

Impact Studies – Status Update

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Webpage: <https://gepard.phy.hr/>

gepard

Search docs

CONTENTS:

- Software documentation
- Data sets
- Publications
- Credits

» Tool for studying the 3D quark and gluon distributions in the nucleon [View page source](#)

Gepard Tool for studying the 3D quark and gluon distributions in the nucleon

Gepard is software for analysis of three-dimensional distribution of quarks and gluons in hadrons, encoded in terms of the so-called Generalized Parton Distributions (GPDs).

This web site has manifold purpose:

- Documentation of the software
- Examples of the use of software
- Interface to various representations of results: numerical and graphical
- Interface to datasets used in analyses: numerical and graphical

Contents:

- [Software documentation](#)
 - [Installation](#)
 - [Quickstart](#)
 - [Tutorial](#)
 - [Data points, sets and files](#)
 - [GPDs and form factors](#)
 - [Processes and observables](#)
 - [Building the theory](#)
 - [Fitting theory to data](#)
 - [Detailed package info](#)
 - [Developer info](#)
 - [TODO items](#)

Impact Studies GitHub Page

GitHub Page: <https://github.com/kemaltezgin/Impact-Studies>

kemaltezgin / Impact-Studies Public

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<> Code Issues Pull requests Actions Projects Wiki Security Insights Settings

main 3 branches 0 tags Go to file Add file Code

kemaltezgin Add files via upload 8d3a959 2 days ago 48 commits

bin	propose new structure	last month
build	propose new structure	last month
include	add plotting of single histograms and slopes	3 days ago
src	Add files via upload	2 days ago
CMakeLists.txt	add possibility of setting specific instalation of HepMC3 library	11 days ago
README.txt	Update README.txt	11 days ago

README.txt

To compile:

```
cd build
cmake ..
make
```

If HepMC3 is not installed in your system use:

```
-DHEPMC3_DIR=ABSOLUTE_PATH
```

where ABSOLUTE_PATH is the absolute path to directory containing HepMC3Config.cmake file (typically in share/HepMC3/cmake subfolder of HepMC3 installation)

About

No description, website, or topics provided.

Readme 0 stars 3 watching 0 forks

Releases

No releases published
[Create a new release](#)

Packages

No packages published
[Publish your first package](#)

Contributors 2

- pawelsznajder Pawel Sznajder
- kemaltezgin Kemal Tezgin

- DVCS + BH + INT
- GK16 model
- Kinematic cuts:

$$0.0001 < xB < 0.630957$$

$$1 \text{ GeV}^2 < Q^2 < 1000 \text{ GeV}^2$$

$$0.2 \text{ GeV}^2 < |t| < 1.3 \text{ GeV}^2$$

$$0.03 < \phi < 6.2531$$

$$0.01 < y < 0.95$$

- Electron energy = 10 GeV, Proton energy = 100 GeV
- No radiative corrections
- Unpolarized target, 1.2 M Events (0.6 M parallel, 0.6 M antiparallel)
- Luminosity scaled to 10 fb^{-1} , $A_{LU} = \frac{d\sigma^{\rightarrow} - d\sigma^{\leftarrow}}{d\sigma^{\rightarrow} + d\sigma^{\leftarrow}}$

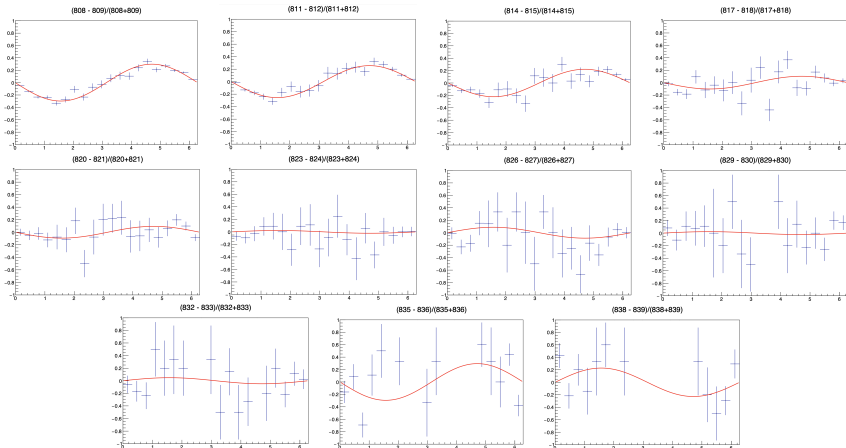
$$Q^2 = [1.0, 1.77828, 3.16228, 5.62341, 10, 17.7828, 31.6228, 56.2341, 100, 177.828, 316.228, 562.341, 1000.0]$$

$$x_{Bj} = [0.0001, 0.000158489, 0.000251189, 0.000398107, 0.000630957, 0.001, 0.00158489, 0.00251189, 0.00398107, 0.00630957, 0.01, 0.0158489, 0.0251189, 0.0398107, 0.0630957, 0.1, 0.158489, 0.251189, 0.398107, 0.630957]$$

