MB/UE Related Measurements in HzTool

Victor Lendermann
University of Heidelberg
H1 Collaboration

- What is HzTool
- Available routines
- Running projects
- Tests of MC tuning: H1 inclusive jets in γp
- New project: higher meson resonances

HERA–LHC WG2/WG5 Meeting CERN, Oct 11, 2004

HzTool

A library of generic fortran routines to allow easy access to experimental published data distributions and to calculate predictions of Monte Carlo generators for these distributions

- Developed at HERA, where MC have difficulties to describe the data, but where MC are needed for precision physics
- Common project between ZEUS and H1
  Includes (not yet all) H1 and ZEUS published measurements
- Extended to gamma-gamma collisions of LEP (OPAL)
- Easily extendable to TEVATRON and LHC data
- One routine per publication includes histos filled with published data and histos being filled by running MCs for comparison

DESY–XX–XXX $\Longleftrightarrow$ hzXXXXX.F

Documentation: http://hztool.hep.ucl.ac.uk/
http://www.desy.de/~carli/hztool.html

Tutorial by H. Jung in HERA-LHC June meeting:
http://agenda.cern.ch/fullAgenda.php?ida=a041878

Already Available Routines

Used for MC tuning by J. Butterworth and M. Wing

HZ01225	*Di-Jets in γp*	H1
HZ01220	*Di-Jets in γp and Photon Structure*	ZEUS
HZ00035	*Di-Jets in γp and Photon Structure*	H1
HZ99057	*Di-Jets in γp at high E_T*	ZEUS
HZ98162	*Three-Jets in γp*	ZEUS
HZC98113	*Di-Jets in $\gamma\gamma$*	OPAL
HZ98085	*Inclusive D^* and Associated Di-Jets*	ZEUS
HZ98018	*Inclusive Jets at High E_T*	ZEUS
HZ97196	*Di-Jets in γp*	ZEUS
HZ97191	*Jet Shapes in γp*	ZEUS
HZ97164	*Inclusive Di-Jets in γp and Parton Distributions in Photon*	H1
HZC96132	*Inclusive Jets in $\gamma\gamma$*	OPAL
HZ96094	*Di-Jet Angular Distributions in Resolved and Direct γp*	ZEUS
HZ95219	*Jets and Energy Flow γp*	H1
HZ95194	*Rapidity Gaps between Jets in γp*	ZEUS
HZ95033	*Di-Jets in γp*	ZEUS
HZ94176	*Inclusive Jets in γp*	ZEUS
	Charged Jet Evolution and Underlying Event in $p\bar{p}$	CDF
	Multijet Photoproduction	ZEUS

