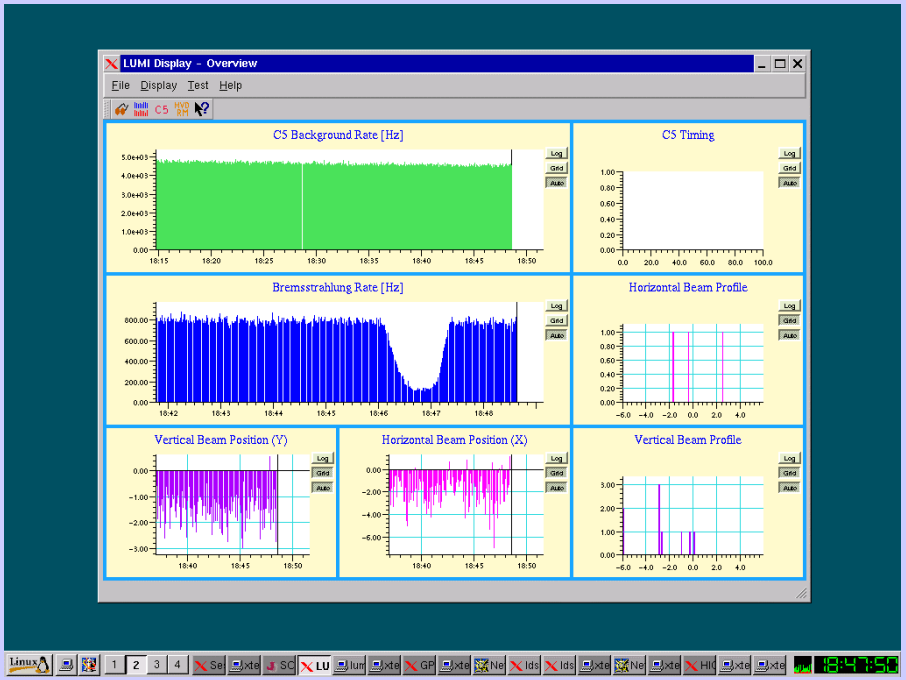
ZEUS Status and Results

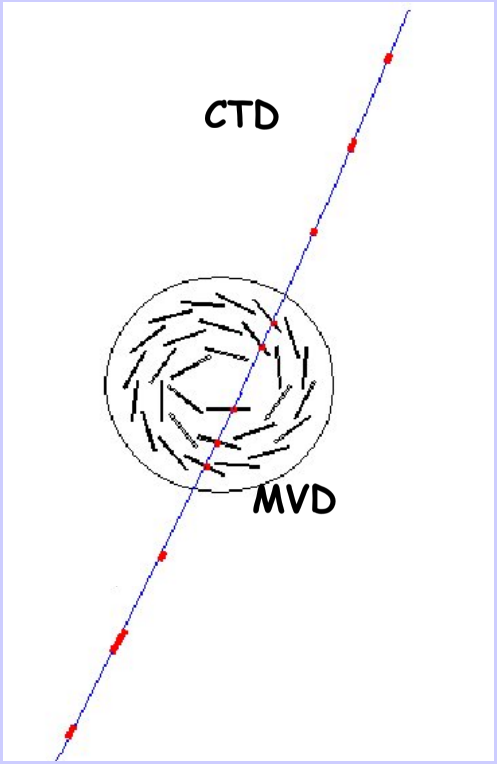
DESY PRC, 25/10/2001
Roberto Carlin, Università di Padova

- Status of the upgrade
- Searches
- Heavy Flavours
- QCD
- Diffraction
- Conclusions



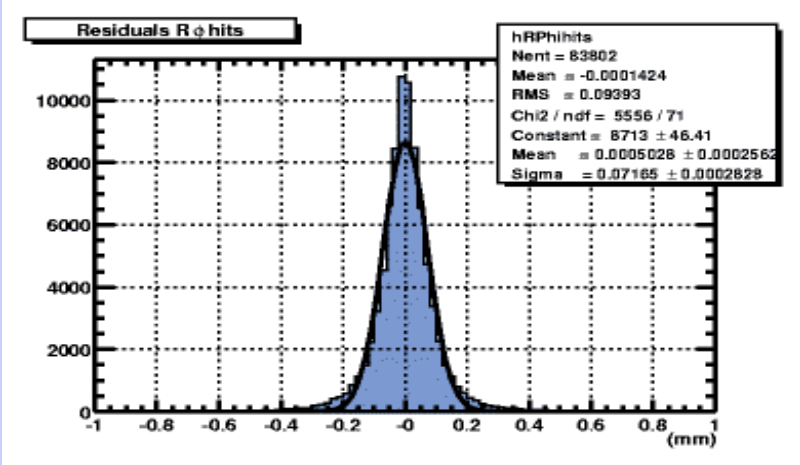
Upgrade: status of MVD

- MVD – Short, successful cosmic ray run after installation and complete recabling



- Detector timed in and operated well
- All hardware, readout and second level trigger components ready
- Waiting for luminosity

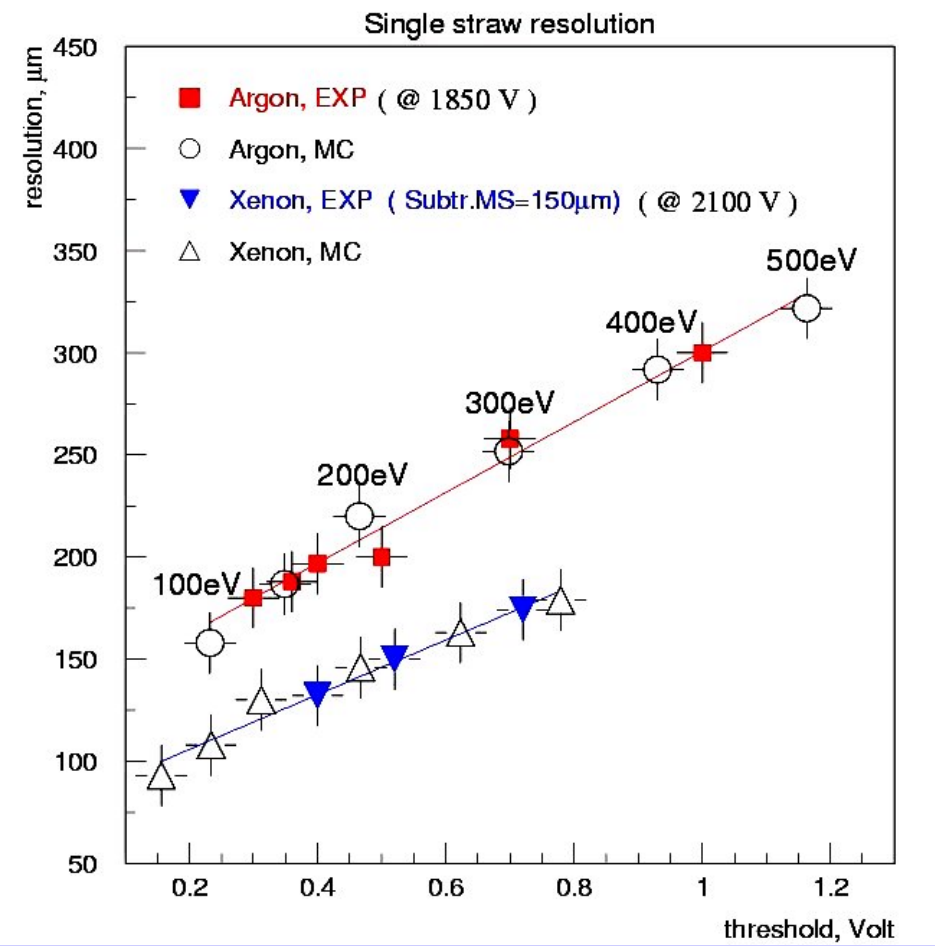
- MVD – Detailed analyses on the system test data



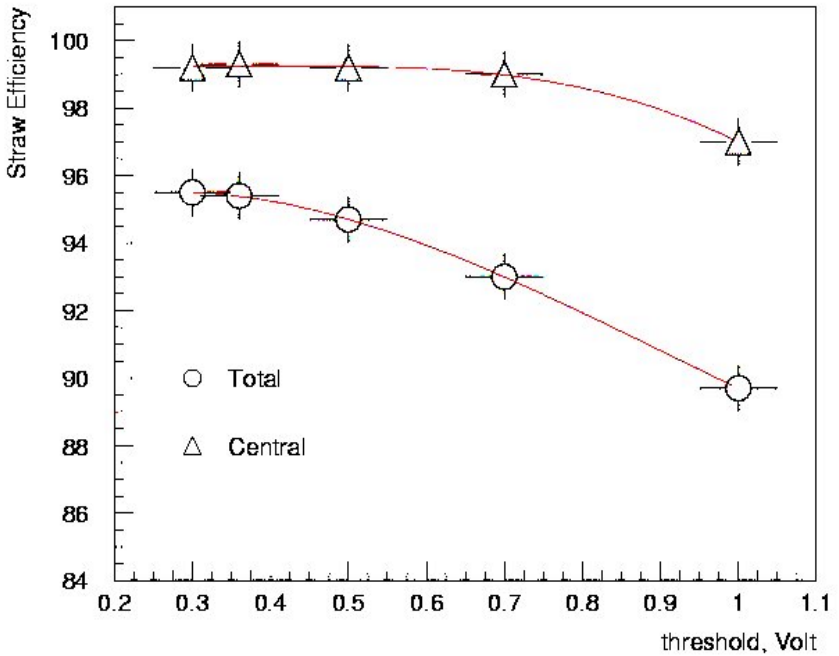
- Alignment residuals from track fit:
  - σ_ϕ=70 μm, σ_z=80 μm
  - No correction from survey data included
- MVD mechanics is very precise

