H2 Very Low Energy tertiary beam

Provide e/p in the 2-9 GeV/c range

- Similar design as H8
- Main installation upstream of NA49

Contents

- layout in H2
- Impact on operation of H2
- Simulation & experience from H8 VLE

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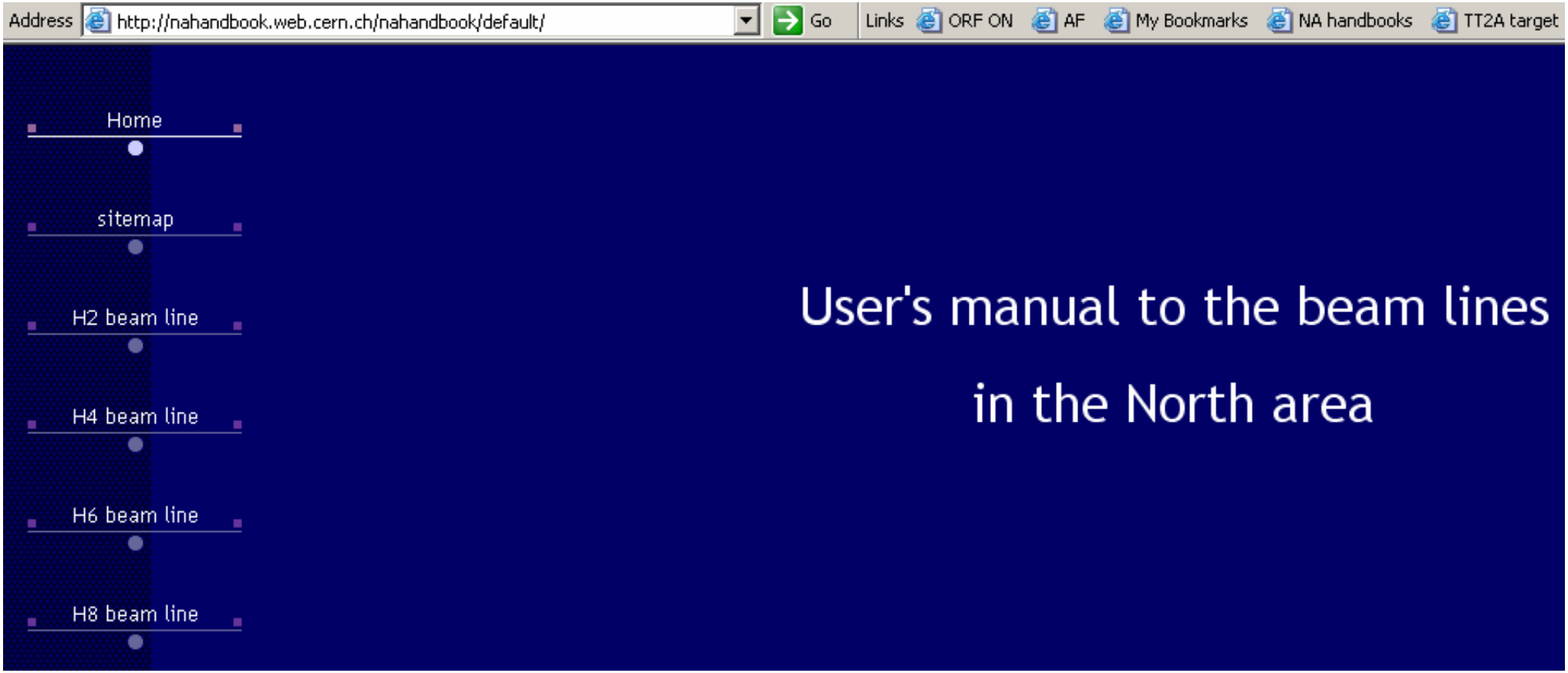
Useful information on H2 can be found in

