Experimental Conference Summary
• At this conference more than 70 experimental talks were given

• I do not attempt to summarize all results in detail and I had to make a selection; I would in no way be capable of giving justice and fair credit to the fantastic amount of work presented during this week (I will also not quote any names of speakers)

• My apologies to those speakers whose results I have omitted
  It is not intended as a reflection of the relative importance!
The role of the LHC

1. **Explore the TeV mass scale**
   - What is the origin of the electroweak symmetry breaking? 
     Does the Higgs boson exist?
   - Search for physics Beyond the Standard Model 
     (Low energy supersymmetry, other scenarios…,)

   Look for the “expected”, but we need to be open for surprises
   → perform as many searches (inclusive, exclusive…) for as many final states as possible

2. **Precise tests of the Standard Model**
   - There is much sensitivity to physics beyond the Standard Model in the precision area (loop-induced effects, probe energy scales far beyond direct reach)
   → precise measurements, search for rare processes
Ultimate test of the Standard Model:

compare direct prediction of the Higgs boson mass with direct observation
The role of the LHC

1. Explore the TeV mass scale
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2. Precise tests of the Standard Model
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   → precise measurements, search for rare processes

→ Guidance to theory and Future Experiments
Many theoretical models for physics Beyond the Standard Model
I. The LHC
-a new era in particle physics-

Steve Meyers:

“The first two years of LHC operation have produced sensational performance: well beyond our wildest expectations. The combination of the performance of the LHC machine, the detectors and the GRID have proven to be a terrific success story in particle physics.”
A few facts to back this up:

- Very rapid rise in luminosity
- + good machine stability \( \rightarrow \) high integrated luminosities

- World record on instantaneous luminosity on 22. April 2011: \(4.67 \times 10^{32} \text{ cm}^{-2} \text{ s}^{-1}\) (Tevatron record: \(4.02 \times 10^{32} \text{ cm}^{-2} \text{ s}^{-1}\))

- 2011: collect per day as much int. luminosity as in 2010

- 2012: now regularly above \(6 \times 10^{33} \text{ cm}^{-2} \text{ s}^{-1}\), record \(\sim 6.6 \times 10^{33} \text{ cm}^{-2} \text{ s}^{-1}\)
Completion of an era: Tevatron

Accelerator Innovations
- First major SC synchrotron
- Industrial production of SC cable (MRI)
- Electron cooling
- New RF manipulation techniques

Detector innovations
- Silicon vertex detectors in hadron environment
- LAr-U238 hadron calorimetry

Analysis Innovations
- Data mining from Petabytes of data
- Use of neural networks, boosted decision trees
- Major impact on LHC planning and developing
  - GRID pioneers

Major discoveries
- Top quark
- B_s mixing
- Precision W and Top mass \rightarrow Higgs mass prediction
- Direct Higgs searches
- Ruled out many exotica

The next generation
- Fantastic training ground for next generation
- More than 500 Ph.D.s
- Produced critical personnel for the next steps, especially LHC

But Tevatron is still in the game:
- W mass
- H \rightarrow bb
- B physics
- …
II. Detector Performance
Detector performance is impressive:

- Very high number of working channels (> 99% for many sub-systems) in all experiments;
- Data taking efficiency is high (> 94%)
- Impressive reconstruction capabilities for physics objects (e, γ, μ, τ, jets, b-tagging, $E_T^{\text{miss}}$)

Have been optimized to cope with the ever increasing number of pile-up interactions (impressive examples shown here)

An event with 20 reconstructed vertices
(error ellipses are scaled up by a factor of 20 for visibility reasons)
Some performance figures from 2011 data:

**Electron ID efficiency in ATLAS**

**Jet energy scale, E-flow in CMS**
Particle Identification in ALICE and LHCb:

LHCb: Search for $\phi \rightarrow K^+K^-$

Proper time resolution: 45 fs
b-tagging performances in ATLAS and CMS: extremely important for many physics analyses (Higgs, SUSY, SM, ….)

- Reconstruction of the original flavour (B, Bbar) of the reconstructed B meson (important for mixing and CP analyses)

- Performance calibrated from control channels, e.g.

