Detector Design Considerations for a TESLA+HERA e^-p Collider

Detector and Infrastructure Group

L. Bauerdick

U. Katz

M. Klein

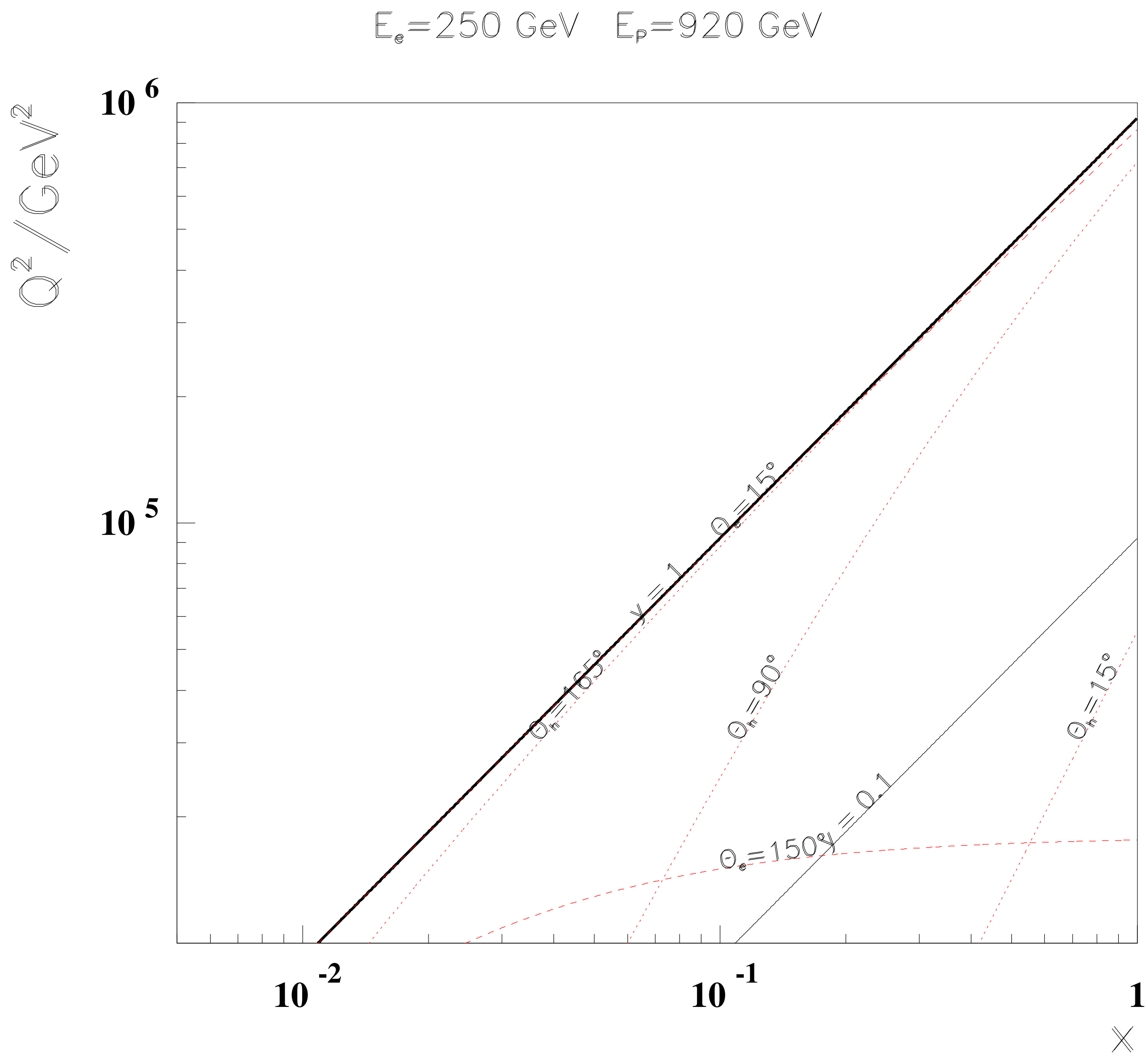
D. Pitzl

Jim Crittenden