To Be Implemented

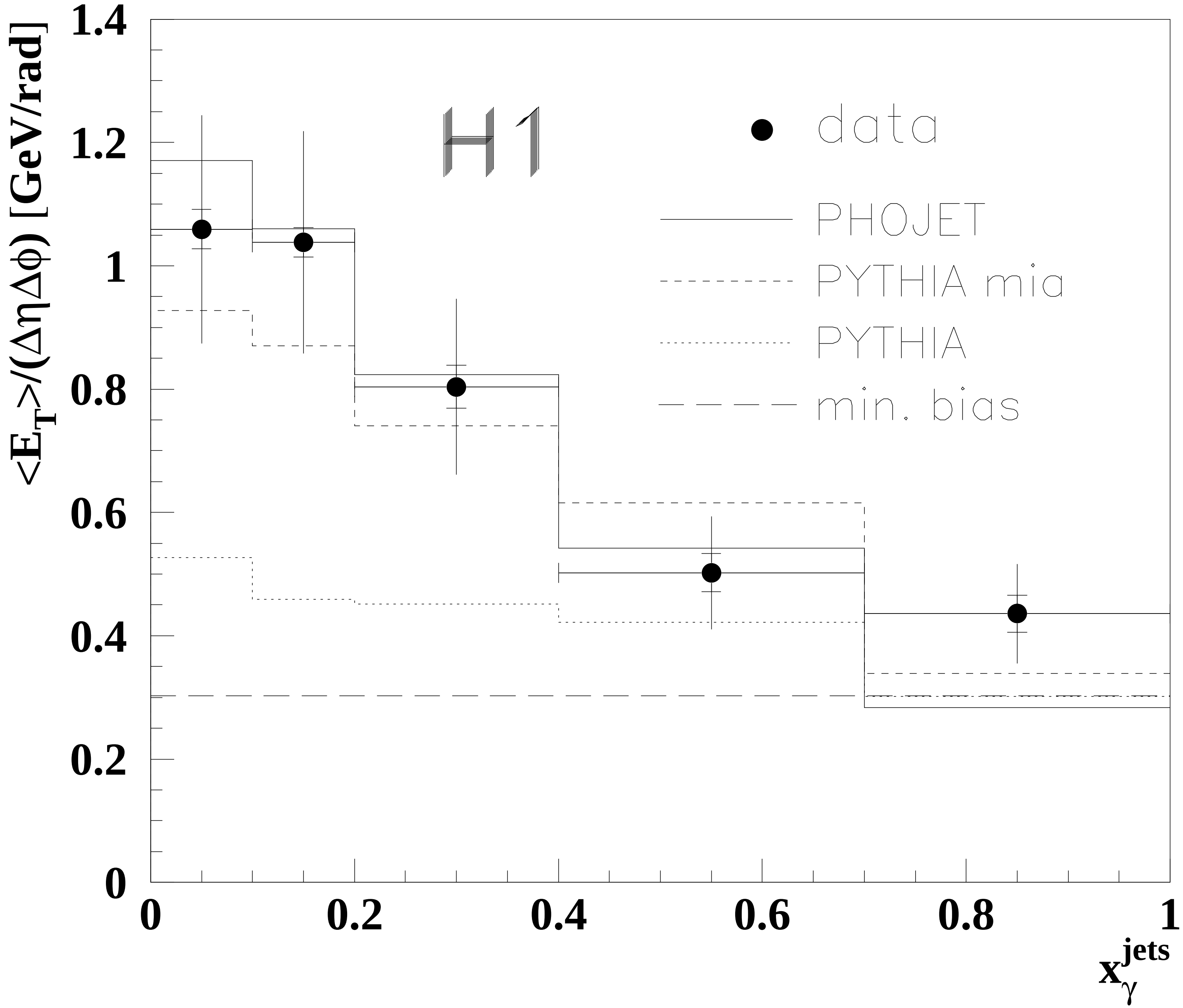
H1

- DESY–95–219 : *Jets and Energy Flow in γp at HERA,*
  Fig. 4 and Fig. 2 ⟶ S. MAXFIELD
- DESY–98–148 : *Charged Particle Cross-Sections in γp,*
  Fig. 3 (a,b) ⟶ S. LAUSBERG, V.L.
- DESY–00–085 : *Inclusive γp of π^0 in the Photon Hemisphere,*
  Fig. 5 + possibly 2, 3, 6 ⟶ D. BENECKENSTEIN, V.L.
- DESY–02–225 : *Inclusive Jet Cross Sections in γp*
  Lots of plots ⟶ K. LOHWASSER, V.L.

