ZEUS-note 98-074
27 October 1998

An update of the F_2^{ep} analysis using the 1995 shifted vertex data.

M. Raso
I.N.F.N. - Sezione di Roma, Italy.

Abstract

This note describes, schematically, the improvements applied to the measurement of F_2^{ep} with the '95 Shifted Vertex Data. The kinematical region of the measurement is now extended up in Q^2 (up to $Q^2 = 17$ GeV^2) and the available number of events is increased. In addition, they allow to give a correct estimation of the background and a better understanding of the data.

1 Motivations

From the write-up of my note describing the F_2 analysis of the '95 Shifted Vertex Data [1] to the publication of the results by the collaboration I have had several interactions with the author of the other parallel analysis, as well as with other ZEUS colleagues, in order to cross-check methods and results. Since several aspects of my analysis are not standard I would like to give in this note the final numbers on F_2 obtainable from those data with this method, on the light of the increased confidence of the data and on the method (and also after that some mistake has been corrected ...).

The analysis strategy is described in detail in [1], and it is sketched here very shortly: from the observed number of events we infer the ("true") number of events to be attributed to each y and Q^2 cell. These values are then corrected for the radiative contribution, obtaining the born cross section for each bin. The F_2 values are calculated in the centre of the bin, using a Taylor's expansion up to the second order, to take into account the non constant behaviour of the cross section in the bin. Finally the uncertainties due to systematic effects are evaluated in a probabilistic way, also taking into account the correlations they introduce on the data points.

2 Update

The introduced improvements are essentially applied to the energy measurement and the positron position measurement. Two mistakes are also found and corrected. The applied adjustments can be summerized in this way:

- *Calorimeter Energy correction* :

  Due to the miscalibration of the calorimeter a correction of 6% in BCAL and 2.5% in RCAL is applied to the measured energy.

- *Positron Energy correction*:

  The new energy correction function for the scattered positron is now applied. No calorimeter correction is applied to the uncorrected positron energy.

- *Positron position*:

  The misalignment of the SRTD is taken into consideration. The calorimeter position informations are used when the SRTD is not avaible. In this way is possible to extend the measurement towards higher values of Q^2.

- *Noise suppression*:

  The noise suppression routine NOISE95m is applied both to the data and to the MC events. In this way a better agreement between data and MC in the low y_{JB} and $E - P_z$ region is achieved.

- *Timing*:

  A bug was corrected in the old analysis: before the events without timing information were excluded from the analysis while now they are included (thanks to Mike Wodarczyk).

- *Photoproduction background* :

  This source of background was estimated using the PYTHIA Monte Carlo generator. For this analysis a sample corresponding to 253 nb^{-1} was used with a cut of $Q^2 < 2$ GeV^2. With this cut not all the positrons are lost in the beam pipe, due to the new geometry of the detector, and so there was an overestimation of the PHP background.

  This problem has been fixed using only the events with a $Q^2_{app} < 0.3$ GeV^2.

- *New bins* :

  In order to have a real comparison with the other analysis, a new binning in y and Q^2 was chosen.

Figure 1 shows the bins used in this analysis. There are now 12 bins in Q^2 and 5 in x except for the low Q^2 bins, where there are only 1 and 3 bins for $Q^2 = 0.6$ GeV^2 and $Q^2 = 0.9$ GeV^2, respectively.

- F_L:

  The value of F_L is quoted using now the BKS model [5], instead of the ZEUS NLO fit to the '94 data.

- *smoothing function*:

  Different checks were made to see if the smoothing function used during the unfolding procedure biases the data.

3 Results

The results on the F_2 measurements are reported in the table 1. Using this table it's possible to go through each step of the analysis (and to make the always possible corrections). In fact the x, y and Q^2 values, at which the F_2 is extracted, are shown with the width of each bin, the number of observed events and the unfolded ones, too. In addition to those data, the extracted born differential cross section (without systematics corrections) and the radiative contributions are written down.

The reported F_2 values with their uncertainties (both type A and B) are corrected by systematic effects, as described in the previous note [1]. The overall normalisation uncertainty of 2% is not included in the quoted uncertainty. The used F_L values are also shown.

The full correlation matrix is printed in table 2 [6] (the values are expressed in percentage).

The results, compared with the published 95 SVX data, are shown in figure 4 at different Q^2. A good agreement is obtained in all bins except for the highest y bin at $Q^2 = 1.3$ GeV^2 and at $Q^2 = 6.$ GeV^2. In figure 5 the results are compared to some of the available data.

The ZEUS NLO fit to data [3], made including the '95 official ZEUS shifted vertex data, is also shown (solid line).

4 Conclusions

The update results on F_2 obtained by this analysis are consistent with the those presented in 1996 even if they are systematically lower due to the overestimation of the photoproduction background. They are in agreement with official ZEUS results, except for few bins in the highest y region, although the discrepancy is within the quoted uncertainty.

