LEPTONIC SUSY SEARCH WITH SAME SIGN DIMUONS (TTBAR BACKGROUND ESTIMATION)

Jingjing ZANG

藏京京

REUSLT OF UCSB AND KIT

Process	Num evts in 100/pb		Efficiency(%)		Comments
	UCSB	KIT	UCSB	KIT	
LM0	3.49233	3.256	0.0317485	0.0296	
LM1	0.635566	0.613	0.0395745	0.0382	
LM2	0.103858	0.109	0.0429168	0.0452	
LM3	0.937129	0.902	0.0794851	0.0765	
LM4	0.390348	0.352	0.0582609	0.0525	
LM5	0.093871	0.090	0.0483874	0.0466	
LM6	0.215295	0.213	0.1682	0.1666	
LM7	0.116343	0.144	0.0401183	0.0498	
LM8	0.57416	0.537	0.200756	0.1879	
LM9	0.253765	0.231	0.0219141	0.0199	
wjets	0		0		
zjets	0	0	0	0	
ttbar	0.0402708	0.046	9.7721e-05	14.3e-05	

Process	Num evts in 100/pb At least 2 muons	Efficiency(%)
LM0	6.888 (3.29)	0.0562 (0.0299)
LM1	1.152 (0.59)	0.0729 (0.0370)
TTbar	1.178 (0.5058)	0.0037 (0.0016)
Wjets	0	0
Zjets	0	0
WW	0	0
WZ	0	0
ZZ	0	0

- I also plan to QCD backgroud data sample, but I was faced with a problem.

- So ttbar may be our main background
  - It’s very important to estimate it.

