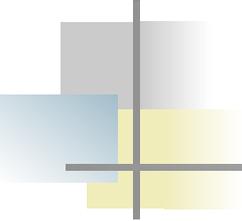


Luminosity Monitor MWPCs. Status and plans.

A.Kiselev

OLYMPUS Collaboration Meeting

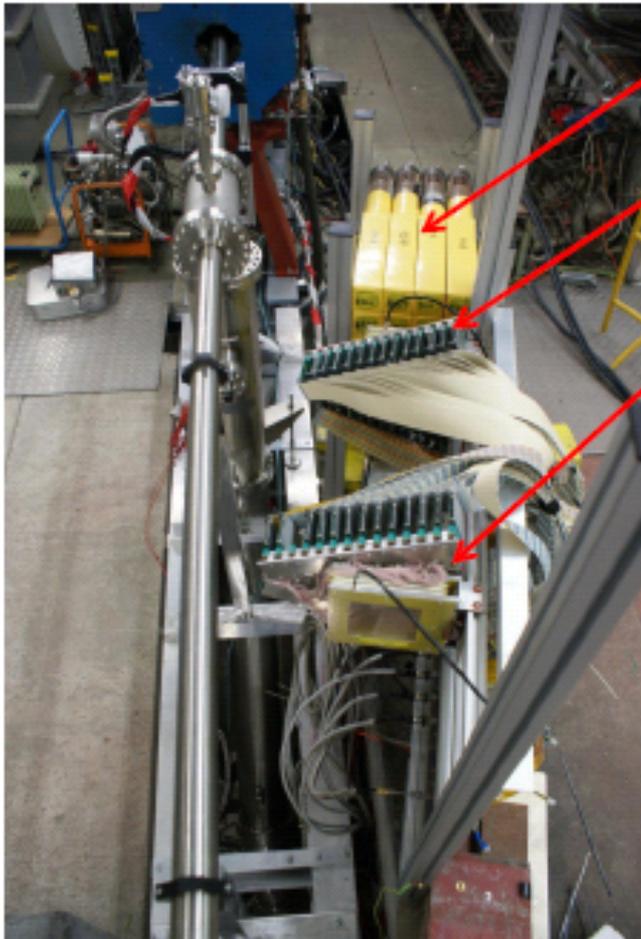
DESY, Hamburg, 26.04.2011



Talk overview

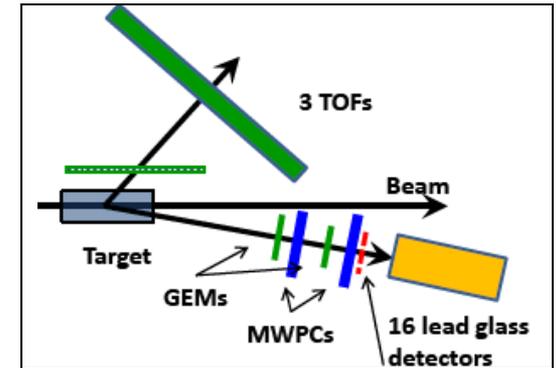
- DORIS test run experience
- Construction plans, further test run(s), etc

DORIS test run: MWPC installation



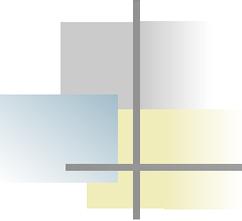
Lead Glass Calorimeter

MWPC#1,2 with the onboard electronics



- 2x prop.chambers (1mm spacing, XUV)
- 864 channels total
- modern CROS3 electronics (Gatchina)

→ ~1/3 of the final setup!



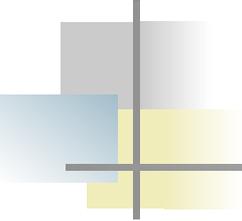
Test run: MWPCs & Bonn DAQ

→ CROS3 is a PCI-based readout system, hard to interface to the Bonn DAQ!

