Physics Highlights: many new results!

IBL Insertion and ID cooling tests

Milestone Week 3: cosmics in ATLAS!
Recent Physics Highlights
Finalizing Run 1 data analysis (7 and 8 TeV)

- Measurement of the underlying event in jet events from 7 TeV proton-proton collisions with the ATLAS detector
- Jet energy measurement and its systematic uncertainty in proton-proton collisions at \( \sqrt{s} = 7 \) TeV with the ATLAS detector
- Search for squarks and gluinos with the ATLAS detector in final states with jets and missing transverse momentum using 20.3 fb\(^{-1}\) of \( \sqrt{s} = 8 \) TeV proton-proton collision data
- Light-quark and gluon jet discrimination in pp collisions at \( \sqrt{s} = 7 \) TeV with the ATLAS detector
- Evidence of electroweak production of WWjj in pp collisions at \( \sqrt{s} = 8 \) TeV with the ATLAS detector
- Search for supersymmetry in events with four or more leptons in \( \sqrt{s} = 8 \) TeV pp collisions with the ATLAS detector
- Search for microscopic black holes and string balls in final states with leptons and jets with the ATLAS detector at \( \sqrt{s} = 8 \) TeV
- Search for High-Mass Dilepton Resonances in pp Collisions at \( \sqrt{s} = 8 \) TeV with the ATLAS Detector
- Measurement of the centrality and pseudorapidity dependence of the integrated elliptic flow in lead-lead collisions at \( s_{NN} = 2.76 \) TeV with the ATLAS detector
- The monitoring and data quality assessment of the ATLAS liquid argon calorimeter
- Operation and Performance of the ATLAS Semiconductor Tracker
- Measurement of \( \chi_{c1} \) and \( \chi_{c2} \) production with \( \sqrt{s} = 7 \) TeV pp collisions at ATLAS
- Observation of Boosted Z\( \rightarrow \)bb Production in Proton-Proton Collisions at \( \sqrt{s} = 8 \) TeV and Measurement of the Production Cross-Section
- Muon Reconstruction Efficiency and Momentum Resolution of the ATLAS Experiment in Proton-Proton Collisions at \( \sqrt{s} = 7 \) TeV in 2010
- Search for supersymmetry at \( \sqrt{s} = 8 \) TeV in final states with jets and two same-sign leptons or three leptons with the ATLAS detector
- Electron reconstruction and identification efficiency measurements with the ATLAS detector using the 2011 LHC proton-proton collision data
- Measurement of the low mass Drell-Yan differential cross section at \( \sqrt{s} = 7 \) TeV using the ATLAS detector
- Measurement of the parity violating asymmetry parameter \( \alpha_b \) and the helicity amplitudes for the decay \( AB \rightarrow J/\psi A0 \) with the ATLAS detector
- Search for dark Matter in events with single \( Z \) and missing transverse Energy using pp collisions at \( \sqrt{s} = 8 \) TeV with the ATLAS detector
- Search for top quark decays \( t \rightarrow qH \) with \( H \rightarrow \gamma\gamma \) using the ATLAS detector
- Searches for direct production of charginos, neutralinos and sleptons in final states with two leptons and missing transverse momentum in pp collisions at \( \sqrt{s} = 8 \) TeV with the ATLAS detector
- Measurement of the 4l Cross Section at the Z Resonance and Determination of the Branching Fraction of \( Z \rightarrow 4l \) in pp Collisions at \( \sqrt{s} = 7 \) and 8 TeV with ATLAS
- Search for direct stop pair production in events with a \( Z \) boson, \( b \)-jets and missing transverse energy with the ATLAS detector using 21 fb\(^{-1}\) from proton-proton collision at \( \sqrt{s} = 8 \) TeV
- Search for direct top squark pair production in final states with two leptons in \( \sqrt{s} = 8 \) TeV pp collisions with the ATLAS detector
- Measurement of event-plane correlations in \( s_{NN} = 2.76 \) TeV lead-lead collisions with the ATLAS detector

Since the last LHCC meeting:
- 25 new papers
- 27 CONF notes

Paper shown in this talk
- Paper in back-up
Heavy Ions

- **10 new results** released since last LHCC meeting!
  - Cover a variety of topics aiming to study quark gluon plasma using soft and hard probes (in p-Pb and Pb-Pb)
  - Presented at QuarkMatter 2014 Conference

