LEPTONIC SUSY SEARCH WITH SAME SIGN DIMUONS

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CUTS

$2SS\ Global\ \ Muons$

$pt > 10,\ \ nHits > 11$

$|\eta| < 2.1, \quad \chi^2 / ndof > 3$

$|d_0| < 0.2, \quad ECE < 4, \quad HCE < 6$

muon ID

$nJets > 3, \quad Jet\_et\_L > 175, \quad Jet\_et\_NL > 130,$

$Jet\_et\_NNL > 55$

$MET > 200$

	LM0	100/pb	LM1	100/pb	TTbar	100/pb
No cuts	48872	11000	30400	1600	630855	31700
2SSGμ	6670	494 (4.49%)	773	40.97 (2.56%)	24157	1207.8 (3.81%)
μID	960	71 (14.37%)	103	5.46 (13.33%)	3478	173.9 (14.4%)
Jet N>3 L Jet et>175	286	21.16 (29.8%)	56	2.97 (54.40%)	150	7.5 (4.31%)
Jet N>3 NL Jet et>175	116	8.58 (40.55%)	22	1.17 (39.4%)	51	2.55 (34%)
Jet N>3 NNL Jet et>55	72	5.33 (62.12%)	14	0.741 (63.33%)	32	1.6 (62.7%)
MET>200	20	1.48 (27.77%)	10	0.53 (71.5%)	2	0.1 (6.25%)

	WW	100/pb	WZ	100/pb	ZZ	100/pb
No cuts	100000	4480	84000	1740	57000	710
2SSGμ	330	14.78 (0.33%)	505	10.61 (0.61%)	254	3.16 (0.45%)
μID	10	0.45 (3.04%)	55	1.16 (10.93%)	11	0.13 (0.13%)
Jet N>3 L Jet et>175	0	0	0	0	1	0.012 (9.23%)
Jet N>3 NL Jet et>175	0	0	0	0	0	0
Jet N>3 NNL Jet et>55	0	0	0	0	0	0
MET>200	0	0	0	0	0	0

251 (0.251%)

265 (0.315%)

172 (0.302%)

125 (0.125%)

182 (0.217%)

161 (0.282%)

	QCD 100-250	100/pb	QCD 250-500	100/pb	QCD 500-1000	100/pb	QCD 1000-Inf	100/pb
No cuts	716227	1.5e+9	200000	4e+7	149728 3	1.4e+6	983120	37000
2SSGμ	470	984324(0.066%)	459	91800 (0.230%)	8173	7642 (0.546%)	12166	458 (1.24%)
μID	5	10470 (1.06%)	7	1400 (1.53%)	91	85 (1.11%)	60	2.256 (0.49%)
Jet N>3 L Jet et>175	0	0	0	0	38	35.53 (41.8%)	59	2.218 (98.3%)
Jet N>3 NL Jet et>175	0	0	0	0	26	24.31 (68.4%)	57	2.143 (96.6%)
Jet N>3 NNL Jet et>55	0	0	0	0	8	7.48 (30.8%)	46	1.730 (80.7%)
MET>200	0	0	0	0	0	0 (0%)	1	0.0376(2.14%)

0(0%)

8(0.004%)

10 (0.001%)

14 (0.007%)