$$|t| = [0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3]$$

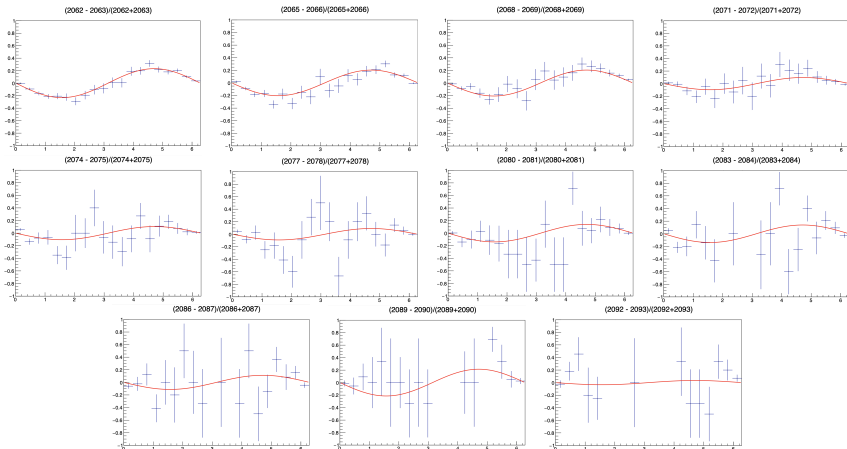
Beam Spin Asymmetry

Bin: $0.000251189 \leq x_B < 0.000398107$, $1 \leq Q^2 < 1.77828$



Beam Spin Asymmetry

Bin: $0.001 \leq x_B < 0.00158489$, $3.16228 \leq Q^2 < 5.62341$



ALU parameters

Fit: par 0 \times $\text{Sin}(x)$

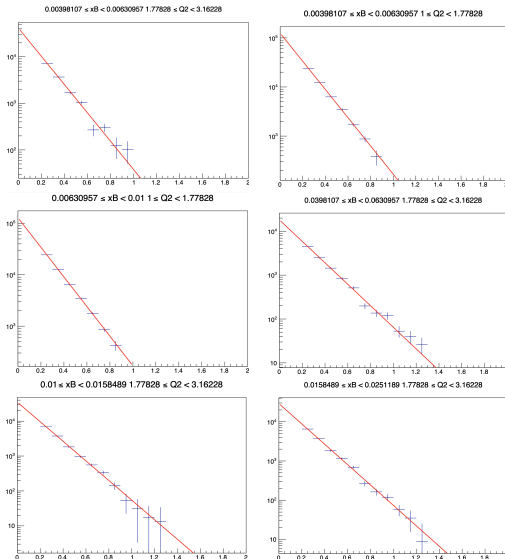
EXT	PARAMETER			STEP	FIRST
NO.	NAME	VALUE	ERROR	SIZE	DERIVATIVE
1	p0	-2.81710e-01	2.40865e-02	6.46731e-05	-1.97760e-08

BinALU::print debug: number of events: 3662
BinALU::print debug: range xB: min: 0.00251189 max: 0.00398107 mean (from events): 0.00298898
BinALU::print debug: range Q2: min: 5.62341 max: 10 mean (from events): 8.23649
BinALU::print debug: range |t|: min: 0.2 max: 0.3 mean (from events): -0.245312
FitResult::print debug: status code: 0 chi2/ndf: 1.53886
FitResult::print debug: par 0: value: -0.28171 unc: 0.0240865
Warning in <TH1D::Sumw2>: Sum of squares of weights structure already created
FCN=14.3606 FROM MIGRAD STATUS=CONVERGED 12 CALLS 13 TOTAL
EDM=7.53481e-19 STRATEGY= 1 ERROR MATRIX ACCURATE