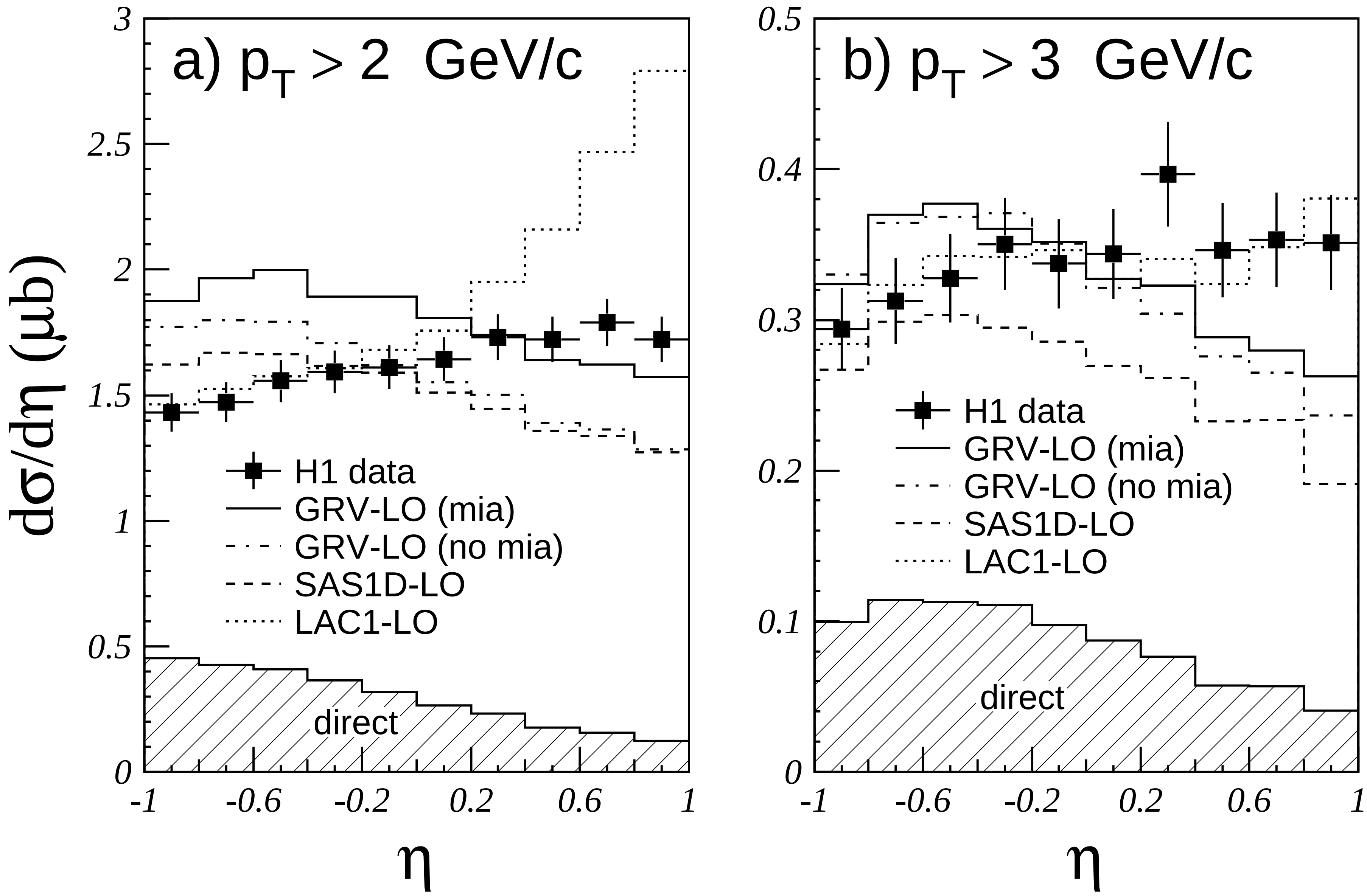
ZEUS

- DESY–95–083 : *Photon Remnant in Resolved γp*
  difficult to implement ⟶ J. BUTTERWORTH