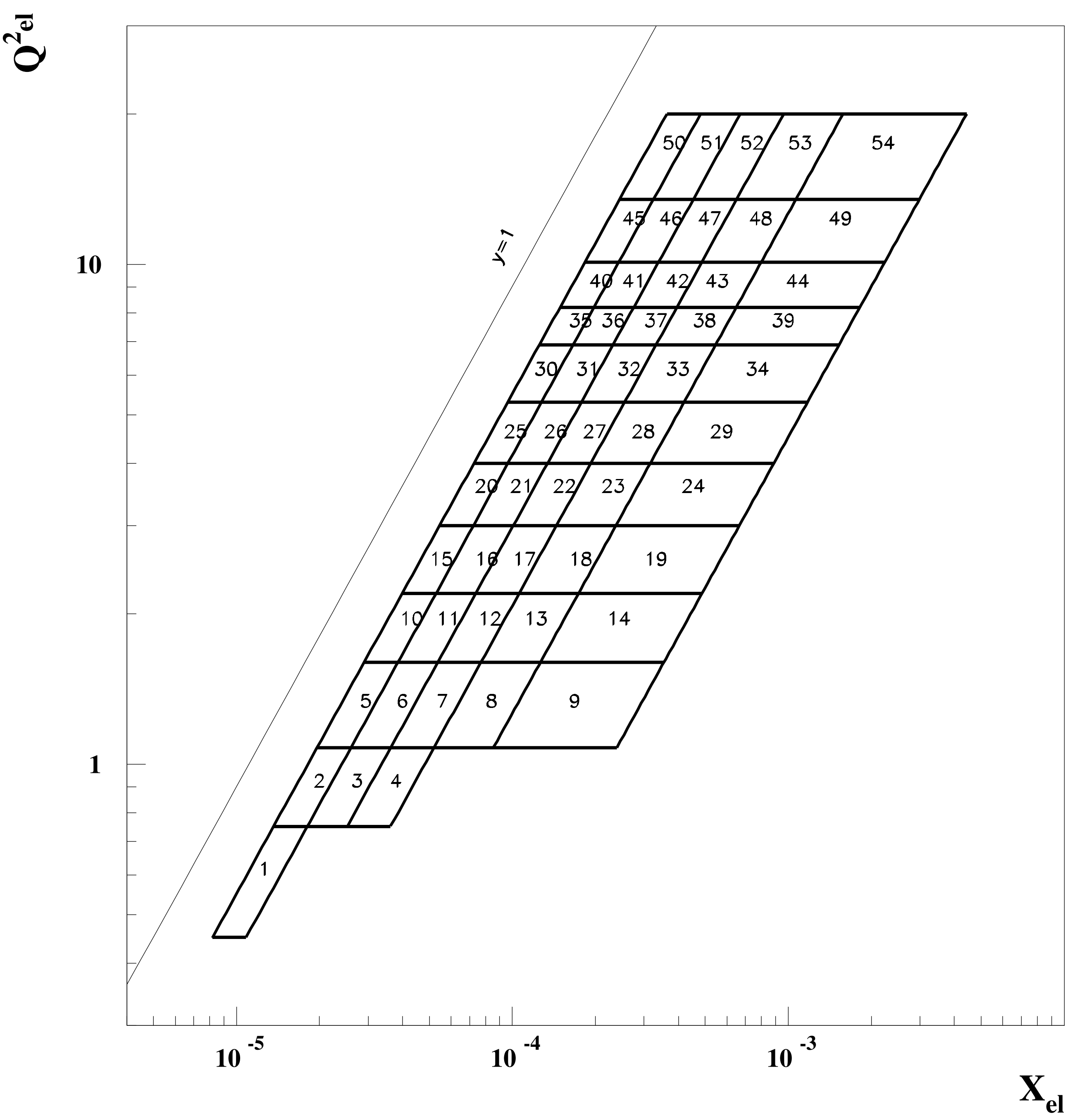

Figure 1: *Binning used in the analysis.*

Q^2 (GeV^2)	y	x	$N_{obs.}$	$N_{unf.} \pm \delta N$	$\frac{d^2\sigma_B}{dydQ^2} \pm \delta\sigma_B$ (nb/GeV^2)	$F_2 \pm \delta F_2$	δF_L (%)	δ_{rc} (%)
0.6 (0.75-0.45)	0.54 (0.61-0.46)	1.2 10^{-5}	903	4672±103	412.8±9.5	0.527±0.055	3.4	1.7
0.9 (1.08-0.75)	0.54 (0.61-0.46)	1.9 10^{-5}	1282	2884±54	227.5±4.4	0.677 ±0.067	3.8	5.5
	0.39(0.46-0.33)	2.6 10^{-5}	1588	3642±64	335.7±6.1	0.640 ± 0.045	1.7	3.6
	0.28 (0.33-0.23)	3.6 10^{-5}	1167	3966±73	468.9±8.8	0.569 ± 0.036	0.08	5.2
1.3 (1.6-1.08)	0.54 (0.61-0.46)	2.8 10^{-5}	1596	2476±45	125.8±2.4	0.786 ± 0.076	4.28	3.4
	0.39(0.46-0.33)	3.8 10^{-5}	1909	3275±52	184.9±3.1	0.748 ±0.045	1.99	6.7
	0.28 (0.33-0.23)	5.3 10^{-5}	1955	3755±60	271.9±4.5	0.694 ±0.037	0.09	8.4
	0.19 (0.23-0.14)	8.0 10^{-5}	2193	5063±74	407.4 ±6.2	0.622 ± 0.029	0.04	7.3
	0.09 (0.14-0.05)	1.6 10^{-4}	2030	9678±141	761±12	0.541 ± 0.027	0.0	5.3
1.9 (2.2-1.6)	0.54 (0.61-0.46)	3.9 10^{-5}	1617	1623±30	72.7±1.4	0.942 ± 0.090	5.5	2.3
	0.39(0.46-0.33)	5.3 10^{-5}	1851	2164±36	105.4±1.8	0.859 ± 0.047	2.5	8.3
	0.28 (0.33-0.23)	7.5 10^{-5}	1480	2371 ±39	149.8±2.5	0.778± 0.034	1.1	8.5
	0.19 (0.23-0.14)	1.1 10^{-4}	1731	3181 ±47	229.4±3.5	0.711 ±0.028	0.5	4.7
	0.09 (0.14-0.05)	2.2$10^{-4}$	1845	6371±92	428.6±6.7	0.609 ± 0.031	0.01	7.3
2.5 (3.0-2.2)	0.54 (0.61-0.46)	5.4 10^{-5}	1459	1397±28	43.0±0.88	1.020±0.088	5.2	11.6
	0.39(0.46-0.33)	7.3 10^{-5}	1868	1590±27	61.8±1.1	0.930±0.049	2.4	1.8
	0.28 (0.33-0.23)	1.0 10^{-4}	1818	1749±27	90.4±1.4	0.862±0.039	1.1	-.05
	0.19 (0.23-0.14)	1.6 10^{-4}	1809	2431±35	134.6±2.0	0.781±0.029	0.4	2.4
	0.09 (0.14-0.05)	3.0 10^{-4}	1759	4940±70	250.8±3.8	0.658±0.029	0.01	7.0
3.5 (4.0-3.0)	0.54 (0.61-0.46)	7.3 10^{-5}	1151	956±22	26.1±0.6	1.140± 0.098	6.0	7.0
	0.39(0.46-0.33)	9.8 10^{-5}	1474	1101±20	34.6±0.65	0.997±0.051	2.8	8.0
	0.28 (0.33-0.23)	1.4 10^{-4}	1555	1334±22	51.5±0.9	0.913±0.038	1.2	6.7
	0.19 (0.23-0.14)	2.1 10^{-4}	1792	1794±27	77.7±1.2	0.802±0.030	0.5	4.9
	0.09 (0.14-0.05)	4.1 10^{-4}	1624	3464±51	140.5±2.2	0.682±0.037	0.01	7.2
4.5 (5.3-4.0)	0.54 (0.61-0.46)	9.3 10^{-5}	875	826±21	15.3±0.4	1.173±0.095	6.2	14.4
	0.39(0.46-0.33)	1.3 10^{-4}	1200	921±18	21.5 ±0.4	1.039±0.059	2.7	4.6
	0.28 (0.33-0.23)	1.8 10^{-4}	1253	1055±19	31.5 ±0.6	0.979±0.056	1.2	6.2
	0.19 (0.23-0.14)	2.7 10^{-4}	1573	1418±23	46.4±0.8	0.859±0.036	0.05	7.0
	0.09 (0.14-0.05)	5.2$10^{-4}$	1427	2663±42	81.8±1.4	0.706±0.039	0.01	9.9
6.0 (6.9-5.3)	0.54 (0.61-0.46)	1.2 10^{-4}	671	597±18	9.5±0.3	1.27±0.11	6.9	8.0
	0.39(0.46-0.33)	1.7 10^{-4}	855	666±18	13.4±0.36	1.126±0.054	2.8	-0.13