EXT	PARAMETER			STEP	FIRST
NO.	NAME	VALUE	ERROR	SIZE	DERIVATIVE
1	p0	-2.43198e-01	3.52390e-02	6.74371e-05	3.48359e-08

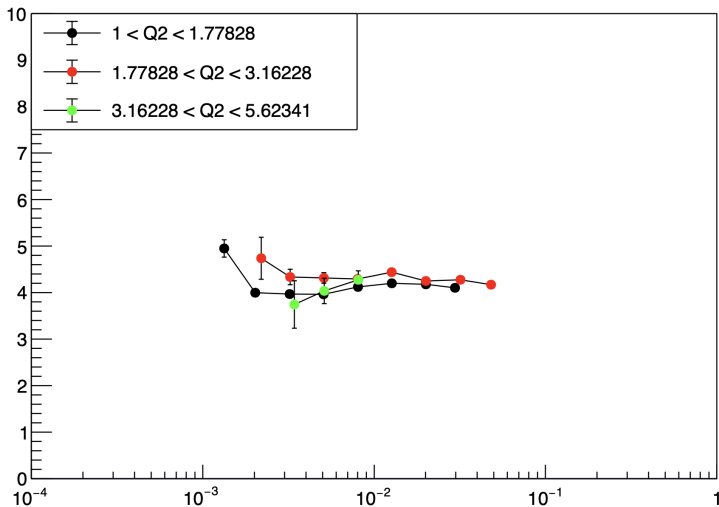
BinALU::print debug: number of events: 2030
BinALU::print debug: range xB: min: 0.00251189 max: 0.00398107 mean (from events): 0.00294367
BinALU::print debug: range Q2: min: 5.62341 max: 10 mean (from events): 8.24565
BinALU::print debug: range |t|: min: 0.3 max: 0.4 mean (from events): -0.346707
FitResult::print debug: status code: 0 chi2/ndf: 0.755824
FitResult::print debug: par 0: value: -0.243198 unc: 0.035239

t-slope (BH-subtracted)



t-slope (BH-subtracted)

t-slope vs. x_B



Bethe-Heitler Contribution

- Bethe-Heitler amplitude includes singularities

$$|\mathcal{T}_{\text{BH}}|^2 = \frac{1}{x_B y^2 (1 + \epsilon^2) t \mathcal{P}_1(\phi) \mathcal{P}_2(\phi)} \left\{ c_0^{\text{BH}} + \sum_{n=1}^2 c_n^{\text{BH}} \cos(n\phi) + s_1^{\text{BH}} \sin(\phi) \right\}$$

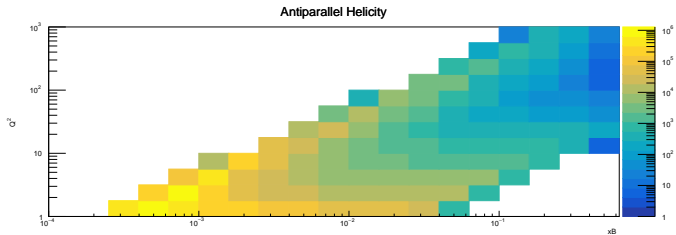
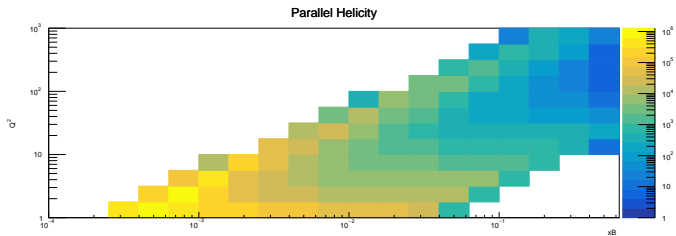
with

$$\mathcal{P}_1(\phi) = 1 + \frac{2k \cdot \Delta}{Q^2} \quad \mathcal{P}_2(\phi) = \frac{t - 2k \cdot \Delta}{Q^2}, \quad \text{where}$$

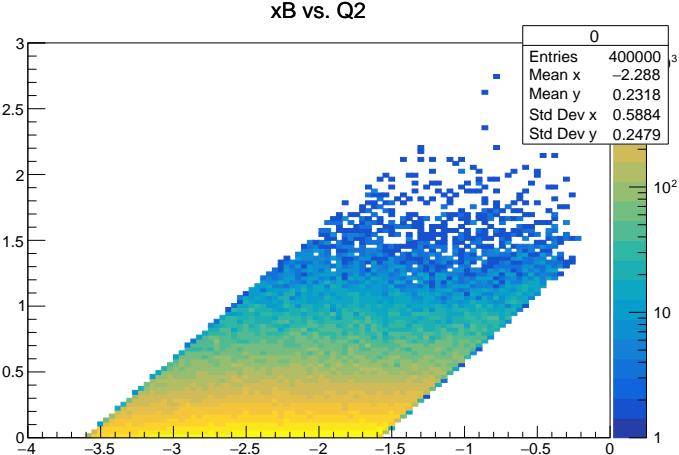
$$k \cdot \Delta = -\frac{Q^2}{2y(1 + \epsilon^2)} \left\{ 1 + 2K \cos\phi - \frac{t}{Q^2} (1 - x_B(2 - y) + \frac{y\epsilon^2}{2}) + \frac{y\epsilon^2}{2} \right\}$$

$$K^2 = -\frac{t}{Q^2} (1 - x_B) \left(1 - y - \frac{y^2 \epsilon^2}{4} \right) \left(1 - \frac{t_{\min}}{t^2} \right) \left\{ \sqrt{1 + \epsilon^2} + \frac{4x_B(1 - x_B) + \epsilon^2}{4(1 - x_B)} \frac{t - t_{\min}}{Q^2} \right\}$$

$x_B - Q^2$ correlation



$x_B - Q^2$ correlation



t-slope parameters