Upgrade: status of STT

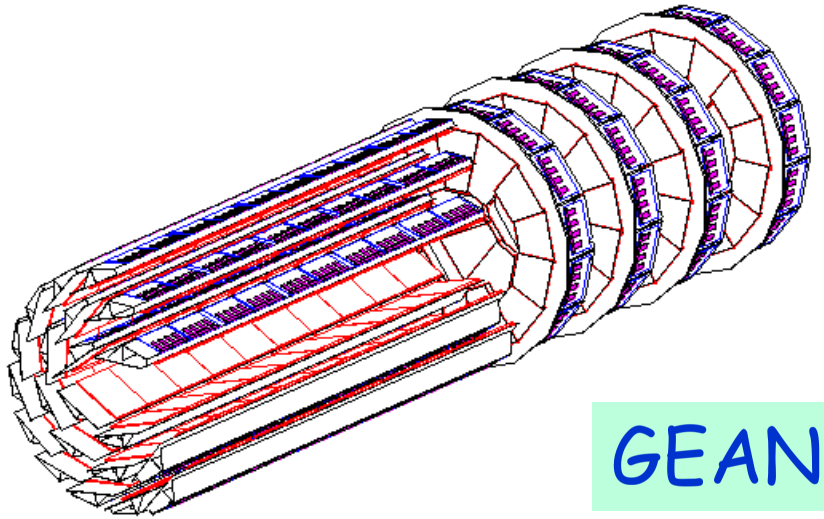
All hardware and readout components are ready to operate



- Waiting for a halo muons run
- Good results from the test beam analysis

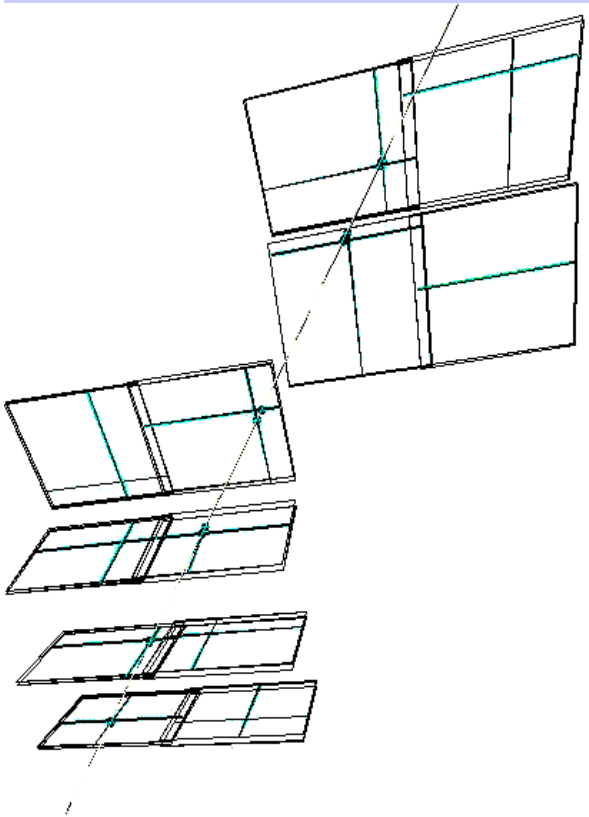


Status of the new tracking software



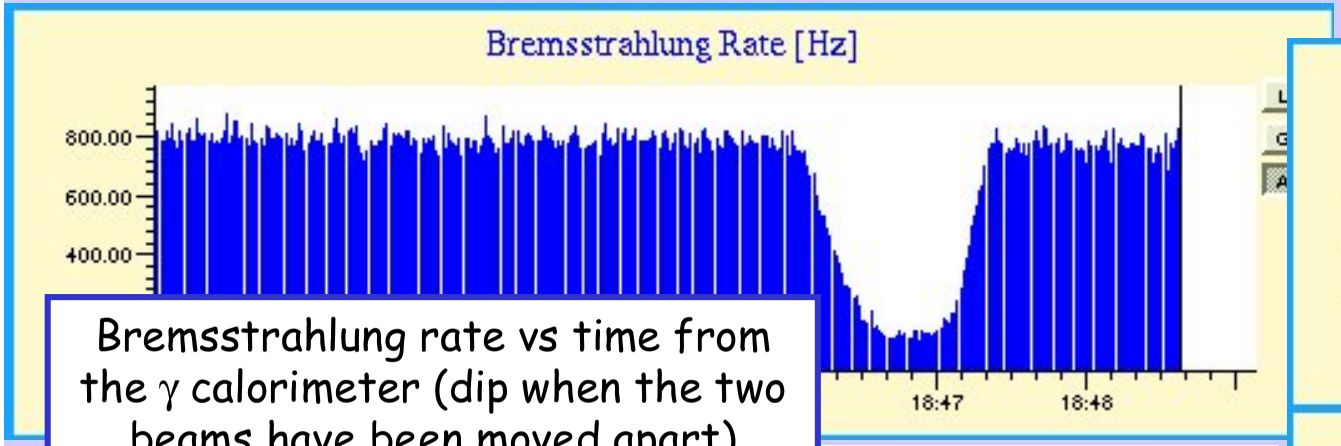
GEANT

Detailed Monte Carlo simulations exist for MVD and STT

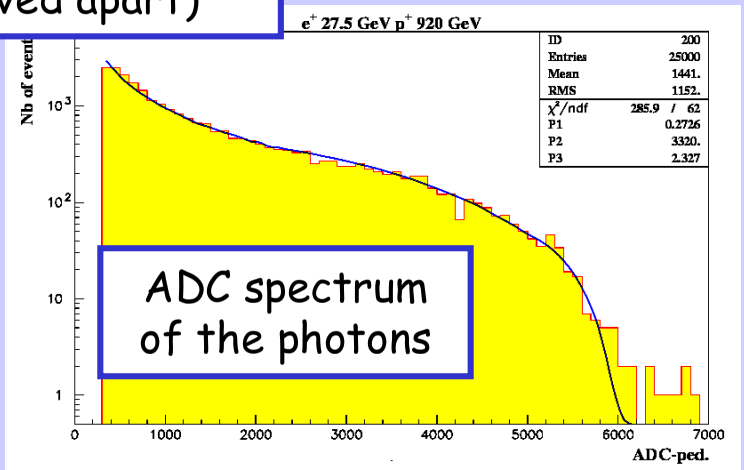


- Very promising results on tracking and pattern recognition
- Plans to be ready within 2001
- Need tracks for checks and final alignment

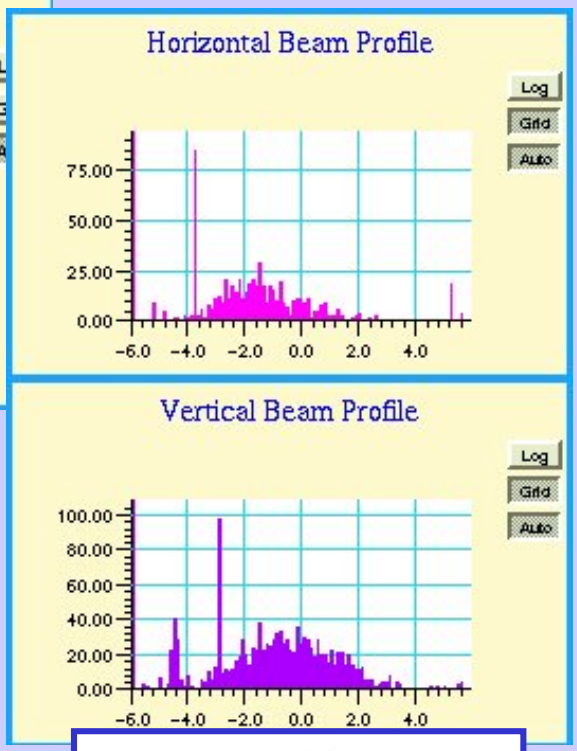
Upgrade: status of LUMI



Bremsstrahlung rate vs time from the γ calorimeter (dip when the two beams have been moved apart)