→ solution found:

- Use SC150 Gatchina experiment DAQ "as is" (standalone)
- Interface to the Bonn DAQ via Struck VME controller SDRAM:
 - Arrange a handshake
 - Write out complete MWPC (& later TDC as well?) events
 - Pass Bonn DAQ commands through the same channel

→ yet a better DAQ-to-DAQ synchronization is needed!



Test run: MWPC alignment

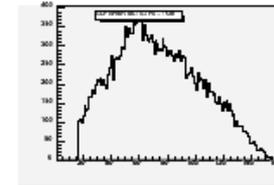
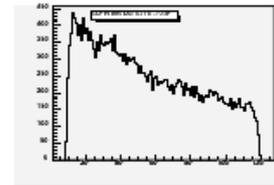
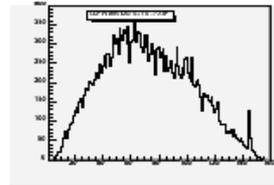
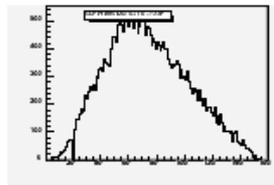
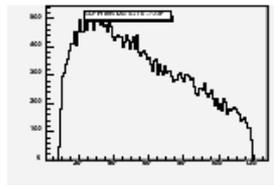
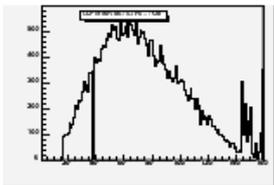
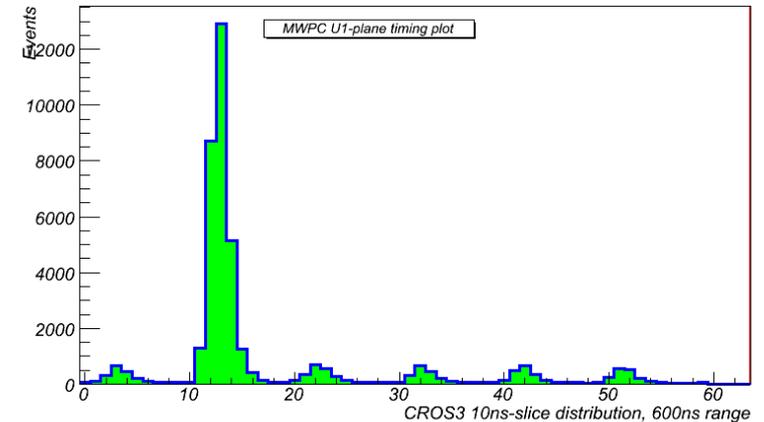
- sensitive planes vs frames surveyed on the optical stand during manufacturing
- each prototype chamber has 3x bushings for optical targets
- surveyed by DESY staff using FARO laser tracker
- alignment/survey data analysis results:
 - survey targets manufacturing accuracy $\sim 170\mu\text{m}$ ($\chi^2/\text{ndf} \sim 6.2/6$)
 - MWPC@DORIS 3D positioning accuracy $< 150\mu\text{m}$ per XYZ-projection

→ pretty much sufficient for rough tracking!