TWO ESTIMATING METHOD

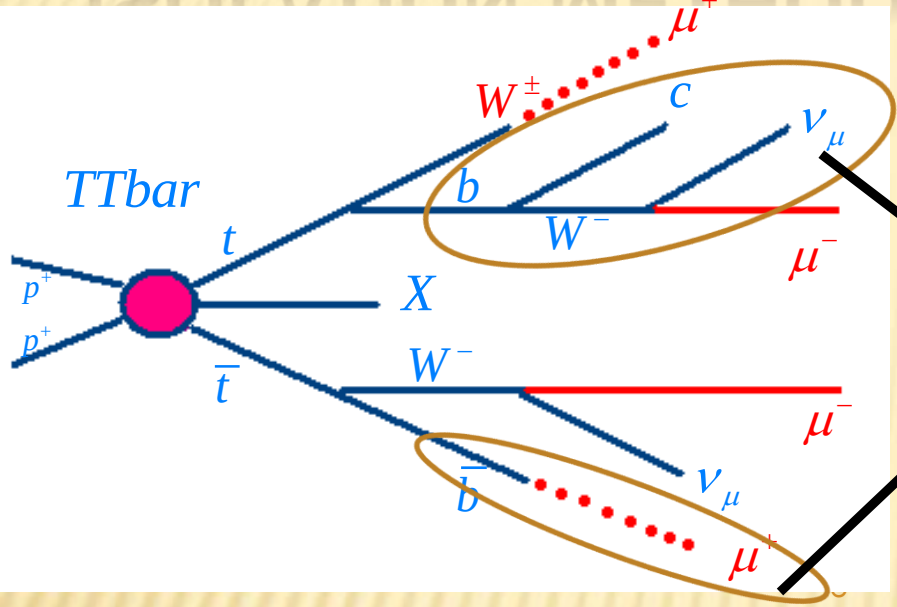
- Isolation method

  based in different muon isolation behavior between ttbar and susy

- ABCD method

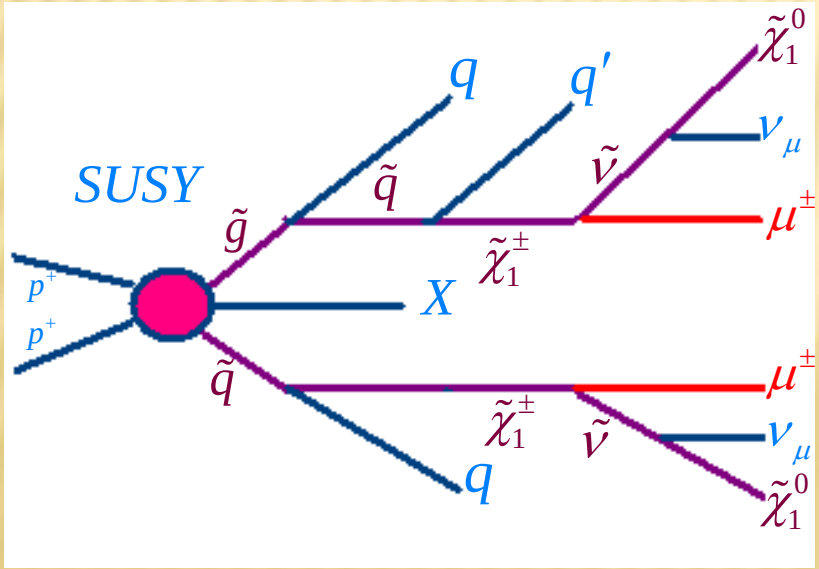
  based on two independent variables 2D distribution

ISOLATION METHOD



JET

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

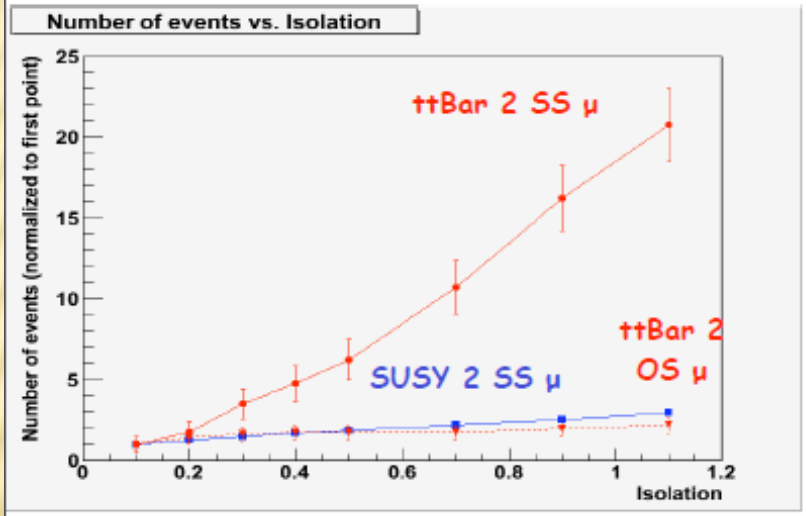


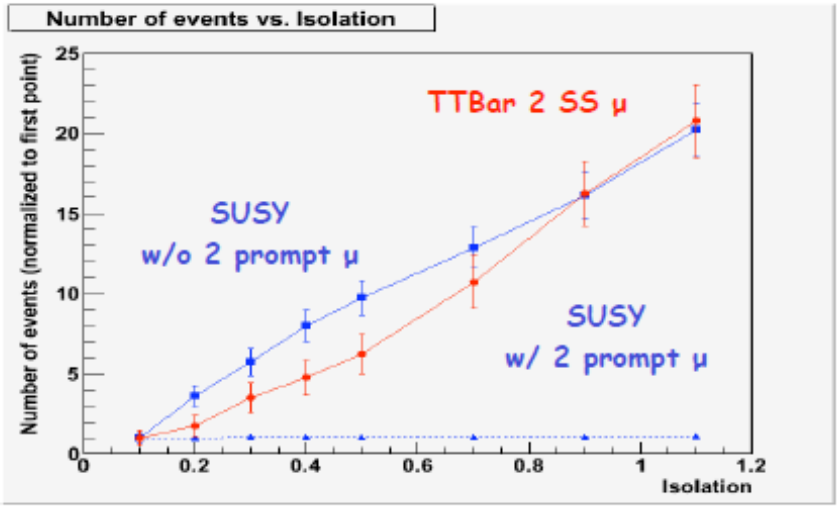
- In SS dimuon susy events, both muon are excepted to be prompt. (isolated)

Following is sildes of UF.

