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CERN JETSET GROUP

ANALYSIS OF THE DATA FROM DECEMBER 1990 TO JULY 1991

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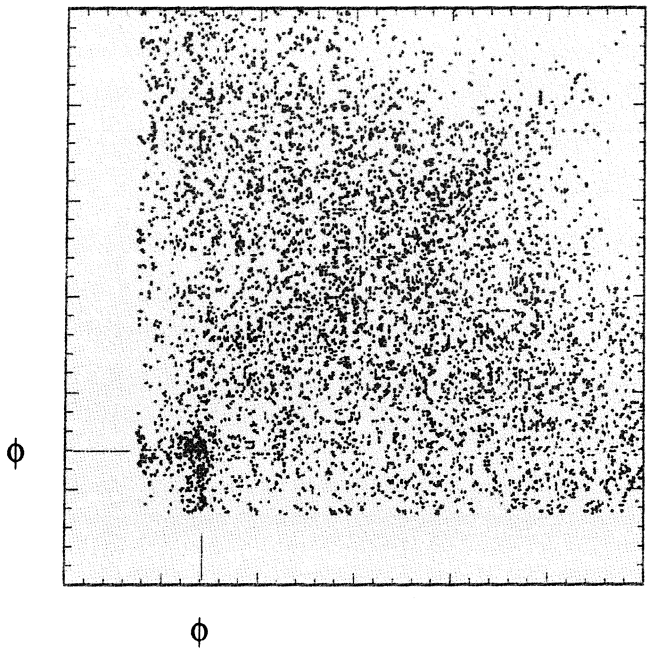
with the participation of M. Lo Vetere (Genova)



1. INTRODUCTION

This is essentially a collection of figures with little or no text. It represents the preliminary results of the analysis of data taken from the beginning of the experiment up to and including the July 1991 run. None of the results presented here should be taken as definitive. The procedure followed to obtain them is in a state of evolution and it may well be that in a few weeks the results will look different. All the same, we think it is useful to present in a coherent form what we have obtained up to now even if the results may be ephemeral. In the spirit of keeping the Collaboration informed we plan a regular updating of this report with the amended results in their latest form.

As for the present conclusions we notice that among the "4-forward" events (referred to in the following as **4F**) there is clear production of $\phi\phi$ albeit with an unexplained erratic behaviour as a function of momentum. This is not the case for the "1-barrel 3-forward" events (referred to in the following as **1B3F**) where the evidence for $\phi\phi$ production is much flimsier and the background[1] much heavier. We do not understand this difference and attribute it to either a possible misalignement of the barrel-forward detectors or an uncorrect calibration of the z-coordinate of the barrel straws. Even worse, it could be due to an inadequacy of our track reconstruction method as applied to the barrel.

An intriguing side observation allowed by the large statistics available when all the runs are put together is that within the $\phi\phi$ region the events seem to be clustered along separate ϕ lines rather than around a single central point. We believe that this is a clue for some as yet undetected anomaly in either the fitting procedure or the accelerator beam-momentum setting.

Notice that at this stage we are still far from being able to put forward even tentative values of the cross sections. Not only are we still missing a reliable calculation of the detector acceptance and the analysis efficiency but we also lack the normalisation to the data taken and to the luminosity. It is hoped that in later editions of this report we will be able to answer the above points.

This report is composed of : (a) plots of mass distributions, (b) tables of event numbers and related information, (c) program listings.

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[1] By background here we do not necessarily mean physics background but rather a mixture of wrong tracks, wrong angles, wrong event types, all this resulting from detector accidentals and any other conceivable source of pollution which we may have failed to filter out.

2. ANALYSIS

The analysis has followed the three stages illustrated in figure 1. The original raw data were "reduced" in the first stage by applying basic cuts to eliminate events other than the "4K triggers". The latter were retained only when the data were compatible with a reconstructable event, in particular if there was a number of detector-hits sufficient to eventually allow track-fitting and if the pipe-scintillators configuration was compatible with momentum balance[2]. Notice that this first stage was the only part of the analysis to be done on the central computers at CERN. All the rest was performed on our *Macintosh* farm after converting the cartridge data unto 8-mm cassettes readable via Exabyte units connected to the *Macintosh.*

The second stage consisted in repeating the momentum balance test — more strictly this time — and in performing a systematical track-fitting operation with all the possible straw hits as long as the event had a number of hits compatible with a suitably determined upper and lower limit. At the conclusion of this procedure we ended up with a certain number of "projected tracks" (separate xz and yz projections). If this number was such as to provide the sufficient and necessary components for the "space tracks" then all possible matching associations were attempted using the pipe scintillators and the forward pixels in the association criterium. If the number of space tracks thus obtained was the required four (all in the forward direction for the **4F** configuration or three forward and one in the barrel for the **1B3F** configuration) the event was accepted. Matching ambiguities were tolerated up to a maximum of 10. The event was then passed on to the "kinematical reconstruction" procedure and retained when this succeeded. The average computing time of this stage was typically 100 ms per event (on the *Macintosh-fx*). The accepted events of this stage were collected in separate files for further treatment.

The third stage consisted of analysing the above selected events applying stricter criteria concerning track-fitting and kinematical reconstruction and verifying the direction and momentum attribution of the tracks with the signals from the external detectors. Each track was thus examined for agreement with the measurements of the Cherenkov and Silicon counters. A rudimentary energy-loss calculation was also performed and the tracks were required to have enough energy to reach the outer part of the detector. Typical computing time of this stage was 250 ms per event (on the *Macintosh-fx*). Section 3 describes the rejection criteria in some detail.

Table 1 gives the number of events per momentum setting obtained during the various analysis steps.

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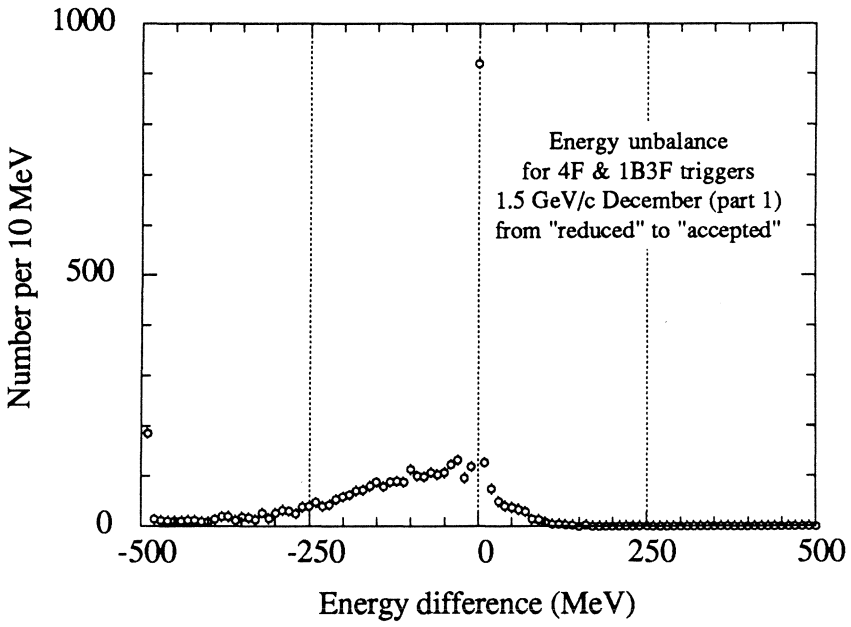
[2] For more details better ask Maurizio.

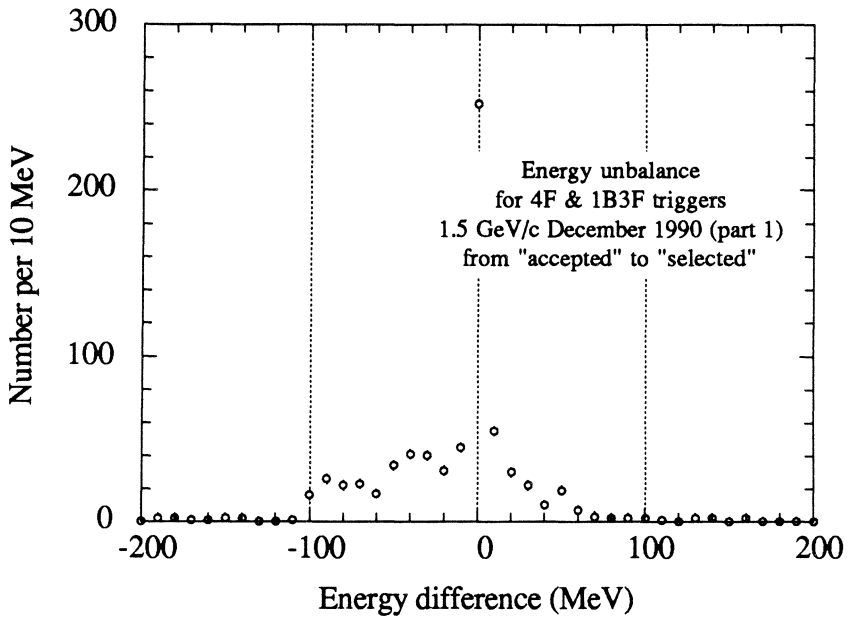
3. REJECTION

A few definitions are in order. The kinematical quantity ΔE (*deltaE* in the tables) is the energy unbalance of the kinematical reconstruction. For negative values of ΔE we only have a single solution to the momentum-energy equations. Notice that no event has been retained having ΔE below - 100 MeV, so when we talk about "uncut data" we have actually cut something.... For positive values of ΔE up to 20 MeV we have systematically adopted one solution (the average of the two possible solutions). Beyond 20 MeV there will be one or two solutions depending on the event configuration.

Some of us are uneasy about the ΔE distribution particularly about the arbitrariness of the above cuts. Lacking for the moment any better argument we present the spectra observed for this quantity during the first two stages of the analysis. The peak at $\Delta E = 0$ corresponds to those events where only one solution was available (the other solution being unphysical); these events contribute in reality to the right hand side of the spectra. How they are distributed will be answered in a future installment.



During "stage 1" of the analysis.



During "stage 2" of the analysis.

In the tables we have referred to the **4F** events and **1B3F** events as *conf* = 1 and 2 respectively. The serial number of the solution accepted for the kinematical equations is listed under *sol.* Of the many possible track sets provided by the track-matching procedure we have accepted no more than two: they are listed under *set* = 1 or 2.

Triggers of the **4F** type were rejected if the Gamma-Veto barrel (**GVB**) or the Julich-straight barrel (**JSB**) had one or more hits with ADC ≥ 200. For the **1B3F** triggers the condition for rejection was raised to two or more hits in the **JSB** or **GVB** with ADC ≥ 200.

Only two sets of tracks (out of a maximum of 10 fabricated by the track-fitting and matching procedure) were considered in this analysis. A chi-squared test was applied to accept the set, the maximum allowed chi-squared being chosen to be 100 on the basis of the observed distribution (tail extending more or less uniformly up to this value). The value of the chi-squared was defined from the agreement of the tracks with the pipe-scintillators and the pixels. Only azimuthal differences were used for the pipe-scintillators; both azimuthal and polar differences were used when comparing tracks and pixels. Individual pixels were used for this test (the procedure is presently being modified to deal with "pixel clusters"). The condition for accepting the second set was that its probability be not smaller than a factor 10 with respect to that of the first set.

Notice that no test was performed to insure that the two sets were in fact distinct, so it may well be that we have been accepting degenerate sets. This problem is now being dealt with, but be warned that the results of this report may contain a (small) sample of such duplicates.

Each track was checked for consistency with the requirements of the trigger type. Thus we rejected tracks in the **4F** configuration if they turned out to have polar angles outside the 15° - 45° region. For the **1B3F** configuration the limits for the "barrel track" were taken to be 45° - 70°. An additional test was performed on the latter trigger to ascertain that none of the "forward tracks" was uncomfortably close to the "barrel track"; if both the azimuth and the polar angle of the "barrel track" were within 15° of the direction of any forward track the event was rejected.

The kinematical reconstruction was performed according to the procedure outlined in an earlier note by JMP[3]. The difference in energy to satisfy the momentum-energy constraints (ΔE) was calculated in each case and used as a basis both to accept or reject the event and to derive its kinematics. As already mentioned we have retained only events with ΔE above -100 MeV and have used for the kinematics one or two solutions depending on ΔE being respectively below or above an arbitrarily fixed upper limit of 20 MeV (notice that not all the $\Delta E \geq 0$ cases have a physical second solution).

The momentum of each track was used to calculate the expected signal in the Forward Cherenkovs (no attempt has yet been made to use the Barrel Cherenkovs). The relationship between track momentum and Cherenkov ADC channel has been concocted on the basis of (a) the theoretical beta dependence of the Cherenkov emission, (b) the experimental angular dependence observed in beam tests and (c) the signal conversion into ADC channels obtained from the LED calibration. All this boils down to the following empirical (and possibly wrong) formula :

$$S_{expected} = S_{max} \frac{1 - (\frac{\beta_{threshold}}{\beta})^2}{(1 - \beta^2_{threshold}) \cos\theta} (1.822 - 0.087x + 0.003x^2)$$

where x is the distance of the impact point measured from the interface where light-guide ends and radiator begins

$$x = 52.2 - 53.6 \tan\theta$$

and S_{max} = 300 ADC channels is our estimate of the $\beta = 1$ response of the Cherenkov signal at normal incidence.

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[3] J.-M. Perreau : "Reconstruction of 4K events The special property of this kinematical analysis demonstrated". 17/1/1989. Private note, ask the author.

The comparison between expected and measured values was introduced in a chi-squared calculation with an experimental variance of 400 (ADC channels squared). The number of tracks entering this calculation was taken into account when going from chi-squared to probability. The event was accepted when its probability was $\geq 1\%$.

While applying the above tests the impact position of the track on the counter (x in the above formulae) was used to decide if the test should or should not be done. If x was outside the sensitive counter region (such as on the light-guide or altogether outside the counter) the test was not performed.

A decay probability was also performed at this stage. The event was rejected if the lifetime of any track turned out to be smaller than that required to reach in one piece the counter itself. The rejection level was taken at 3 decay lengths.

The trajectory of each track was followed from target to Cherenkov and a rough estimate was made of its energy loss. The event was discarded if the track stopped before reaching the counter. The calculation is a straightforward repetition of what was described (and listed) in an earlier note[4].

The agreement between track momenta and values of dE/dx measured by the silicon counters was performed using the following empirical prescription for the expected signal :

$$S_{expected} = \frac{17.0}{\beta^2}$$

As "measured value" of dE/dx we have taken the smallest of the two readings along the track (from the two silicon planes). When only one was available we have ignored the measurement. The measured value was used for a track-by-track calculation of the chi-squared to obtain an overall probability for the event to be in agreement with the 4K hypothesis. The variance employed here for the measured quantities was 100 (ADC channels squared). The event was rejected if the probability turned out to be $\leq 1\%$.

4 M. Ferro-Luzzi. "Estimate of the multiple scattering effect of the JETSET vacuum pipe JETSET note 91-03". (7/6/1991)

4.RESULTS

4.1 Separate momenta

Plots and tables are given in the same order for each momentum setting:

The first page shows plots referring to the **4F** events; (a) effective-mass plot with no cut on ΔE (beside the general cut on $\Delta E \geq -100$ MeV) ; (b) same with a cut on negative values of ΔE (rejecting all events with $\Delta E \leq -20$ MeV); this cut seems to eliminate some background, as witnessed by the cleaner appearence of the gap around the $\phi\phi$ region; (c) same but specifically for the the $\phi\phi$ region; (d) cosine of the c.m. angle of the events in (c).

This is followed by a table of the $\phi\phi$ events from (c) above listing their run and event number in addition to mass values, cosine of the cm angle and other information.When there is an ambiguity in the run number attribution (we forgot to record it during the analysis and had to look for it afterwards..) we have listed the alternative number under *"run ?"*.

The third page contains only one plot (e) showing the mass-squared version of the events (without ΔE cuts). This is provided because some of us feel more comfortable staring at this type of plot. Notice that, in view of the unfortunate fact of life that the ϕ mass is close to 1 and the extreme mass values are not much further than 1.3, there is little visual difference between the two kinds of plot.

The fourth page refers to the **1B3F** events and contains two mass plots — (f) and (g) — without and with ΔE cuts respectively.

Following these we give — more for estetic reasons then else — some Lego plots, each of them clearly labelled as to its content. The same **4F** data appear in two different stereo projections. They all refer to uncut ΔE data (beside the -100 MeV general cut).

The last page lists a table of entries in each bin of the Lego plot (only for the **4F** events). Bins are 20×20 MeV^2. This table may be useful when estimating the number of events we are dealing with.

Yes, we have noticed that there is a surprising prominent enhancement in the mass region near 1.25 GeV where nothing known is expected to show up. Alas, rather than a new resonance we find that this enhancement is a reflection of the $\phi\phi$ peak; on the other hand we don't understand why it should be so concentrated on a narrow region and not spread out more evenly over the much wider available reflection area.

4.2 All momenta together

The temptation of putting together all these data was irresistible. So here we present a series of plots (same data in all plots but different scales) showing the superposition of the 4F data from all incident momenta. We didn't think it was worth presenting the same thing for the **1B3F** data. Legends on the plots are self-explanatory.

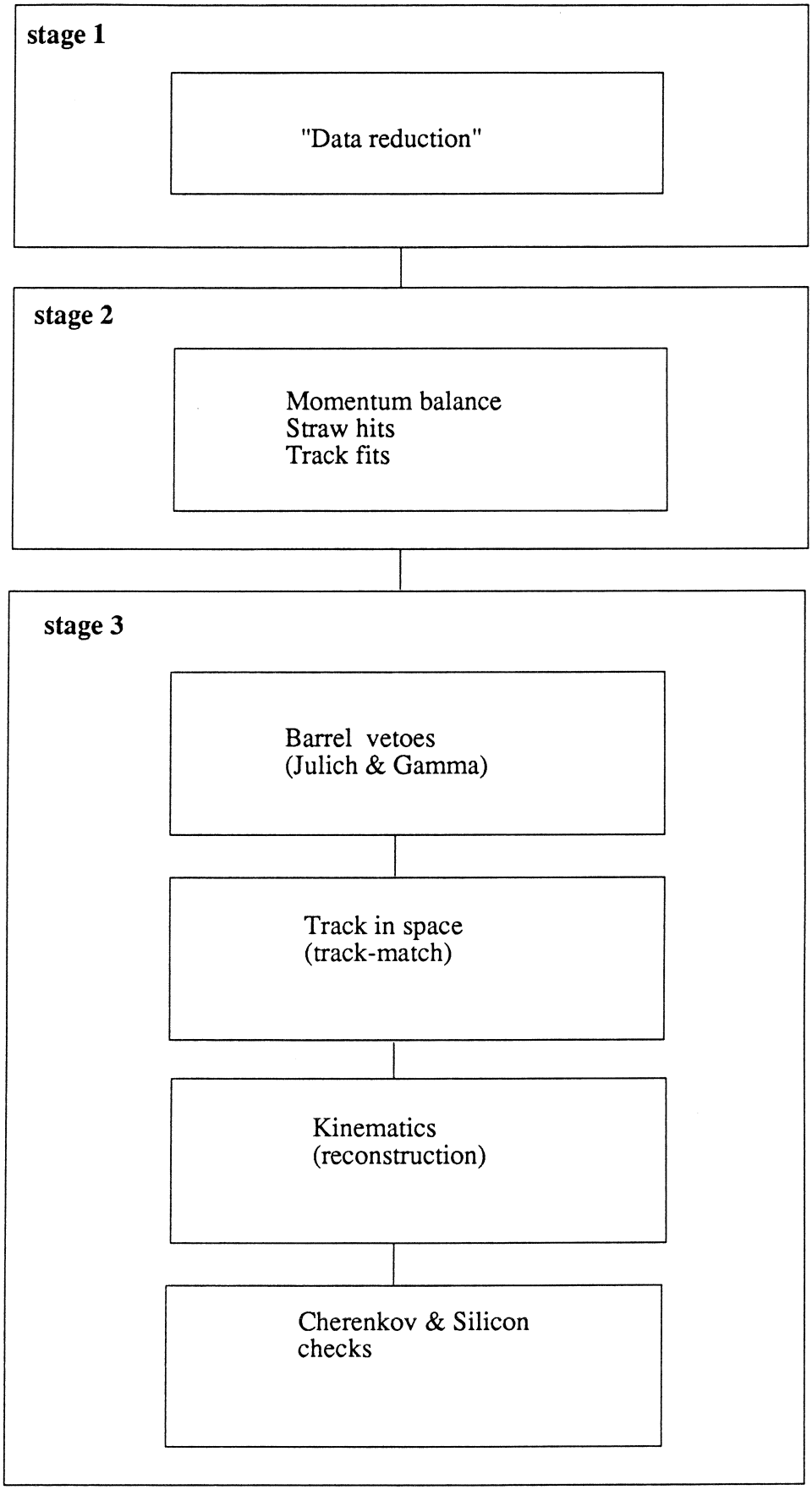
Notice the curious agglomeration of points along fixed ϕ lines not stretching along the full plot. We don't understand what this is trying to tell us: a displacement between assumed and real momentum setting ? a systematic angular shift between reconstructed tracks ? a physical effect ? a trivial mistake ? Your guess is welcome.

5. PROGRAM LISTINGS

For those of you who may prefer the real thing to the cursory description offered above we have prepared an appendix containing the full listing of the FORTRAN programs used for the analysis. This is not joined to this report because of its unmanageable bulk, but available under request. Also under request we are ready to provide the same in executable form together with the necessary framework (MacSys, data tapes, etc.).

The main analysis steps can be found in the *USER* subroutines (*Mass4K, Usersubs1* and *Usersubs2* with their common *UserCDE*), while the projection and space track-fitting and reconstructing routines are in *StrawFit, Match* and *Kine* respectively. The general common is in *CDE1*. The other routines deal with general purpose chores such as event reading and decoding (*InOut*), calorimeter and silicon decoding (*CaloDec*), main steering (*JetSet*), straw reading and decoding (*StrawDec*), vertex fitting (*Vertex*). Parts such as *Draw* and *DiaMenu* have more to do with the "display" features of the program than with the analysis but are given anyway. Various constants and utilities defining the run momentum, detector calibration etc. are contained in the sections labelled *Util, Const* and *JetTitles*.

Analysis Flow-chart



Analysis accounting

Cassette	Beam	Run date	Analysis date	Total data	Reduced data	Output 1	Output 2	Output 3	Output 3
			(output 1)		*(4K triggers)*	*(4F&1B3F)*	*(4F&1B3F)*	*(4F)*	*(1B3F)*
38	1.20	July	11-Sep-91		163247	1948	208	15	182
37	1.30	July	25-Aug-91		698582	11244	1166	53	740
36	1.40	July	9-Sep-91		645812	9377	1153	119	984
01	1.50	December	23-Sep-91		1415186	1956	113	43	69
40	1.50	April	21-Sep-91		94831	625	130	39	89
33	1.50	July	19-Sep-91		239985	3724	479	52	425
35	1.60	July	8-Sep-91		549011	10352	1288	188	1039
32	1.70	July	15-Sep-91		696035	16075	1700	349	1269
34	1.80	July	14-Sep-91		572689	19280	2491	624	1686
31	1.90	July	18-Sep-91		789000	26282	1319	313	1001
41	2.00	April	20-Sep-91		241834	12686	212	79	133

1.2 GeV/c
[4F triggers]

M_x = Mass(1+2)+Mass(1+3)+Mass(2+3)

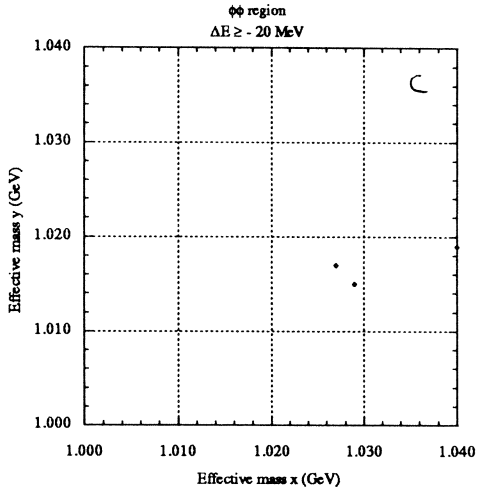
M_y = Mass(3+4)+Mass(2+4)+Mass(1+4)

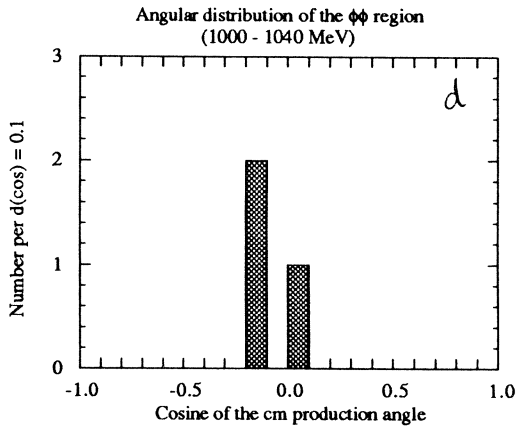
Cher & Sil prob > 1 %
any pixel assoc. & any vertex
10 MeV/c fixed mom. cut
Barrel (Julich & Gamma) in veto at > 200 AD

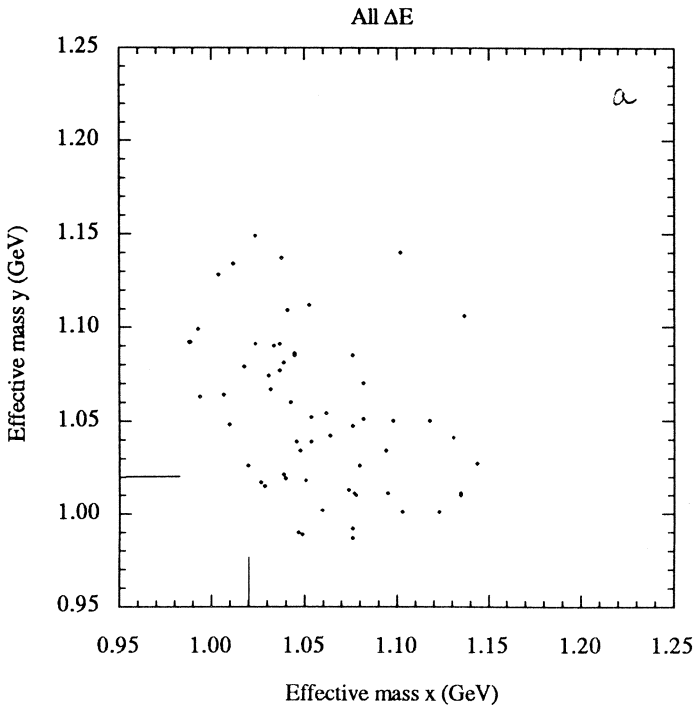
3 entries per solution.
max of 2 solutions per track set.
max of 2 track sets per event

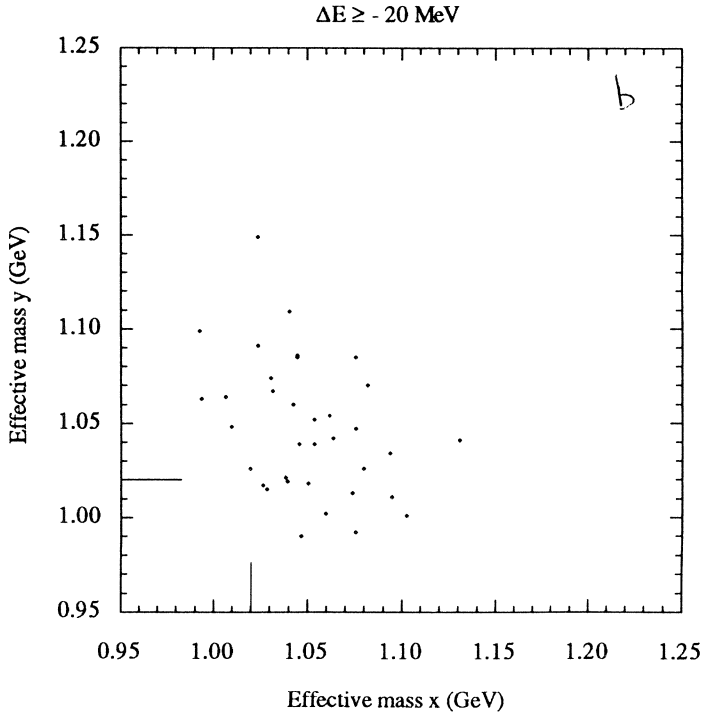
kinematics based on

-100 ≤ ΔE ≤ +20 MeV

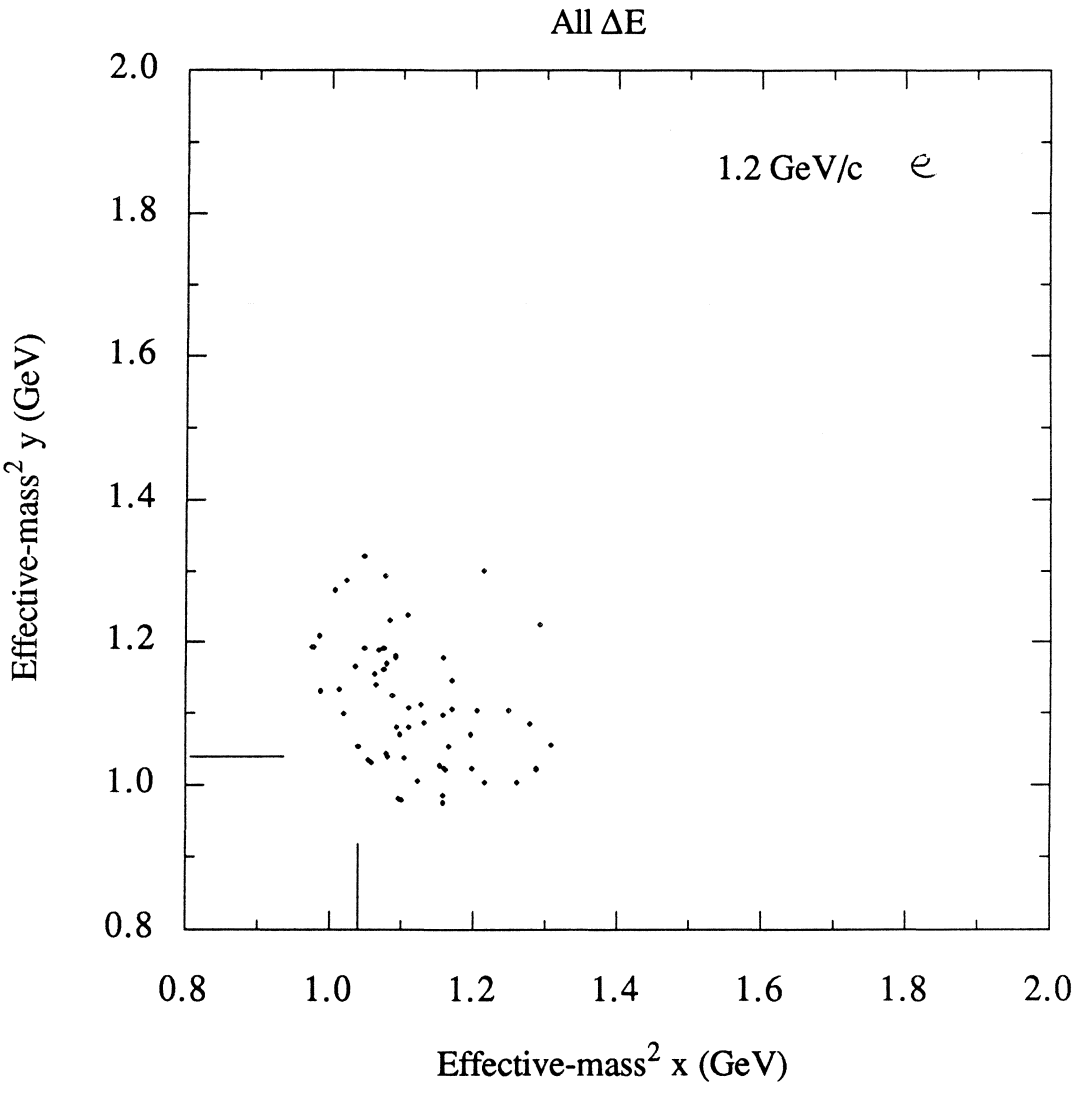




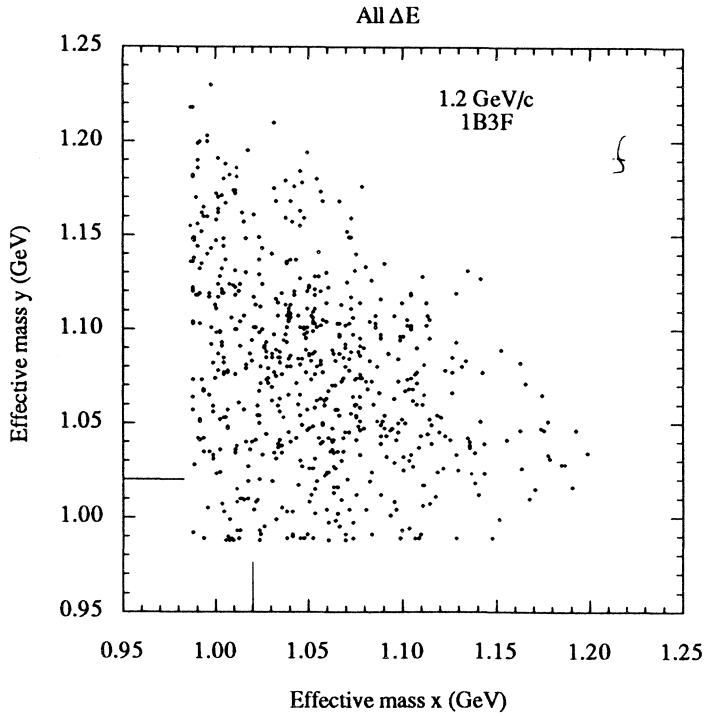


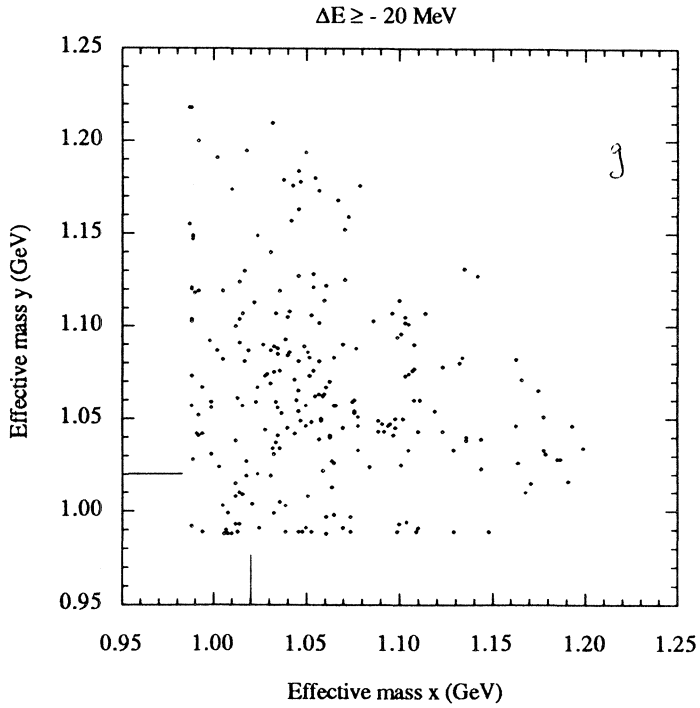


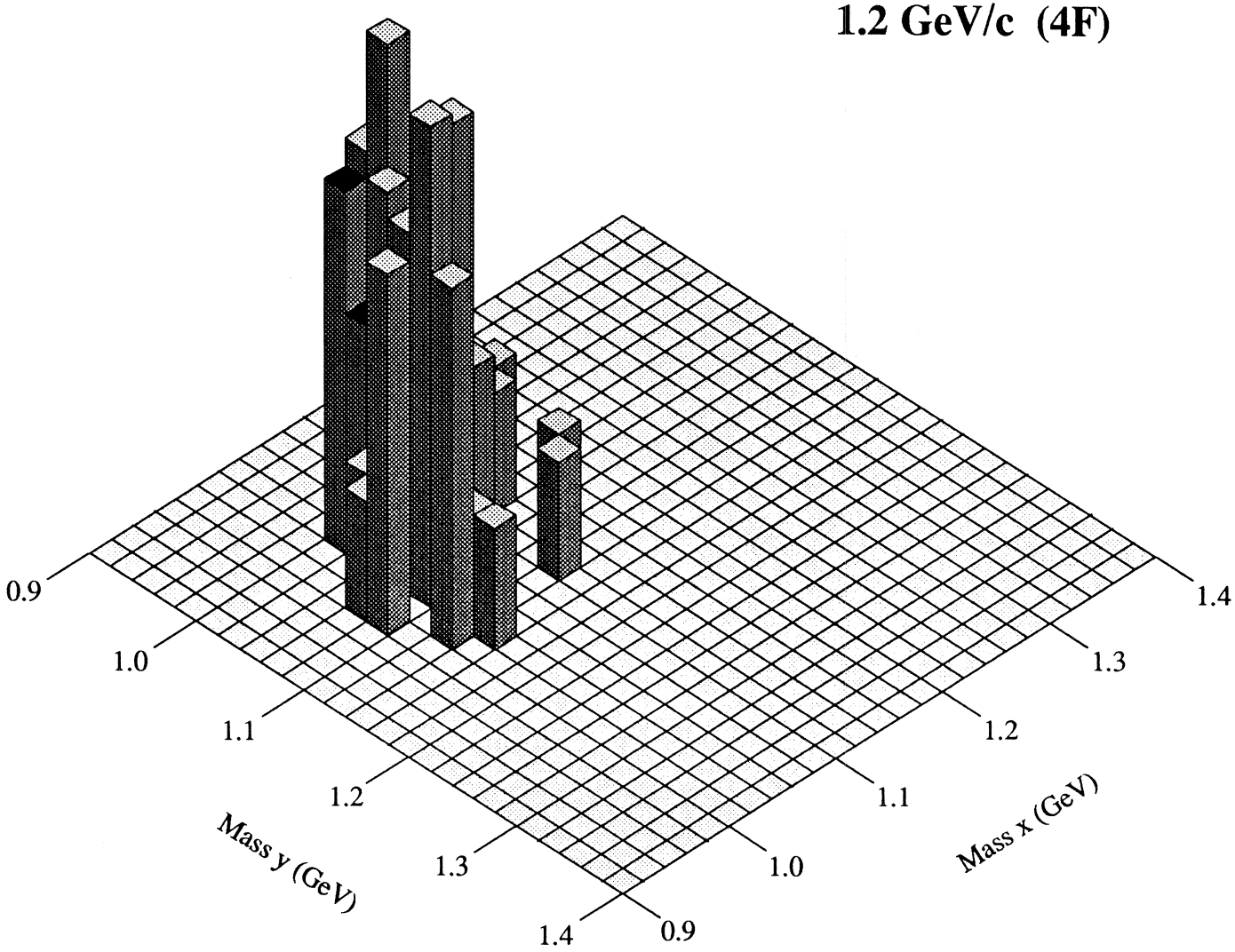
	1.2 GeV/c	Run #	event	conf	sol	set	DeltaE	M(2+3)	M(1+4)	cos(2+3)
1		1401	17856	1	1	1	-0.015	1.0290	1.0150	-0.100
2		1401	17856	1	1	2	-0.009	1.0270	1.0170	-0.145
3		1420	90478	1	1	2	0.027	1.0390	1.0210	0.091
4		1420	90478	1	1	1	0.026	1.0400	1.0190	0.091
5		1422	69968	1	1	1	0.042	1.0200	1.0260	0.021


All ΔE
1.2 GeV/c e
Effective-mass^2 y (GeV)
Effective-mass^2 x (GeV)
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.8
1.0
1.2
1.4
1.6
1.8
2.0

