Scaled Momentum Spectra in the Target Region of the Breit Frame

Status Report

Nick Brook, Corinna Catterall, Lydia Shcheglova

Motivation

- practically not studied region, ZEUS data, *Europ. Phys. Journ. C 11(1999)2,* were obtained with 6.4 pb^{-1}. *Times Cited : 53*

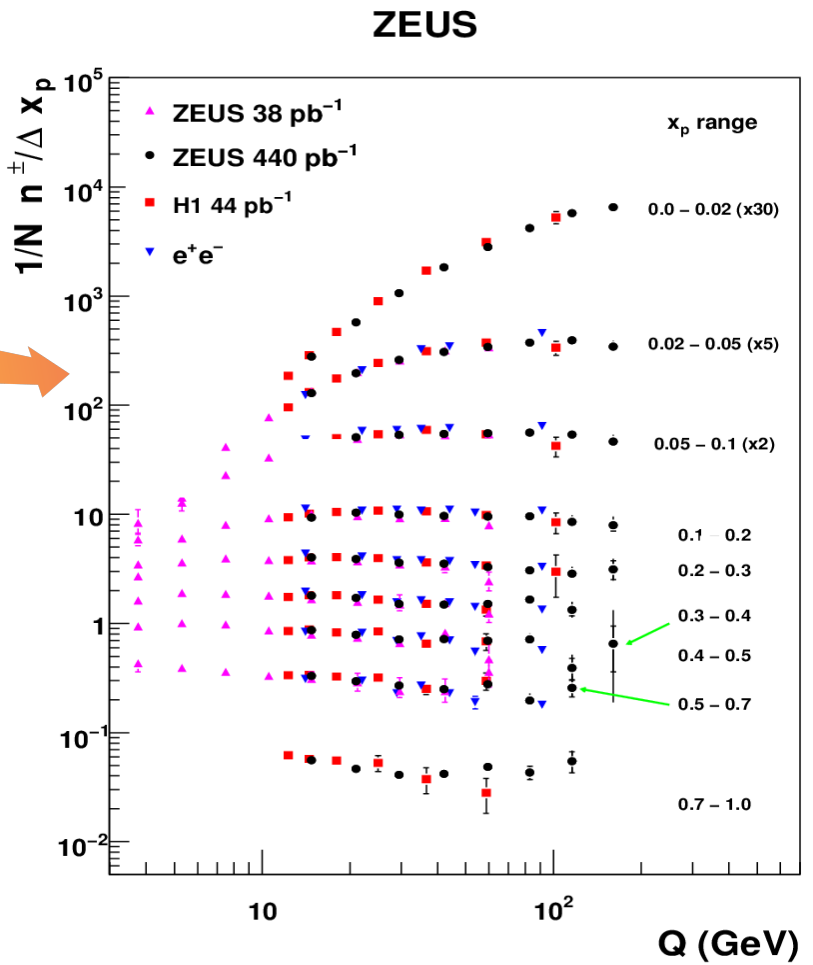
- no H1 data

- compare with the ZEUS recent data (*JHEP 6,2010*) in the current region, strong scaling violation was observed
  Times Cited : 3

- do we have scaling violation in the target region ?

- fit of the shape of $\ln(1/x_p)$ distributions – to study Q^2, x -dependence of the peak position

