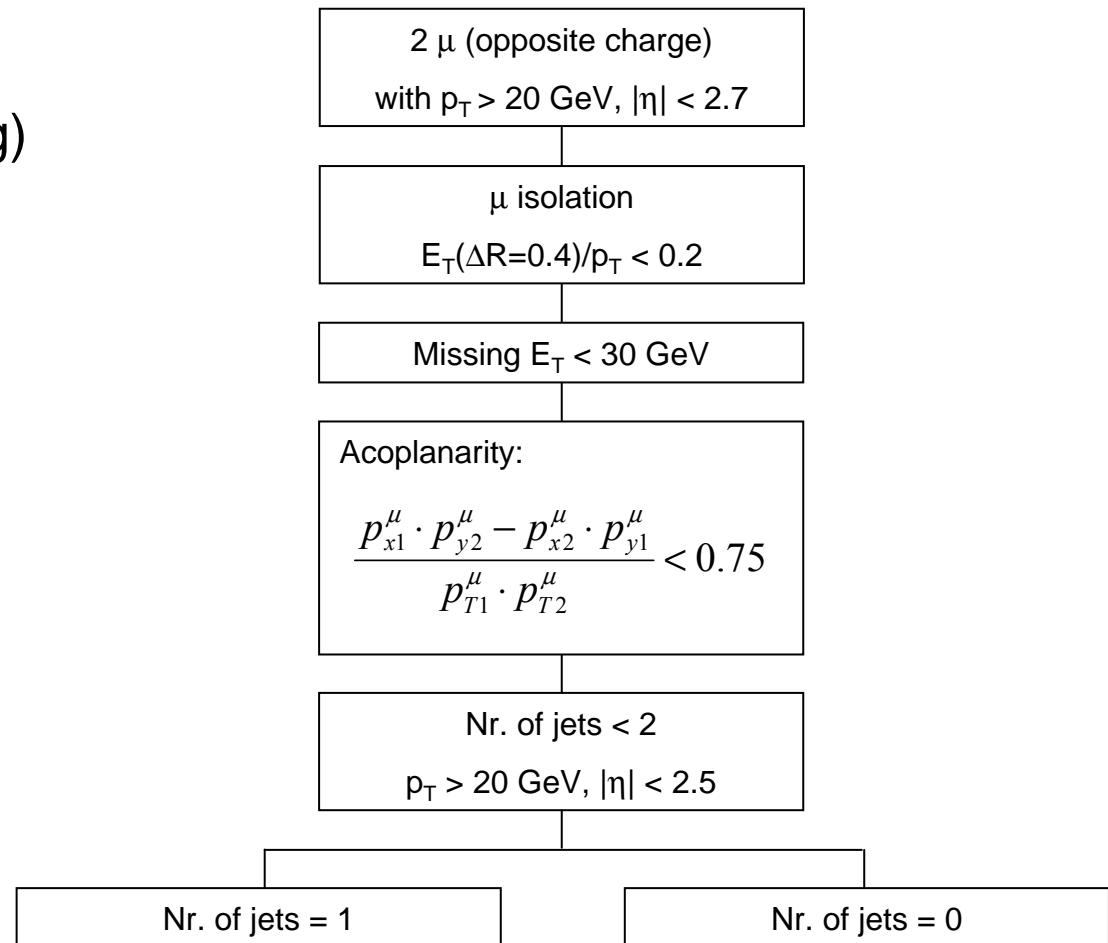


Higgs to Muons Status, CSC Note and Plans

Arantxa Ruiz Martínez
TileCal Valencia meeting
December 17th, 2007

Analysis Overview

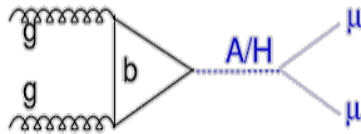
- $A \rightarrow \mu\mu$ inclusive analysis (without requiring b-tagging)
- Feasible to be done with very first ATLAS data, low integrated luminosity required



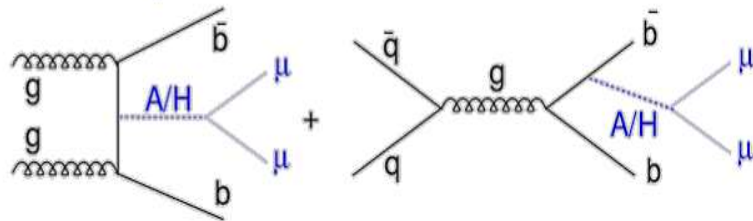
Cut flow tables for signal samples

- Signal samples used:
 - Gluon fusion $gg \rightarrow A$
 - bbA

Direct production:



Associated production:



- Best sensitivity at high $\tan \beta$ and m_A values.

