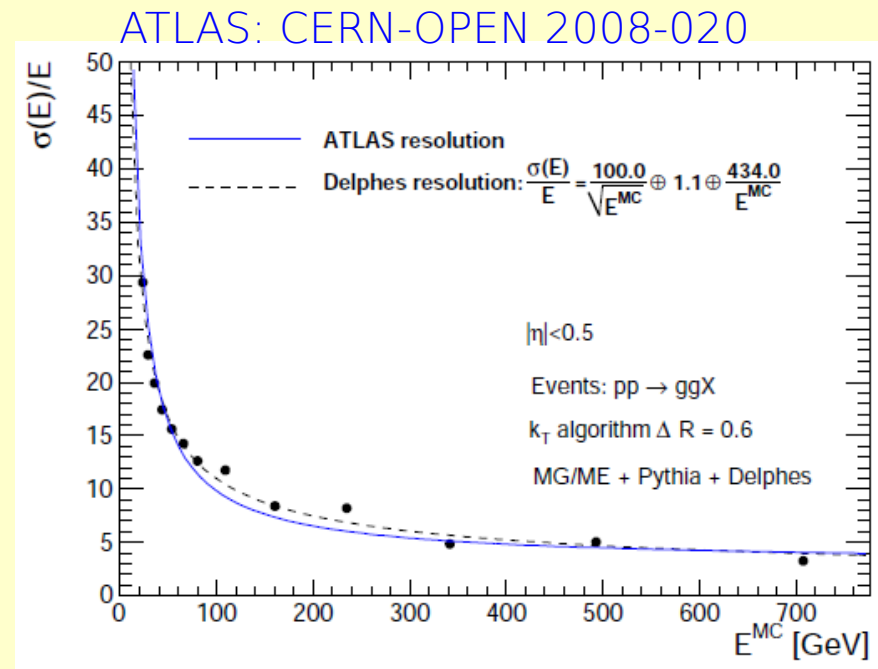
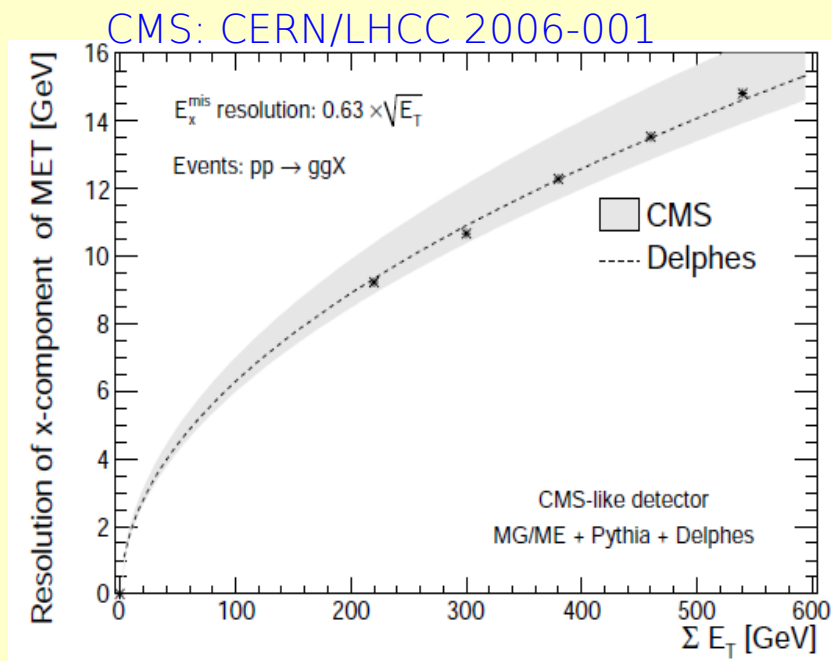