1.2 GeV/c
1-barrel 3-forward events (1B3F)

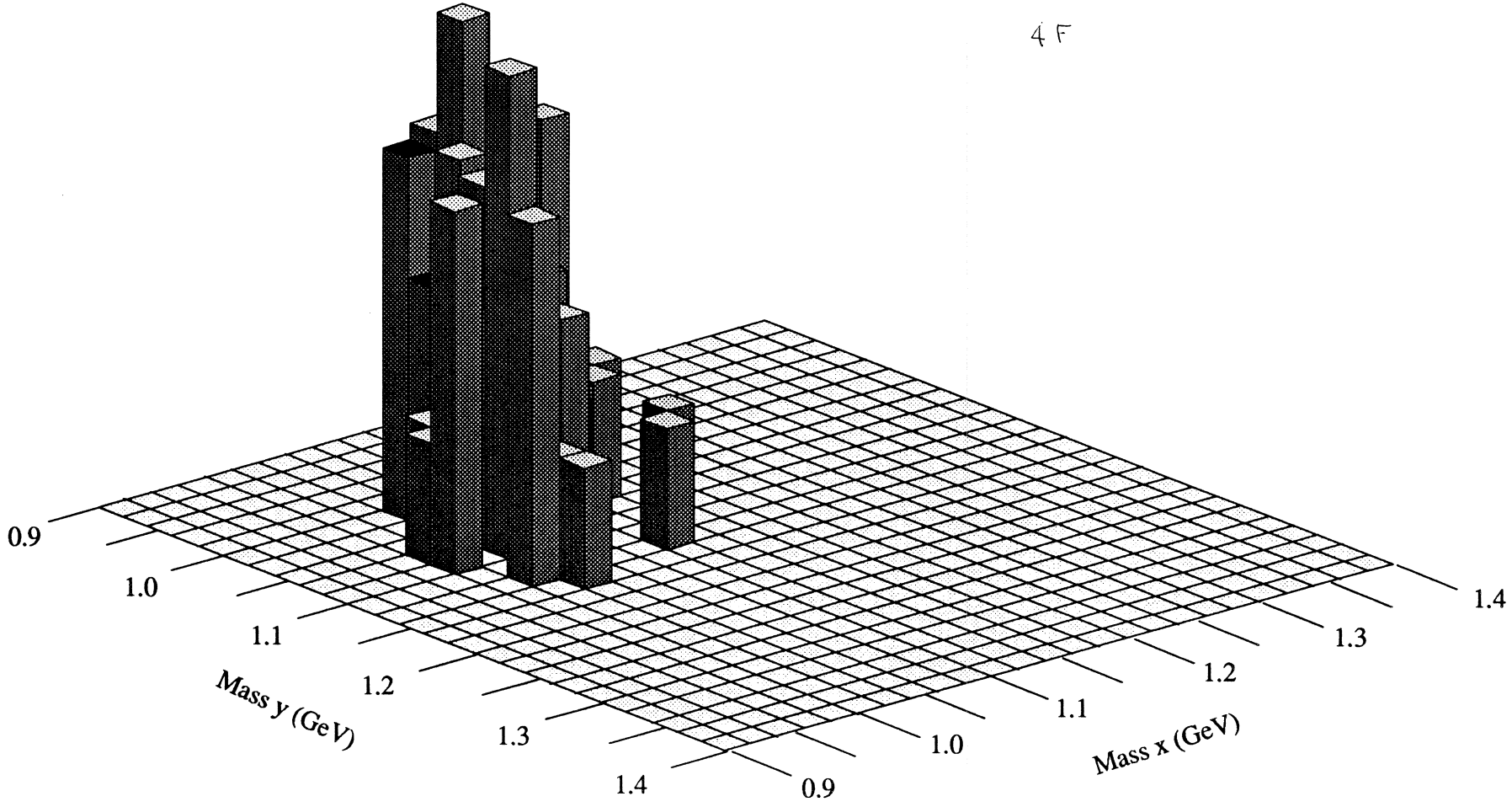




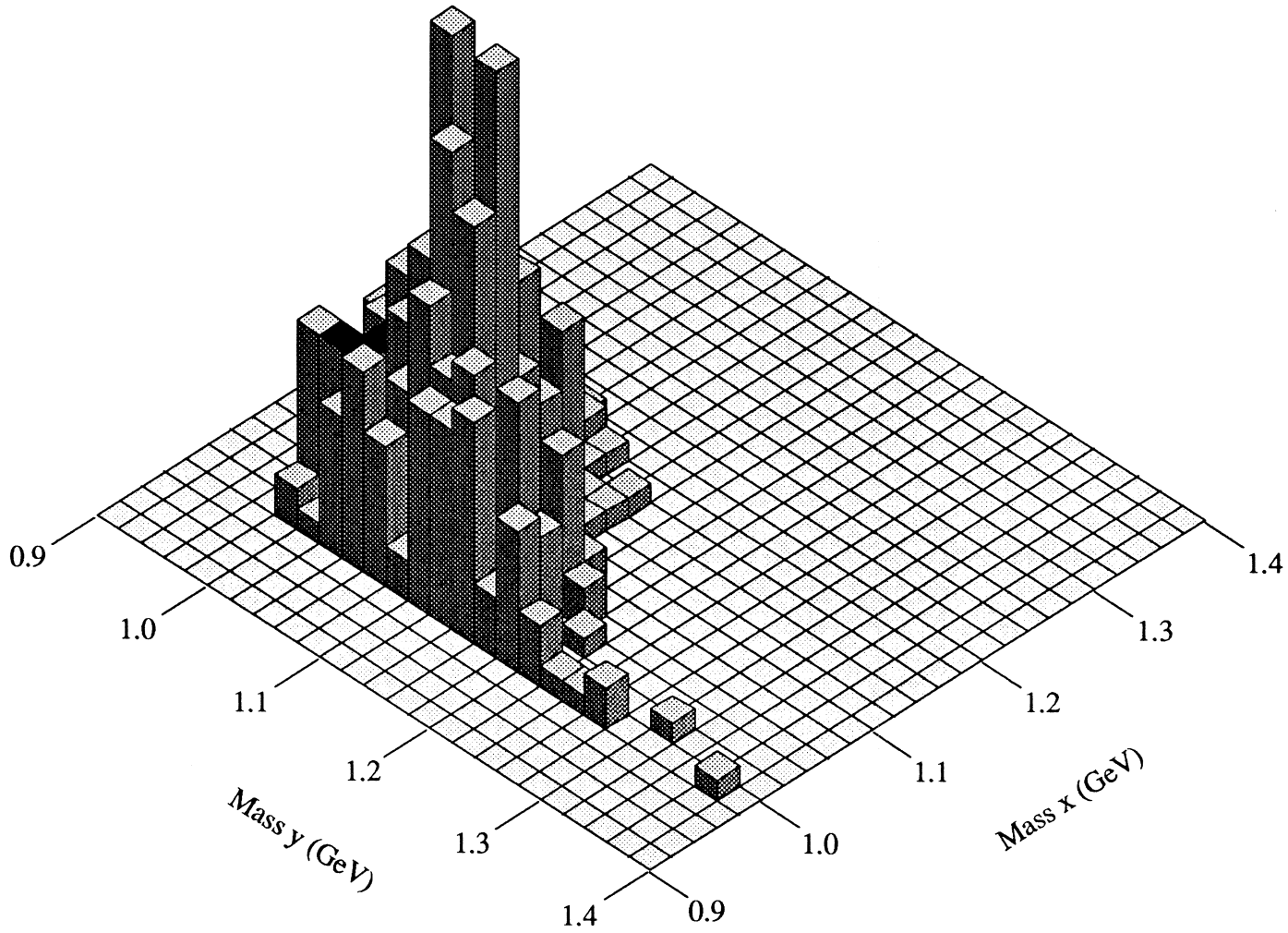

1.2 GeV/c (4F)
0.9
1.0
1.1
1.2
1.3
1.4
Mass y (GeV)
0.9
1.0
1.1
1.2
1.3
1.4
Mass x (GeV)

1.2 GeV/c

4 F



1.2 GeV/c (1B3F)



24 Sept. 1991

Content of the EffMass files used for the Lego-plots(all deltaE values)
Scale of effective masses in GeV
x and y from 0.900 to 1.400 GeV
one bin = 20 MeV
x = columns
y = rows

□ $\phi\phi$ region (1.0 ÷ 1.04 GeV)

1.2 GeV/c
21 events

	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
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	3	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	3	0	4	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	1	2	3	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	1	0	2	3	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	2	3	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	3	2	4	1	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

1.3 GeV/c
[4F triggers]

M_x = Mass(1+2)+Mass(1+3)+Mass(2+3)

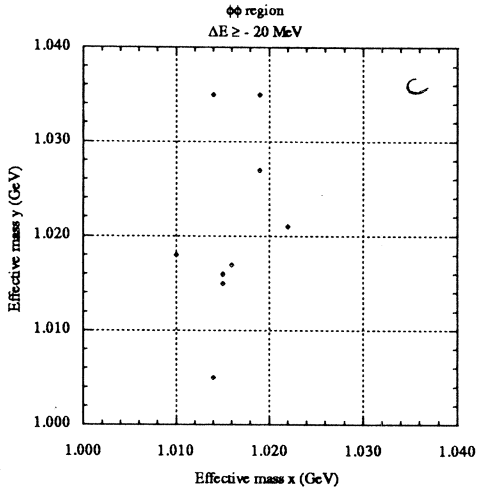
M_y = Mass(3+4)+Mass(2+4)+Mass(1+4)

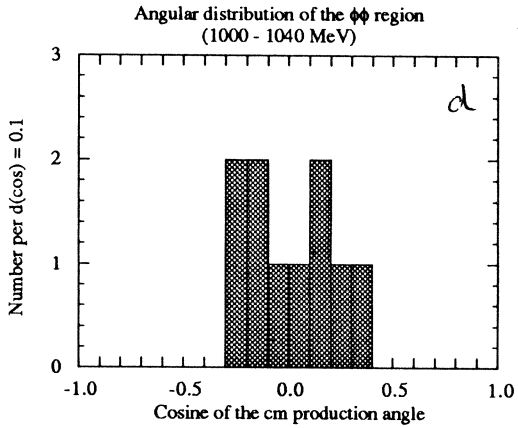
Cher & Sil prob > 1 %
any pixel assoc. & any vertex
10 MeV/c fixed mom. cut
Barrel (Julich & Gamma) in veto at > 200 AD

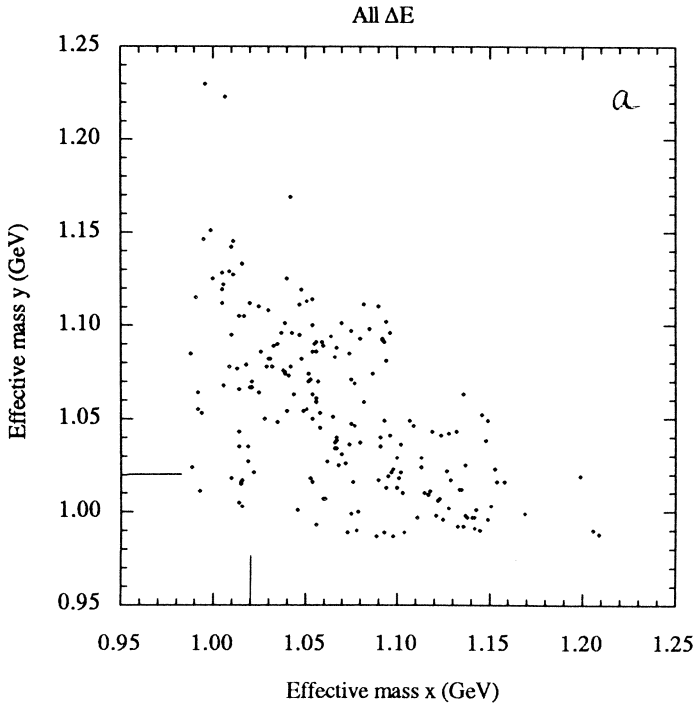
3 entries per solution.
max of 2 solutions per track set.
max of 2 track sets per event

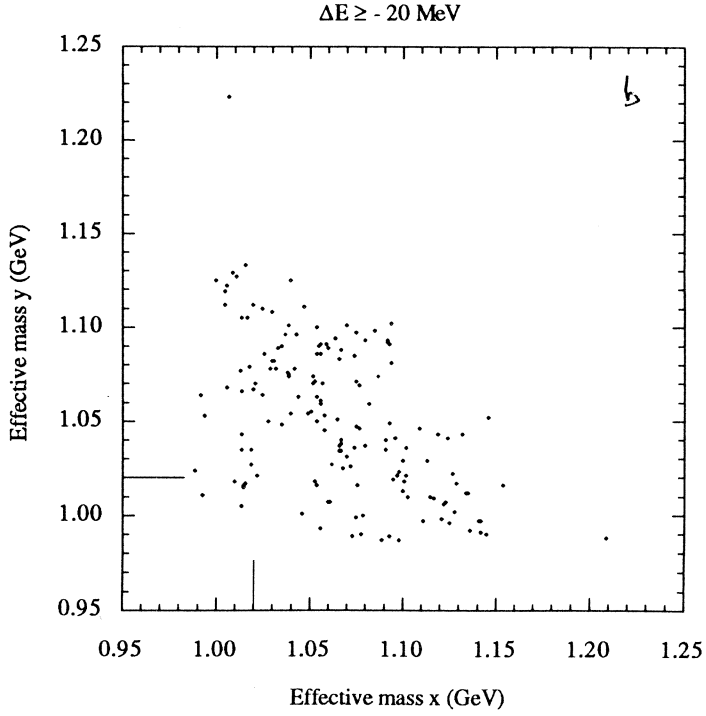
kinematics based on

$-100 \leq \Delta E \leq +20$ MeV

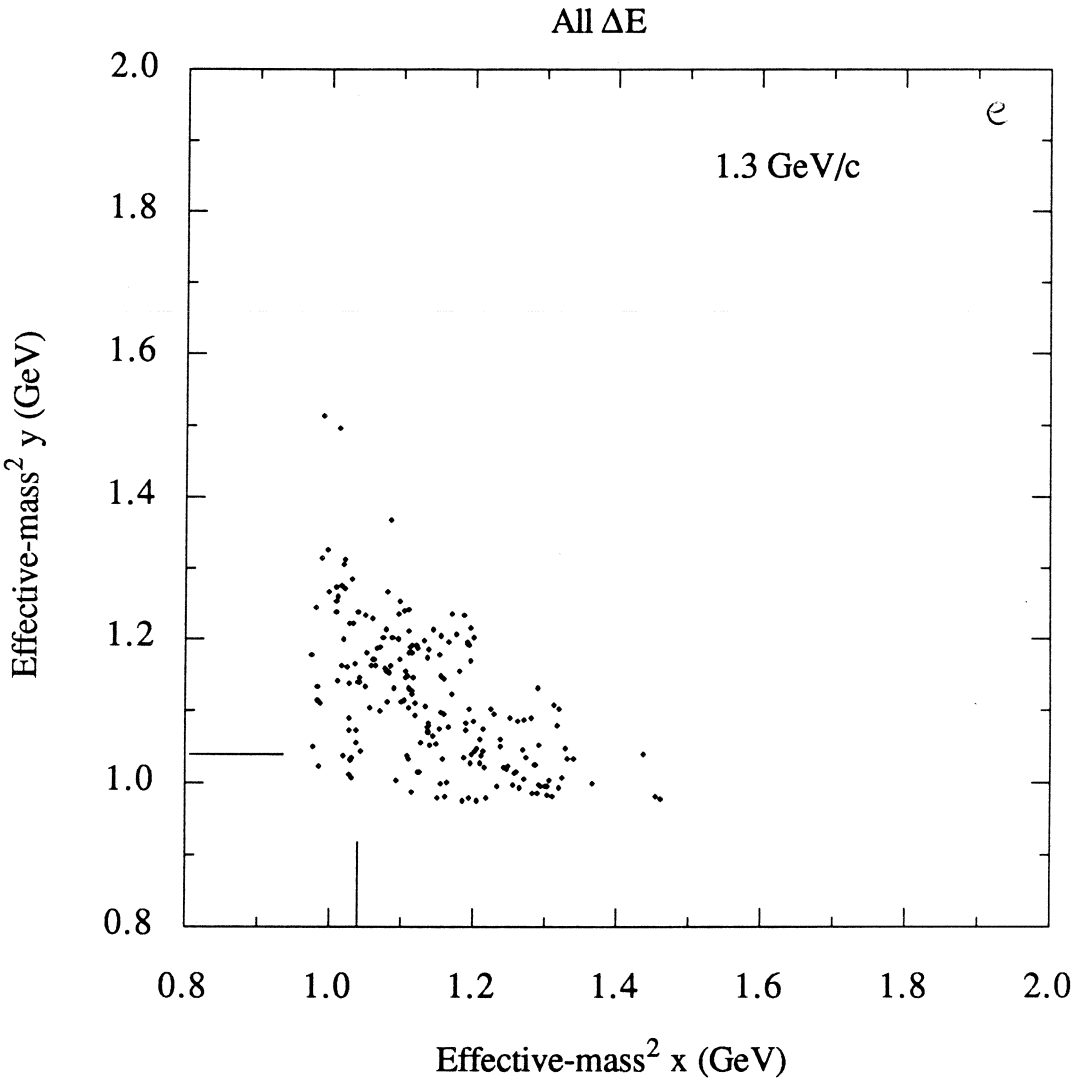




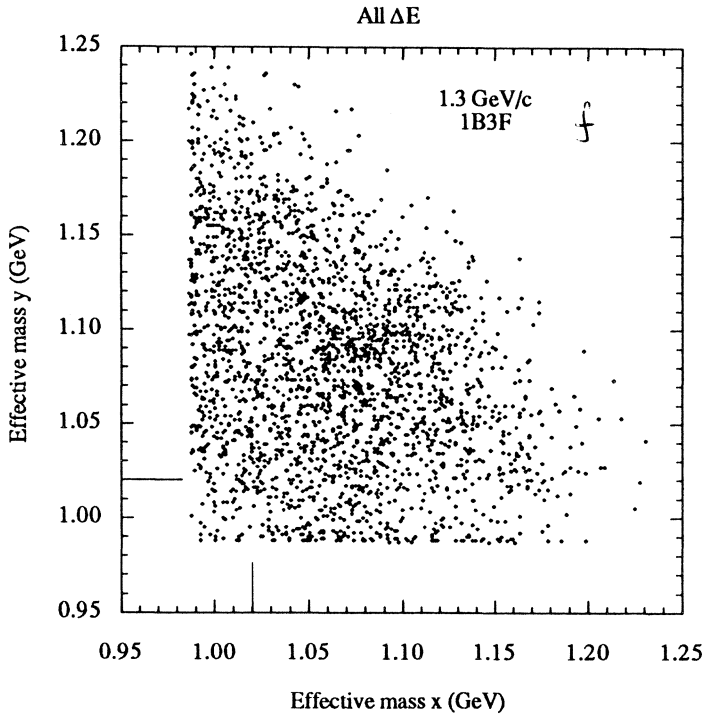


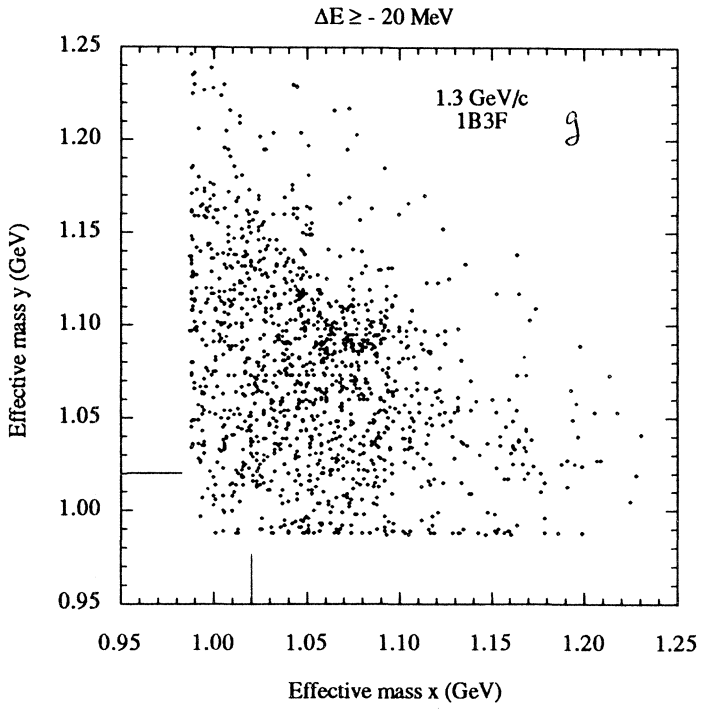


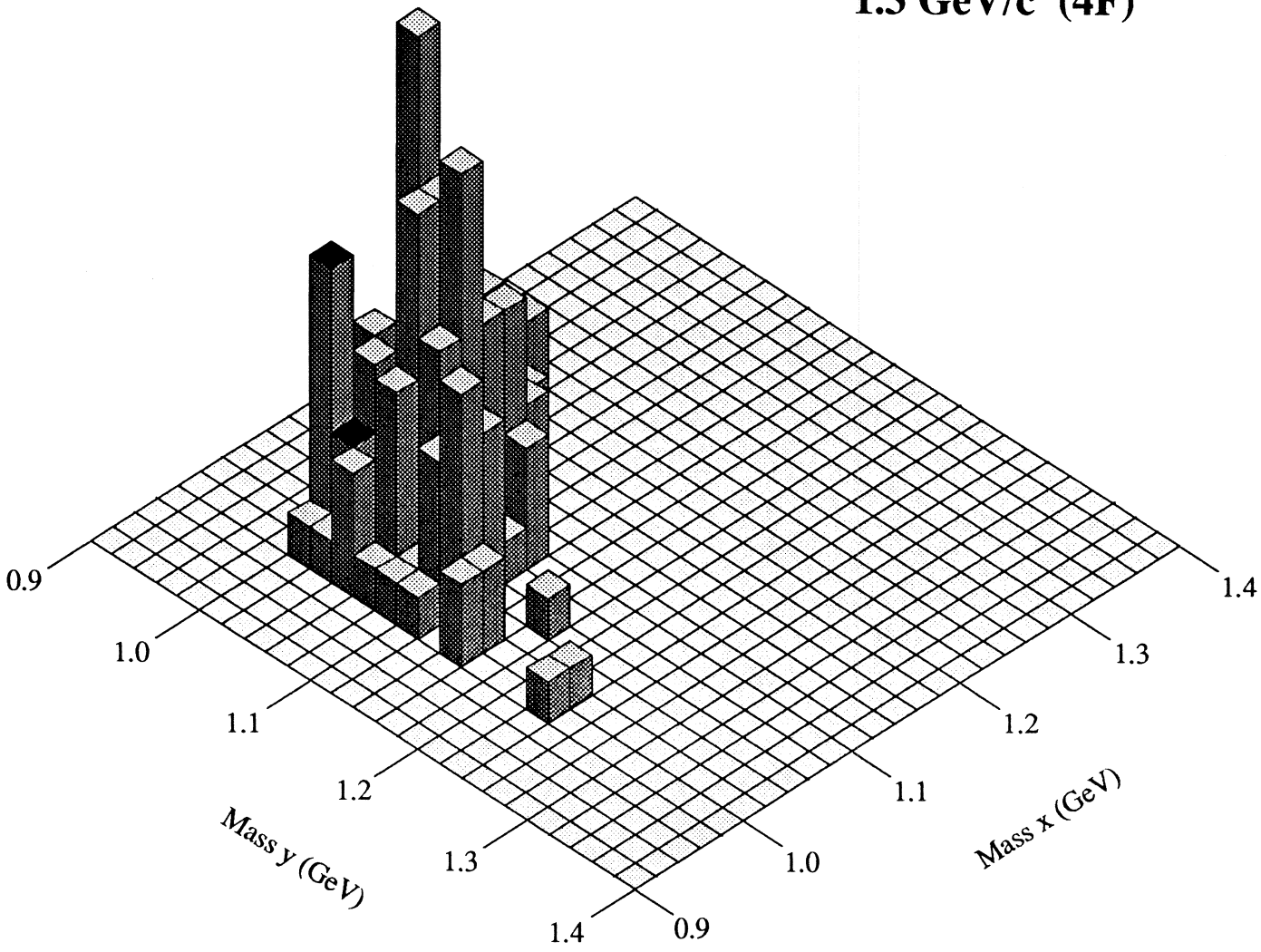
	1.3 GeV/c	Run ?	Run #	event	conf	sol	set	DeltaE	M(2+3)	M(1+4)	cos(2+3)
1			1268	26132	1	1	1	0.047	1.0060	1.0110	-0.083
2			1288	122035	1	1	2	0.017	1.0150	1.0180	0.359
3		1289	1314	69025	1	2	1	0.064	1.0250	1.0030	-0.201
4		1289	1314	69025	1	2	1	0.064	1.0290	1.0270	-0.265
5			1324	23362	1	1	1	-0.003	1.0200	1.0160	-0.155
6			1328	131923	1	1	2	0.037	1.0300	1.0350	-0.214
7			1346	117918	1	1	1	0.048	1.0170	1.0050	0.011
8			1346	117918	1	1	1	0.048	1.0350	1.0210	0.299
9			1358	57279	1	1	1	-0.002	1.0200	1.0350	-0.007
10			1365	3276	1	1	1	-0.026	1.0210	1.0150	-0.150
11			1374	90245	1	1	1	0.026	1.0210	1.0170	0.134
12			1378	101083	1	1	1	0.060	1.0050	1.0240	-0.229
13			1388	99189	1	1	1	0.019	1.0250	1.0170	0.126


All ΔE
e
1.3 GeV/c
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.8
1.0
1.2
1.4
1.6
1.8
2.0
Effective-mass^2 y (GeV)
Effective-mass^2 x (GeV)

1.3 GeV/c
1-barrel 3-forward events (1B3F)

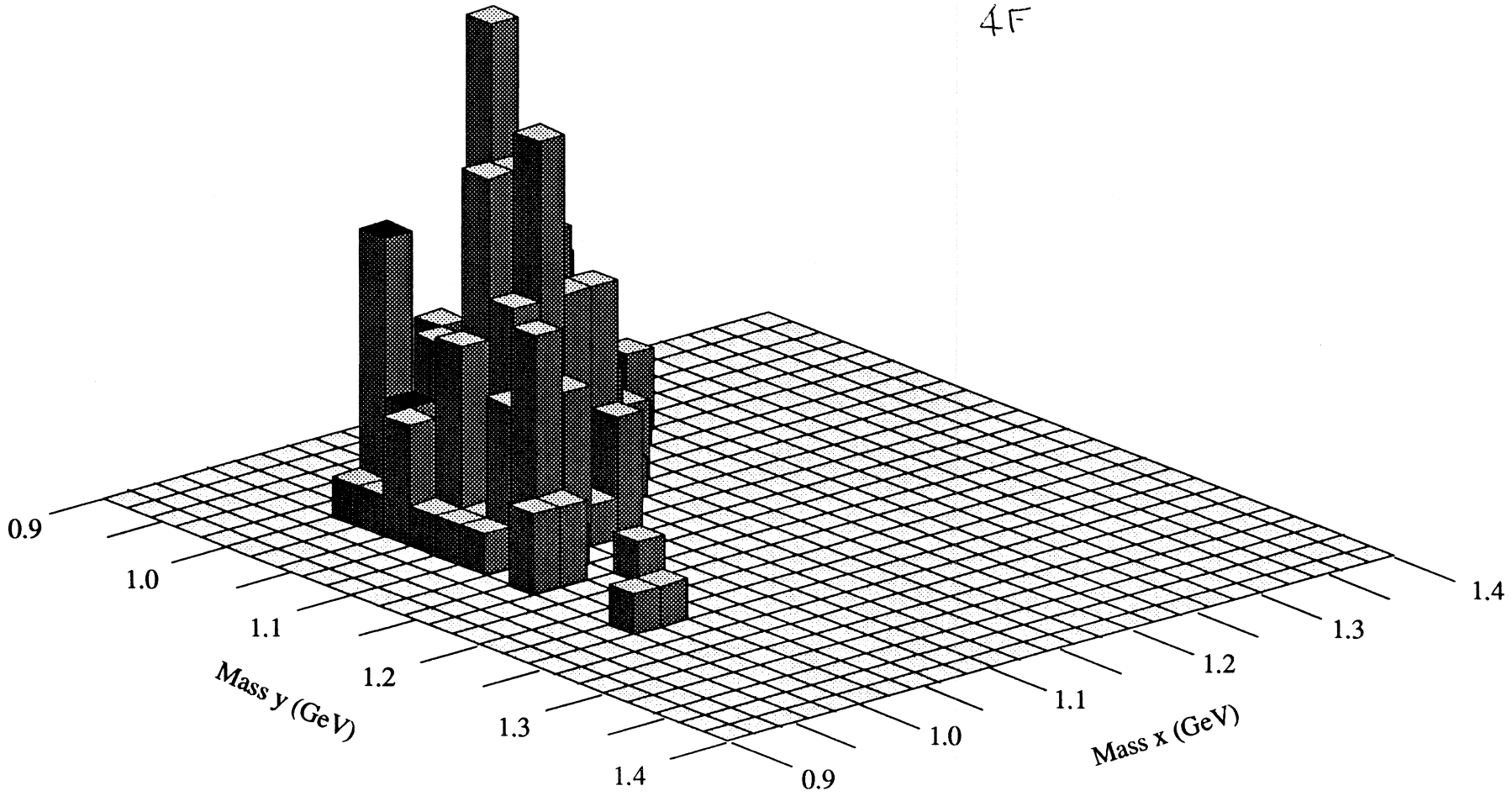




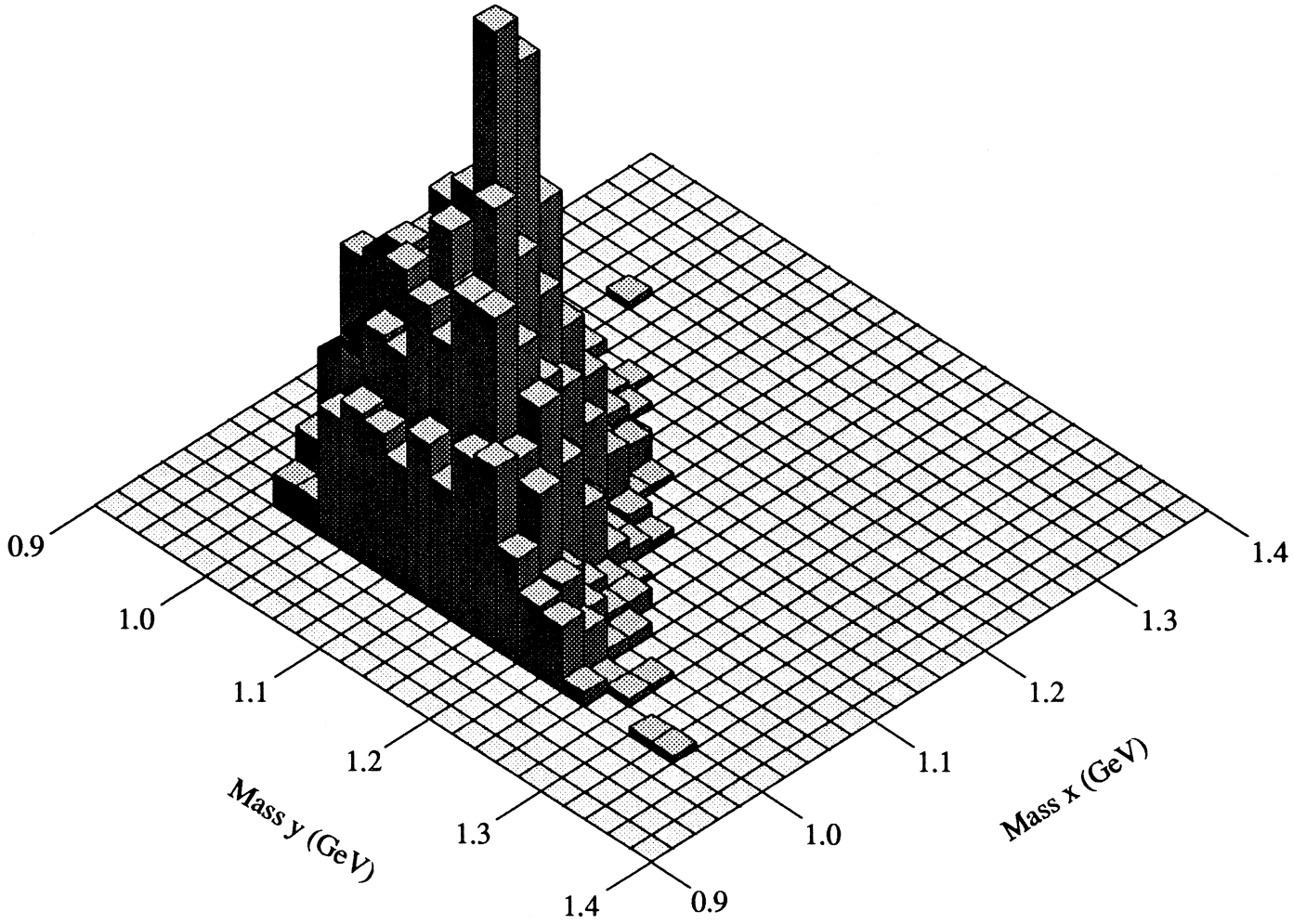

1.3 GeV/c (4F)
0.9
1.0
1.1
1.2
1.3
1.4
Mass y (GeV)
1.4
1.3
1.2
1.1
1.0
0.9
Mass x (GeV)

1.3 GeV/c

45



1.3 GeV/c (1B3F)



1.3 GeV/c
69 events

	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
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	6	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	1	4	4	4	1	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	1	1	6	10	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	1	5	9	9	2	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	3	1	3	7	3	3	3	3	2	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	1	3	1	0	12	6	4	2	2	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	1	7	0	4	3	4	5	6	4	0	1	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	1	4	3	2	6	5	1	0	2	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

1.4 GeV/c
[4F triggers]

M_x = Mass(1+2)+Mass(1+3)+Mass(2+3)

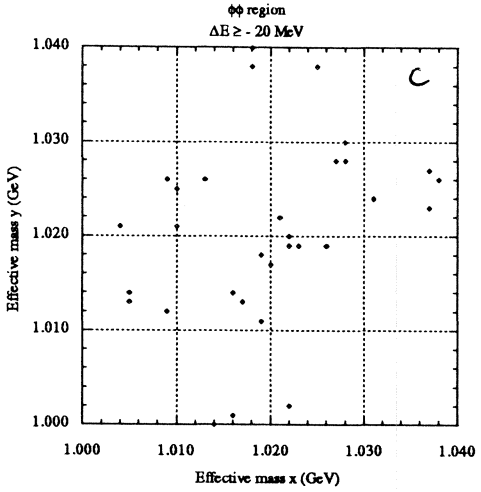
M_y = Mass(3+4)+Mass(2+4)+Mass(1+4)

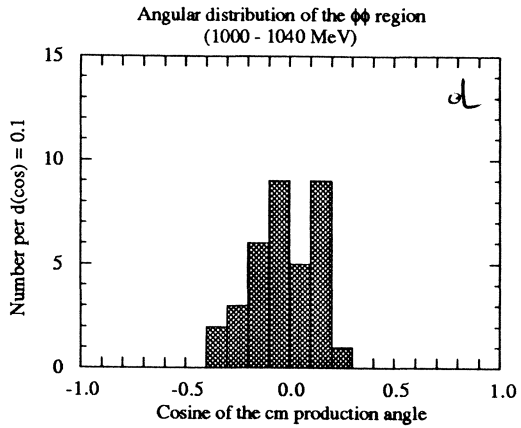
Cher & Sil prob > 1 %
any pixel assoc. & any vertex
10 MeV/c fixed mom. cut
Barrel (Julich & Gamma) in veto at > 200 AD

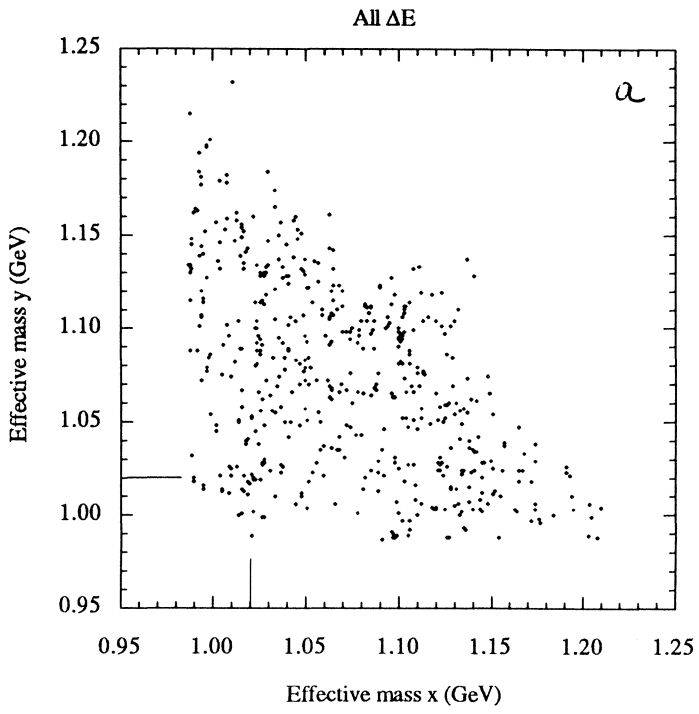
3 entries per solution.
max of 2 solutions per track set.
max of 2 track sets per event

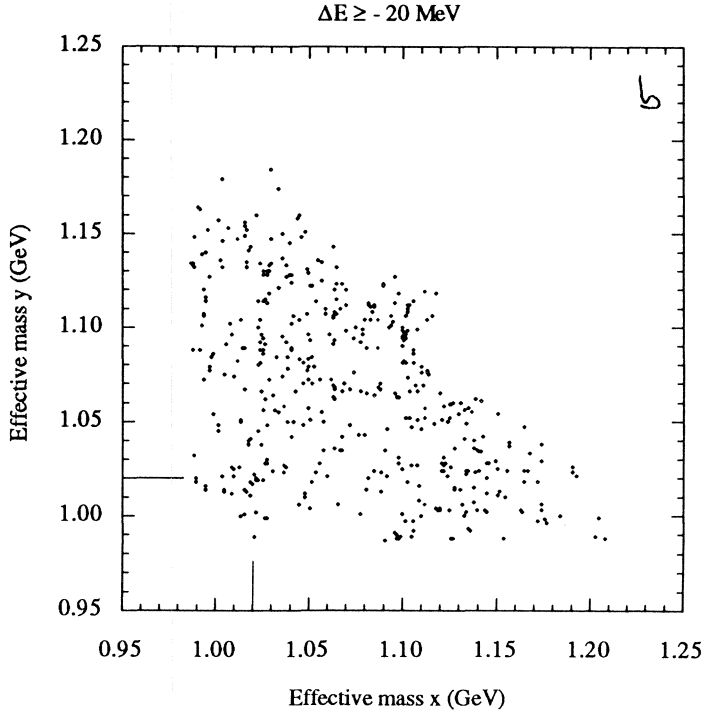
kinematics based on

-100 ≤ ΔE ≤ +20 MeV

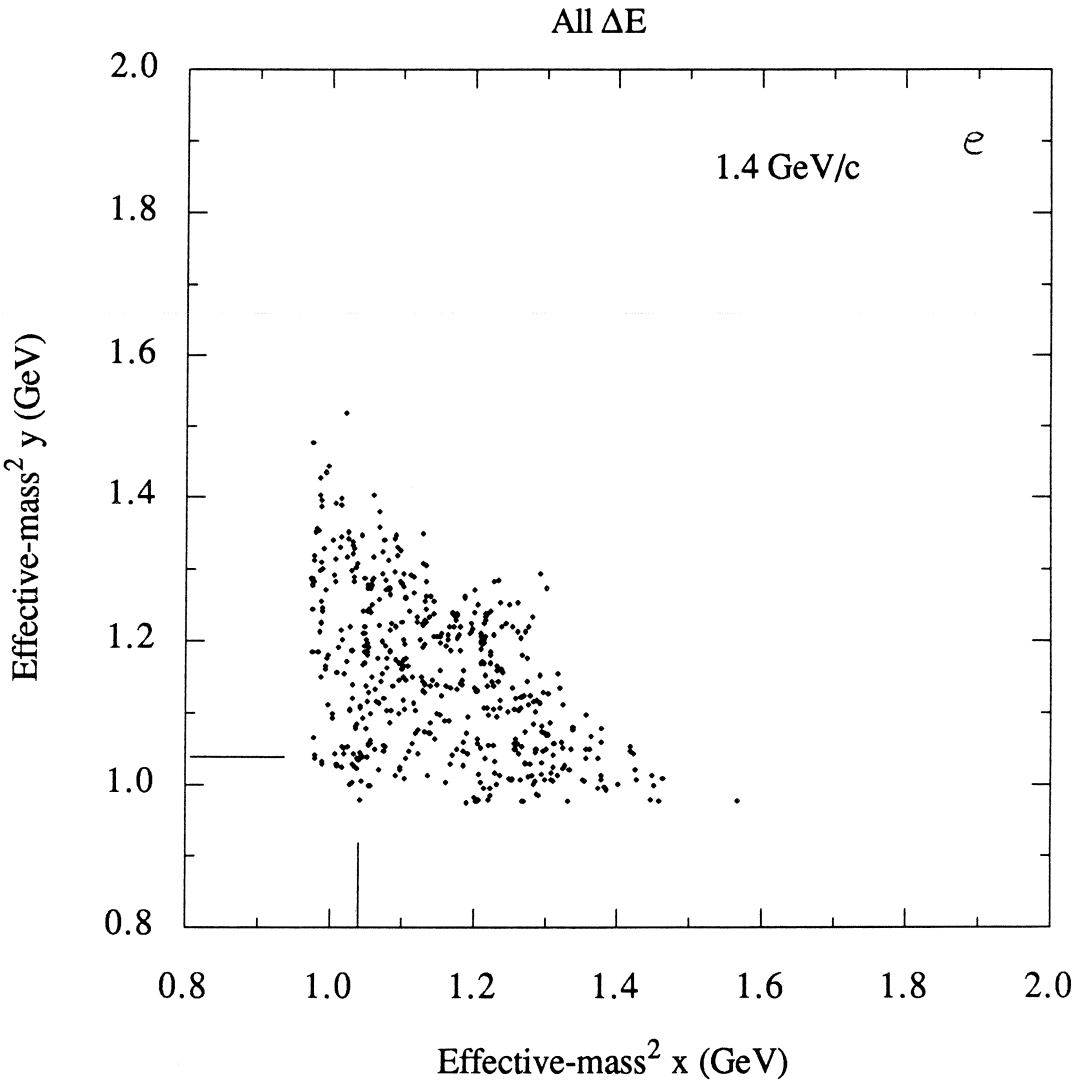




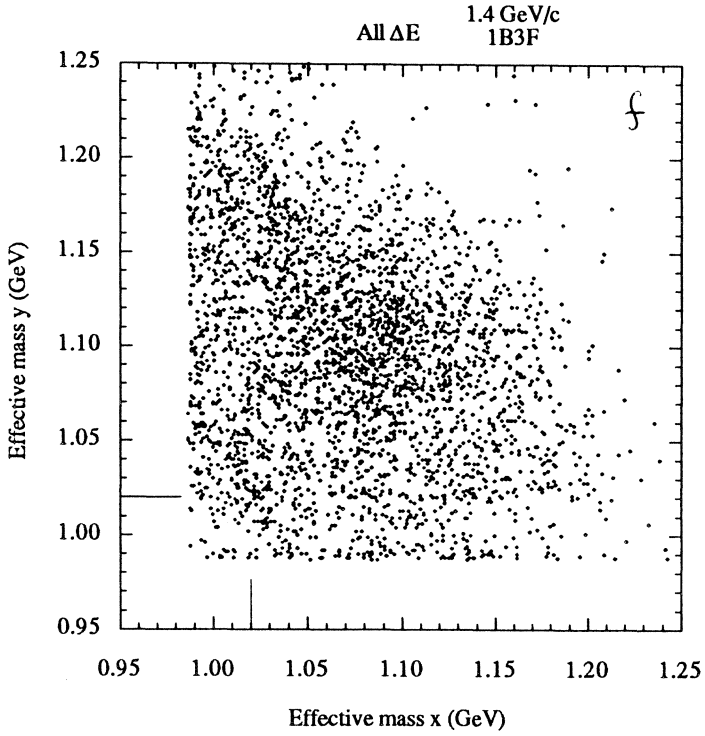


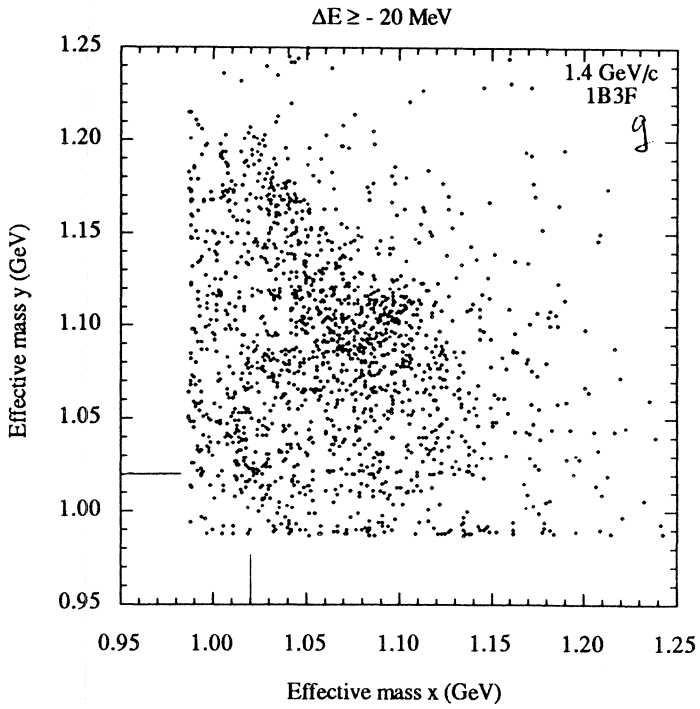


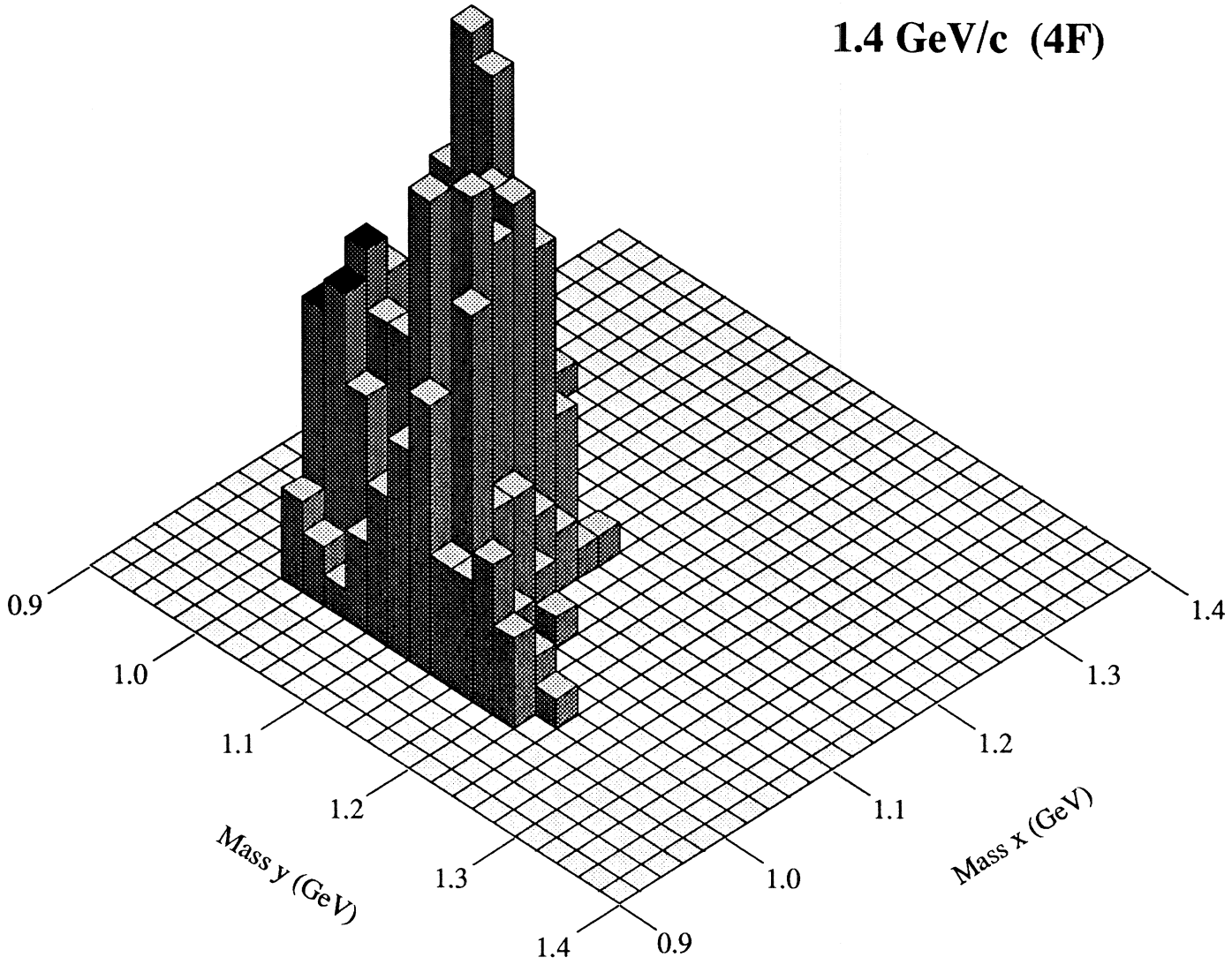
	1.4 GeV/c	Run #	event	conf	sol	set	DeltaE	M(2+3)	M(1+4)	cos(2+3)
1		1127	17367	1	1	1	0.025	1.0090	1.0120	-0.046
2		1133	109637	1	1	1	0.013	1.0160	1.0140	0.136
3		1137	97165	1	2	1	0.041	1.0370	1.0230	-0.122
4		1139	57520	1	1	1	0.018	1.0170	1.0130	-0.380
5		1139	57520	1	1	2	0.023	1.0210	1.0220	-0.300
6		1143	122159	1	1	1	0.005	1.0100	1.0250	-0.191
7		1143	122159	1	1	2	0.010	1.0090	1.0260	-0.220
8		1145	43977	1	1	1	0.013	1.0380	1.0260	0.049
9		1146	62005	1	2	2	0.058	1.0250	1.0380	0.058
10		1159	39812	1	1	2	0.007	1.0260	1.0190	0.044
11		1159	39812	1	1	1	0.005	1.0260	1.0190	0.056
12		1168	8707	1	1	1	0.037	1.0280	1.0280	-0.108
13		1168	8707	1	1	2	0.036	1.0280	1.0300	-0.106
14		1178	10785	1	2	2	0.026	1.0040	1.0210	0.059
15		1178	38919	1	1	1	0.014	1.0130	1.0260	0.177
16		1179	10484	1	1	1	-0.017	1.0190	1.0110	-0.037
17		1181	122622	1	1	2	-0.017	1.0230	1.0190	-0.064
18		1181	122622	1	1	1	-0.010	1.0220	1.0200	-0.083
19		1182	52224	1	1	1	0.008	1.0190	1.0180	0.182
20		1183	122628	1	1	2	0.029	1.0270	1.0280	0.113
21		1183	122628	1	2	1	0.047	1.0220	1.0020	-0.079
22		1183	122628	1	2	2	0.029	1.0220	1.0020	-0.080
23		1187	1723	1	1	1	-0.015	1.0200	1.0170	-0.103
24		1191	39701	1	2	2	0.024	1.0180	1.0400	-0.035
25		1191	39701	1	2	1	0.035	1.0180	1.0380	-0.052
26		1205	28135	1	1	1	0.005	1.0370	1.0270	-0.021
27		1234	101347	1	1	1	0.009	1.0130	1.0260	-0.110
28		1236	18077	1	1	1	-0.006	1.0310	1.0240	0.209
29		1238	121115	1	1	1	-0.004	1.0050	1.0130	0.132
30		1238	121115	1	1	2	-0.004	1.0050	1.0140	0.137
31		1243	87774	1	1	1	-0.004	1.0220	1.0190	0.183
32		1257	25879	1	1	1	0.007	1.0100	1.0210	-0.244
33		1257	25879	1	1	2	0.006	1.0100	1.0210	-0.240
34		1262	34462	1	1	2	0.014	1.0160	1.0010	0.163
35		1262	34462	1	1	1	0.016	1.0140	1.0000	0.125