Charged hadron production in p+Pb collisions at √s_{NN}=-5.02-TeV measured at high transverse momentum

Measurement of the production of neighbouring jets in lead-lead collisions at √s_{NN} = 2.76 TeV

Collective flow with higher-order cumulants in lead-lead collisions at √s_{NN} = 2.76 TeV

Centrality, rapidity and pT dependence of isolated prompt photon production in Pb-Pb collisions at √s_{NN} = 2.76 TeV

**Measurements of the nuclear modification factor for jets in Pb+Pb collisions at sqrt{NN}=2.76 TeV**

Centrality and rapidity dependence of inclusive jet production in √s_{NN}=-5.02-TeV proton–lead collisions

**Measurement of W boson production and lepton charge asymmetry in Pb+Pb collisions at √s_{NN} = 2.76 TeV**

Elucidating the event-shape fluctuations via flow correlations and jet tomography studies in 2.76 TeV Pb+Pb collisions

**Measurement of the long-range pseudorapidity correlations and associated Fourier harmonics in √s_{NN}=5.02 TeV proton-lead collisions**

**Measurement of the Z-boson production in pPb collisions at √s_{NN}=5.02 TeV**
HI highlights: Hard Probes and jets

Jet production in p-p and Pb-Pb:

- Measure absolute jet suppression: $R_{AA}$ (=nuclear modification factor) vs rapidity and in ranges of centrality
  - 0-10% Centr: $R_{AA} = 0.47$ (0.56) for $p_T = 55$ (355) GeV consistent with central-to-peripheral ratio

EWK Boson measurements \(\rightarrow\) additional way to study partonic energy loss in HI collisions (standard candles).

\[ E.g.: W (\rightarrow e, \mu) \]
Evidence for Electroweak Production of $W^\pm W^\pm jj$

- Key process to probe the nature of EWK symmetry breaking
- Use 8 TeV full dataset in $e^\pm e^\pm$, $e^\pm \mu^\pm$, and $\mu^\pm \mu^\pm$ final state (+2jets)

‘Inclusive’ and ‘VBS’ fiducial regions

combined significance: $4.5 (3.6) \sigma$ in the inclusive (VBS) region

Fiducial cross section in VBS region:

$\sigma^{\text{fid}} = 1.3 \pm 0.4(\text{stat}) \pm 0.2(\text{syst})$ fb

SM: $0.95 \pm 0.06$ fb

Set also limits on anomalous quartic gauge boson couplings ($a4$, $a5$)
Top production

- Single top t-channel inclusive and fiducial cross section

Translate fiducial $\sigma$ to total $\sigma$

Also:

arXiv:1403.6293

Search for FCNC top $\rightarrow$ Hq, H$\rightarrow$ $\gamma\gamma$

BR < 0.79% and limits on tqH ($q=u,c$) coupling
Higgs highlights

- Shortly after last LHCC meeting: update on higgs couplings
  - Inclusion of fermion results (H to $\tau\tau$ and VH, $H \rightarrow bb$)

### ATLAS-CONF-2014-009

**ATLAS Prelim.**

<table>
<thead>
<tr>
<th>Channel</th>
<th>$\sigma$ (stat.)</th>
<th>$\sigma$ (sys inc.)</th>
<th>$\sigma$ (theory)</th>
<th>Total uncertainty</th>
<th>$\mu$ (1σ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$H \rightarrow \gamma\gamma$</td>
<td></td>
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<td>1.57$^{+0.33}_{-0.28}$</td>
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<td>$H \rightarrow ZZ^* \rightarrow 4l$</td>
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<td>1.44$^{+0.40}_{-0.35}$</td>
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<tr>
<td>$H \rightarrow WW^* \rightarrow l\nu l\nu$</td>
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<td>1.00$^{+0.32}_{-0.29}$</td>
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<tr>
<td>Combined $H \rightarrow \gamma\gamma, ZZ^<em>, WW^</em>$</td>
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<td>1.35$^{+0.21}_{-0.20}$</td>
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<tr>
<td>$W, Z \rightarrow b\bar{b}$</td>
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<td></td>
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<td>0.2$^{+0.7}_{-0.6}$</td>
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<tr>
<td>$H \rightarrow \tau\tau$ (8 TeV data only)</td>
<td></td>
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<td></td>
<td></td>
<td>1.4$^{+0.5}_{-0.4}$</td>
</tr>
<tr>
<td>Combined $H \rightarrow b\bar{b}, \tau\tau$</td>
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<td></td>
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<td>1.09$^{+0.36}_{-0.32}$</td>
</tr>
</tbody>
</table>