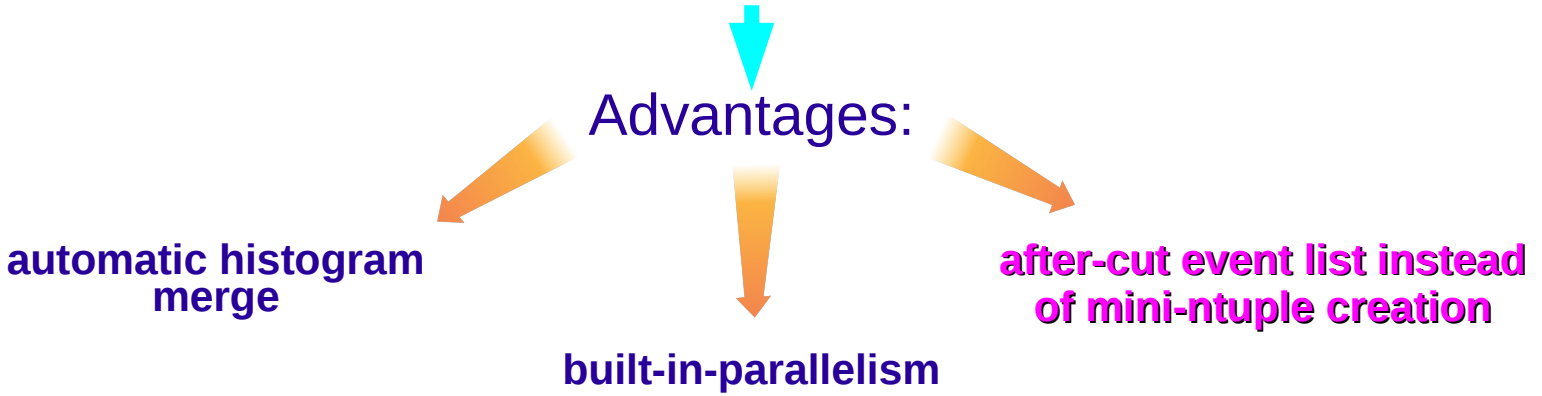
FF study needs data analysis over a wide range of Q^2 and x.



Could we start from Q^2 >10 ?

Analysis

- based on HERA II Root Common Ntuples, v08b
- migrated to **PROOF** (**P**arallel **Roo**t **F**acillity) – now have the framework for effective running the the analysis.



- **running the whole HERA II statistics (~1/3 billion events) takes about 2 hours on 24 cores of nafhh-zeus01**
- **in case the bug in producing after-cut-list event is fixed, disk space usage reduces by several orders of magnitude**

- **C++ code for boosting CN's particle lab momenta to the Breit frame**

Comments about ROOT6 on NAF2

ROOT5 on NAF2 (February 2013) is old and buggy: PROOF running the same code over the same data several times yields notably fluctuating number of useful events...

ROOT6 is now available on NAF2 (6.02/05, 9 February 2015), but not usable:

```
"...fatal error: 'atomic' file not found"
```

Instead use current CERN's stuff directly via AFS:

```
source/afs/cern.ch/sw/lcg/contrib/gcc/4.8/x86_64-slc6/setup.csh
source/afs/cern.ch/sw/lcg/app/releases/ROOT/6.04.02/x86_64-slc6-gcc48-opt/root/
bin/thisroot.csh
```

Thanks Anatoly Solomin (UoB) for the solution of the problem

On nafhh-zeus01 PROOF runs this analysis at processing rate ~100K events/sec. E.g. running over ~40M 2007p events takes ~7 min.

Data sample and selection

Standard DIS Event Selection:

- DST bit 14 ==> Bit11 and 13cm boxcut, Ee>5, E-pz+2*elumg>35
- & boxcut 14x14
- Sinistra electron with E > 10 GeV
- $Q^2_{DA} > 10\ GeV^2$
- yel < 0.95
- $y_{JB} > 0.04$
- 40 GeV< E-Pz < 60
- reconstructed vertex with $|Z_{vtx}| < 50$ cm