All ΔE
1.4 GeV/c
e
Effective-mass^2 y (GeV)
Effective-mass^2 x (GeV)
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.8
1.0
1.2
1.4
1.6
1.8
2.0

1.4 GeV/c
1-barrel 3-forward events (1B3F)

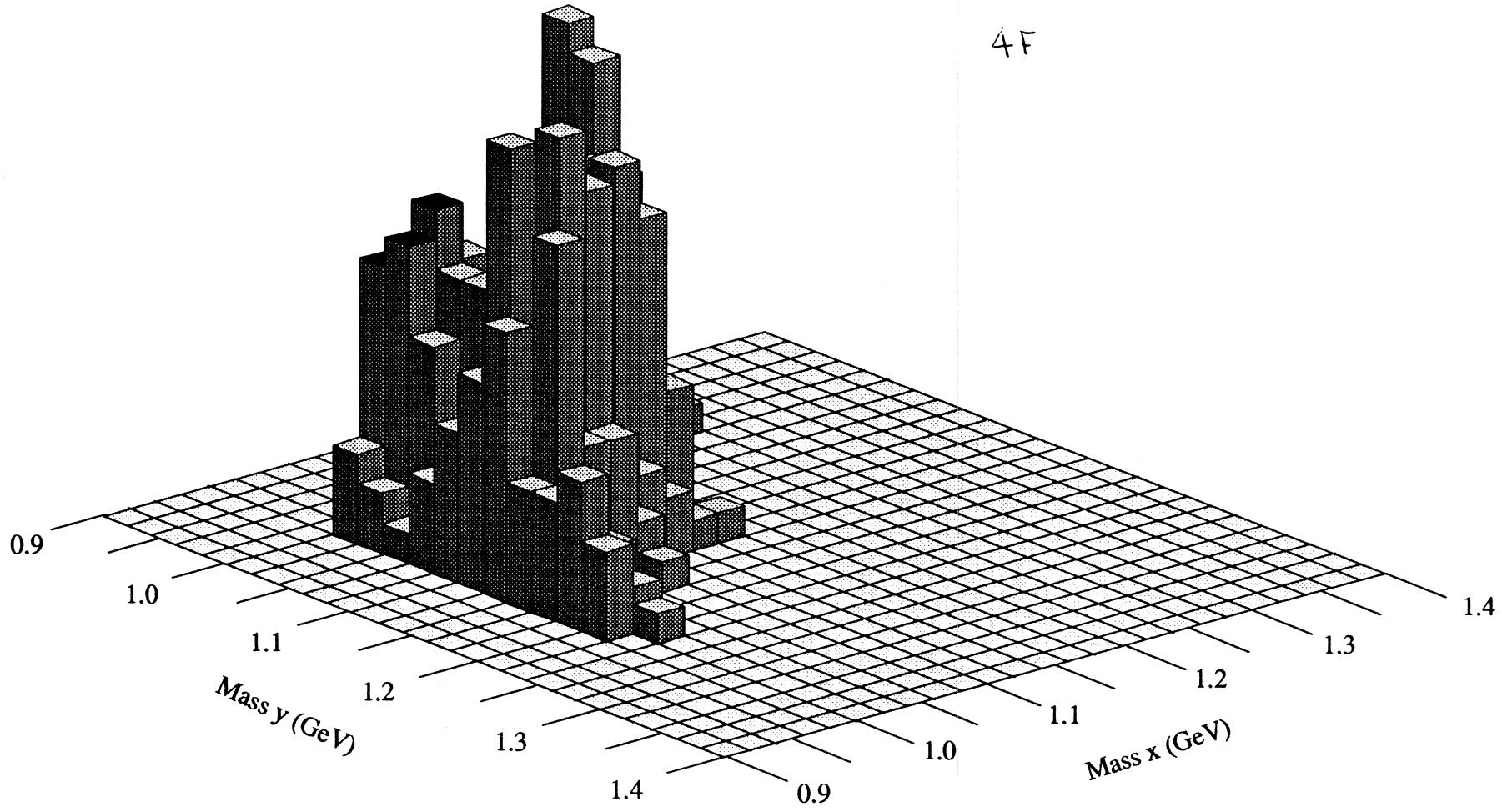




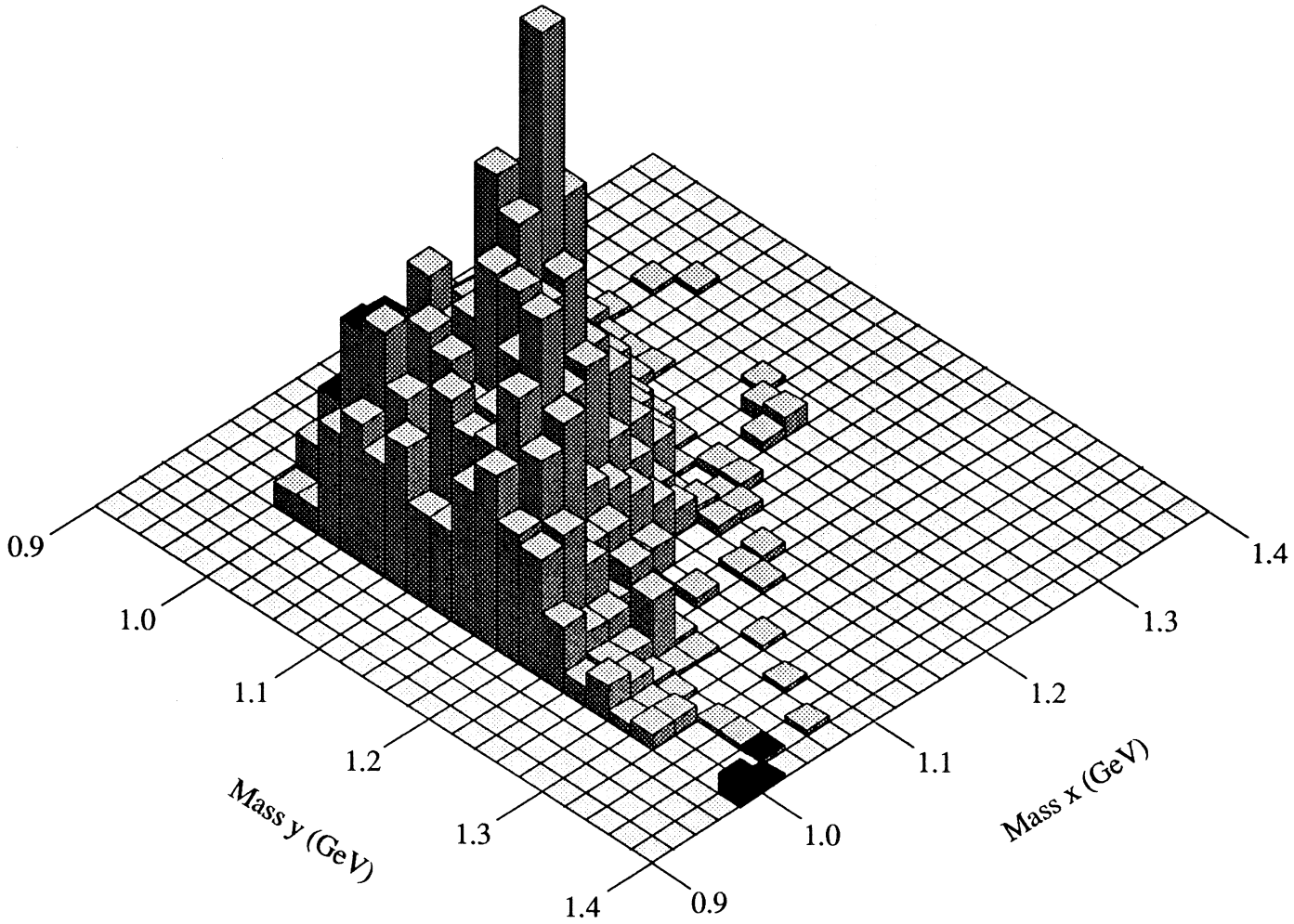

1.4 GeV/c (4F)
0.9
1.0
1.1
1.2
1.3
1.4
Mass y (GeV)
1.4
1.3
1.2
1.1
1.0
0.9
Mass x (GeV)

1.4 GeV/c

4F



1.4 GeV/c (1B3F)



1.4 GeV/c
178 events

	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
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	5	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	4	3	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	4	12	5	5	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	9	5	15	13	4	3	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	7	2	7	8	10	13	11	5	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	5	5	14	8	11	11	12	3	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	3	3	9	8	11	11	12	4	4	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	1	7	9	7	6	1	8	15	2	1	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	2	10	11	5	4	9	2	16	12	5	3	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	3	9	8	5	2	4	9	11	8	6	3	2	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	4	0	0	8	4	4	1	3	0	4	0	1	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

1.5 GeV/c "July data" [4F triggers]

M_x = Mass(1+2)+Mass(1+3)+Mass(2+3)

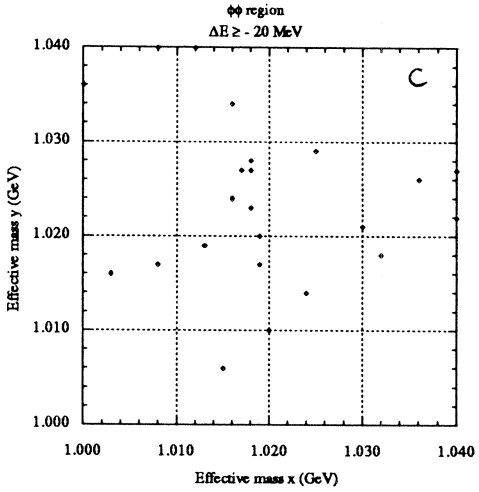
M_y = Mass(3+4)+Mass(2+4)+Mass(1+4)

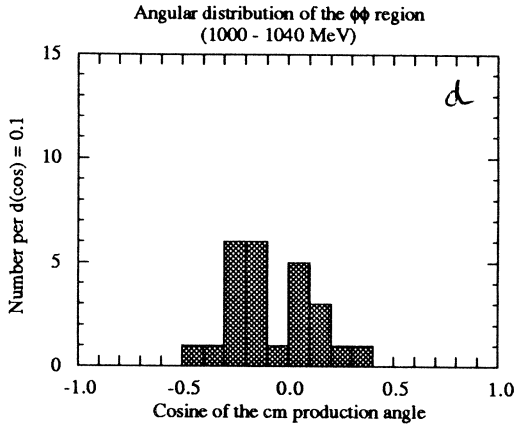
Cher & Sil prob > 1 %
any pixel assoc. & any vertex
10 MeV/c fixed mom. cut
Barrel (Julich & Gamma) in veto at > 200 AD

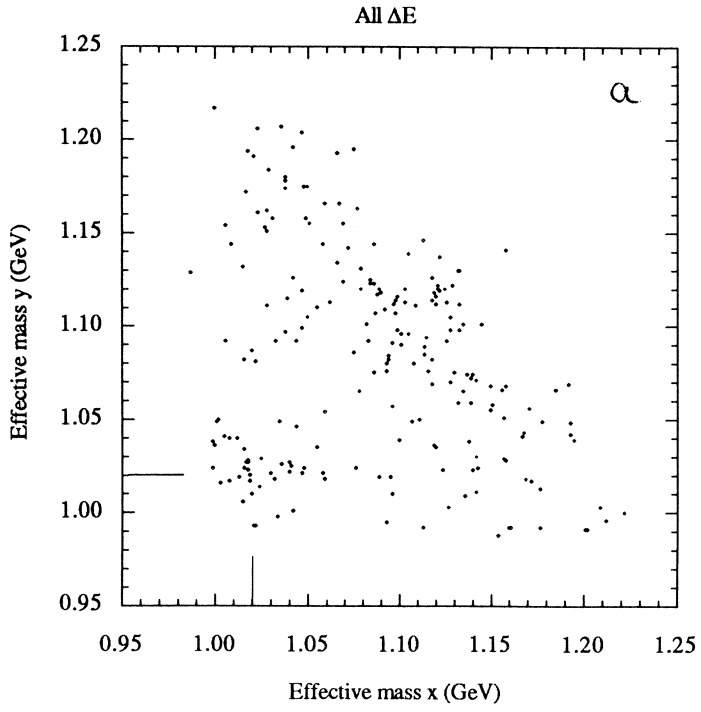
3 entries per solution.
max of 2 solutions per track set.
max of 2 track sets per event

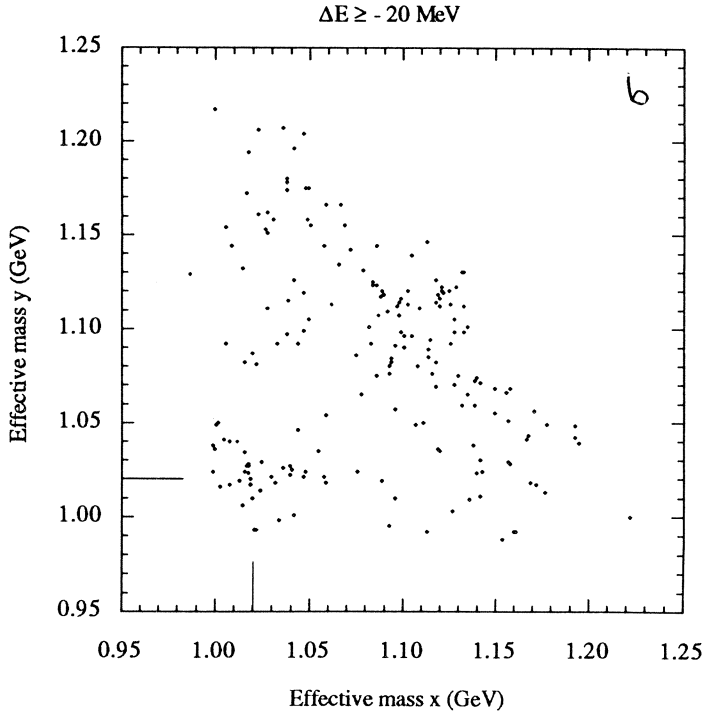
kinematics based on

$-100 \leq \Delta E \leq +20$ MeV









1.5 GeV/c
"December data part 1"
[4F triggers]

M_x = Mass(1+2)+Mass(1+3)+Mass(2+3)

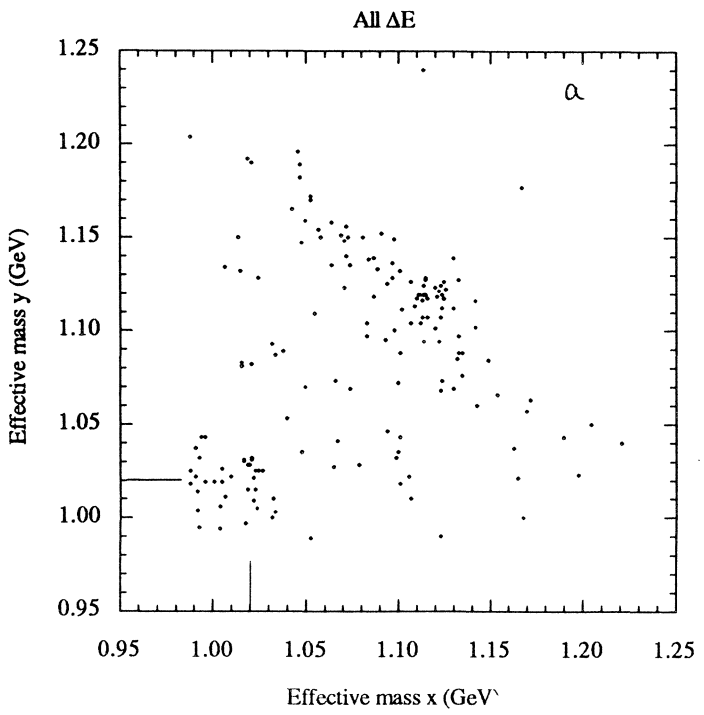
M_y = Mass(3+4)+Mass(2+4)+Mass(1+4)

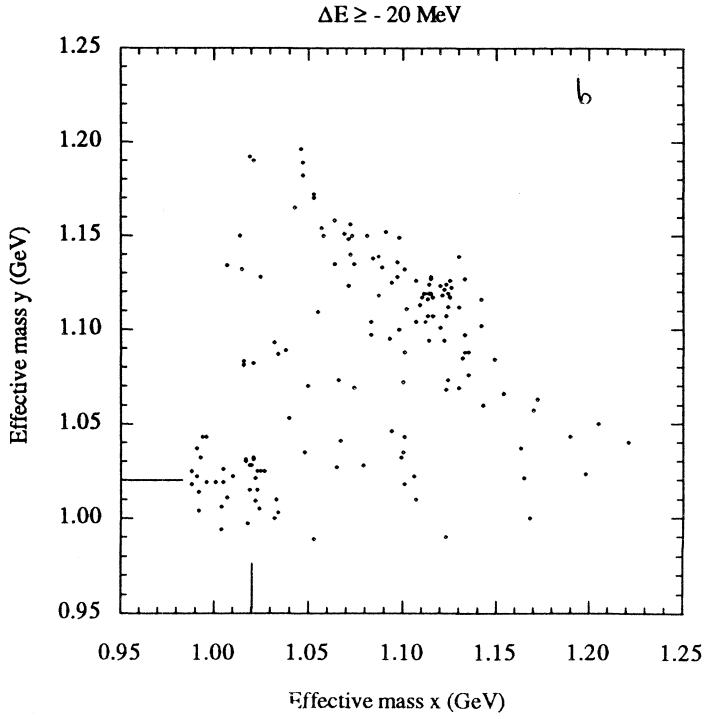
Cher & Sil prob > 1 %
any pixel assoc. & any vertex
10 MeV/c fixed mom. cut
Barrel (Julich & Gamma) in veto at > 200 AD

3 entries per solution.
max of 2 solutions per track set.
max of 2 track sets per event

kinematics based on

-100 ≤ ΔE ≤ +20 MeV





1.5 GeV/c "April data" [4F triggers]

M_x = Mass(1+2)+Mass(1+3)+Mass(2+3)

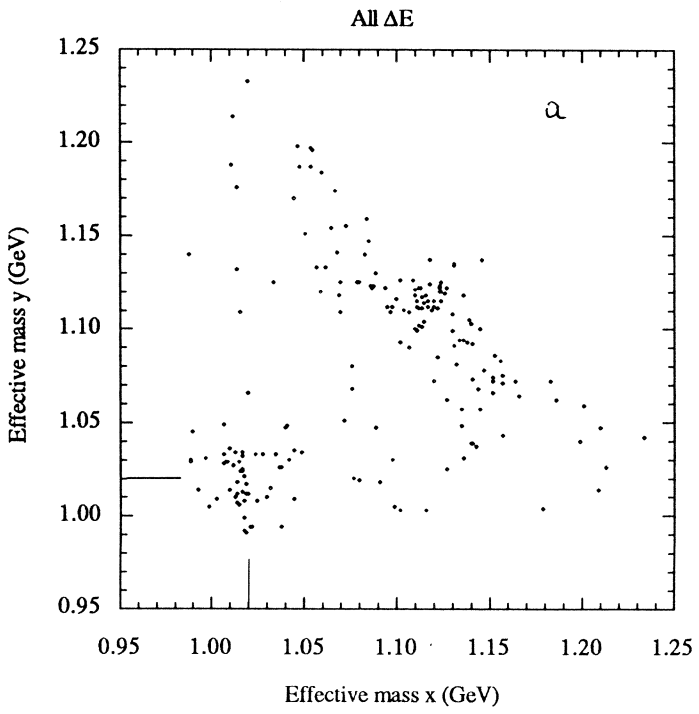
M_y = Mass(3+4)+Mass(2+4)+Mass(1+4)

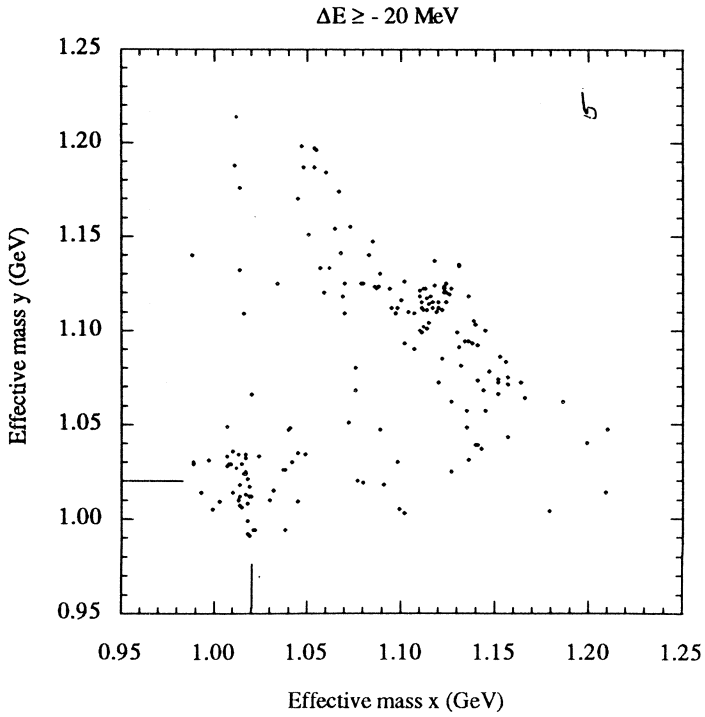
Cher & Sil prob > 1 %
any pixel assoc. & any vertex
10 MeV/c fixed mom. cut
Barrel (Julich & Gamma) in veto at > 200 AD

3 entries per solution.
max of 2 solutions per track set.
max of 2 track sets per event

kinematics based on

$-100 \leq \Delta E \leq +20$ MeV





1.5 GeV/c "Total" [4F triggers]

M_x = Mass(1+2)+Mass(1+3)+Mass(2+3)

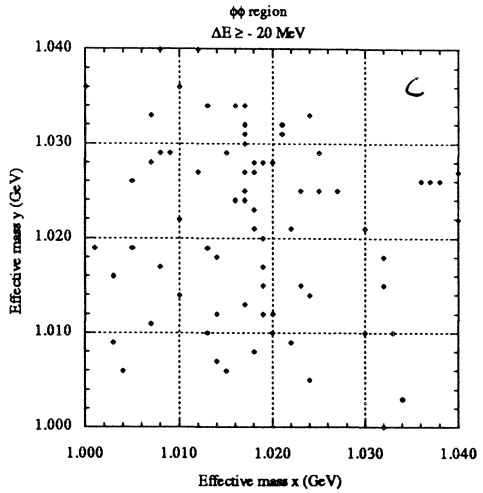
M_y = Mass(3+4)+Mass(2+4)+Mass(1+4)

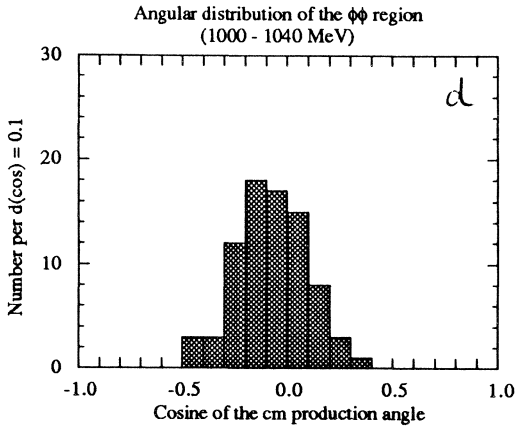
Cher & Sil prob > 1 %
any pixel assoc. & any vertex
10 MeV/c fixed mom. cut
Barrel (Julich & Gamma) in veto at > 200 AD

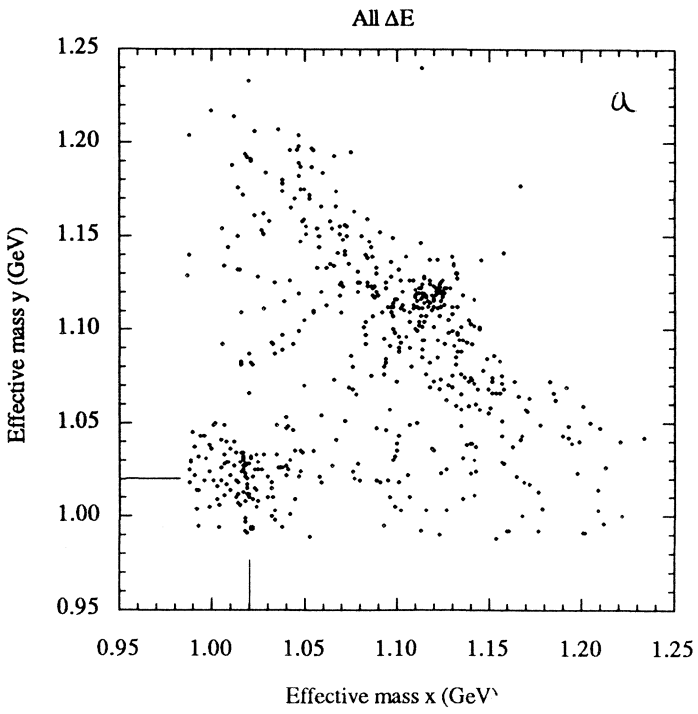
3 entries per solution.
max of 2 solutions per track set.
max of 2 track sets per event

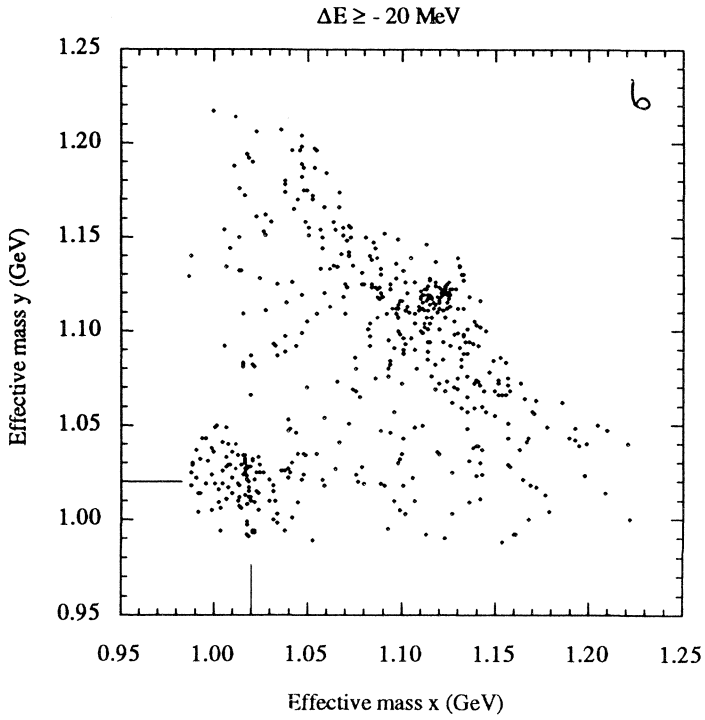
kinematics based on

$-100 \leq \Delta E \leq +20$ MeV



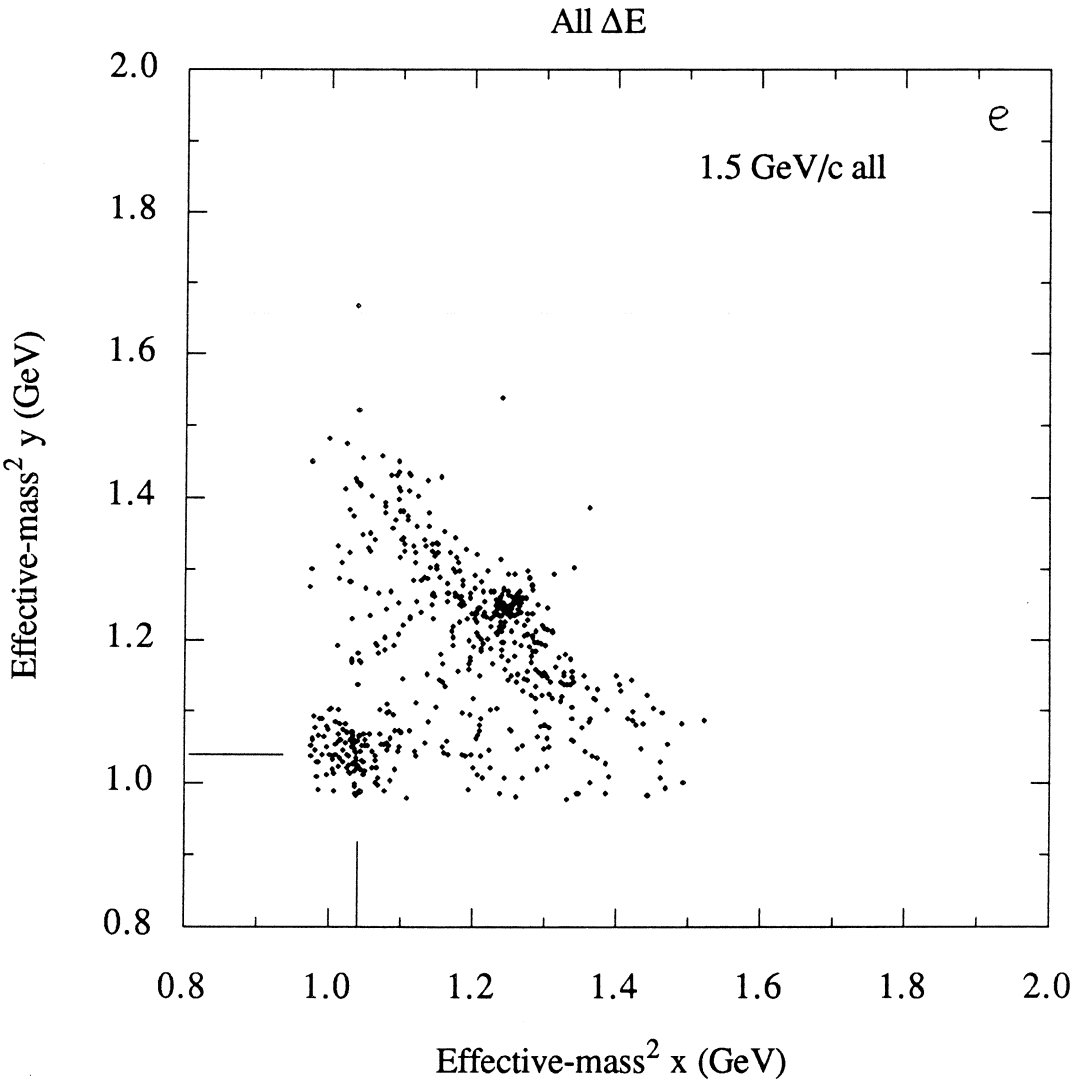




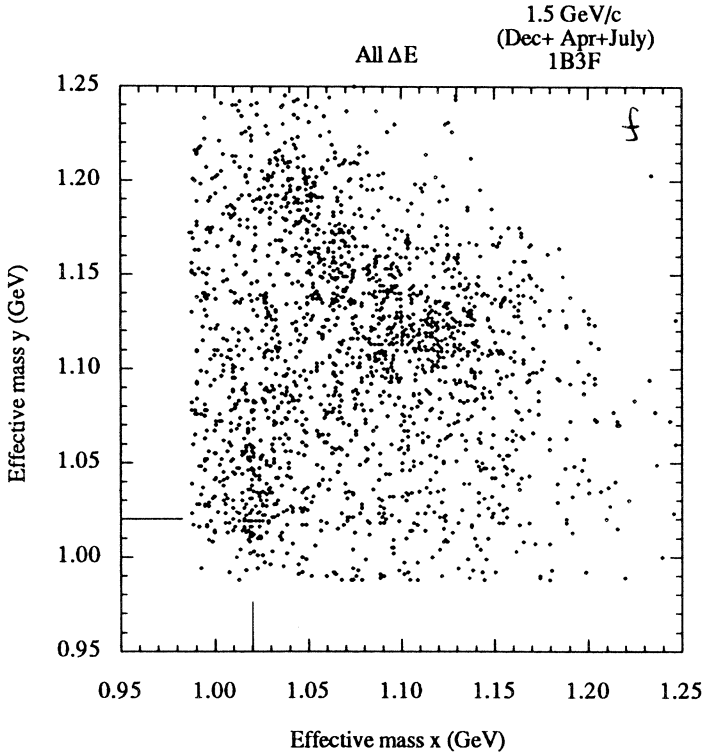


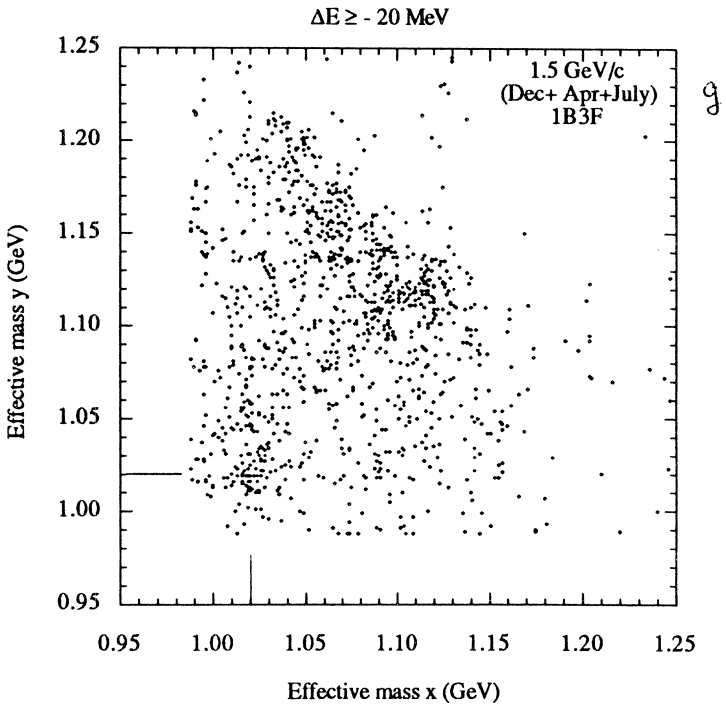
	1.5 GeV/c	Run #	event	conf	sol	set	DeltaE	M(2+3)	M(1+4)	cos(2+3)
1		184	5017	1	1	2	-0.003	1.0100	1.0220	-0.072
2		184	5017	1	1	1	-0.020	1.0050	1.0260	-0.104
3		235	8307	1	1	1	0.003	1.0070	1.0110	-0.062
4		241	34509	1	1	1	0.010	1.0190	1.0280	0.005
5		246	89720	1	1	1	0.011	1.0330	1.0100	-0.253
6		250	18348	1	1	1	0.000	1.0240	1.0050	-0.061
7		252	10880	1	1	2	0.010	1.0320	1.0000	0.125
8		252	10880	1	1	1	-0.011	1.0340	1.0030	0.043
9		265	4832	1	1	1	-0.006	1.0200	1.0280	0.066
10		265	8057	1	1	1	-0.006	1.0220	1.0090	0.158
11		267	75267	1	1	1	0.008	1.0040	1.0060	-0.097
12		268	14469	1	1	1	-0.002	1.0050	1.0190	0.062
13		270	83761	1	1	2	0.045	1.0250	1.0250	-0.103
14		270	83761	1	1	1	0.042	1.0270	1.0250	-0.116
15		287	15914	1	1	1	0.002	1.0170	1.0300	-0.046
16		289	95664	1	1	1	0.003	1.0220	1.0210	0.111
17		293	63519	1	1	2	0.050	1.0210	1.0310	-0.107
18		293	63519	1	1	1	0.048	1.0210	1.0320	-0.107
19		294	16727	1	1	1	0.006	1.0010	1.0190	-0.278
20		295	17910	1	1	2	0.005	1.0230	1.0150	-0.200
21		304	15126	1	1	1	0.014	1.0190	1.0150	-0.019
22		306	96162	1	1	1	0.002	1.0230	1.0250	-0.001
23		306	40243	1	2	1	0.037	1.0170	1.0310	0.057
24		449	34094	1	1	2	-0.031	1.0350	1.0330	0.181
25		449	84280	1	1	1	0.054	1.0320	1.0150	-0.134
26		449	34094	1	1	1	-0.022	1.0280	1.0330	0.193
27		449	84280	1	1	2	0.057	1.0300	1.0100	-0.097
28		450	82534	1	2	2	0.021	1.0150	1.0290	-0.102
29		450	82534	1	1	2	0.021	1.0150	1.0060	-0.065
30		450	14289	1	1	1	0.007	1.0180	1.0080	0.006
31		450	82534	1	2	1	0.023	1.0140	1.0070	-0.063
32		450	82534	1	1	1	0.023	1.0130	1.0340	-0.093
33		462	66734	1	1	1	0.000	1.0170	1.0250	-0.370
34		463	91281	1	1	1	0.002	1.0170	1.0130	-0.110
35		470	47595	1	2	2	0.022	1.0100	1.0140	-0.295
36		470	47595	1	1	2	0.022	1.0070	1.0280	-0.420
37		470	33417	1	1	1	-0.017	1.0200	1.0120	-0.189
38		470	33417	1	1	2	-0.030	1.0250	1.0080	-0.160
39		472	20991	1	1	1	-0.010	1.0180	1.0210	-0.183
40		476	57416	1	1	1	0.012	1.0140	1.0180	-0.116
41		476	77757	1	2	1	0.029	1.0130	1.0100	0.091
42		476	77757	1	1	2	0.029	1.0130	1.0100	0.090
43		478	39672	1	1	1	0.013	1.0090	1.0290	-0.198
44		481	97353	1	2	2	0.034	1.0380	1.0260	-0.065
45		481	97353	1	2	1	0.030	1.0370	1.0260	-0.056
46		486	19619	1	1	1	-0.018	1.0080	1.0290	-0.095
47		487	29046	1	1	1	0.005	1.0030	1.0090	0.149
48		487	15878	1	1	1	0.011	1.0170	1.0240	-0.058
49		487	15878	1	1	2	0.010	1.0160	1.0240	-0.060
50		488	3036	1	1	1	0.049	1.0240	1.0330	-0.453

