

Overview of work done



Carlos Solans
Valencia TileCal meeting
6th May 2009





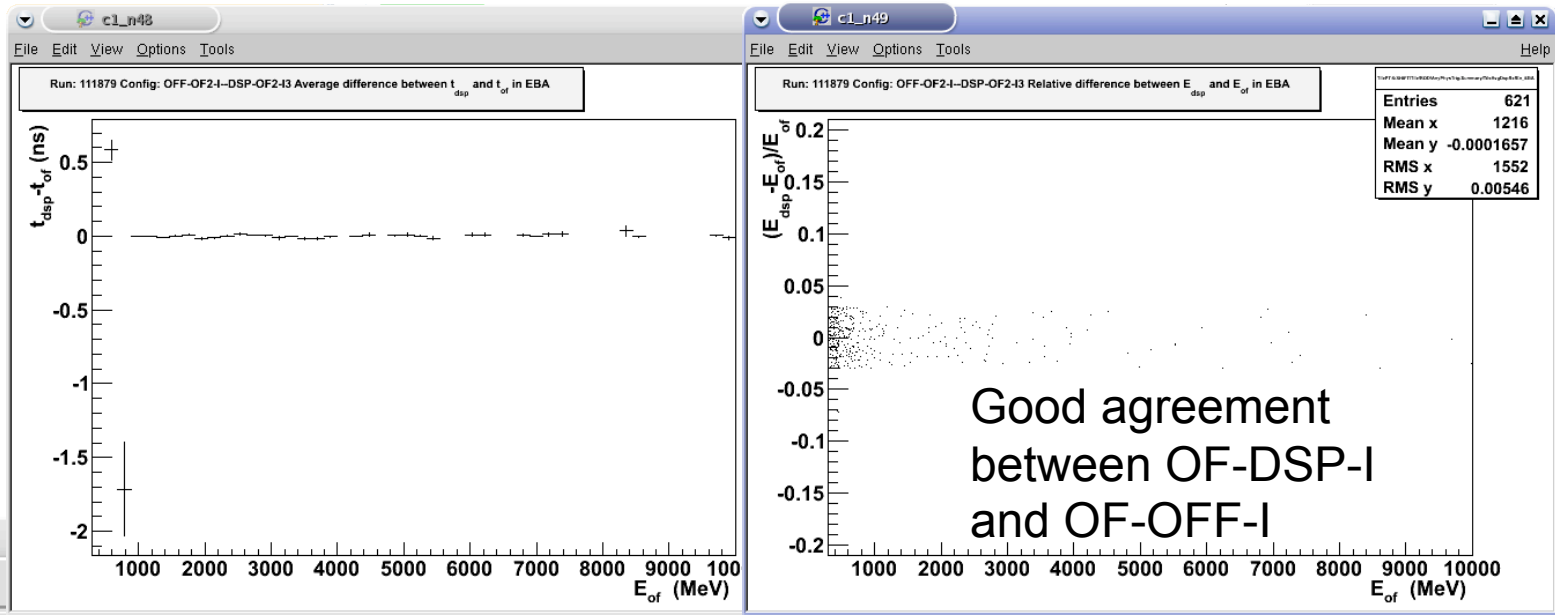
- Contributed to calorimeter (Tile+LAr +L1Calo+CTP) slice week (20-26 April)
 - Good agreement between DSP and offline magnitudes
 - ROD/DSP monitoring producing results
 - Steadily running at 80kHz (DSP only) for 30 min
 - ROD busy/ROS not accepting events issue not understood.
 - ROD configuration patch applied.
- Contributing to HLT slice (Calo+ID+Muon+HLT) week (4-10 May)
 - Taking DAQ on call shifts whole week.
 - Couple of DSP not booting problems and a misbehaving drawer.
- Compiled 2 Tile online releases (tile-2.0.1, tile-2.0.1.1)
 - Installed tdaq-02-00-01 in the lab (Valencia, CERN)

Service work



Plots produced by
EF monitoring
running online.
(AKA Mike's tool)