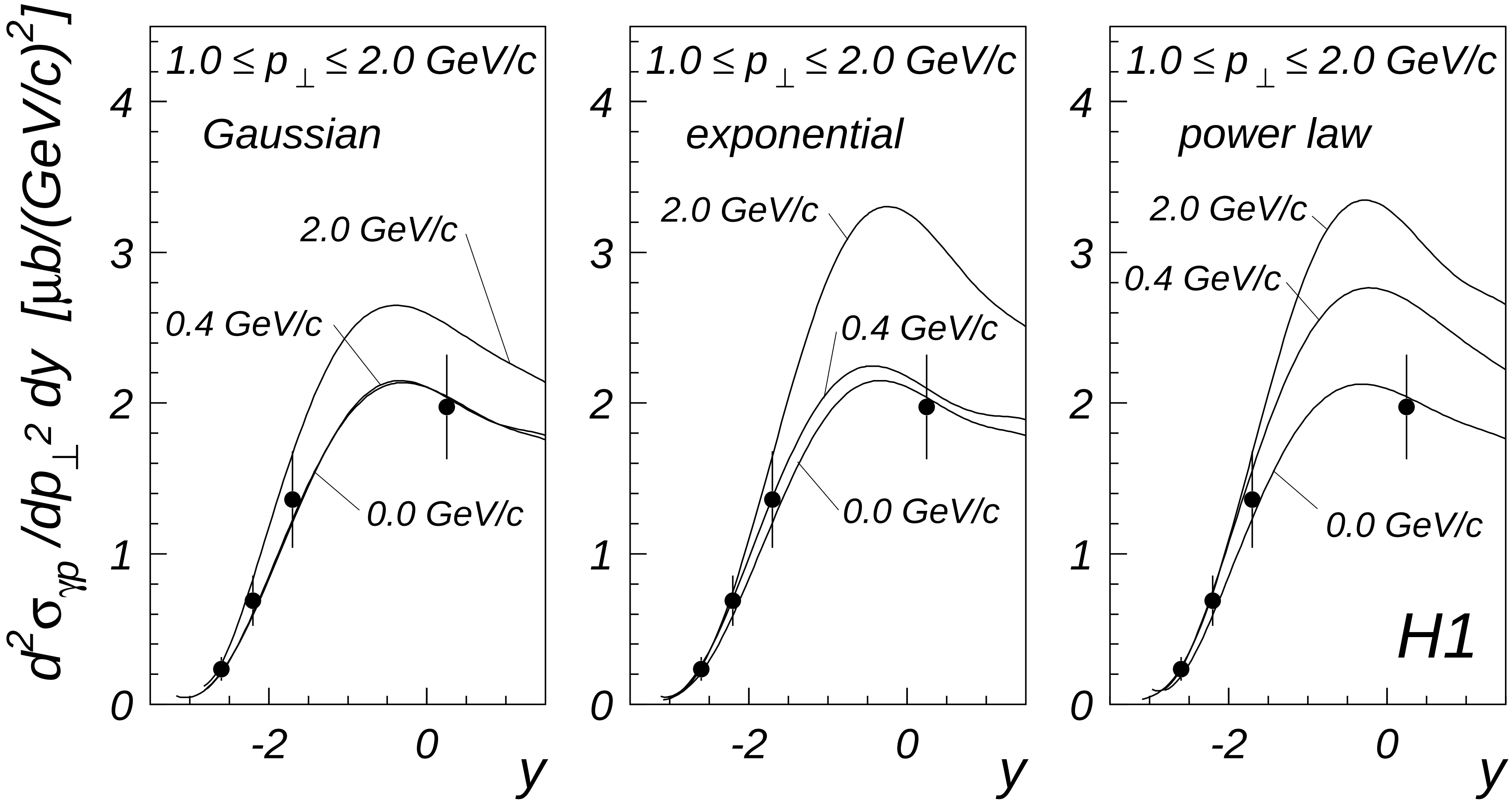
DESY–95–219, Jets and Energy Flow



DESY–98–148, Charged Particles in γp



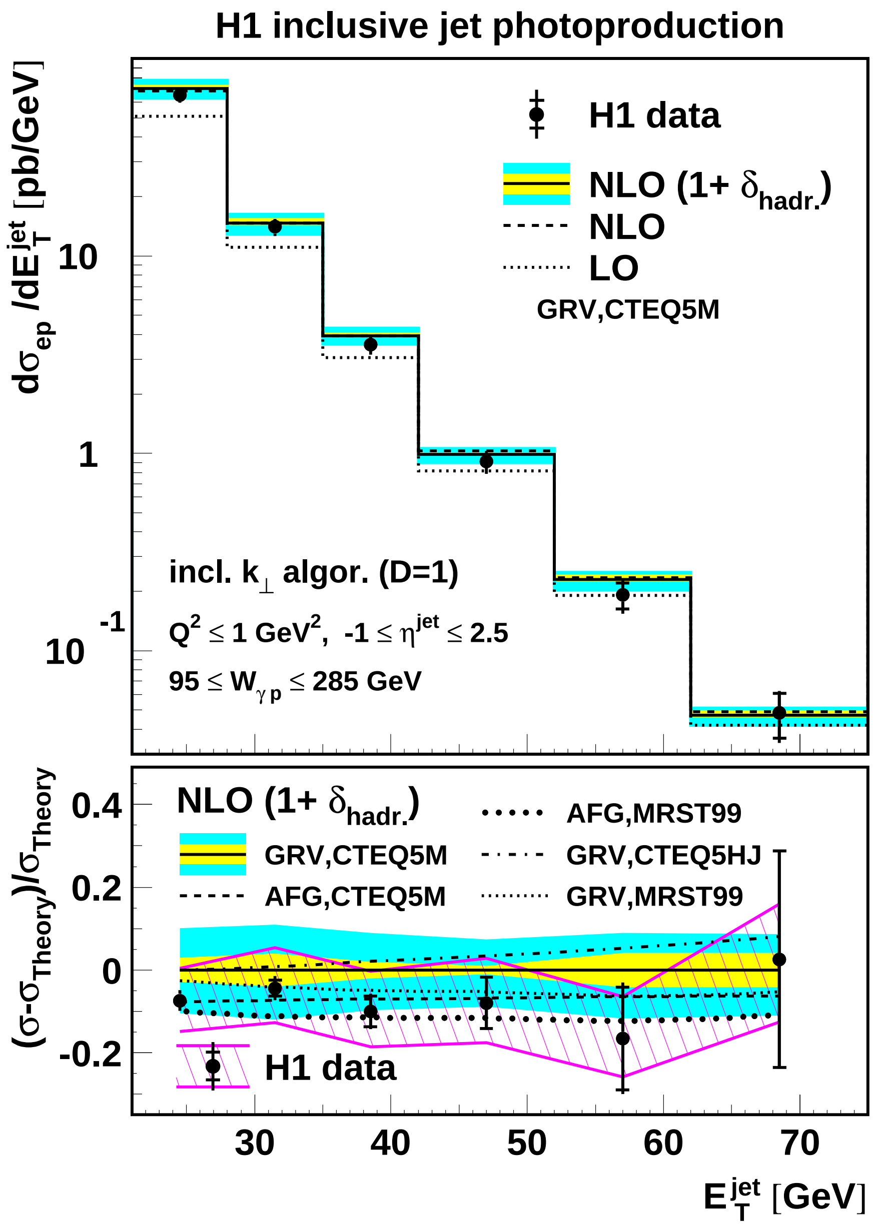
DESY–00–085, π^0 in γp

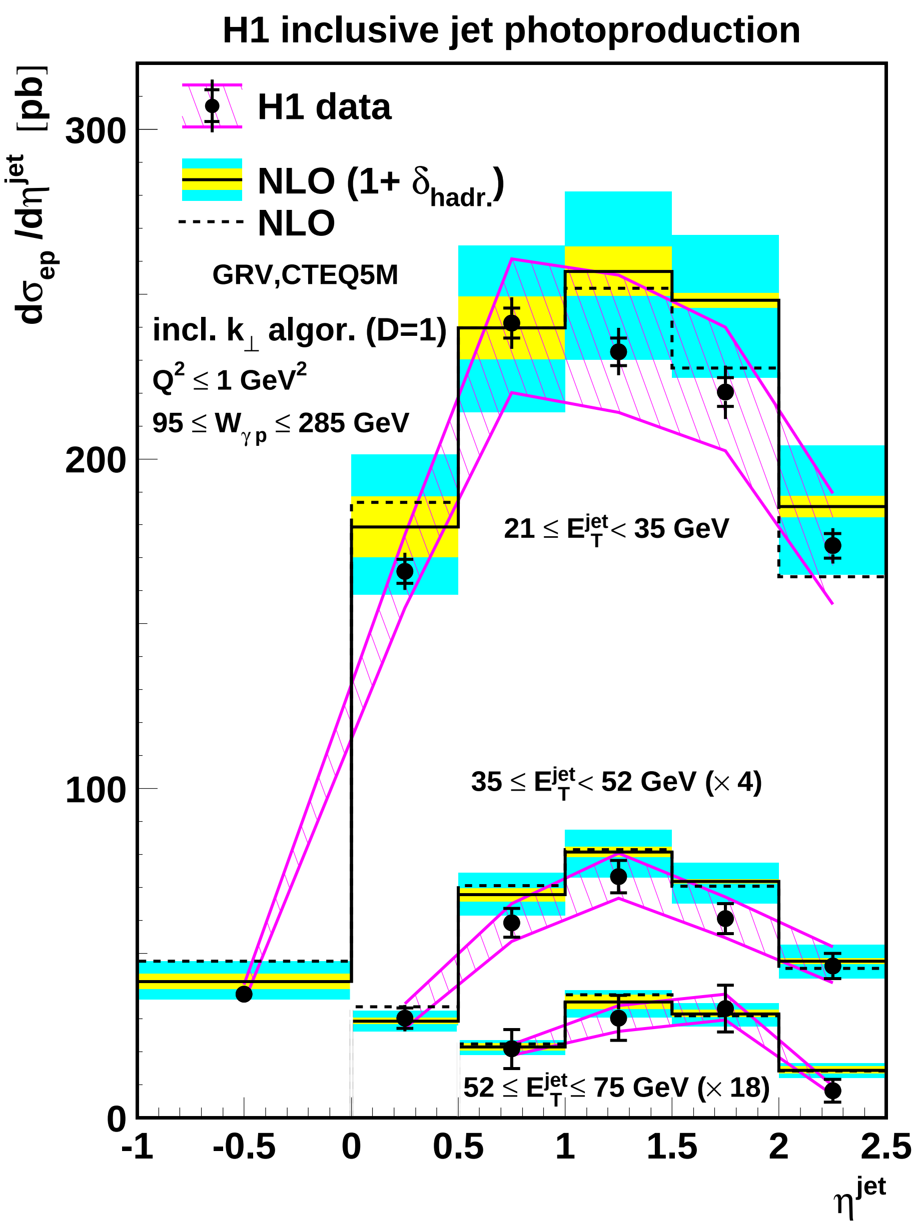


Search for an intrinsic transverse momentum of partons in the photon (primordial k_t) in PYTHIA. k_{t0} defines the width of the k_t distribution

DESY–02–225, Inclusive Jets in γp

Lots of differential cross sections in $W_{\gamma p}$, E_T and η





