LHCf (+ATLAS ZDC) beam test in 2021

allocated for Week 37, 38 (14 days) (in v1.0)

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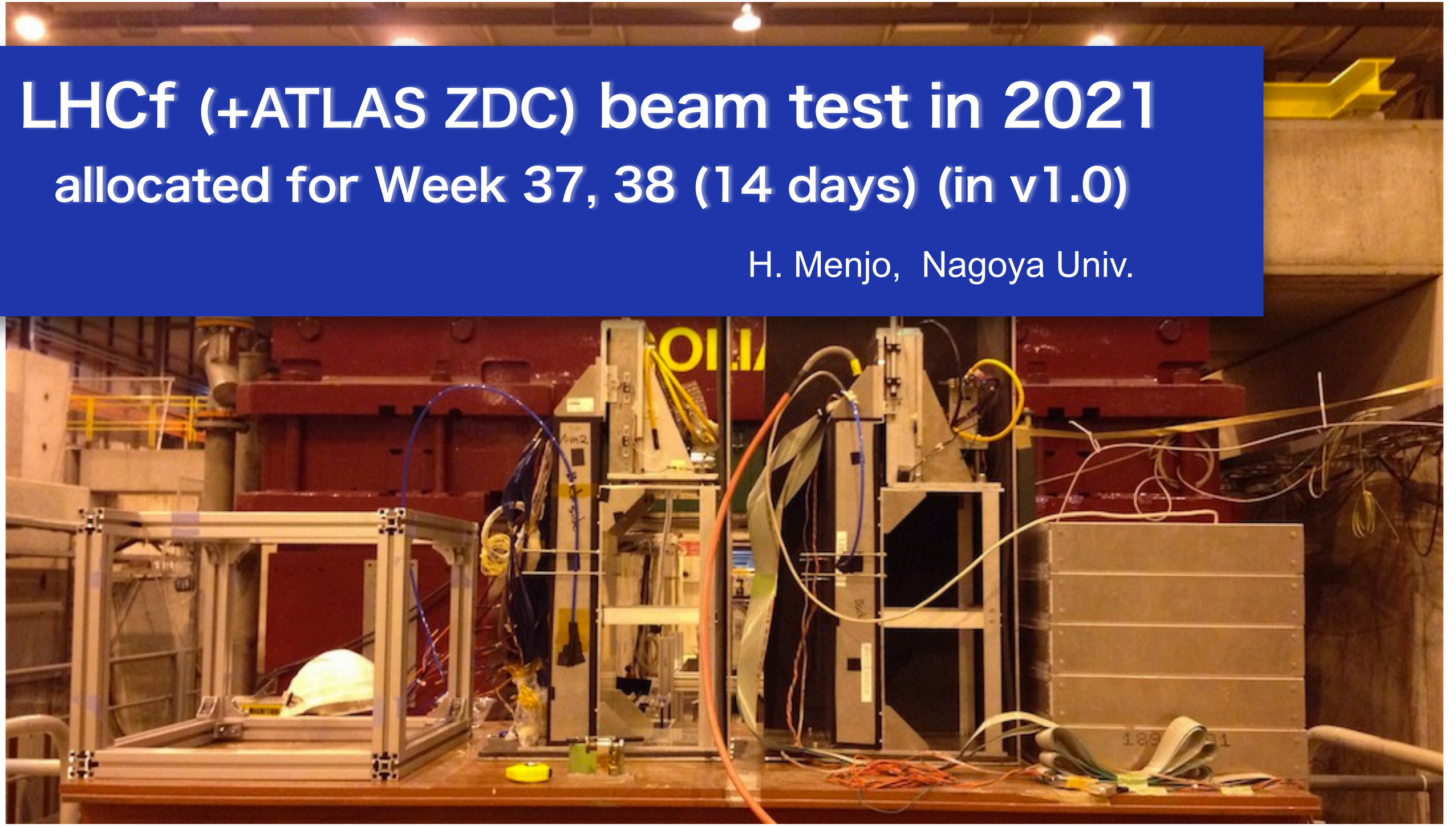
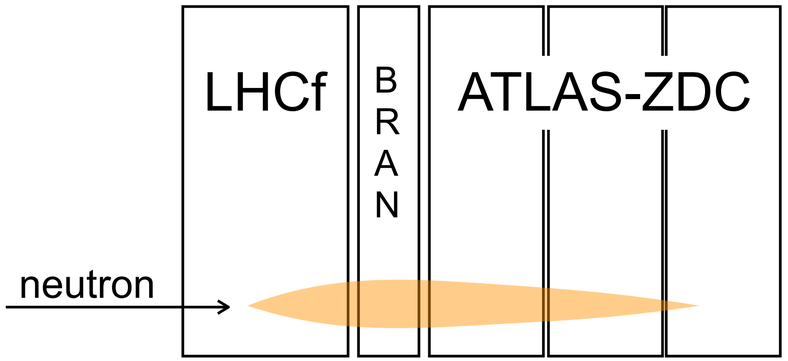


Motivations

- Precise pre-calibration of LHCf detectors before Run3
  - Evaluation of aging of the detectors after the last operation (4 or 5 years ago)
  - Precise energy scale calibration with <~ 2% precision under temperature control. (dominant systematic error on our measurements)
- Test of a upgraded readout system of silicon strip layers
  - It is newly developed for Run3 to improve the readout speed by x10.
- Joint calibration of LHCf and ATLAS-ZDC
  - New opportunities of joint operations in the Run3 period (pp at 2022 and pO, OO at 202?) to improve the energy resolution for hadronic showers from 40% (LHCf alone) to 20% (LHCf+ZDC)
  - First joint calibration of the two detectors.

