



H1 analyses (not) in Rivet / HZtool



HELMHOLTZ
RESEARCH FOR GRAND CHALLENGES

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Survey of the H1 papers
for Rivet / HZtool





H1 information



- H1 papers are listed on this page, including auxiliary information (tables, figures, etc)

<https://www-h1.desy.de>



Survey of H1 papers

- Approximate grouping into topics
- Check whether analyses are in HZtool or in Rivet

	Total	HZtool	Rivet
searches/rare processes	48	0	0
inclusive	36	4	0
electroweak	4	0	0
diffraction	10	1	0
exclusive final states	23	0	0
charm and beauty	24	7	0
jets	49	21	1
hadronic final state	37	16	2
	231	49	3

Only 3 analyses are in Rivet
These are duplicate with
HZtool

And only 49/231 analyses
are in HZtool

Following pages: more
details grouped by topic



- A total of **98** analyses are in these categories
- “Inclusive” here also includes inclusive diffraction (scattered electron + rapidity gap or fwd proton)
- Only **5** analyses in HZtool (most recent from 2000) – many H1 analyses on these topics were published after that date and are much more precise

Inclusive Measurement of Diffractive Deep-Inelastic ep Scattering	HZ97158
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A Measurement and QCD Analysis of the Proton Structure Function $F_2(x, Q^2)$ at HERA	HZ96039
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First Measurement of the Deep-Inelastic Structure of Proton Diffraction	HZ95036
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Deep-Inelastic Inclusive ep Scattering at Low x and a Determination of α_s	HZ00181
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Measurement of Leading Proton and Neutron Production in Deep Inelastic Scattering at HERA	HZ98169
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These analyses are important for PDFs and diffractive PDFs.
Maybe less interesting for MC model builders and Rivet users?



Exclusive final states



- **23** analyses in this category
- **0** analyses in HZtool
- **Diffractive signature plus fully reconstructed final state**
- **Typically a vector meson or a photon**
- **At LHC corresponding to “central exclusive production”**

- **A few recent examples**

arxiv:0907.5289 DESY 09-093	Diffractive Electroproduction of rho and phi Mesons at HERA
arxiv:0907.5289 DESY 09-109	Deeply Virtual Compton Scattering and its Beam Charge Asymmetry in e^+p Collisions at HERA
arxiv:1508.03176 DESY 13-058	Elastic and Proton-Dissociative Photoproduction of J/psi Mesons at HERA
arxiv:1508.03176 DESY 15-120	Exclusive rho Meson Photoproduction with a Leading Neutron at HERA

Should this be changed or are these processes not interesting for Rivet?



Charm and beauty production



- A total of **24** H1 analyses
- And **7** are in HZtool
- The missing analyses are the **most precise ones**
- We even have combined H1+ZEUS results to be added

Included in HZtool

Inclusive D*-Meson Cross Sections and D*-Jet Correlations in Photoproduction at HERA	HZH0608042
Inclusive Production of D ⁺ , D ⁰ , D _s ⁺ and D ⁺ Mesons in Deep Inelastic Scattering at HERA	HZH0408149
D ^(*+-) Meson Production in Deep-Inelastic Diffractive Interactions at HERA	HZH0108047
Measurement of Open Beauty Production at HERA	HZ99126
Measurement of D ⁺ Meson Cross Sections at HERA and Determination of the Gluon Density in the Proton	HZ98204
Inclusive D0 and D ⁺ /D ⁻ Production in Deep-Inelastic ep Scattering at HERA	HZ96138
Measurement of D ^(*+-) Meson Production and F ₂ ^c in Deep-Inelastic Scattering at HERA	HZ01100

Six most recent results not yet in HZtool

DESY 12-059	Measurement of Beauty and Charm Photoproduction using Semi-muonic Decays in Dijet Events at HERA
DESY 12-072	Measurement of Beauty Photoproduction near Threshold using Di-electron Events with the H1 Detector at HERA
DESY 12-172	Combination and QCD Analysis of Charm Production Cross Section Measurements in Deep-Inelastic ep Scattering at HERA
DESY 15-037	Combination of Differential D ^(*+-) Cross-Section Measurements in Deep-Inelastic ep Scattering at HERA
DESY 17-043	Measurement of D ⁺ Production in Diffractive Deep Inelastic Scattering at HERA
DESY 18-037	Combination and QCD analysis of beauty and charm production cross section measurements in deep inelastic ep scattering at HERA



Analyses with jets (in HZtool)

- **49 analyses total**
- **21 in HZtool**
- Not in HZtool:
precision jet
cross sections,
trijets, jet+ extra
conditions
(diffractive,
heavy flavour)