http://cern.ch/nahandbook



Production of hadrons with low p

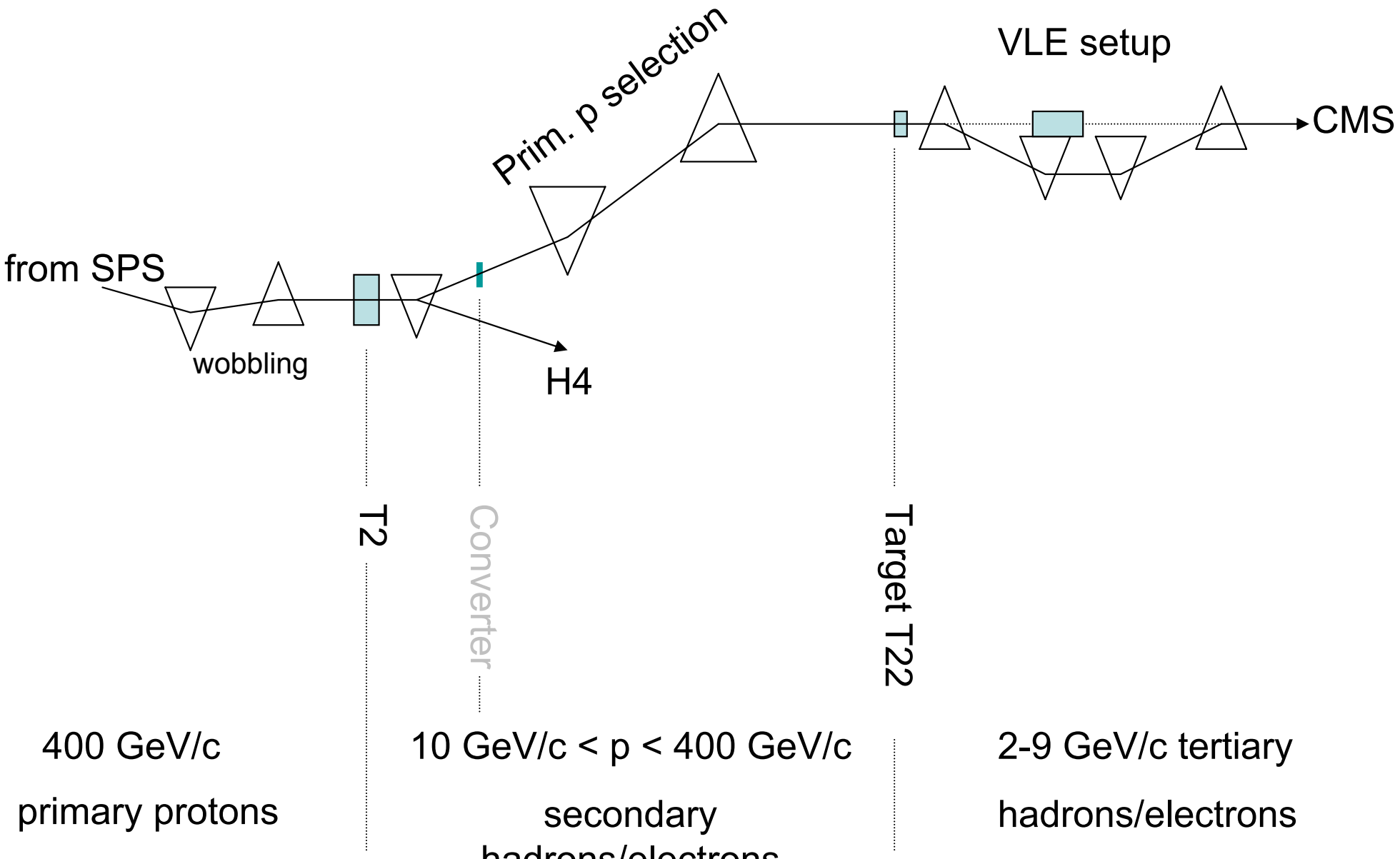
New setup needed due to

- decay time of low energy pions
- low momentum transport limited by current instabilities of beam elements

VLE setup:

- Tertiary production target T22
- Momentum selection: 4 dipoles + collimator
- Beam instrumentation
  - Spectrometer: trigger + beam chambers
  - Cherenkov
- **IMPORTANT:** Dump for secondary high intensity beam
  - Muon background

H2 beam line



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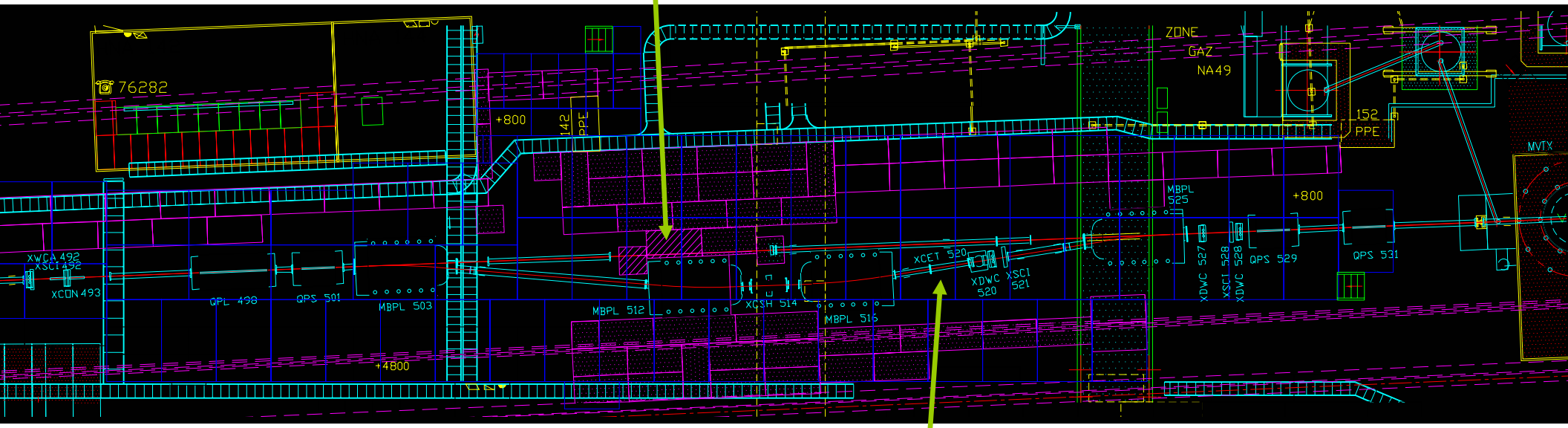
VLE implementation

Zone 142 upstream of NA49 is completely rebuilt!

