Tools: Who needs whom?

The first three years of the LHC
March 21, 2013
Dirk Zerwas
LAL Orsay

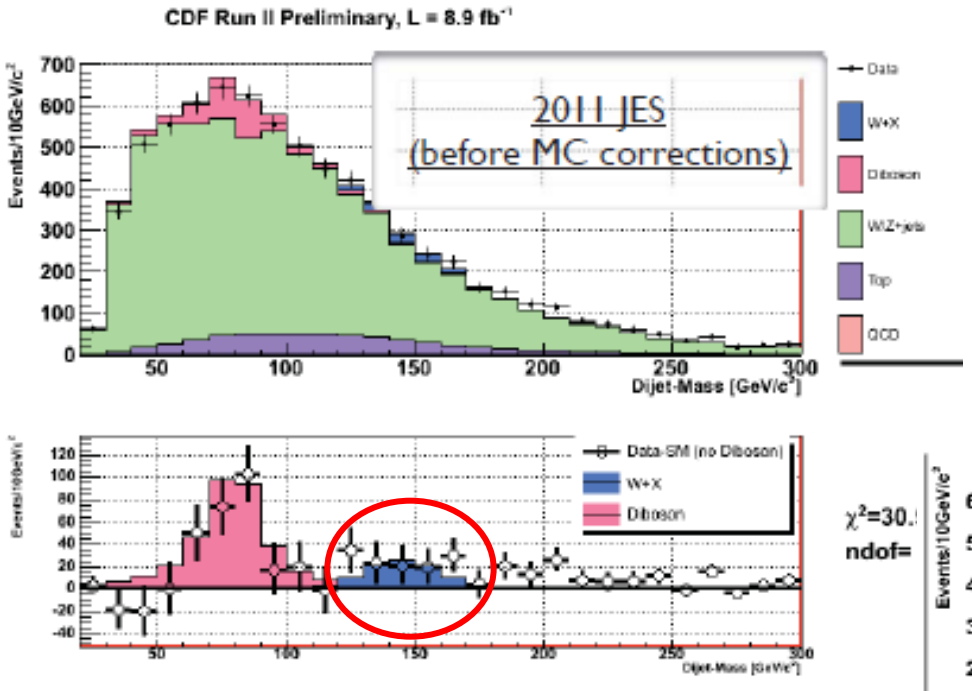
Charge:
- **no talk**
- **practically no transparencies**
- **be provocative**

LABORATOIRE DE L'ACCÉLÉRATEUR LINÉAIRE

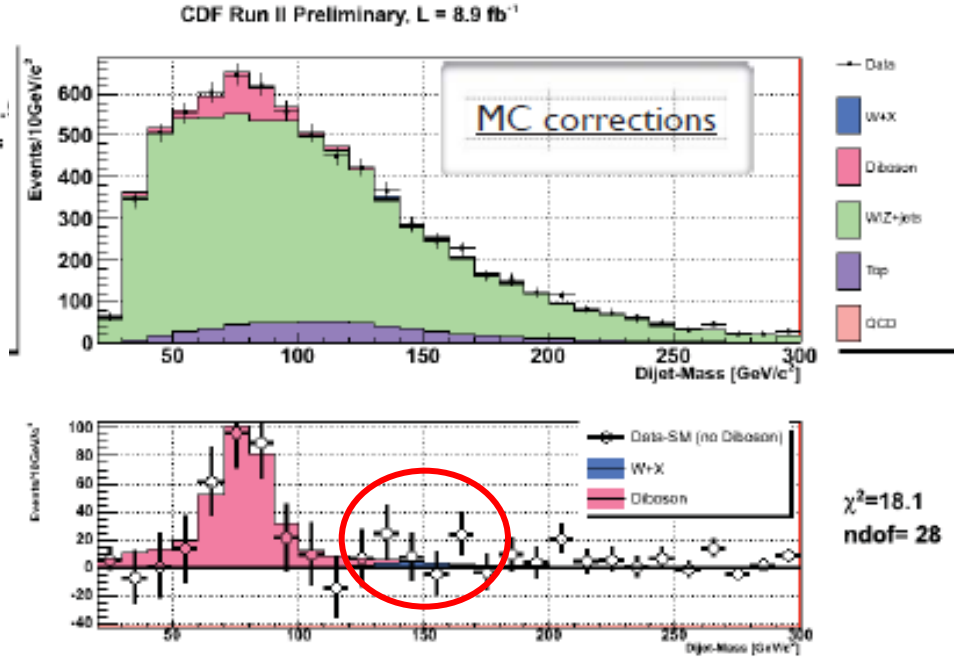
cnrs IN2P3 Les deux infinis

BBSM (Background in BSM)