Track Selection

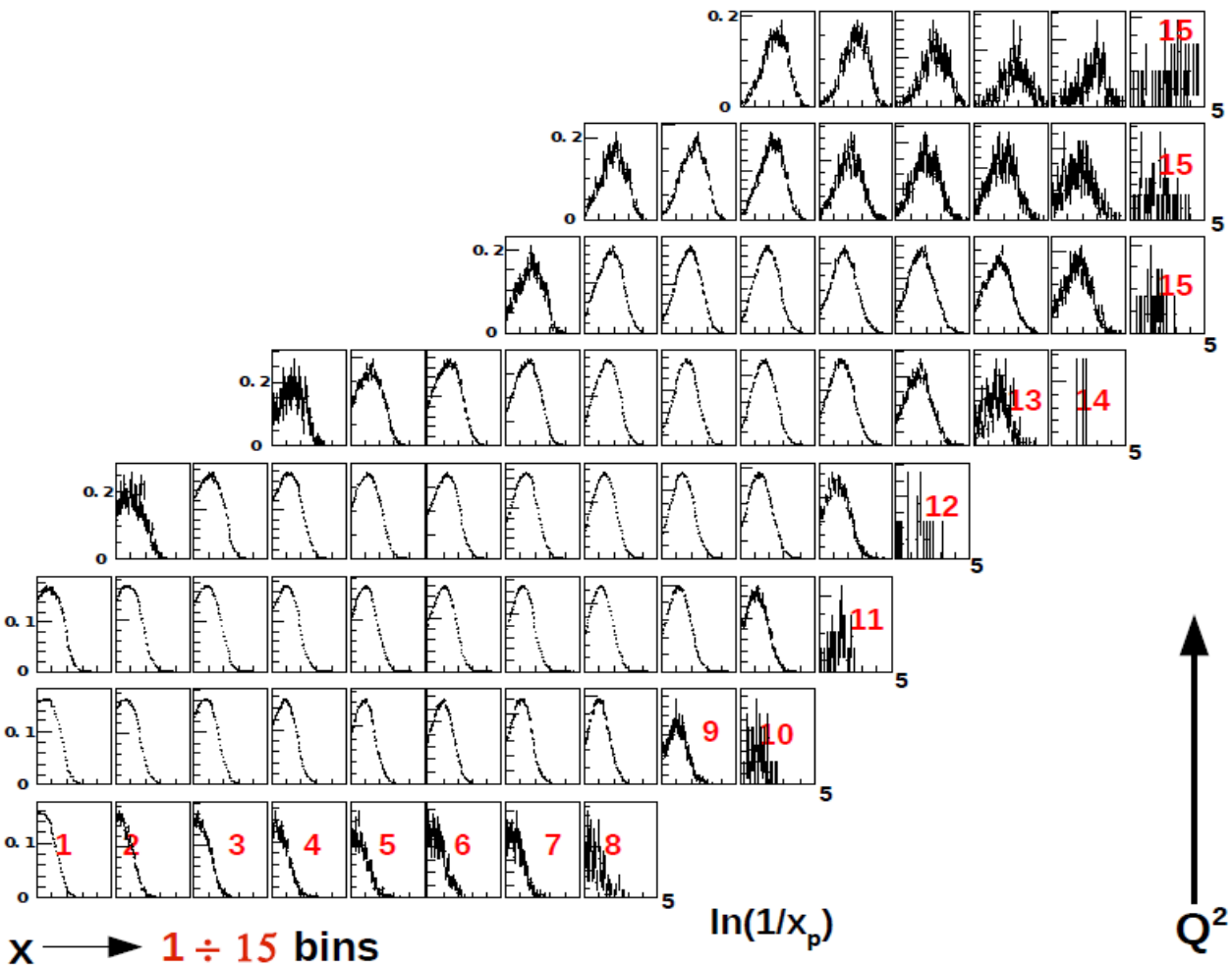
- tracks associated with primary vertex
- pT > 150 MeV
- CTD OuterSL>=3 or NSTT>=16 or NMVD hits>=5

HERA II 03-07data

Corinna's quality track criteria, based on Gerd's studies of track's efficiency vs purity