Dump for primary beam



Target T22

acceptance

dispersion

collimator

Cherenkov

Spectrometer
• 120 mrad

NA49

To H2A: ~90 m

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Construction

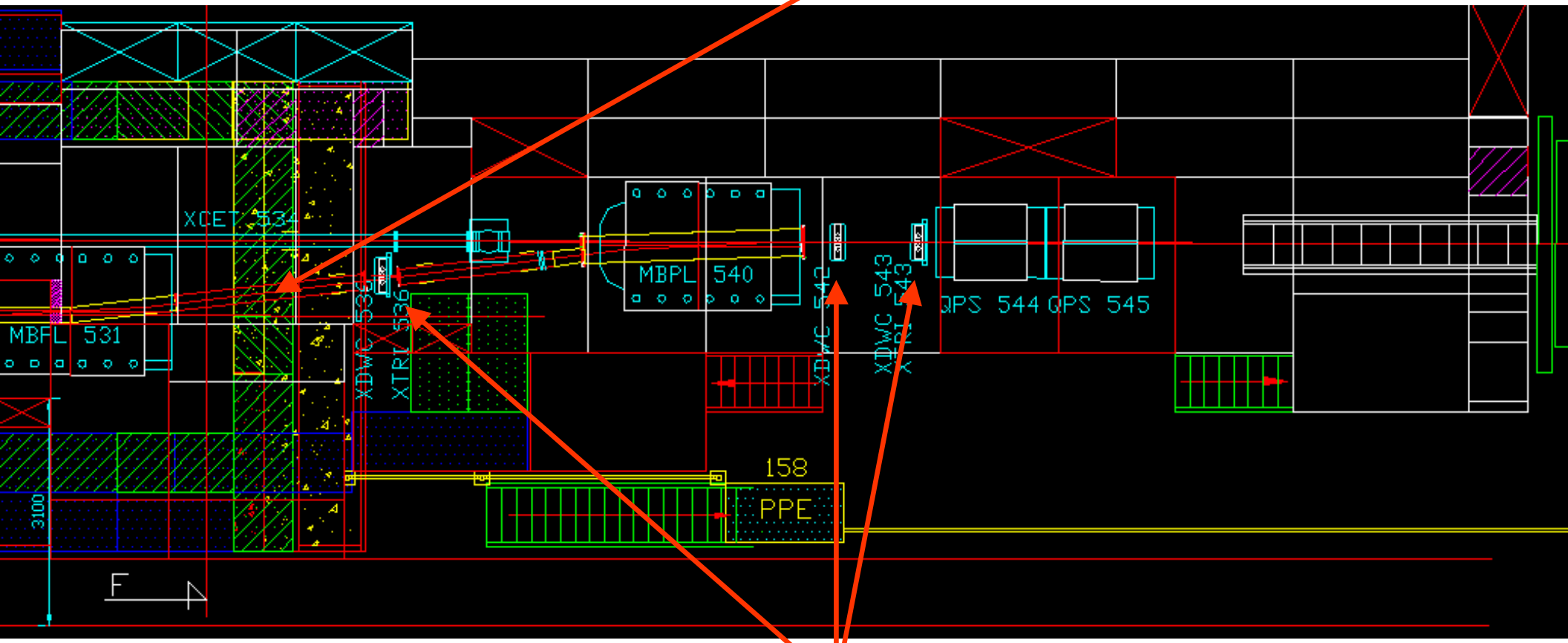
Upstream of NA49: dump region

Spectrometer (layout H8 similar H2)

Cherenkov Counter (2m Helium)