- Effective efficiencies 2.1-3.5% (opp. side) and 0.7% – 1.3% (same side) dep. on analysis
Physics Results
Total, elastic and inelastic pp cross sections at 7 TeV

- Domain of the TOTEM experiment
  Detectors in the CMS forward regions

**Elastic scattering: $d\sigma_{el}/dt$**

$0.36 < |t| < 2.5$ GeV$^2$

$\sqrt{s} = 7$ TeV

- Total cross section
  (four methods give consistent results)

1. (low) Luminosity + Elastic scattering + Optical theorem
   $\sigma_{tot} = 98.3 \pm 2.2$ mb

2. (high) Luminosity + Elastic scattering + Optical theorem
   $\sigma_{tot} = 98.2 \pm 2.4$ mb

3. (high) Luminosity + Elastic scattering + Inelastic scattering
   $\sigma_{tot} = 98.7 \pm 4.4$ mb

4. Elastic scattering + Inelastic scattering + Optical theorem
   $\sigma_{tot} = 97.8 \pm 2.9$ mb
Inelastic pp cross section at 7 TeV:

- The inelastic cross section was also measured by ALICE, ATLAS and CMS; Good agreement among the experiments, within systematic uncertainties

- Measurement require the subtraction of diffractive components and acceptance extrapolations; The associated model dependence (e.g. Donnachie-Landshoff) constitutes the largest systematic uncertainty

\[
\begin{align*}
\text{ALICE:} & \quad \sigma_{\text{inel}} = (72.7 \pm 1.1 \text{ (stat)} \pm 5.1 \text{ (model)}) \text{ mb} \\
\text{ATLAS:} & \quad \sigma_{\text{inel}} = (69.1 \pm 2.4 \text{ (stat)} \pm 6.9 \text{ (model)}) \text{ mb} \\
\text{CMS:} & \quad \sigma_{\text{inel}} = (64.5 \pm 1.1 \text{ (stat)} \pm 3.0 \text{ (model)}) \text{ mb} \\
\text{TOTEM:} & \quad \sigma_{\text{inel}} = (73.5 \pm 0.5 \text{ (stat)} \pm 1.8_{-1.3} \text{ (syst)}) \text{ mb}
\end{align*}
\]
Soft Physics and diffraction

- Measurements of soft inelastic collisions and diffractive processes are important for any modeling of the underlying event or pile-up processes

- LHCb and Totem experiments extend the measurements far into the forward region

- General behaviour: experiments agree well among each other, however, Monte Carlo models underestimated inclusive particle production;

A Monte Carlo tuning that describes simultaneously all observables is still missing
Particle production in the extreme forward region

- Single photon and $\pi^0$ spectra, compared to models:

- Important input for astro-particle physics experiments
Hard processes:
Tests of perturbative QCD

- Jet production
- W/Z production
- Production of Top quarks
- Heavy hadrons
  (Onia and B hadrons)
- Quark-gluon plasma
Double differential cross sections, as function of $p_T$ and rapidity $y$ (full 2010 data set)

- Data are well described by NLO pert. QCD calculations (NLOJet++)
- Experimental systematic uncertainty is dominated by jet energy scale uncertainty
- Theoretical uncertainties: renormalization/ factorization scale, pdfs, $\alpha_s$, ..., uncertainties from non-perturbative effects

somewhat larger deviations in the forward region
Double differential cross sections, as function of $p_T$ and rapidity $y$:
(full 2010 data set)

- Data are well described by NLO pert. QCD calculations (NLOJet++)
- Experimental systematic uncertainty is dominated by jet energy scale uncertainty
- Theoretical uncertainties: renormalization/ factorization scale, pdfs, $\alpha_s$, ..., uncertainties from non-perturbative effects

CMS: include full 2011 data set; comparison up to 2 TeV (central rapidities)
Inclusive b and bb-cross sections

Also good agreement found for the more challenging inclusive b and bb di-jet cross sections (limited to central region, tracker acceptance)
In general good agreement, (within uncertainties, dominated by systematics, e.g. $\pi^0$ background, contributions from fragmentation, pdfs, …)

Similar ratios (data / theory) found as function of pseudorapidity in ATLAS and CMS
$\gamma + b$ jet production at the Tevatron

- NLO calculation describe data well in low $p_T$ region
- Larger deviations at high $p_T$ (large NNLO contributions ??)
**QCD in W/Z (+ jet) production**

- Drell-Yan pair production measured over large mass range (normalized to Z peak)
- Clear signals, measurements extend into the forward rapidity region by LHCb
W cross sections at the LHC