Kirill +Keith
Moriond 2013
- **Search for W+X**
- **X to jj**



Many explanations
- **top background**
- **new physics (majority)**

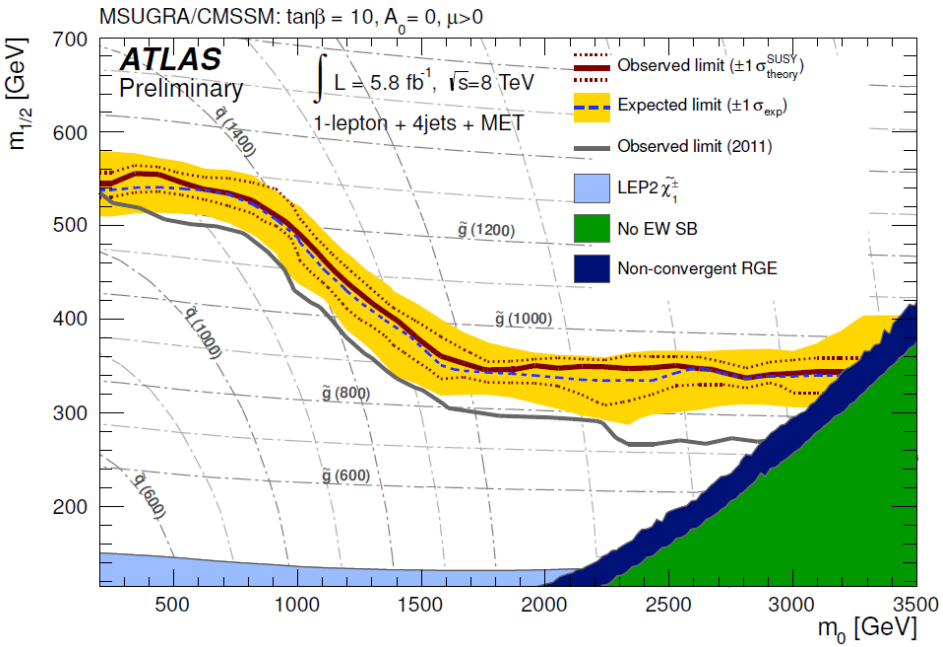


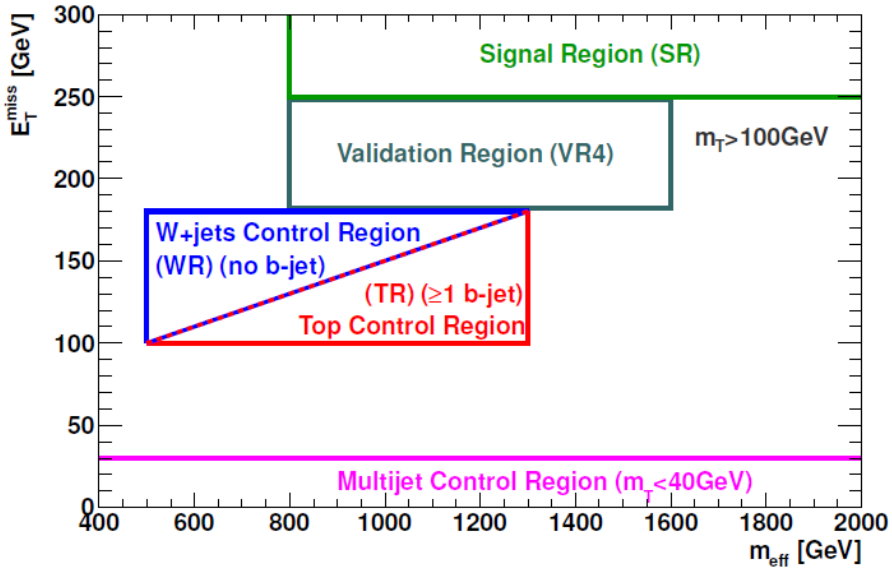
JES: different between quarks and gluons
Changing as function of M

Can we learn something?
- **creativity in BSM is there ☺**
- **effect hard to "predict" without knowledge of the calibration**
- **data-driven normalization (top Xchecks)**