# Validation

- Validation of the code:
  - Reproduction of previous results when implementing changes...
- Object reconstruction:
  - Reproduce the jets, leptons, met, ..., performances
  - develop detector cards which reproduce the published performances, efficiency maps out of published performance data (e.g leptons id, b-tagging)
- Analysis validation
  - Reproduce the cutflow / the analysis acceptance
  - Compare results to published signal acceptance x efficiency maps and to kinematic distributions after cuts if available
  - Limit validation might be considered as a 3rd level – if the limit includes signal uncertainty -> less stringent than quoted effective cross section limit

# Object reconstruction

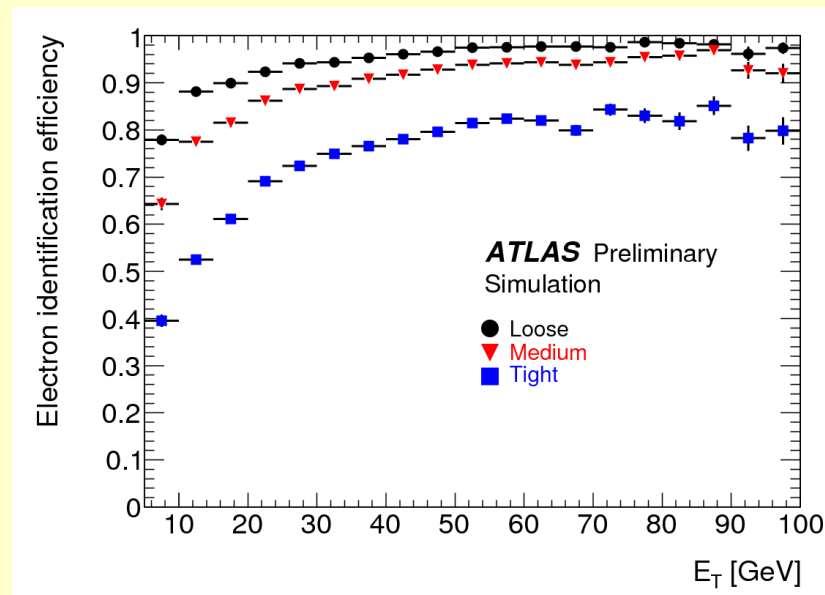
- Some already done when developping fast simulators - detector card



How does it compare to the reality now?

# Object reconstruction

- Efficiency maps can also be implemented by the users, but:
  - Have to dig them out from public results / performance papers, sometimes from auxiliary material of analyses, often only in figures...
  - Efficiency maps remain a rough estimate, although most probably better than a flat 100% efficiency...



# Analysis-level validation, using HepData

HepData - AAD 2011 - Mozilla Firefox

Fichier Édition Affichage Historique Marque-pages Outils Aide

hepdata.cedar.ac.uk/view/p8106

BBC NEWS | News Fr... Dictionary and Thes... ATLAS Experiment ATLAS SUSY ETMISS... SusyEtMissSubGroup SUSYSignalProducti... Indico - Calendar Ov... EvgenMetadataBase...

Panda jobs for user Marie-Hel... SUSY Working Group Approva... http://atlsusy...c11c\_p832.html HepData - AAD 2011

**The Durham HepData Project**

REACTION DATABASE • DATA REVIEWS • PARTON DISTRIBUTION FUNCTION SERVER • OTHER HEP RESOURCES

**Reaction Database Full Record Display**

View [short record](#) or as: [plain text](#), [AIDA](#), [PyROOT](#), [YODA](#), [ROOT](#), [mpl](#) or [jhepwork](#)

**AAD 2011 — Search for squarks and gluinos using final states with jets and missing transverse momentum with the ATLAS detector in  $\sqrt{s} = 7$  TeV proton-proton collisions**

Experiment: [CERN-LHC-ATLAS \(ATLAS\)](#)  
Preprinted as [CERN-PH-EP-2011-145](#)  
Archived as: [ARXIV:1109.6572](#)  
Conference paper [ATLAS-CONF-2011-155](#)  
Record in: [INSPIRE](#)