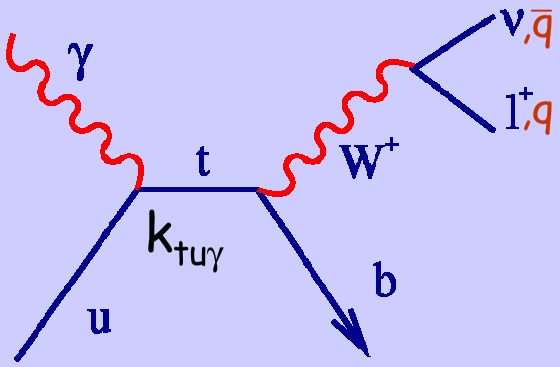
ADC spectrum of the photons



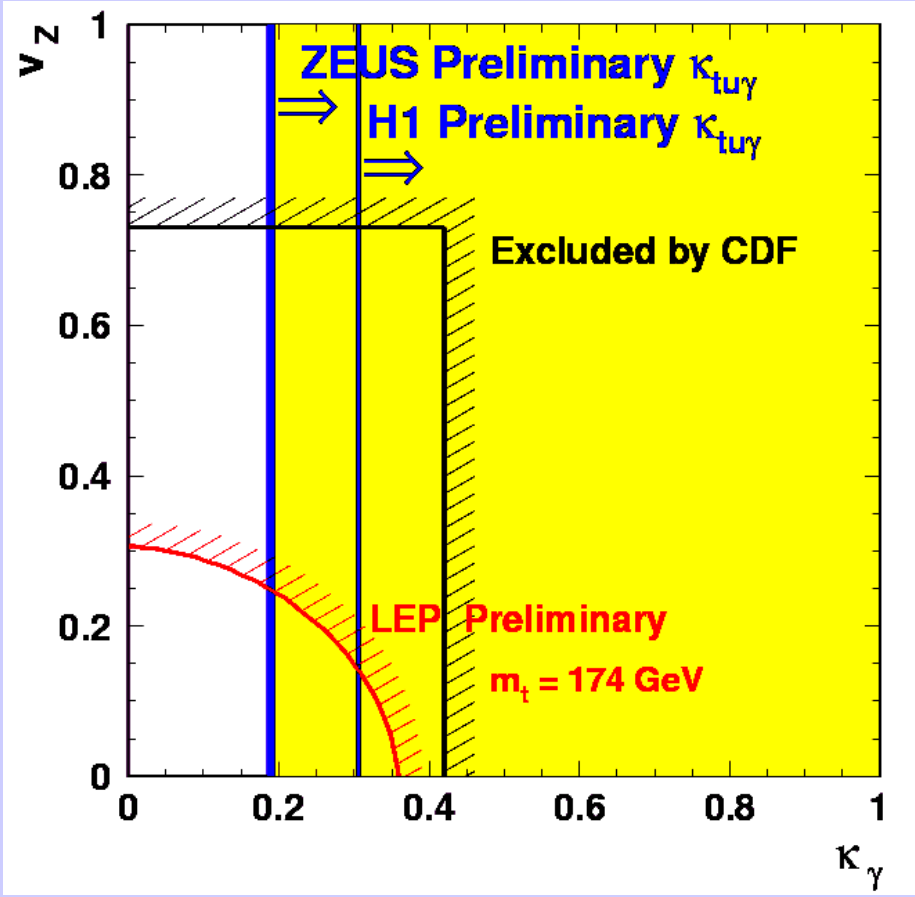
Beam profiles from the γ calorimeter

- Complete hardware installed (γ cal, spectrometer, 6 and 40 m taggers)
- Final electronics for the γ cal installed (apart from the trigger card)
- Temporary electronics for the other components, final will be installed in the November access
- Commissioning going on together with HERA

Search for single top production (FCNC)

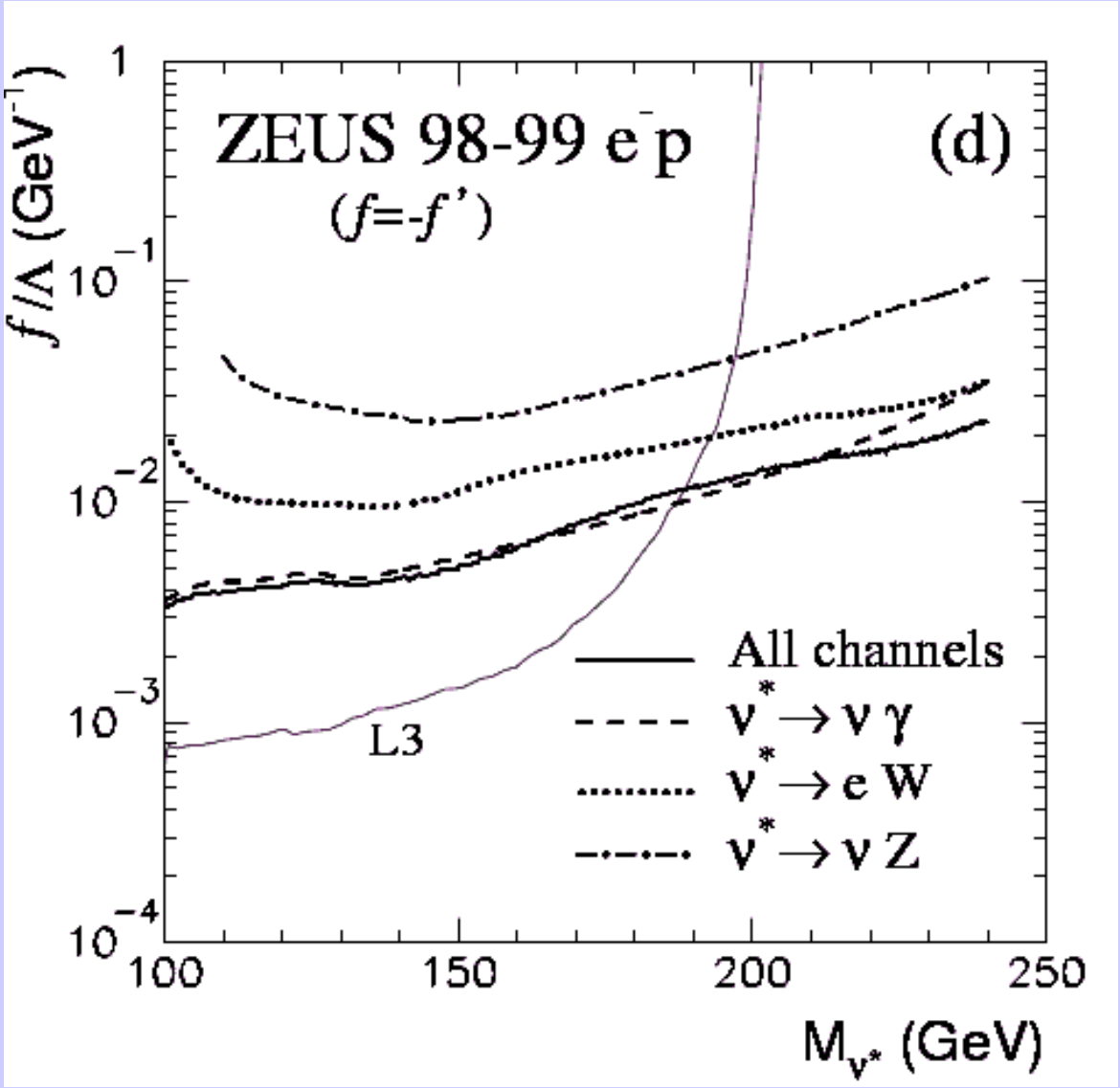


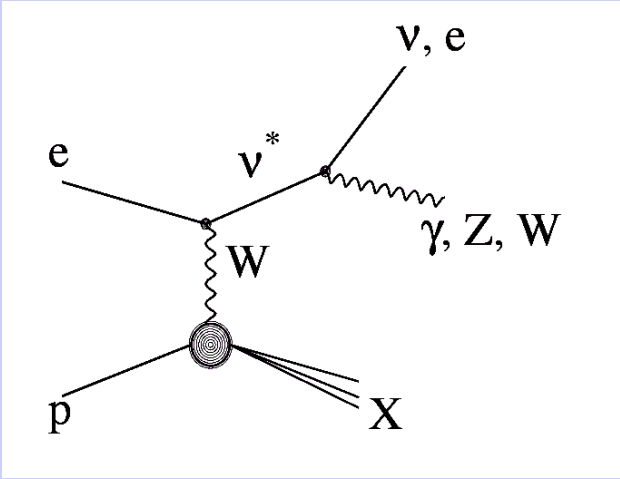
- Select events with 3 jets using the full ZEUS luminosity up to year 2000
- Require a pair of jets to have an invariant mass around M_W
- Look at invariant mass of the 3 jets around the top mass
- No deviation from SM