ROS status after
a non-recoverable
busy



Tile ROS status

File Help

EBA							LBA							LBC							EBC						
robId	Xoff	pagesFree	MayCome	NeverToCome	NotDeleted	frags	robId	Xoff	pagesFree	MayCome	NeverToCome	NotDeleted	frags	robId	Xoff	pagesFree	MayCome	NeverToCome	NotDeleted	frags	robId	Xoff	pagesFree	MayCome	NeverToCome	NotDeleted	frags
0	1	8189	0	0	0	85378346	0	1	7939	641	4	20913	20913	0	1	8000	264	2	20913	20913	0	1	8184	837	0	20913	20913
1	1	8189	0	0	0	85378346	1	1	8172	645	0	20913	20913	1	1	7941	264	2	20913	20913	1	1	8112	837	0	20913	20913
2	1	8189	0	0	0	85378346	2	1	7976	643	2	20913	20913	2	1	8182	266	0	20913	20913	2	1	8151	836	1	20913	20913
3	1	8189	0	0	0	85378346	5	1	8175	645	0	20913	20913	3	1	8188	0	266	20913	20913	7	1	8183	837	0	20913	20913
4	1	8189	0	0	0	85378346	6	1	7997	645	0	20913	20913	4	1	8170	75	191	20913	20913	8	1	8180	658	0	20913	20913
5	1	8189	0	0	0	85378346	7	1	7995	642	3	20913	20913	5	1	8114	266	0	20913	20913	9	1	8096	658	0	20913	20913
6	1	8189	0	0	0	85378346	8	1	8132	672	0	20913	20913	6	1	7953	262	4	20913	20884	10	1	8184	658	0	20913	20913
7	1	8189	0	0	0	85378346	9	1	8104	669	3	20913	20913	7	1	8166	266	0	20913	20913	11	1	8177	658	0	20913	20913
8	1	8188	0	0	87	85378260	10	1	8184	672	0	20913	20913	8	1	8133	6	0	20913	20913	12	1	8014	652	6	20913	20913
9	1	8188	0	0	87	85378260	11	1	8167	672	0	20913	20913	9	1	8192	6	0	20913	20913	13	1	7970	654	4	20913	20913
10	1	8188	0	0	87	85378260	12	1	8162	672	0	20913	20913	10	1	8184	6	0	20913	20913	14	1	7931	649	9	20913	20913
11	1	8188	0	0	87	85378260	13	1	8173	672	0	20913	20913	11	1	7981	6	0	20913	20913	15	1	8085	656	2	20913	20913
12	1	8188	0	0	87	85378260	14	1	8150	671	1	20913	20913	12	1	8174	6	0	20913	20913							
13	1	8186	0	0	87	85378262	15	1	8180	671	1	20913	20913	13	1	8136	6	0	20913	20913							
14	1	8189	0	0	0	85378346								14	1	8173	6	0	20913	20913							
15	1	8189	0	0	0	85378346								15	1	8184	6	0	20913	20913							
														16	1	8189	0	0	20913	20913							

ATLAS TDAQ Software Graphical User Interface - Status Display

File Commands Access Control Tools Settings Help

Partition ATLAS

Run control

RUN CONTROL STATE **RUNNING**

Shutdown Boot

Terminate Initialize

Unconfig Config

Stop Start

Pause Continue

Run Information

Run type **Physics**

Run number 112831

Lumi block 9

Recording **Enable**

Run Start Time 22/04/09 16:24:34

Run Stop Time

Total run time 00:20:50

	Number	Rate
Level 1	83681200	79.46 kHz
Level 2	9271	6.58 Hz
Event Builder	9331	6.38 Hz
Event Filter	9267	6.48 Hz
Recorded Events	9267	6.48 Hz

Run Control

- RUNNING** RootController
 - RUNNING** TDAQ:pc-tdq-onl-19
 - RUNNING** Tile
 - RUNNING** TileEBA
 - RUNNING** TileLBA
 - RUNNING** TileLBC
 - RUNNING** TileEBC
 - RUNNING** DQM_Tile_Controller
 - RUNNING** Tile-MDAController
 - RUNNING** TileEFMon-Segment:pc-tdq-mon-17
 - RUNNING** TileMBM
 - RUNNING** TileEFMonitoring:pc-atlas-cr-10

DataFlow

DFM-1

- current XOFF 0
- number of XOFF 0
- Rate of LVL2 accepts 6.585
- Rate of LVL2 rejects 79387.953
- Rate of assigned events 6.386
- Rate of built events 6.386
- Rate of cleared events 79394.339**
- Averaging time for rates 10.022
- Number of disabled SFIs 0

80 kHz!