HERA II reg. tracks, target region

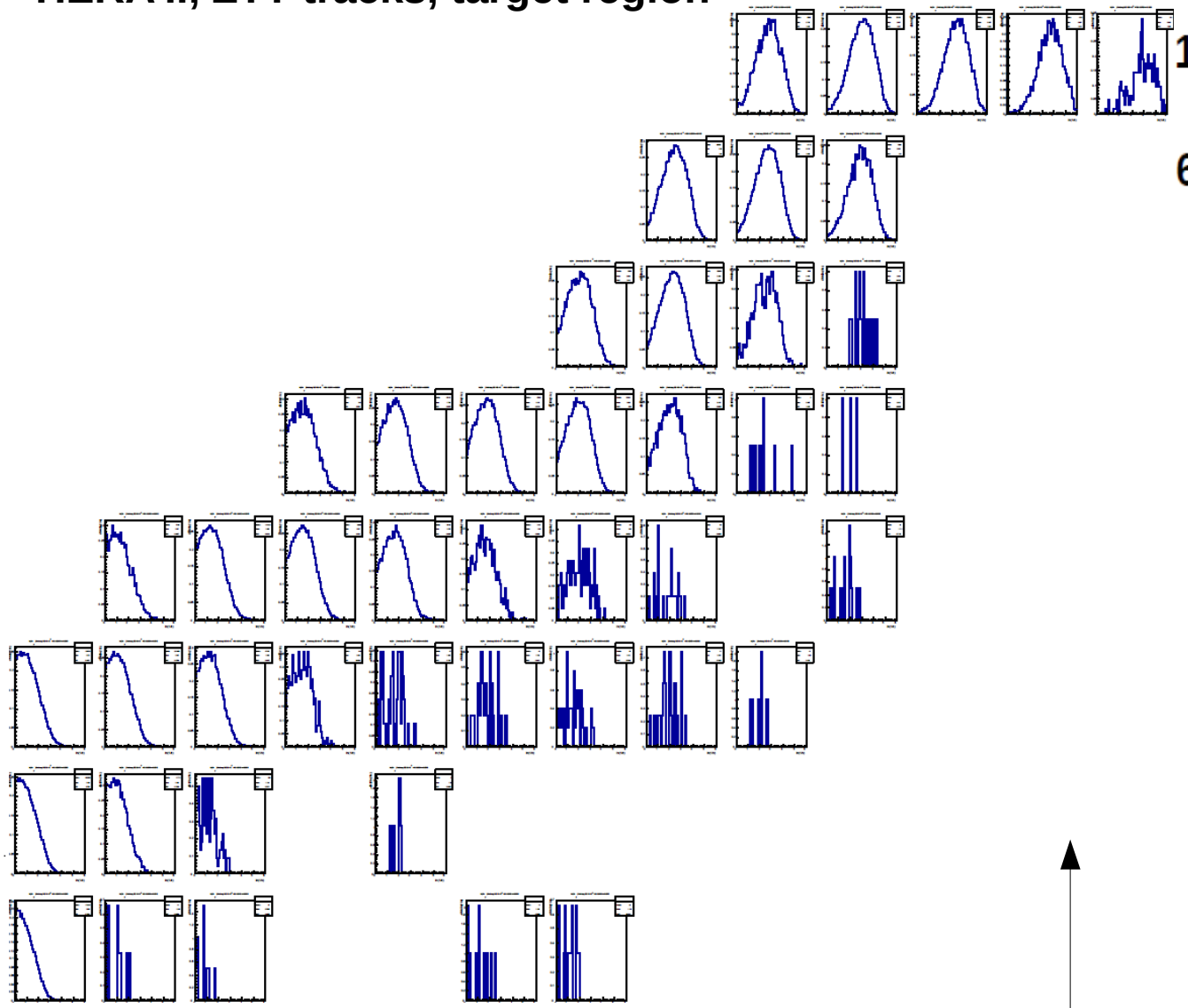
x		
1	1.5×10^{-4}	8.0×10^{-4}
2	6.0×10^{-4}	12.0×10^{-4}
3	1.2×10^{-3}	1.8×10^{-3}
4	1.8×10^{-3}	2.4×10^{-3}
5	2.4×10^{-3}	3.0×10^{-3}
6	3.0×10^{-3}	3.6×10^{-3}
7	3.6×10^{-3}	5.0×10^{-3}
8	5.0×10^{-3}	10.0×10^{-3}
9	1.0×10^{-2}	1.6×10^{-2}
10	1.6×10^{-2}	3.0×10^{-2}
11	3.0×10^{-2}	5.0×10^{-2}
12	5.0×10^{-2}	7.0×10^{-2}
13	7.0×10^{-2}	0.1
14	0.1	0.15
15	0.15	0.25



Q^2(GeV^2)	
1280 - 5120	8
640 - 1280	7
320 - 640	6
160 - 320	5
80 - 160	4
40 - 80	3
20 - 40	2
10 - 20	1