	0.28 (0.33-0.23)	2.4 10^{-4}	951	782±18	19.6±0.4	1.038±0.042	1.2	2.9
	0.19 (0.23-0.14)	3.6 10^{-4}	1229	1099±20	29.3±0.6	0.915±0.038	0.05	6.9
	0.09 (0.14-0.05)	7.0 10^{-4}	1139	2058±37	52.0±1.0	0.763±0.033	0.01	8.6
7.5 (8.2-6.9)	0.54 (0.61-0.46)	1.6 10^{-4}	341	335±12	6.37 ±0.24	1.27±0.10	6.8	12.3
	0.39(0.46-0.33)	2.1 10^{-4}	426	348±10	8.9±0.3	1.139±0.060	2.9	-3.4
	0.28 (0.33-0.23)	3.0 10^{-4}	474	425±12	12.9±0.4	1.078±0.046	1.2	5.2
	0.19 (0.23-0.14)	4.5 10^{-4}	570	539±13	18.4±0.4	0.901±0.042	0.05	3.5
	0.09 (0.14-0.05)	8.7 10^{-4}	681	1095±25	34.6±0.8	0.794±0.030	0.01	6.8
9.0 (10.1-8.2)	0.54 (0.61-0.46)	1.9 10^{-4}	373	302±13	4.3±0.2	1.35±0.10	5.9	1.6
	0.39(0.46-0.33)	2.5 10^{-4}	448	386±11	6.20±0.19	1.18±0.06	2.9	5.2
	0.28 (0.33-0.23)	3.6 10^{-4}	471	426±11	8.3±0.2	0.996±0.047	1.2	11.7
	0.19 (0.23-0.14)	5.0 10^{-4}	588	548±14	12.1±0.3	0.862±0.040	0.6	8.5
	0.09 (0.14-0.05)	9.8$10^{-4}$	724	1159±26	23.4±0.6	0.776±0.029	0.1	13.2
12.0 (13.5-10.1)	0.54 (0.61-0.46)	2.5 10^{-4}	416	357±15	2.6±0.1	1.30±0.10	6.0	9.8
	0.39(0.46-0.33)	3.4 10^{-4}	519	453±15	3.8±0.1	1.189±0.062	2.7	10.5
	0.28 (0.33-0.23)	4.7 10^{-4}	551	479±13	5.35±0.15	1.063±0.052	1.2	7.9
	0.19 (0.23-0.14)	7.2 10^{-4}	716	672±16	8.3±0.2	0.995±0.047	0.5	8.0
	0.09 (0.14-0.05)	1.4 10^{-3}	828	1375±30	15.8±0.4	0.894±0.037	0.1	10.3
17. (20.-13.5)	0.54 (0.61-0.46)	3.5·10^{-4}	415	351 ±15	1.33 ± 0.06	1.36±0.10	6.0	8.9
	0.39(0.46-0.33)	4.8·10^{-4}	530	476 ± 16	1.89 ± 0.07	1.24±0.069	2.7	19.9
	0.28 (0.33-0.23)	6.7·10^{-4}	589	481 ± 14	2.62 ± 0.08	1.08±0.056	1.2	13.3
	0.19 (0.23-0.14)	1.0·10^{-3}	768	671 ± 16	3.98 ± 0.10	0.993±0.052	0.5	14.8
	0.09 (0.14-0.05)	2.0·10^{-3}	769	1387 ± 32	7.84 ± 0.20	0.911±0.048	0.0	15.1

Table 1: *In the table are reported the principal steps of the analysis. δN, $\delta\sigma$ stay for type A uncertainties ("statistical") while δF_2 is the total uncertainties (type A and B). The radiative corrections (δ_{rc}) and F_L contribution (δF_L)are also reported.*

After all cross checks the only difference between this and the other analysis remains that due to the different unfolding and uncertainty evaluation methods. The agreement can be also seen from the comparison (figure 5) with the NO QCD fit, made using the the published data. In some bins the agreement to the fit is even better than that of the published data.

Finally, it is worth noticing that this analysis allows to evaluate the covariance matrix of the data points, which it is not trivial (see table 2) and it can be of crucial importance to extract precise QCD informations from the data.