- ABCD method introduction

ABCD METHOD

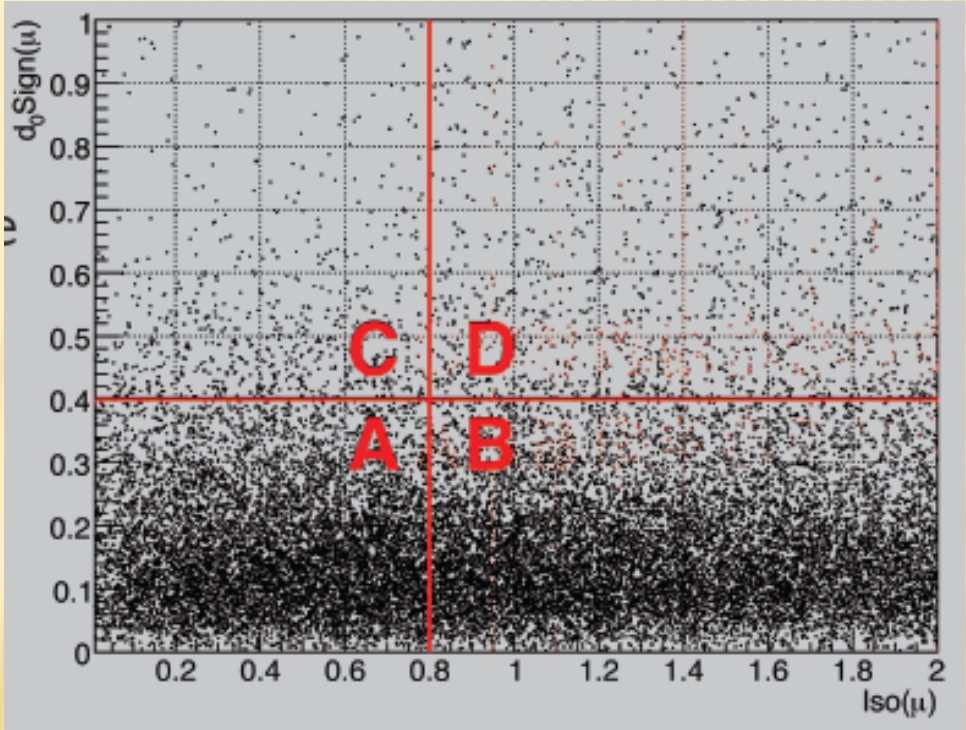
- Look at 2D distribution

Of two variables.

If the two variables are uncorrelated.

$$\frac{N_A}{N_B} = \frac{N_C}{N_D} \Rightarrow N_A = N_B \frac{N_C}{N_D}$$

Choose regions that signal is contained in it.

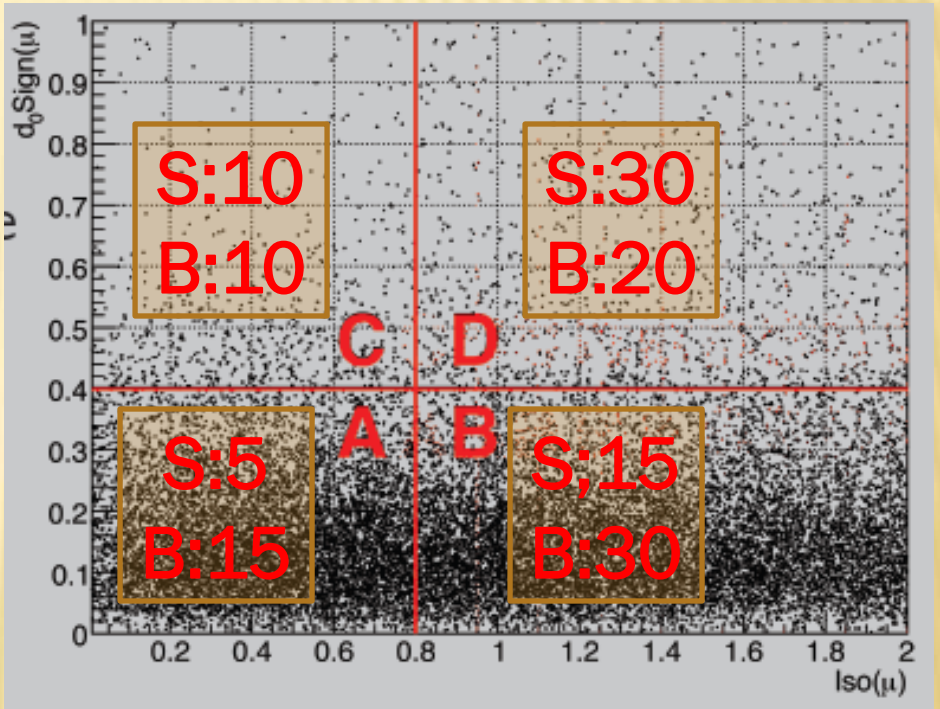


TWO SHORTCOMINGS OF ABCD METHOD

1. How to select two uncorrelated variables.
2. Signal contamination

Example: $\frac{N_B^C}{N_B^A}=\frac{N_B^D}{N_B^B},\frac{N_S^C}{N_S^A}=\frac{N_S^D}{N_S^B}$