Q^2 → 1 ÷ 8 bins

HERA II, ZTT tracks, target region



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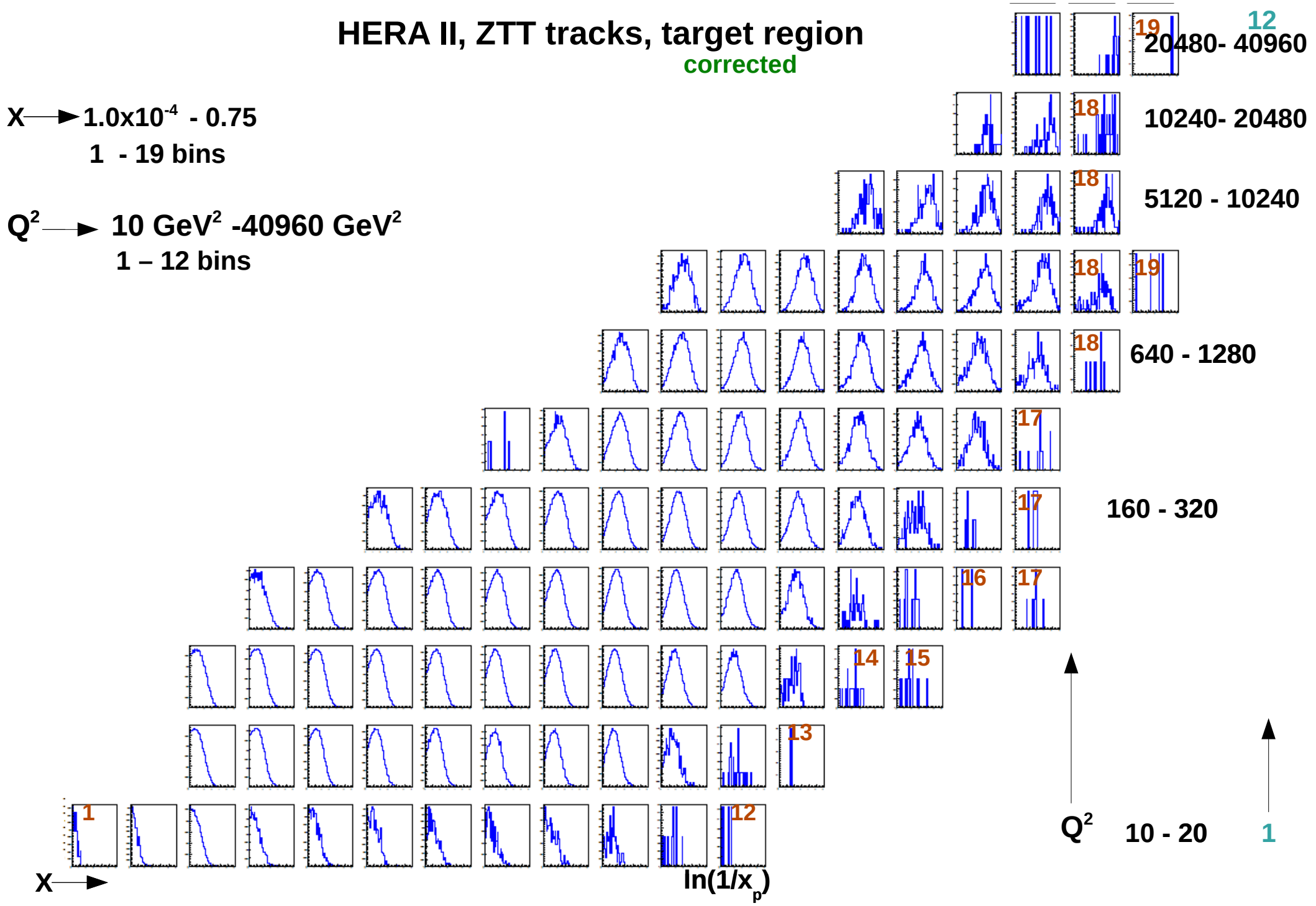
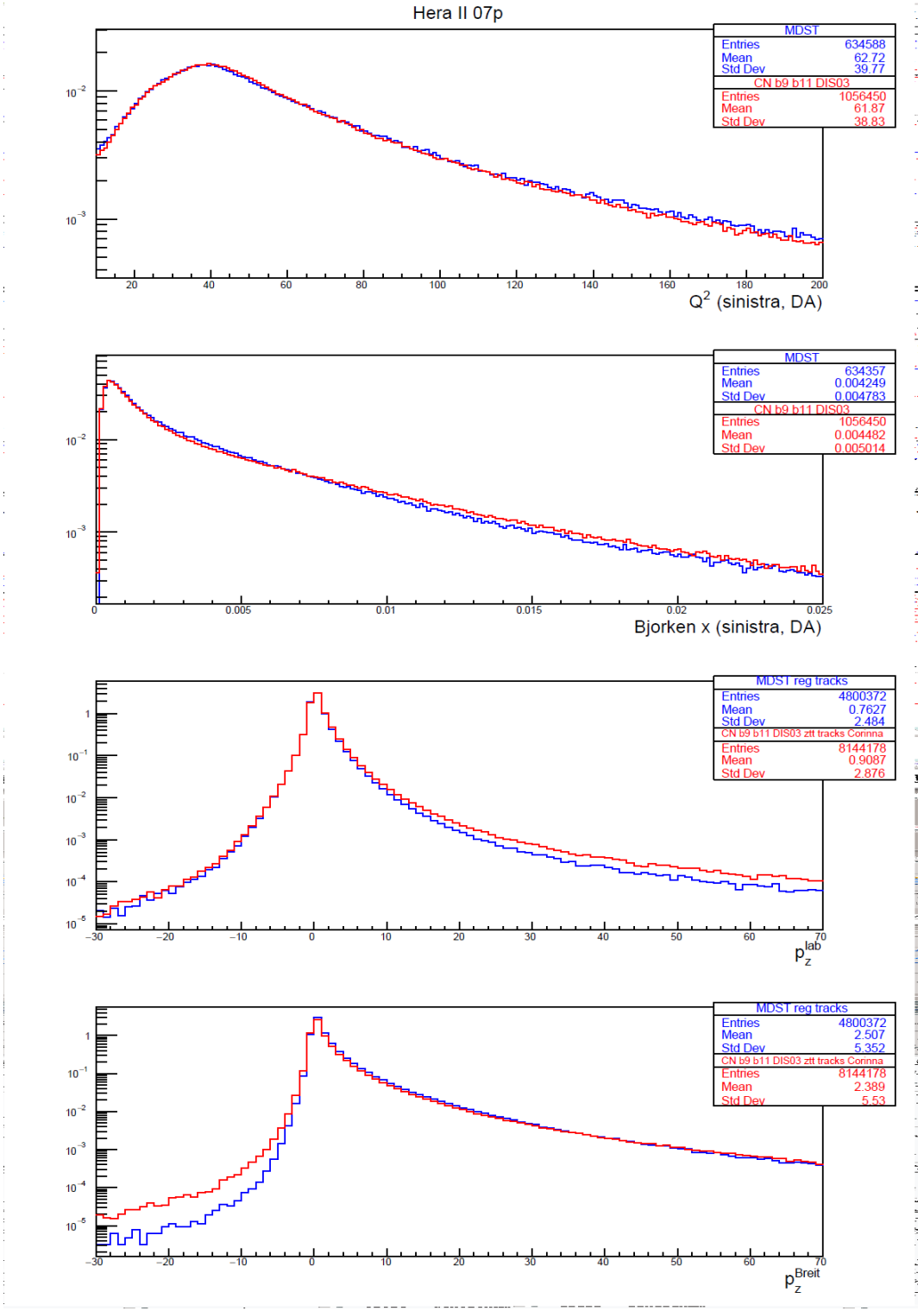
Q^2 → 1-8 bins