5 Acknowledgements

Due to my service on army I could write this note only in this period even if the results shown here have been developed during the collaboration with Ludger Lindemann, and all Fsigma group, to study the F_2 structure function with '95 SVX data.

For this reason I can say, only now, thank you to all Fsigma group and to the "young dad".

References

[1] M. Raso *A measurement of the F_2 structure function using '95 Shifted Vertex Data.* ZEUS-note 96-132; 98-074.

[2] ZEUS Collaboration: M Derrick et al *DESY 96-076.*

[3] ZEUS Collaboration: J. Breitweg et al. *DESY 98-121.*

[4] G. D'Agostini *Probability and Measurement Uncertainty in Physics - a Bayesian Primer-* DESY 95-242

[5] B. Badelek, J. Kwiecinski, A. Stasto, Z. Phys. C74 (1997) 297.

[6] the correlation matrix is also avaible at /bologna/user1/raso/cov_svx95.data

[7] H1 Collaboration, I. Abt et al., Nucl. Phys. B497 (1997) 297.

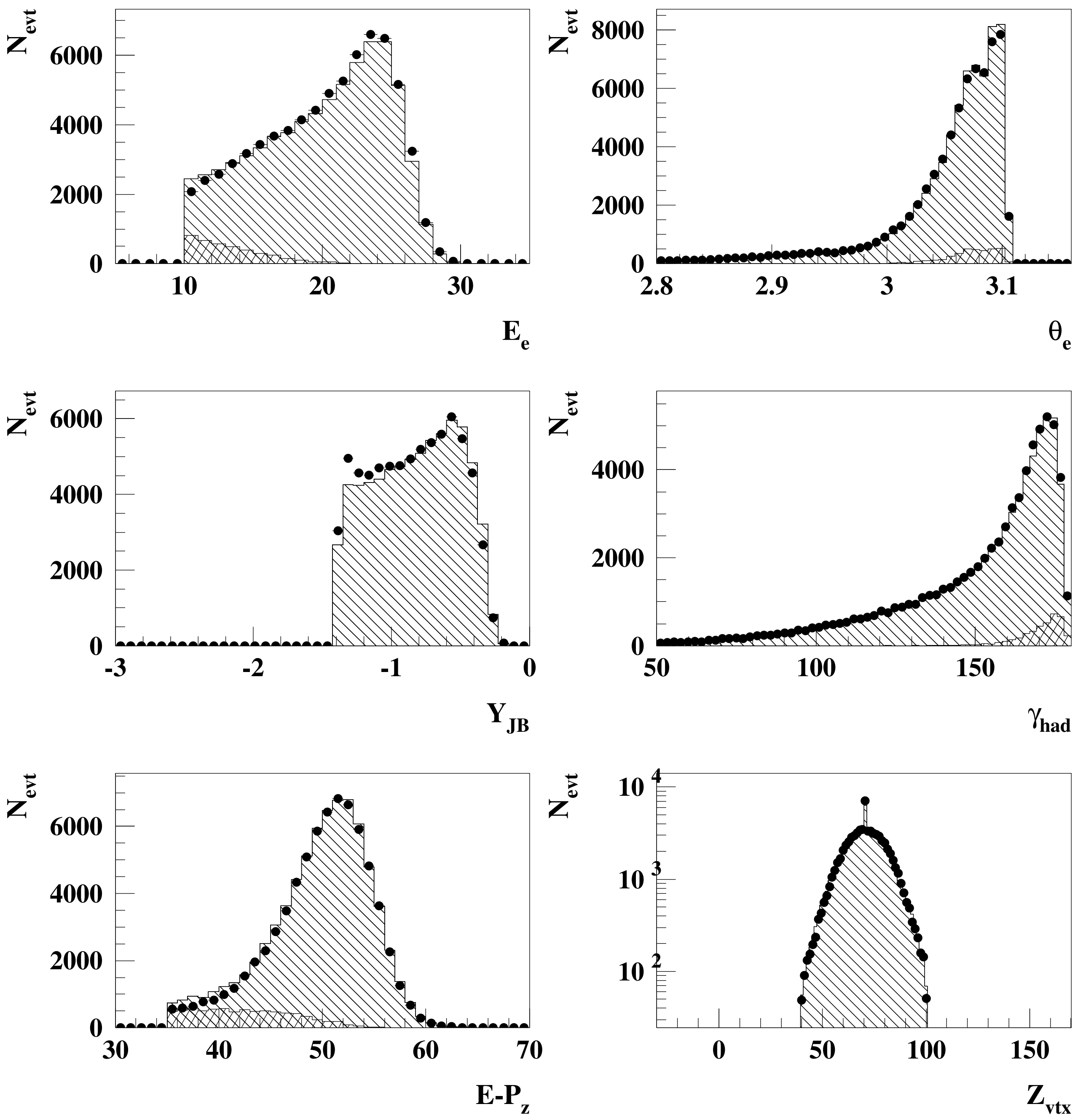

Figure 2: *Comparison between data (dots) and MonteCarlo(hatched histogram)*

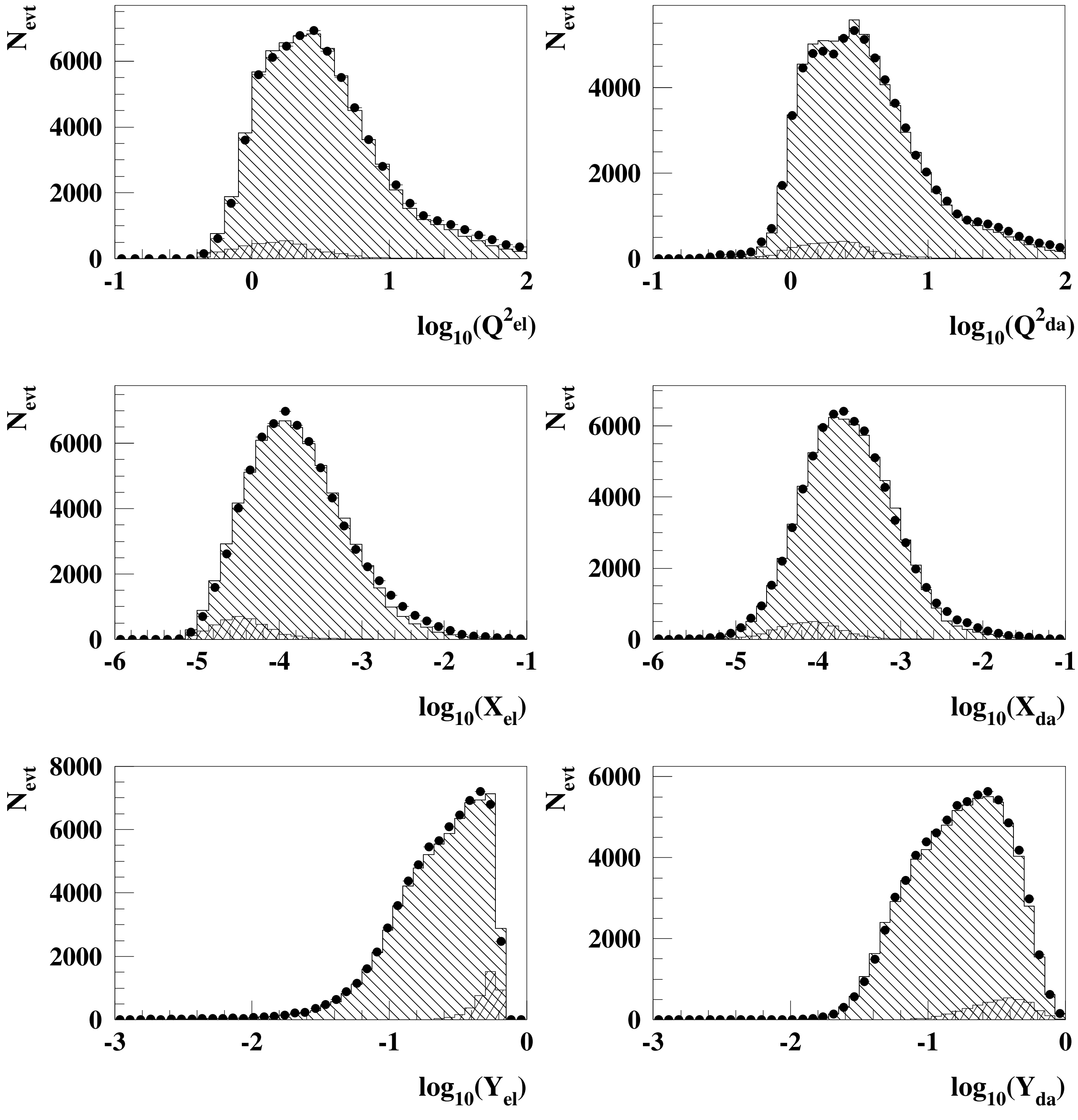

Figure 3: *Comparison between data (dots) and MonteCarlo(hatched histogram)*

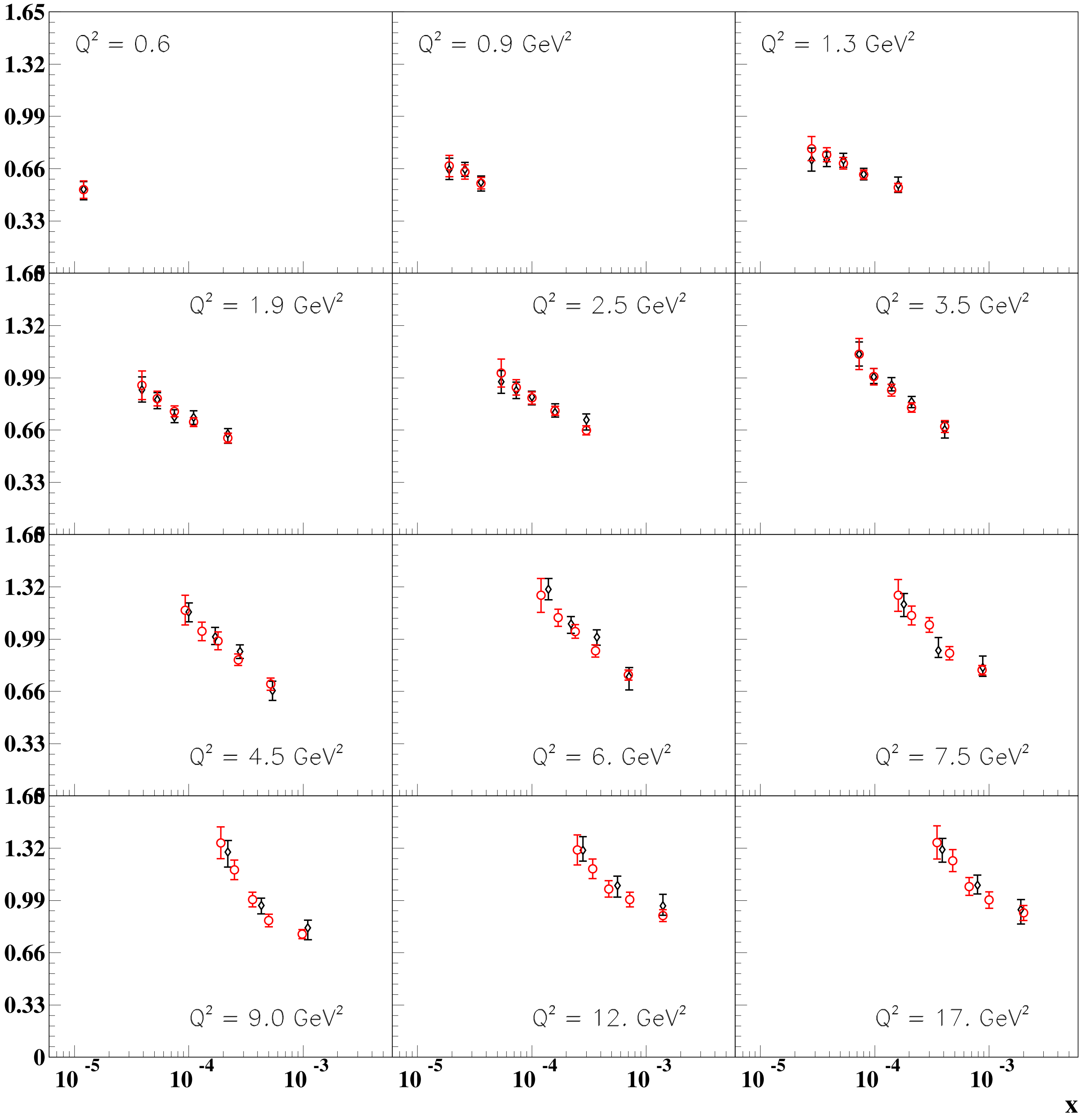

Figure 4: *Results (open circle) on F_2 vs x compare with the published ZEUS '95 SVX data (open diamond)*