D区为信号区。如果ABC三区的信号数远远小于本底数。那么D区的本底数可以近似等于$\frac{N^C}{N^A}\cdot N^B$



如果ABC的本底和信号可比，就不能近似了。

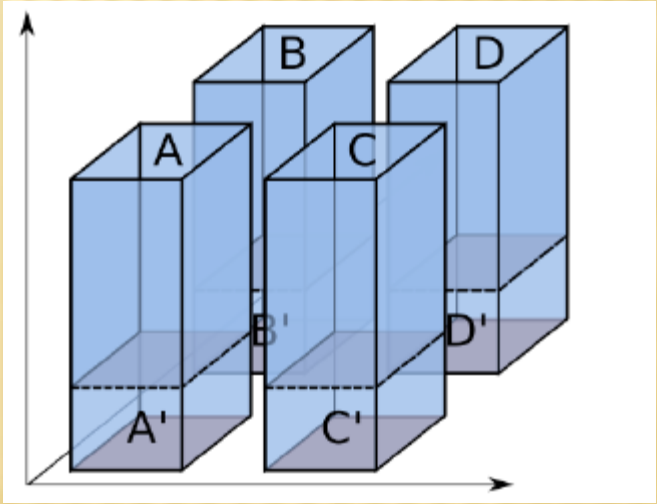
$$N_B^D=\frac{N^C}{N^A}\cdot N^B=\frac{N_B^C+N_S^C}{N_B^A+N_S^A}\cdot(N_B^B+N_S^B)=\frac{10+10}{15+5}\cdot(15+30)=45\neq 20$$

8 FIELDS/ESTIMATE CORRELATION

- We want to estimate correlation from data
- Measure correlation in signal depleted subregion A'C'B'D'
- Transport it into full ABCD regions to correct measurement
- Desired method for extension of ABCD:

  D=k'*B*C/A
- Measure k' in signal depleted subregion as:

  k'=(A'/B')(C'/D')



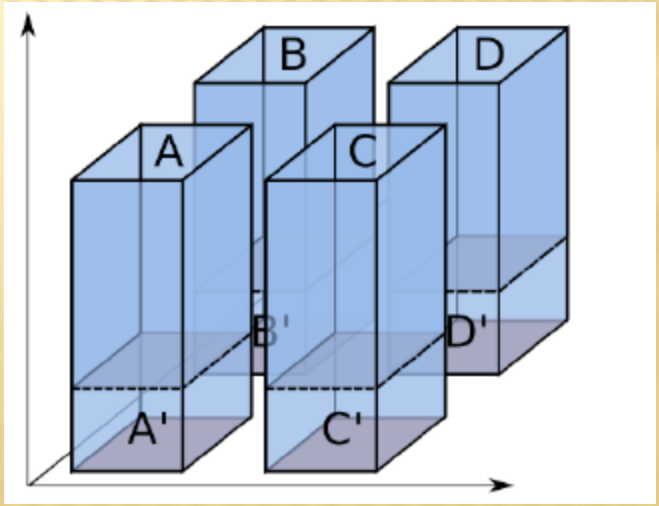
RUBIKS METHOD

- Attempt to improve 8 Fields by avoiding contamination
- Strong signal contamination in region B and C
- If variables allow estimate on the SIDES of the cube:

  B=B'*A/A'