CERN-LHC. Study of events having final states with no leptons, jets and missing transverse momentum, and with no reconstructed electrons or muons, in proton-proton collisions at a centre-of-mass energy of 7 TeV. Data are selected with various cuts and criteria to enhance different physics regions as described in the text of the paper. Exclusion limits on gluino and squark masses in SUSY models are presented for a simplified model (described in the paper) together with limits on  $m_0$  and  $m_{1/2}$  in MSUGRA/CMSSM models. The data sample has a total integrated luminosity of 1.04 FB-1 and shows no excess above the Standard Model background. Additional model interpretations are given in the Conference Note.

[Extra data files \(exclusion limits, acceptance\\*efficiency, silha files\)](#)

[View list of currently selected plots](#)

Table 1 ( F 1. ) [HIDE DATA](#) or as: [plain text](#), [AIDA](#), [PyROOT](#), [YODA](#), [ROOT](#), [mpl](#) or [jhepwork](#)  
The distribution in  $M_{\text{eff}}$  (scalar sum of the missing transverse momentum and the transverse momenta of the two highest  $p_T$  jets) for events with at least 2 jets after the application of all selection criteria (other than the  $M_{\text{eff}}$  cut itself). The table shows the number of observed data points per 100 GeV bin plus the background prediction of the Standard-Model Monte-Carlo and its upper and lower 1-sigma error limits uncertainty band..

DATA BACKGROUND

Rechercher : supersymmetric

Précédent Suivant Tout surligner Respecter la casse

# Using HepData for validation

HepData - AAD 2011 - Mozilla Firefox

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BBC NEWS | News Fr... Dictionary and Thes... ATLAS Experiment ATLAS SUSY ETMISS... SusyEtMissSubGroup SUSYSignalProdukti... Indico - Calendar Ov... EvgenMetadataBase...

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[Extra data files \(exclusion limits, acceptance\\*efficiency, slha files\)](#)

[View list of currently selected plots](#)

Table 1 ( F 1. ) [HIDE DATA](#) or as: [plain text](#), [AIDA](#), [PyROOT](#), [YODA](#), [ROOT](#), [mpl](#) or [jhepwork](#)  
The distribution in  $M_{\text{eff}}$  (scalar sum of the missing transverse momentum and the transverse momenta of the two highest  $p_T$  jets) for events with at least 2 jets after the application of all selection criteria (other than the Meff cut itself). The table shows the number of observed data points per 100 GeV bin plus the background prediction of the Standard-Model Monte-Carlo and its upper and lower 1-sigma error limits uncertainty band..

DATA BACKGROUND

Rechercher : supersymmetric

Précédent Suivant Tout surligner Respecter la casse



# Using HepData for validation

**The Durham HepData Project**

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## Reaction Database Full Record Display

View [short record](#) or as: [plain text](#), [AIDA](#), [PyROOT](#), [YODA](#), [ROOT](#), [mpl](#) or [jhepwork](#)

### AAD 2011 — Search for squarks and gluinos using final states with jets and missing transverse momentum with the ATLAS detector in $\sqrt{s} = 7$ TeV proton-proton collisions

Experiment: [CERN-LHC-ATLAS](#)  
Preprinted as [CERN-PH-EP-20](#)  
Archived as: [ARXIV:1109.657](#)  
Conference paper [ATLAS-CONF-2011-015](#)  
Record in: [INSPIRE](#)

CERN-LHC. Study of events having no reconstructed electrons or muons and no selected with various cuts and selection criteria. Exclusion limits on gluino and squark masses (the paper) together with limits on the mass of the integrated luminosity of 1.04 FB<sup>-1</sup> and shows no excess above the Standard Model background. Additional model interpretations are given in the Conference Note.