Forward Jet Production in Deep Inelastic Scattering at HERA	HZH0508055
Energy Flow and Rapidity Gaps Between Jets in Photoproduction at HERA	HZ02023
Measurement of Dijet Cross Sections in Photoproduction at HERA	HZ01225
Measurement of Dijet Electroproduction at Small Jet Separation	#N/A
Photoproduction of Dijets with High Transverse Momenta at HERA	HZH0603014
Measurement of Beauty Production at HERA Using Events with Muons and Jets	HZH0502010
Measurement of inclusive jet cross sections in photoproduction at HERA	HZH0302034
Measurement of Internal Jet Structure in Di-jet Production in Deep Inelastic Scattering at HERA	HZ98210
Measurement of Dijet Cross-Sections at Low Q^2 and the Extraction of an Effective Parton Density for t	HZ98205
Forward Jet and Particle Production at HERA	HZ98143
Diffractive Dijet Production at HERA	HZ98092
Multi-Jet Event Rates in Deep-Inelastic Scattering and Determination of the Strong Coupling Constant	HZ98087
Di-Jet Event Rates in Deep-Inelastic Scattering at HERA	HZ98076
Thrust Jet Analysis of Deep-Inelastic Large-Rapidity-Gap Events	HZ97210
Measurement of the Inclusive Di-Jet Cross Section in Photoproduction and Determination of an Effective	HZ97164
Jets and Energy Flow in Photon-Proton Collisions at HERA	HZ95219
Transverse Energy and Forward Jet Production in the Low x Regime at HERA	HZ95108
Measurement of Dijet Production at Low Q^2 at HERA	HZ03206
Inclusive Dijet Production at Low Bjorken-x in Deep Inelastic Scattering	HZ03160
Measurement of Inclusive Jet Cross-Sections in Deep-Inelastic ep-Scattering at HERA	HZ02079
Diffractive Jet Production in Deep-Inelastic ep Collisions at HERA	HZ00174
Measurement of Di-jet Cross-Sections in Photoproduction and Photon Structure	HZ00035



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DESY 00-145	Measurement and QCD Analysis of Jet Cross Sections in Deep-Inelastic Positron-Proton Collisions at \sqrt{s} c
DESY 01-073	Three-Jet Production in Deep-Inelastic Scattering at HERA
DESY 04-247	Measurement of Dijet Cross Sections in ep Interactions with a Leading Neutron at HERA
DESY 06-039	Measurement of Charm and Beauty Dijet Cross Sections in Photoproduction at HERA using the H1 Vertex Det
DESY 07-018	Tests of QCD Factorisation in the Diffractive Production of Dijets in Deep-Inelastic Scattering and Photoproduc
DESY 07-073	Measurement of Inclusive Jet Production in Deep-Inelastic Scattering at High Q^2 and Determination of the
DESY 07-115	Dijet Cross Sections and Parton Densities in Diffractive DIS at HERA
DESY 07-200	Three- and Four-jet Production at Low x at HERA
DESY 09-032	Jet Production in ep Collisions at High Q^2 and Determination of α_s
DESY 09-162	Jet Production in ep Collisions at Low Q^2 and Determination of α_s
DESY 10-043	Diffractive Dijet Photoproduction in ep Collisions at HERA
DESY 10-083	Measurement of Charm and Beauty Jets in Deep Inelastic Scattering at HERA
DESY 11-166	Measurement of Dijet Production in Diffractive Deep-Inelastic Scattering with a Leading Proton at HERA
DESY 11-183	Measurement of the Azimuthal Correlation between the most Forward Jet and the Scattered Positron in Deep-I
DESY 14-089	Measurement of Multijet Production in ep Collisions at High Q^2 and Determination of the Strong Coupling α
DESY 14-200	Measurement of Dijet Production in Diffractive Deep-Inelastic ep Scattering at HERA
DESY 14-242	Diffractive Dijet Production with a Leading Proton in ep Collisions at HERA
DESY 16-200	Measurement of Jet Production Cross Sections in Deep-inelastic ep Scattering at HERA
DESY 17-137	Determination of the strong coupling constant $\alpha_s(M_Z)$ in next-to-next-to-leading
DESY 92-142	Hard Scattering in γ -p interactions
DESY 93-100	Measurement of Inclusive Jet Cross Sections in Photoproduction at HERA
DESY 93-137	A Measurement of Multi-jet Rates in Deep-Inelastic-Scattering at HERA
DESY 94-220	Determination of the Strong Coupling Constant from Jet Rates in Deep Inelastic Scattering
DESY 95-086	A Direct Determination of the Gluon Density in the Proton at Low x
DESY 97-179	Low Q^2 Jet Production at HERA and Virtual Photon Structure