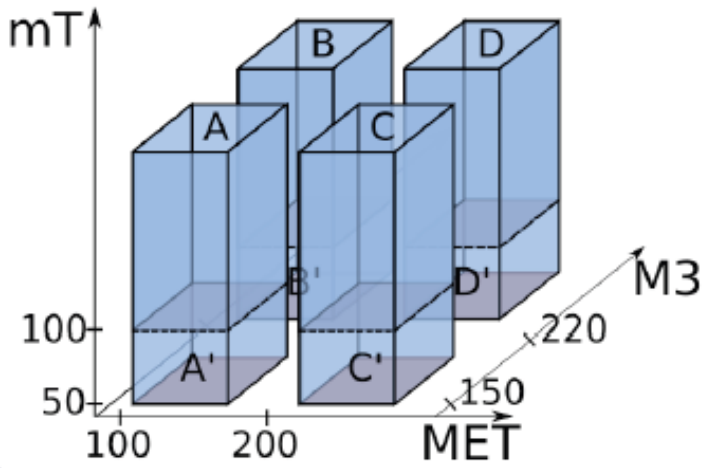
  C=C'*A/A'
- Combined with estimation for k from 8 fields
- Result:

  D=D'*A/A'
- Trade-Off between effect of correlation and signal contamination!



Results for 1 fb-1

	True Events in D at 1fb-1
TTbar	139
TTbar+WJets	**235**
LM1	360
LM2	72
LM8	149

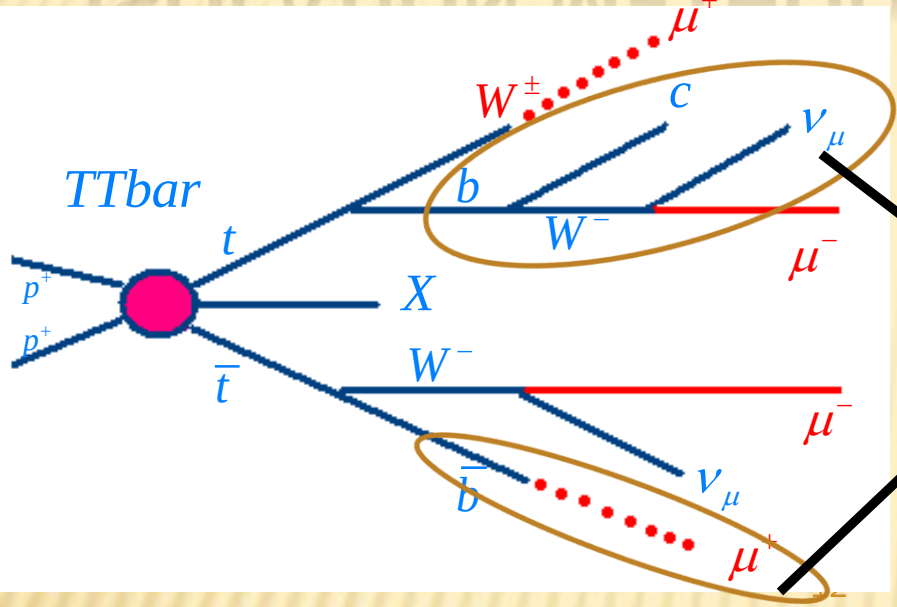


Estimation	ABCD MET/M3	8 Fields	Rubiks
No Signal	177 ± 32	214 ± 35	219 ± 27
Cont w/ LM1	241 ± 38	458 ± 68	407 ± 37
Cont w/ LM2	185 ± 30	247 ± 42	245 ± 28
Cont w/ LM8	208 ± 35	286 ± 46	260 ± 29

- ABCD does not work due to correlation
- Estimation increases quality of result
- Evading signal contamination brings additional small gain