Limit on the coupling $k_{tu\gamma}$ improved using also the hadronic decay channel of the W

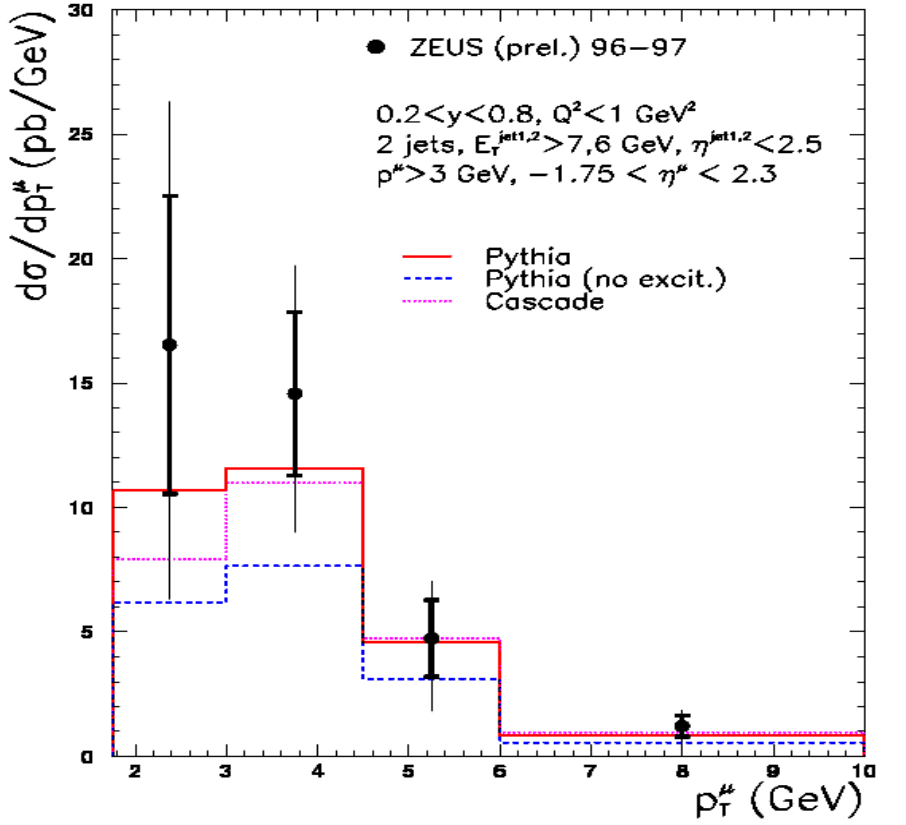
Search for excited fermions

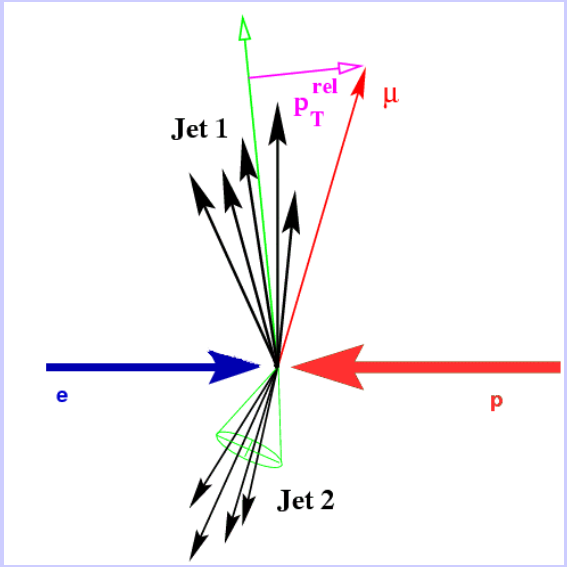


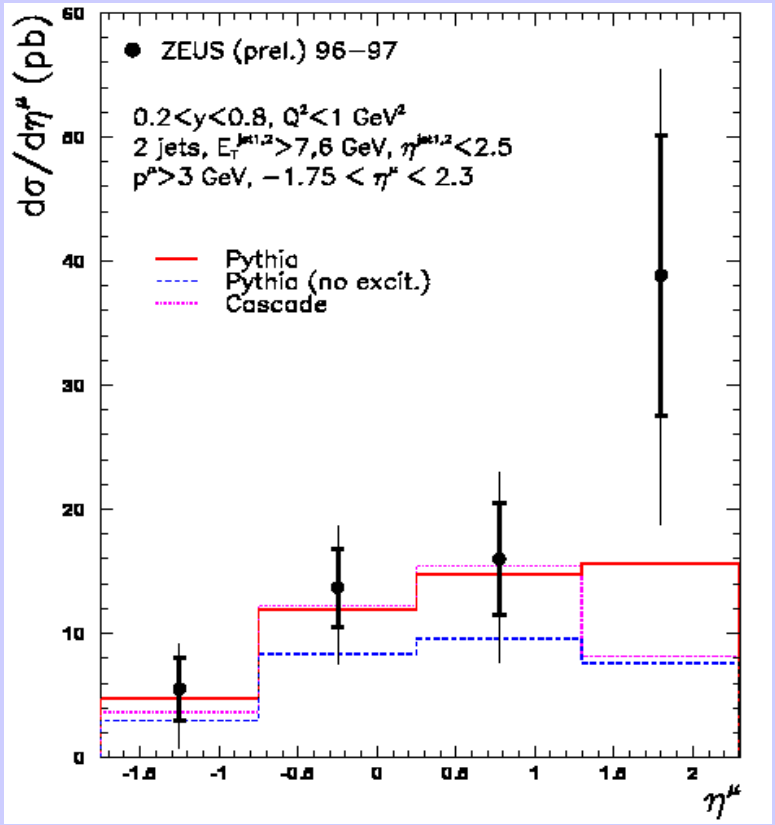


- Excited neutrino in the $\nu^* \rightarrow \nu\,\gamma$, νZ,eW channels
- Using 98-99 e^- data, very large improvement w.r.t. the previous ZEUS limit