	1.5 GeV/c	Run #	event	conf	sol	set	DeltaE	M(2+3)	M(1+4)	cos(2+3)
51		488	50331	1	1	1	0.004	1.0190	1.0170	-0.305
52		491	11542	1	1	2	0.007	1.0170	1.0340	0.022
53		491	11542	1	1	1	0.011	1.0170	1.0320	0.049
54		493	33341	1	2	2	0.023	1.0100	1.0360	0.170
55		494	22977	1	1	2	0.000	1.0190	1.0120	0.224
56		494	22977	1	1	1	0.002	1.0140	1.0120	0.216
57		499	10837	1	1	1	0.008	1.0070	1.0330	-0.238
58		499	10837	1	1	2	0.007	1.0120	1.0270	-0.240
59		828	91170	1	1	2	0.008	1.0180	1.0230	0.096
60		828	91170	1	1	1	0.009	1.0160	1.0240	0.109
61		828	79366	1	1	1	0.010	1.0080	1.0400	0.060
62		828	79869	1	1	1	-0.003	1.0240	1.0140	-0.172
63		830	8702	1	1	1	-0.015	1.0320	1.0180	-0.189
64		831	15446	1	1	1	-0.007	1.0190	1.0170	0.325
65		839	106570	1	1	1	0.015	1.0030	1.0160	0.296
66		841	104241	1	1	1	0.013	1.0130	1.0190	-0.252
67		842	91046	1	1	1	0.008	1.0200	1.0100	-0.248
68		842	91046	1	1	2	0.007	1.0200	1.0100	-0.242
69		846	75107	1	2	1	0.030	1.0250	1.0290	-0.166
70		846	75107	1	2	2	0.033	1.0190	1.0200	-0.117
71		851	61045	1	1	1	0.003	1.0120	1.0400	0.083
72		857	154	1	1	1	0.018	1.0180	1.0270	-0.459
73		857	16886	1	1	1	0.020	1.0400	1.0270	-0.193
74		857	16886	1	1	2	0.020	1.0400	1.0270	-0.192
75		858	76385	1	1	1	0.003	1.0080	1.0170	0.106
76		859	30103	1	2	1	0.026	1.0400	1.0220	-0.365
77		859	30103	1	1	2	0.032	1.0000	1.0360	-0.213
78		859	58646	1	1	1	-0.010	1.0300	1.0210	0.128
79		859	54480	1	1	1	0.026	1.0180	1.0280	0.011
80		862	112542	1	2	2	0.039	1.0170	1.0270	-0.211
81		862	112542	1	1	1	0.040	1.0360	1.0260	-0.094
82		862	112542	1	2	1	0.040	1.0160	1.0340	-0.210
83		863	107759	1	1	1	0.016	1.0150	1.0060	0.015

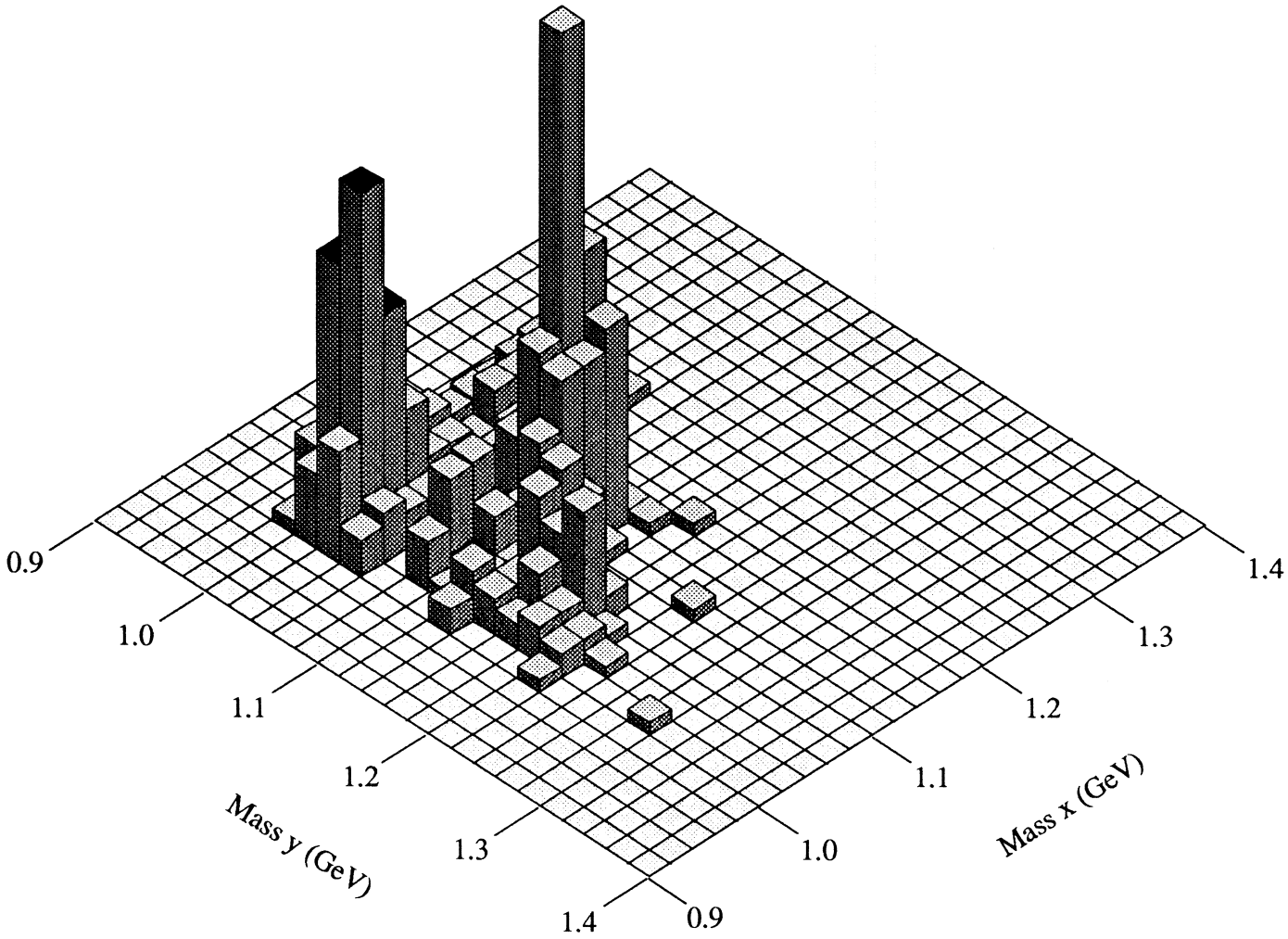

All ΔE
e
1.5 GeV/c all
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.8
1.0
1.2
1.4
1.6
1.8
2.0
Effective-mass^2 y (GeV)
Effective-mass^2 x (GeV)

1.5 GeV/c (all data)
1-barrel 3-forward events (1B3F)



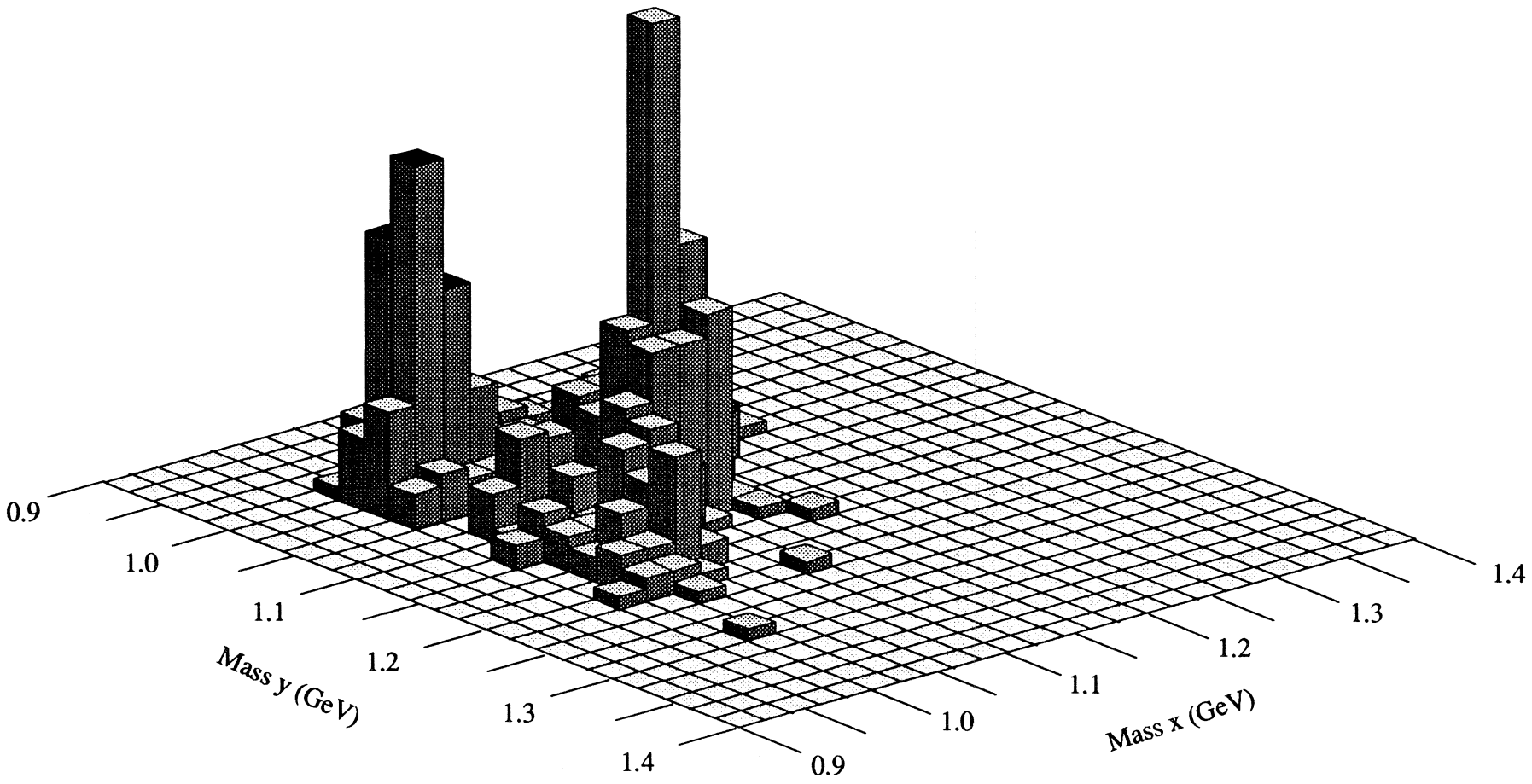


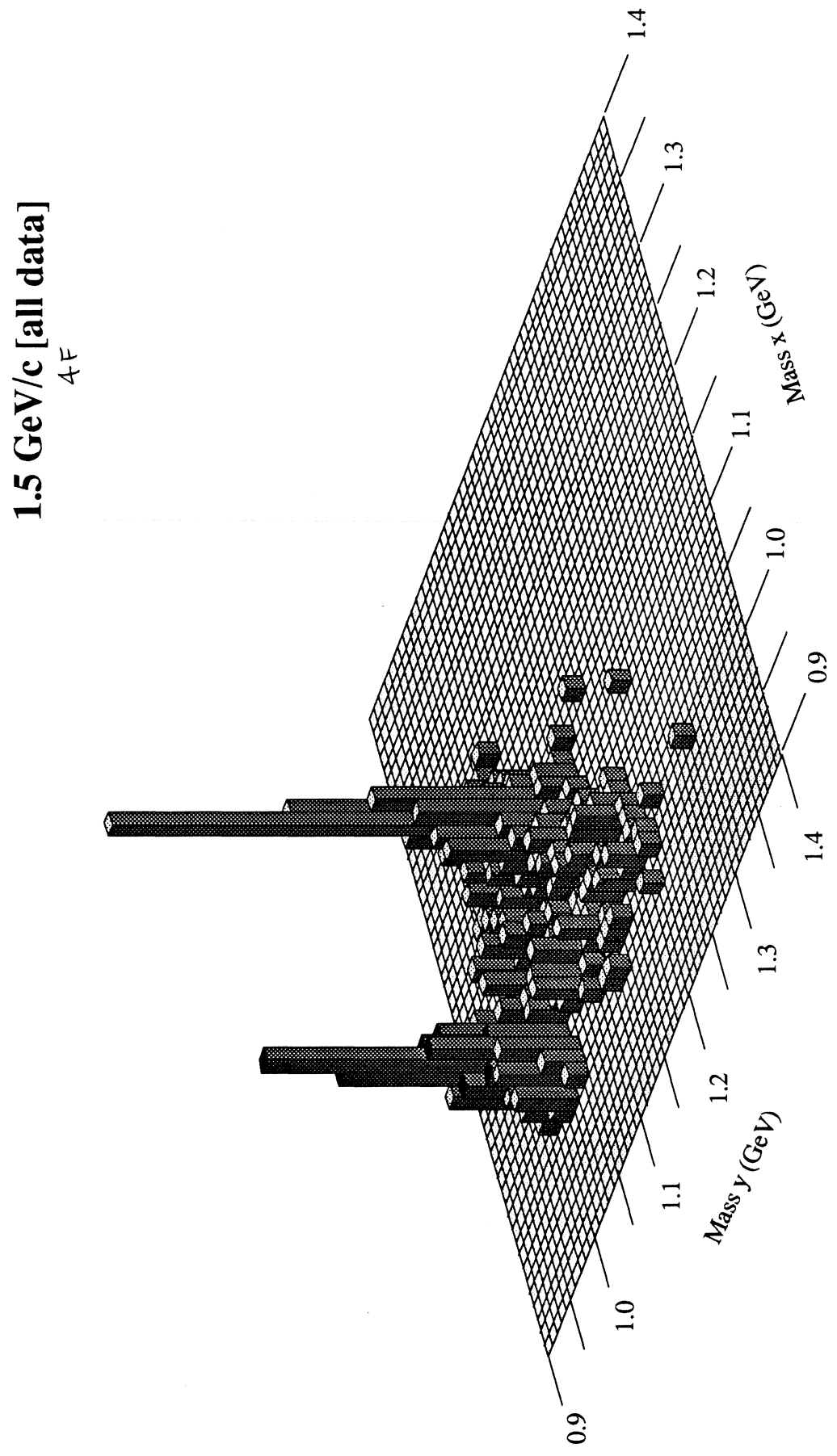
1.5 GeV/c (4F)



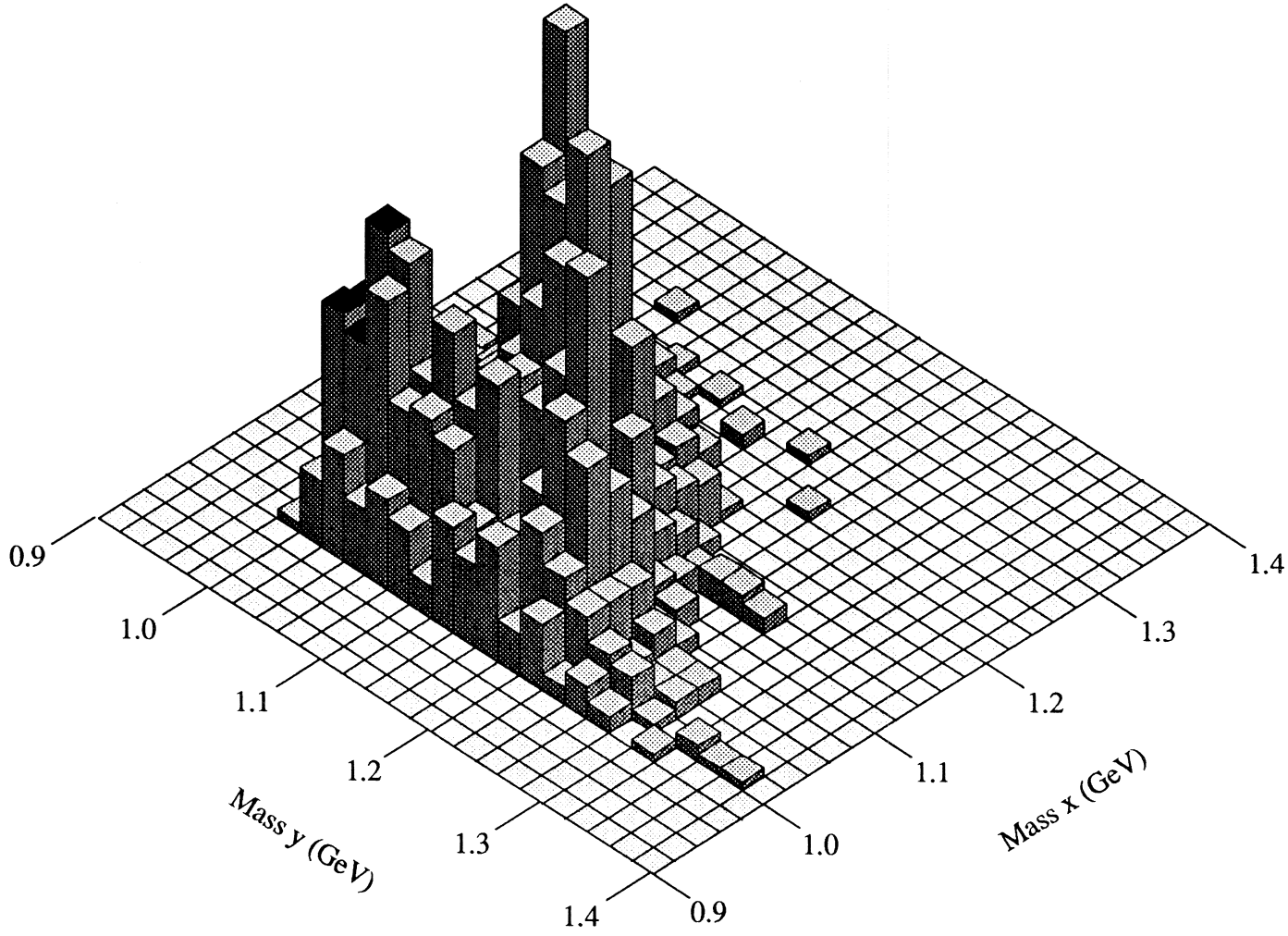
1.5 GeV/c all data

4 F




1.5 GeV/c [all data]
4F
0.9
1.0
1.1
1.2
1.3
1.4
Mass y (GeV)
0.9
1.0
1.1
1.2
1.3
1.4
Mass x (GeV)

1.5 GeV/c (1B3F)



1.5 GeV/c
191 events

	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
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	1	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	3	3	10	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	2	5	7	3	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	3	3	9	10	6	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	2	4	2	2	11	15	15	17	1	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	1	2	5	4	16	41	22	3	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	4	8	2	1	8	13	15	5	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	1	1	6	4	4	11	13	3	4	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	3	4	3	3	2	3	3	4	6	5	3	3	1	0	0	0	0	0	0	0	0
7	0	0	0	0	9	29	18	9	4	4	3	6	6	2	3	1	1	0	0	0	0	0	0	0	0
6	0	0	0	0	6	22	14	3	1	5	4	2	1	5	0	2	1	0	0	0	0	0	0	0	0
5	0	0	0	0	1	6	7	1	0	1	1	1	2	2	0	3	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

1.6 GeV/c
[4F triggers]

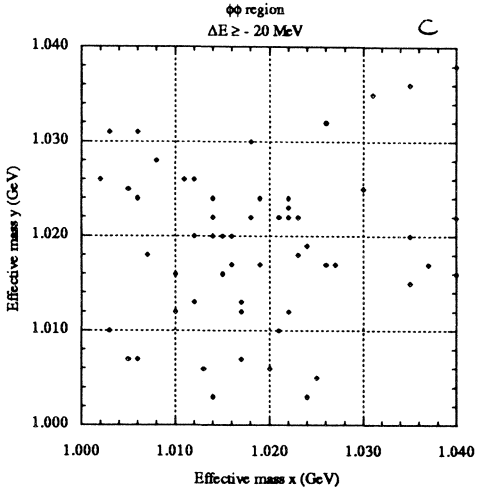
M_x = Mass(1+2)+Mass(1+3)+Mass(2+3)

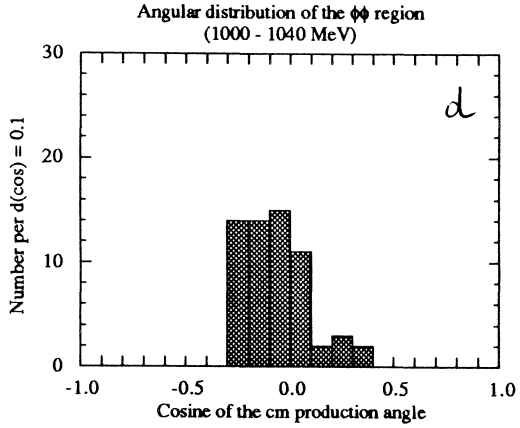
M_y = Mass(3+4)+Mass(2+4)+Mass(1+4)

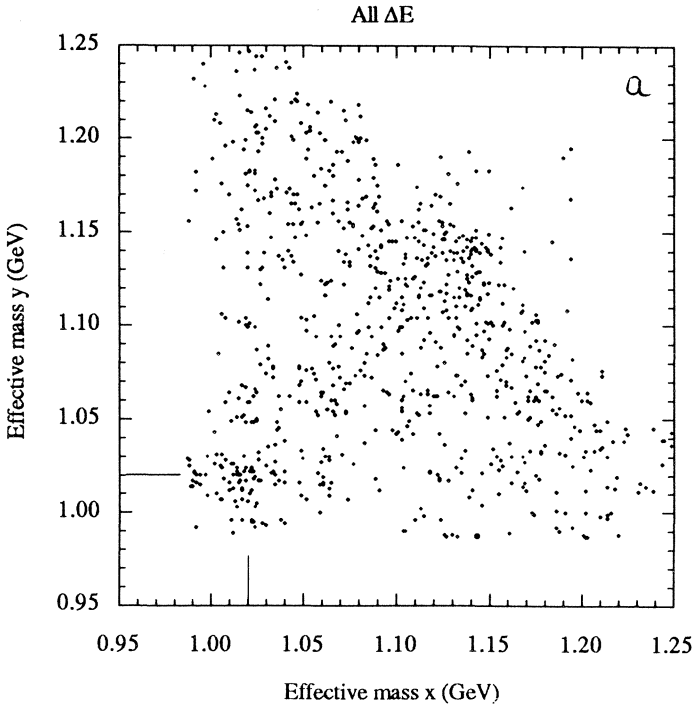
Cher & Sil prob > 1 %
any pixel assoc. & any vertex
10 MeV/c fixed mom. cut
Barrel (Julich & Gamma) in veto at > 200 AD

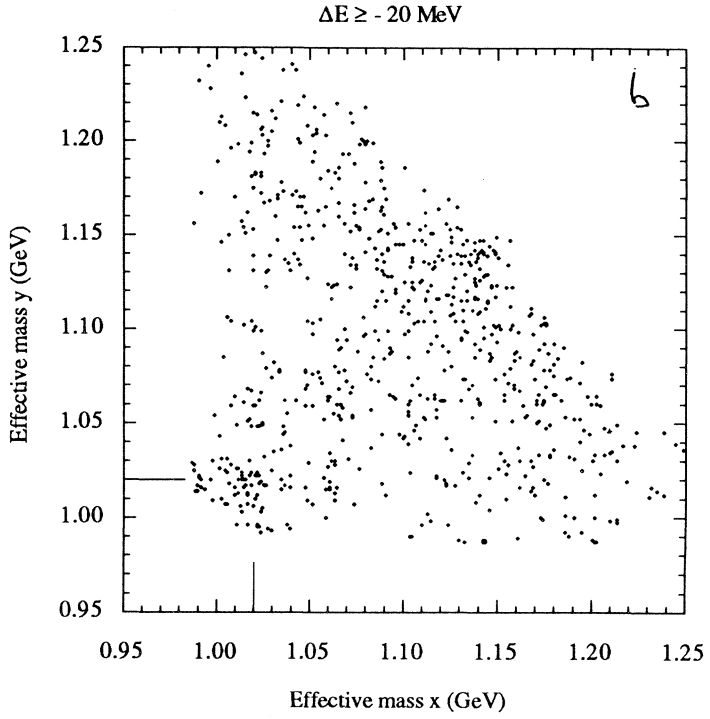
3 entries per solution.
max of 2 solutions per track set.
max of 2 track sets per event

kinematics based on
-100 ≤ ΔE ≤ +20 MeV



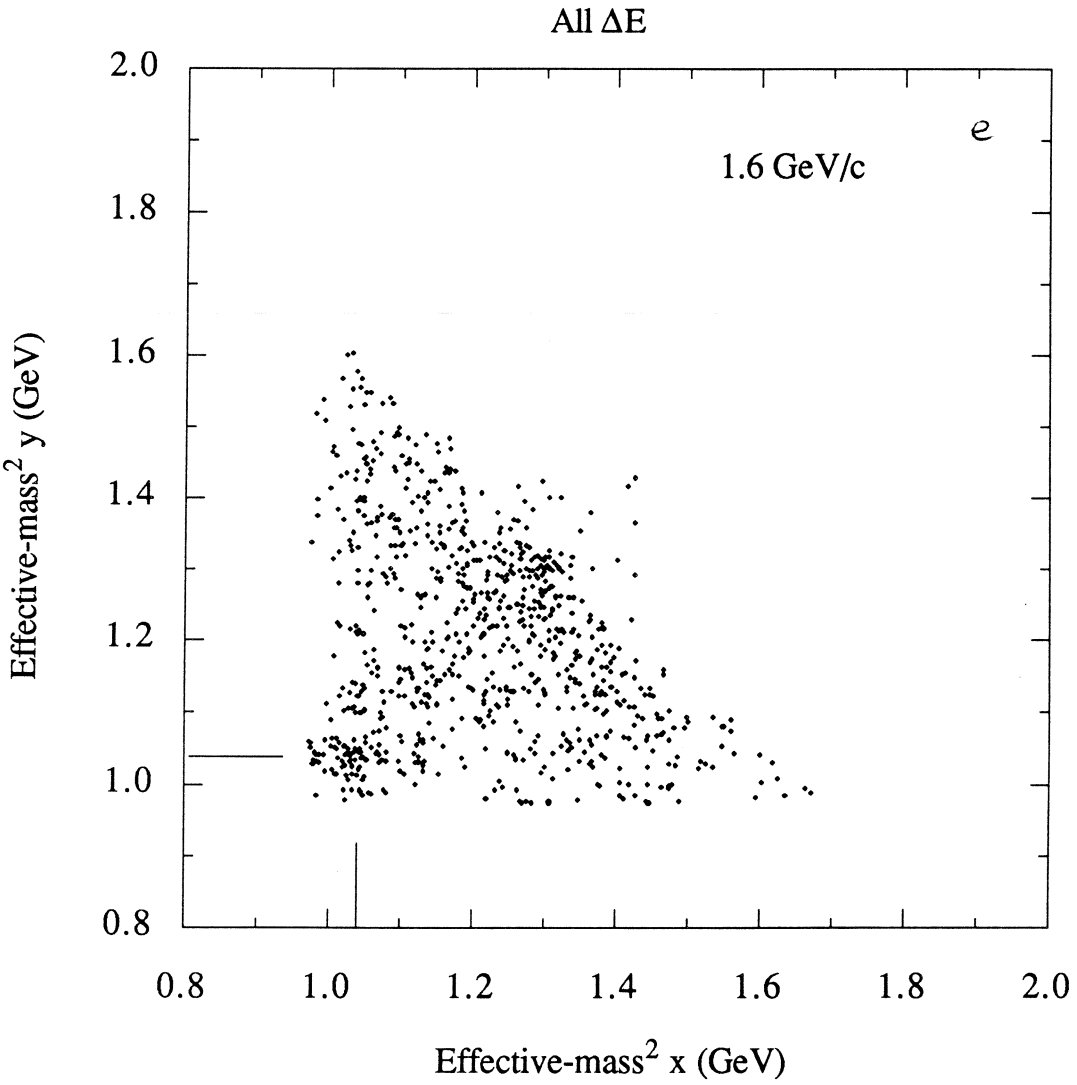




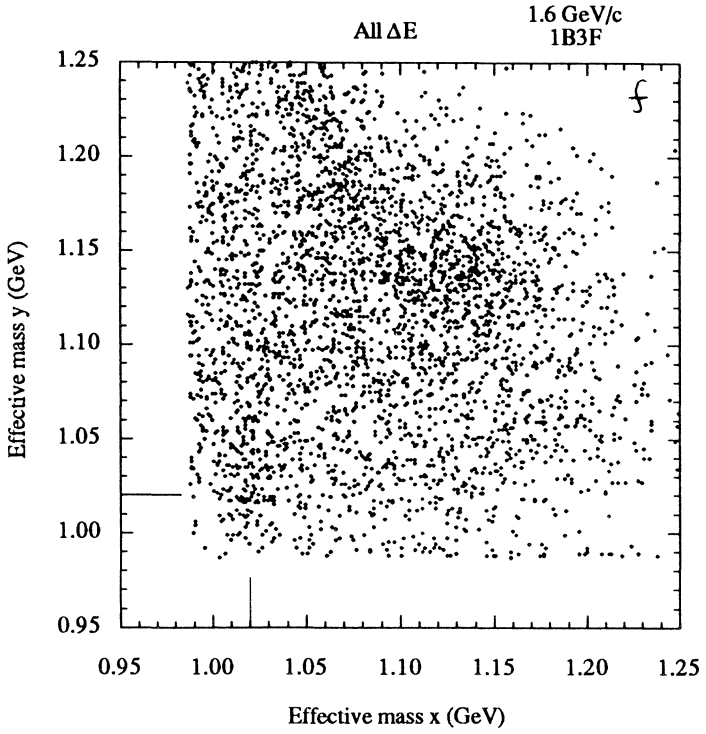


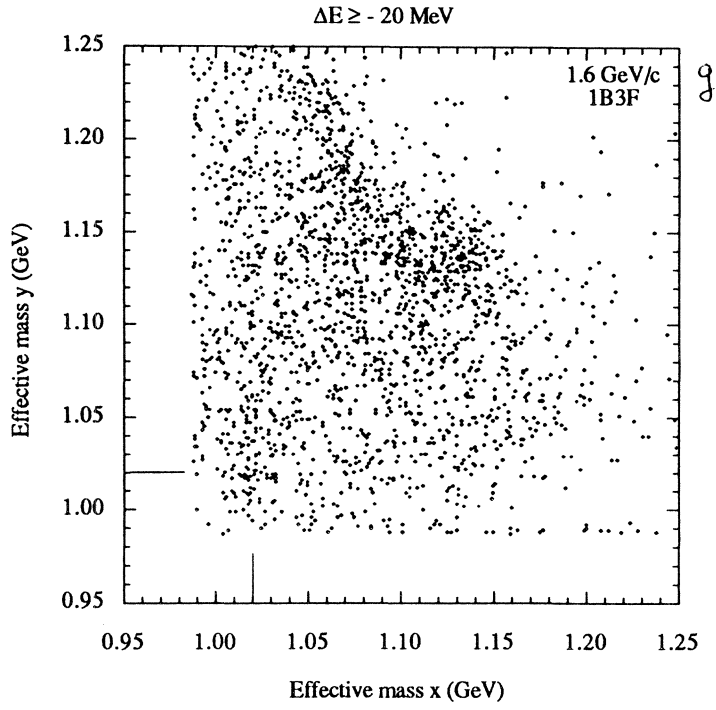
	1.6 GeV/c	Run #	event	conf	sol	set	DeltaE	M(2+3)	M(1+4)	cos(2+3)
1		1009	5285	1	2	1	0.021	1.0260	1.0170	-0.216
2		1009	5285	1	1	2	0.021	1.0270	1.0170	-0.219
3		1009	5285	1	1	1	0.021	1.0070	1.0180	-0.230
4		1009	5285	1	2	2	0.021	1.0070	1.0180	-0.227
5		1015	58217	1	1	2	-0.017	1.0350	1.0150	0.191
6		1015	58217	1	1	1	-0.026	1.0330	1.0210	0.194
7		1017	20070	1	2	1	0.030	1.0190	1.0240	0.057
8		1024	3121	1	1	1	0.005	1.0260	1.0320	0.080
9		1029	135553	1	1	2	0.007	1.0170	1.0130	-0.027
10		1029	135553	1	1	1	0.005	1.0210	1.0100	-0.038
11		1030	101806	1	1	1	0.002	1.0220	1.0240	0.129
12		1031	56043	1	1	1	0.001	1.0350	1.0200	-0.129
13		1032	58878	1	1	1	0.037	1.0400	1.0380	-0.290
14		1033	121620	1	1	2	0.005	1.0220	1.0220	-0.246
15		1033	121620	1	1	1	0.006	1.0220	1.0230	-0.248
16		1037	113751	1	1	2	-0.008	1.0120	1.0130	-0.148
17		1037	113751	1	1	1	-0.010	1.0100	1.0160	-0.140
18		1038	63916	1	1	2	-0.006	1.0030	1.0310	0.040
19		1038	63916	1	1	1	0.002	1.0050	1.0250	0.069
20		1039	72335	1	1	2	-0.010	1.0140	1.0200	0.068
21		1039	72335	1	1	1	-0.011	1.0190	1.0170	0.049
22		1042	44298	1	1	1	0.000	1.0150	1.0200	0.299
23		1044	75117	1	2	1	0.041	1.0180	1.0220	0.094
24		1046	79700	1	1	1	-0.023	1.0350	1.0270	0.069
25		1046	104013	1	1	1	0.021	1.0230	1.0220	-0.042
26		1049	49006	1	1	2	0.011	1.0120	1.0260	-0.248
27		1049	49006	1	1	1	0.014	1.0110	1.0260	-0.260
28		1049	28910	1	2	1	0.028	1.0230	1.0180	-0.122
29		1051	121316	1	1	2	0.031	1.0370	1.0170	-0.064
30		1051	121316	1	1	1	0.031	1.0370	1.0170	-0.064
31		1054	27782	1	1	1	0.006	1.0140	1.0030	-0.122
32		1055	83892	1	1	1	0.001	1.0240	1.0190	-0.179
33		1056	34783	1	1	1	0.010	1.0060	1.0240	0.221
34		1057	83087	1	1	2	0.023	1.0030	1.0100	0.012
35		1059	100460	1	1	1	0.005	1.0210	1.0220	-0.188
36		1064	114144	1	1	1	-0.017	1.0020	1.0260	0.001
37		1064	130045	1	1	2	-0.023	1.0340	1.0220	0.158
38		1066	71769	1	1	1	0.028	1.0350	1.0360	-0.100
39		1066	71769	1	2	1	0.028	1.0160	1.0200	0.059
40		1067	58683	1	1	1	-0.030	1.0260	1.0280	0.019
41		1069	49437	1	1	2	0.020	1.0050	1.0070	-0.072
42		1069	49437	1	2	2	0.020	1.0080	1.0280	-0.106
43		1069	49437	1	1	1	0.020	1.0060	1.0070	-0.070
44		1069	49437	1	2	1	0.020	1.0060	1.0310	-0.110
45		1071	67218	1	1	2	0.023	1.0300	1.0250	-0.036
46		1082	47018	1	1	1	0.030	1.0140	1.0220	0.224
47		1083	129086	1	1	1	-0.003	1.0400	1.0160	-0.160
48		1084	87182	1	1	1	0.012	1.0370	1.0170	-0.055
49		1087	92028	1	1	1	0.019	1.0310	1.0350	0.076
50		1097	28247	1	1	1	-0.008	1.0180	1.0300	-0.087

	1.6 GeV/c	Run #	event	conf	sol	set	DeltaE	M(2+3)	M(1+4)	cos(2+3)
51		1100	9234	1	1	2	-0.004	1.0140	1.0240	0.330
52		1100	9234	1	1	1	-0.005	1.0140	1.0240	0.320
53		1100	71081	1	1	1	-0.002	1.0400	1.0220	-0.120
54		1104	26611	1	1	1	0.012	1.0160	1.0170	-0.234
55		1104	75653	1	2	2	0.025	1.0220	1.0120	-0.264
56		1104	75653	1	1	2	0.025	1.0130	1.0060	-0.247
57		1104	75653	1	2	1	0.025	1.0170	1.0120	-0.270
58		1104	75653	1	1	1	0.025	1.0170	1.0070	-0.238
59		1106	42369	1	2	2	0.024	1.0200	1.0060	-0.002
60		1106	54213	1	1	1	0.015	1.0100	1.0120	-0.161
61		1106	42369	1	2	1	0.022	1.0200	1.0060	-0.002
62		1113	15632	1	1	1	0.013	1.0250	1.0050	-0.083
63		1118	110474	1	2	1	0.046	1.0120	1.0200	-0.011
64		1118	110474	1	2	2	0.049	1.0150	1.0160	-0.027
65			116290	1	1	1	0.000	1.0240	1.0030	-0.186

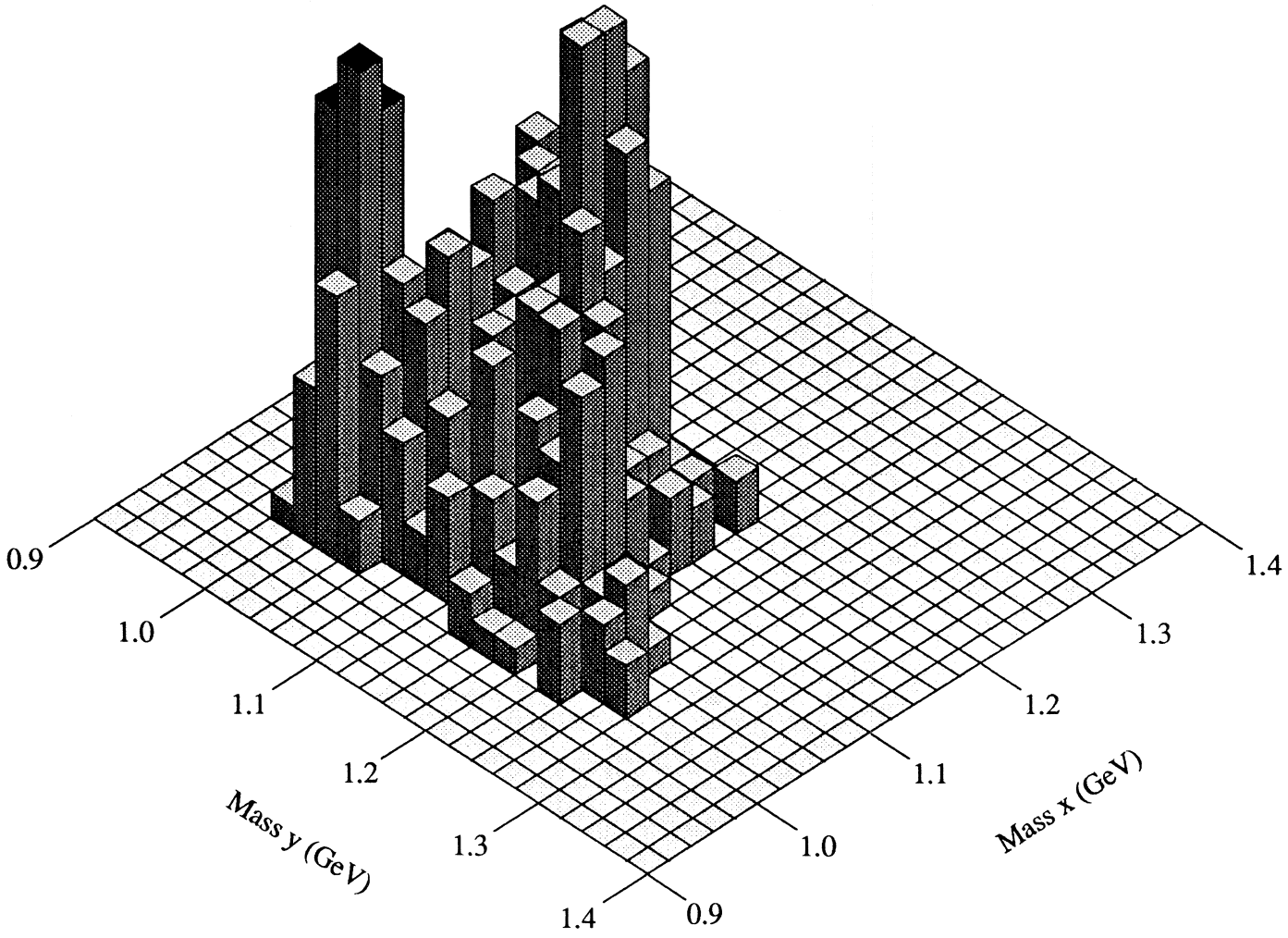

All ΔE
e
1.6 GeV/c
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.8
1.0
1.2
1.4
1.6
1.8
2.0
Effective-mass^2 y (GeV)
Effective-mass^2 x (GeV)