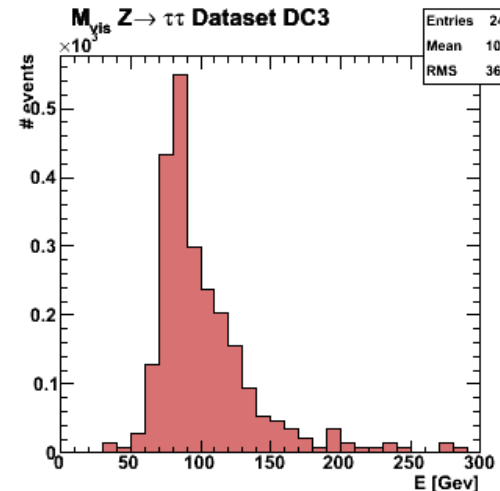
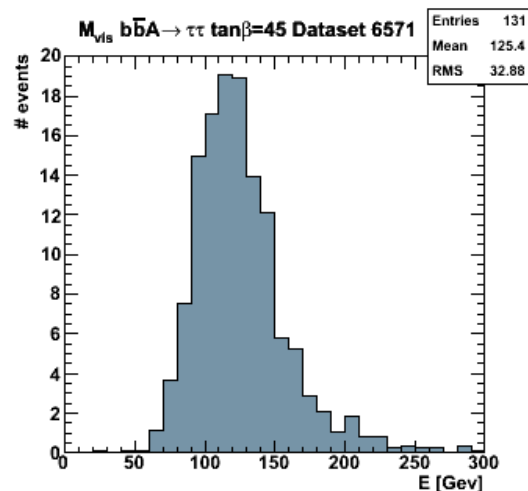
Status Informations Commands Infrastructure

16:45:26	WARNING	CheckBCIDGnam	bcidcheck:AnyError	Run 112831 Evt 2089 Ref 1 L1 0xf2016c5b TT 0x84 BC 0xb92 Status 0x 0 - TDAQ_LVL2, module=30270 (opt=0) (ROB 0x7b763e) new ROB added -- 116 similar messages suppressed, last occurrence was at 2009-Apr-22 16:45:25
16:45:26	WARNING	CheckBCIDGnam	bcidcheck:AnyError	Run 112831 Evt 2089 Ref 1 L1 0xf2016c5b TT 0x84 BC 0xb92 Status 0x 0 - TDAQ_LVL2, module=32675 (opt=0) (ROB 0x7b7fa3) missing ROB removed -- 116 similar messages suppressed, last occurrence was at 2009-Apr-22 16:45:25
16:44:55	WARNING	CheckBCIDGnam	bcidcheck:AnyError	Run 112831 Evt 1972 Ref 1 L1 0xec006fdc TT 0x84 BC 0x764 Status 0x 0 - TDAQ_LVL2, module=30188 (opt=0) (ROB 0x7b75ec) new ROB added -- 112 similar messages suppressed, last occurrence was at 2009-Apr-22 16:44:54
16:44:55	WARNING	CheckBCIDGnam	bcidcheck:AnyError	Run 112831 Evt 1972 Ref 1 L1 0xec006fdc TT 0x84 BC 0x764 Status 0x 0 - TDAQ_LVL2, module=29033 (opt=0) (ROB 0x7b7169) missing ROB removed -- 112 similar messages suppressed, last occurrence was at 2009-Apr-22 16:44:54
16:44:24	WARNING	CheckBCIDGnam	bcidcheck:AnyError	Run 112831 Evt 1859 Ref 1 L1 0xe505033d TT 0x84 BC 0xb7f Status 0x 0 - TDAQ_LVL2, module=29089 (opt=0) (ROB 0x7b71a1)



- Exclusion limit and expected sensitivity for MSSM Higgs to tau tau in the lepton hadron channel
- Given a set of datasets (A signal, Z background) in Ntuples
- We compute the M_{vis} (template) applying event selection cuts
 - [MSSMHiggsToTauTauToLH](#)

$$M_{vis} = |p_l^\alpha + p_h^\alpha + p_{miss}^\alpha| \quad p_{miss}^\alpha = \left(p_{miss}^x, p_{miss}^y, 0, \sqrt{(p_{miss}^x)^2 + (p_{miss}^y)^2} \right)$$





- As we have no data to compare with, we define a pseudo-experiment as a poisson fluctuation of the background.

$$x_i = Pois(Z_i)$$

- We fit to each pseudo-experiment a model of signal + background. The expected value for each bin is

$$\mu_i = L\sigma_A A_i + L\sigma_Z Z_i$$

- We will fit a Likelihood function of the data to the parameters which is maximum at the best value of the parameters.