- Theoretical NNLO predictions in very good agreement with the experimental measurements (for pp, ppbar and as a function of energy)
- Precision is already dominated by systematic uncertainties
- Good agreement as well between experiments
Differential measurements start to constrain pdfs

(i) Lepton charge asymmetries

(ii) Flavour separated $W+$jet production

(iii) Extraction of $s/s_{\bar{s}}$ from global fit to ATLAS $W/Z$ differential measurements

\[ r_s = 0.5 \left( s + s_{\bar{s}} \right) / d_{\bar{b}} \]

e.g. $W+c$ production
W/Z + jet cross section measurements

Jet multiplicities in W+jet production

- Impressive description of jet multiplicities and kinematic properties up to high jet multiplicities
- Impressive progress on NLO calculations for higher jet multiplicity (NLO W+5 jet in reach)
**W + b jets**

- Important background for many studies (Higgs, SUSY, top)
- Measurements at the Tevatron exceed NLO prediction

- Measured by ATLAS using 2010 data sample
  - studied $W + 1$ jet and $W + 2$ jets
  - require at least one $b$-tagged jet

Results from e and $\mu$ combined. Measurements $\sim 1.5\sigma$ above NLO prediction, but still consistent within uncertainties
Top Quark pair production

Pair production: \( qq \) and \( gg \)-fusion

\[
\begin{align*}
q & \rightarrow t + \ell^- + \nu \\quad \text{Lep. jet} \\
\bar{q} & \rightarrow \bar{t} + \ell^+ + \bar{\nu} \\
q & \rightarrow \gamma^* \rightarrow \ell^+ \ell^- + \nu \\quad \text{All Hadronic} \\
\bar{q} & \rightarrow \gamma^* \rightarrow \ell^+ \ell^- + \bar{\nu}
\end{align*}
\]

\( q_i = \{u, d, s, c\} \)

\( b \)-tag multiplicity in 1-jet events \( \ldots \) and \( \ldots \) in di-lepton events
• Measurements at the Tevatron and at the LHC are well described by approx. NNLO calculations

• Precision reached at the Tevatron: 6.4%

• LHC experiments have already reached a comparable precision (6.2%)

(large dataset, still potential to reduce the already dominant systematic uncertainties)
Top properties according to expectations, except maybe $A_{FB}$ (Tevatron)

$A_{fb} = \frac{F - B}{F + B} = \frac{N(\Delta y > 0) - N(\Delta y < 0)}{N(\Delta y > 0) + N(\Delta y < 0)}$

Needs clarification:

More data, improved theoretical calculations
Charmonium and Bottomonium states

Is this for the LHC?

- except for ALICE and LHCb-

Yes, all experiments at the Tevatron and LHC have observed these states, measured production cross sections and have even discovered new ones

use $\mu\mu$ decays and $\gamma$-signatures
Charmonium production:

- Production reasonably well described by NLO QCD calculations
- Simple colour singlet model not adequate
- Similar conclusions for bottomonium states
- Polarization is still not understood, further measurements needed
New heavy meson or baryon states

- First observation by ATLAS: $\chi_b (3P) \rightarrow Y(1S)+ \gamma$ and $Y(2S)+ \gamma$

- First observed by CDF in $B^+ \rightarrow J/\psi \nu$
- Observed in $B^+ \rightarrow J/\psi \pi$ (LHCb, ATLAS) and $J/\psi \pi\pi\pi$ (LHCb)

- Many other states by LHCb ($B_s^{**}$, $\Lambda_b^{0*}$, ...)

**$\chi_b (3P)$**

**$B^+_c$**
\( \Xi_b^{*0} \rightarrow \Xi_b^{-} \pi^{+} \rightarrow \Xi^{-} J/\psi \pi^{+} \rightarrow \Lambda \pi^{-} \mu^{+}\mu^{-}\pi^{+} \rightarrow p^{+}\pi^{-}\pi^{-}\mu^{+}\mu^{-}\pi^{+} \)

\begin{align*}
M(p^{+}\pi^{-}) &= 1116.7 \text{ MeV} \\
M(\Lambda^{0}\pi^{-}) &= 1315.5 \text{ MeV} \\
M(\mu^{+}\mu^{-}) &= 3117.1 \text{ MeV} \\
M(J/\psi \Xi^{-}) &= 5787.8 \text{ MeV} \\
Q(J/\psi \Xi^{-}\pi^{+}) &= 15.7 \text{ MeV}
\end{align*}