Tests: Try Available PYTHIA Tunes

PYTHIA 6.224, MSTP(81) = 1 – MI on, PDF = CTEQ5L

Model / Tune	MSTP	PARP	
simple model (def)	MSTP(82) = 1	PARP(81) = 1.9 (default)	
complex model	MSTP(82) = 4	PARP(82) = 1.9 (default)	
ATLAS tune (Moraes *et al.*)	MSTP(82) = 4	PARP(82) = 2.2	
fit 246 (Butterworth *et al.*)	MSTP(82) = 3	PARP(67) = 2.0, PARP(90) = 0.0 PARP(85) = 1.0, PARP(86) = 1.0	$P_T^{min} = 3\,\mathrm{GeV}$ $P_T^{min2} = 1.6\,\mathrm{GeV}$
fit 325 (Butterworth *et al.*)	MSTP(82) = 4	PARP(67) = 1.0, PARP(84) = 0.5, $k_T^p = 0.0\,\mathrm{GeV}$	$P_T^{min} = 3\,\mathrm{GeV}$ $P_T^{min2} = 1.9\,\mathrm{GeV}$

PARP(67) – Q^2 is multiplied by this factor to define maximum parton virtuality in space-like showers

PARP(81) – effective minimum p_t for MI with MSTP(82) = 1

PARP(82) – regularization scale $p_{t,0}$ for MI with MSTP(82) > 1

PARP(84) – a_2/a_1 for core of double Gaussian matter distribution in hadron

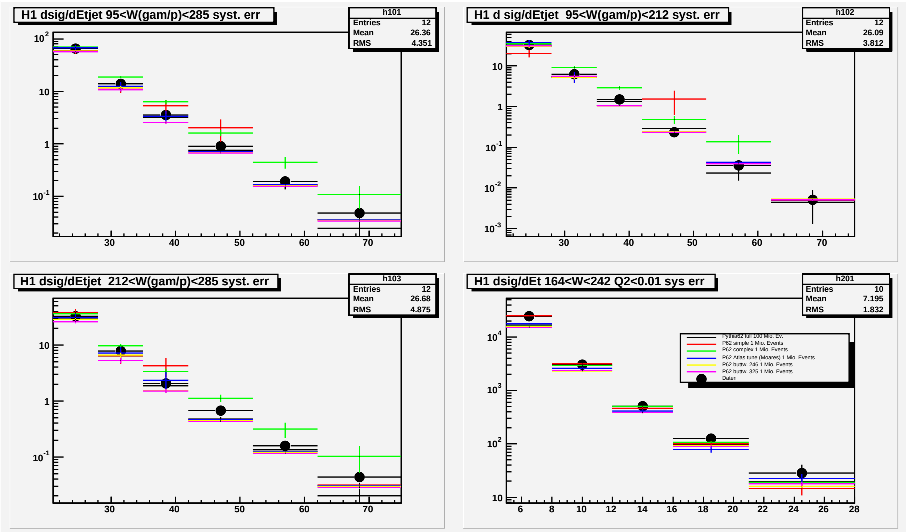
PARP(90) – power of energy rescaling term