Table 1: Cuts for $gg \rightarrow A(200, 30) \rightarrow \mu\mu$ ($\sigma=71.95$ fb, dataset=6335, Staco).

Cut	Nr. of events	Absolute	Relative	σ (fb)
All events	8500	1		71.95
$2 \mu p_T > 20$ GeV, $ \eta < 2.7$	6471	0.761	0.761	54.78
muon isolation	6061	0.713	0.937	51.31
MET < 30 GeV	5612	0.660	0.926	47.50
acoplanarity	5203	0.612	0.927	44.04
nr. of jets < 2	4452	0.524	0.856	37.69
nr. of jets=1	1723	0.203	0.387	14.58
nr. of jets=0	2729	0.321	0.613	23.10

Table 2: Cuts for $bbA(200, 45) \rightarrow \mu\mu$ ($\sigma=160.24$ fb, dataset=6339, Staco).

Cut	Nr. of events	Absolute	Relative	σ (fb)
All events	2250	1		160.24
$2 \mu p_T > 20$ GeV, $ \eta < 2.7$	1710	0.760	0.760	121.78
muon isolation	1611	0.716	0.942	114.73
MET < 30 GeV	1494	0.664	0.927	106.40
acoplanarity	1436	0.638	0.961	102.27
nr. of jets < 2	1265	0.562	0.881	90.09
nr. of jets=1	398	0.177	0.315	28.34
nr. of jets=0	867	0.385	0.685	61.74

Table 3: Cuts for $bbA(300, 30) \rightarrow \mu\mu$ ($\sigma=14.97$ fb, dataset=6342, Staco).

Cut	Nr. of events	Absolute	Relative	σ (fb)
All events	2500	1		14.97
$2 \mu p_T > 20$ GeV, $ \eta < 2.7$	1943	0.777	0.777	11.63
muon isolation	1808	0.723	0.931	10.82
MET < 30 GeV	1558	0.623	0.862	9.33
acoplanarity	1528	0.611	0.981	9.15
nr. of jets < 2	1235	0.494	0.808	7.39
nr. of jets=1	405	0.162	0.328	2.42
nr. of jets=0	830	0.332	0.672	4.97

Cut flow tables for background samples

- Background samples used:
 - $Z \rightarrow \mu\mu$
 - $Z \rightarrow \mu\mu$ ($M > 150$ GeV)
 - $ZZ \rightarrow bb\mu\mu$ [\times BR($Z \rightarrow$ hadrons/ $Z \rightarrow bb$)]
 - WW
 - $t\bar{t}$

Table 4: Cuts for $Z \rightarrow \mu\mu$ ($\sigma=1497$ pb, dataset=5145, Staco).

Cut	Nr. of events	Absolute	Relative	σ (pb)
All events	435850	1		1497.00
$2 \mu p_T > 20$ GeV, $ \eta < 2.7$	168733	0.387	0.387	579.54
muon isolation	159731	0.366	0.947	548.62
MET < 30 GeV	156993	0.360	0.983	539.22
acoplanarity	147038	0.337	0.937	505.03
nr. of jets < 2	137606	0.316	0.936	472.63
nr. of jets = 1	31783	0.073	0.231	109.16
nr. of jets = 0	105823	0.243	0.769	363.47

Table 5: Cuts for $Z \rightarrow \mu\mu$, $M > 150$ GeV ($\sigma=1.647$ pb, dataset=5115, Staco).

Cut	Nr. of events	Absolute	Relative	σ (pb)
All events	19750	1		1.65
$2 \mu p_T > 20$ GeV, $ \eta < 2.7$	8791	0.445	0.445	0.73
muon isolation	8263	0.418	0.940	0.69
MET < 30 GeV	7690	0.389	0.931	0.64
acoplanarity	7421	0.376	0.965	0.62
nr. of jets < 2	6712	0.340	0.904	0.56
nr. of jets = 1	1959	0.099	0.292	0.16
nr. of jets = 0	4753	0.241	0.708	0.40

Table 6: Cuts for $ZZ \rightarrow bb\mu\mu$ ($\sigma=0.091$ pb, dataset=6356, Staco).

Cut	Nr. of events	Absolute	Relative	σ (fb)
All events	10000	1		91.00
$2 \mu p_T > 20$ GeV, $ \eta < 2.7$	5335	0.533	0.533	48.55
muon isolation	4762	0.476	0.893	43.33
MET < 30 GeV	4339	0.434	0.911	39.48
acoplanarity	3448	0.345	0.795	31.38
nr. of jets < 2	1615	0.162	0.468	14.70
nr. of jets = 1	1145	0.115	0.709	10.42
nr. of jets = 0	470	0.047	0.291	4.28

Table 8: Cuts for WW ($\sigma=24.5$ pb, dataset=5985, Staco).