Isolation: ttBar vs SUSY

In SUSY 90% of the SS events are prompt (isolated), and 10 % are non-prompt (should have same isolation behavior as SS muons in ttBar)

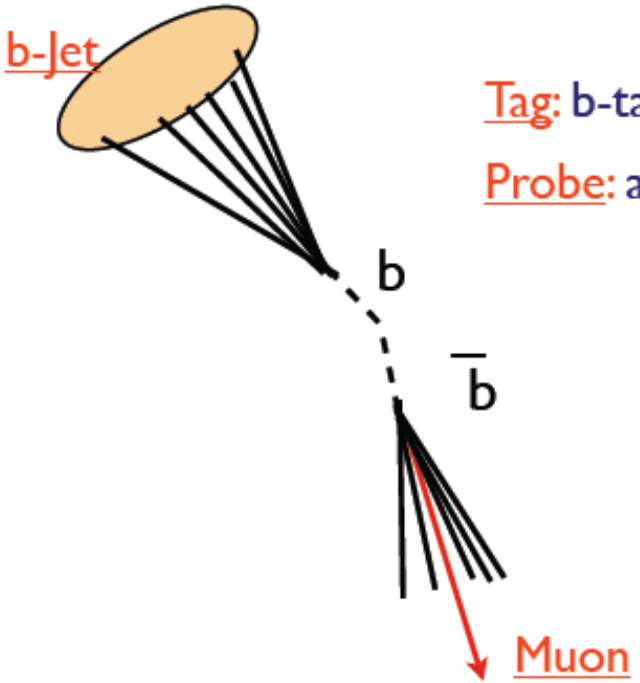




- All selection cuts applied, only isolation parameter relaxed
- Values in every point normalized to value in first point
- Number of selected events with 2 SS muons in SUSY signal and TTBar background has different dependence on relaxed isolation threshold

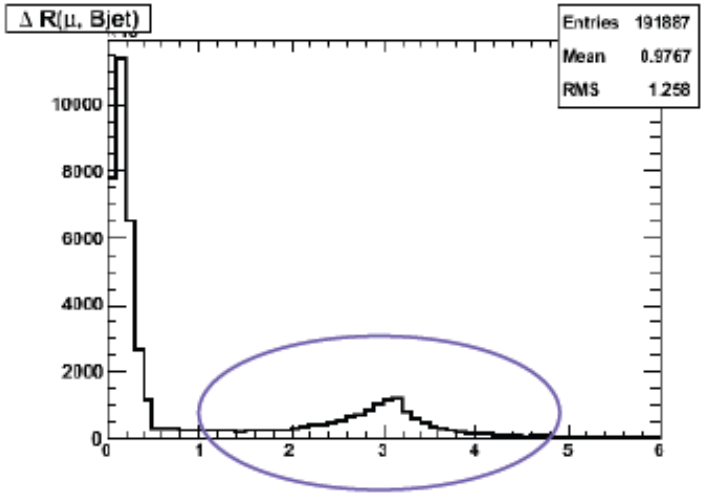
Tag-and-Probe for isolation

- data driven Tag-and-Probe method based on the knowledge that b-quarks are produced in pairs, use QCD events.



Tag: b-tagged jet with high purity

Probe: a muon in the opposite hemisphere to the b-jet

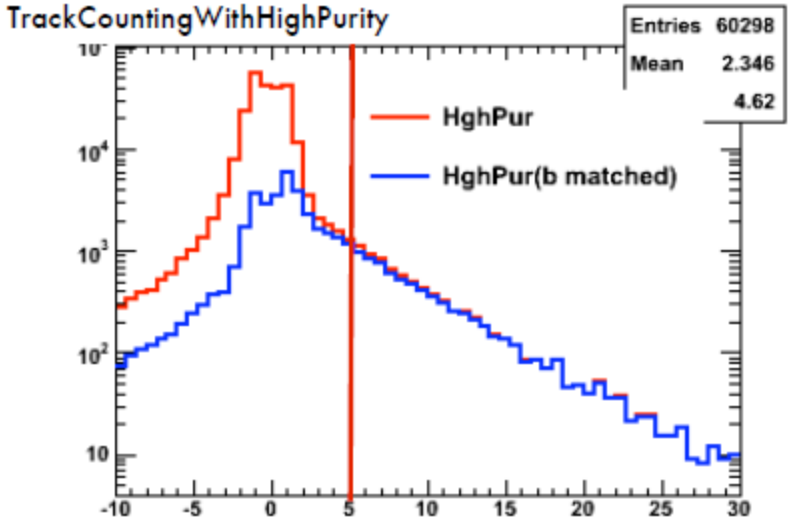


Muons with ΔR(b-jet,μ)>1 selected

Data Samples & Methods

UF UNIVERSITY of FLORIDA

- Using PAT
- QCD_BCtoMu Summer08 & MC@NLO ttBar Summer08
- "GlobalMuons"
- Jets with ICone05
- RelativeIsolationR03