Setup at LHC *140 m from IP1*



- Parasitic beam test of RPD detector by the ATLAS-ZDC group

Beam requirements

- Particles and energies
  - protons: 150, 350 GeV
  - electrons: 100, 150, 200, (250)* GeV
  - muons

    *) Highest energy with reasonable intensity

- Beam conditions
  - Parallel beams
  - Intensity of > 1000 per spill
  - beam spot size of ~1.5 cm radius

    2x2 cm^2 scintillator is used for triggers

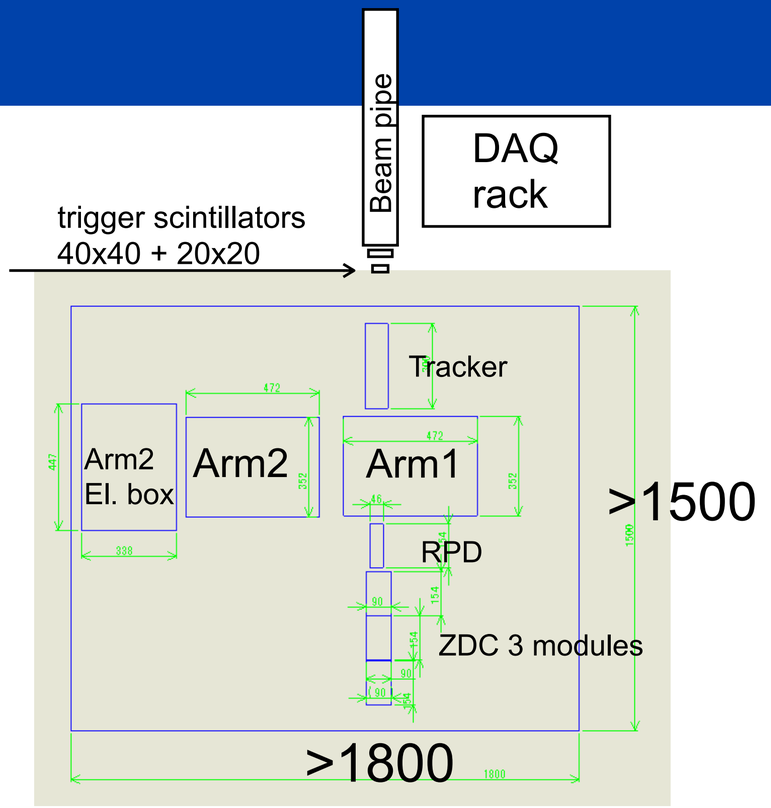
Preliminary operation plan

Setup (3 days)
• Installation (1.5 day) • Beam tune and Commissioning (1.5 days)
Operation with Arm2 (3 days)
• Energy scan by electron beams (0.5 day) • Position scan by election beams (1 day) • Position scan by proton beams (1 day) • Muon data taking (0.5 day)
Switch to Arm1 (1.5 days)
• Switching the detector to Arm1 (0.5 day) • Commissioning (1 day)
Operation with Arm1 (3 days)
• Energy scan by electron beams (0.5 day) • Position scan by election beams (1 day)ConPosition scan by proton beams (1 day) • Muon data taking (0.5 day)
Contingency (additional tests) (3 days)
• Tests of new analog modules • PRD tests
Deinstallation (0.5 day)

Infrastructure requests

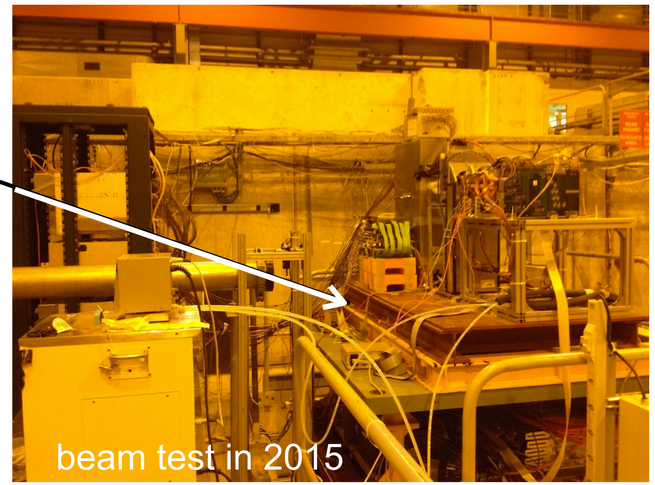
Beam line

- Big movable table
  - Required movable range H: 80 cm V: 20 cm
  - Table size: **>1.8 m x 1.5 m**
- One electronics rack
  - locate near the table
- Dry air (gas) for avoiding dew condensation
  - Only very small flow
- Crane works
  - for installation (1st-day) and de-installation (last-day)
- Geometrical Survey to align the detector to the beam line



- Operation room
- Space for pre-DAQ setup and test
  - ~ 5x5 m2
  - from 1-2 week before the beam time

This plate size: 2 x 1 m^2
Bigger plate is require
for this year operation .



- A chiller for temperature control
  - Can we rent it from someone ?

Others

- Concerns about unclear COVID-19 situation in September.
  - All members come from Italy, Japan, and US.
  - Travel restriction (of the countries, institutes) to CERN in this moment.
  - Poor vaccination situation in Japan