**Extra data files (exclusion limits, acceptance\*efficiency, slha files)**

[View list of currently selected plots](#)

Table 1 ( F 1. ) [HIDE DATA](#) or as: [plain text](#), [AIDA](#), [PyROOT](#), [YODA](#), [ROOT](#), [mpl](#) or [jhepwork](#)  
The distribution in Meff (scalar sum of the missing transverse momenta of the two highest pT jets) for events with at least 2 jets after the application of all selection criteria (other than the Meff cut itself). The table shows the number of observed data points per 100 GeV bin plus the background prediction of the Standard-Model Monte-Carlo and its upper and lower 1-sigma error limits uncertainty band..

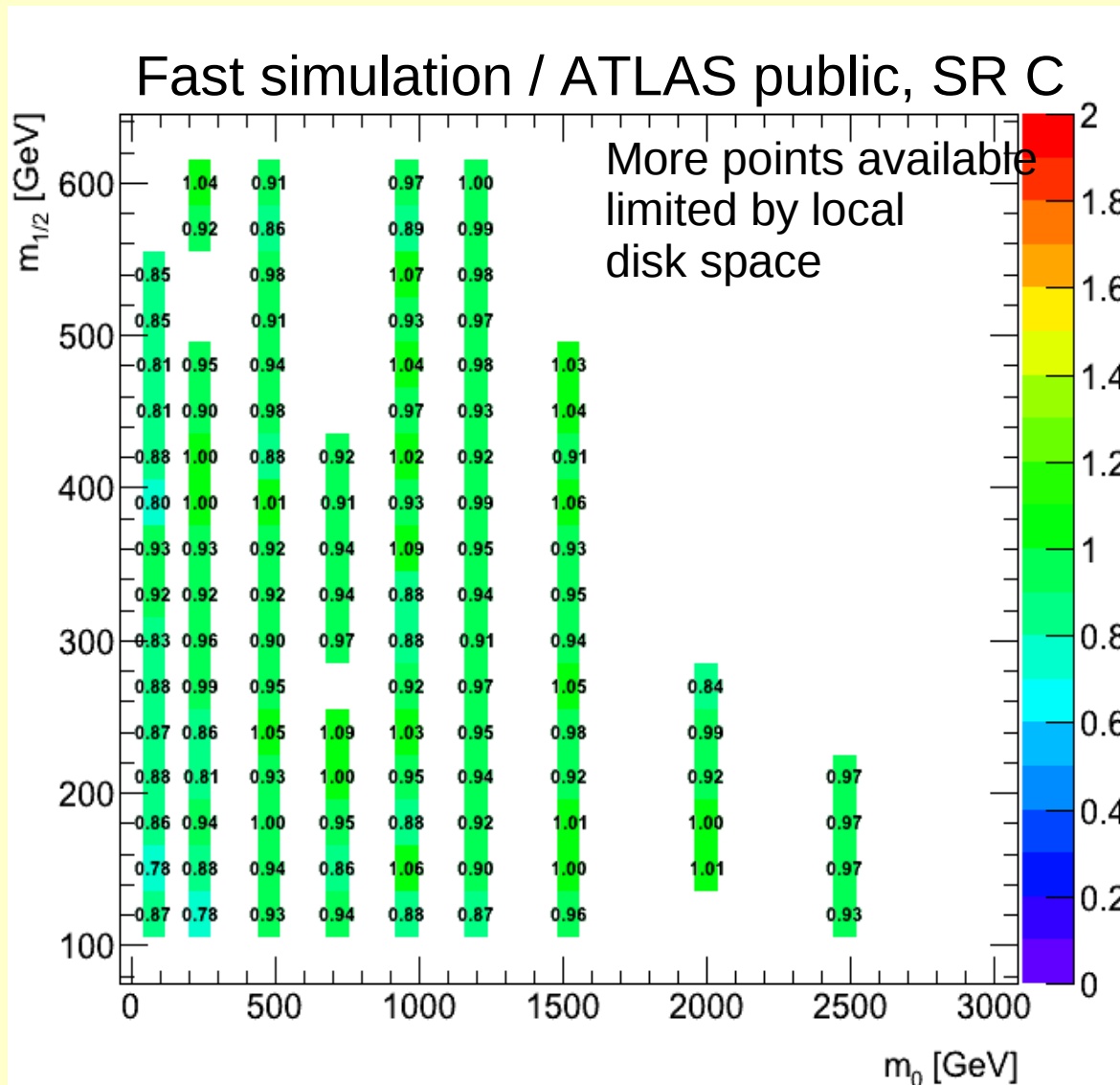
DATA BACKGROUND