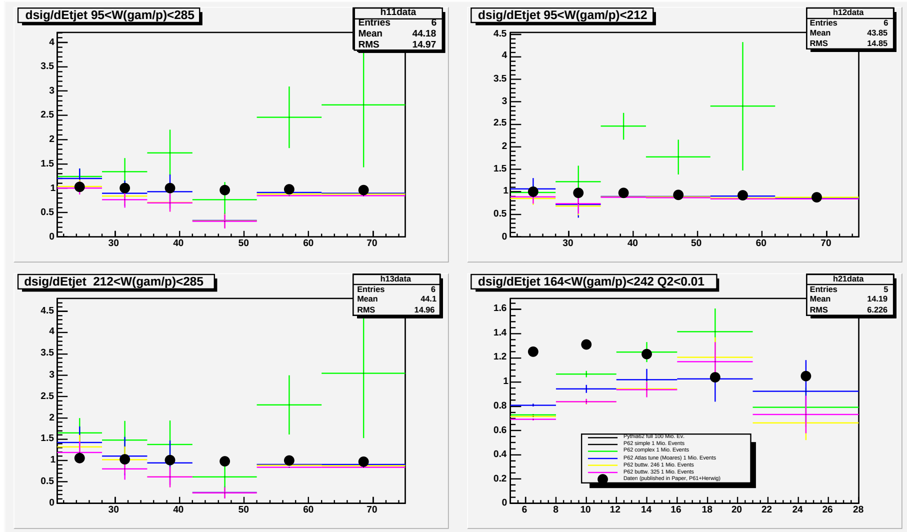
Compare data and MC

In paper:

- Use analytic NLO calculation on parton level
- Corrections for UE and fragmentation from PYTHIA and HERWIG

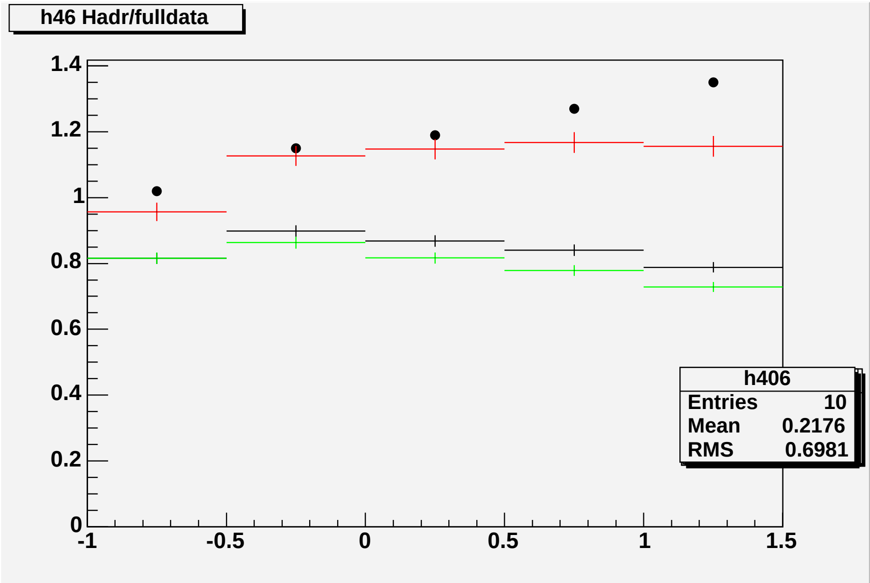
Shall we tune MC, based on x-sections (LO) or correction factors?