Candidate \( \Xi_b^{*0} \) event with 3 secondary and \(~10\) primary vertices.
Heavy Ions

- Experiments at the RHIC collider have established a “New State of Matter“

- The matter
  - shows a hydro-dynamical behaviour (like a nearly ideal fluid)
  - opaque to coloured partons,
  - transparent to el.magnetic and weakly interacting particles

- The LHC experiments ALICE, ATLAS and CMS have impressively confirmed the properties seen at RHIC in the first heavy ion runs in 2010/11;

Impressive results on “jet quenching” right after first collisions
Flow Measurements:

\[ E \frac{d^3N}{d^3p} = \frac{1}{2\pi} \frac{d^2N}{p_T dp_T dy} \left( 1 + \sum_{n=1}^{\infty} 2v_n \cos [n(\phi - \Psi_R)] \right) \]

- \( \Psi_R \) : angle of reaction plane
- \( v_2 \) : known as elliptic flow
- LHC measurements confirm the hydrodynamical behaviour;
  \( v_2 (p_T)_{LHC} \approx v_2 (p_T)_{RHIC} \)
- Low viscosity, nearly a perfect liquid
- Measurements extended to high \( p_T \)
- Flow measured for identified hadrons, including D mesons
Matter effects, jet quenching:

- Expected behaviour seen (hadrons, jets, photons, W and Z particles)
- Heavy mesons/quarks are less suppressed
“Early hints of news from “Beyond the Standard Model” physics may come from “beautiful” flavour physics
(P. Jenni, PLHC Summary DESY-2010)
Highlights from LHCb and other Flavour Experiments:

Lot of impressive results

- Charm mixing has been well established (combination of many experiments)
- Large CP violation effects emerge in the charm system (larger than expected)

LHCb measures difference in CP asymmetry for $D^0 \rightarrow K^+ K^-$ and $D^0 \rightarrow \pi^+ \pi^-$

Zero CP violation is excluded at the $3.5\sigma$ level (LHCb only)

Theoretical work needed and ongoing to disentangle possible new physics effects from SM hadronic effects.
CP violation in B decays

- Precise measurement of CP phase $\phi_s$: LHCb result consistent with Standard Model

- First significant direct measurement of $\Delta \Gamma_s = 0.116 \pm 0.018 \pm 0.006 \text{ ps}^{-1}$

- First evidence for direct CP violation in $B_0^s \rightarrow K\pi$

$$\int L dt = 0.35 \text{ fb}^{-1} \rightarrow \sim 300 \; B_s^0 \rightarrow K\pi$$

LHCb: $A_{CP}(B_s^0 \rightarrow K\pi) = 0.27 \pm 0.08(\text{stat}) \pm 0.02(\text{syst})$

CDF: $A_{CP}(B_s^0 \rightarrow K\pi) = 0.39 \pm 0.15(\text{stat}) \pm 0.08(\text{syst})$
Search for the decays $B_0 \rightarrow \mu^+\mu^-$ and $B_0^s \rightarrow \mu^+\mu^-$

The motivation:

The data:

$$B(B_s^0 \rightarrow \mu^+\mu^-) = 1.1 \times (3.2\pm0.2) \times 10^{-9}$$
The limits:

\[ B(B_s^0 \rightarrow \mu^+\mu^-) < (3.7 \ (4.2)) \times 10^{-9} \text{ at } 90(95) \% \text{ C.L.} \]
- Excess over background at \( \sim 2\sigma \) level (1-CL\text{_b} (p-value)=5%)
- Compatible with SM at 1\( \sigma \) (1-CL\text{_sr+b}=84%)

\[ B(B^0 \rightarrow \mu^+\mu^-) < (0.67 \ (0.81)) \times 10^{-9} \text{ at } 90(95) \% \text{ C.L.} \]
My summary on B physics

• Beautiful results are coming out!

