

# Large Angle Spectrometer Trigger at COMPASS

DPG-Frühjahrstagung Münster HK 28.3

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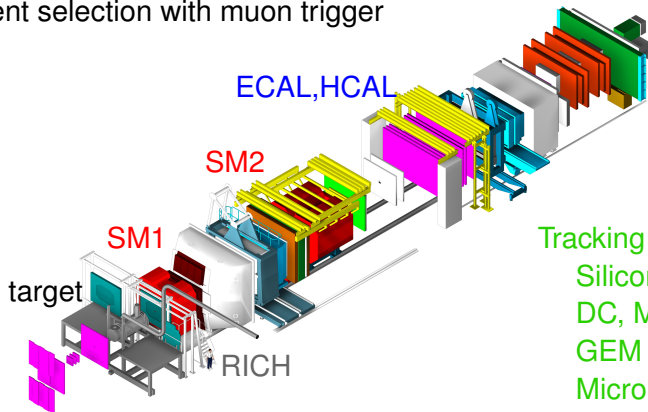


# The COMPASS Experiment

**C**ommon **M**uon and **P**roton **A**pparatus for **S**tructure and **S**pectroscopy  
M2 beamline at SPS located at CERN

Beam: 160 GeV  $\mu$ , pol. 80% and 190 GeV hadron beam (p,  $\pi$ , K)

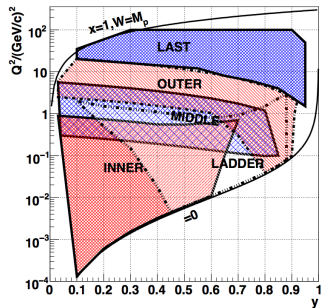
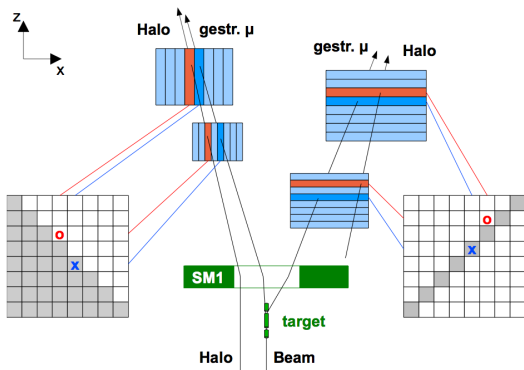
Event selection with muon trigger



Tracking detectors:  
Silicon  
DC, MWPC, Straws  
GEM  
MicroMegas

# Muon Trigger

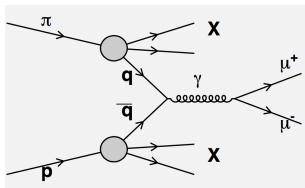
Selection of physical interesting events with 1<sup>st</sup> level trigger  
pairs of scintillator hodoscopes in coincidence  
different triggers for different kinematic regions



# Drell-Yan

## Drell-Yan

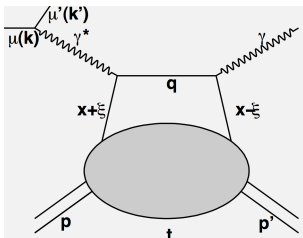
$$\pi + p \rightarrow \mu^+ + \mu^- + X$$



- annihilation of a quark antiquark pair into a lepton pair
- hadrons are absorbed
- transverse dependent quark distribution (pol. and unpol.)
- Triggering on muon pair ( $\mu^+$  and  $\mu^-$ )

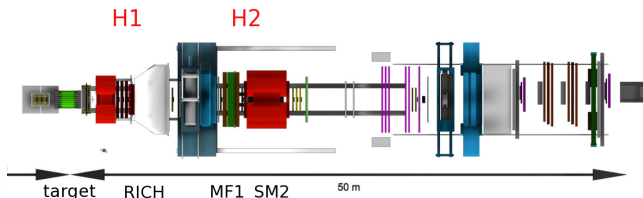
## Deeply virtual compton scattering

$$\mu + N \rightarrow \mu' + N + \gamma$$



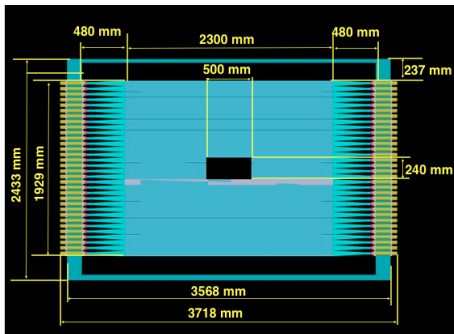
- hard exclusive photon production
- access to **G**eneralized **P**arton **D**istribution (GPD)
- Measuring longitudinal parton distribution and transverse expansion (3D-Tomography)
- DVCS vs. Bethe-Heitler

# Upgrade Large Angle Spectrometer Trigger



- Set up of new trigger (H1,H2) in the large angle spectrometer (target pointing)
- For GPD: triggering on  $Q^2 > 10 \text{ (GeV/c)}^2$  and high  $x_{Bj}$
- For DY: triggering on pairs of muons ( $\pm$ )
- Position: H1 in front of RICH and H2 in front of SM2 and behind the Muon Filter 1
- Size of H2 defined by Muon Wall 1
- Installation end May 2010 and first data taken

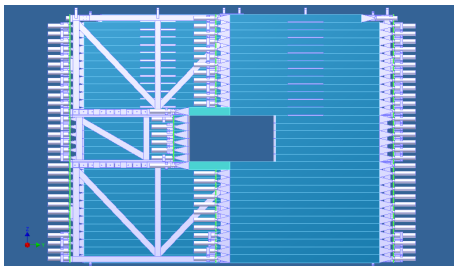
Dimension: 230 cm  $\times$  192 cm



- slabs: 230cm  $\times$  6 cm  $\times$  1 cm
- Thickness due to RICH (Particle ID)
- central hole with air light guide
- Photo multiplier tubes: XP2982