Physikalisches Institut
Universität Bonn

Some Facts

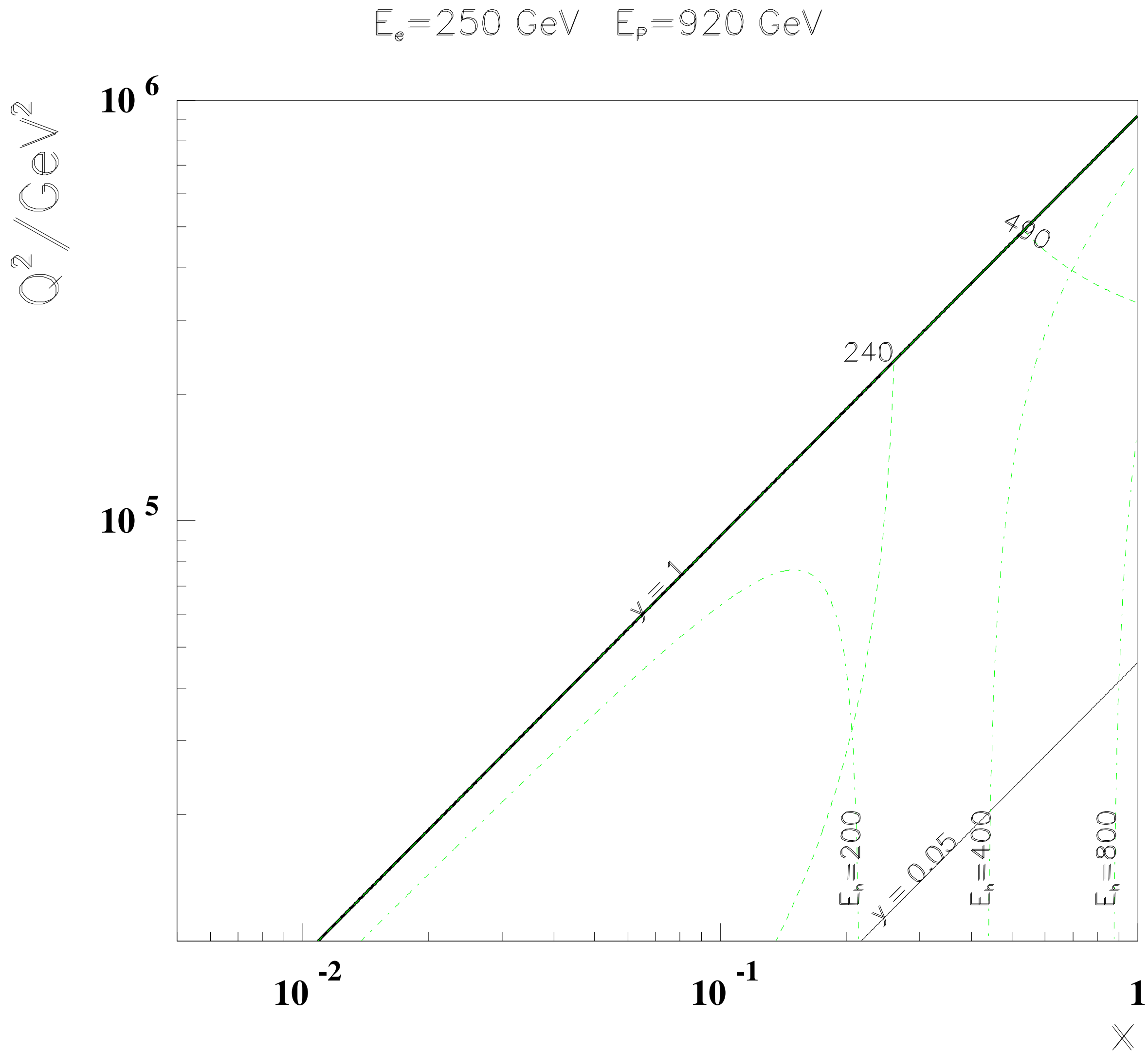
	HERA	TESLA+HERA
$E_e \times E_p$	27.5×920	250×920
$\sqrt{s}$	320 GeV	960 GeV
η_{kinlim}	7.7 units	8.8 units
γ	3.0	1.2