• LHCb has taken a leading role in many areas, but Tevatron is still nicely in the game

• $e^+e^-$ machines complementary ($\tau$ decays)

• LHCb appears as an “Anomaly terminator” ($\phi_s$, BR ($B_s \rightarrow \mu \mu$) approaching Standard Model prediction)

• Some remaining “tensions”:
  - large CP violation in charm $\rightarrow$ LHCb, Theory
  - $\sin 2\beta$ vs. BR ($B \rightarrow \tau \nu$) $\rightarrow$ BELLE
  - Asymmetry in semileptonic B decays from D0 $\rightarrow$ CDF, D0

G. Dissertori, Moriond
V. Electroweak parameter

July 2011

today
W mass measurements

The beginning

\[ m_W = 80.35 \pm 0.33 \pm 0.17 \text{ GeV} \]

D. Froidevaux, Blois 2012
W mass measurements

The beginning

State of the art, today

$m_W = 80.371 \pm 0.013 \text{ GeV}$

1.68 M events, electrons $|\eta| < 1.05$

$m_W = 80.35 \pm 0.33 \pm 0.17 \text{ GeV}$
Systematic uncertainties:

Can the LHC improve on this?

In principle yes, but probably not soon and not with 30 pileup events

- Very challenging (e-scale, hadronic recoil, \( p_T(W) \),..)

- However there is potential for reduction of uncertainties
  - statistics
  - statistically limited systematic uncertainties (marked in green above)
  - pdfs, energy scale, .., recoil(?)

### Mass of the W Boson

<table>
<thead>
<tr>
<th>Measurement</th>
<th>( M_W ) [MeV]</th>
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<tbody>
<tr>
<td>CDF-0/I</td>
<td>80432 ± 79</td>
</tr>
<tr>
<td>DØ-1</td>
<td>80478 ± 83</td>
</tr>
<tr>
<td>DØ-1 (1.0%)</td>
<td>80402 ± 43</td>
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<tr>
<td>CDF-II (2.2%)</td>
<td>80387 ± 19</td>
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<tr>
<td>DØ-1 (4.3%)</td>
<td>80369 ± 26</td>
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<tr>
<td>Tevatron Run-0/I/II</td>
<td>80387 ± 16</td>
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<tr>
<td>LEP-2</td>
<td>80376 ± 33</td>
</tr>
<tr>
<td>World Average</td>
<td>80385 ± 15</td>
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</tbody>
</table>

March 2012

### New CDF Result (2.2 fb\(^{-1}\))

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<th></th>
<th>electrons</th>
<th>muons</th>
<th>common</th>
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<tr>
<td>W statistics</td>
<td>19</td>
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<tr>
<td>Lepton energy scale</td>
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<tr>
<td>Recoil energy scale</td>
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<td>Selection bias</td>
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<tr>
<td>Lepton removal</td>
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<td>Backgrounds</td>
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<tr>
<td>( p_T(W) ) model</td>
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<tr>
<td>Total systematic</td>
<td>18</td>
<td>16</td>
<td>15</td>
</tr>
<tr>
<td>Total</td>
<td>26</td>
<td>23</td>
<td></td>
</tr>
</tbody>
</table>
Top quark mass

Mass of the Top Quark

- ATLAS I+jets $174.5 \pm 0.6 \pm 2.3$
- CMS prelim mu+jets $172.64 \pm 0.57 \pm 1.18$
- ATLAS prelim allhad $174.9 \pm 2.1 \pm 3.8$
- CMS dilepton $173.3 \pm 1.2 \pm 2.6$

without uncertainties due to underlying event and colour reconnection

- Still dominated by the Tevatron experiments
- However, first competitive LHC results appear; CMS measurement in (l-jet)-channel claims a precision of 1.2 GeV;

Uncertainties need to be analyzed / understood
Di-boson production: $W\gamma$, $WW$, $WZ$, $ZZ$

- All di-boson processes have been measured by both ATLAS and CMS
- Good agreement with expected Standard Model cross sections
Constraints on anomalous Triple Gauge Couplings

- Anomalous coupling modify production rates (cross sections) and kinematics
- So far, limits extracted from production cross sections
- Start to be competitive with limits from LEP and Tevatron (process dependent)
Some numerology:

Frequently mentioned numbers at this conference?