Bend 3

Bend 4



Recombination

~ 9m

Momentum analysis

3x delay wire chambers

2x trigger

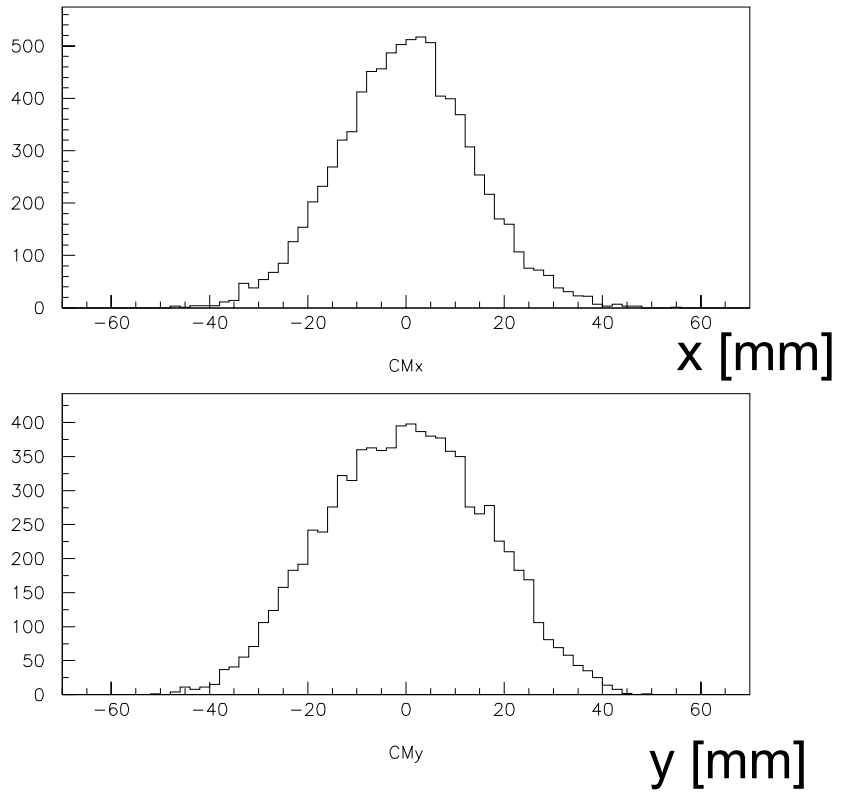
~ 50 m to H2A CMS

x/y & trigger & Cherenkov signals locally in PPE152 available

VLE beam in H2

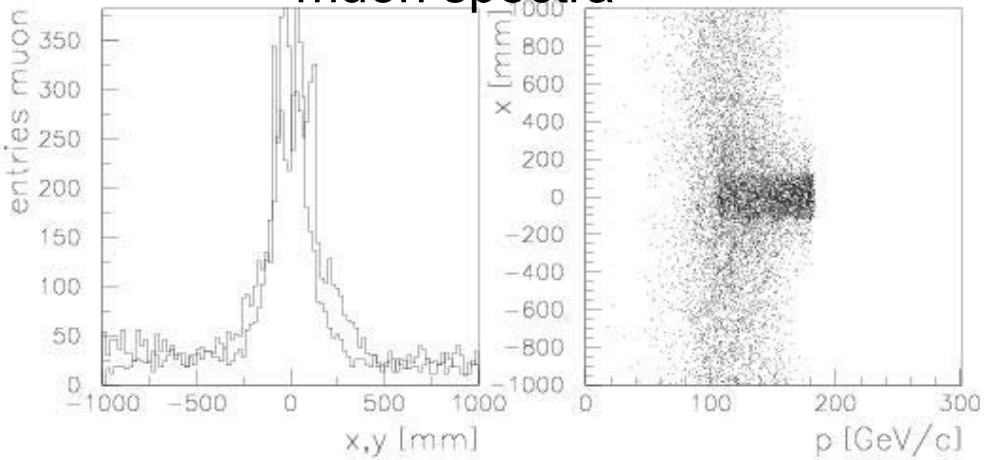
- p=2-9 GeV/c
  - few 100 π/pulse at 2 GeV/c
  - electrons dominating pions (2 GeV/c)
- $\Delta p/p < 4.5\%$ full acceptance
- Beam size @ CMS:

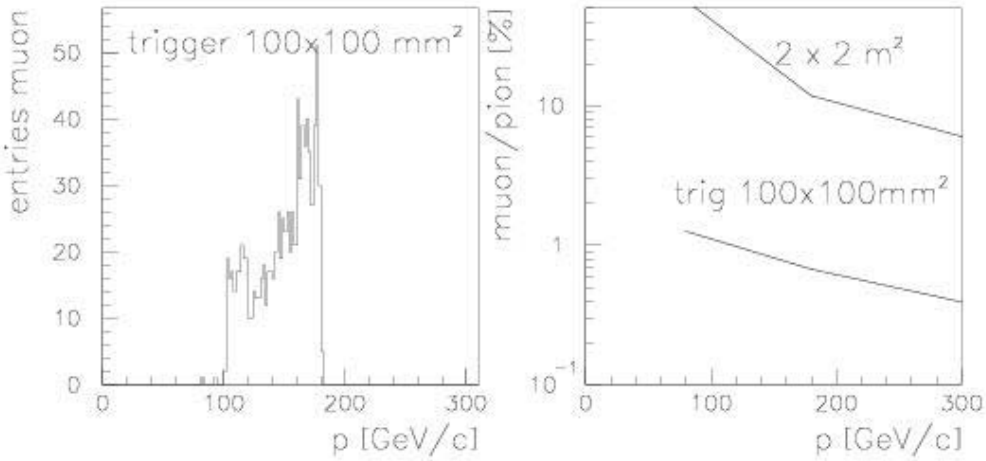
  6 x 8 cm
- μ background:
  - ~ 1 % of primary pions within 10x10cm