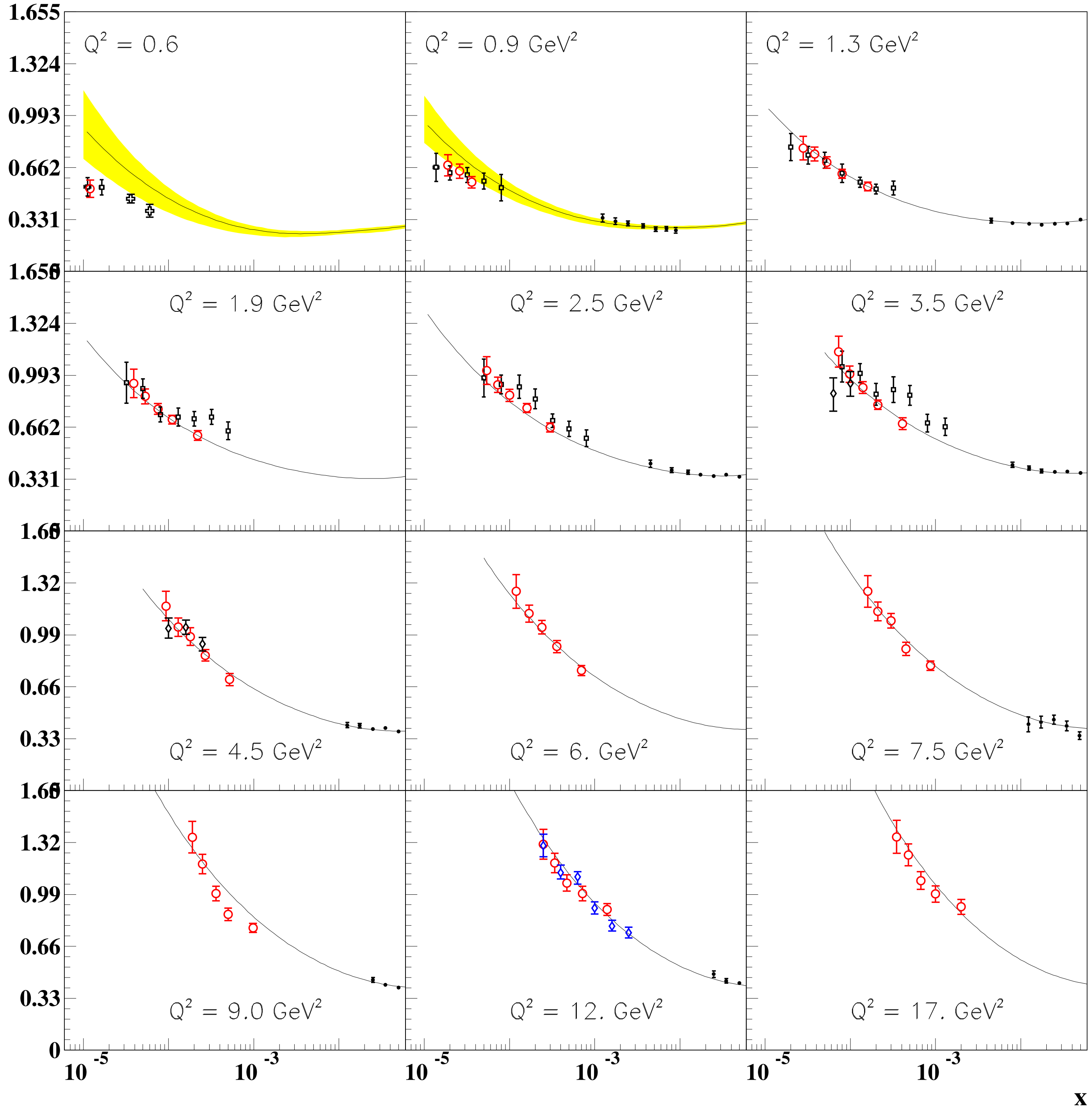

Figure 5: *Results (open circle) on F_2 vs x compare with H1 95 (open square), ZEUS 94 (open diamond), BPC (cross) and E665,SLAC,NMC (solid circle). The solid line is the ZEUS NLO fit [3]. For the first 2 bins the uncertainties on the fit (shadow area) is shown, too.*