Cut	Nr. of events	Absolute	Relative	σ (pb)
All events	50000	1		24.50
$2 \mu p_T > 20$ GeV, $ \eta < 2.7$	759	0.0152	0.015	0.37
muon isolation	721	0.0144	0.950	0.35
MET < 30 GeV	214	0.0043	0.297	0.10
acoplanarity	200	0.0040	0.935	0.10
nr. of jets < 2	194	0.0039	0.970	0.10
nr. of jets = 1	43	0.0009	0.222	0.02
nr. of jets = 0	151	0.0030	0.778	0.07

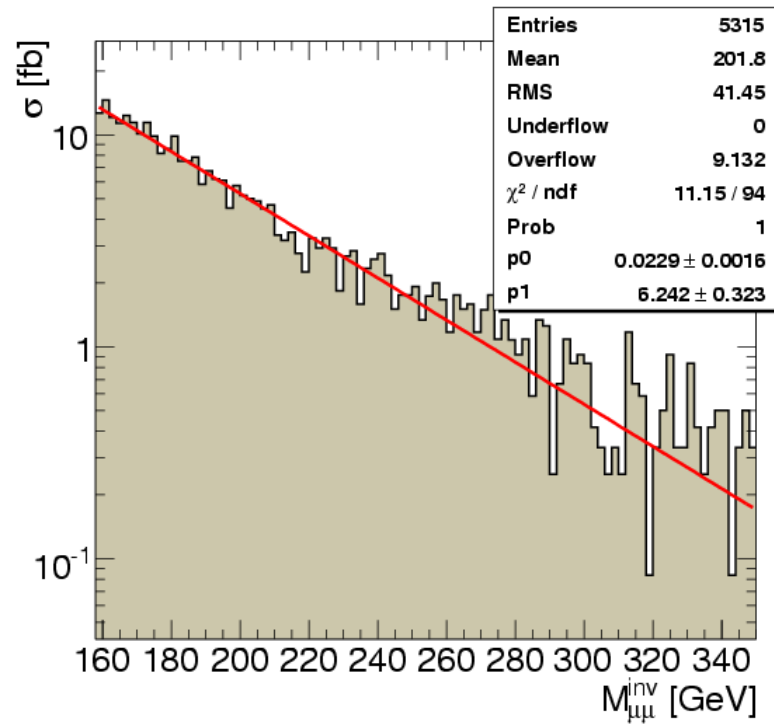
Table 9: Cuts for $t\bar{t}$ ($\sigma=56.5$ pb, dataset=5210, Staco).

Cut	Nr. of events	Absolute	Relative	σ (pb)
All events	360685	1		56.50
$2 \mu p_T > 20$ GeV, $ \eta < 2.7$	43720	0.1212	0.121	6.85
muon isolation	30751	0.0853	0.703	4.82
MET < 30 GeV	4242	0.0118	0.138	0.66
acoplanarity	3367	0.0093	0.794	0.53
nr. of jets < 2	577	0.0016	0.171	0.09
nr. of jets = 1	509	0.0014	0.882	0.08
nr. of jets = 0	68	0.0002	0.118	0.01

Fits performed (0-jet analysis)