Differential beauty cross sections in photoproduction



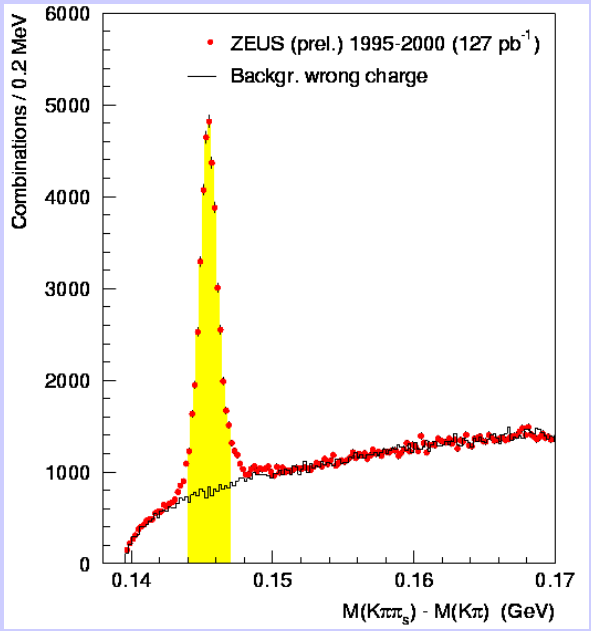


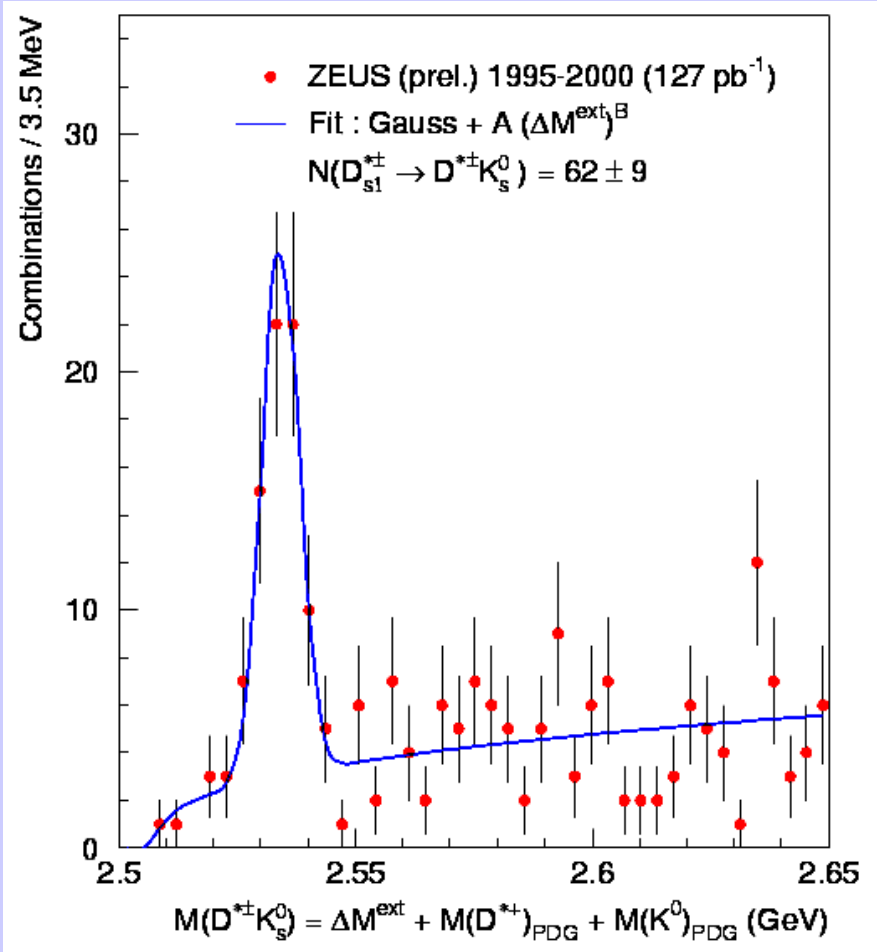


- Search for events with ≥2 jets with large E_T
- Selects events with μ
- Extract fraction of b quarks from the P_T of the μ w.r.t the jet axis

Production of orbitally excited $D^{\pm}_{s1}$

- Use the large number of D* collected in ZEUS (~31K)
- Select $D^{+}_{s1} \rightarrow D^{*+}K^{0}_{S} \rightarrow (K^{-}\pi^{+}\pi^{+}_{S})(\pi^{+}\pi^{-})$ + c.c.
- From the well measured $f(c \rightarrow D^{*+})$ we get the fragmentation fraction $f(c \rightarrow D^{+}_{s1})$

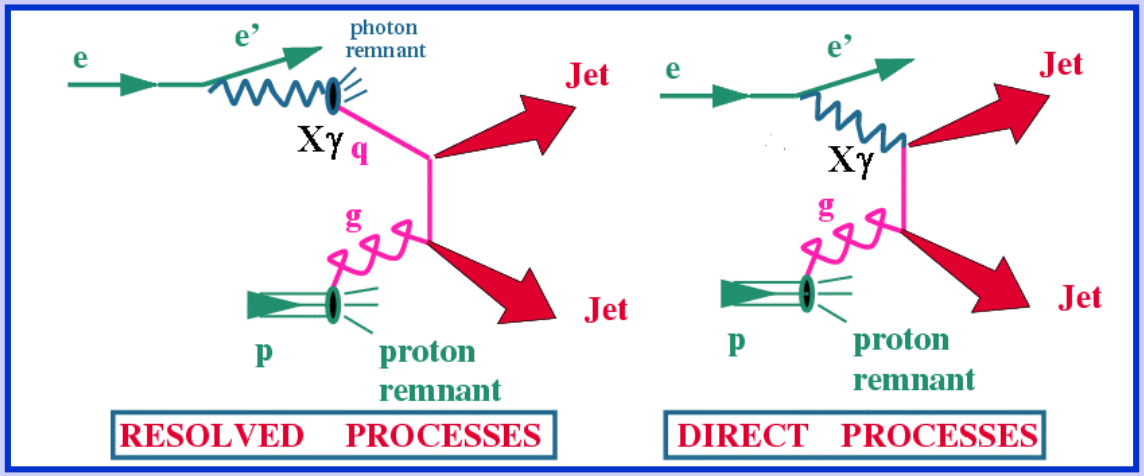


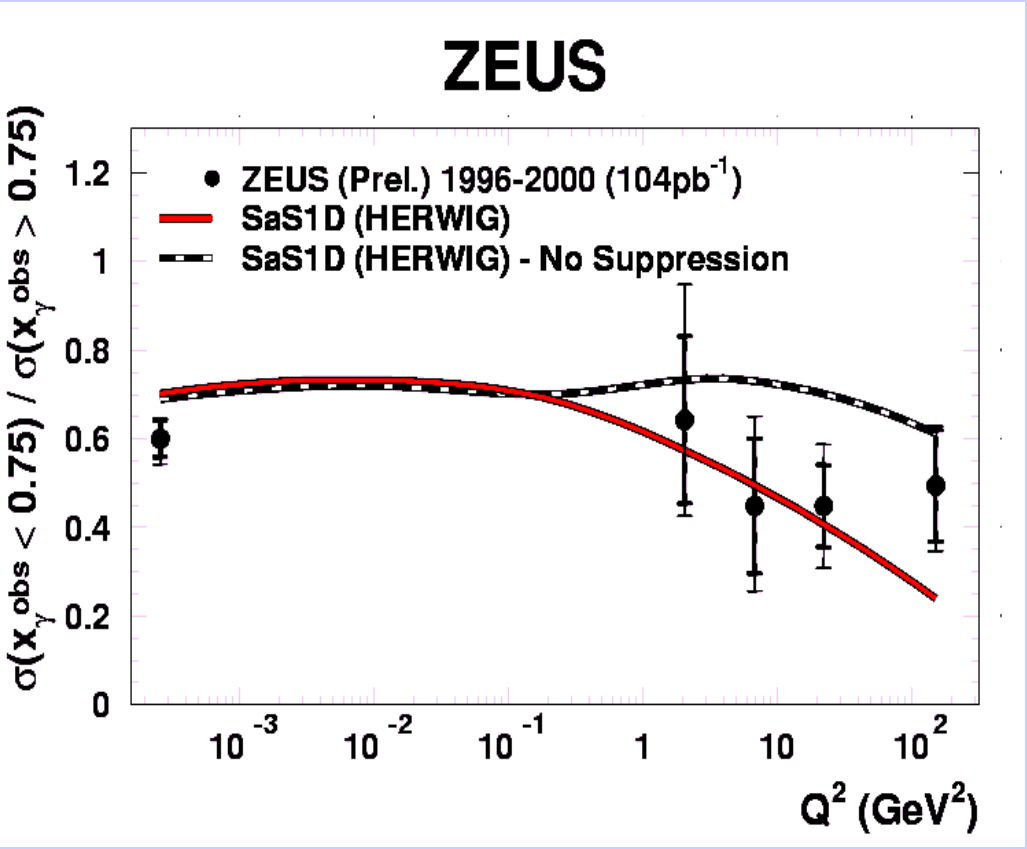


$$f(c \rightarrow D^{+}_{s1}) = 1.24 \pm 0.18(stat.)^{+0.08}_{-0.06}(syst.) \pm 0.14(br.)\%$$

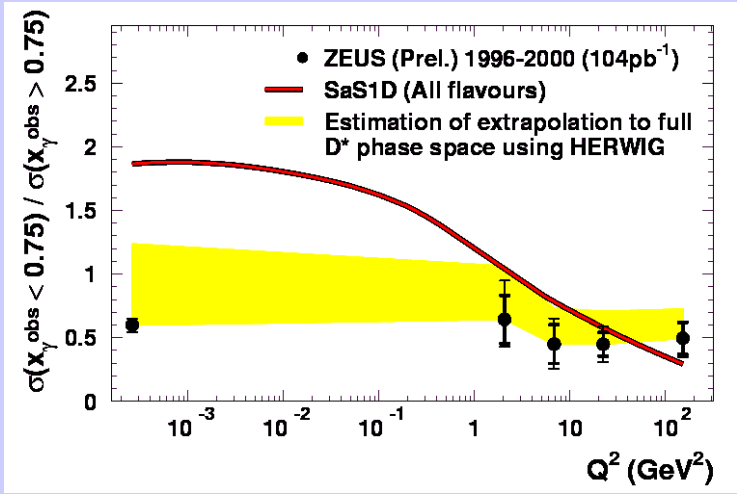
- Large, compatible with 1.6±0.4 ±0.3% measured by OPAL