1.6 GeV/c
1-barrel 3-forward events (1B3F)



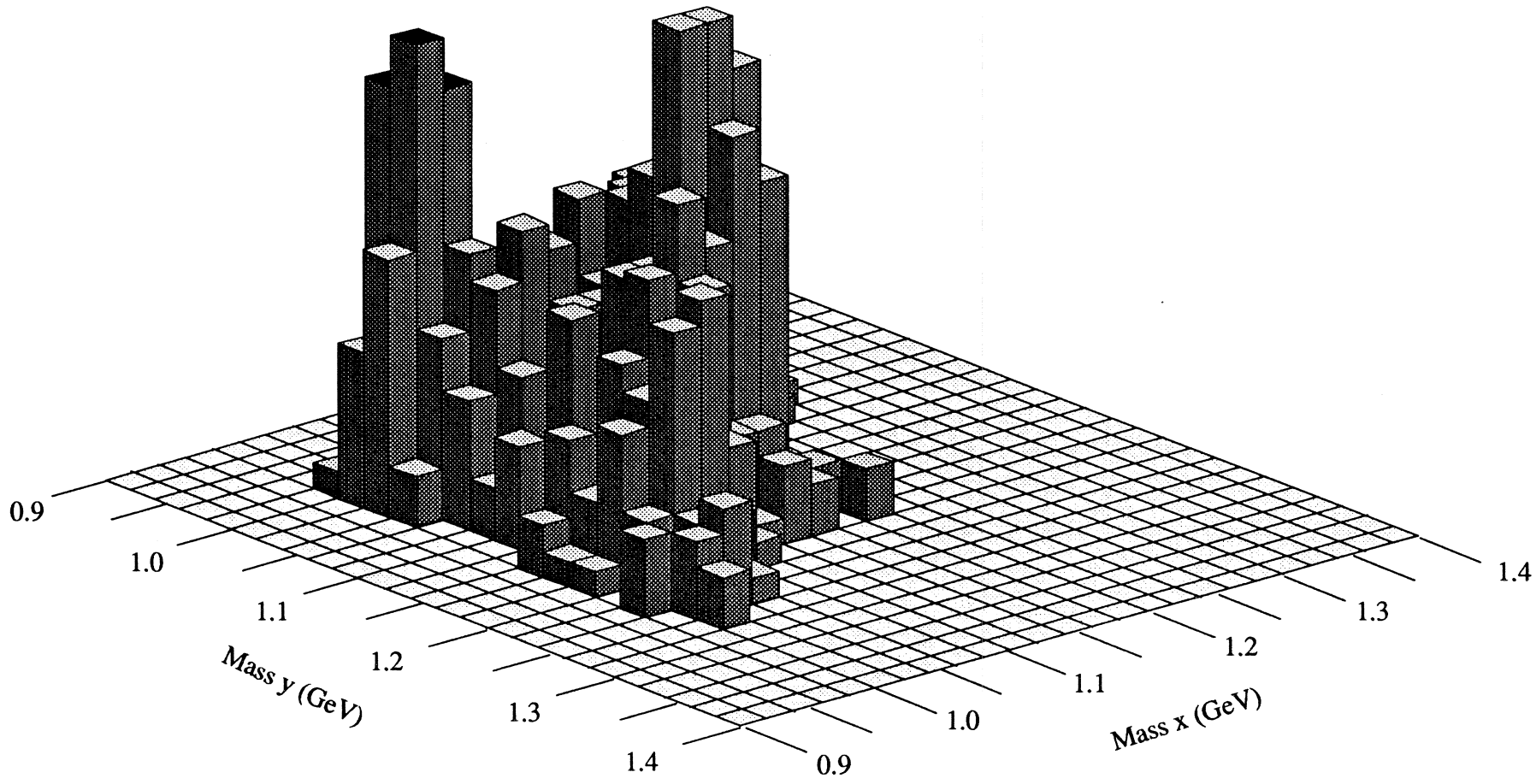


1.6 GeV/c (4F)

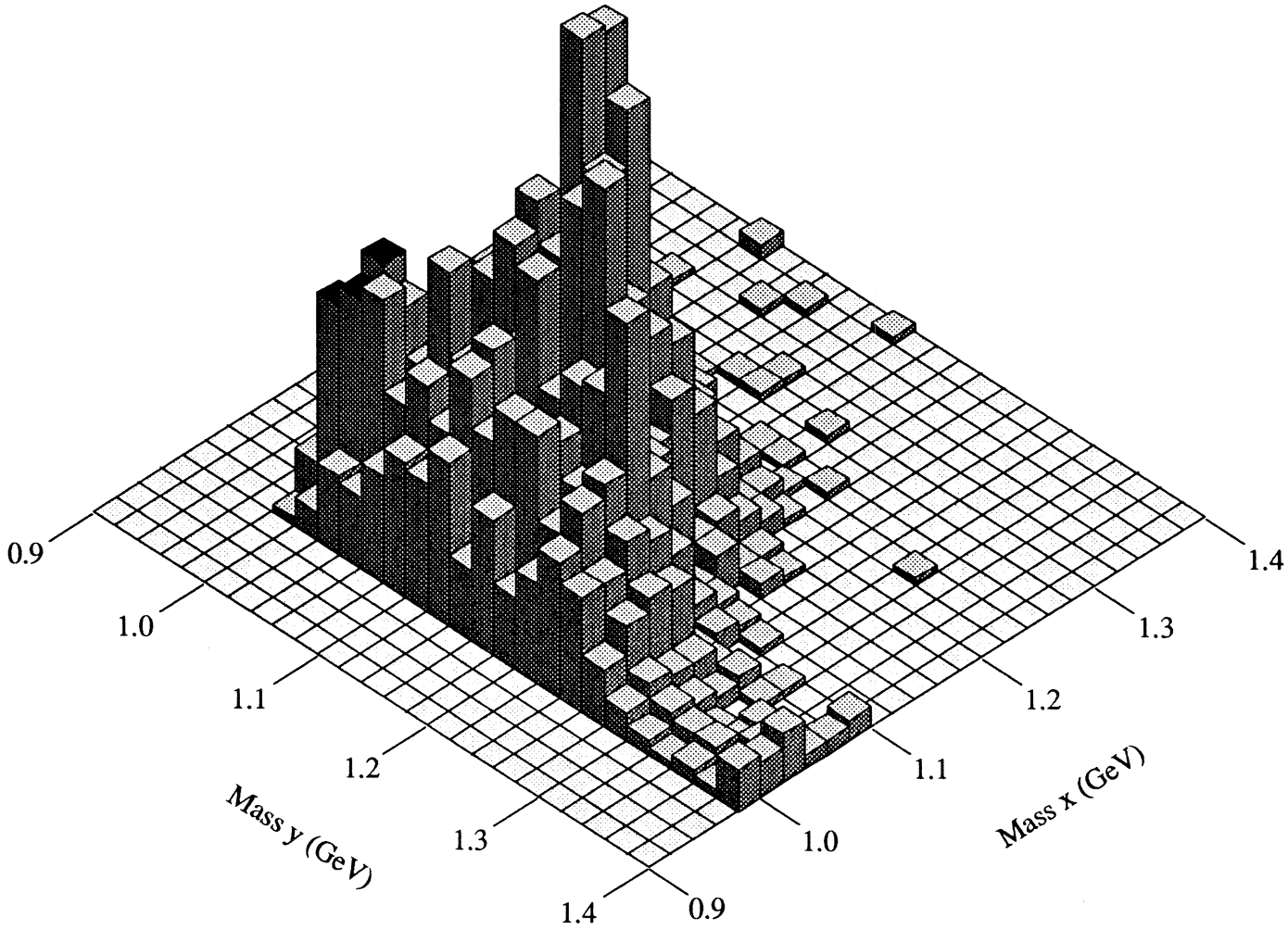


1.6 GeV/c

4F



1.6 GeV/c (1B3F)



1.6 GeV/c
283 events

	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
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	3	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	3	2	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	3	10	11	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	1	6	7	5	9	4	1	3	2	0	2	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	1	3	8	11	7	10	4	4	0	2	1	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	2	5	3	7	7	13	11	15	13	0	1	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	1	9	6	10	10	19	19	17	1	1	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	4	2	3	3	8	13	18	11	10	1	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	2	6	2	8	8	7	8	12	10	3	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	5	9	11	10	7	8	11	9	11	6	3	0	0	0	0	0	0	0	0	0
8	0	0	0	0	2	7	10	4	10	4	11	2	3	10	8	6	3	1	0	0	0	0	0	0	0
7	0	0	0	0	10	18	16	4	6	1	4	6	7	10	4	9	1	5	1	0	0	0	0	0	0
6	0	0	0	0	6	16	15	5	7	2	1	4	3	6	3	6	4	0	3	0	0	0	0	0	0
5	0	0	0	0	1	4	8	0	0	0	4	5	4	2	3	9	0	0	2	2	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

1.7 GeV/c
[4F triggers]

M_x = Mass(1+2)+Mass(1+3)+Mass(2+3)

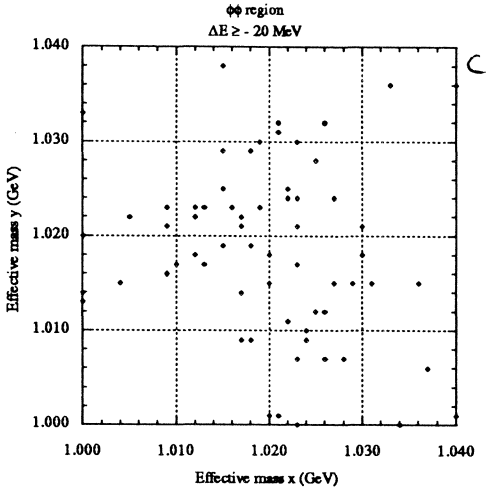
M_y = Mass(3+4)+Mass(2+4)+Mass(1+4)

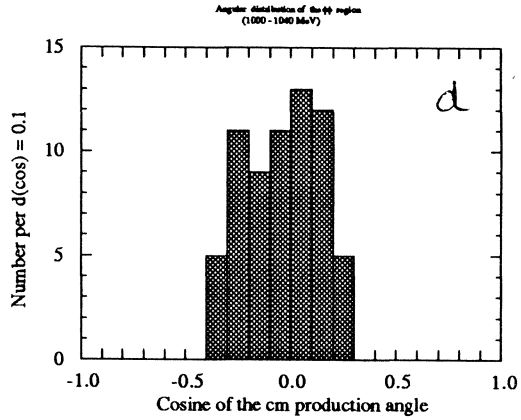
Cher & Sil prob > 1 %
any pixel assoc. & any vertex
10 MeV/c fixed mom. cut
Barrel (Julich & Gamma) in veto at > 200 AD

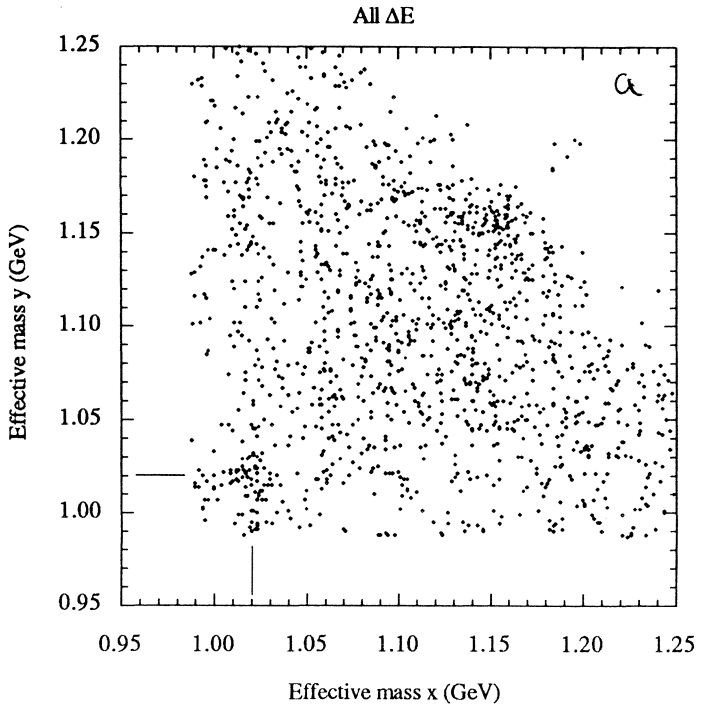
3 entries per solution.
max of 2 solutions per track set.
max of 2 track sets per event

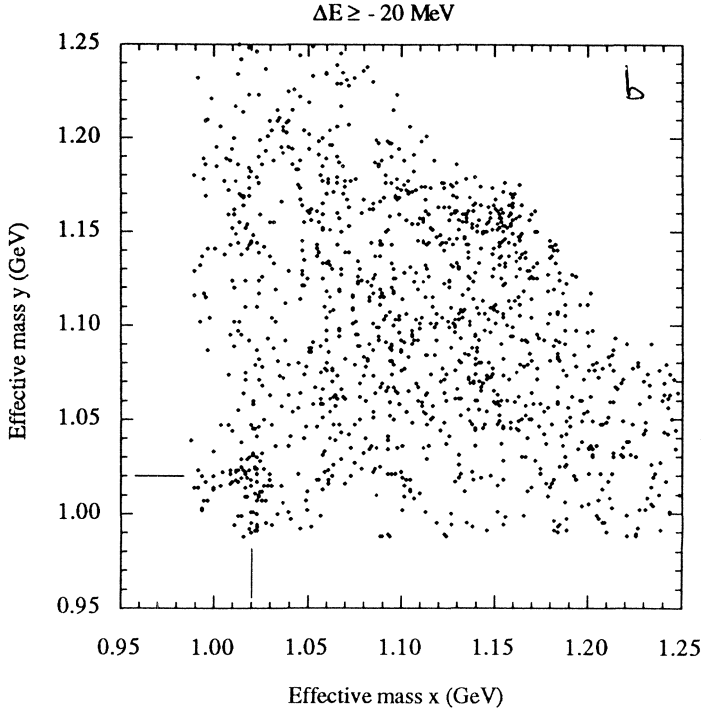
kinematics based on

$-100 \leq \Delta E \leq +20$ MeV









1.7 GeV/c
[4F triggers]

M_x = Mass(1+2)+Mass(1+3)+Mass(2+3)

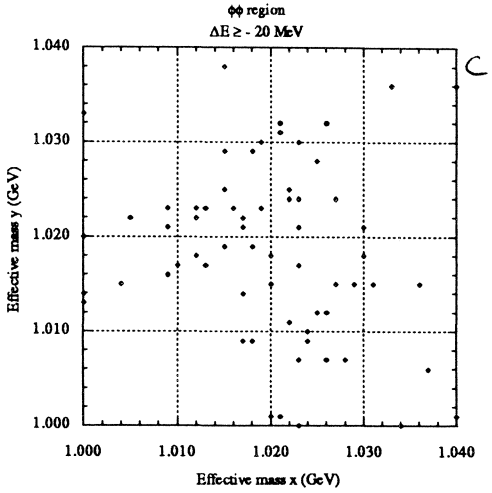
M_y = Mass(3+4)+Mass(2+4)+Mass(1+4)

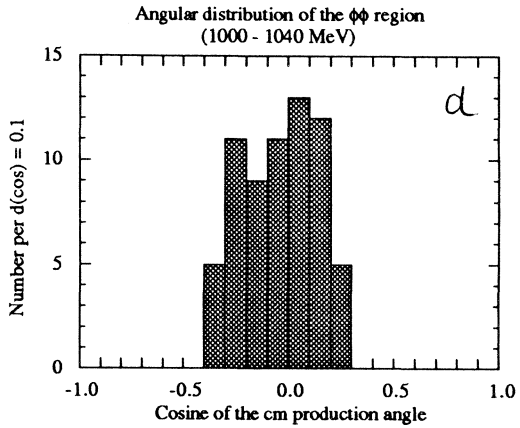
Cher & Sil prob > 1 %
any pixel assoc. & any vertex
10 MeV/c fixed mom. cut
Barrel (Julich & Gamma) in veto at > 200 AD

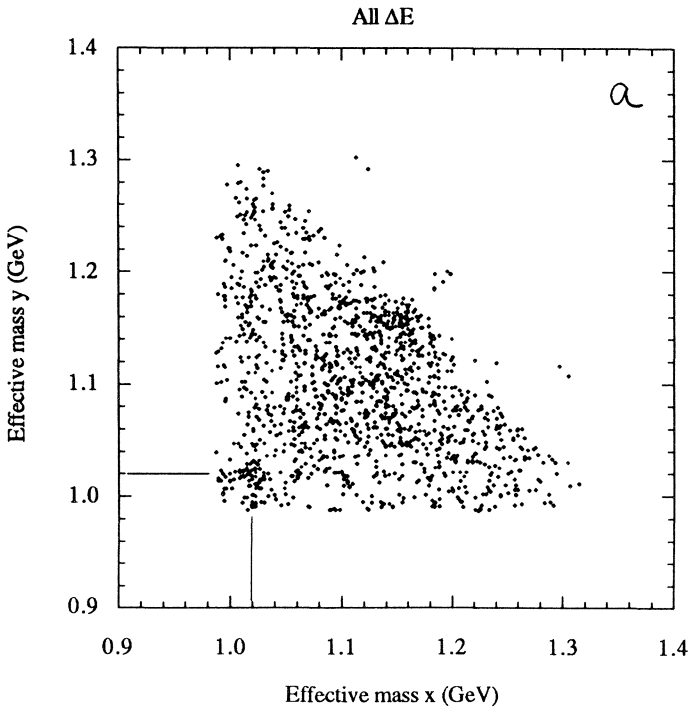
3 entries per solution.
max of 2 solutions per track set.
max of 2 track sets per event

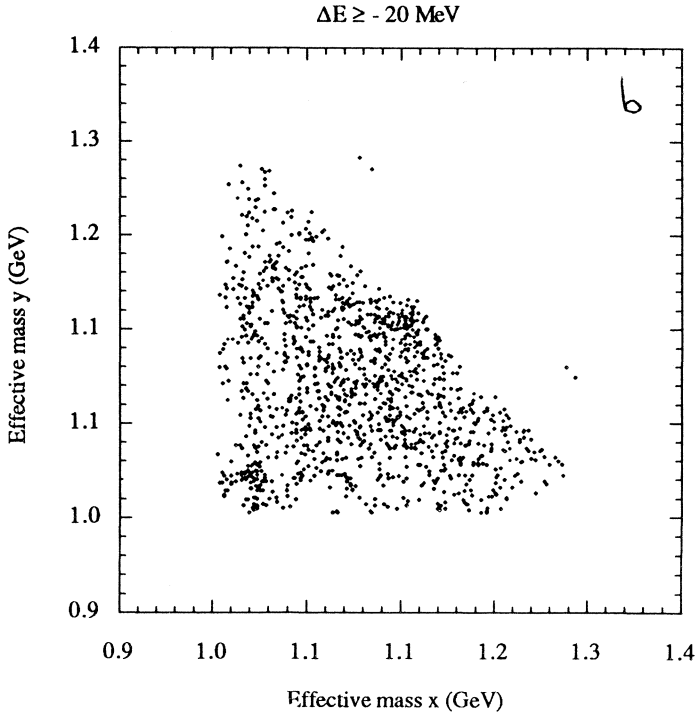
kinematics based on

-100 ≤ ΔE ≤ +20 MeV



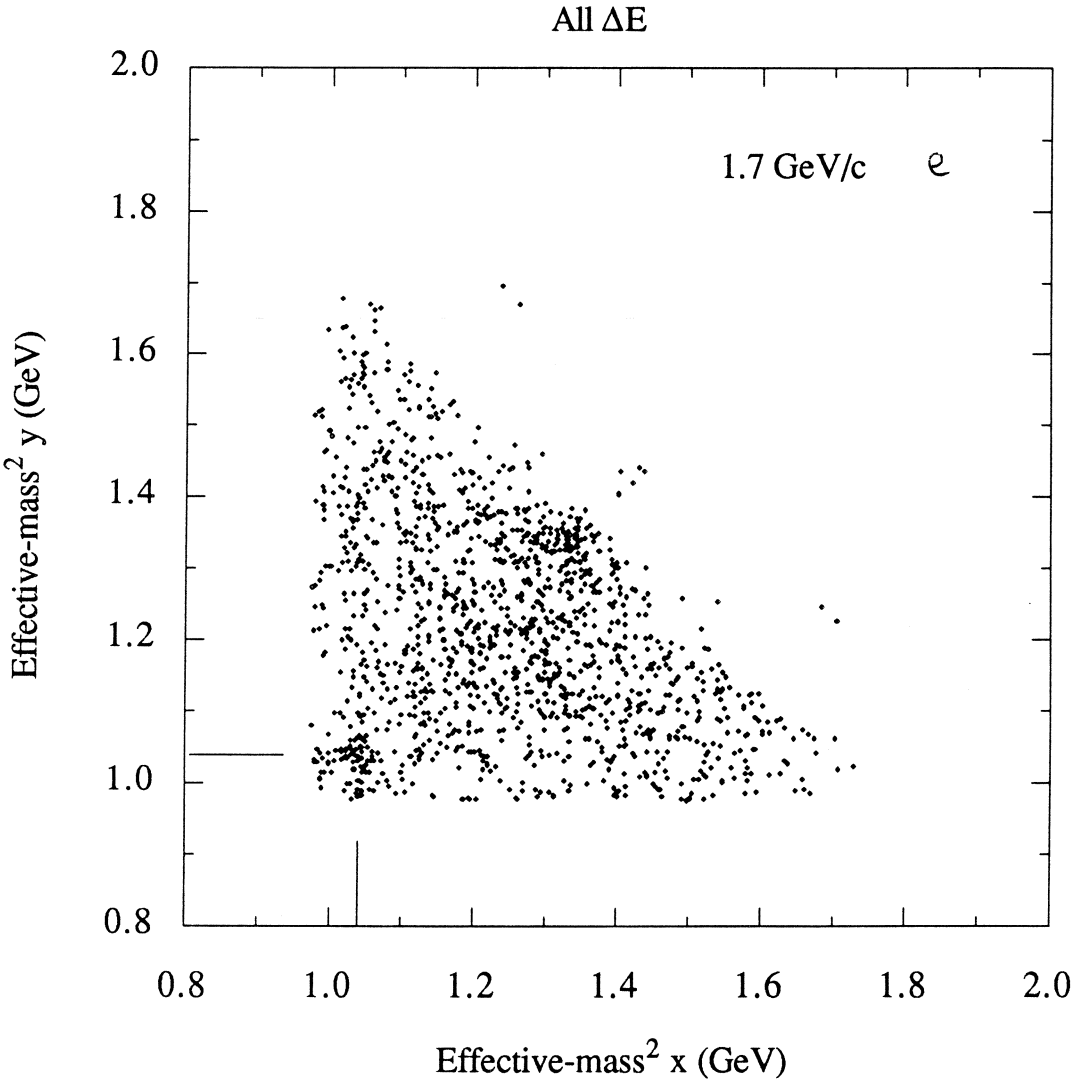




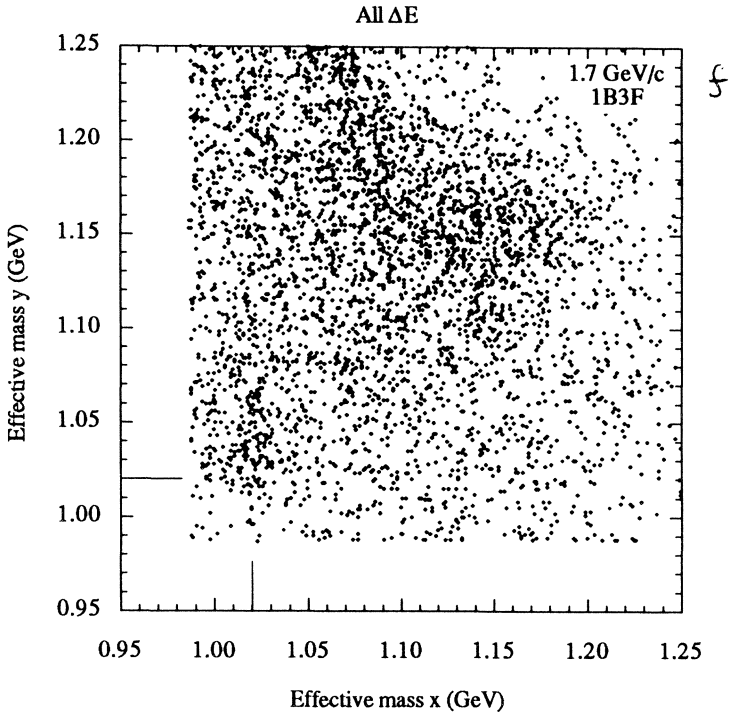


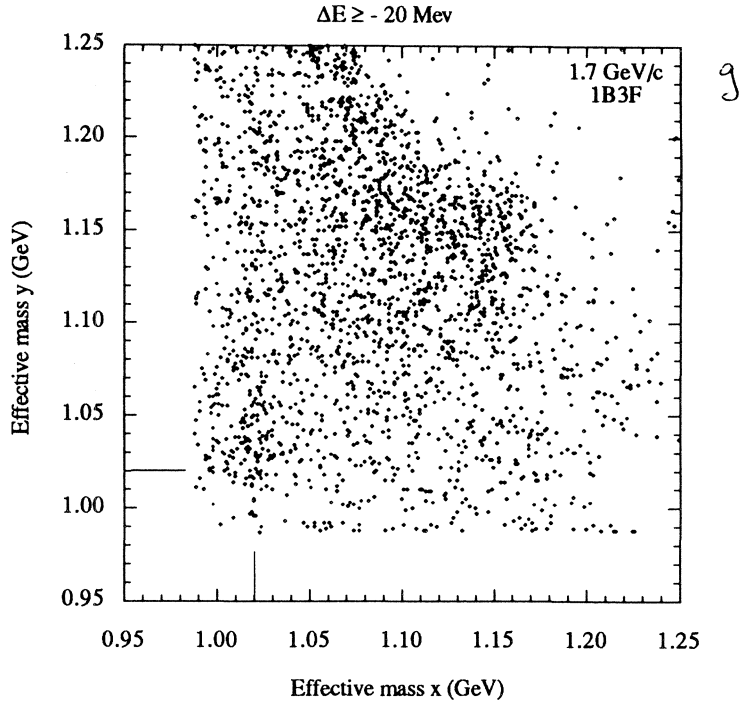
	1.7 GeV/c	Run #	event	conf	sol	set	DeltaE	M(2+3)	M(1+4)	cos(2+3)
1		748	22228	1	1	1	0.007	1.0230	1.0300	0.196
2		748	98840	1	1	1	0.000	1.0000	1.0200	0.182
3		748	22228	1	1	2	0.008	1.0230	1.0300	0.202
4		751	28696	1	2	2	0.042	1.0170	1.0090	-0.049
5		751	28696	1	2	1	0.041	1.0180	1.0090	-0.053
6		752	112792	1	1	1	0.054	1.0250	1.0120	-0.223
7		752	64752	1	1	1	0.019	1.0040	1.0150	-0.198
8		752	64752	1	1	2	0.029	1.0120	1.0220	-0.169
9		753	94471	1	1	1	0.003	1.0160	1.0230	-0.274
10		753	94471	1	1	2	0.005	1.0170	1.0220	-0.285
11		753	76793	1	1	2	0.022	1.0300	1.0210	0.225
12		753	76793	1	1	1	0.023	1.0260	1.0320	0.218
13		755	104325	1	1	1	0.012	1.0210	1.0310	-0.113
14		755	49090	1	1	1	0.004	1.0090	1.0160	0.024
15		756	96941	1	1	1	-0.012	1.0230	1.0240	0.032
16		759	78616	1	1	1	-0.013	1.0250	1.0280	-0.323
17		761	107598	1	1	1	0.010	1.0150	1.0250	0.042
18		761	107598	1	1	2	0.011	1.0170	1.0220	0.039
19		763	67945	1	1	2	0.014	1.0000	1.0140	-0.290
20		763	67945	1	1	1	0.011	1.0000	1.0130	-0.289
21		764	9310	1	1	1	-0.003	1.0400	1.0360	-0.107
22		765	43243	1	1	2	0.010	1.0090	1.0210	0.074
23		765	40508	1	2	1	0.022	1.0230	1.0000	-0.185
24		765	43243	1	1	1	0.004	1.0090	1.0230	0.042
25		769	6223	1	1	1	0.005	1.0260	1.0070	0.003
26		771	13047	1	1	1	0.005	1.0300	1.0180	0.103
27		771	29257	1	2	1	0.047	1.0330	1.0360	0.045
28		773	37623	1	1	1	-0.005	1.0210	1.0010	-0.086
29		774	78641	1	1	1	0.010	1.0220	1.0240	0.110
30		777	79146	1	1	2	0.041	1.0230	1.0170	-0.110
31		777	79146	1	1	1	0.036	1.0200	1.0180	-0.101
32		777	57533	1	1	1	-0.022	1.0340	1.0200	-0.068
33		784	120490	1	1	1	0.019	1.0240	1.0090	0.217
34		790	19766	1	1	1	-0.013	1.0310	1.0150	-0.278
35		791	88745	1	2	1	0.030	1.0260	1.0120	-0.088
36		792	81051	1	1	2	0.045	1.0150	1.0290	-0.261
37		792	80565	1	1	1	-0.002	1.0210	1.0320	0.042
38		793	27068	1	1	1	0.004	1.0170	1.0210	0.125
39		794	33337	1	1	1	-0.005	1.0000	1.0330	-0.242
40		796	71055	1	1	1	-0.003	1.0280	1.0070	0.143
41		796	71055	1	1	2	0.010	1.0240	1.0100	0.125
42		797	51136	1	1	1	-0.007	1.0150	1.0380	-0.087
43		797	77961	1	1	1	0.004	1.0130	1.0230	-0.240
44		797	77961	1	1	2	0.007	1.0120	1.0230	-0.243
45		801	81276	1	2	1	0.072	1.0370	1.0060	-0.142
46		803	25727	1	1	1	-0.008	1.0290	1.0150	0.198
47		803	25727	1	1	2	-0.007	1.0270	1.0150	0.194
48		803	104078	1	1	1	0.003	1.0270	1.0240	0.118
49		803	118124	1	1	2	0.031	1.0180	1.0190	-0.360
50		803	118124	1	2	2	0.031	1.0340	1.0000	-0.367

	1.7 GeV/c	Run #	event	conf	sol	set	DeltaE	M(2+3)	M(1+4)	cos(2+3)
51		803	118124	1	2	1	0.032	1.0170	1.0140	-0.366
52		803	118124	1	1	1	0.032	1.0400	1.0010	-0.361
53		804	118469	1	1	1	0.010	1.0200	1.0150	0.098
54		806	105902	1	1	1	0.018	1.0130	1.0170	-0.007
55		806	105902	1	1	2	0.015	1.0120	1.0180	-0.018
56		807	64315	1	1	1	0.022	1.0220	1.0110	-0.094
57		809	78014	1	1	1	-0.025	1.0020	1.0070	0.076
58		809	77758	1	1	1	-0.006	1.0050	1.0220	0.295
59		811	107196	1	1	1	-0.002	1.0360	1.0150	0.188
60		816	21473	1	2	1	0.026	1.0100	1.0170	0.165
61		816	3787	1	1	1	0.018	1.0180	1.0290	-0.039
62		816	3787	1	1	2	0.011	1.0190	1.0230	-0.040
63		817	25397	1	2	1	0.027	1.0220	1.0250	-0.165
64		817	102209	1	1	1	-0.011	1.0200	1.0010	-0.215
65		819	108713	1	1	1	0.010	1.0230	1.0070	0.006
66		820	109867	1	1	1	-0.002	1.0230	1.0210	0.050
67		822	33442	1	1	1	0.022	1.0190	1.0300	0.086
68		823	116200	1	1	1	-0.002	1.0150	1.0190	-0.054

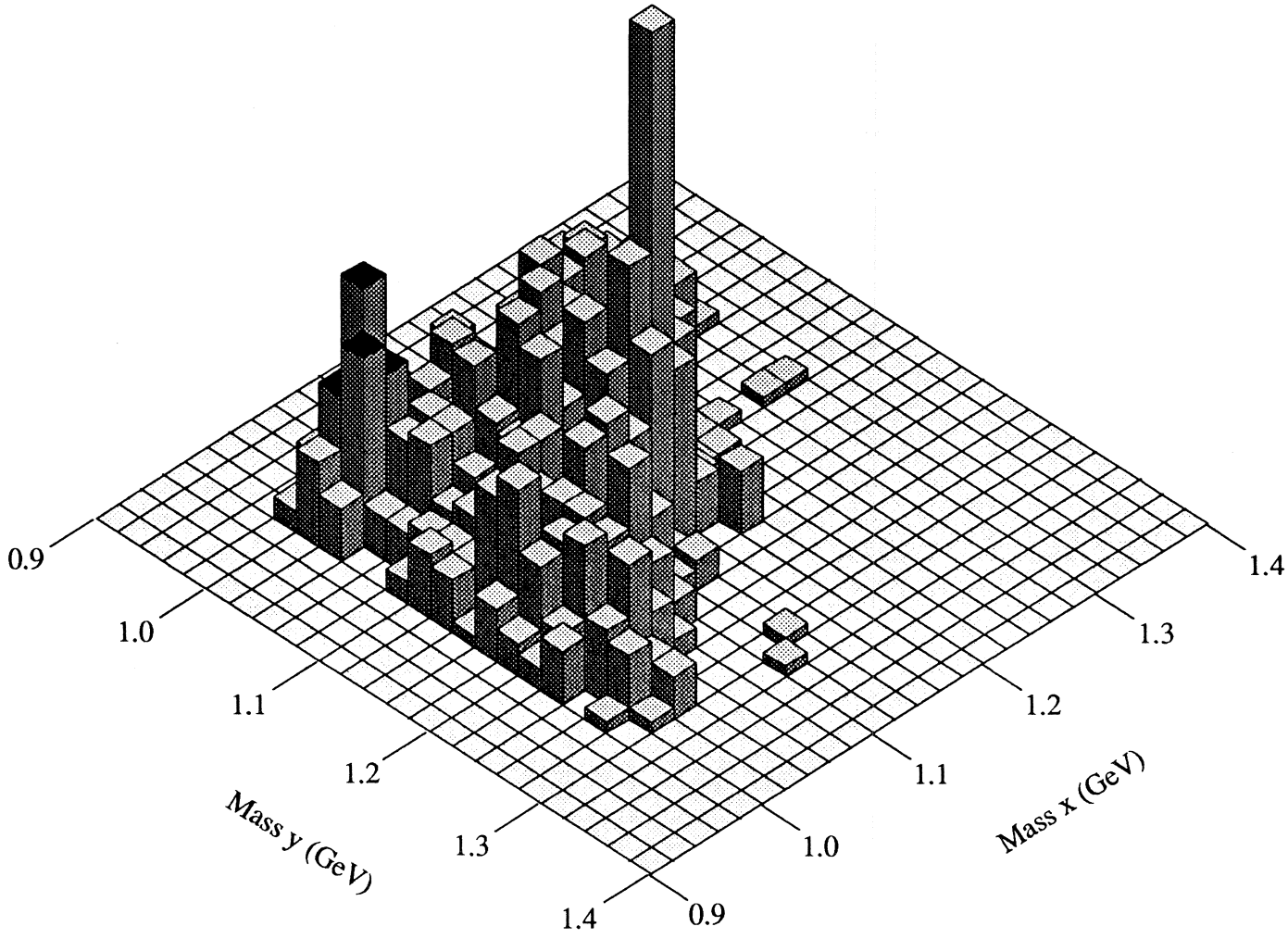

All ΔE
1.7 GeV/c e
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.8
1.0
1.2
1.4
1.6
1.8
2.0
Effective-mass^2 y (GeV)
Effective-mass^2 x (GeV)

1.7 GeV/c
1-barrel 3-forward events (1B3F)



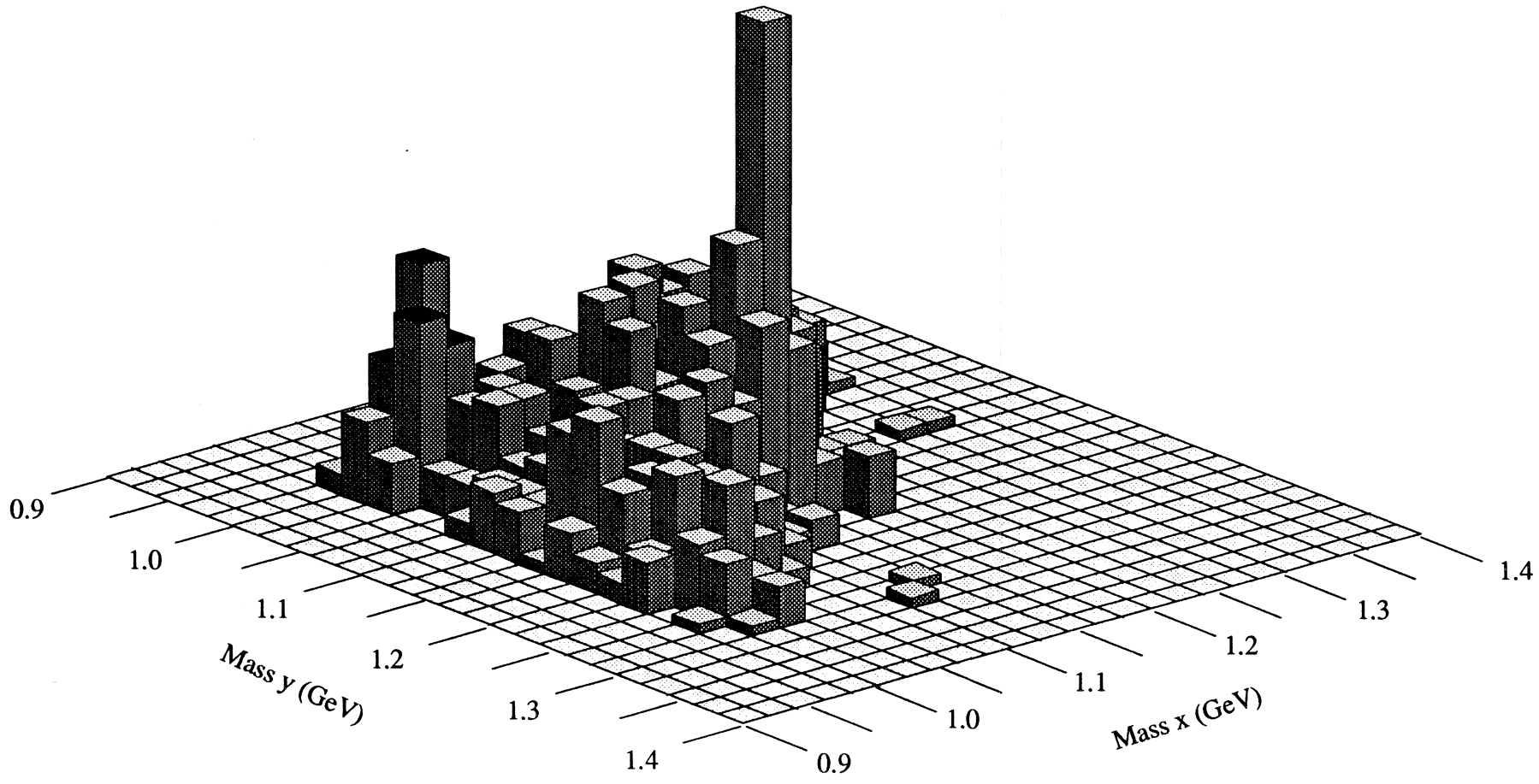


1.7 GeV/c (4F)

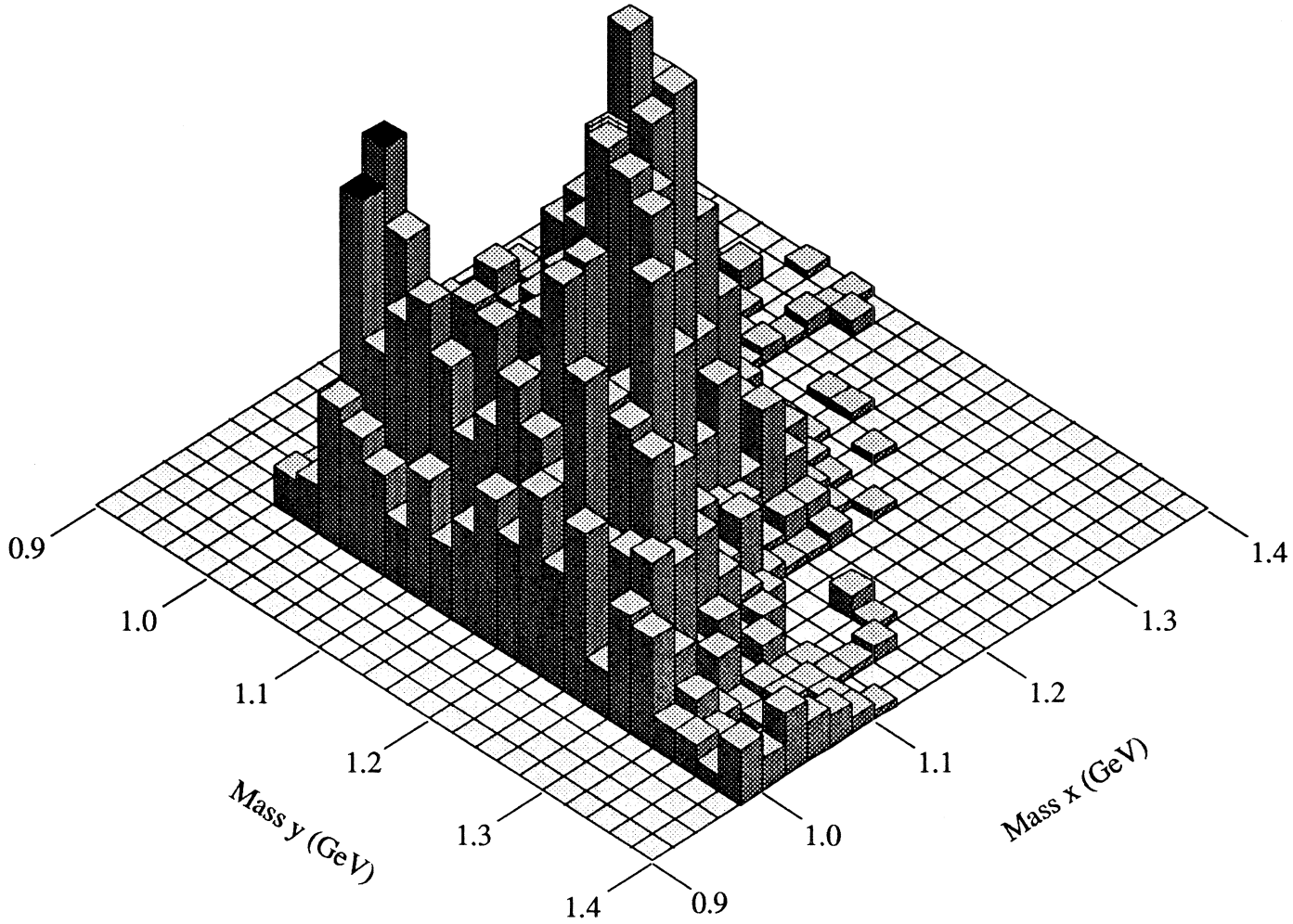


1.7 GeV/c

4F



1.7 GeV/c (1B3F)



1.7 GeV/c
489 events

	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
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	1	4	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	1	6	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	7	12	6	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	5	3	4	7	8	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	2	4	11	10	6	1	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	3	9	10	11	5	13	7	2	0	0	6	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	5	15	4	11	15	16	13	20	17	5	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	1	13	9	10	7	9	18	27	48	17	3	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	5	5	6	13	13	10	8	15	16	18	11	1	1	0	0	0	0	0	0	0	0
11	0	0	0	0	6	5	7	5	11	18	12	19	16	10	9	1	1	1	0	1	1	0	0	0	0
10	0	0	0	0	2	5	6	8	12	20	15	15	11	9	13	8	3	0	0	0	0	0	0	0	0
9	0	0	0	0	0	4	11	11	16	13	7	19	16	8	6	14	8	8	0	0	0	0	0	0	0
8	0	0	0	0	0	4	10	11	9	8	11	12	19	16	17	11	7	11	9	0	0	0	0	0	0
7	0	0	0	0	5	18	15	5	11	14	4	6	5	7	9	15	9	8	6	5	1	0	0	0	0
6	0	0	0	0	8	13	22	7	3	1	12	6	4	6	6	7	10	10	4	1	2	0	0	0	0
5	0	0	0	0	2	6	9	4	2	6	1	7	5	1	7	5	10	1	1	4	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

1.8 GeV/c
[4F triggers]

M_x = Mass(1+2)+Mass(1+3)+Mass(2+3)

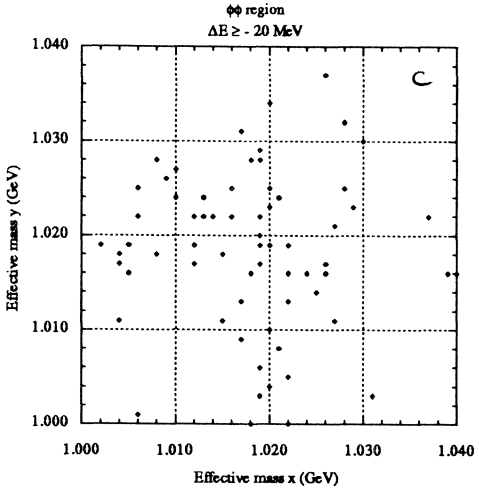
M_y = Mass(3+4)+Mass(2+4)+Mass(1+4)