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
1	100.	95.	86.	63.	94.	89.	67.	51.	-5.	89.	84.	-2.	-17.	-2.	45.	82.	-4.	-23.	-4.	78.	36.	-4.	45.	-6.	77.	69.	-18.	-24.	-12.	63.	62.	52.	42.	-19.	77.	10.	-9.	-30.	-4.	33.	67.	-14.	-29.	-8.	54.	8.	46.	-26.	-16.	40.	9.	-14.	-27.	-11.
2		100.	90.	69.	96.	91.	69.	53.	-4.	93.	89.	-1.	-16.	-3.	49.	88.	-4.	-24.	2.	84.	38.	-1.	49.	-10.	79.	75.	-20.	-24.	-10.	68.	64.	58.	50.	-14.	71.	9.	-12.	-34.	-2.	30.	67.	-12.	-28.	-2.	56.	8.	47.	-30.	-15.	32.	3.	-14.	-26.	-11.
3			100.	88.	84.	94.	86.	74.	-2.	79.	83.	-22.	-39.	-22.	19.	84.	-29.	-46.	-16.	72.	14.	-20.	56.	-10.	71.	77.	-42.	-46.	-12.	57.	61.	67.	66.	-25.	65.	-13.	-27.	-53.	-15.	7.	70.	-30.	-46.	-13.	43.	-15.	54.	-52.	-30.	13.	-15.	-31.	-47.	-27.
4				100.	61.	80.	90.	86.	15.	58.	69.	-26.	-48.	-40.	0.	70.	-39.	-52.	-27.	55.	0.	-22.	47.	-1.	58.	71.	-46.	-52.	4.	46.	57.	63.	71.	-21.	48.	-19.	-27.	-55.	-20.	-8.	63.	-34.	-45.	-17.	31.	-26.	47.	-61.	-40.	0.	-22.	-37.	-52.	-44.
5					100.	90.	63.	47.	-1.	95.	89.	7.	-7.	2.	55.	85.	6.	-15.	8.	82.	44.	5.	44.	-8.	78.	71.	-11.	-16.	-7.	66.	62.	52.	42.	-8.	70.	14.	-6.	-25.	3.	35.	62.	-6.	-22.	1.	54.	12.	42.	-20.	-10.	36.	9.	-8.	-19.	-9.
6						100.	83.	68.	-1.	84.	88.	-8.	-24.	-11.	31.	86.	-15.	-33.	-7.	76.	30.	-8.	57.	-7.	74.	80.	-28.	-32.	-9.	58.	66.	65.	61.	-21.	66.	-3.	-18.	-42.	-9.	14.	69.	-20.	-37.	-10.	44.	-7.	53.	-40.	-23.	21.	-6.	-19.	-34.	-19.
7							100.	90.	5.	59.	72.	-31.	-50.	-38.	-4.	72.	-45.	-58.	-30.	59.	-4.	-32.	54.	-5.	63.	71.	-53.	-57.	-7.	47.	61.	65.	71.	-31.	50.	-25.	-33.	-60.	-23.	-11.	68.	-42.	-55.	-25.	30.	-32.	58.	-63.	-38.	-1.	-26.	-41.	-58.	-41.
8								100.	30.	44.	57.	-34.	-51.	-57.	-15.	58.	-50.	-56.	-26.	45.	-16.	-34.	38.	-8.	50.	58.	-54.	-57.	12.	37.	52.	55.	67.	-17.	38.	-29.	-30.	-56.	-14.	-17.	59.	-46.	-52.	-16.	21.	-38.	48.	-64.	-33.	-7.	-28.	-46.	-59.	-58.
9									100.	0.	0.	43.	17.	-51.	24.	-9.	26.	29.	20.	-4.	13.	35.	-54.	20.	5.	-7.	29.	19.	90.	6.	5.	-23.	-11.	67.	0.	28.	38.	31.	36.	23.	-7.	17.	29.	32.	8.	13.	-37.	13.	6.	20.	31.	6.	15.	-64.
10										100.	92.	11.	-4.	3.	66.	89.	10.	-11.	12.	90.	49.	9.	44.	-6.	86.	72.	-7.	-12.	-5.	78.	68.	52.	41.	-5.	64.	22.	-2.	-22.	3.	41.	64.	-2.	-18.	3.	62.	19.	43.	-18.	-7.	36.	11.	-6.	-15.	-6.
11											100.	7.	-13.	-3.	51.	92.	1.	-22.	0.	87.	41.	3.	52.	-1.	85.	78.	-17.	-22.	-6.	75.	72.	61.	53.	-14.	58.	12.	-10.	-32.	-8.	28.	68.	-9.	-27.	-7.	56.	6.	50.	-30.	-19.	25.	2.	-12.	-25.	-12.
12												100.	74.	34.	68.	-8.	87.	77.	30.	3.	70.	82.	-37.	48.	8.	-2.	83.	68.	53.	13.	4.	-27.	-38.	54.	-2.	68.	65.	68.	25.	55.	-20.	70.	69.	23.	18.	57.	-45.	63.	13.	43.	64.	61.	69.	11.
13													100.	53.	52.	-19.	81.	86.	65.	-6.	66.	70.	-19.	2.	-11.	-8.	80.	83.	29.	-8.	-11.	-23.	-32.	53.	-18.	48.	51.	69.	46.	33.	-34.	69.	65.	43.	-2.	50.	-33.	73.	50.	22.	42.	69.	79.	38.
14														100.	30.	-5.	48.	40.	10.	-3.	45.	36.	21.	25.	-9.	-1.	45.	42.	-44.	-8.	-10.	-6.	-26.	-20.	-10.	25.	18.	31.	-13.	16.	-20.	45.	33.	-11.	-4.	32.	-8.	45.	6.	9.	21.	48.	48.	78.
15															100.	44.	69.	51.	38.	60.	80.	63.	-6.	21.	56.	30.	57.	47.	29.	60.	38.	4.	-14.	39.	29.	66.	46.	41.	25.	70.	17.	52.	42.	26.	55.	60.	-10.	42.	18.	52.	52.	41.	44.	14.
16																100.	-6.	-29.	2.	86.	36.	-5.	60.	-12.	82.	79.	-26.	-28.	-15.	72.	69.	65.	59.	-19.	56.	3.	-19.	-40.	-8.	20.	68.	-15.	-34.	-5.	53.	1.	56.	-36.	-15.	17.	-8.	-17.	-31.	-9.
17																	100.	88.	46.	3.	76.	84.	-26.	32.	3.	-4.	87.	79.	39.	8.	-2.	-27.	-40.	52.	-6.	65.	62.	72.	33.	53.	-25.	75.	71.	30.	14.	61.	-41.	72.	29.	40.	60.	69.	78.	30.
18																		100.	63.	-16.	61.	74.	-34.	16.	-17.	-20.	84.	84.	43.	-12.	-18.	-37.	-44.	60.	-20.	54.	58.	75.	45.	38.	-39.	70.	71.	41.	-3.	52.	-46.	76.	44.	28.	51.	67.	79.	28.
19																			100.	12.	40.	32.	-5.	-50.	-1.	2.	40.	61.	28.	-1.	-6.	-6.	-5.	60.	-12.	18.	19.	37.	67.	13.	-19.	33.	31.	66.	-2.	25.	-10.	43.	71.	1.	8.	35.	47.	14.
20																				100.	46.	3.	48.	-13.	91.	74.	-12.	-15.	-9.	84.	73.	57.	45.	-9.	55.	19.	-5.	-25.	1.	37.	66.	-5.	-22.	3.	65.	17.	51.	-22.	-3.	30.	5.	-8.	-19.	-5.