- **anything to learn from this?**
- **quark/gluon definition? (Gavin/Giulia?)**

BBSM in Susy





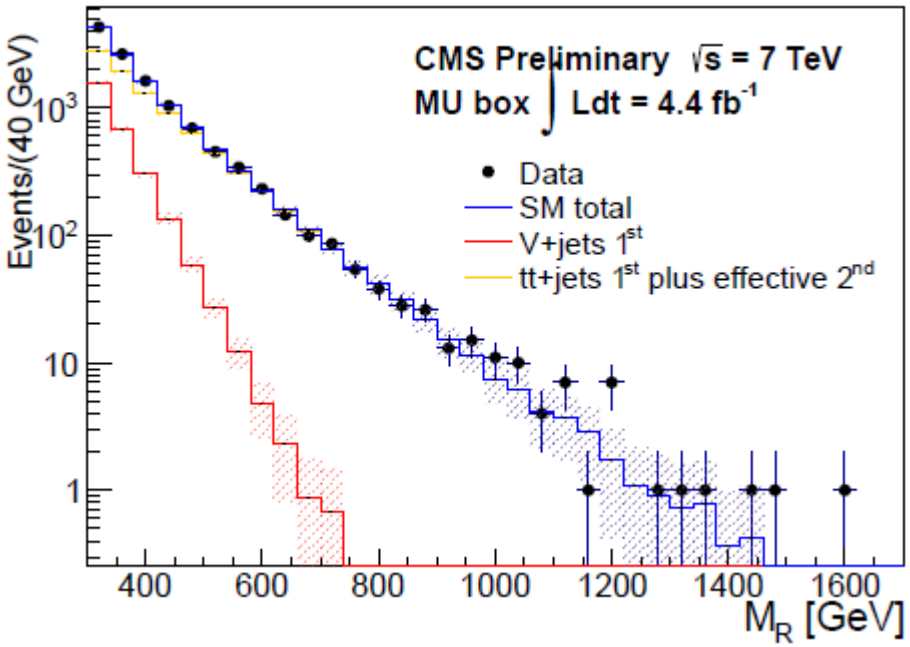
Scale factors:

- **are they N-analysis scalable?**
- **A t what point do they have to be consistent?**
- **can we Control-away a signal (shape)?**

	$t\bar{t}$ control region		W+jets control region	
	Electron	Muon	Electron	Muon
Observed events	64	51	25	33
Fitted background events	64.2 ± 6.3	50.2 ± 5.4	26.6 ± 4.5	32.3 ± 5.1
Fitted $t\bar{t}$ events	54.1 ± 6.7	44.5 ± 5.6	7.8 ± 2.0	9.4 ± 2.1
Fitted W/Z+jets events	1.3 ± 1.2	0.0 ± 1.8	14.9 ± 4.3	19.6 ± 5.2
Fitted other background events	8.3 ± 1.9	5.1 ± 1.9	1.3 ± 0.7	2.7 ± 0.7
Fitted multijet events	0.5 ± 1.5	0.5 ± 0.7	2.6 ± 3.0	0.6 ± 0.8
MC expected SM events	66.5	51.6	48.3	48.1
MC expected $t\bar{t}$ events	55.1	44.7	9.5	9.0
MC expected W/Z+jets events	2.6	0.0	33.6	35.5
MC expected other background events	8.4	6.4	1.7	2.7
Data-driven multijet events	0.4	0.5	3.5	0.9

BBSM

Razor (see Matt Buckley's talk)
Recast search into flat background with a peaking signal



- **seems to be slightly less powerful than "standard SUSY search"?**
- **is this more robust than using transfer factors?**
- **or this just another TMVA, BDT, Mct, MT2 variable**

Cross sections and simplified models

	$\langle \epsilon\sigma \rangle^{95}_{\text{obs}}$ [fb]	S^{95}_{obs}	S^{95}_{exp}	CL_B
Electron	1.69	9.9	$9.3^{+3.3}_{-2.6}$	0.59
Muon	1.09	6.4	$8.3^{+3.4}_{-2.3}$	0.19

BSM (e.g. SUSY): visible cross section:

- **useful?**
- **how do you (=theorists) use it?**

Simplified Models (heavy industry):

- **eg. Sq Sq → qχ± qχ±→ qWχ qWχ**
- **disentangle different final states**
- **old-fashioned way (LEP): MSSM**
- **3 masses (4 parameters)**

- **who has used these?**
- **how useful have they been?**
- **cross section limit**
- **what about the mass limit?**