Study of dijet events with charm at different photon virtualities

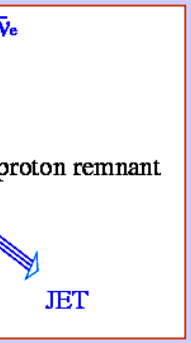


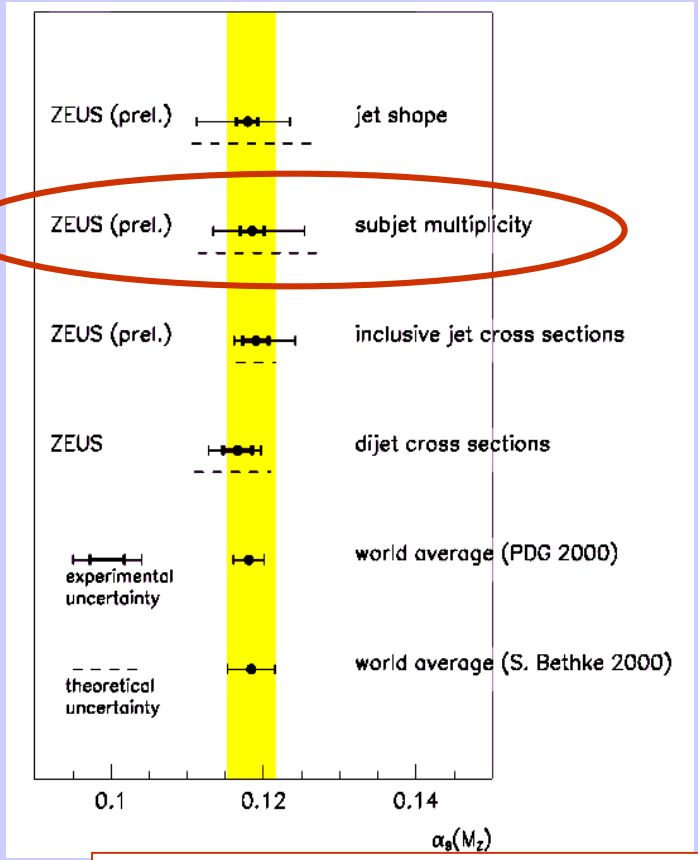


- Dijet events (PHP+DIS) with a D* candidate
- Plot ratio of "resolved" and "direct" cross sections
- σ ratio vs Q^2 is rather flat
- Suppression due to charm and to Q^2 not independent

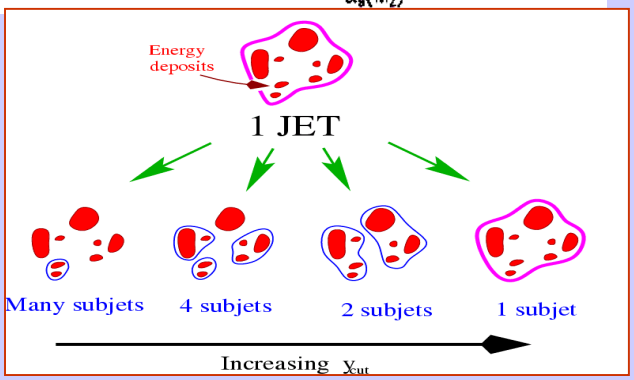


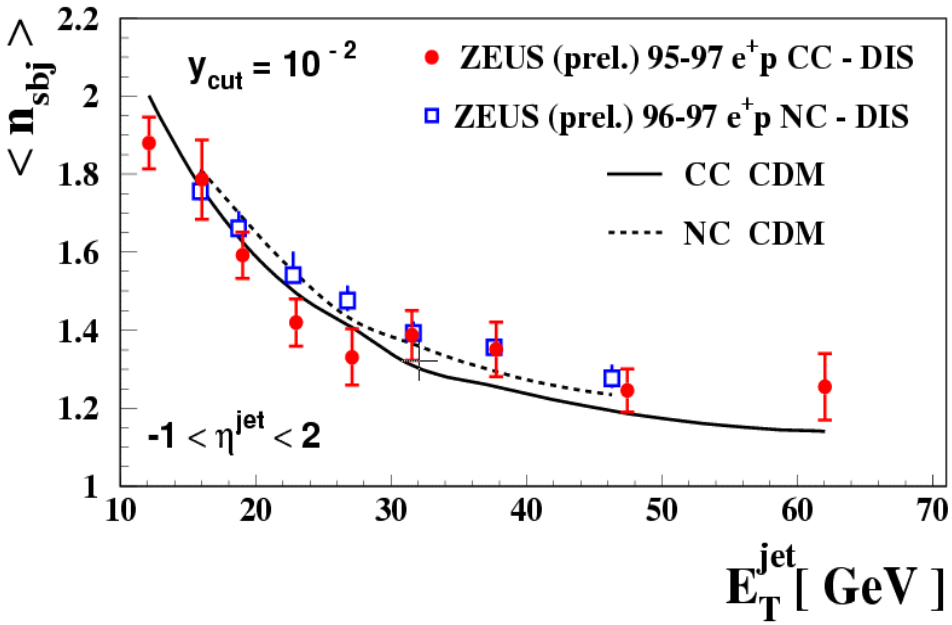
Jet substructure in CC



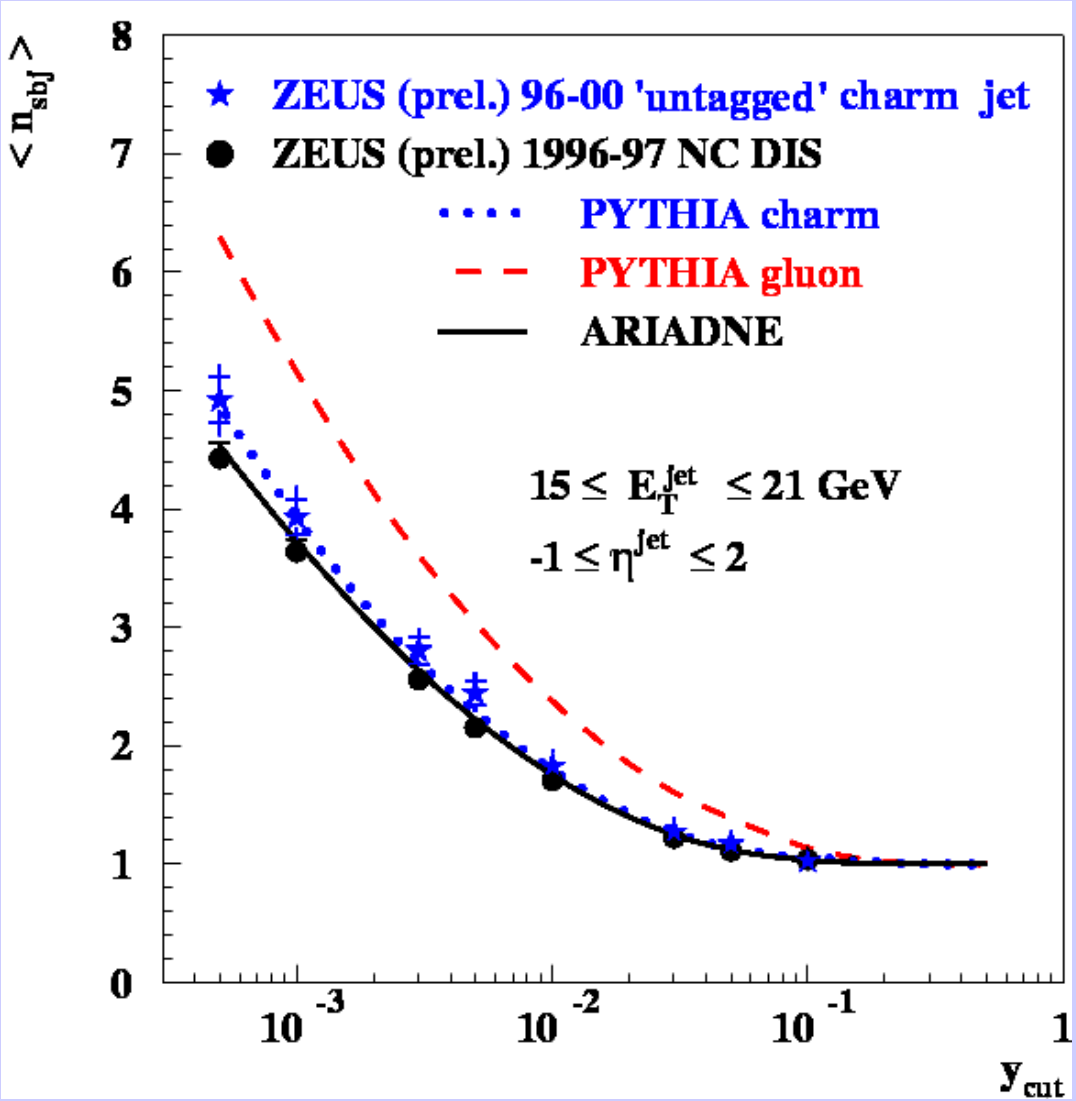


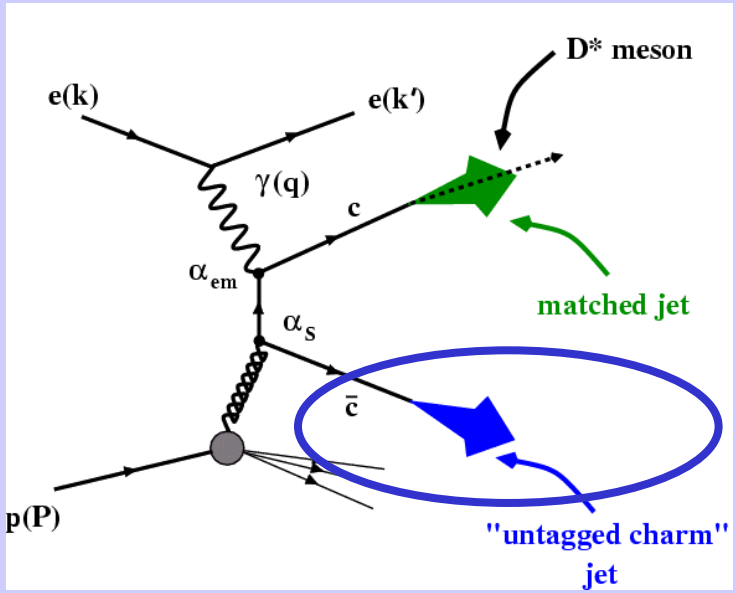
- Look for subjet multiplicities
- Jets become narrower as $E^{\dagger}_{jet}$ increases
- Agreement with NC DIS
- Mostly quark initiated jets, QCD radiation independent of the hard scattering