125

95

3 \times 10^{-9}
Where is the Higgs boson?
• The Higgs boson has been searched for in both experiments, ATLAS and CMS, in a large mass range and in many channels

• Example: Some ATLAS search channels

• Data are largely consistent with the expectations from Standard Model background processes … use statistical methods to quantify this statement
Compatibility with the background-only hypothesis

Comments:

- ATLAS: low $p_0$ value around 126 GeV driven by $\gamma\gamma$ and ZZ channels
- CMS: $\gamma\gamma$ channel is dominant
- $WW \rightarrow l_\nu l_\nu$ contributes little in both experiments
Exclusion limits on Higgs boson cross sections

ATLAS Preliminary

\[ \int L dt = 4.6-4.9 \text{ fb}^{-1} \]

\( \sqrt{s} = 7 \text{ TeV} \)

CMS Preliminary

\[ \sqrt{s} = 7 \text{ TeV} \]

\[ L = 4.6-4.8 \text{ fb}^{-1} \]

95\% CL limit on \( \sigma/\sigma_{\text{SM}} \)

Higgs boson mass (GeV)

95\% CL Limit on \( \sigma/\sigma_{\text{SM}} \)

ATLAS+CMS Exclusion

100 < m_H < 106 GeV

147 < m_H < 179 GeV

February 2012
My personal comments:

• It is impressive to see what Higgs boson mass range the LHC experiments were able to explore after just two years of running!!

Many beloved plots (blue-band, $m_W$ vs. $m_t$) have drastically changed

• But: the Higgs boson has not yet been discovered!

[ For many many theorists it seems obvious that $m_H = 125$ GeV ]

Due to $m_H = 125$ the fate of the universe now seems to depend critically on the top mass and 1 GeV can make an enormous difference 

H. Murayama, Blois 12
Picked up for you in the parallel sessions:

still early... let's not get carried away

J. Galloway

A. Martin
My personal comments (part II, more positive):

- The two experiments have sensitivity to exclude the existence of the SM Higgs boson over the entire mass range \([114 – 600 \text{ GeV}]\)

- But they don’t! … and leave the same mass window open!

- There are interesting events in both experiments in the high resolution \(\gamma\gamma\) and \(ZZ^*\) channels;

but the significances are low (in particular after correcting for the famous “look-elsewhere effect”)

- The WW channel does not seem to contribute much to the excess in neither experiment
  But: - this is a challenging channel
  - this channel is not made for 125 GeV

- More data and careful analyses are needed!

- \(\tau\tau\) and \(bb\) decay modes will come into play (challenging as well)
Searches for

Physics Beyond the Standard Model

The story in short:

- Many searches, many papers, even more exclusion plots
- Nothing found … …. and frustration increased
- There are not even the “Zoo” events that appeared at any collider so far
Some exclusion plots show at this conference
.... a few selected ones

mSUGRA interpretation

Search channels:
1. veto leptons + $E_T^{\text{miss}} + \geq 2-6$ jets
Results compatible with SM only.

Interpretation in simplified model, which
assumes only gluino, squarks, and LSP.

$M_{sq} \approx 1380$ GeV, $M_{gl} \approx 940$ GeV
limits from 3rd generation squarks (gluon mediated sbottom production)

first limits on stop quarks from the LHC

\[ M_{gl} \approx 1020 \text{ GeV for } M_{\text{LSP}} \approx 400 \text{ GeV} \]
… a few more selected ones (Exotics)

No Black holes (so far)
What are the main messages?

• “Low energy SUSY” in its minimal version with $E_T^{\text{miss}}$ signatures is in trouble
  - squark and gluino limits for sparticles of first two generations at TeV scale

• Limits do not hold for third generation squarks, in particular the light stop window is not yet closed
What are the main messages?

• “Low energy SUSY” in its minimal version with $E_T^{miss}$ signatures is in trouble
  - squark and gluino limits for sparticles of first two generations at TeV scale

• Limits do not hold for third generation squarks, in particular the light stop window is not yet closed

• There might be more complicated realizations of SUSY (R-parity violation, long-lived sparticles,…multileptons, …)

• Goto MMSSM, NMSSM, NNMSSM, ………………………………………, NNNNNNNNNNN

• We had an excellent talk on such “escape roads” by Csaba Csaki yesterday…

  and I am confident that Gian Giudice will come up with further ideas to keep the experimentalists’ motivation for the search for BSM physics high

→ The experimentalists program: we will continue to study as many final state topologies as precisely as possible and confront the data to the predictions of the model that seem to survive all attacks (even those from LHCb)
2012/13 are exiting years for particle physics:

• Final word on the existence of the Standard Model Higgs boson?

• There might be surprises in searches
  (more data, slightly higher energy, not yet looked in all corners …)

• LHCb will challenge the Standard Model at the precision frontier

• ALICE will measure more parameters of the Quark-Gluon-Plasma
THANKS to the Organizers of the Conference for the fantastic meeting!

… and to all Speakers for presenting such a wealth of interesting and exiting results!