Rechercher : supersymmetric

Précédent Suivant Tout surligner Respecter la casse

- Generate events using the SLHA files (used Herwig)
- Simulate (used Delphes)
- Implement analysis code (object definition, cuts...)
- Cross check results (acceptance x efficiency)

# Efficiency x acceptance

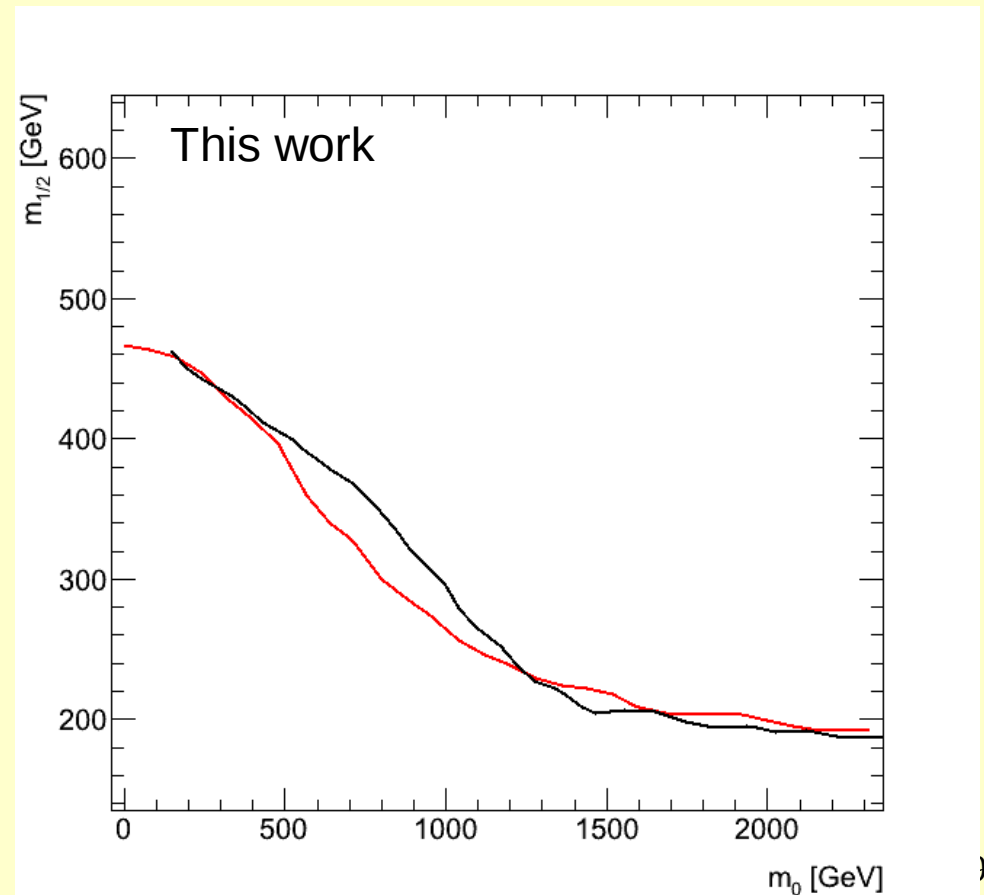
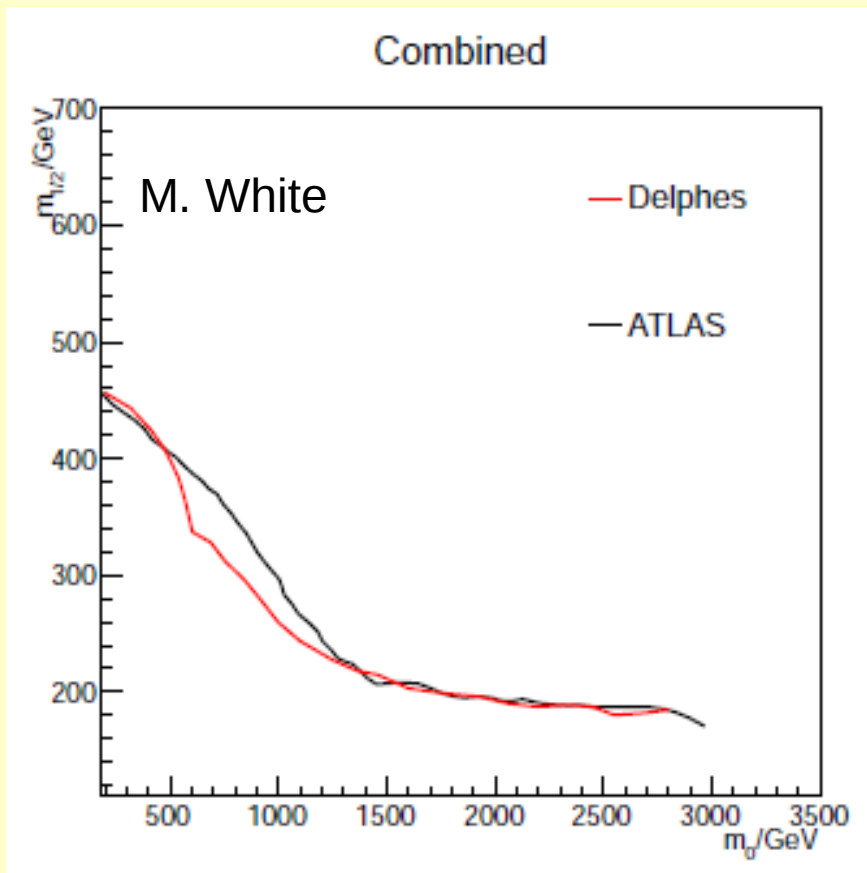