Subjet multiplicity with charm tagged jets

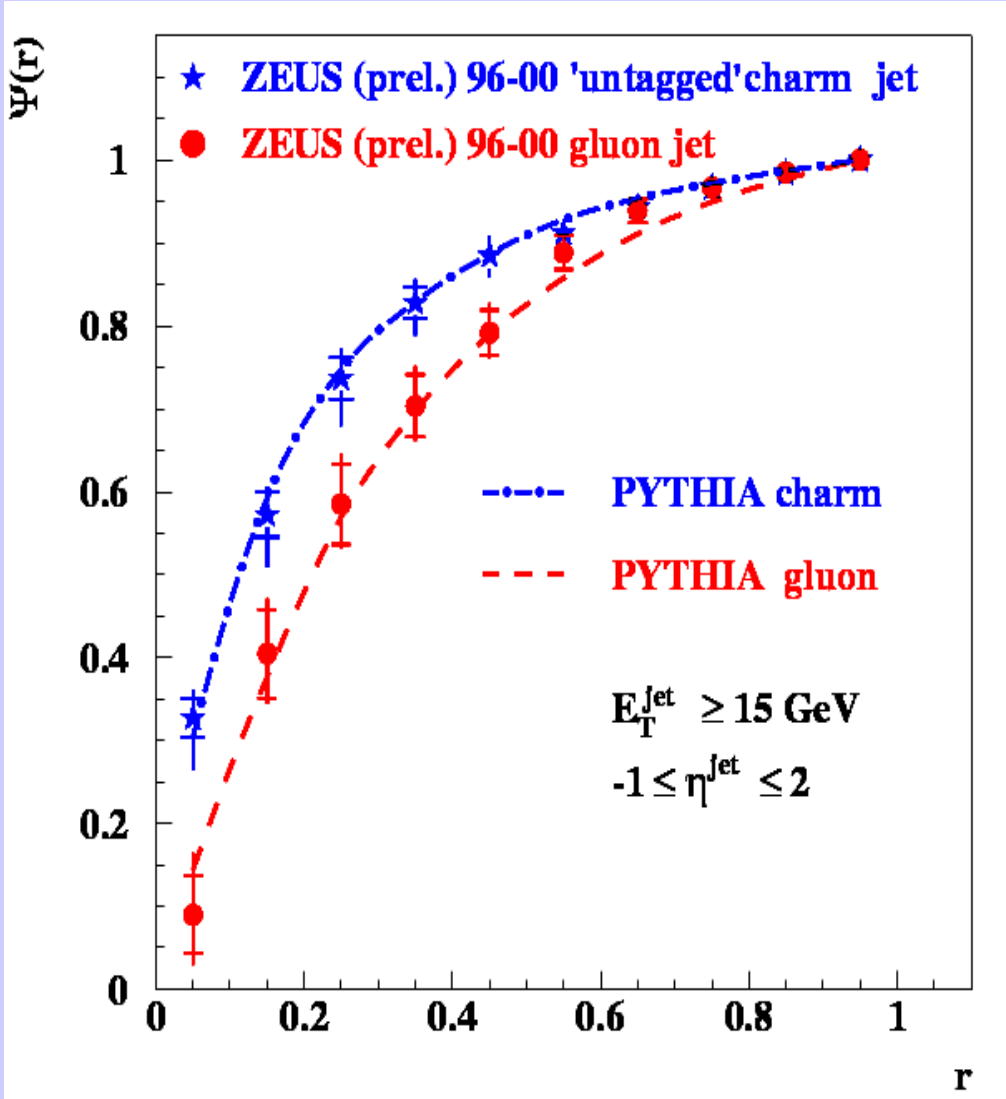


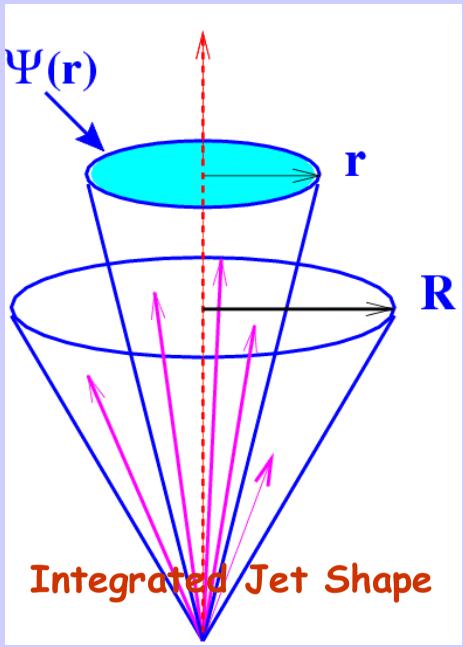


- Analyse ~100 pb^{-1} photoproduction data
- Dijet events, charm tagging
- Compare with DIS jets, $Q^2>200\ GeV^2$