HERA II, ZTT tracks, target region

corrected



Control plots



Comparison with MC

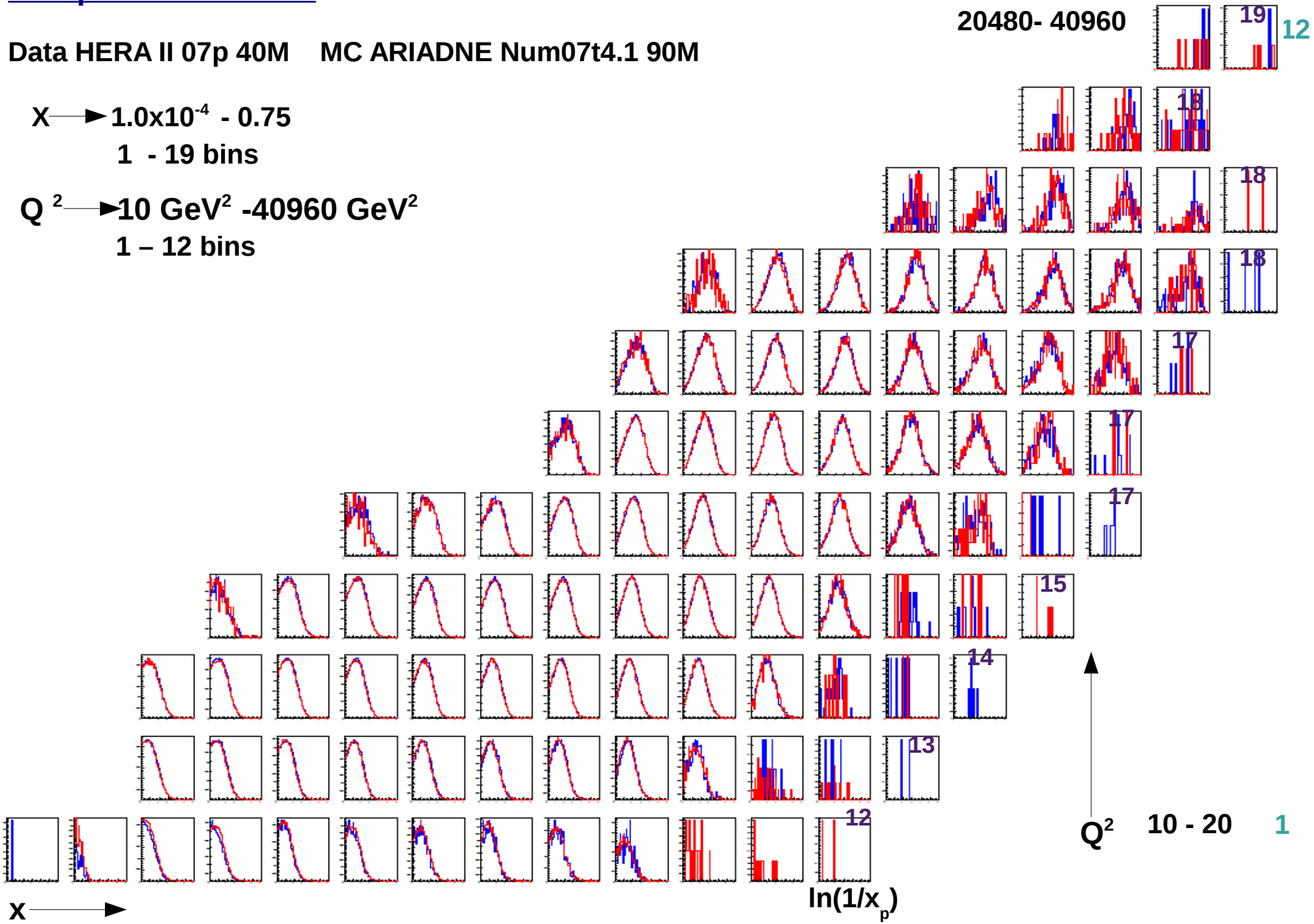
Data HERA II 07p 40M MC ARIADNE Num07t4.1 90M