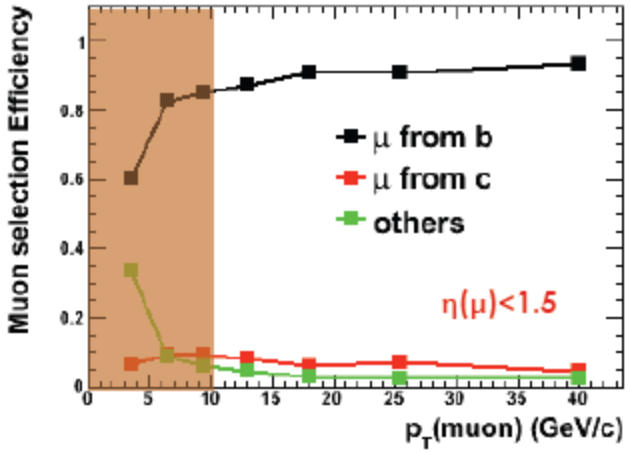


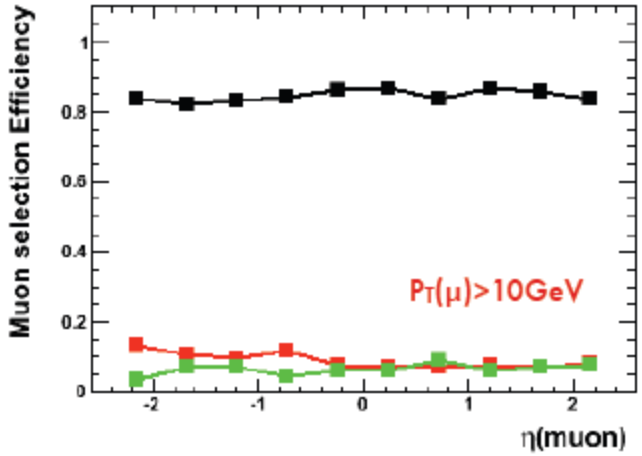
- b-tagging with a "TrackCountingWithHighPurity" discriminator: Impact Parameter significance of the third track (ordered in descending significance)
- ~40% efficiency

Are we probing right muon ?

UF UNIVERSITY of FLORIDA

muons matched(with ΔR) to b-,c-quarks





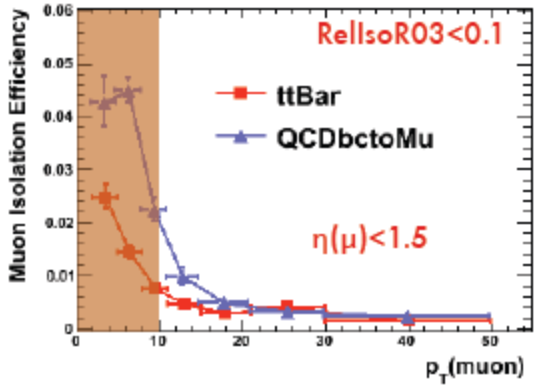
- Selecting muons in the opposite hemisphere to b-tagged jets provide ~80% purity of getting the right muon
- ~10% from c-quarks, probably also coming from b-decays
- >90% of the case we are working with the right muon
- if the b-tagged jet is fake, it contributes to "others"