- Charm initiated jets are very similar to light quark jets

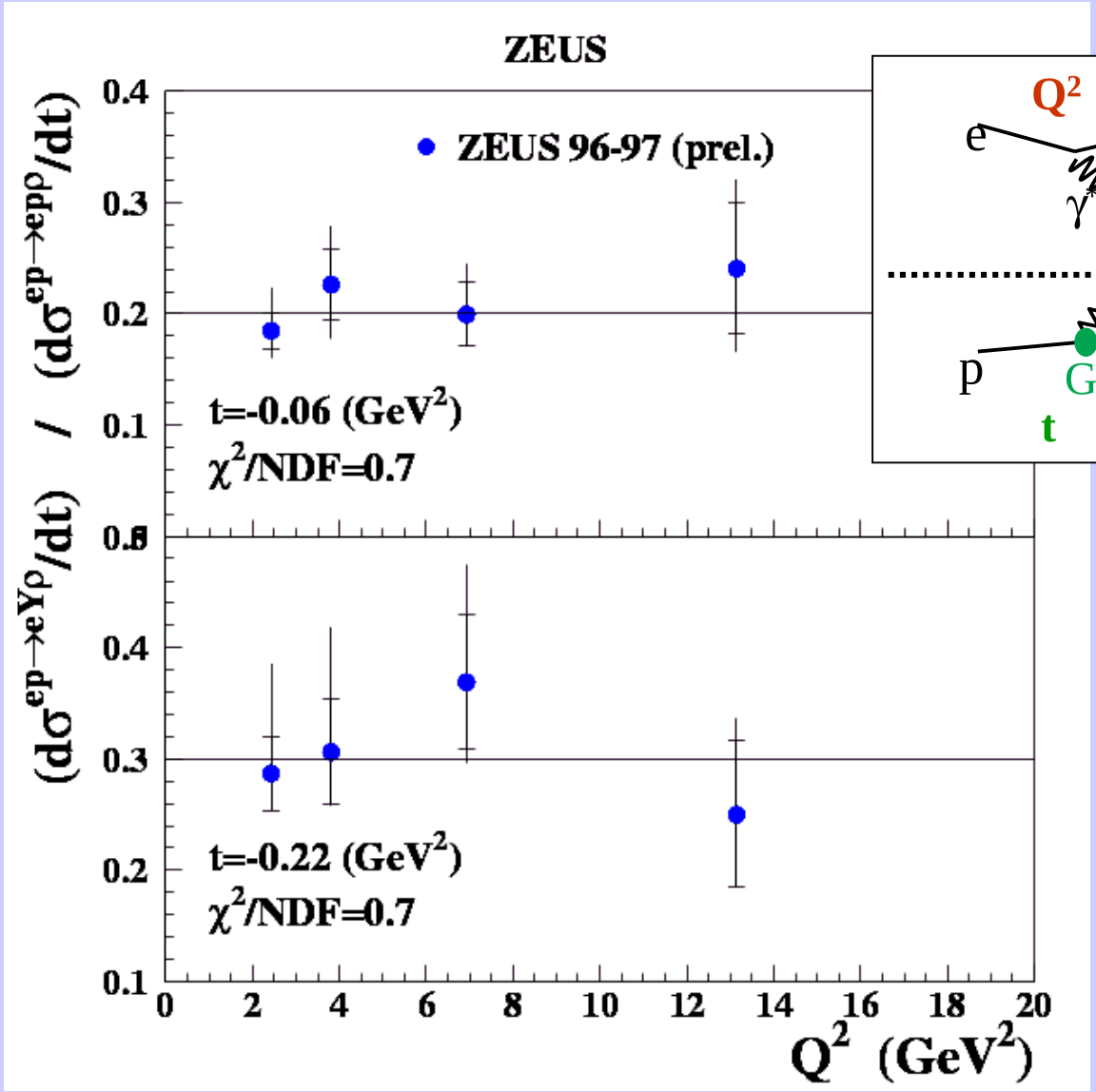
Characterization of gluon jets

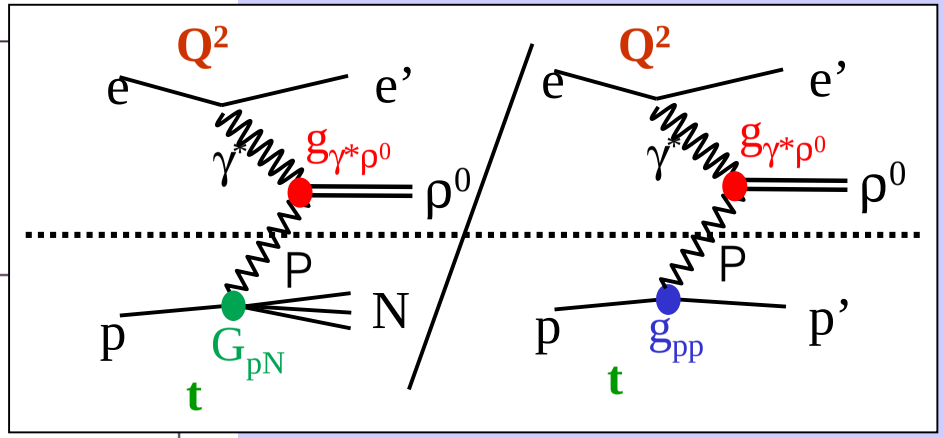




- $\Psi_{dijet} = f_q \Psi_q + (1-f_q) \Psi_g$
- Use MC to get the fraction of quark jets f_q in the inclusive dijet sample
- Very good agreement with pQCD predictions

Diffractive: ratio of p-dissociation and elastic ρ^0 electroproduction vs Q^2



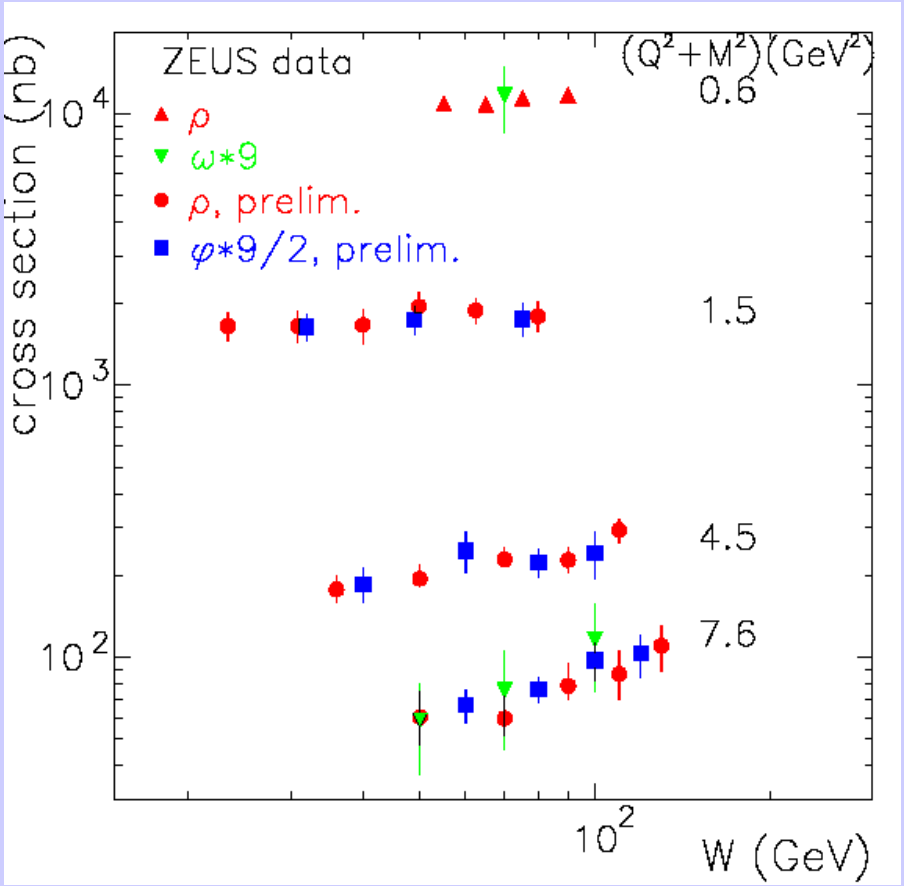


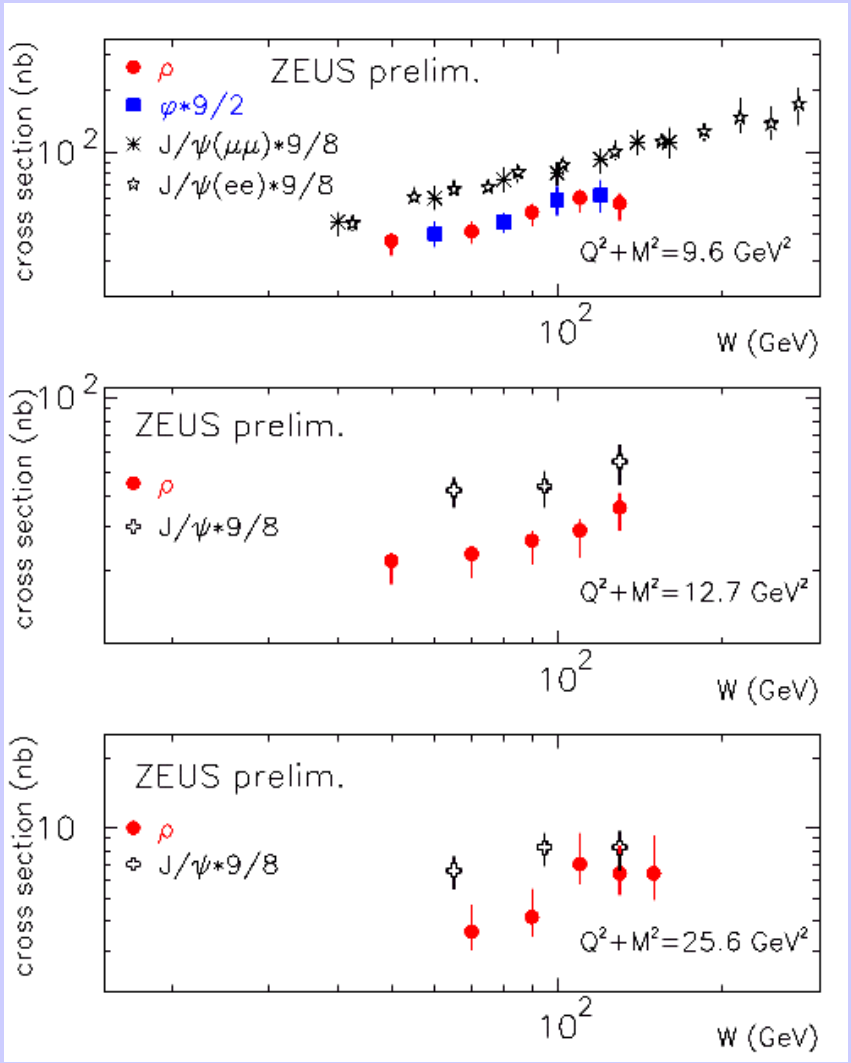
At a given t, the ratio is independent from Q^2

→ Vertex factorization holds

Diffractive: compilation of VM cross sections

- Light VM follow SU(4) relations (9:1:2:8) if the scale ($Q^2+m^2_V$) is used
- J/Ψ cross sections are above those of the light VM at the same scale





Outlook

- Hera and ZEUS upgrades, lots of new opportunities:
  - Run with e^-:
    - Balance the samples, make comparisons
    - Higher cross section in the DIS CC
  - Polarized leptons: detailed studies of the EW interactions
  - Heavy flavours: tagging with the new microvertex
  - High x,Q^2 : better track reconstruction in the forward direction with MVD and STT

Conclusions

- ZEUS detector is ready for the new data taking
- We are making good use of the data taken so far
- Looking forward to improve our analyses and study new topics with the wealth of luminosity to come in the next years