High-Q^2 Region: Contours of Fixed Angle



$\Rightarrow$ Need wide angular coverage for hadrons

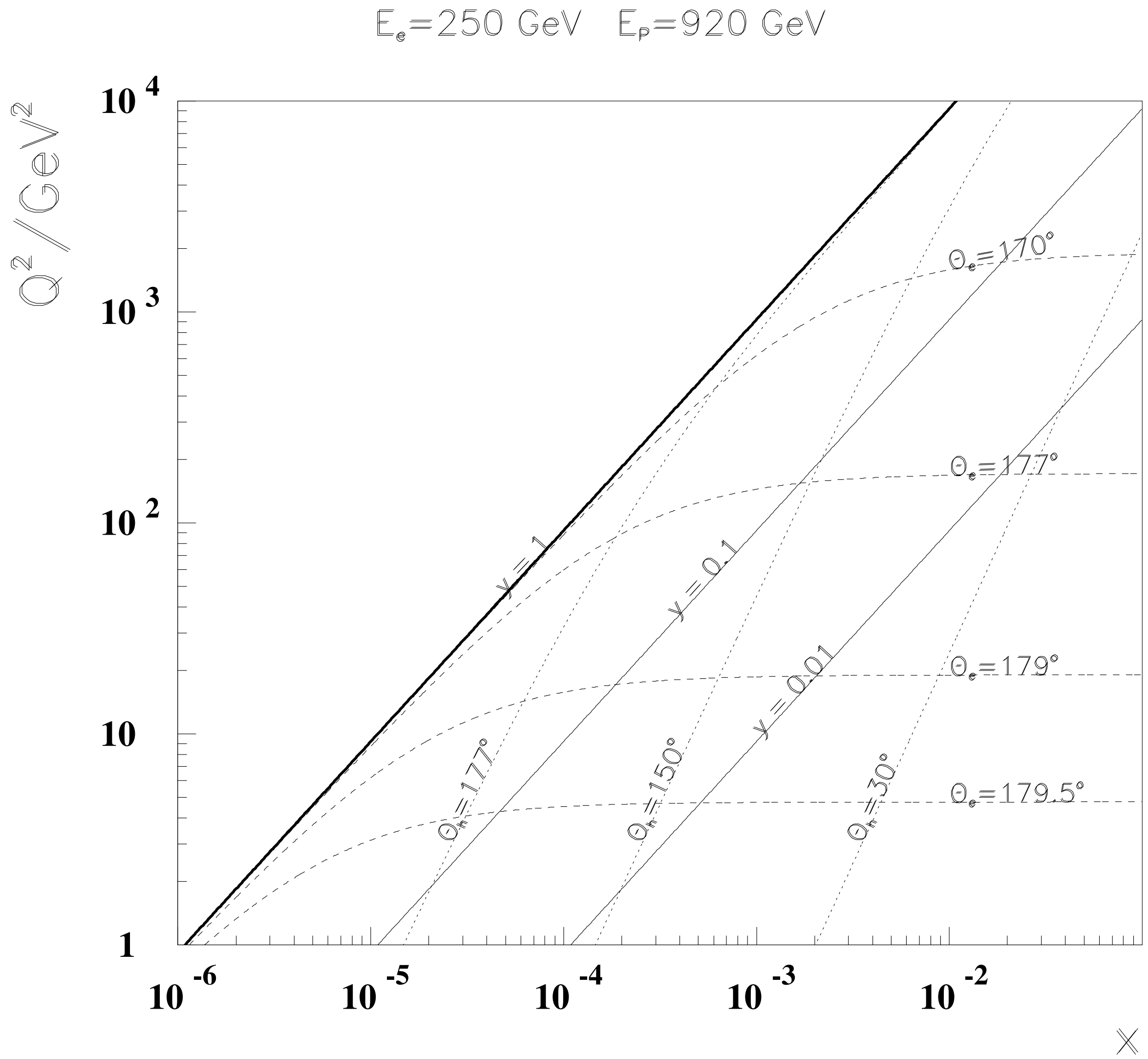
High-Q^2 Region: Contours of Fixed Energy



⇒ Kinematic peak spans wide Q^2 range

⇒ Hadron energies comparable to HERA

Low-x Region:
Contours of Fixed Angle



⇒ Low Q^2 (low x) range very difficult !

Some Tough Issues

- Need close interaction with accelerator physicists
- Backward region requires extremely fine angular resolution
  $\Rightarrow$ May need a momentum-analyzing spectrometer
- Hermetic calorimetry required for $E - P_z$ (y_{JB})
- Time structure very different from HERA
  TESLA 6 kHz $\Rightarrow$ 160μs between bunches
- Organizational staging with TESLA
- Best way of measuring luminosity?

Some Questions

- Radiative corrections
- Hadrons in backward region
- Top and Beauty cross sections
- Beam magnet configurations (also beam dump)
- Crossing angle
- How isolated is scattered electron?

Low-x Region: Contours of Fixed Energy