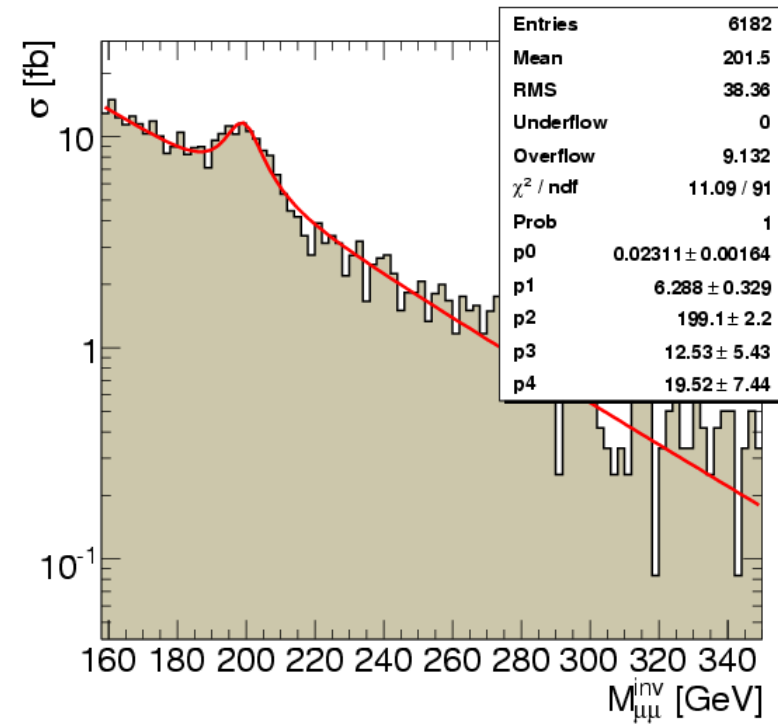
Background Only

FIT: $\exp(-ax+b)$



bbA(200,45) + Background

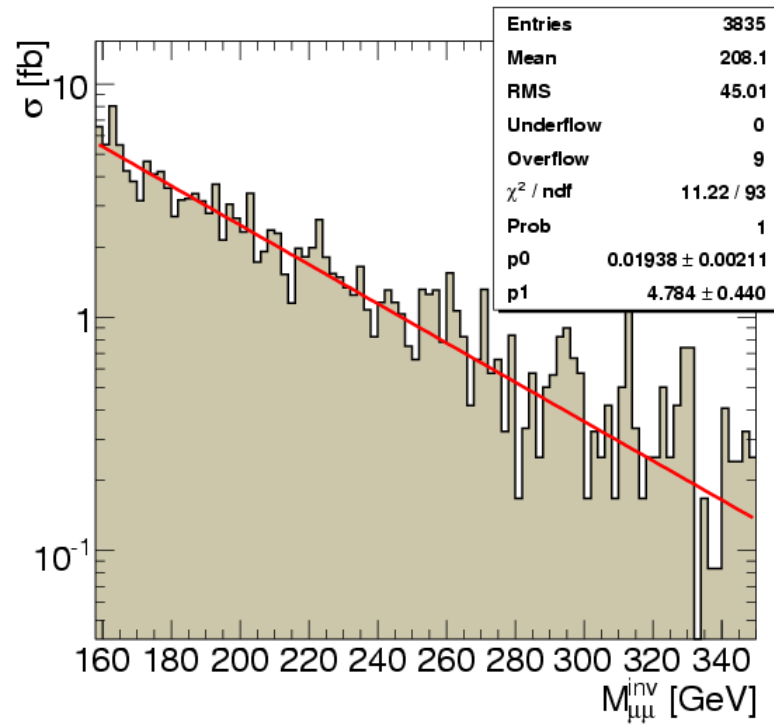
FIT: $\exp(-ax+b) + \text{Breit Wigner}$



Fits performed (1-jet analysis)

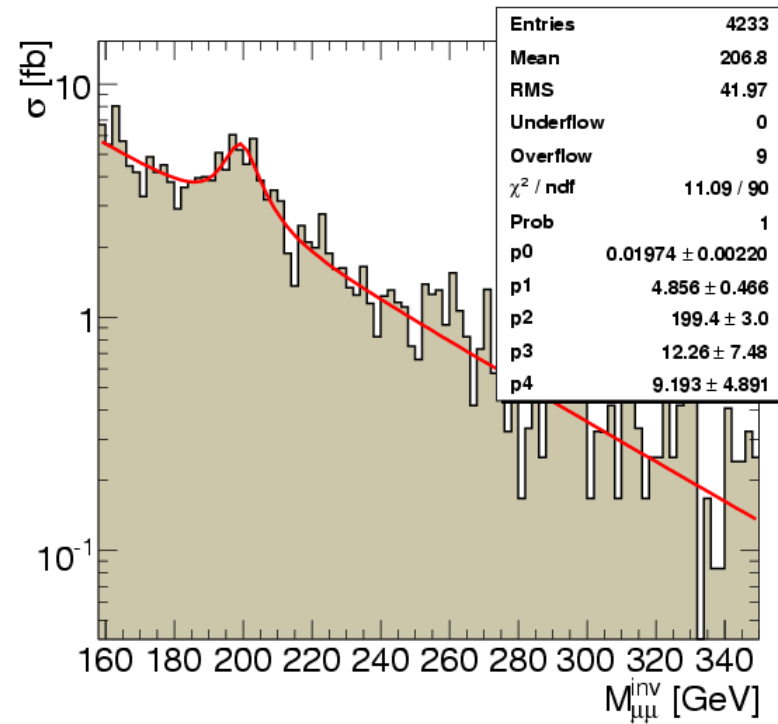
Background Only

FIT: $\exp(-ax+b)$



bbA(200,45) + Background

FIT: $\exp(-ax+b)$ + Breit Wigner



Next steps

- Generation of toy MC with the functions obtained with the fits to background and signal+background distributions, to be started soon
- Compute likelihood ratios
- First draft with the highlights of the contribution given to HG8 conveners (<http://aranzazu.web.cern.ch/aranzazu/draft.pdf>)