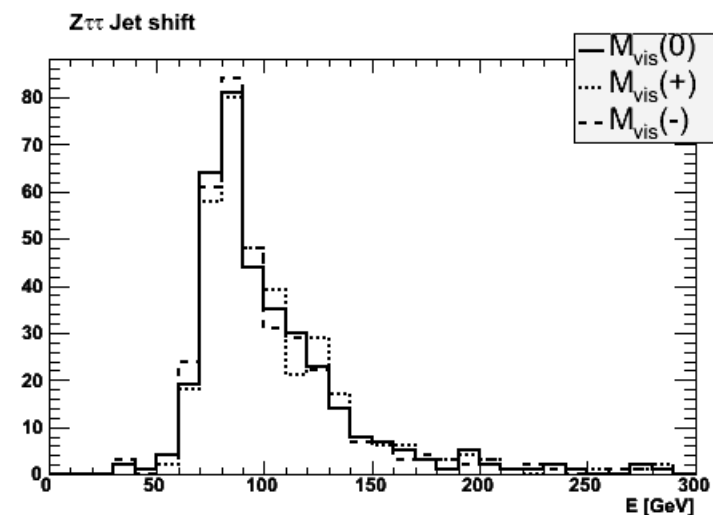
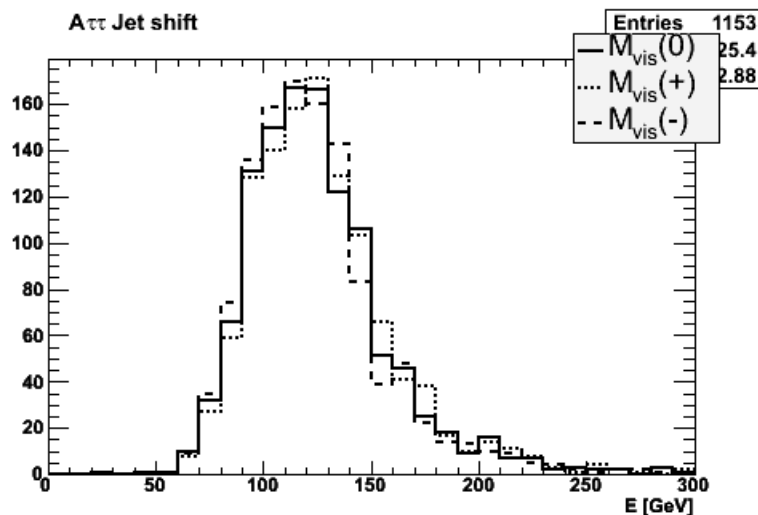
$$\mathcal{L}(\mu|x) = \frac{\exp(-\mu)\mu^x}{x!}$$

- Numerically means that we will minimize the minus log likelihood.
- As the likelihood function is not known a priori we can specify that it has a dependency on known systematic uncertainties (Luminosity, cross sections)

$$\mathcal{L}(\mu|x) = \frac{\exp(-\mu)\mu^x}{x!} + G(L, \hat{L}, \varepsilon(L)) + G(\sigma_Z, \hat{\sigma}_Z, \varepsilon(\sigma_Z))$$



- Other systematic uncertainties due to the error in the energy scale can be introduced with morphing parameters
- Apart from the nominal template we should compute two new templates that take into account the energy scale shift positive and negative.

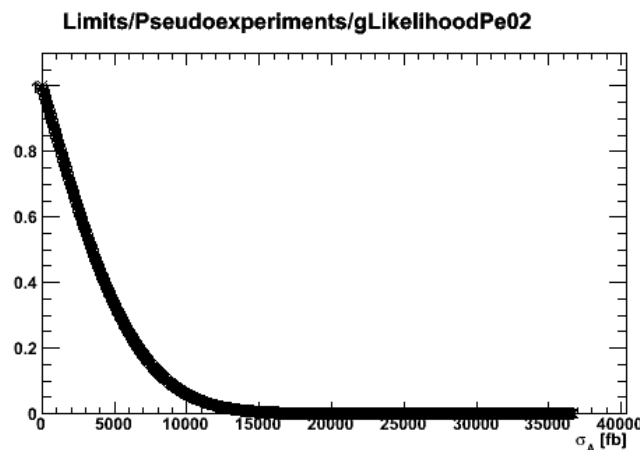


- As a first order approximation the templates in our fit are $A'_i = A_i^0 + f_j \frac{A_i^+ - A_i^-}{2}$
- Therefore the Likelihood function should take into account these systematic uncertainties

$$\mathcal{L}(\mu|x) = \frac{\exp(-\mu)\mu^x}{x!} + G(L, \hat{L}, \varepsilon(L)) + G(\sigma_Z, \hat{\sigma}_Z, \varepsilon(\sigma_Z)) + G(f_j, \hat{f}_j, \varepsilon(f_j))$$