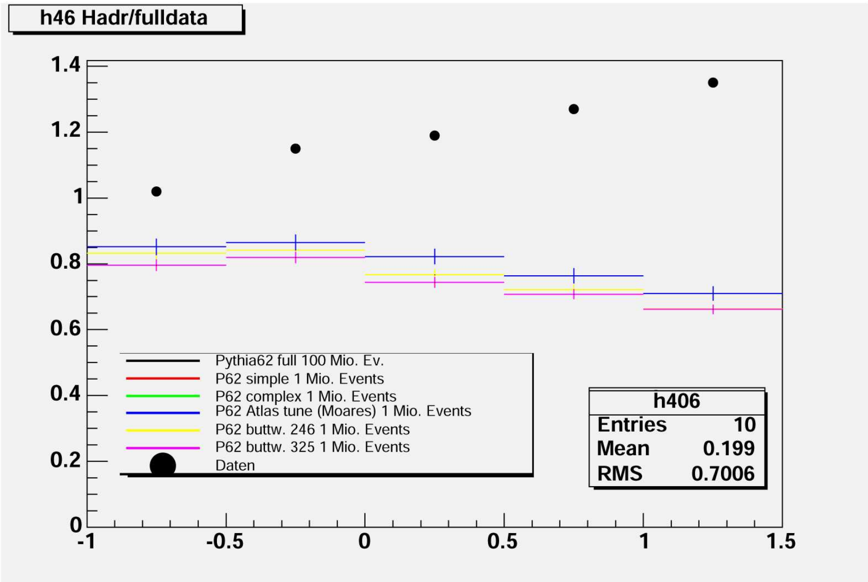


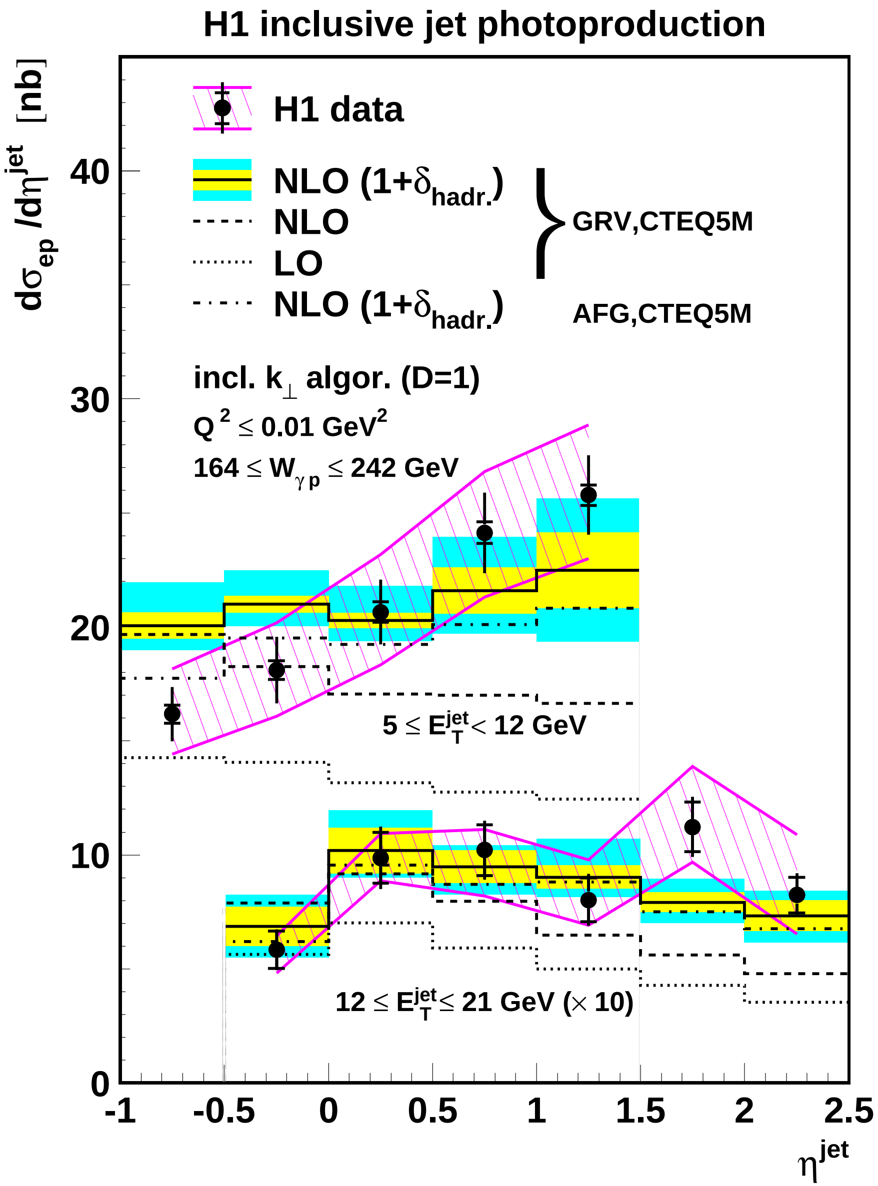


η Dependence at Low E_T

Correction factors in η at $5 \leq E_T \leq 12\,\mathrm{GeV}$ (Possibly lots of bugs!)







Production of Higher Meson Resonances

H1prelim–03–037 for DIS'03

Measurement of Inclusive γp of η, ρ^0, f_0 and f_2 Mesons at HERA

Test PYTHIA tunes by LEP at HERA ⟶ A. KROPIVNITSKAYA

PARJ(14)	P(S=0,L=1,J=1)	Axial
PARJ(15)	P(S=1,L=1,J=0)	Scalar
PARJ(16)	P(S=0,L=1,J=1)	Axial
PARJ(17)	P(S=0,L=1,J=2)	Tensor