X ⟶ 1.0×10^{-4} - 0.75

1 - 19 bins

Q^2 ⟶ 10 GeV^2 -40960 GeV^2

1 – 12 bins



Comparison with MC inclusive

HERA II data 03-07, MC ARIADNE 03-07

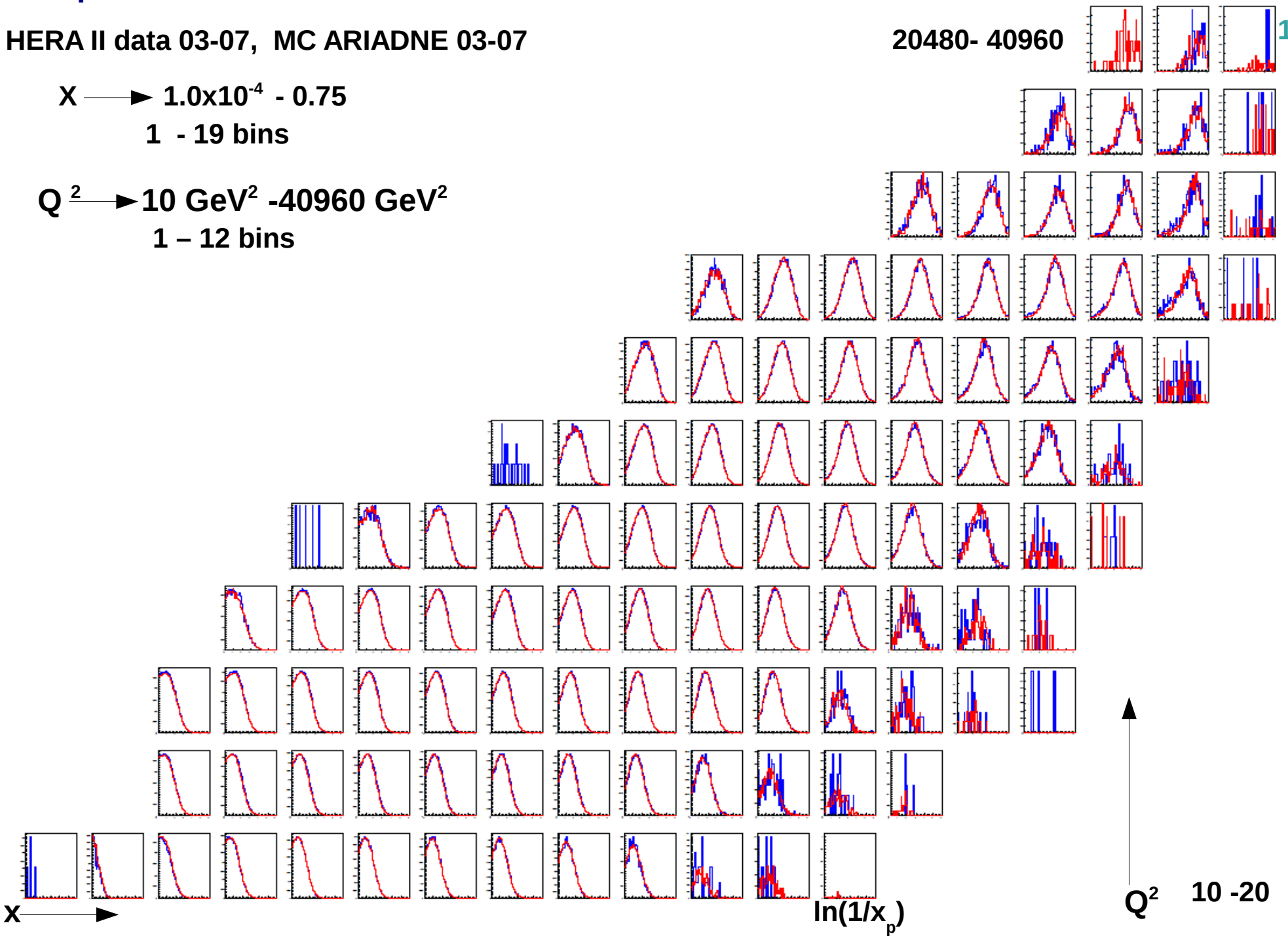
20480- 40960 12

X ⟶ 1.0×10^{-4} - 0.75

1 - 19 bins

Q^2 ⟶ 10 GeV^2 -40960 GeV^2

1 – 12 bins



Summary

- comparison with MC shows a good agreement with the data

- next step is to obtain the resolutions and the correction factors in the bins

- we are now at the stage to get physics results

- plan to show the first results at the next Collaboration meeting

Thank you for your attention!