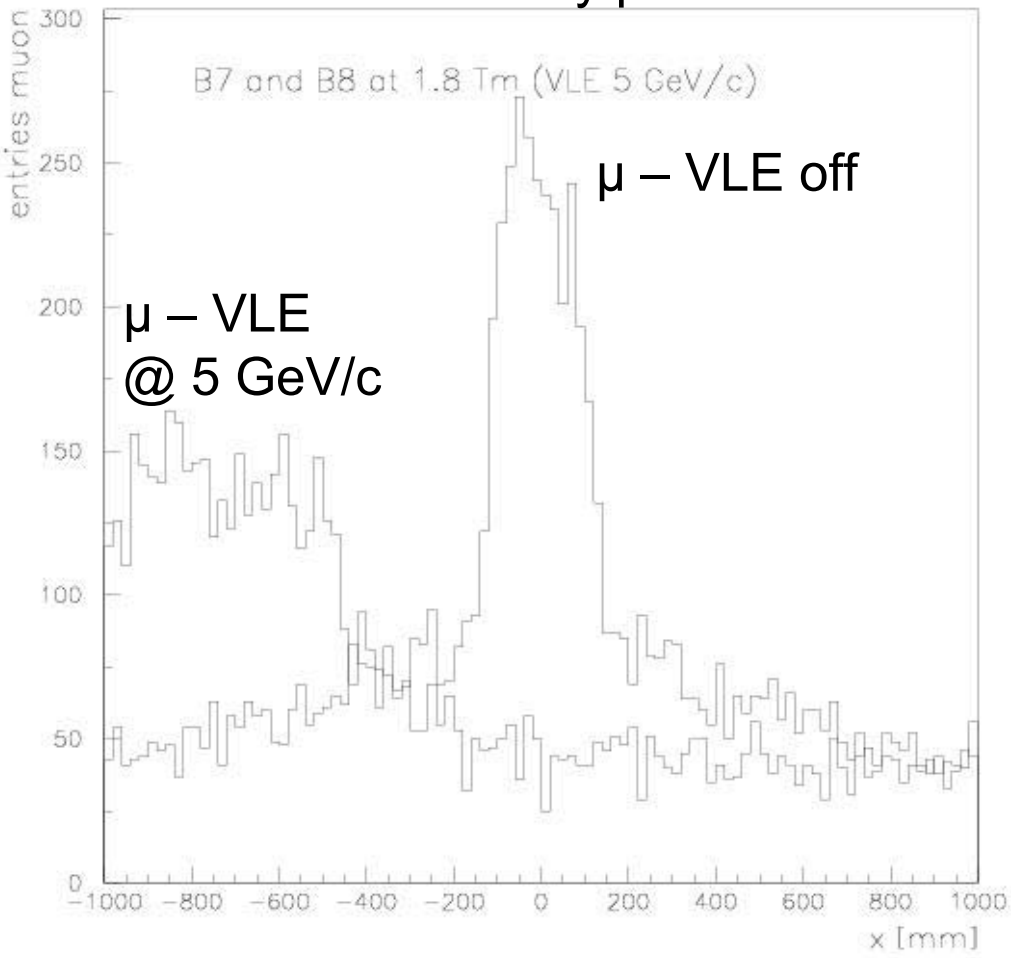
Muon Halo
@ H2A

180 GeV/c secondary pions
→ muon spectra





80 GeV/c secondary pions



Displacement by ~1 m

~1% muons within 10x10 cm²

Setting-up/Tuning

- swap from normal operation to VLE
  - 1 short MD: modify dump+vacuum
  - Minimize total number per year!
- Setting up
  - About 1 day at the beginning
  - collaboration with CMS
  - need calorimeter information
    - e/π ratio, particle ID
    - profiles

Radiation Issues

- few 10^7 hadrons per spill in the secondary beam
  - To achieve reasonable rate in VLE beam at 2 GeV/c
- During VLE operation access to:
  - laser barrack (CMS/Ecal)
  - zone de montage

    will be strictly limited and closed if needed

Impact on ‘normal operation’

- displacement of Quadrupoles
  - Q15-17 moved 6m upstream
  - Negligible impact on high energy beams

H8 VLE beam experience

Run of August 2003

users:

- ATLAS TRT
- ATLAS TileCal

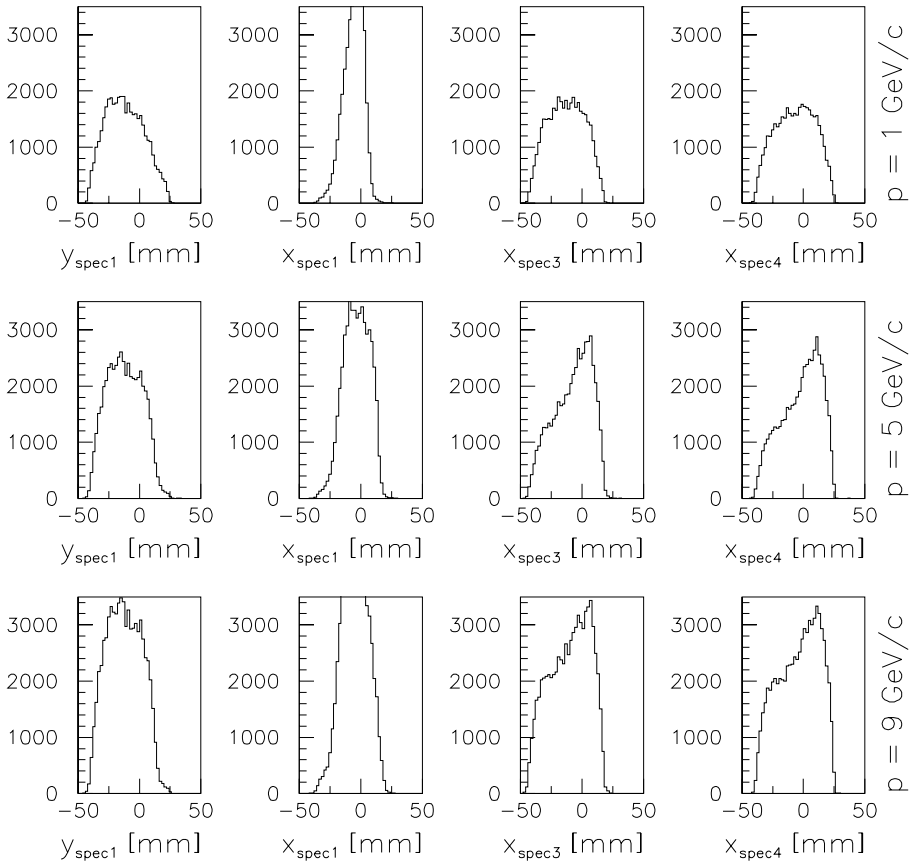
Secondary beam 80 GeV/c pions

Target: lead 15 cm → VLE pions

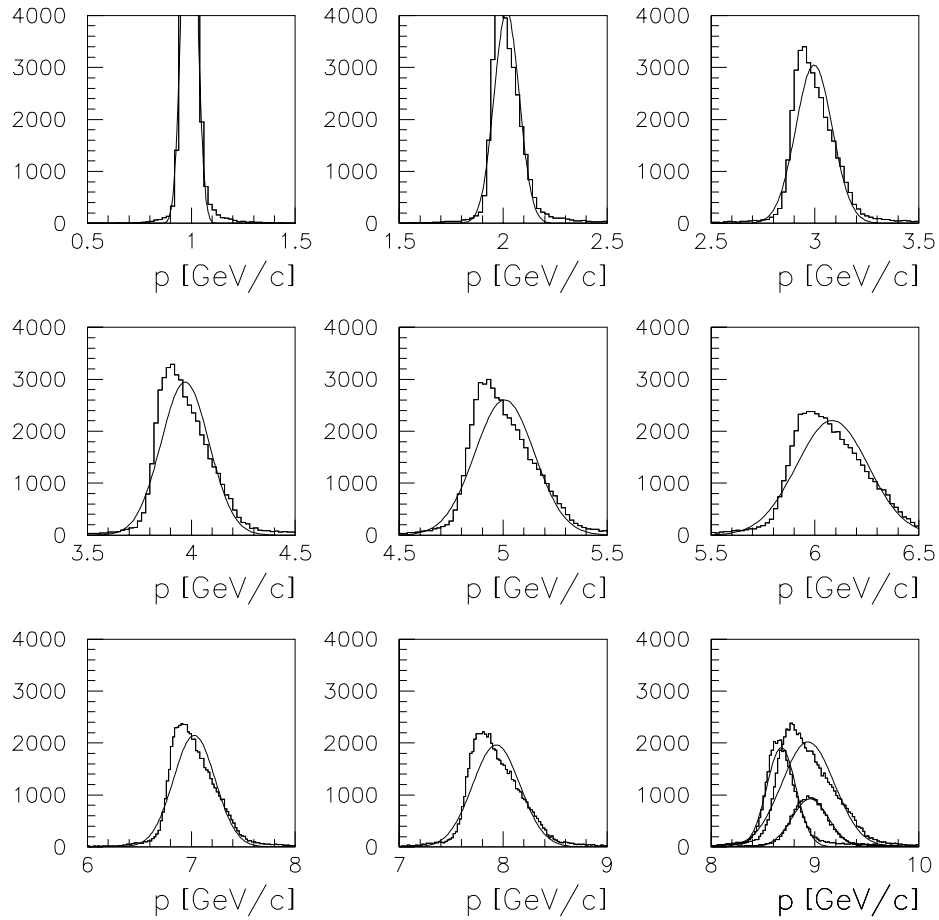
polyethylene 1m or lead 6 mm → VLE electrons