Test run: MWPC performance

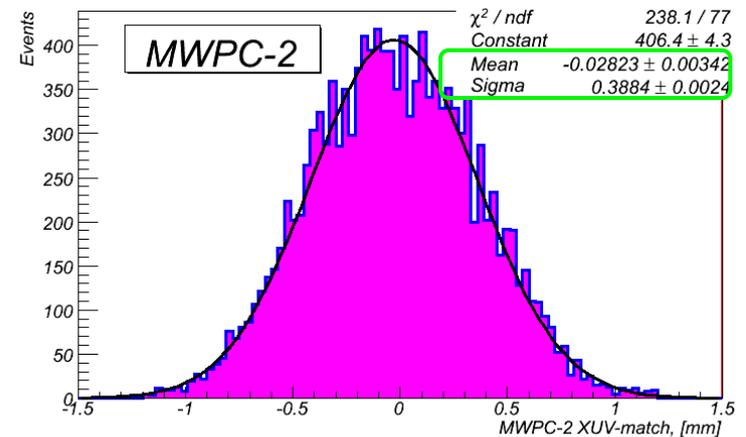
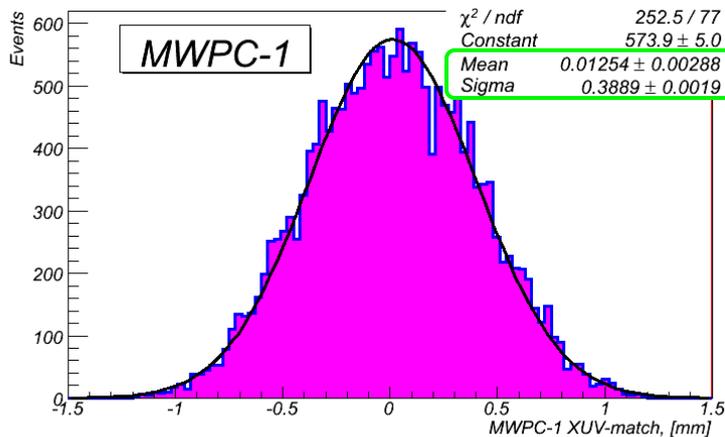
→ last Feb' 2011 run #285: ~60mA after injection, Bhabha electrons flux ~700kHz:

- almost no noise
- clear timing correlation with the trigger
- very low leakage currents (few μA at most)
- rather low hit multiplicities
- no sensitivity to synchrotron background
- on-board electronics works fine in “partly off-board” configuration
- useful acceptance $\sim 105 \times 105 \text{mm}^2$ confirmed
- relatively low efficiency ($\sim 95\%$)



Test run: MWPC tracking basics

there should be a match between $X_x=X$ and $X_{uv}=f(U,V) \rightarrow$ check on that!

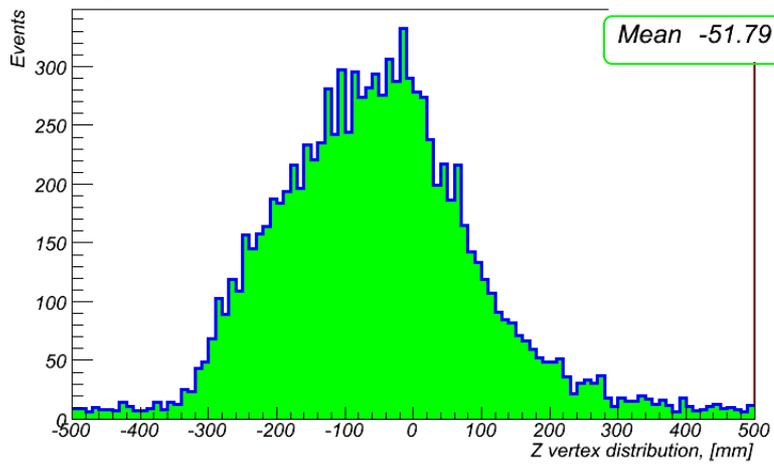


- very small offsets from 0 \rightarrow internal alignment is indeed very good
- $X_x - X_{uv}$ width of $\sim 390 \mu\text{m}$ perfectly matches expected value ($\sim 375 \mu\text{m}$)
 \rightarrow one can assume that a single chamber module has $\sigma_x \sim 185 \mu\text{m}$ and $\sigma_y \sim 410 \mu\text{m}$

Use simple tracking logic for now:

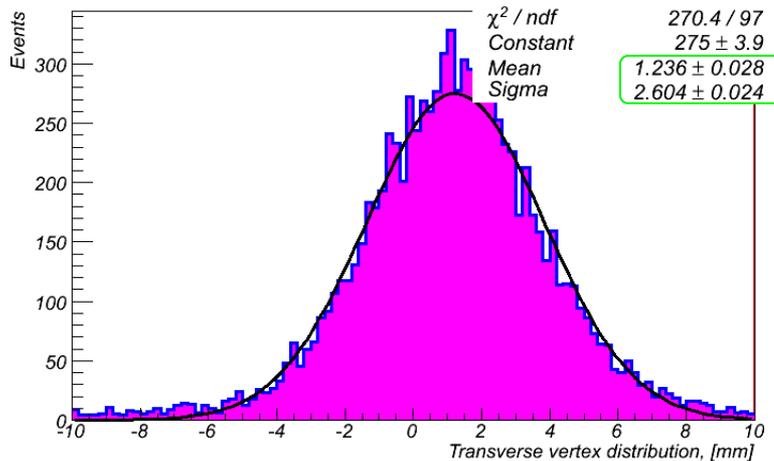
- \rightarrow select events with unique XUV-combinations within $\pm 1.2\text{mm}$ in each chamber
- \rightarrow using survey results construct two 3D space points
- \rightarrow build 3D track out of this pair of space points

