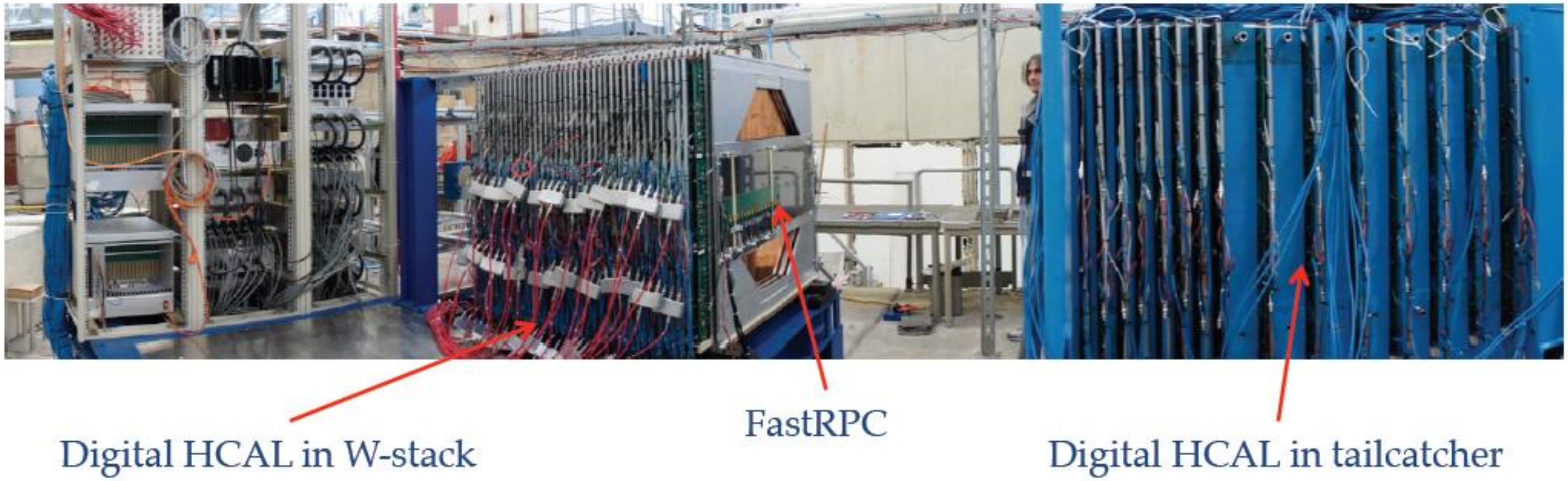

  - Status
    - Test system operational at Frascati
    - Study on long-term stability and experimental precision
    - Design of mechanical assembly in progress
    - Freeze of design and validate in a couple of months

**Coordination of combined beam tests and common DAQ**

# Task 8.6

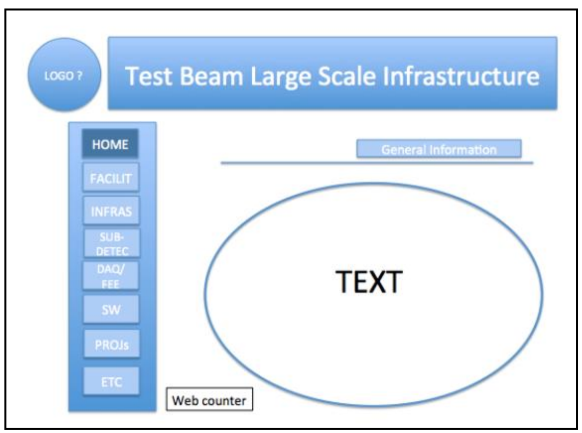
8.6.1. Common test beam experiments at CERN and DESY
8.6.2. Common DAQ

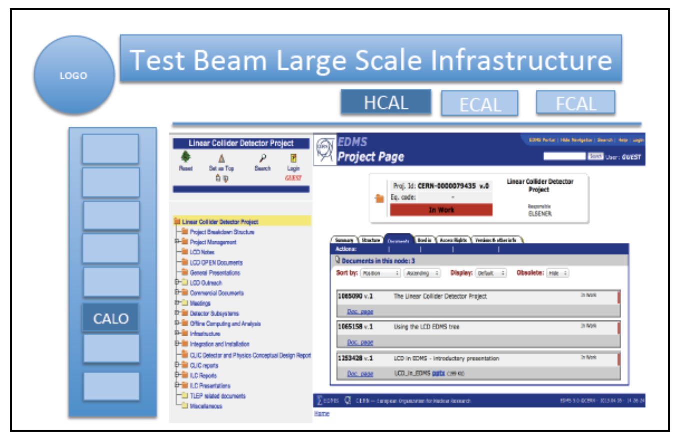
- CERN: Support of common test beams for linear collider
  - Trigger & tracking telescope, W-stack and Fe-tailcatcher successfully used again in 2012.
  - Beam tests performed with several HCAL technologies (link to WP 9.5).