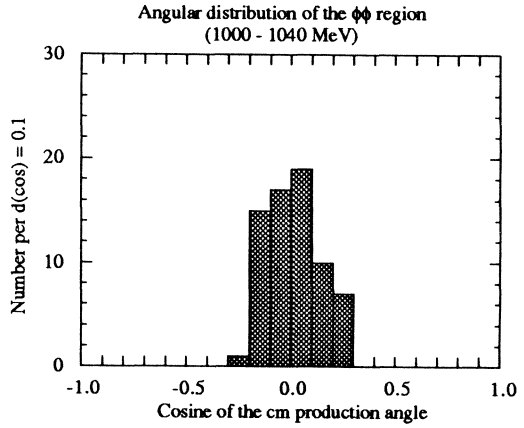
Cher & Sil prob > 1 %
any pixel assoc. & any vertex
10 MeV/c fixed mom. cut
Barrel (Julich & Gamma) in veto at > 200 AD

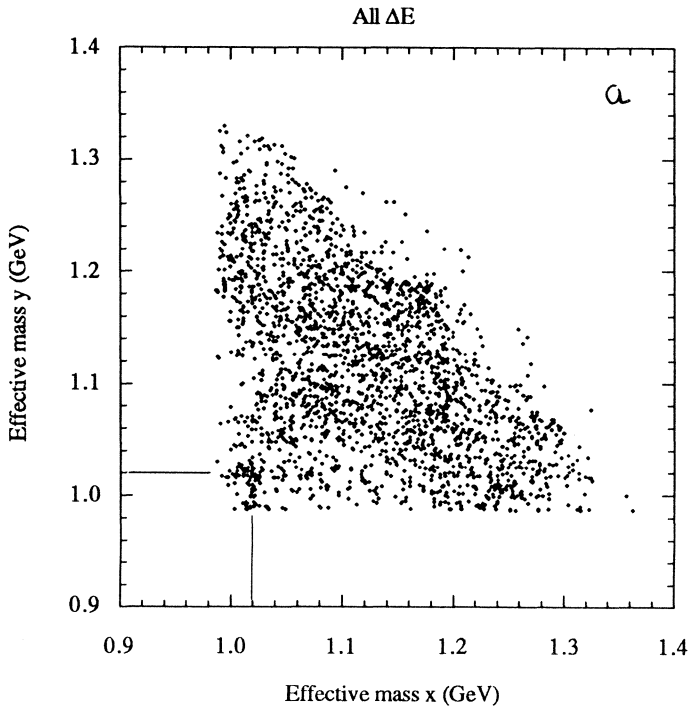
3 entries per solution.
max of 2 solutions per track set.
max of 2 track sets per event

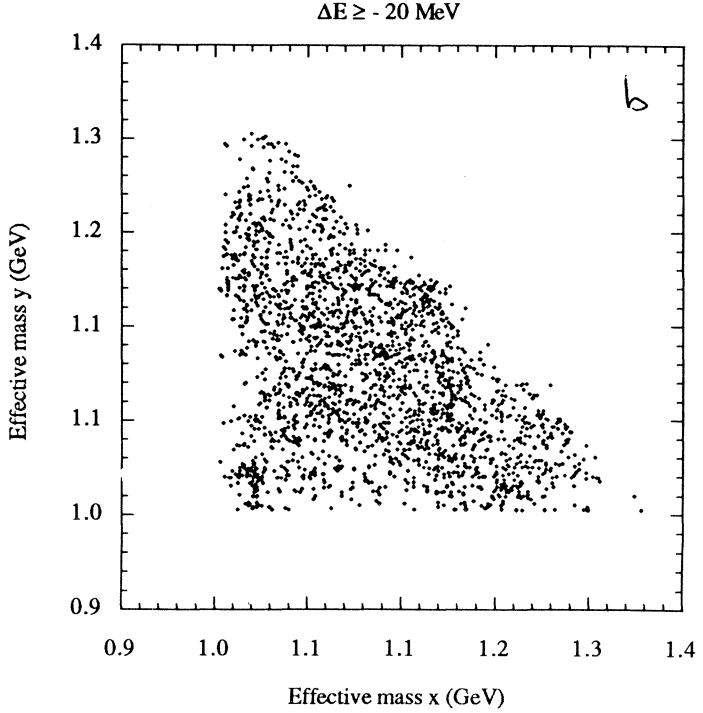
kinematics based on

$-100 \leq \Delta E \leq +20$ MeV









1.8 GeV/c
[4F triggers]

M_x = Mass(1+2)+Mass(1+3)+Mass(2+3)

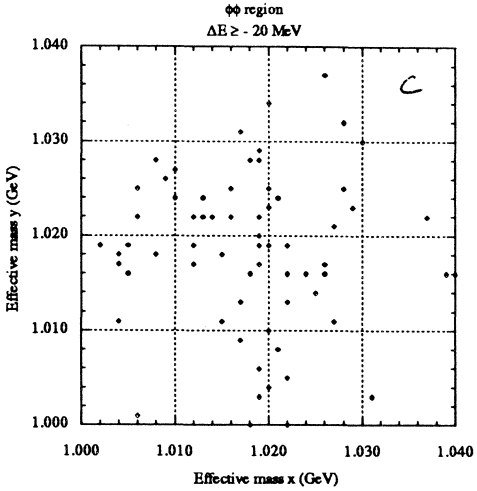
M_y = Mass(3+4)+Mass(2+4)+Mass(1+4)

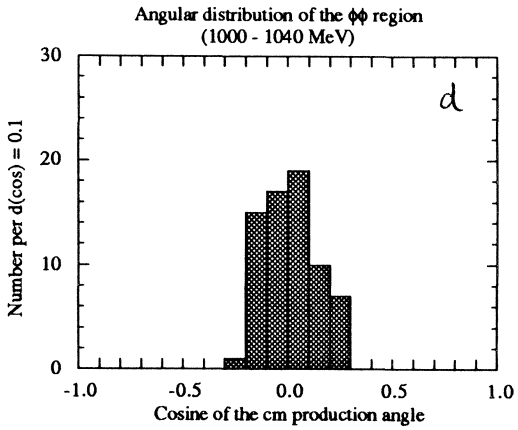
Cher & Sil prob > 1 %
any pixel assoc. & any vertex
10 MeV/c fixed mom. cut
Barrel (Julich & Gamma) in veto at > 200 AD

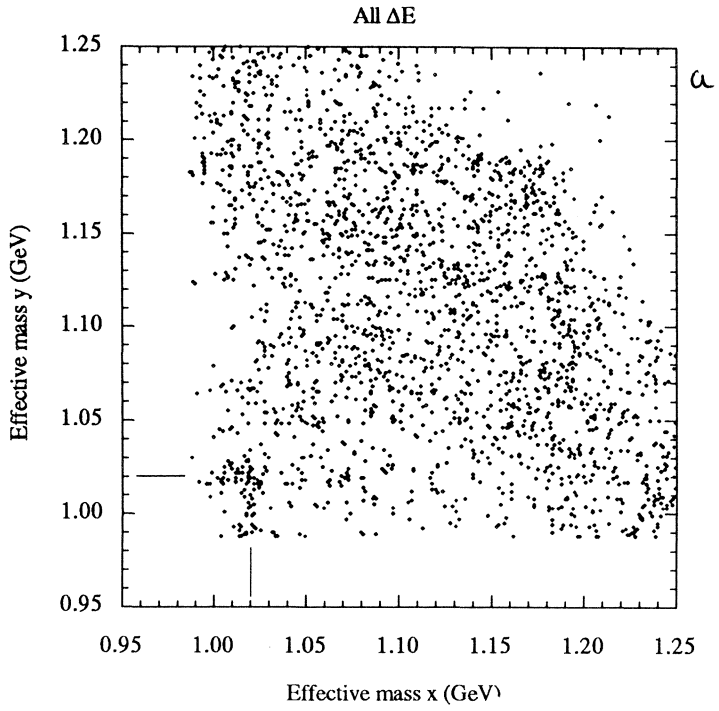
3 entries per solution.
max of 2 solutions per track set.
max of 2 track sets per event

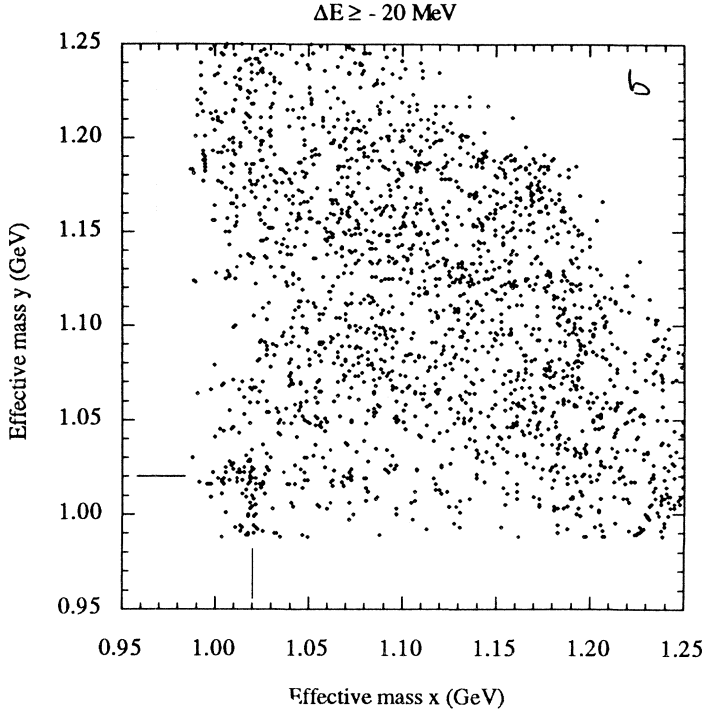
kinematics based on

$-100 \leq \Delta E \leq +20$ MeV



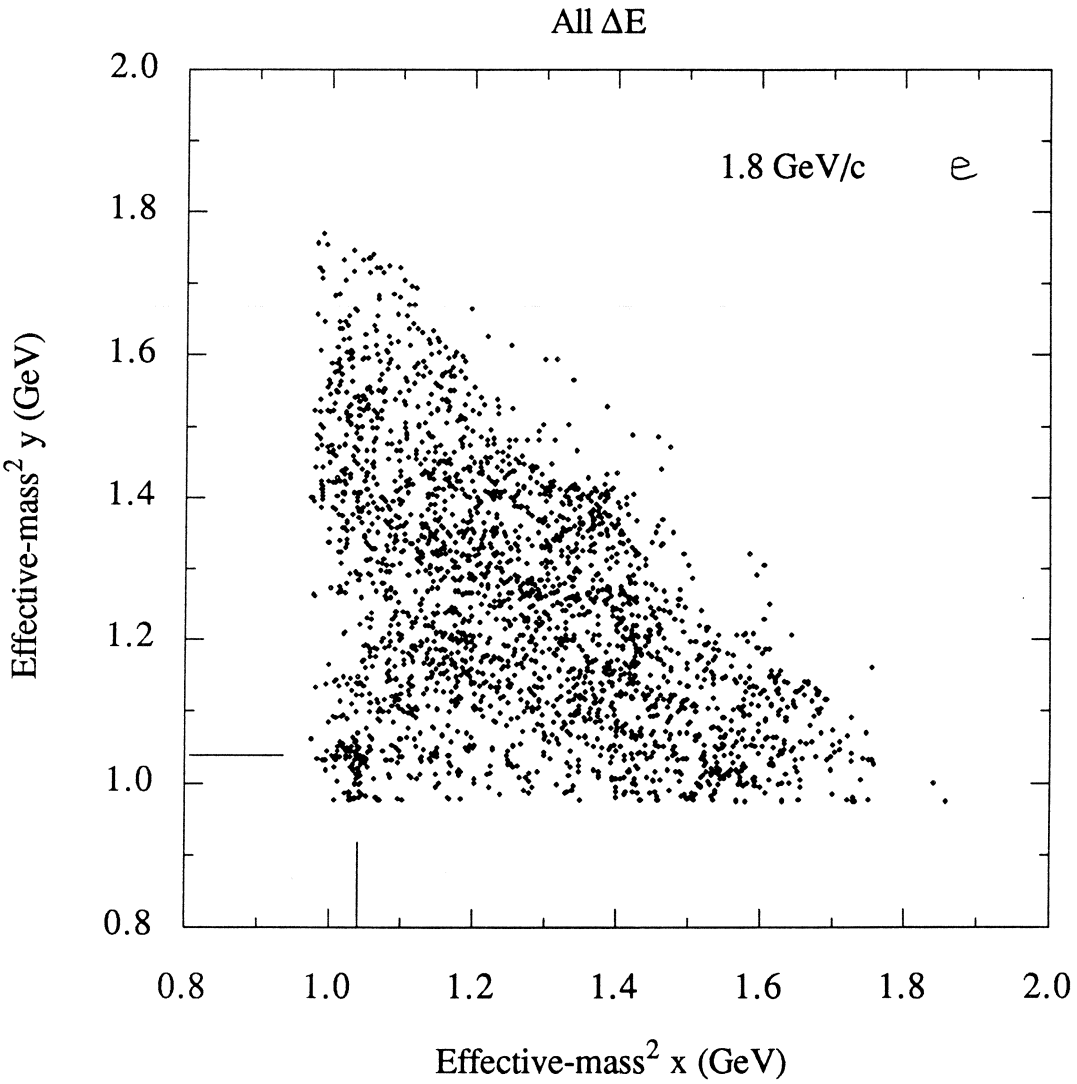




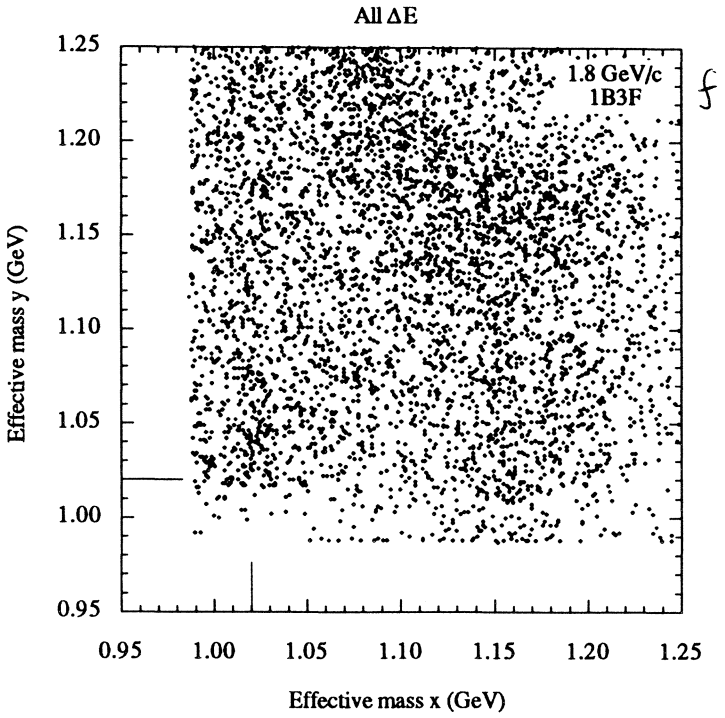


	1.8 GeV/c	run ?	Run #	event	conf	sol	set	DeltaE	M(2+3)	M(1+4)	cos(2+3)
1			868	80573	1	1	2	0.000	1.0090	1.0260	0.072
2			868	85044	1	1	2	0.000	1.0190	1.0170	-0.090
3			868	80573	1	1	1	0.010	1.0100	1.0270	0.099
4			869	77274	1	1	2	0.039	1.0190	1.0290	0.082
5			869	77274	1	1	1	0.041	1.0160	1.0250	0.102
6		921	870	45293	1	1	1	0.018	1.0370	1.0220	0.114
7			870	46805	1	1	2	0.013	1.0190	1.0190	-0.120
8			872	42008	1	1	1	0.009	1.0050	1.0190	-0.078
9			873	33102	1	1	1	-0.007	1.0040	1.0170	-0.091
10			881	62982	1	1	1	0.009	1.0310	1.0030	-0.172
11		869	881	91280	1	1	1	0.020	1.0160	1.0220	0.189
12			881	90794	1	1	2	-0.002	1.0280	1.0320	0.012
13		869	881	91280	1	2	1	0.020	1.0170	1.0090	0.204
14		869	881	91280	1	2	2	0.020	1.0170	1.0090	0.204
15			881	90794	1	1	1	0.014	1.0300	1.0300	0.038
16			886	1633	1	1	1	0.016	1.0200	1.0100	-0.070
17			888	65510	1	2	1	0.044	1.0260	1.0170	-0.050
18			888	65510	1	2	2	0.051	1.0130	1.0220	0.027
19			889	94443	1	1	1	0.016	1.0080	1.0280	-0.135
20			894	79902	1	1	1	0.053	1.0190	1.0280	0.240
21			894	51043	1	1	1	0.005	1.0260	1.0160	0.193
22			896	36375	1	1	2	-0.012	1.0200	1.0040	-0.067
23			896	36375	1	1	1	-0.006	1.0190	1.0060	-0.071
24			899	53654	1	1	1	-0.007	1.0200	1.0340	-0.140
25			903	83696	1	2	1	0.023	1.0210	1.0240	-0.063
26			904	75898	1	2	1	0.032	1.0150	1.0110	-0.135
27			904	75898	1	1	2	0.035	1.0170	1.0130	-0.181
28			914	9591	1	2	1	0.041	1.0260	1.0370	0.165
29			917	64640	1	2	2	0.033	1.0220	1.0050	-0.255
30		889	918	17246	1	1	2	0.004	1.0050	1.0160	0.298
31			919	107109	1	1	1	0.003	1.0200	1.0190	-0.186
32			925	66747	1	1	2	0.015	1.0100	1.0240	0.037
33			927	85819	1	1	2	0.007	1.0060	1.0250	-0.169
34			929	78380	1	1	1	-0.022	1.0240	1.0180	-0.141
35			932	43619	1	1	1	-0.009	1.0060	1.0220	-0.198
36			935	13673	1	1	1	0.014	1.0140	1.0220	0.083
37			935	13673	1	1	2	0.016	1.0130	1.0240	0.092
38			939	84338	1	1	1	0.029	1.0250	1.0140	0.029
39			941	34093	1	1	1	0.002	1.0120	1.0170	0.049
40			947	108216	1	1	2	0.000	1.0280	1.0250	0.084
41			948	93270	1	1	2	0.033	1.0120	1.0220	-0.064
42			954	17167	1	1	1	-0.011	1.0220	1.0130	-0.068
43			954	17167	1	1	2	-0.008	1.0220	1.0160	-0.075
44			954	37976	1	1	1	0.010	1.0080	1.0180	0.168
45			954	37976	1	1	2	0.010	1.0080	1.0180	0.171
46			955	108449	1	1	1	0.014	1.0190	1.0200	-0.185
47			955	74119	1	1	1	0.007	1.0120	1.0190	-0.164
48			960	24610	1	1	1	0.011	1.0390	1.0160	0.024
49			960	24610	1	1	2	0.012	1.0400	1.0160	0.024
50			961	86327	1	1	2	0.002	1.0190	1.0030	0.002

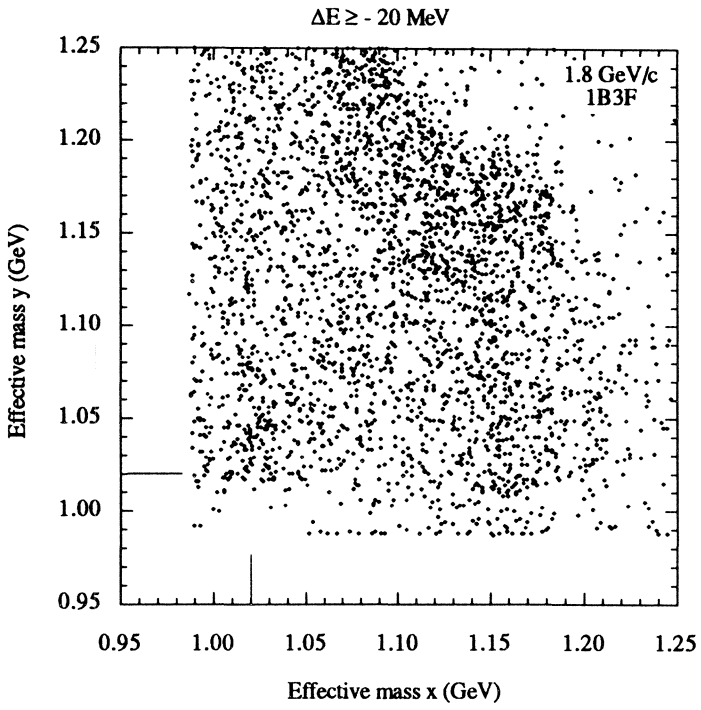
	1.8 GeV/c	run ?	Run #	event	conf	sol	set	DeltaE	M(2+3)	M(1+4)	cos(2+3)
51			961	32250	1	1	2	0.003	1.0180	1.0000	0.127
52			961	125274	1	1	2	0.013	1.0200	1.0230	0.053
53			963	79960	1	1	2	0.009	1.0190	1.0220	-0.089
54			963	79960	1	1	1	0.011	1.0240	1.0160	-0.097
55			966	99440	1	2	1	0.023	1.0180	1.0160	-0.067
56			967	69935	1	1	1	0.005	1.0040	1.0110	0.109
57			970	67820	1	1	1	0.007	1.0220	1.0190	0.263
58			973	26922	1	1	1	0.005	1.0150	1.0180	-0.028
59			975	54856	1	2	1	0.028	1.0180	1.0280	-0.029
60			976	17212	1	1	1	-0.005	1.0130	1.0220	-0.010
61			977	27057	1	1	1	0.011	1.0270	1.0110	-0.140
62			978	63138	1	1	1	-0.016	1.0200	1.0250	0.040
63			979	80818	1	1	2	0.002	1.0020	1.0190	0.212
64			979	80818	1	1	1	0.003	1.0040	1.0180	0.210
65			985	5888	1	2	1	0.020	1.0290	1.0230	-0.123
66			987	82199	1	1	1	0.017	1.0170	1.0310	-0.109
67			988	98973	1	1	1	-0.001	1.0210	1.0080	0.068
68			990	95912	1	1	2	0.007	1.0060	1.0010	0.087
69			991	26912	1	1	1	-0.010	1.0270	1.0210	-0.196
70			994	22915	1	1	1	0.018	1.0220	1.0000	0.138


All ΔE
1.8 GeV/c
e
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.8
1.0
1.2
1.4
1.6
1.8
2.0
Effective-mass^2 y (GeV)
Effective-mass^2 x (GeV)

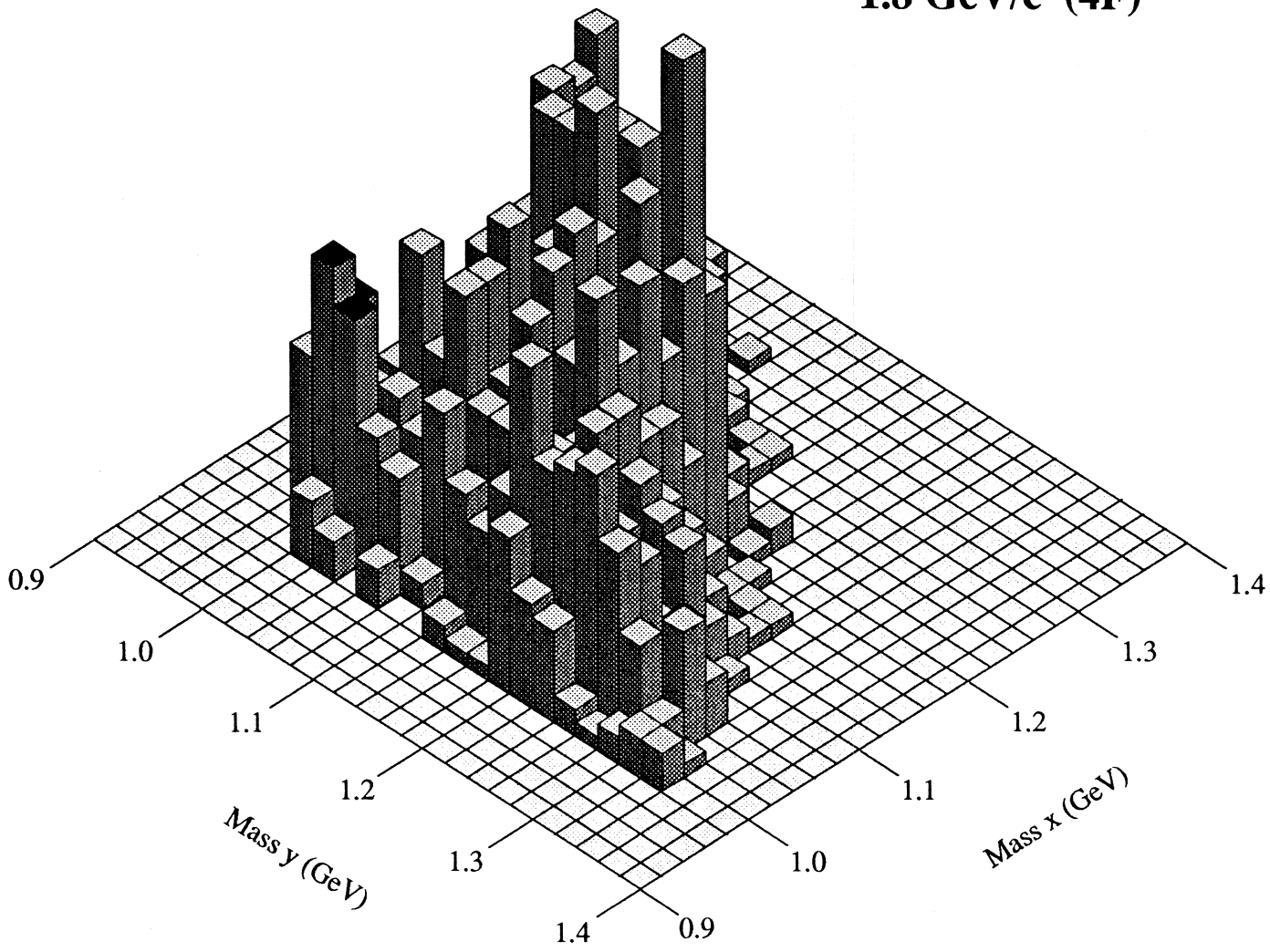
1.8 GeV/c
1-barrel 3-forward events (1B3F)



f

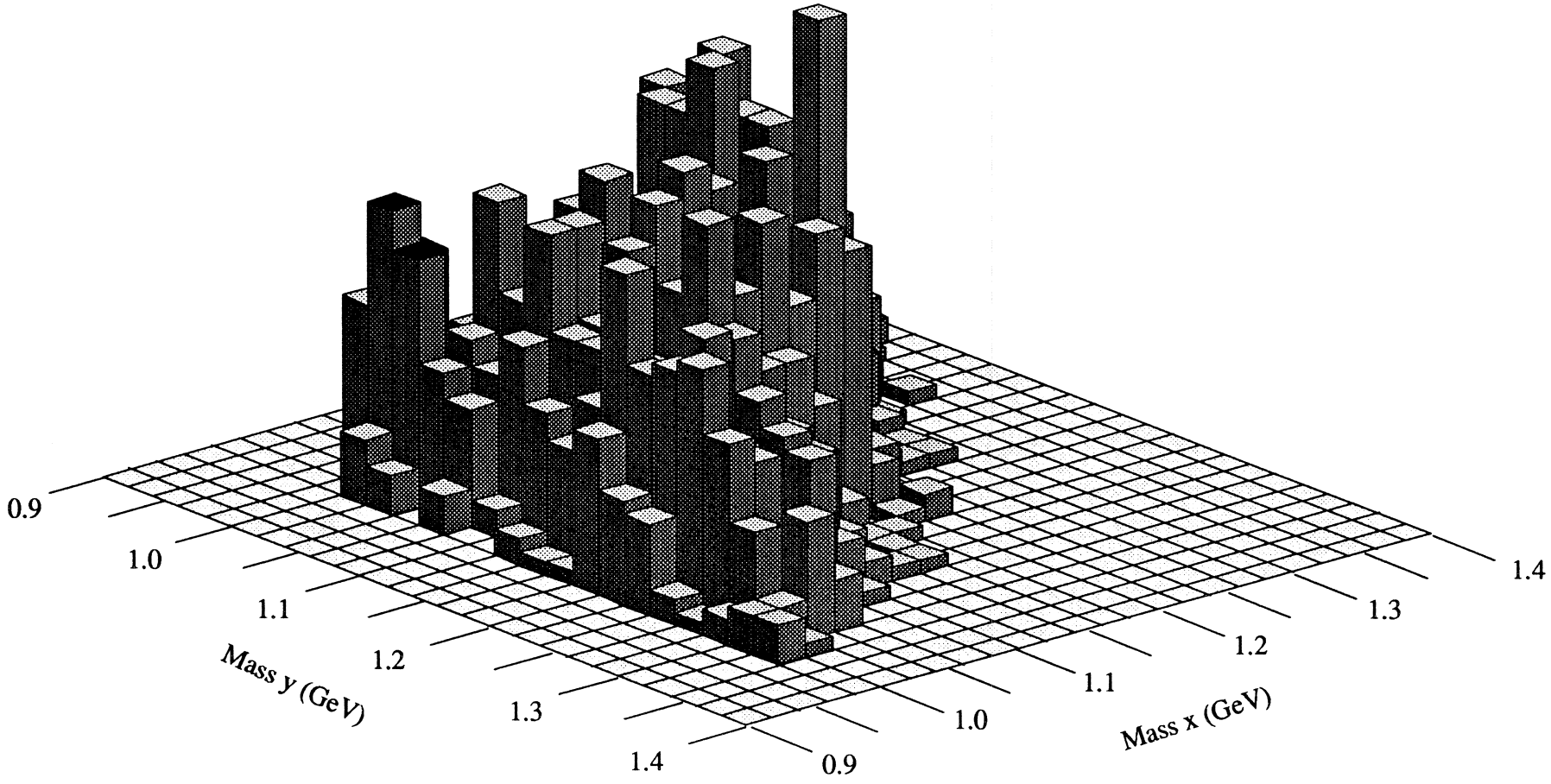


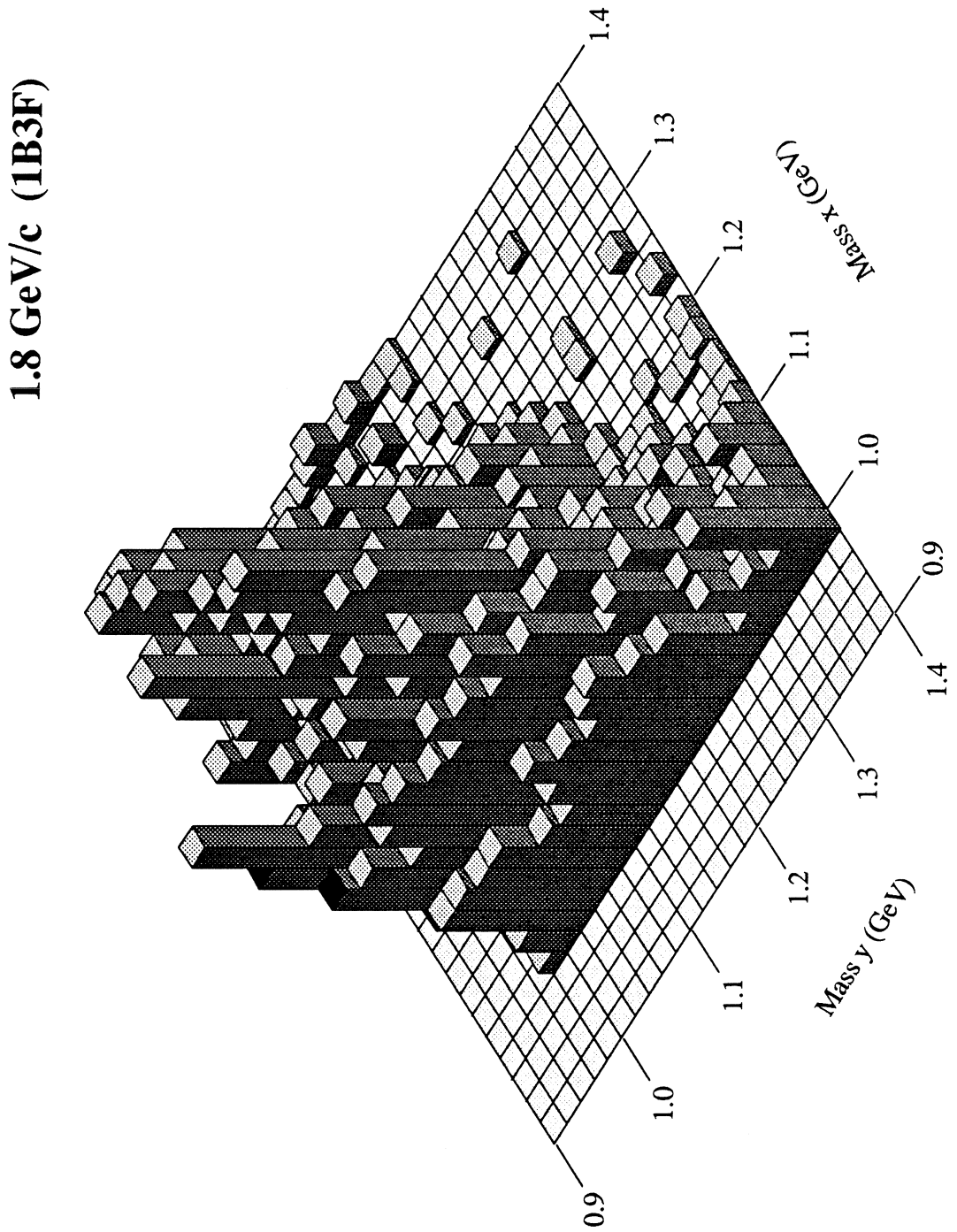
g


1.8 GeV/c (4F)
0.9
1.0
1.1
1.2
1.3
1.4
Mass y (GeV)
1.4
1.3
1.2
1.1
1.0
0.9
Mass x (GeV)

1.8 GeV/c

45




1.8 GeV/c (1B3F)
Mass x (GeV)
Mass y (GeV)
0.9
1.0
1.1
1.2
1.3
1.4

1.8 GeV/c
857 events

	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
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	3	3	9	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	2	8	4	7	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	1	14	12	6	11	4	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	2	19	12	9	12	10	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	7	18	20	11	14	11	6	2	1	1	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	8	17	13	11	18	15	15	11	3	0	1	2	0	0	0	0	0	0	0	0	0
15	0	0	0	0	12	24	16	15	26	20	25	18	23	21	4	1	0	0	0	0	0	0	0	0	0
14	0	0	0	0	1	13	19	14	20	20	11	18	16	38	13	4	0	0	0	0	0	0	0	0	0
13	0	0	0	0	1	9	16	23	26	28	26	14	27	12	15	3	2	1	1	0	0	0	0	0	0
12	0	0	0	0	2	11	16	10	14	18	22	34	24	24	16	7	1	0	1	0	0	0	0	0	0
11	0	0	0	0	0	0	5	14	15	12	17	20	15	10	27	17	7	0	2	0	0	0	0	0	0
10	0	0	0	0	0	2	14	22	22	25	17	21	20	18	27	14	13	8	6	1	0	0	0	0	0
9	0	0	0	0	3	9	11	16	17	22	19	16	14	27	25	11	17	12	16	9	0	1	0	0	0
8	0	0	0	0	0	11	13	23	5	13	12	14	17	27	21	25	13	15	17	12	2	0	0	0	0
7	0	0	0	0	3	19	11	10	11	11	5	10	11	12	27	16	11	19	16	7	7	1	0	0	0
6	0	0	0	0	5	22	18	10	11	12	8	8	4	9	16	15	24	27	12	8	7	3	1	0	0
5	0	0	0	0	0	14	10	2	2	2	2	3	5	2	11	6	20	7	7	2	6	2	0	2	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

1.9 GeV/c
[4F triggers]

M_x = Mass(1+2)+Mass(1+3)+Mass(2+3)

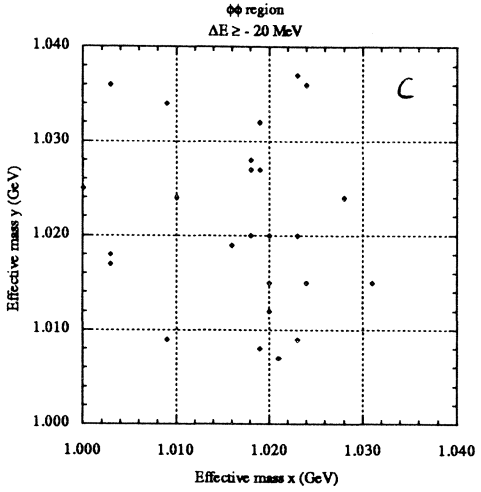
M_y = Mass(3+4)+Mass(2+4)+Mass(1+4)

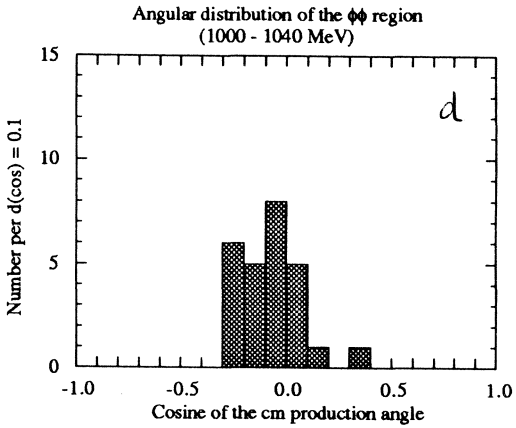
Cher & Sil prob > 1 %
any pixel assoc. & any vertex
10 MeV/c fixed mom. cut
Barrel (Julich & Gamma) in veto at > 200 AD

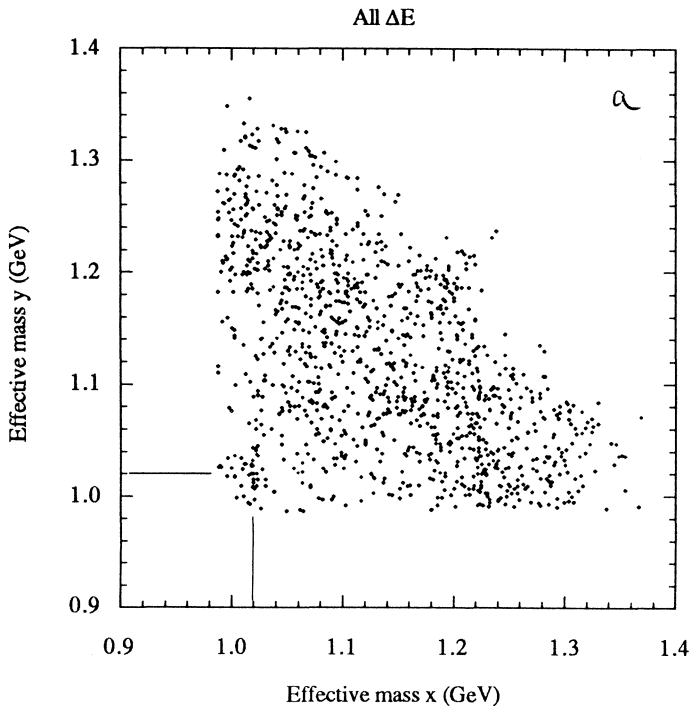
3 entries per solution.
max of 2 solutions per track set.
max of 2 track sets per event

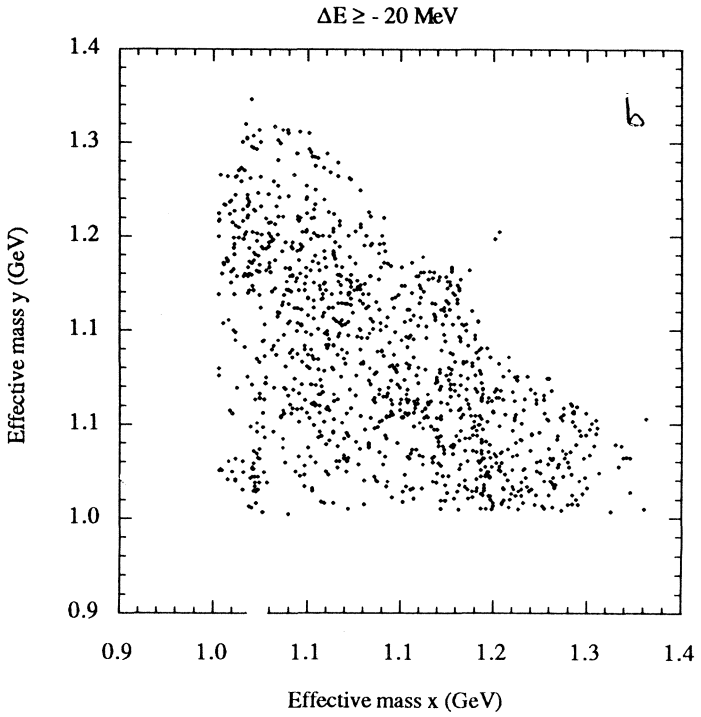
kinematics based on

$-100 \leq \Delta E \leq +20$ MeV









1.9 GeV/c
[4F triggers]

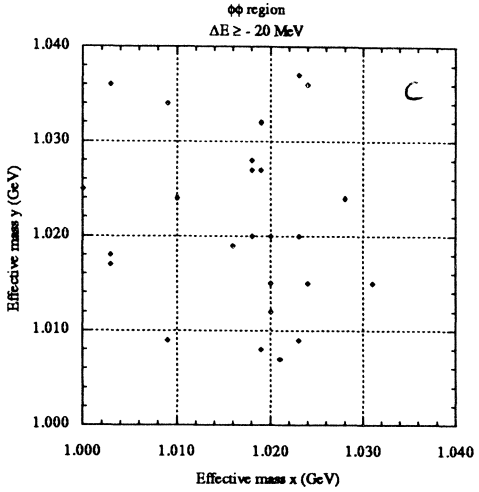
M_x = Mass(1+2)+Mass(1+3)+Mass(2+3)

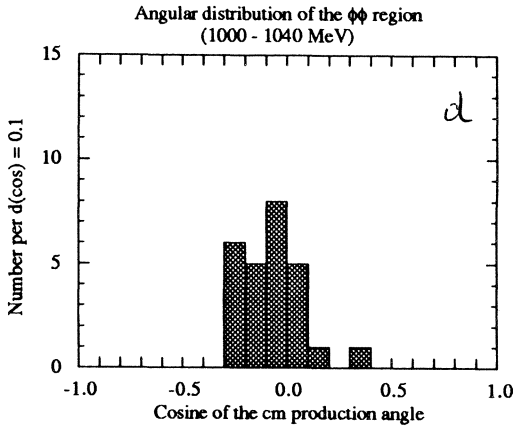
M_y = Mass(3+4)+Mass(2+4)+Mass(1+4)