21																					100.	77.	11.	20.	43.	45.	70.	61.	23.	39.	35.	14.	-1.	34.	24.	59.	47.	46.	24.	54.	12.	63.	48.	22.	36.	54.	-4.	49.	19.	45.	49.	60.	58.	28.
22																						100.	-18.	41.	7.	8.	85.	71.	47.	12.	4.	-16.	-25.	52.	-2.	63.	61.	65.	25.	49.	-20.	74.	68.	25.	16.	56.	-39.	60.	15.	37.	57.	66.	71.	17.
23																							100.	-22.	41.	66.	-35.	-24.	-55.	29.	43.	68.	65.	-49.	26.	-28.	-39.	-48.	-23.	-22.	47.	-21.	-43.	-20.	13.	-22.	66.	-37.	-11.	-17.	-36.	-11.	-28.	26.
24																								100.	1.	-9.	35.	5.	24.	5.	4.	-23.	-31.	-5.	-4.	38.	36.	26.	-38.	28.	-7.	29.	31.	-39.	8.	21.	-33.	16.	-53.	25.	42.	18.	17.	-2.
25																									100.	75.	-10.	-18.	0.	89.	77.	55.	44.	-9.	58.	25.	0.	-23.	-7.	41.	68.	-3.	-20.	-6.	67.	17.	47.	-23.	-14.	37.	12.	-7.	-20.	-15.
26																										100.	-9.	-14.	-10.	59.	71.	76.	71.	-16.	50.	3.	-12.	-32.	-8.	11.	63.	-1.	-24.	-6.	41.	0.	55.	-31.	-16.	13.	-7.	1.	-17.	-5.
27																											100.	86.	43.	-5.	-9.	-31.	-42.	54.	-14.	63.	65.	78.	32.	46.	-34.	76.	75.	28.	4.	58.	-47.	75.	29.	37.	60.	72.	81.	28.
28																												100.	39.	-14.	-16.	-29.	-33.	58.	-22.	49.	52.	71.	45.	32.	-37.	69.	67.	42.	-5.	49.	-38.	74.	49.	23.	44.	69.	79.	35.
29																													100.	2.	1.	-27.	-17.	76.	-7.	35.	45.	42.	41.	27.	-15.	29.	40.	36.	5.	20.	-43.	25.	13.	21.	37.	18.	29.	-54.
30																														100.	72.	45.	33.	-3.	55.	37.	6.	-16.	-7.	49.	61.	5.	-10.	-2.	71.	27.	36.	-18.	-12.	38.	17.	-4.	-15.	-11.
31																															100.	62.	47.	-12.	46.	26.	4.	-22.	-9.	26.	63.	-3.	-20.	-10.	51.	7.	47.	-24.	-16.	26.	6.	-5.	-19.	-14.
32																																100.	81.	-28.	38.	-15.	-20.	-40.	-14.	-9.	56.	-17.	-37.	-11.	28.	-15.	59.	-42.	-15.	-5.	-26.	-14.	-31.	-2.
33																																	100.	-15.	30.	-31.	-35.	-49.	-6.	-25.	52.	-28.	-44.	-6.	16.	-30.	58.	-53.	-15.	-19.	-38.	-24.	-40.	-18.
34																																		100.	-14.	37.	44.	54.	65.	28.	-28.	42.	51.	58.	2.	32.	-44.	44.	43.	17.	33.	33.	49.	-24.
35																																			100.	20.	-2.	-22.	-4.	42.	63.	-8.	-19.	-6.	51.	15.	33.	-20.	-15.	49.	18.	-9.	-22.	-15.
36																																				100.	65.	52.	15.	64.	10.	67.	54.	15.	38.	59.	-27.	49.	9.	52.	59.	46.	50.	11.
37																																					100.	70.	24.	45.	-18.	66.	65.	20.	13.	46.	-37.	52.	14.	38.	53.	46.	53.	3.
38																																						100.	49.	38.	-42.	65.	75.	37.	-4.	48.	-50.	70.	33.	30.	52.	58.	70.	20.
39																																							100.	13.	-18.	23.	30.	67.	-3.	19.	-17.	35.	58.	9.	13.	22.	34.	-8.
40																																								100.	25.	41.	38.	13.	61.	63.	-16.	35.	6.	62.	57.	32.	33.	4.
41																																									100.	-12.	-37.	-18.	49.	3.	62.	-38.	-23.	22.	-6.	-23.	-39.	-18.
42																																										100.	79.	26.	10.	55.	-27.	68.	24.	30.	50.	65.	71.	31.
43																																											100.	44.	1.	51.	-48.	69.	30.	28.	51.	58.	69.	21.
44																																												100.	1.	21.	-17.	31.	63.	4.	9.	21.	33.	-5.
45																																													100.	47.	21.	-6.	-8.	54.	32.	3.	-6.	-8.
46																																														100.	-10.	50.	18.	49.	58.	51.	52.	23.
47																																															100.	-28.	-6.	-8.	-32.	-21.	-38.	5.
48																																																100.	52.	28.	48.	61.	75.	40.
49																																																	100.	0.	3.	27.	38.	22.
50																																																		100.	65.	27.	23.	-2.
51																																																			100.	59.	48.	5.
52																																																				100.	82.	39.
53																																																					100.	48.
54																																																						100.

Table 2: *The correlation matrix between F_2 values, calculated with the systematic effects taken into account, is shown. The bin corresponding to each row or column is shown in figure 1. The values are given in percentage.*