I think this should be improved



Measurements of the HFS (in HZtool)



- **37 analysis total**
- **16 in HZtool**
- As for jets, the most precise or most differential results are not covered

Charged Particle Cross Sections in Photoproduction and Extraction of the Gluon Density	HZH9810020
Measurement of Event Shape Variables in Deep-Inelastic Scattering at HERA	HZh0512014
Measurement of Prompt Photon Cross Sections in Photoproduction at HERA	HZh0407018
Inclusive Photoproduction of Neutral Pions in the Photon Hemisphere at HERA	HZH0006017
Investigation of Power Corrections to Event Shape Variables measured in Deep-Inelastic	HZ99193
Forward π^0 -Meson Production at HERA	HZ99094
Measurements of Transverse Energy Flow in Deep-Inelastic Scattering at HERA	HZ99091
Multiplicity Structure of Hadronic Final States in Diffractive Deep-Inelastic Scattering at	HZ98044
Hadron Production in Diffractive Deep Inelastic Scattering	HZ98029
Evolution of ep Fragmentation and Multiplicity Distributions in the Breit Frame	HZ97108
Measurement of Event Shape Variables in Deep Inelastic ep Scattering	HZ97098
Measurement of Charged Particle Transverse Momentum Spectra in Deep Inelastic Scattering	HZ96215
Charged Particle Multiplicities in Deep-Inelastic Scattering at HERA	HZ96160
Strangeness Production in Deep Inelastic Positron-Proton Scattering at HERA	HZ96122
A Study of the Fragmentation of Quarks in ep Collisions at HERA	HZ95072
Energy Flow and Charged Particle Spectra in Deep Inelastic Scattering at HERA	HZ94033



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DESY 02-059 Inelastic Photoproduction of J/Psi Mesons at HERA
DESY 02-060 Inelastic Leptoproduction of J/Psi Mesons at HERA
DESY 04-032 Measurement of Anti-Deuteron Production and a Search for Heavy Stable Charged Particles at HERA
DESY 04-051 Forward π^0 Production and Associated Transverse Energy Flow in Deep-Inelastic Scattering at HERA
DESY 07-065 Charged Particle Production in High Q^2 Deep-Inelastic Scattering at HERA
DESY 07-147 Measurement of Isolated Photon Production in Deep-Inelastic Scattering at HERA
DESY 08-095 Strangeness Production at low Q^2 in Deep-Inelastic ep Scattering at HERA
DESY 08-172 Inclusive Photoproduction of ρ^0, K^*_0 and ϕ Mesons at HERA
DESY 09-084 Observation of the Hadronic Final State Charge Asymmetry in High Q^2 Deep-Inelastic Scattering at HERA
DESY 09-135 Prompt Photons in Photoproduction at HERA
DESY 09-185 Measurement of Leading Neutron Production in Deep-Inelastic Scattering at HERA
DESY 09-225 Inelastic Production of J/psi Mesons in Photoproduction and Deep Inelastic Scattering at HERA
DESY 11-093 Measurement of Photon Production in the Very Forward Direction in Deep-Inelastic Scattering at HERA
DESY 13-012 Measurement of Charged Particle Spectra in Deep-Inelastic ep Scattering at HERA
DESY 14-035 Measurement of Feynman-x Spectra of Photons and Neutrons in the Very Forward Direction in Deep-Inelastic Scattering at HERA
DESY 92-162 Measurement of the Hadronic Final State in Deep Inelastic Scattering at HERA
DESY 94-030 Inclusive Charged Particle Cross Sections in Photoproduction at HERA
DESY 95-156 Comparison of Deep Inelastic Scattering with Photoproduction Interactions at HERA
DESY 96-014 Energy Flow in the Hadronic Final State of Diffractive and Non-Diffractive Deep-Inelastic Scattering at HERA
DESY 97-075 Bose-Einstein Correlations in Deep Inelastic ep Scattering at HERA
DESY 97-095 Photoproduction of K^0 and Λ at HERA and a Comparison with Deep Inelastic Scattering



Summary



- Only 3 H1 analyses in Rivet (and these are also in HZtool)
- In HZtool there are 49 analyses
- The total number of papers is 231
- Subtracting searches/inclusive/inclusive diffraction/electroweak there are 44/133 analyses in HZtool (2/3 missing)
- The missing analyses typically are the most precise ones
- H1 does not have many active members anymore: we can not do all the work