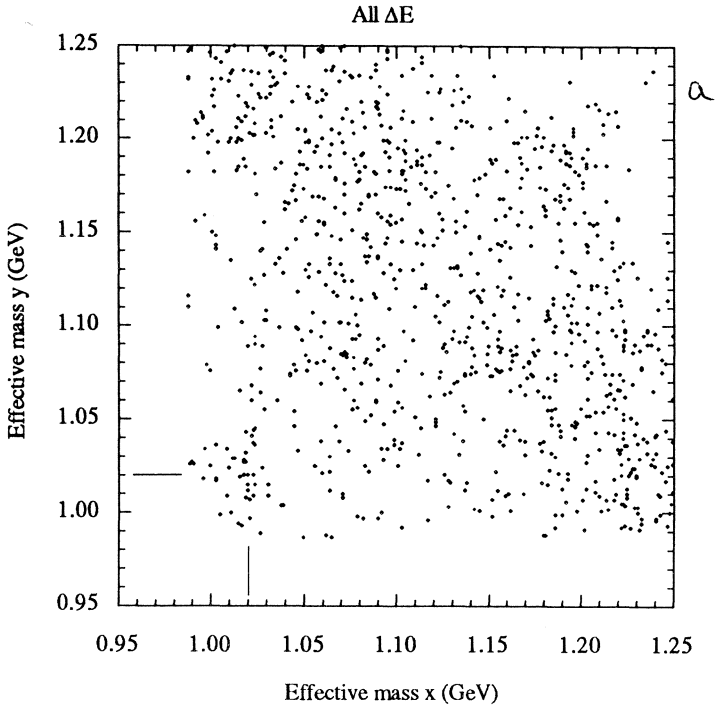
Cher & Sil prob > 1 %
any pixel assoc. & any vertex
10 MeV/c fixed mom. cut
Barrel (Julich & Gamma) in veto at > 200 AD

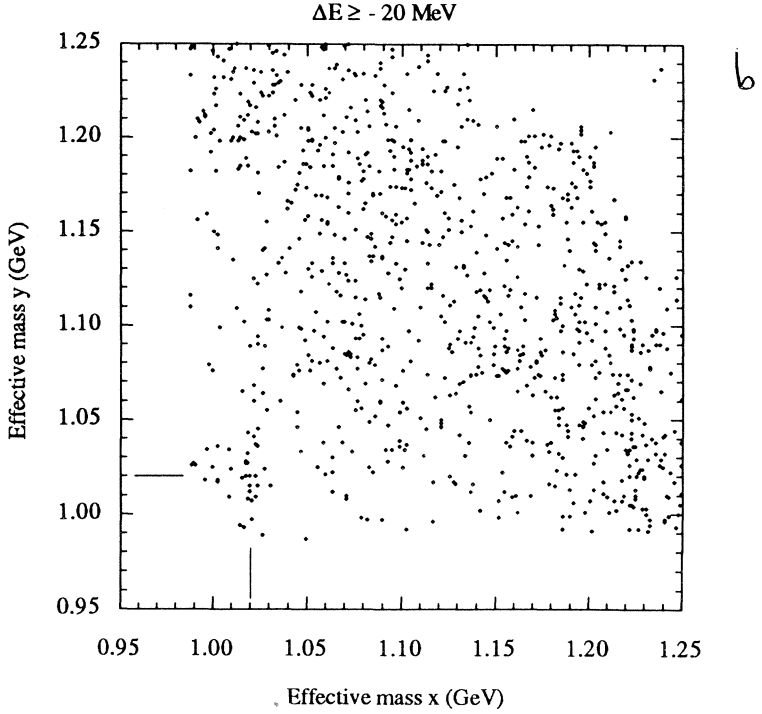
3 entries per solution.
max of 2 solutions per track set.
max of 2 track sets per event

kinematics based on
$-100 \leq \Delta E \leq +20$ MeV

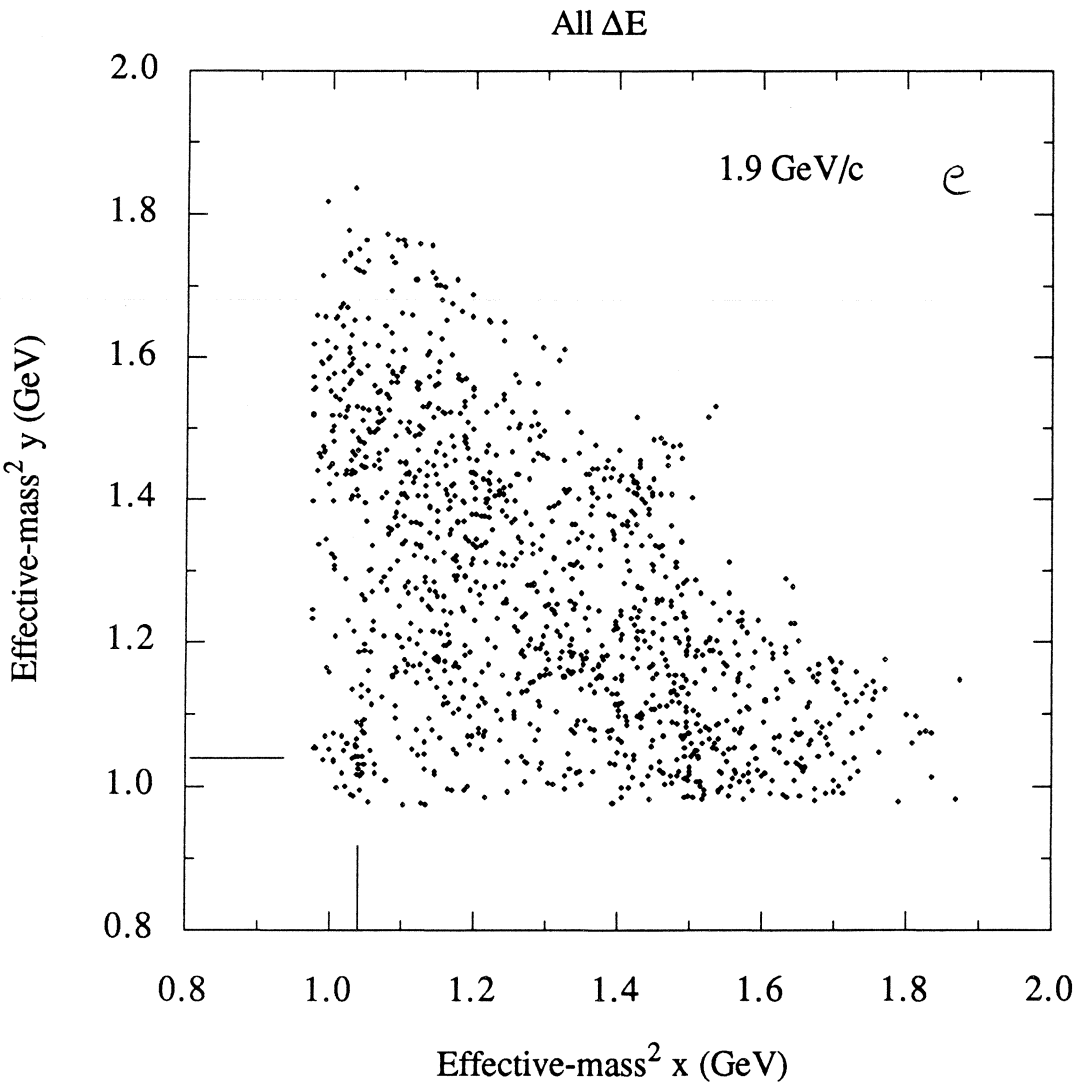




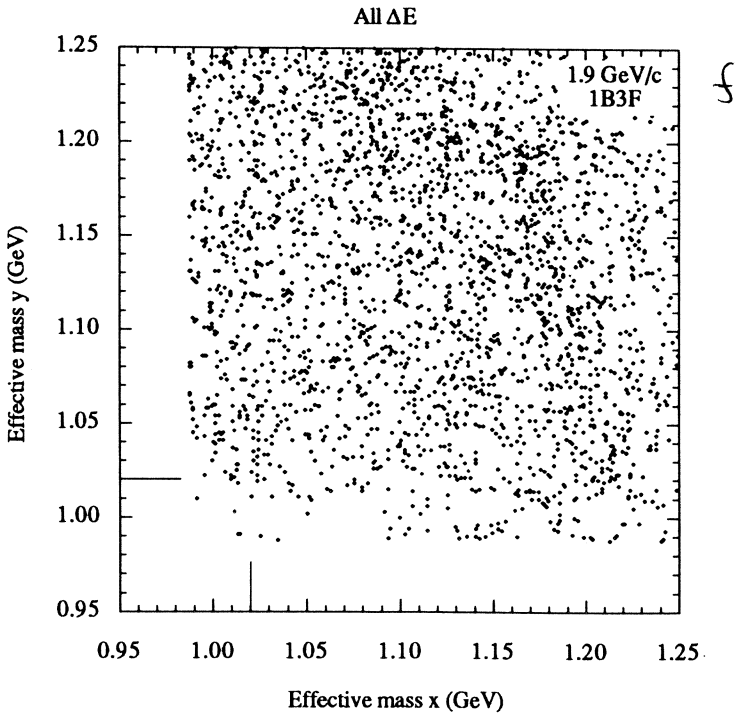


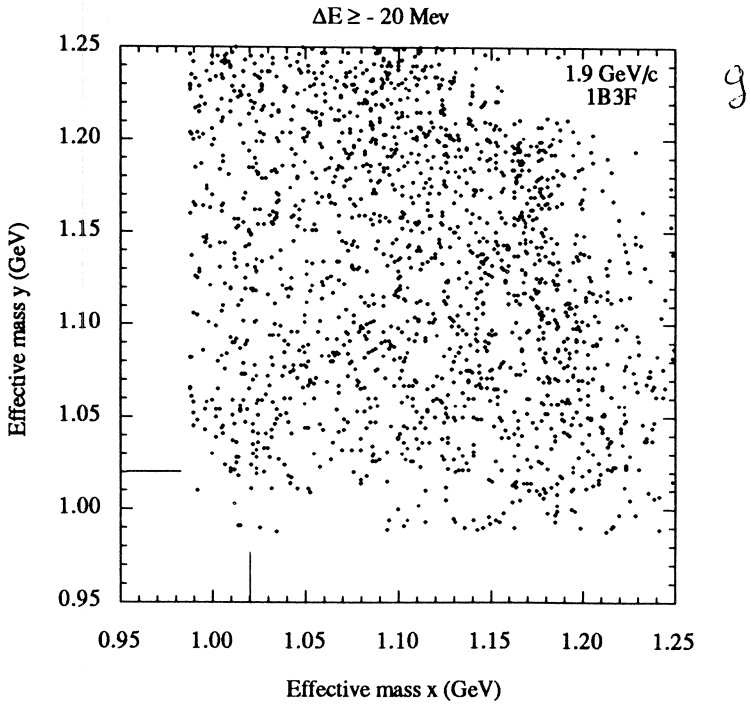


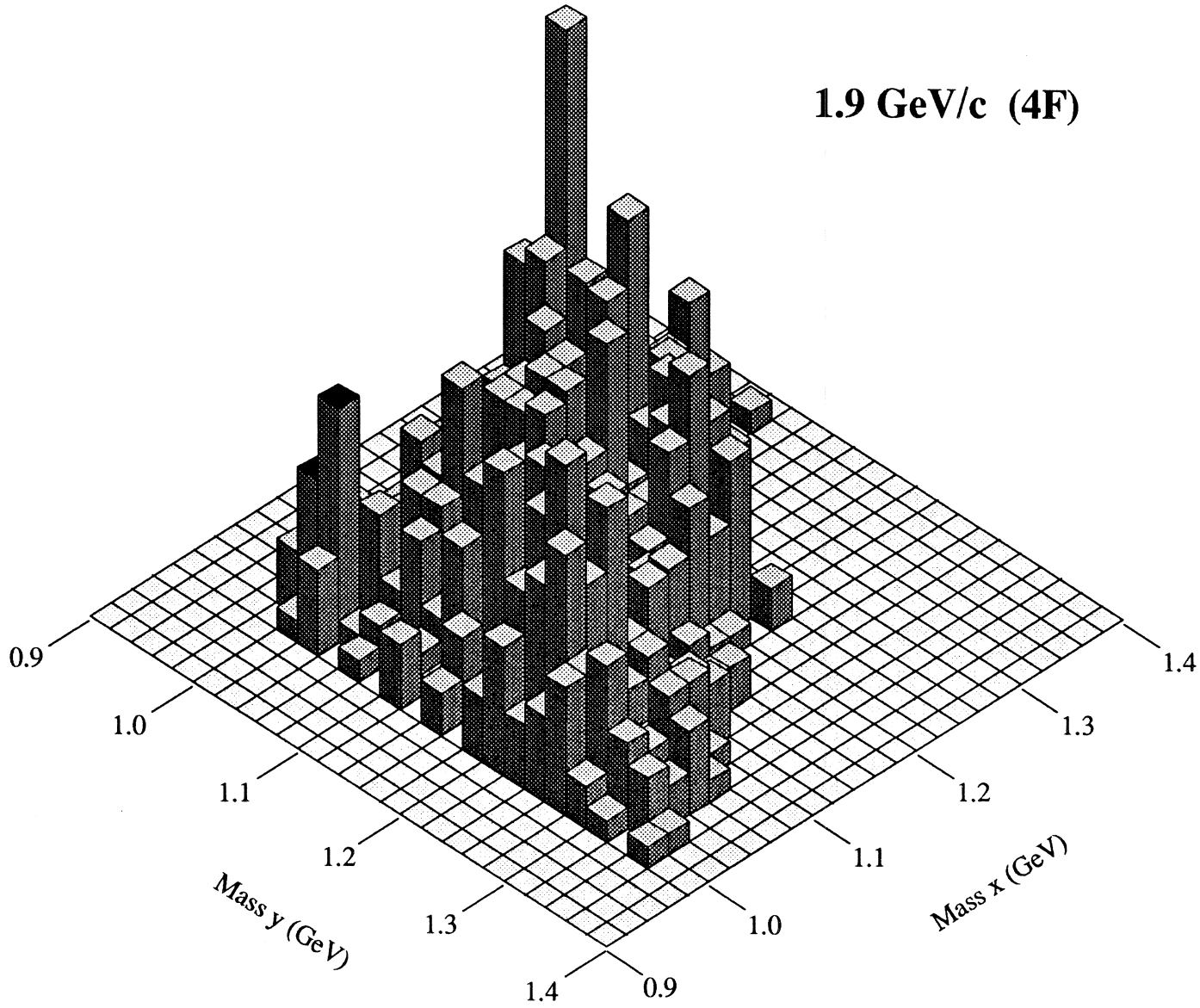
	1.9 GeV/c	Run ?	Run #	event	conf	sol	set	DeltaE	M(2+3)	M(1+4)	cos(2+3)
1			665	33090	1	1	1	-0.029	1.0120	1.0290	0.204
2			665	33090	1	1	2	-0.034	1.0130	1.0290	0.210
3			667	58958	1	1	1	-0.001	1.0180	1.0280	-0.099
4			677	108109	1	1	1	0.004	1.0210	1.0070	0.033
5			677	108109	1	1	2	0.005	1.0190	1.0080	0.034
6			677	113329	1	1	1	-0.028	1.0380	1.0040	0.159
7			677	6108	1	1	1	0.016	1.0000	1.0250	-0.219
8			677	113329	1	1	2	-0.029	1.0390	1.0040	0.161
9			683	106308	1	1	1	-0.018	1.0230	1.0200	-0.227
10			688	119377	1	1	1	0.026	1.0310	1.0150	-0.205
11			694	49069	1	1	1	0.005	1.0030	1.0170	-0.270
12			694	49069	1	1	2	0.004	1.0030	1.0180	-0.269
13			698	106690	1	1	1	0.001	1.0180	1.0200	-0.136
14			702	93129	1	1	1	-0.032	1.0310	1.0090	-0.040
15			702	49622	1	1	1	0.013	1.0190	1.0320	-0.205
16			703	84891	1	1	1	0.008	1.0160	1.0190	-0.142
17			703	84891	1	1	2	-0.010	1.0240	1.0150	-0.101
18			709	4867	1	1	1	0.024	1.0030	1.0360	0.303
19		721	709	5852	1	1	2	0.009	1.0230	1.0090	-0.036
20			709	5852	1	1	1	0.016	1.0200	1.0120	-0.051
21			710	59356	1	1	2	0.010	1.0090	1.0340	0.011
22			721	106786	1	2	1	0.046	1.0280	1.0240	-0.034
23			722	62409	1	1	2	0.025	1.0090	1.0090	0.026
24			722	62409	1	1	1	0.027	1.0090	1.0090	0.028
25			722	67933	1	1	1	-0.009	1.0190	1.0270	-0.137
26			725	16578	1	2	1	0.047	1.0180	1.0270	-0.022
27			726	27529	1	1	1	-0.021	1.0110	1.0000	-0.155
28			726	87512	1	1	1	-0.008	1.0100	1.0240	0.147
29			726	65248	1	2	2	0.028	1.0240	1.0360	-0.051
30			726	65248	1	2	1	0.026	1.0230	1.0370	-0.046
31			731	56106	1	2	1	0.024	1.0200	1.0200	-0.101
32			731	56106	1	2	2	0.027	1.0200	1.0150	-0.084

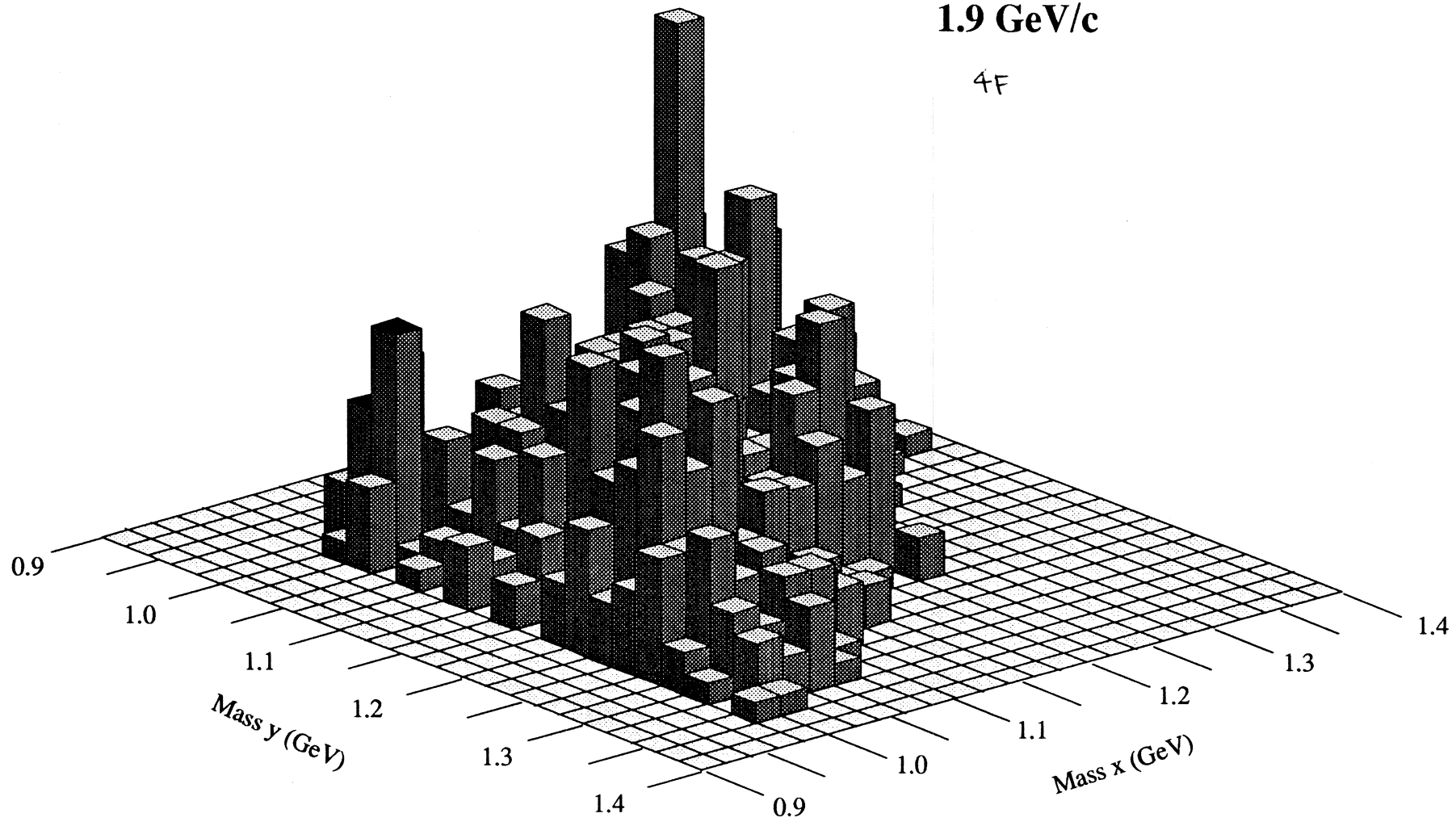

All ΔE
1.9 GeV/c
e
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.8
1.0
1.2
1.4
1.6
1.8
2.0
Effective-mass^2 y (GeV)
Effective-mass^2 x (GeV)

1.9 GeV/c
1-barrel 3-forward events (1B3F)

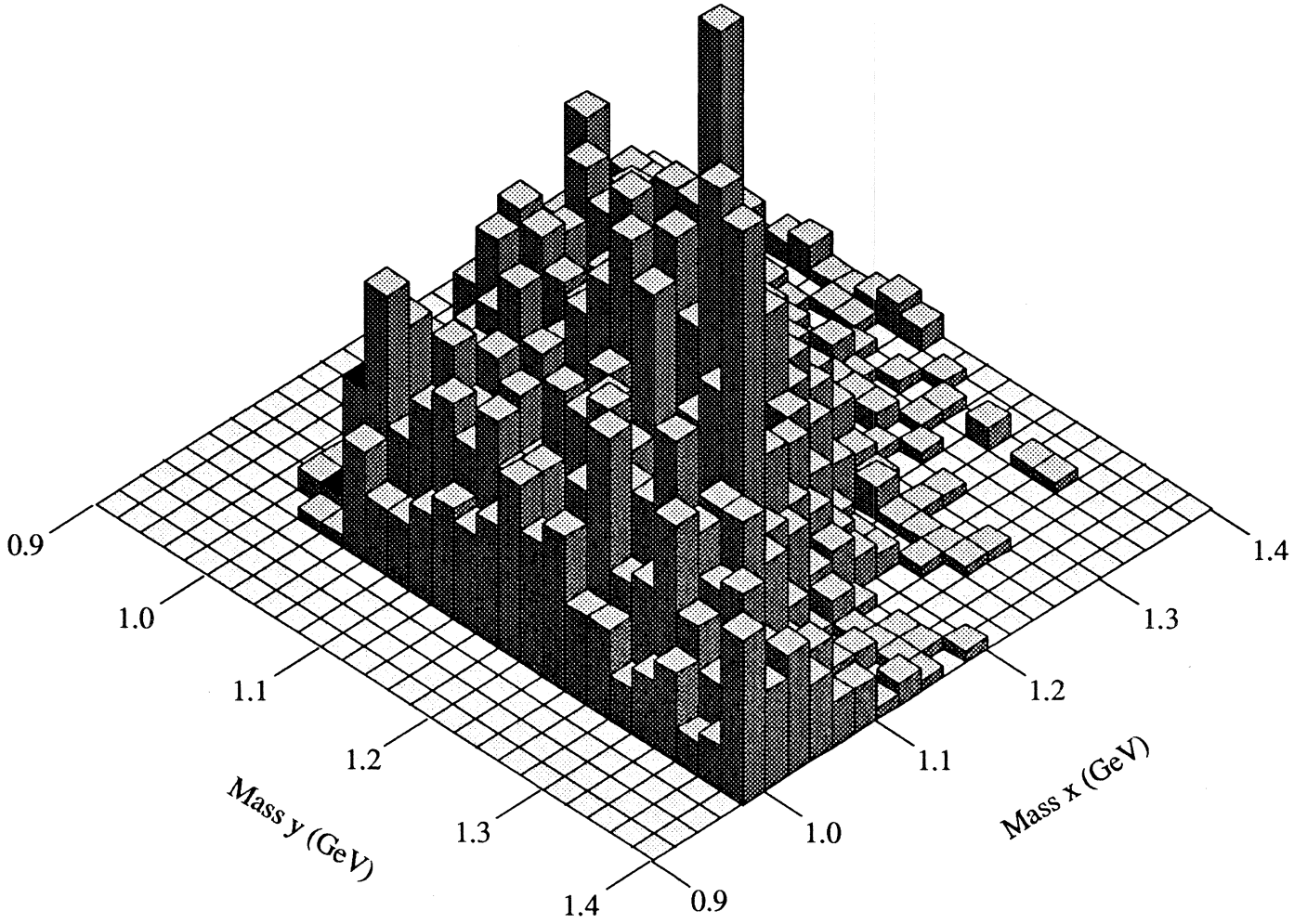





1.9 GeV/c (4F)
0.9
1.0
1.1
1.2
1.3
1.4
Mass y (GeV)
1.4
1.3
1.2
1.1
1.0
0.9
Mass x (GeV)


1.9 GeV/c
4F
0.9
1.0
1.1
1.2
1.3
1.4
Mass y (GeV)
0.9
1.0
1.1
1.2
1.3
1.4
Mass x (GeV)

1.9 GeV/c (1B3F)



1.9 GeV/c
408 events

	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
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	3	2	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	1	4	3	5	5	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	2	7	2	2	2	4	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	6	6	2	4	5	1	1	2	2	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	4	11	9	12	5	7	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	3	9	14	6	9	5	4	6	1	1	1	0	2	0	0	0	0	0	0	0	0
16	0	0	0	0	6	8	11	6	6	10	4	5	3	7	5	8	0	0	0	0	0	0	0	0	0
15	0	0	0	0	3	13	3	12	8	11	16	4	5	9	12	7	1	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	3	7	9	7	8	5	6	6	9	5	0	0	0	0	0	0	0	0	0
13	0	0	0	0	2	4	2	6	6	12	8	8	8	4	4	10	0	1	0	0	0	0	0	0	0
12	0	0	0	0	0	1	7	4	8	9	4	6	3	1	5	7	4	1	1	1	0	0	0	0	0
11	0	0	0	0	3	2	3	2	8	6	3	6	10	4	13	6	4	7	1	2	0	0	0	0	0
10	0	0	0	0	0	1	6	7	12	4	3	9	10	10	8	7	15	4	7	2	3	1	0	0	0
9	0	0	0	0	1	2	3	7	4	6	3	9	9	11	5	12	8	8	2	6	8	4	0	1	0
8	0	0	0	0	0	1	6	2	4	6	4	6	3	2	13	9	7	5	4	4	4	2	2	0	0
7	0	0	0	0	4	11	5	4	4	7	5	3	3	7	6	4	22	8	5	11	4	1	5	0	0
6	0	0	0	0	1	7	9	0	3	1	1	5	5	5	5	11	10	12	6	7	6	0	2	0	0
5	0	0	0	0	0	3	4	1	3	2	2	0	1	1	4	1	6	6	3	4	3	1	0	1	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

2.0 GeV/c
[4F triggers]

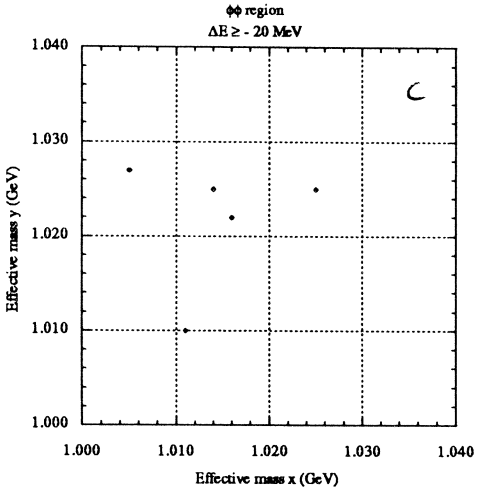
M_x = Mass(1+2)+Mass(1+3)+Mass(2+3)

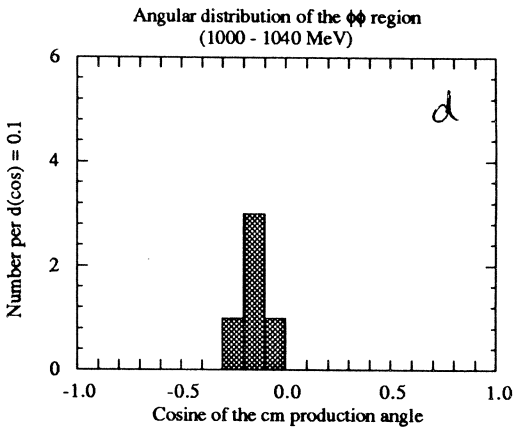
M_y = Mass(3+4)+Mass(2+4)+Mass(1+4)

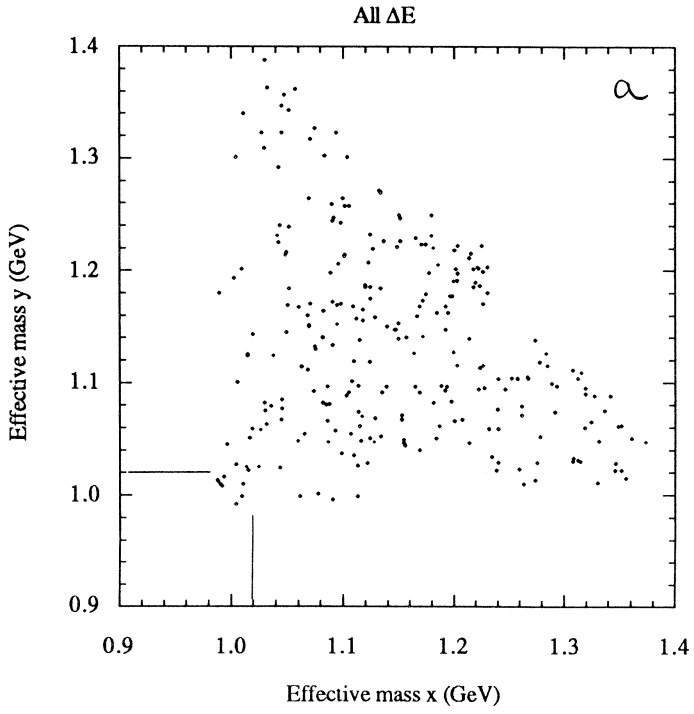
Cher & Sil prob > 1 %
any pixel assoc. & any vertex
10 MeV/c fixed mom. cut
Barrel (Julich & Gamma) in veto at > 200 AD

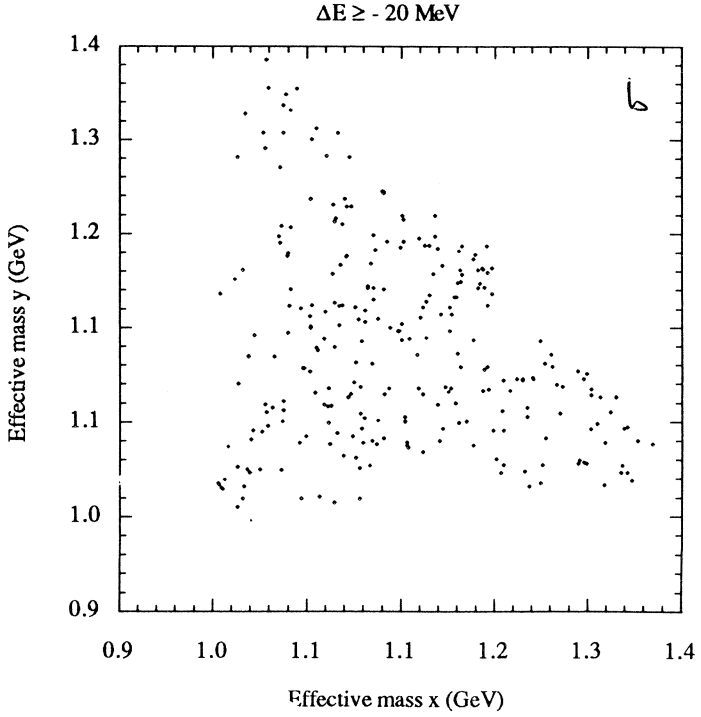
3 entries per solution.
max of 2 solutions per track set.
max of 2 track sets per event

kinematics based on
$-100 \leq \Delta E \leq +20$ MeV









2.0 GeV/c
[4F triggers]

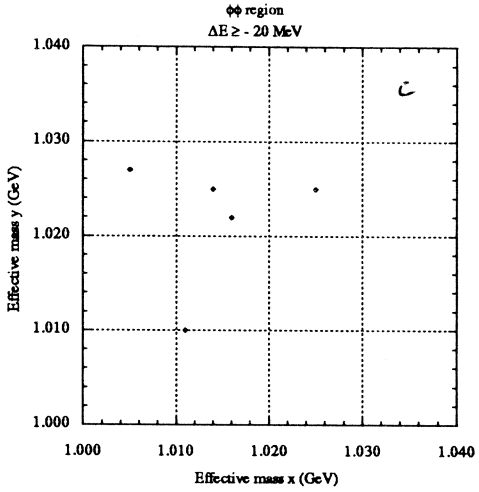
M_x = Mass(1+2)+Mass(1+3)+Mass(2+3)

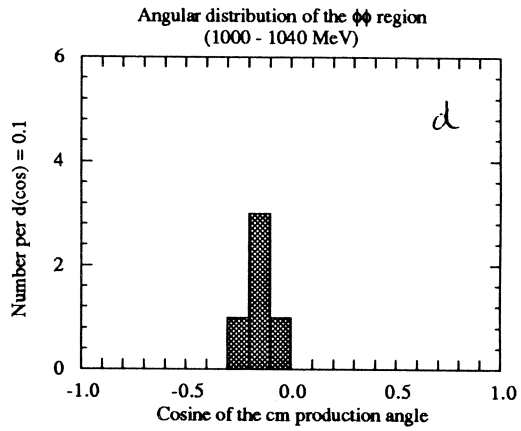
M_y = Mass(3+4)+Mass(2+4)+Mass(1+4)

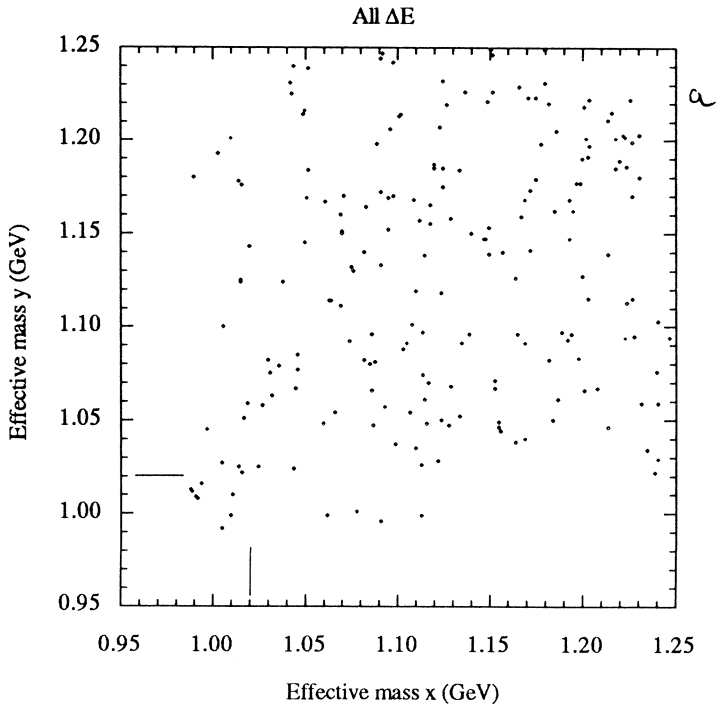
Cher & Sil prob > 1 %
any pixel assoc. & any vertex
10 MeV/c fixed mom. cut
Barrel (Julich & Gamma) in veto at > 200 AD

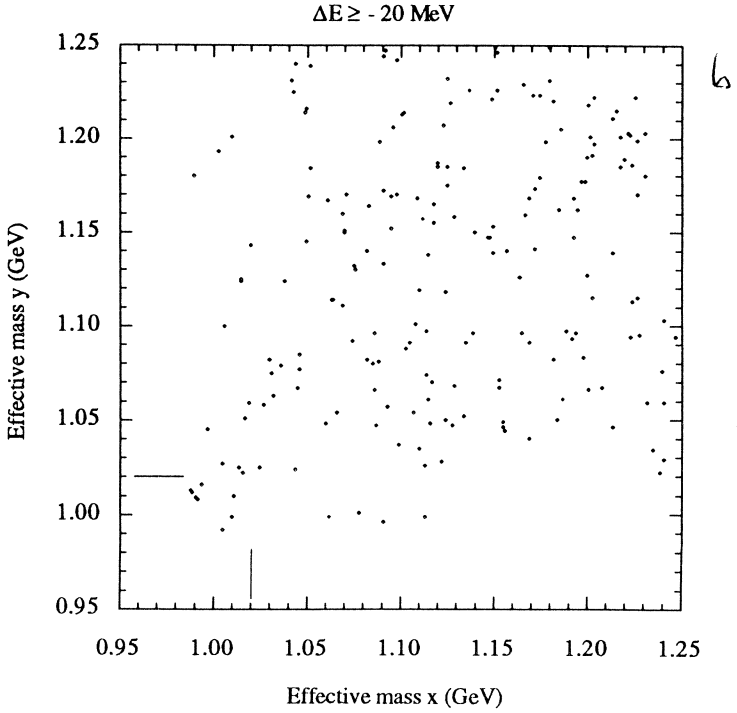
3 entries per solution.
max of 2 solutions per track set.
max of 2 track sets per event

kinematics based on
$-100 \leq \Delta E \leq +20$ MeV

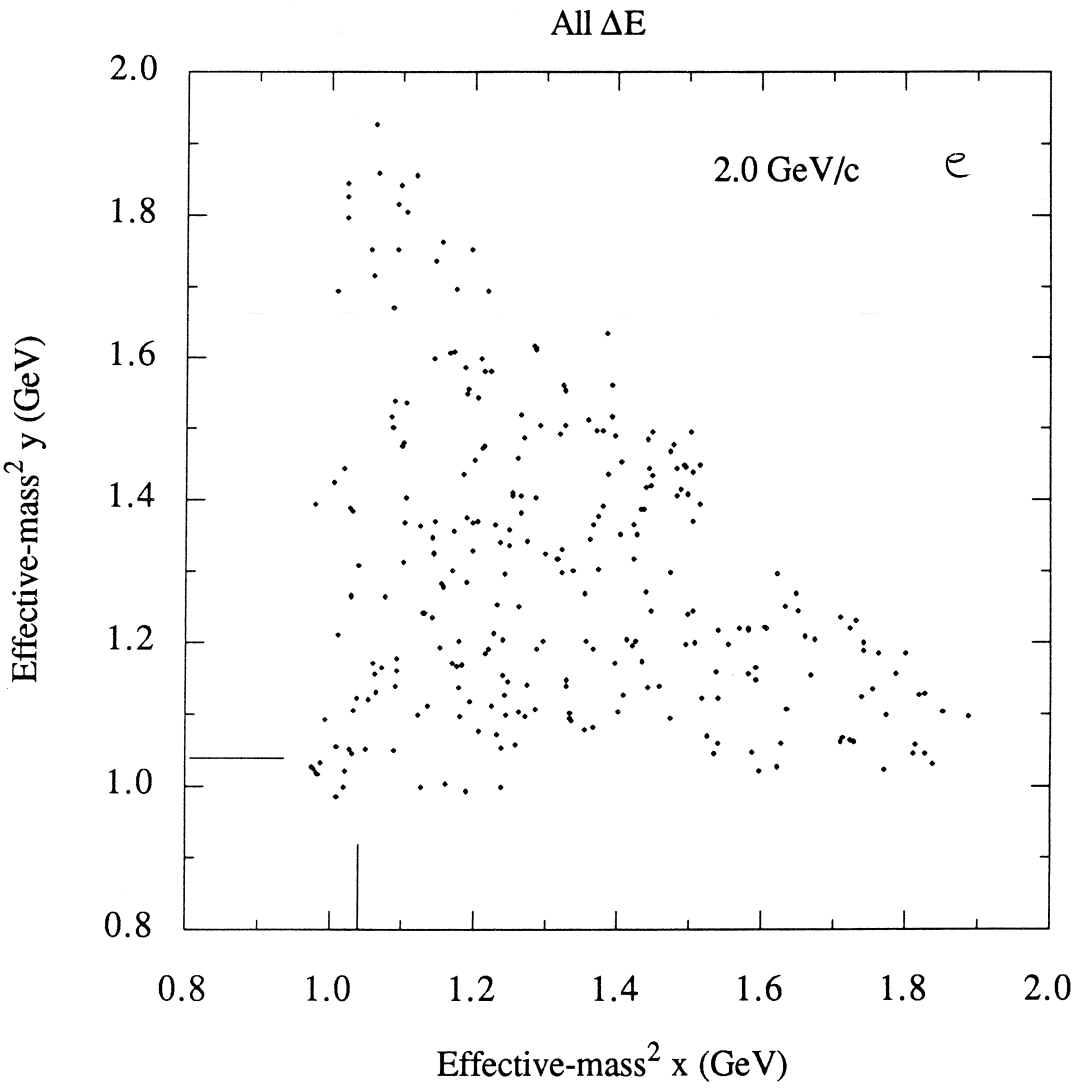




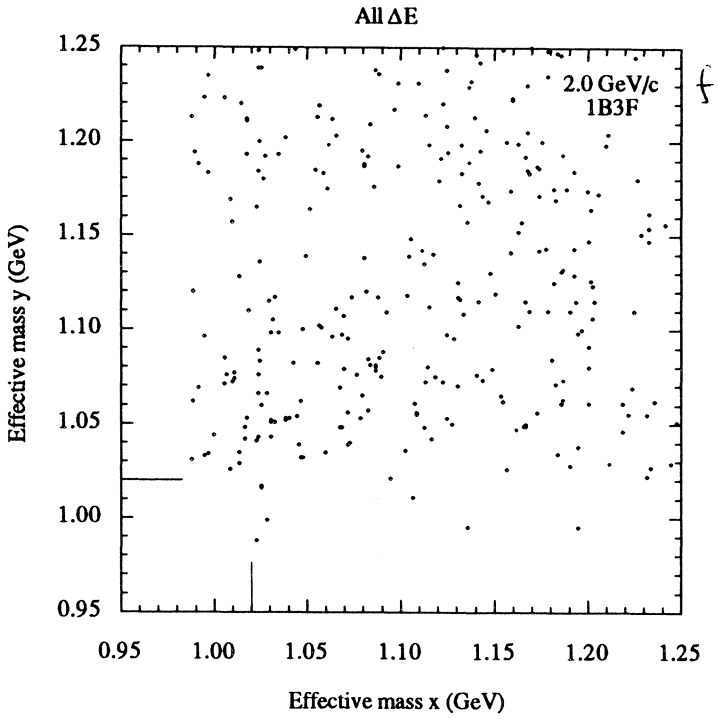




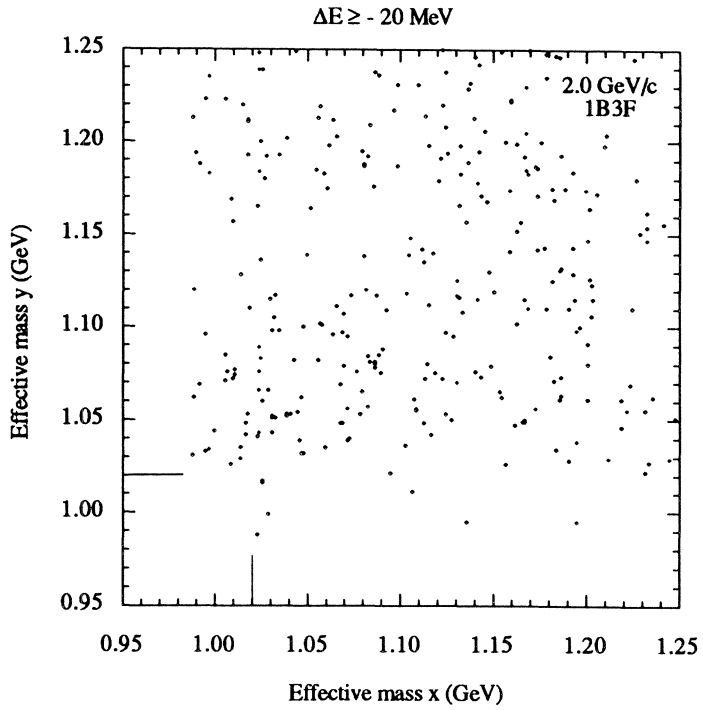
	2.0 GeV/c	Run #	event	conf	sol	set	DeltaE	M(2+3)	M(1+4)	cos(2+3)
1		516	66014	1	1	1	0.002	1.0160	1.0220	-0.243
2		523	13473	1	1	1	0.020	1.0050	1.0270	-0.112
3		529	87012	1	2	1	0.052	1.0250	1.0250	-0.106
4		529	53780	1	1	1	0.022	1.0140	1.0250	-0.023
5		544	13287	1	1	1	-0.005	1.0110	1.0100	-0.113