- DESY: Support of common test beams delivered
  - …busy times ahead as there are no beams at CERN!
- CERN/DESY support demonstrated e.g. in test beams for WP9

- EDMS (Engineering Data Management System)
  - Development driven by DESY with aim to provide functionality as:
    - Document and data management with version & access control, life cycle support.
    - Design and viewing features; Collaborative work including collision analyses
  - DESY EDMS is up and running; … need to fill documents, data
    - D8.2. (report on specs) delayed since Sept. 2012; ready next months
  - Some difficulties in integrating CERN, FNAL EDMS into DESY system
    - Development: web site which dynamically create web pages from EDMS via WEB interface
    - Purpose: extract information from the various EDMS



# Task 8.1: Coordination and Communication

- **WP8.1.** Most of the tasks within WP8 achieved a **very good progress** in the last year.
- **WP8.2** The tasks related to the test beam infrastructure at Frascati **are well on track and the anticipated milestones and deliverables** are at no risk. The CERN deliverable D8.2. is expected to be late by 3 months. A well advanced status report has been given at this meeting.
- **WP8.3 and 8.5** Excellent **progress was achieved in the construction of the irradiation facilities** at CERN, namely the Proton & Mixed field irradiation facility in the East Area and the **GIF++** facility in the North Area. Both projects are now **fully approved CERN.** GIF++ user infrastructure is advancing according to plan.
- **WP8.4** The irradiation testing of materials and components and the database on irradiated materials and components, is **delayed** due to lack of resources at STFC. The milestone **MS30 has gathered a delay of seven months** but is now completed. There will be a delay for the next milestone.
- **WP8.5** TASD and MIND, and tracking telescope are **progressing well and are on schedule.**

  Need for beam line!
- **WP8.6** a delay was cumulated in reaching the objectives set for the EDMS system at DESY and the common DAQ system. **The achievement of the deliverable D8.2 is expected to be late by 8 months.**

# WP8 - Milestones

| | | | | | |
|---|---|---|---|---|---|
| MS27 | Specification for beam line fixed | CERN (1) | m12 Jan 2012 | Final specification for the design study in task 8.2. (Task 8.2.1) | o.k. |
| MS28 | Design of TASD and MIND | STFC (31) | m20 Sept.2012 | Design for deliverable D8.11 (Task 8.5.2) | o.k. |
| MS29 | Design of GIF++ infrastructure | INFN (18) | m20 Sept.2012 | Detailed design ready for the cosmic ray tracker, the radiation measurement facility and the DCS (Task 8.5.3) | o.k. |
| MS30 | Definition of test procedure and specification | STFC (31) | m20 Sept.2012 | Common agreement of how tests for materials will be conducted and which components to test (Task 8.4) | o.k. |
| MS31 | Installation of new equipment | CERN (1) | m26 March 2013 | Movable irradiation tables operational (Task 8.3.2) CERN, UK | writing report |
| MS32 | First test results on selected components | STFC (31) | m26 March 2013 | Intermediate result with respect to D8.7 (Task 8.4) | delayed |
| MS33 | Installation of TASD and MIND | STFC (31) | m36 Jan.2014 | Installation at CERN for deliverable D8.11 completed (Task 8.5.2) | |
| MS34 | Test beam, EDMS and DAQ commissioning | DESY (9) | m36 Jan.2014 | Intermediate stage for deliverable D8.8 (Task 8.6. 1&2) | |
| MS35 | Installation of infrastructure | (34) | m37 Feb. 2014 | Cold boxes and Fluence monitoring system operational (Task 8.3.2) CERN, UK, VU | |
| MS36 | Commissioning of tracking telescope | DESY (9) | m44 Sept.2014 | Start of operation of telescope delivered in D8.5 (Task 8.5.1) | |

# WP8 - Deliverables

| | | | | |
|---|---|---|---|---|
| D8.1 | Experience at LHC and definition of test programme: Based on the experience and expectations for the LHC test programme is defined and described in a document. | [month 12] Jan. 2012 | Task 8.4 | o.k. |
| D8.2 | Publication of specification documents for the DAQ and for the central documentation facilities: Description of common infrastructures and interfaces for the linear collider test beams. | [month 20] Sept. 2012 | Task 8.6. 1&2 | 8m delay |
| D8.3 | Design study on low energy beamline: Design and implementation study on a low energy beam to the range of 1 (or possibly less) to 10 GeV | [month 26] March 2013 | Task 8.2.1 CERN | 3m delay |
| D8.4 | Upgrade scenarios for irradiation lines: Design study on new or upgraded irradiation facilities at CERN based on slow extracted proton beams. Containing a proton and – if feasible – a mixed field irradiation facility. | [month 37] Feb. 2014 | Task 8.3.1 CERN | |
| D8.5 | Installation of tracking telescope: The tracking telescope is installed in the beam line and operational. | [month 40] May 2014 | Task 8.5.1 | |
| D8.6 | Detector and detector control system operational: Cosmic ray tracker including front end electronics, power and gas systems. Detector for radiation measurement. Detector Control System monitoring the tracker working and the environment parameters. | [month 44] Sept. 2014 | Task 8.5.3 | |
| D8.7 | Populated data base of components qualification: The materials and components database is online and populated with data. | [month 46] Nov. 2014 | **Task 8.4.1**. | |
| D8.8 | DAQ performance and test beam utilization: Report on the performances and use of the integrated DAQ setup, and of the common test beam facilities at DESY and CERN | [month 46] Nov. 2014 | Task 8.6 1&2 | |
| D8.9 | Performance of beamline and infrastructure: Report on performance of beamline and infrastructure including GEM based beam profile and tracking detector | [month 48] January 2015 | Task 8.2.2 Frascati | |
| D8.10 | Commissioning of new facility equipment: Report on commissioning of shuttle systems, movable irradiation tables with cold boxes and a fluence monitoring system based on a microwave absorption technique in silicon. | [month 48] January 2015 | Task 8.3.2 CERN, UK, VU | |
| D8.11 | Infrastructure performance and utilization: TASD and MIND are constructed and tested for their performance. | [month 48] Jan. 2015 | Task 8.5.2 | |