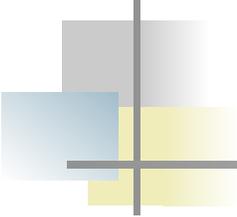


Monte-Carlo simulations and reconstruction for 12-degree ep-elastic Luminosity Monitor

A.Kiselev

OLYMPUS Collaboration Meeting

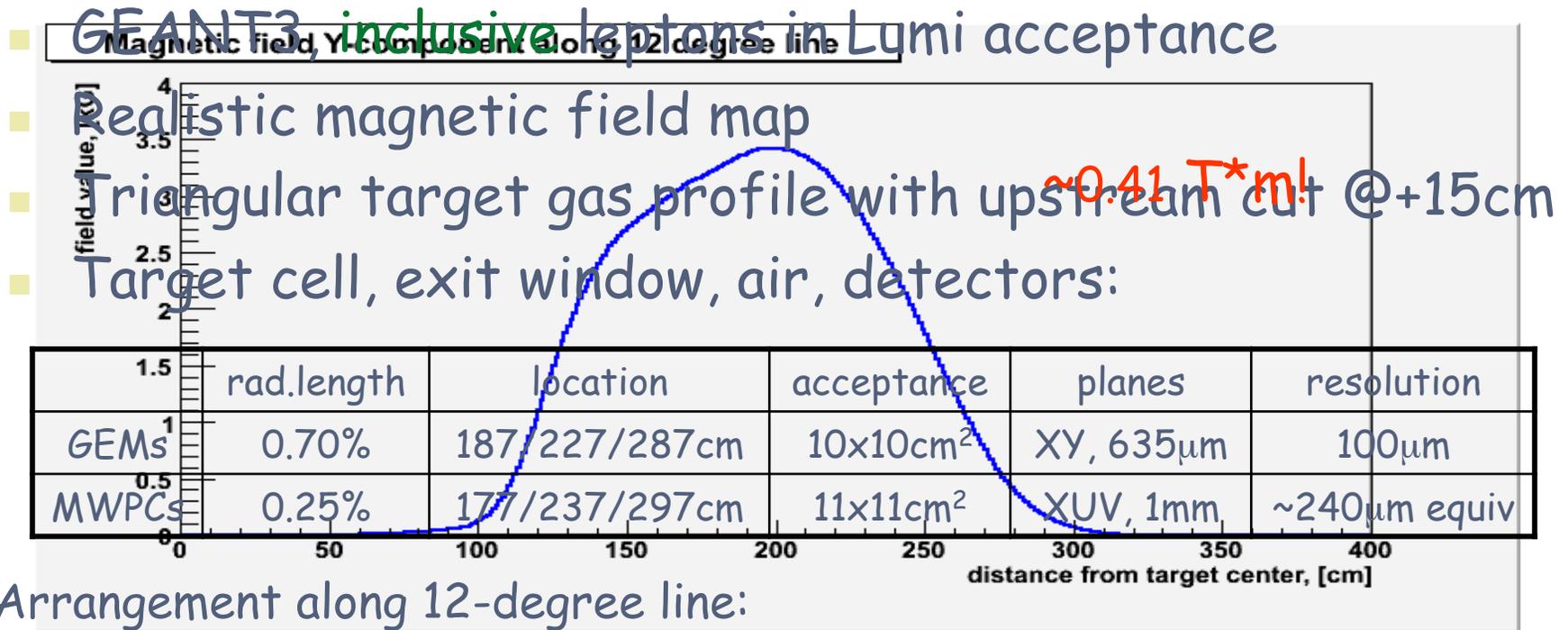
DESY, Hamburg, 24.02.2010

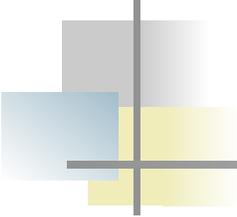


Layout of the talk

- Setup of the simulation
- Kalman-filter-based lepton track reconstruction
- Acceptance, counting rates
- Resolutions with and without MWPCs
- Discussion and future plans

Monte-Carlo setup





Track reconstruction

- Kalman-filter-based:
 - local track following technique
 - Runge-Kutta steering in magnetic field
 - 3D geometry of registering planes
 - precise accounting of scattering materials
 - “best possible” track parameter estimate + covariance at any location along the trajectory ...
 - ... in particular at the primary vertex: $\{x, y, s_x, s_y, 1/p\}$
- Ported from HERMES reconstruction code