All ΔE
2.0 GeV/c
e
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.8
1.0
1.2
1.4
1.6
1.8
2.0
Effective-mass^2 y (GeV)
Effective-mass^2 x (GeV)

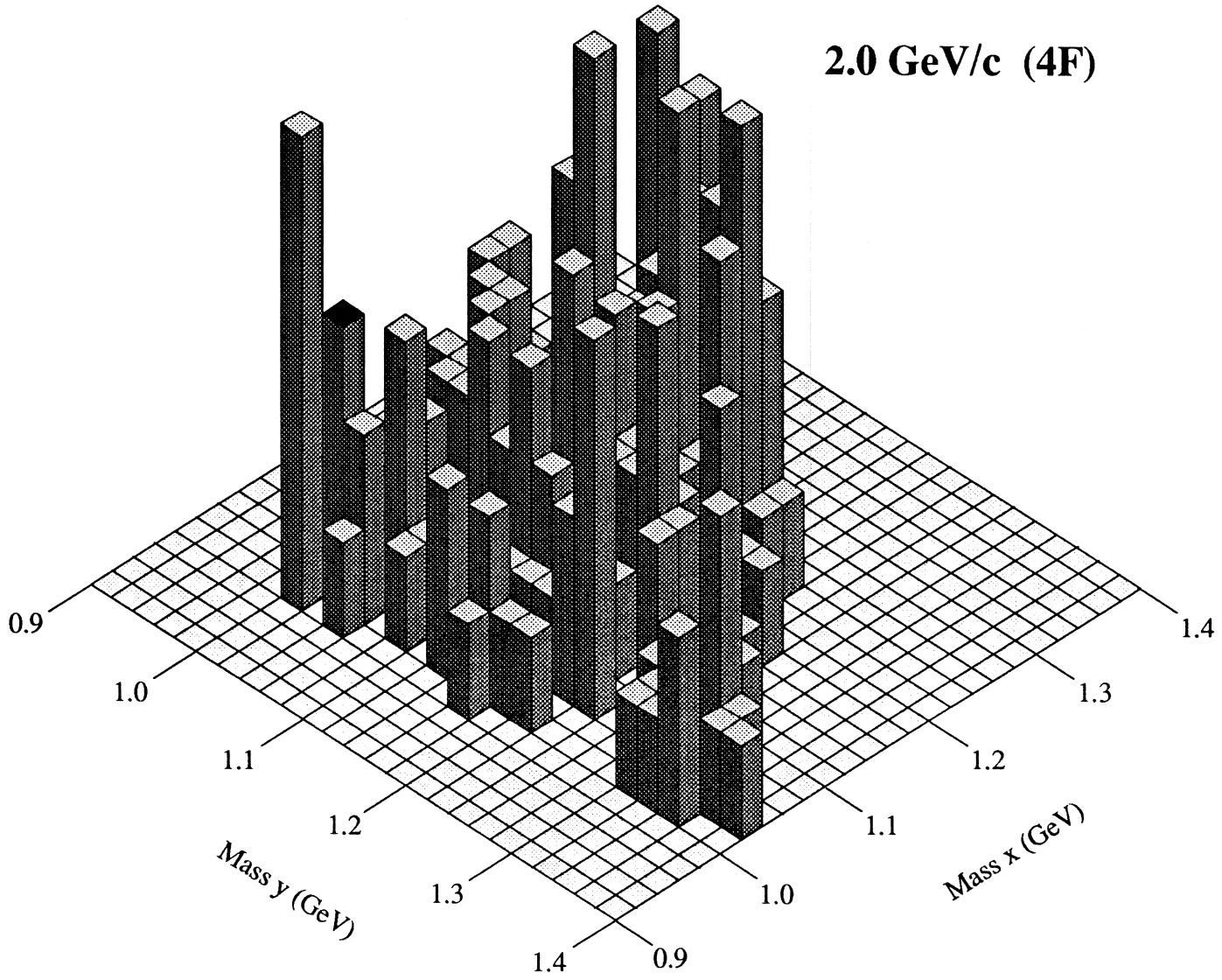
2.0 GeV/c
1-barrel 3-forward events (1B3F)

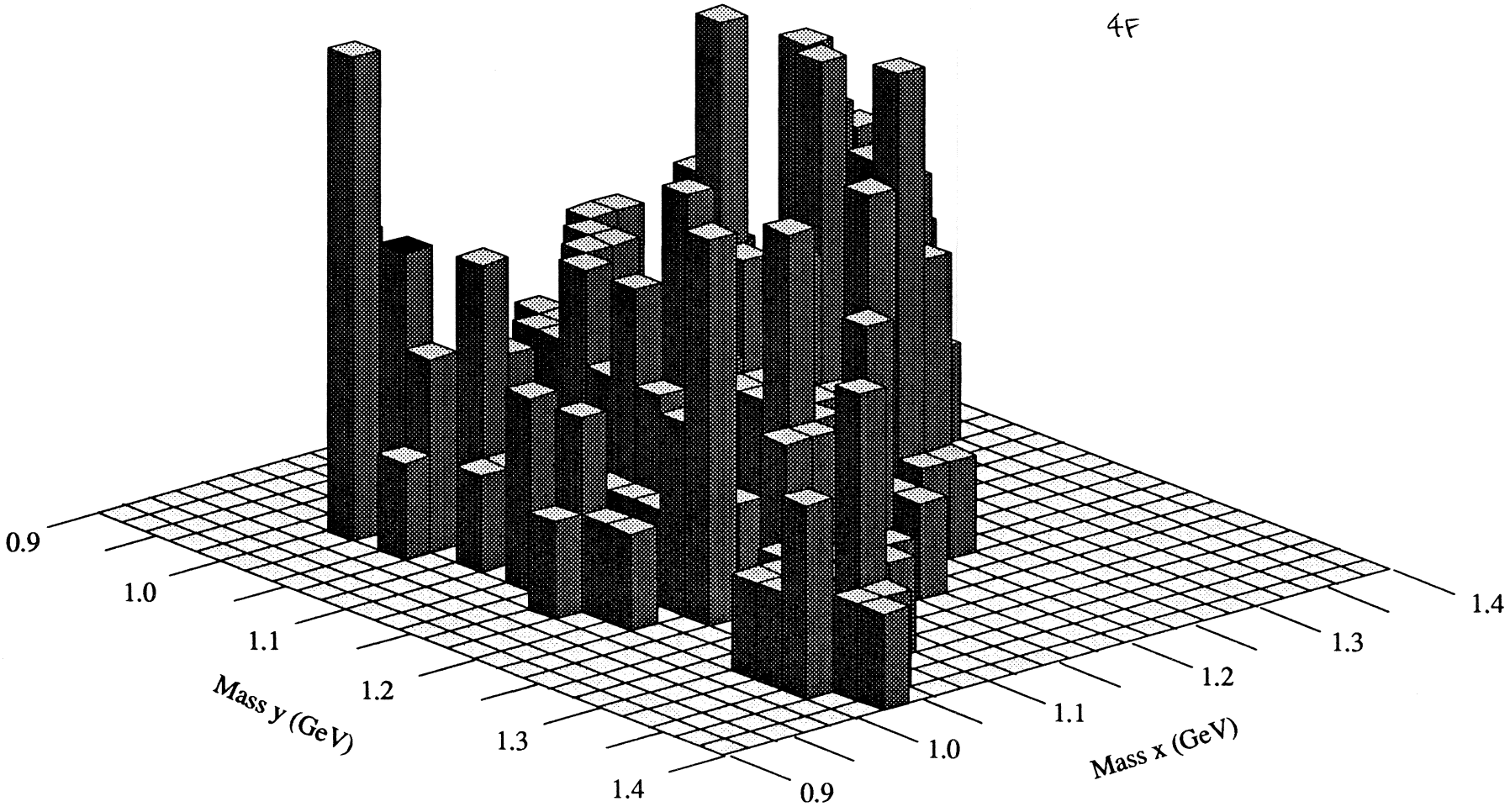


f

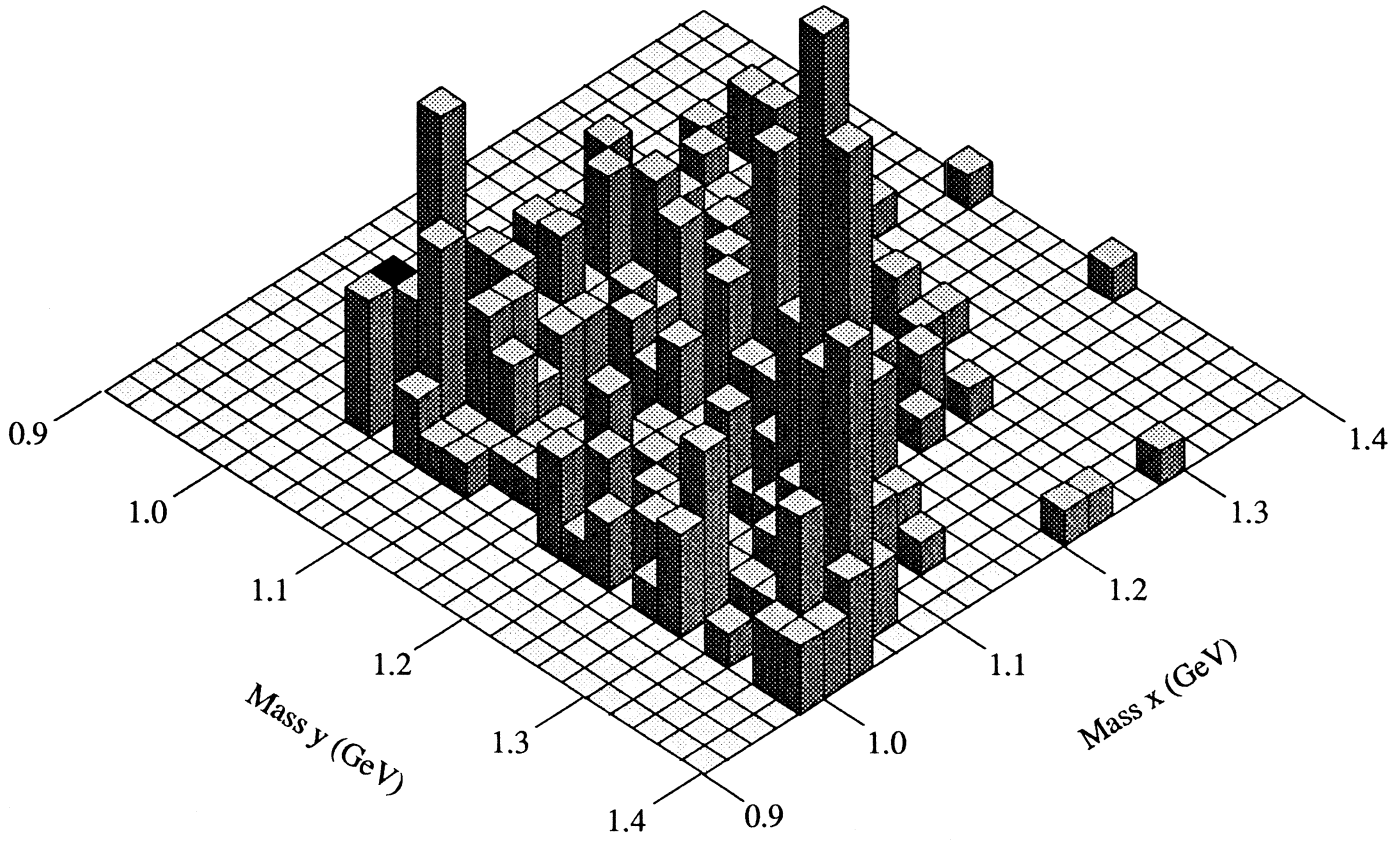


g


2.0 GeV/c (4F)
0.9
1.0
1.1
1.2
1.3
1.4
Mass y (GeV)
1.4
1.3
1.2
1.1
1.0
0.9
Mass x (GeV)


2.0 GeV/c
4F
0.9
1.0
1.1
1.2
1.3
1.4
Mass y (GeV)
0.9
1.0
1.1
1.2
1.3
1.4
Mass x (GeV)

2.0 GeV/c (1B3F)



2.0 GeV/c
92 events

	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
25	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	2	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	2	2	0	3	0	1	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	4	2	0	2	1	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	4	0	0	0	2	2	4	0	1	1	0	0	0	0	0	0	0	0
16	0	0	0	0	0	1	0	2	0	1	2	2	0	0	2	5	3	0	0	0	0	0	0	0	0
15	0	0	0	0	0	1	0	1	0	1	2	2	0	1	1	4	2	0	0	0	0	0	0	0	0
14	0	0	0	0	1	2	0	1	2	4	2	1	0	3	5	0	2	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	1	1	3	1	2	2	3	2	1	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	2	1	0	2	2	1	0	2	1	1	1	0	0	1	1	0	0	0	0	0
11	0	0	0	0	0	0	0	0	3	0	2	1	0	0	0	1	2	4	3	1	3	0	0	0	0
10	0	0	0	0	0	1	1	1	1	3	3	2	0	2	5	0	2	1	0	2	2	1	1	0	0
9	0	0	0	0	0	0	3	2	0	2	3	1	2	0	1	2	1	1	2	1	0	2	2	0	0
8	0	0	0	0	1	2	1	1	1	2	2	3	3	0	1	1	1	1	1	0	1	1	0	2	0
7	0	0	0	0	0	3	1	1	0	1	2	1	0	2	0	0	3	2	1	0	4	0	3	0	0
6	0	0	0	0	5	1	0	0	1	0	0	0	0	0	0	0	0	0	2	0	0	1	1	0	0
5	0	0	0	0	0	3	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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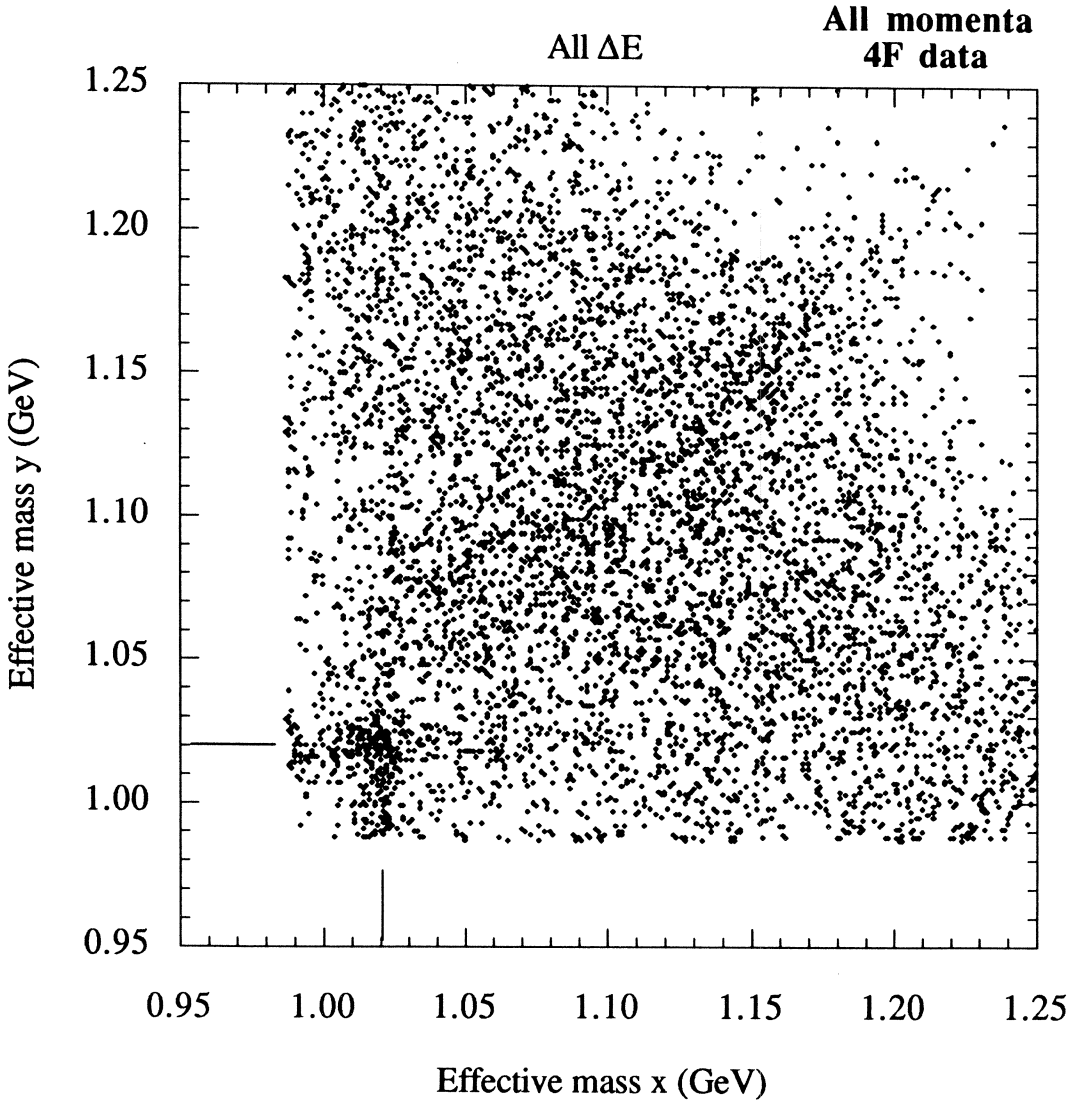
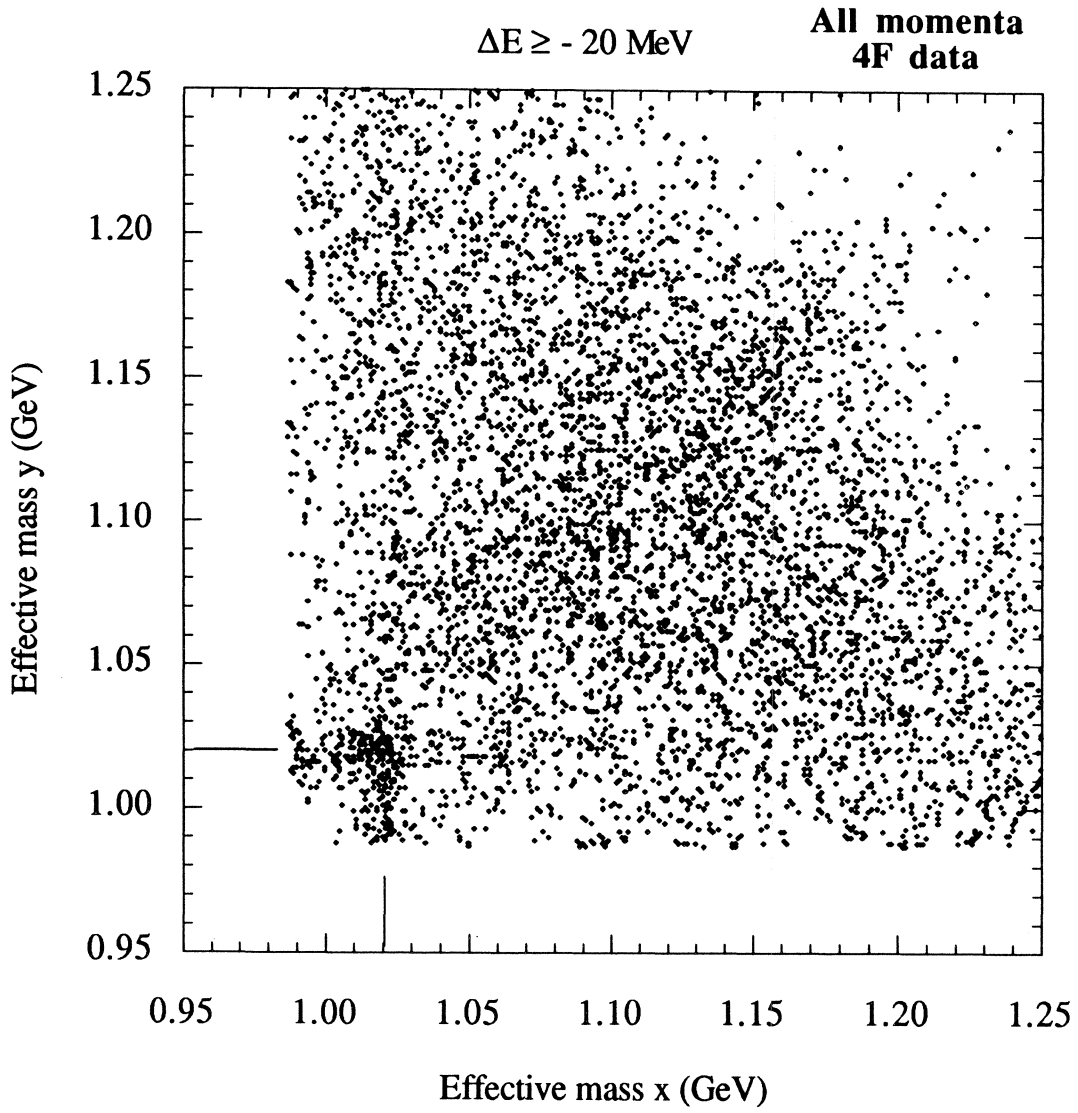
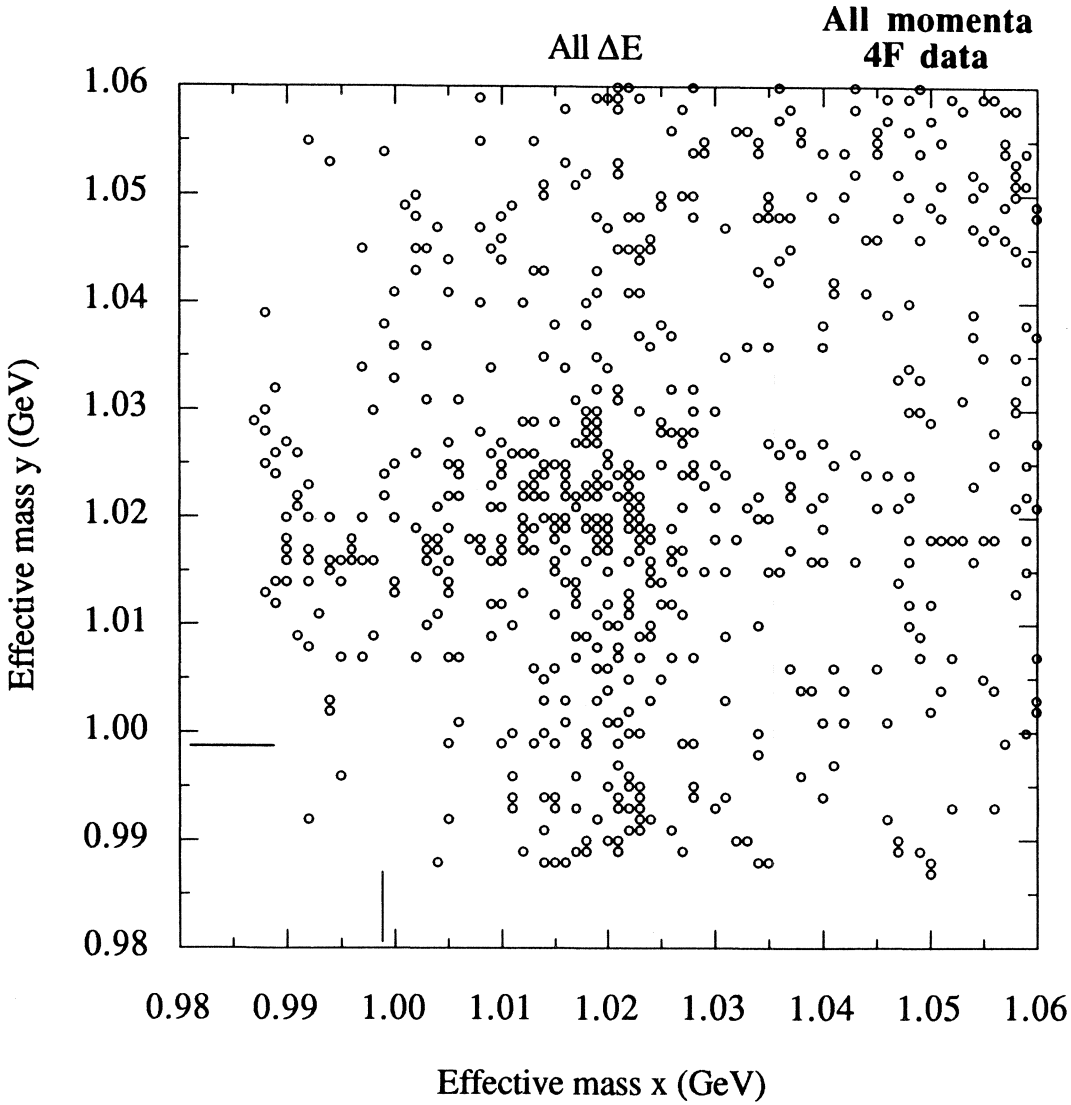
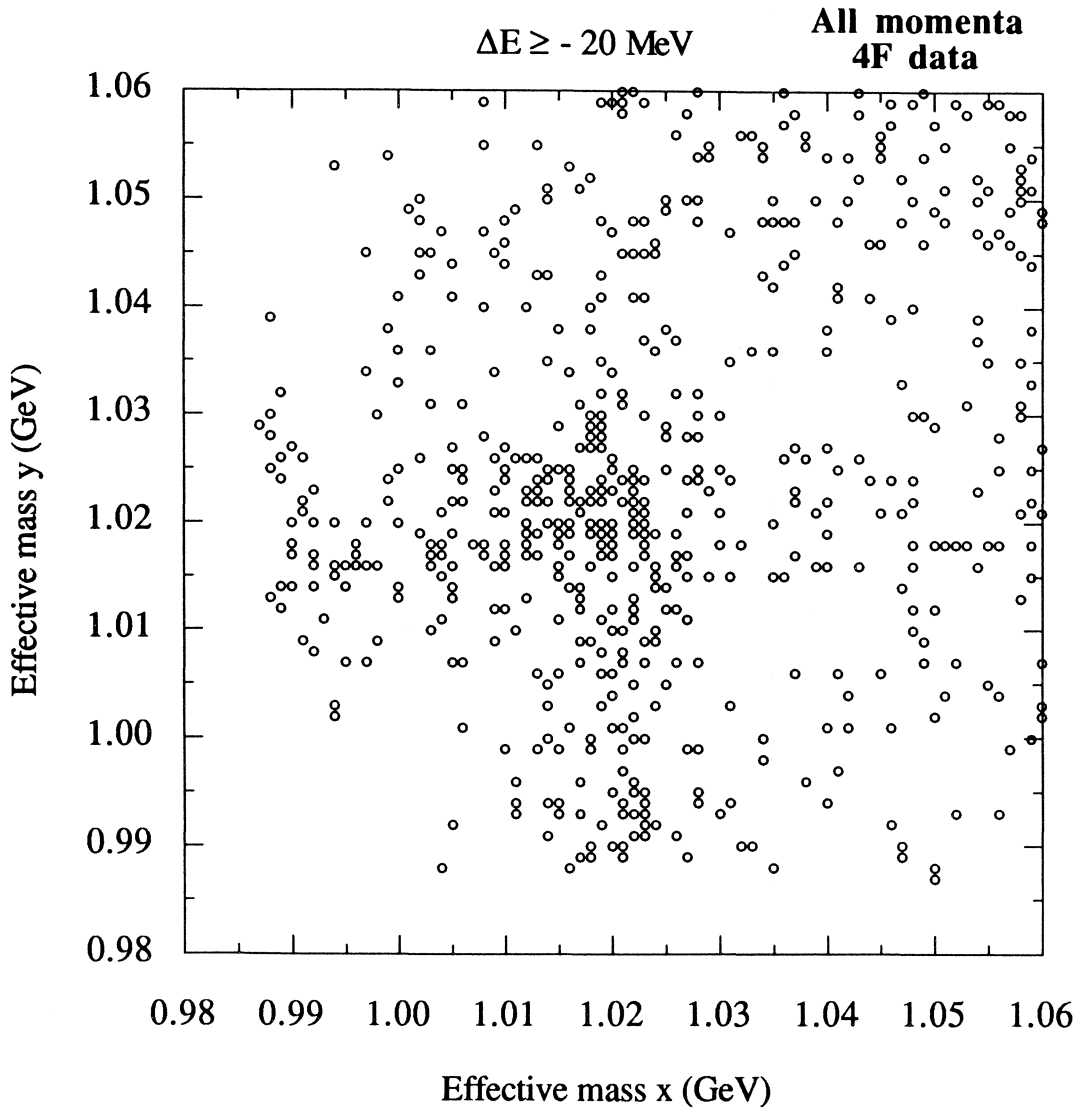
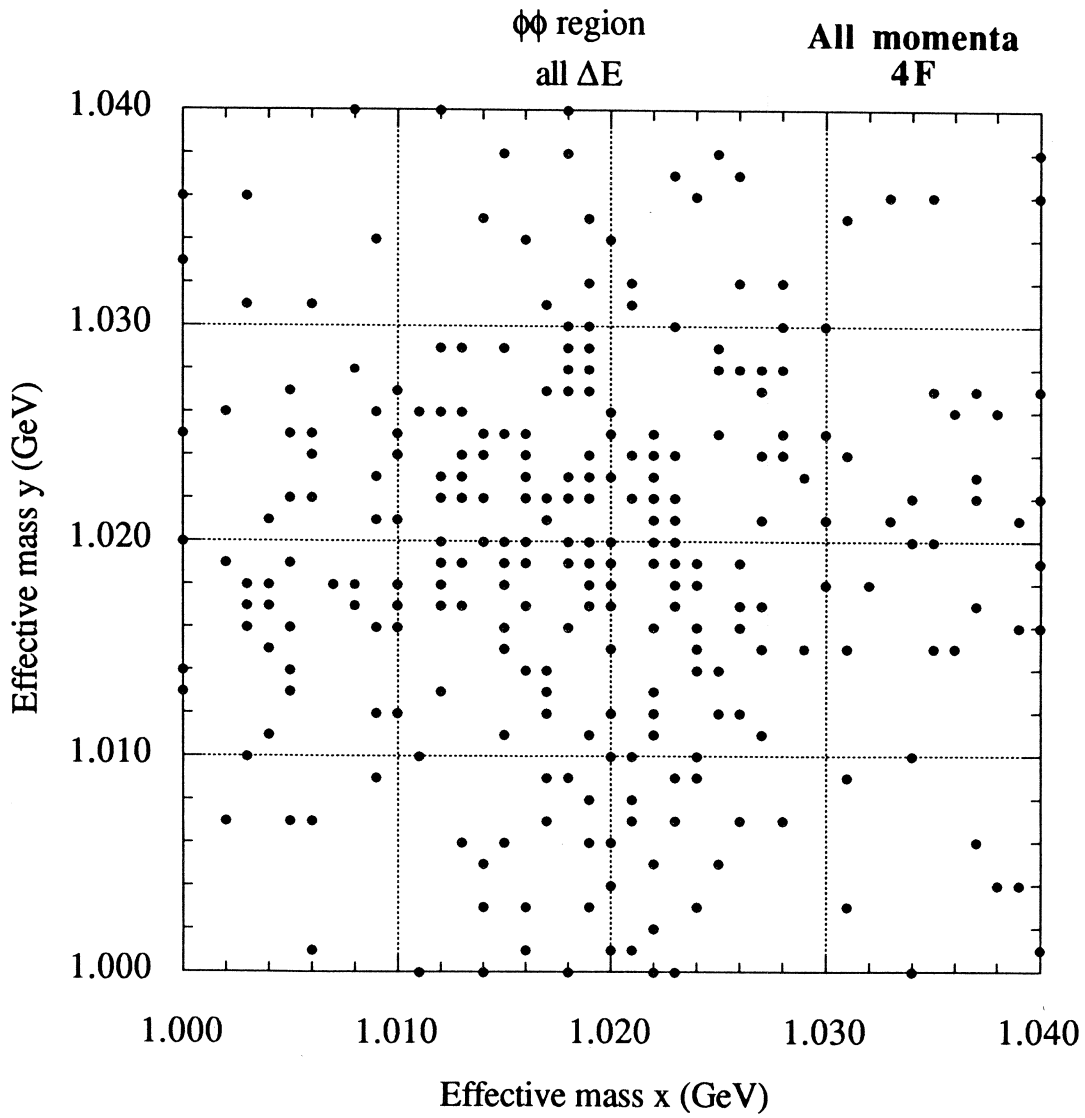
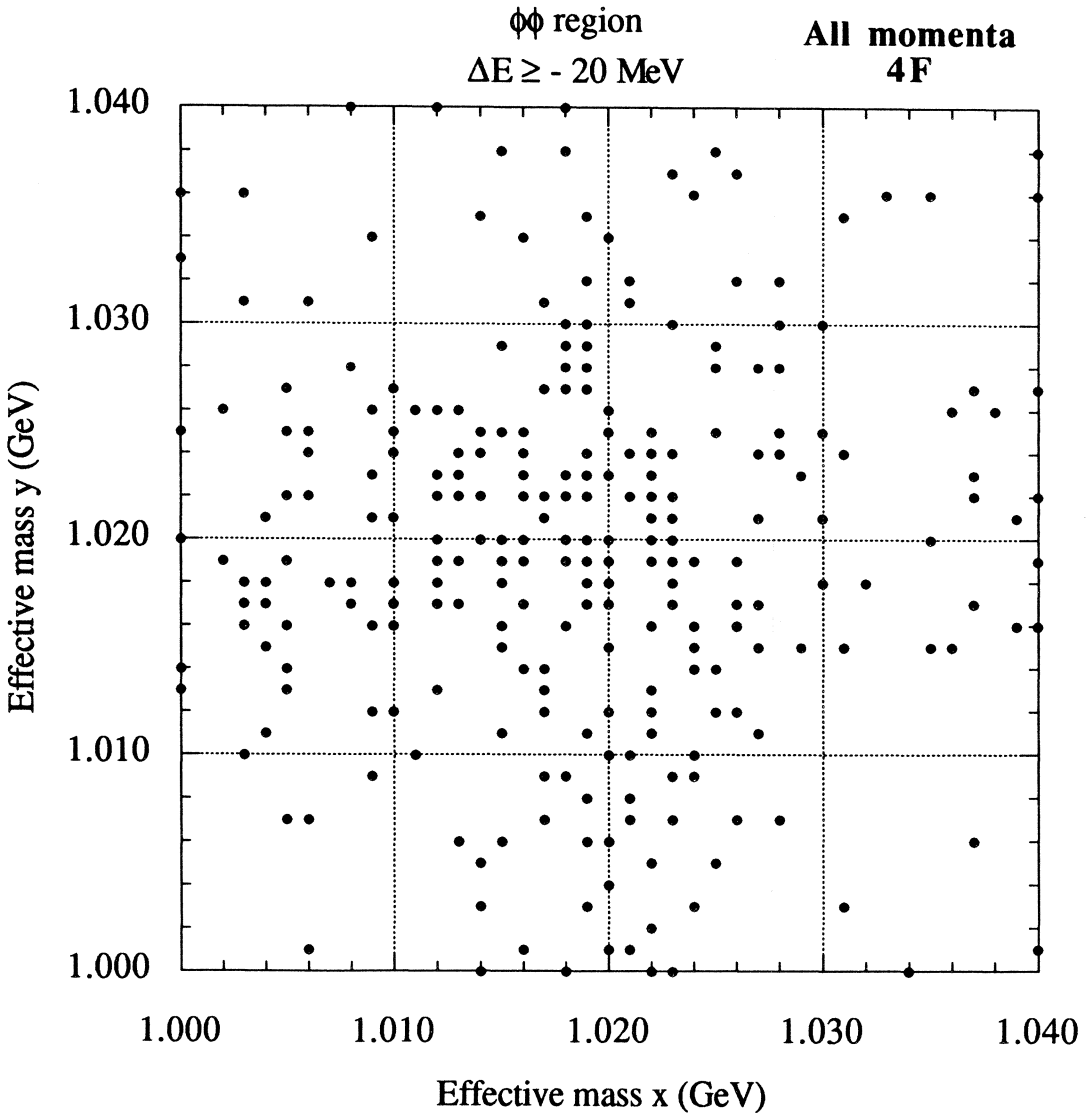

All ΔE
All momenta
4F data
Effective mass y (GeV)
1.25
1.20
1.15
1.10
1.05
1.00
0.95
0.95
1.00
1.05
1.10
1.15
1.20
1.25
Effective mass x (GeV)


ΔE ≥ - 20 MeV
All momenta
4F data
1.25
1.20
1.15
1.10
1.05
1.00
0.95
Effective mass y (GeV)
0.95
1.00
1.05
1.10
1.15
1.20
1.25
Effective mass x (GeV)


All ΔE
All momenta
4F data
1.06
1.05
1.04
1.03
1.02
1.01
1.00
0.99
0.98
Effective mass y (GeV)
0.98
0.99
1.00
1.01
1.02
1.03
1.04
1.05
1.06
Effective mass x (GeV)


ΔE ≥ - 20 MeV
All momenta
4F data
1.06
1.05
1.04
1.03
1.02
1.01
1.00
0.99
0.98
Effective mass y (GeV)
0.98
0.99
1.00
1.01
1.02
1.03
1.04
1.05
1.06
Effective mass x (GeV)


φφ region
all ΔE
All momenta
4F
1.040
1.030
1.020
1.010
1.000
Effective mass y (GeV)
1.000
1.010
1.020
1.030
1.040
Effective mass x (GeV)


φφ region
ΔE ≥ - 20 MeV
All momenta
4F
1.040
1.030
1.020
1.010
1.000
Effective mass y (GeV)
1.000
1.010
1.020
1.030
1.040
Effective mass x (GeV)

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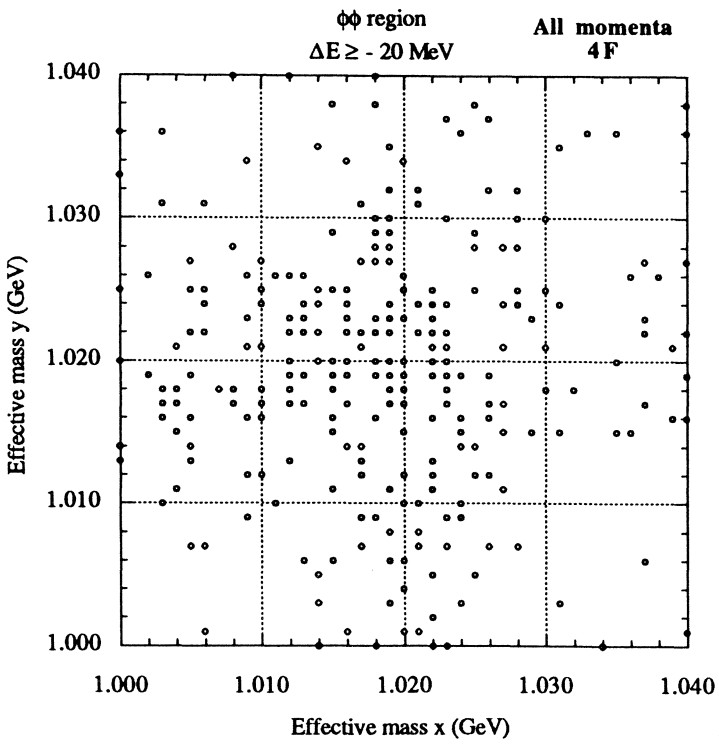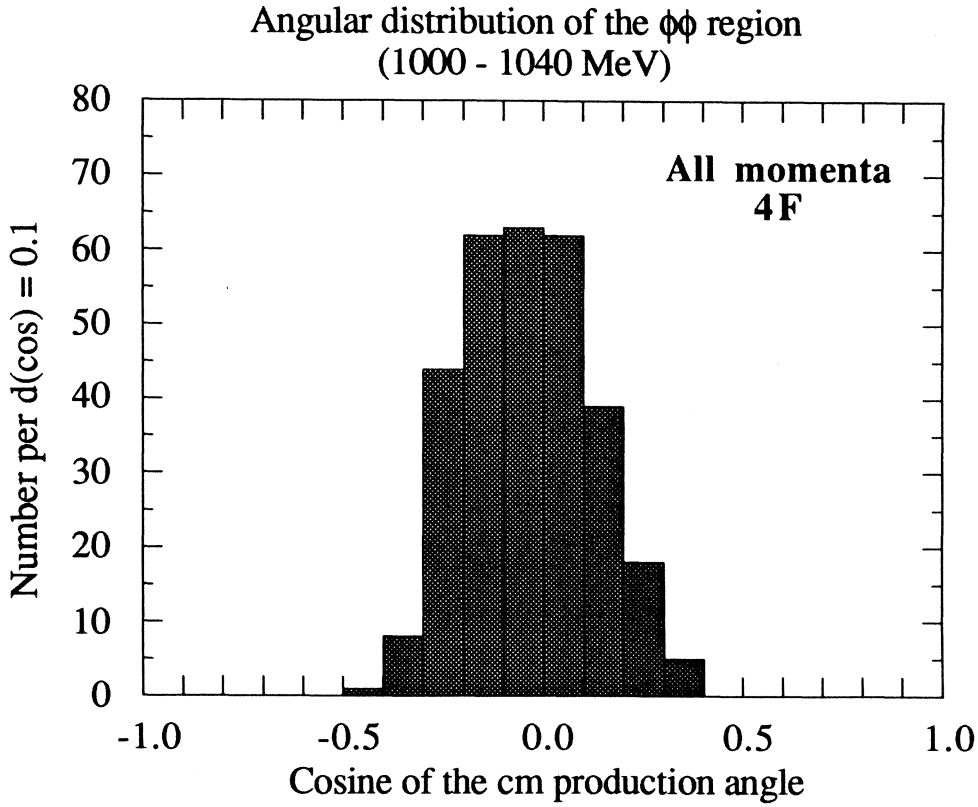
Prix: 5.10 Fr.