Test run: MWPC vertex reconstruction



→ +/-500mm full scale

- cross-section-modulated triangular ep-vertex distribution clearly seen
- ~ -50mm center-of-weight offset (expected?)



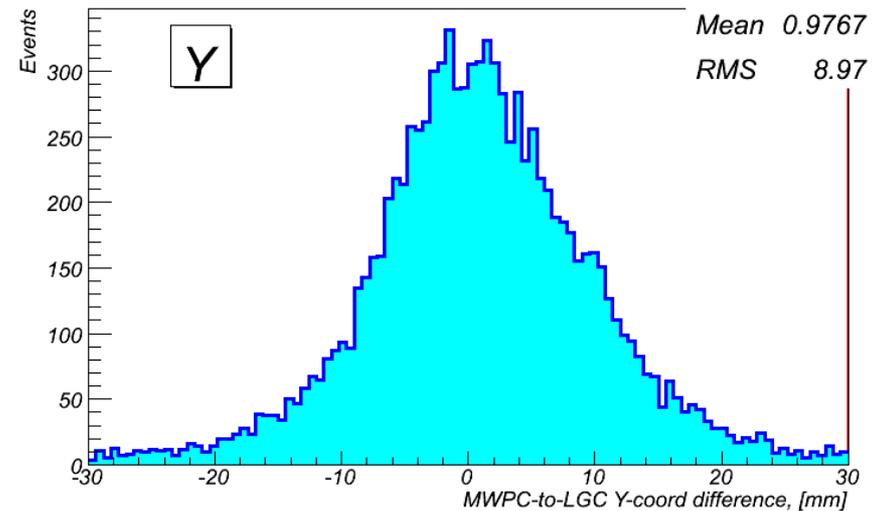
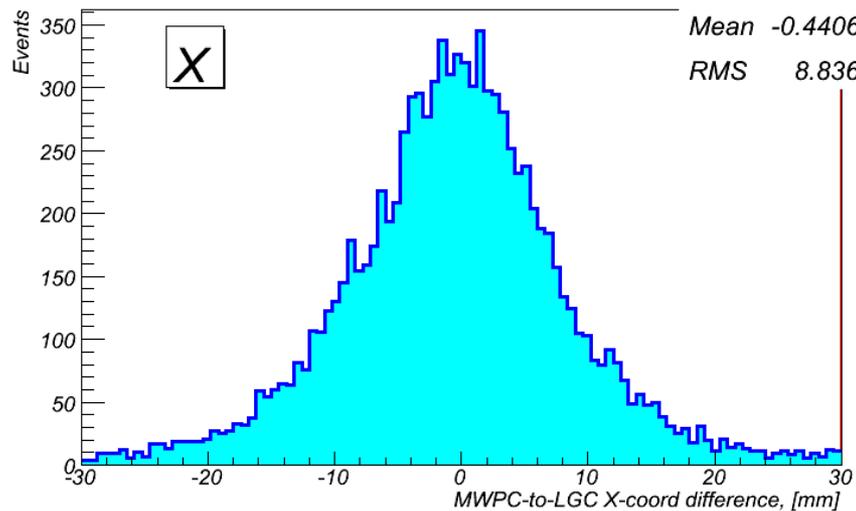
→ NB: +/-10mm full scale here!

- ~2.6mm transverse track-to-beam resolution (very reasonable: resolutions, material, etc)
- ~1.2mm vertical beam line offset (unexpected)

→ remaining alignment issues?