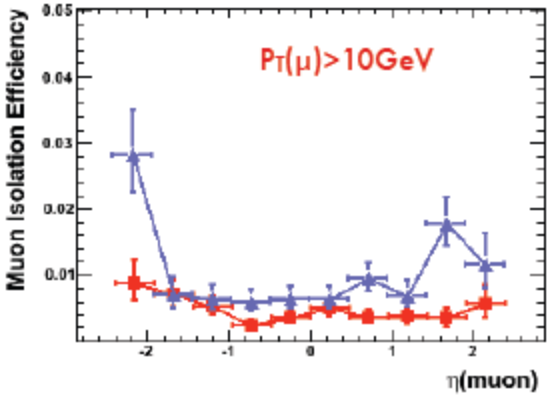
data-driven vs. MC

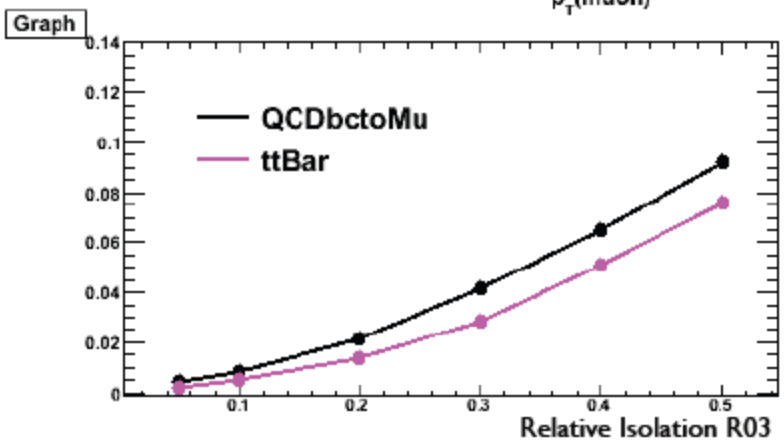
UF UNIVERSITY of FLORIDA

Data-driven: using b-tag and muon probe

MC: Isolation efficiency of muon which matches to b-quark in ttBar events







- Resonable agreement (in the phase-space of interest) between tag-and-probe and MC matching methods
- strong dependence in b-tagged jet pT

ABDC METHOD

- Look at 2D distribution

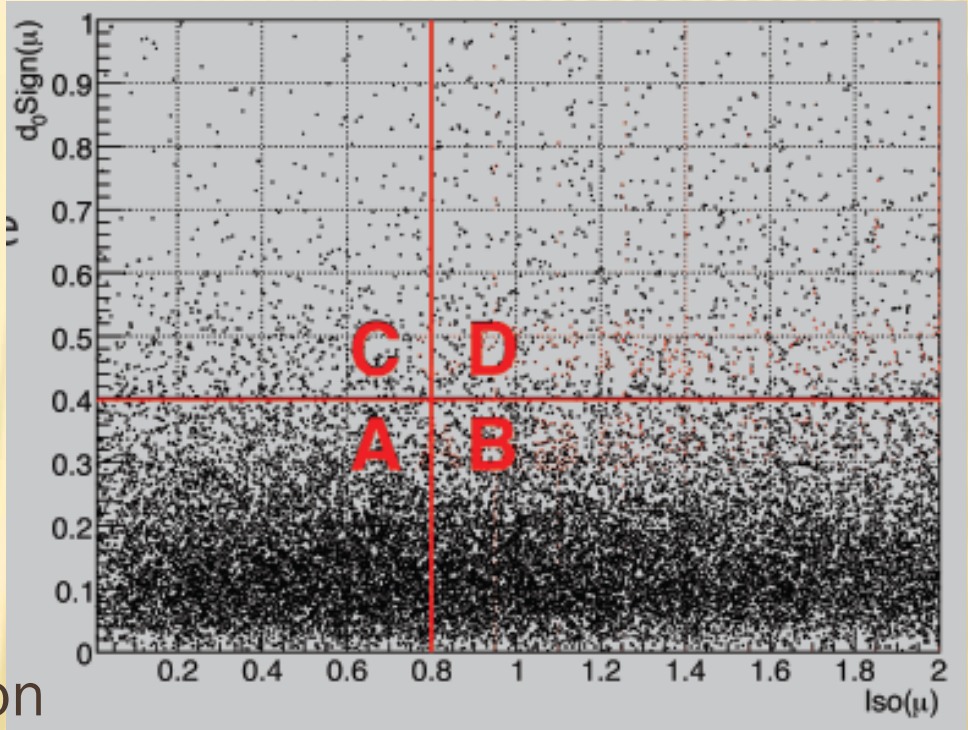
Of two variables

- Can estimate event

Count in one region using the other regions in case they are uncorrelated

- Choose regions such that signal is contained in one region

In example:



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

- They have extended 2 variables to 3 variables. I plan to report a detailed explanation of ABCD method.
- I also want to using the Isolation method to estimate my ttbar and QCD BG.