Rohacell casing provides mechanical stability

Dimension: 500 cm  $\times$  420 cm



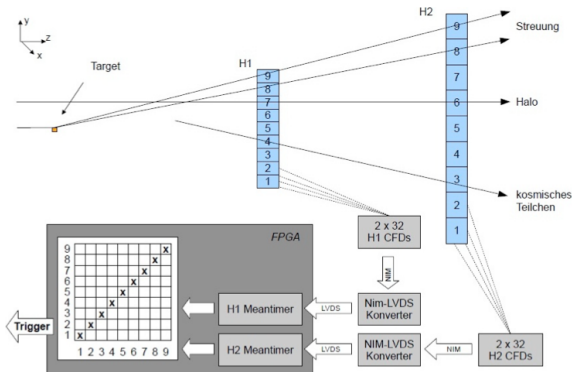
- 252 cm  $\times$  13.6 cm  $\times$  2 cm
- two hodoscope halves
- central hole with bend light guide
- Photo multiplier tube: EMI 9813KB

Mechanical structure made of aluminium

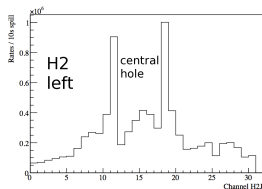
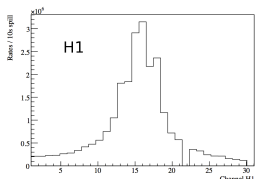


# Electronics

Digital signal to GANDALF-Board (FPGA) for meantimer and matrix (see: Talk from J. Bieling (HK 14.4))



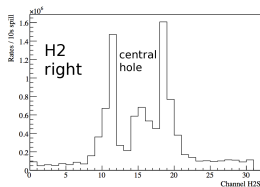
# Rates



Rates produced with the online monitoring tool

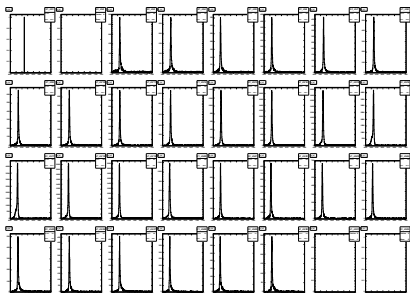
H1 rate  $\approx 300\text{kHz}$

Central hole in H2 visible

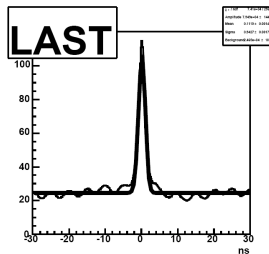


# Timing

## H1 timing



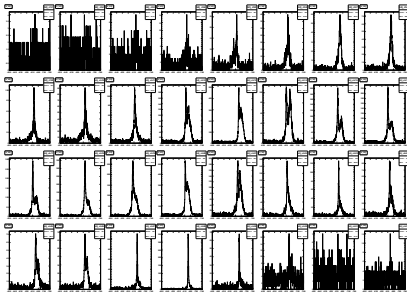
## Trigger timing



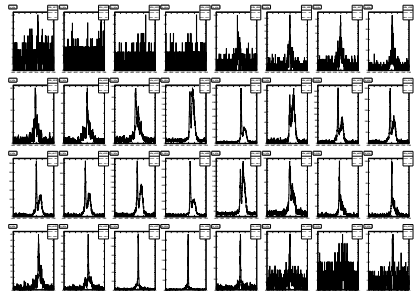
Timing in respect to Beam Momentum Station (BMS)

# Timing

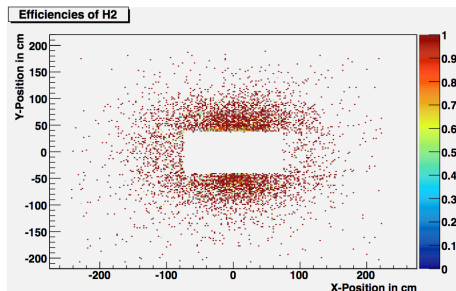
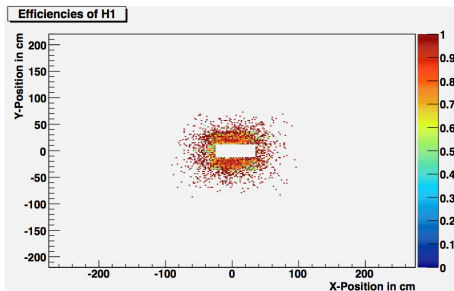
H2 left side timing



H2 right side timing

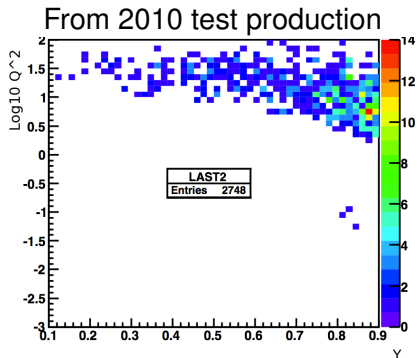


# Efficiencies



Efficiency determined with calorimeter trigger  
Comparison of tracks with hits in hodoscopes

# Kinematics $Q^2$ vs $Y$



- Test production 2010
- Expected kinematic distribution

# H1 and H2



# Outlook

- Two new hodoscopes were constructed and implemented in the COMPASS experiment
- The new trigger is based on known and proven principles
- First look in data (test production) for calibration
- Calibration for mass production of data
- Hodoscope efficiencies are good ( $>95\%$ )
- Deeper look into data to improve purity

Thank you for the attention