Test run: MWPC-LGC matching

NB: use log-weighting a-la-HERMES for LGC cluster coordinate calculation

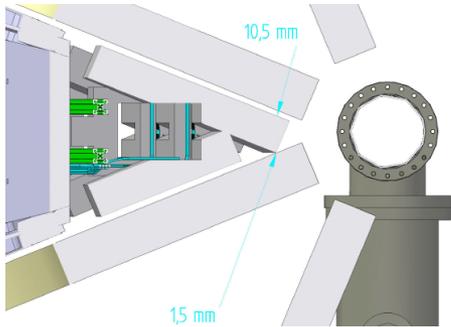


- <1mm offsets in both XY-projections
- $\sigma \sim 9\text{mm}$ with quasi-gaussian shapes, not that bad!

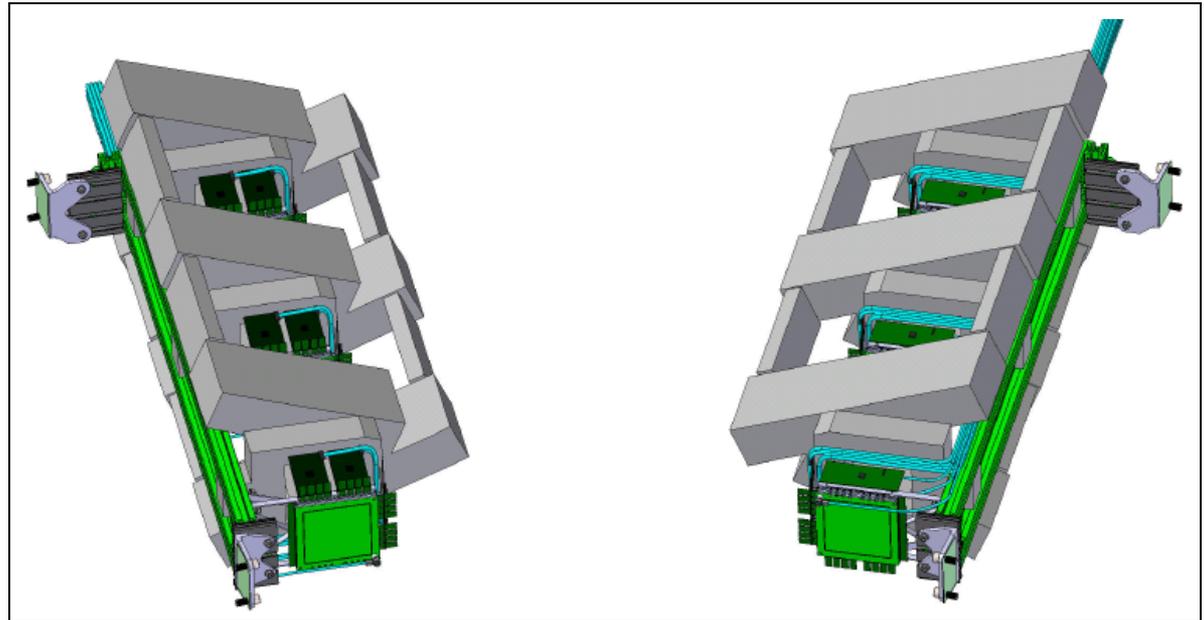
→ there is also a perfect match between MWPC tracks and LGC TDC data!

MWPC design considerations

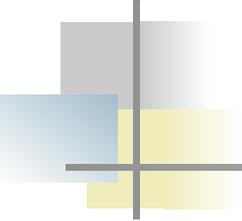
CROS3 readout
for the final setup
→ require design
modifications!



→ fine tuning in progress



- everything seems to fit together → will check in May ☺
- with CROS3 have more freedom to vary Z-positions ...
- ... but also there are more problems with the cables



Tentative schedule (as of Fall'2010)

First 3 chambers ready	Dec 2010
Test run installation	Dec 2010 - Feb 2011
Test run	Feb - Jul 2011
Remaining chambers ready	by Jul 2011
Final installation	Jul - Aug 2011
Commissioning	Aug - Dec 2011