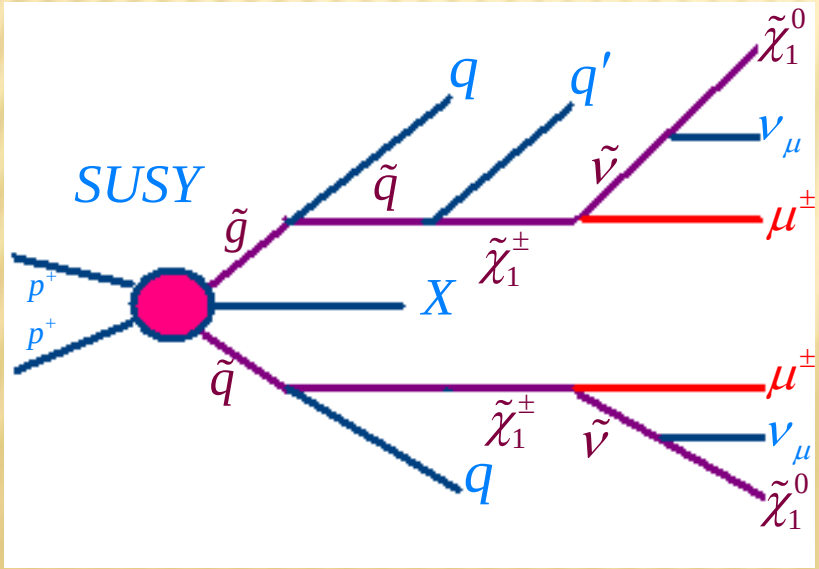
Fully realistic error estimates

ISOLATION METHOD



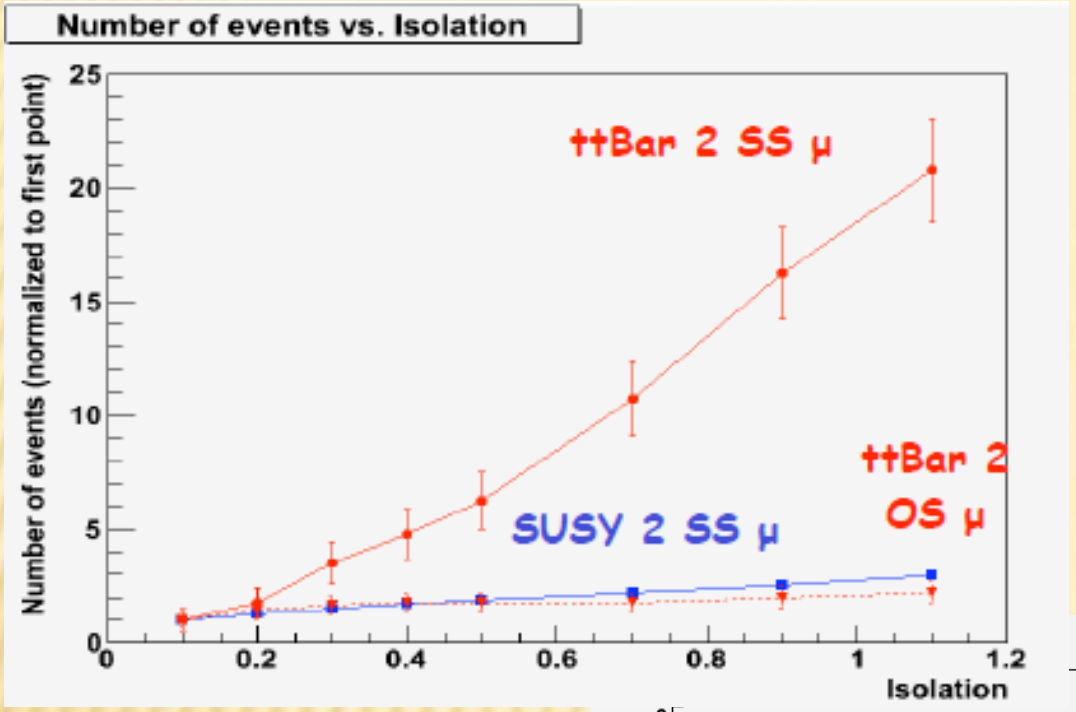
JET

- In ttbar background, one muon must come from b quark. (non-isolated)



- In SS dimuon susy events, both muon are excepted to be prompt. (isolated)

Isolation: TTbar vs SUSY(LM0)



Loose cuts:

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$nJets > 3,\quad Jet\_et\_L > 55,$

$Jet\_et\_NL > 35,$

$Jet\_et\_NNL > 30$

$MET\ > 40$

Normalized to first point