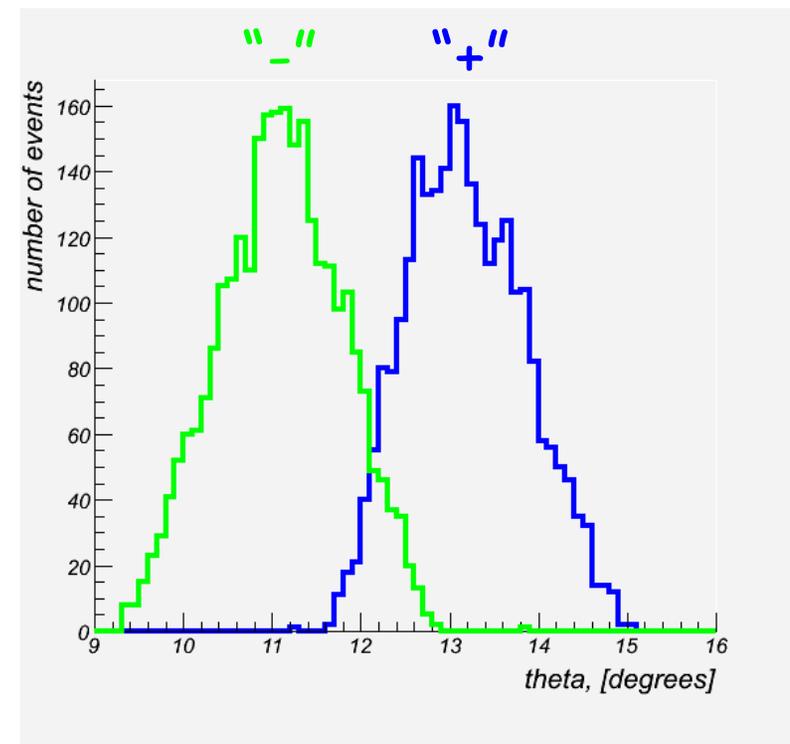
Acceptance, counting rates

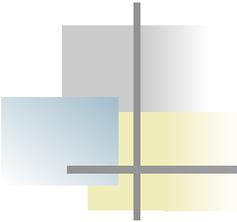
→ 2 very different configurations depending on the
→ relative sign of lepton charge and magnet polarity:

	"+"	"-"
solid angle, [msr]	0.76msr	0.81msr
$\langle z \rangle$, [cm]	-3.5cm	-0.9cm
$\langle \theta \rangle$, [degrees]	13.2	11.1
ϕ range, [degrees]	$\sim[-4..4]$	$\sim[-6..6]$
counting rate, h^{-1}	$\sim 20k$	$\sim 50k$

If this is considered to be a problem:

- run at a fraction of toroid magnetic field?
- go to smaller installation angle (< 10 degrees)?
- use moveable frame (set different installation angles for "+" and "-" configurations)?





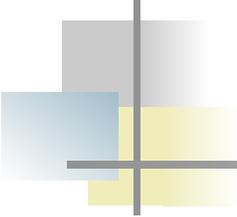
Resolutions

→ use "+" configuration of lepton charge and magnet polarity here

	Bdl, Tm	σ_x , mm	σ_y , mm	σ_{sx} , mrad	σ_{sy} , mrad	σ_p/p , %
#1: GEMs alone	0.22	3.14	1.29	2.00	1.06	3.67
#2: GEMs + MWPC material	0.22	3.28	1.39	2.08	1.10	3.85
#3: GEM material + MWPCs	0.26	3.46	1.82	2.21	1.22	4.19
#4: GEMs + MWPCs together	0.26	2.64	1.36	1.76	1.09	3.28

MWPC installation:

- does not affect GEM resolutions too much (#2 vs #1)
- can actually provide comparable resolutions by itself (#3 vs #2)
 - combined setup (#4) would have superior resolutions, as well as provide reliable tracking efficiency estimates and robustness against noise hits and ghost tracks



Future plans

- Hardware:
 - decide, do we build MWPCs for Lumi detector or not
- Software:
 - switch to the official GEANT4 Monte-Carlo
 - implement proton tracking for Lumi detector
 - develop proton-lepton track matching algorithm, event selection
 - extend the same scheme to the events in the “main” acceptance
 - make use of survey and alignment information