- Very useful information to validate the analysis
- could help to have more detailed cutflows to track problems
- not all analyses have this info for signal



# Limit validation

- Fudge factor included in analyses in order to reproduce the limits in all signal regions, will be better with limits with / without some signal uncertainties...



# Using kinematic distributions

Example with 0-lepton, high jet multiplicity analysis

Benchmark SUSY Point(1220,180)

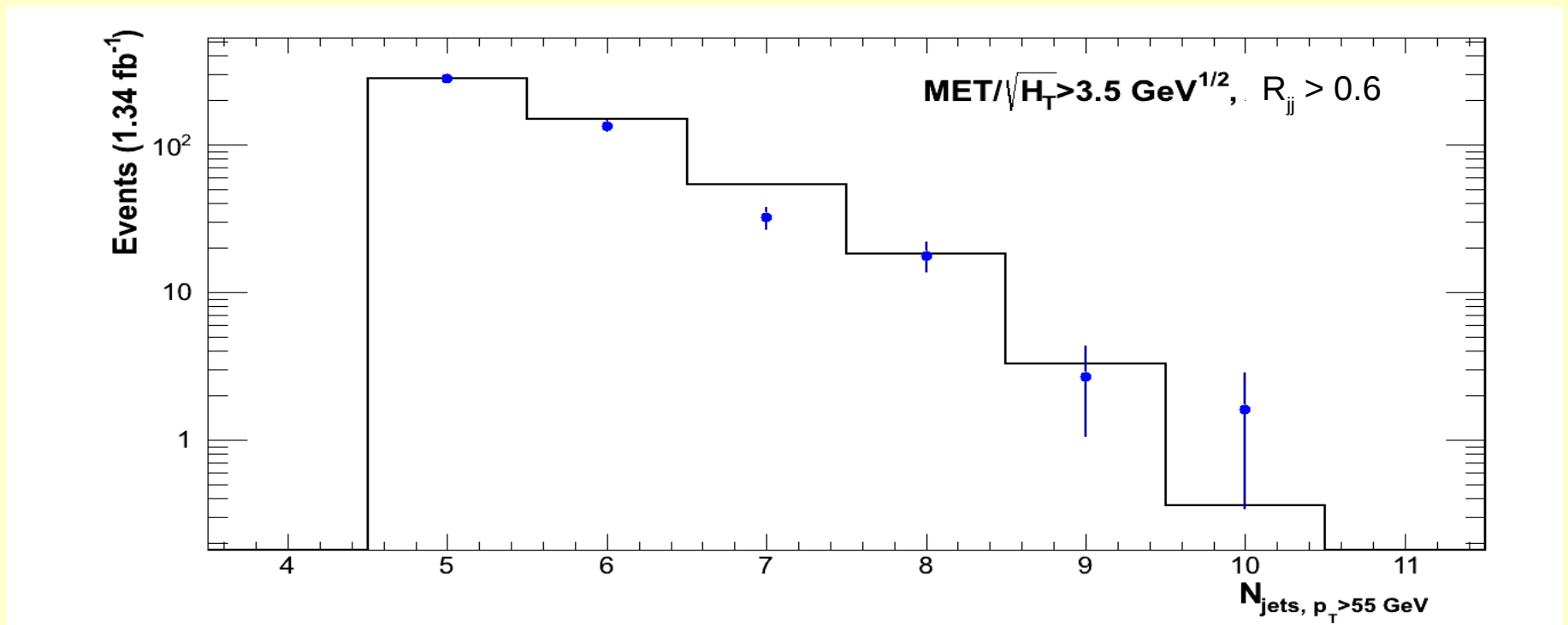
Table 13 ( F 4A. )  or as: [plain text](#), [AIDA](#), [PyROOT](#), [YODA](#), [ROOT](#), [mpl](#) or [jhework](#)  
Observed and predicted distributions of the variable  $ET(C=MISSING)/SQRT(HT)$  for events with 7 or more jets each having  $PT > 55$  GeV..

	DATA	SM PREDICTION	SUSY Point(1220,180)
PT(C=JET) : > 55 GeV			
RE : P P --> .GE.7JET X			
SQRT(S) : 7000.0 GeV			
ET(C=MISSING)/SQRT(HT) IN GEV**0.5	EVENTS		
			<input type="button" value="HIDE DATA"/>
0.000 - 0.250	225	229	-
0.250 - 0.500	645	627	0.724
0.500 - 0.750	894	867	1.81
0.750 - 1.000	913	942	1.81
1.000 - 1.250	832	862	1.27
1.250 - 1.500	734	713	2.90
1.500 - 1.750	473	532	2.72
1.750 - 2.000	302	374	3.62
2.000 - 2.250	195	249	4.16
2.250 - 2.500	127	154	3.08
2.500 - 2.750	68	93.6	5.79