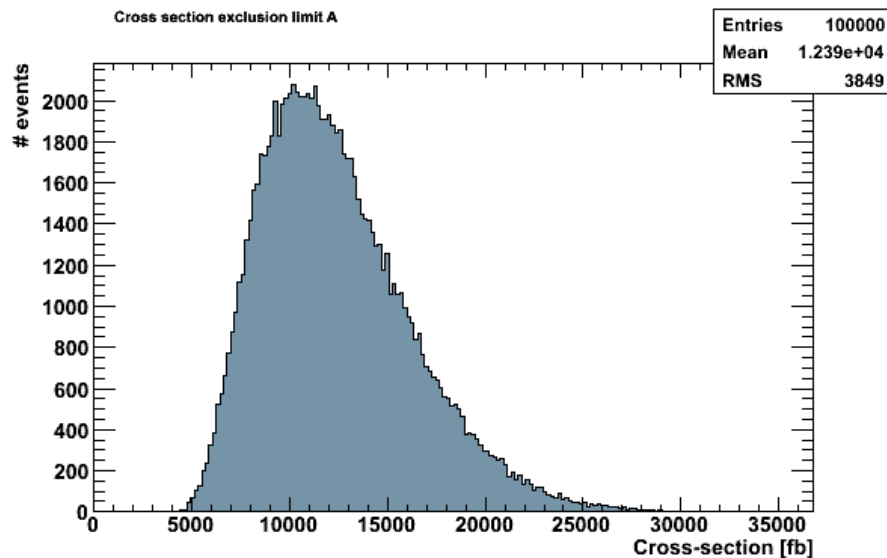
- For each pseudo-experiment we do a signal cross section scan.
 - We try to fit the pseudo-experiment to a model where each time there is more and more signal (signal cross section is fixed).
 - For numerical reasons we normalize the value of the likelihood to a certain value as we are not interested in the value of the likelihood but on its integral.
 - The p-value at 95% indicates the limit for the signal cross section.
 - It is less than 5% probable that the true signal cross section greater than this limit.



As more and more signal is present in the model to which the data is fit, the likelihood is smaller and smaller. It is less likely that the data is described by the model.



mA=150 GeV tanBeta=45 No morphing



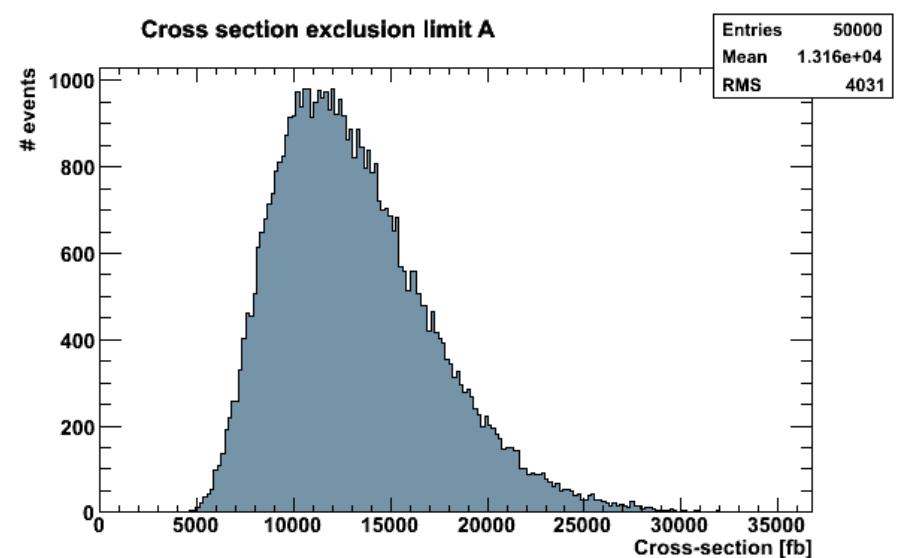
Mean: 12307 fb

Median: 11851 fb

Band (1sigma): (8728 - 16261) fb

Band (2sigma): (6523 - 21406) fb

mA=150 GeV tanBeta=45 jet=5%



Mean: 13075 fb

Median: 12586 fb

Band (1sigma): (9279 - 17180) fb

Band (2sigma): (7074 - 22509) fb



- Still lot of work to do on my analysis
 - Increase the number of morphings, backgrounds
 - Higgs mass scan
 - Event selection efficiency
 - Work on sensitivity code
 - Running feynhiggs
- AOB
 - Preparing abstract on commissioning status and performance for IEEE NSS-MIC 2009