Spectrometer

Beam profiles

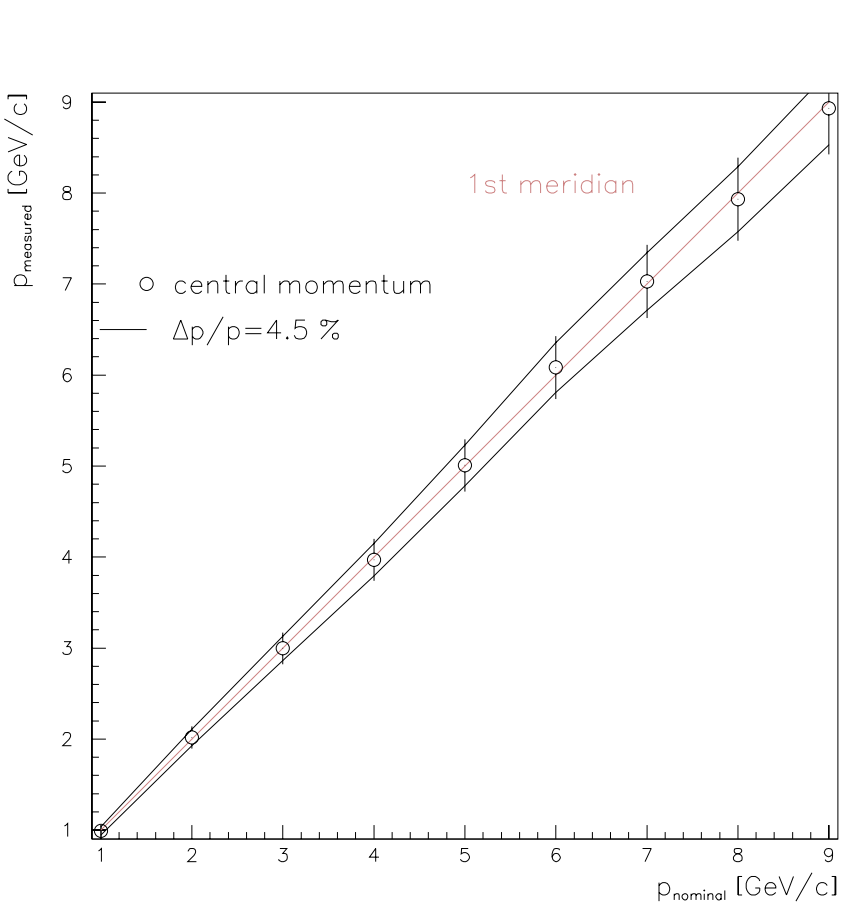


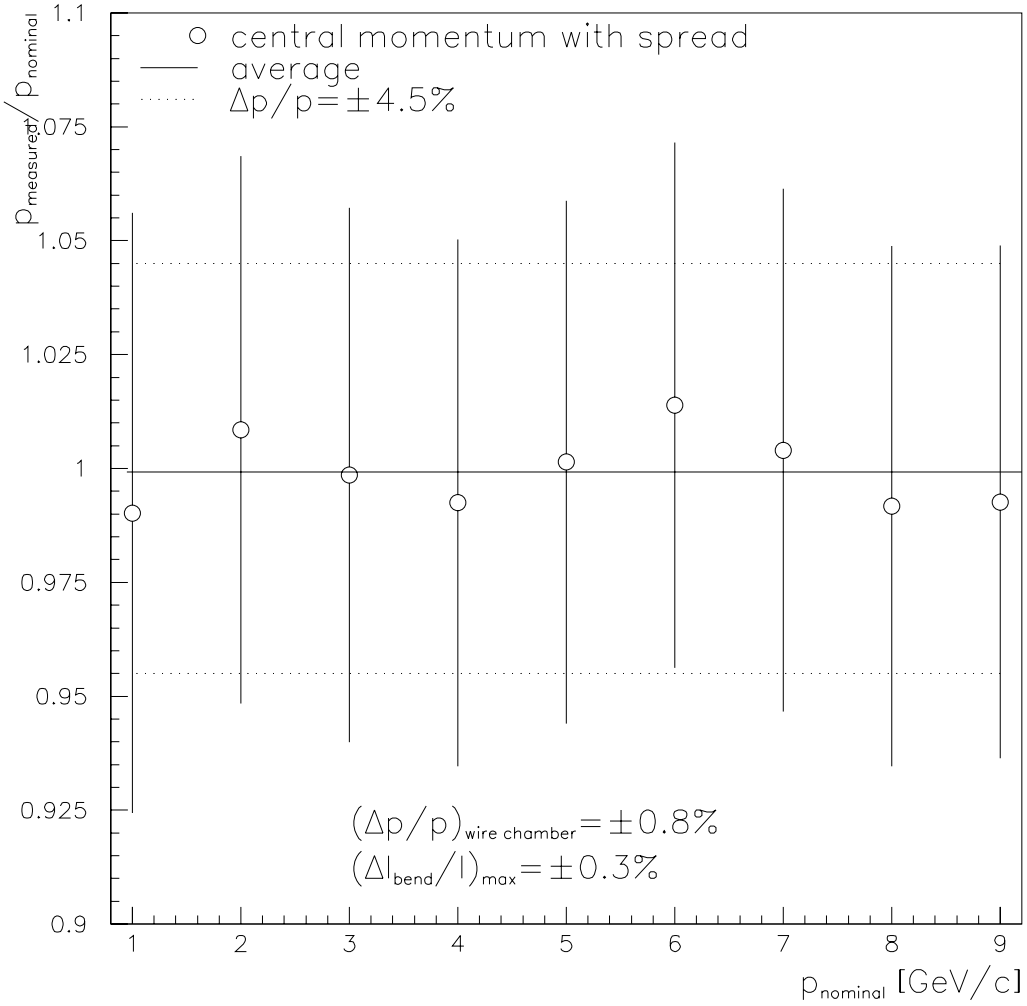
Momentum reconstruction



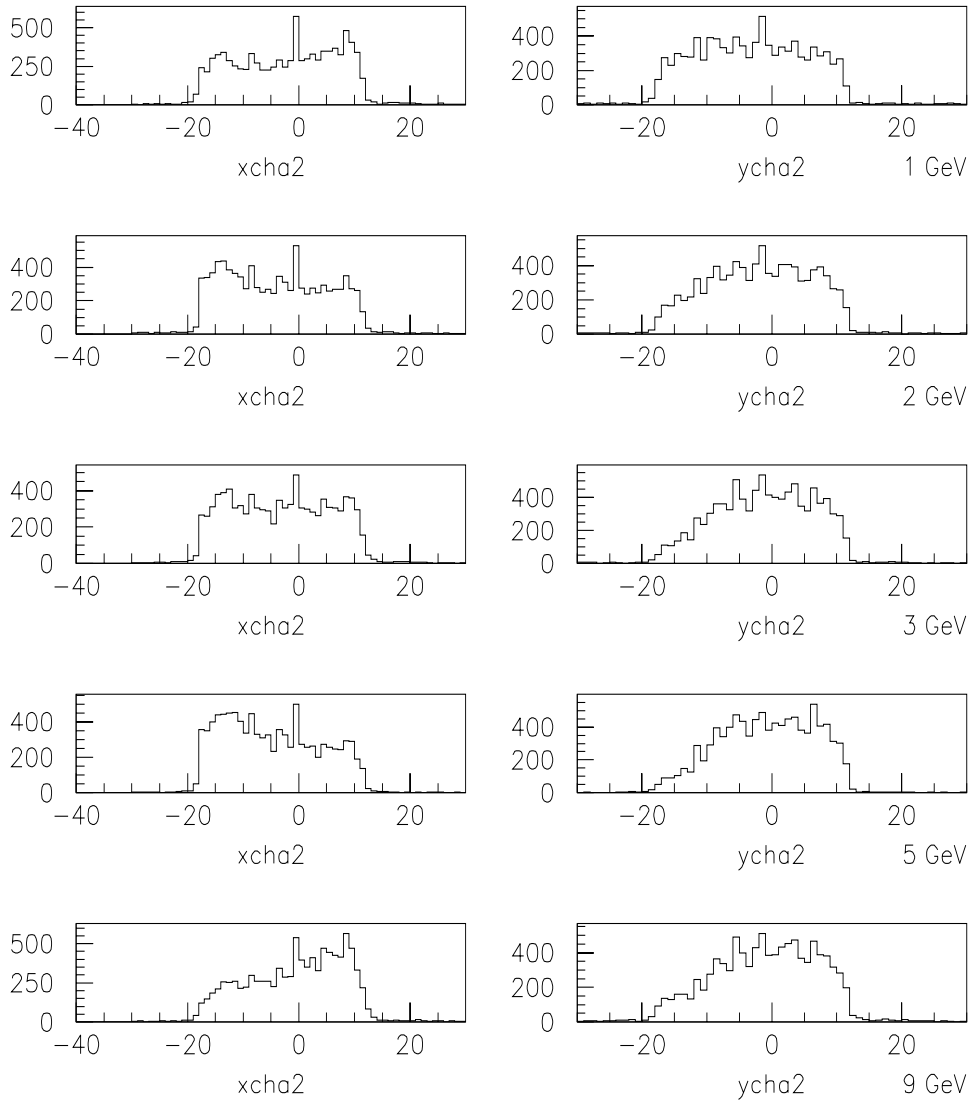
Provided to the experiment

Momentum Spread





Beam Spot at experiment



mm

Limited by trigger 3x3 cm^2

B.Stanek et al., ATLAS TileCal

Particle Rates