Histogram in electronic format

# Using kinematic distributions

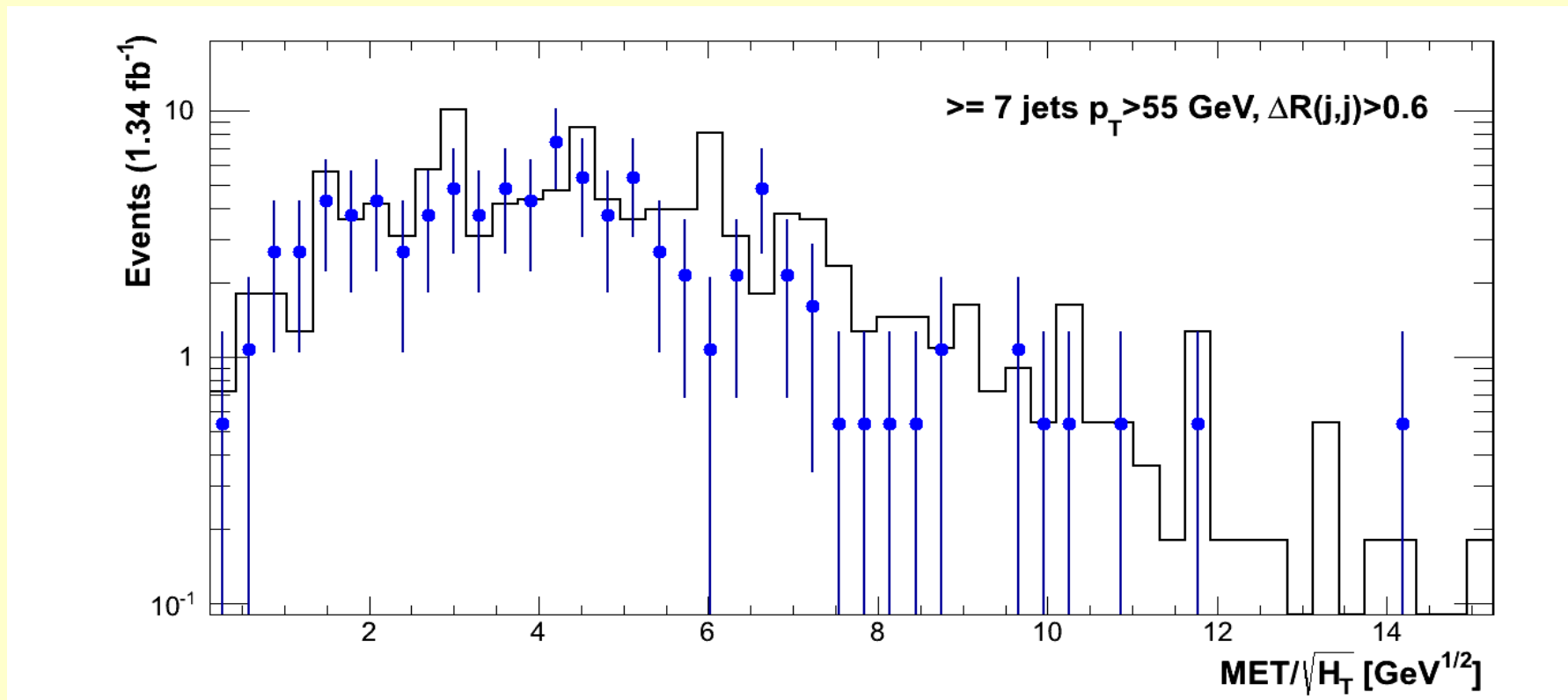
- Apply the relevant cuts, compare distribution:



Not all relevant distributions are given,  $R_{jj}$  would also be interesting for example...

# Using kinematic distributions

- Apply the relevant cuts, compare distribution:



# Joining efforts?

- Some validation efforts ongoing, in parallel
- Many reported in this workshop about the same analysis (eg SUSY 0-lepton ATLAS), revalidating each time (good cross checks - are all the results compatible?)
  - > code sharing? Spire was mentioned?
- Relevant public results / implemented efficiency maps could also be shared once they are implemented (some data/folder in the fast simulation codes with relevant codified maps? Of course, the map to use depends on the analysis to some extent, so modularity is key...)