**Total: $\mu = 1.30 \pm 0.12 \text{ (stat)} \pm 0.14 \text{ (sys).}$**

**Coupling fits assuming only SM**

- $\kappa_V = 1.15 \pm 0.08$
- $\kappa_F = 0.99 \pm 0.17$

**Illustration on how channels contribute**

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*Monica D’Onofrio, 118th Open LHCC Session* 4/06/2014
ttbar+Higgs

- Direct access to top-Higgs Yukawa coupling
- Consider $H \rightarrow b\bar{b}$: single and dilepton channels, categorized in $N$ jets, $N$ b-jets.
- Use Neural Network based on several discriminating variables

E.g.: single lepton $6j, 4b$

Constrain background in suitable Control Regions → help reducing systematic uncertainties

Signal strength assuming $m_H = 125$ GeV

Centrality=$\text{Sum } pT / \text{Sum } E \text{ (all jets and lepton)}$
Since then: improvements in energy-scale calibrations for $e$, $\gamma$ and $\mu$

Ele/photons in 2012 data
6.6M $Z$ to $ee$ used to derive in-situ energy scales for $e$ and $\gamma$
0.3M $J/\psi$ to $ee$ and 0.2M $Z$ to $l\ell\gamma$ for cross checks

Muons in 2012 data:
9M $Z$ to $\mu\mu$, 6M $J/\psi$ used to set the muon p scale and resolution.
5M $Y$ to $\mu\mu$ used to verify results and systematics

Total uncertainty on $e$ energy scale: 0.03%-0.3% for $E_{eT} \sim 40$ GeV
Total uncertainty on $\gamma$ energy scale: 0.2%-0.6% for $E_{\gamma T} \sim 60$ GeV
Total uncertainty on $\mu$: from 0.04% for $\eta \sim 0$ to 0.2% for $|\eta| > 2.0$
Improved measurement of Higgs boson mass

Last Mass measurement (July 2013)

<table>
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<tr>
<th>Channel</th>
<th>Mass value</th>
</tr>
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<tr>
<td>$H \rightarrow \gamma\gamma$</td>
<td>$126.8 \pm 0.2$ (stat) $\pm 0.7$ (sys) GeV</td>
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<tr>
<td>$H \rightarrow 4l$</td>
<td>$124.3^{+0.6}<em>{-0.5}$ (stat) $^{+0.5}</em>{-0.3}$ (sys) GeV</td>
</tr>
<tr>
<td>Combined</td>
<td>$125.5 \pm 0.2$ (stat) $^{+0.5}_{-0.6}$ (sys) GeV</td>
</tr>
</tbody>
</table>

Measurement limited by systematic uncertainties on $e/\gamma$ energy scale

Mass measurement in $H \rightarrow \gamma\gamma$

- Unbinned likelihood fit with $m_H$ as parameter of interest
- **10 mutually orthogonal categories** (converted/ unconverted $\gamma$, $\eta$ of $\gamma$) with different S/B, optimized to minimize the expected uncertainty on the mass measurement
- Reduction by 10% of expected signal resolution
- Reduce systematics on $m_{\gamma\gamma}$ from **0.7 GeV** (Summer 2013) to **0.24 GeV** (now!)
Improved measurement of Higgs boson mass

Last Mass measurement (July 2013)

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Measurement limited by systematic uncertainties on $e/\gamma$ energy scale

Mass measurement in $H\rightarrow 4l$

Factor of 2 to 10 reduction of uncertainties related to energy calibration

Improvements in analysis techniques

- Use new multivariate discriminant
- 2D fit ($m_{4l}$,BDT) with 4 categories ($4\mu,4e,2\mu 2e,2e2\mu$)

Increase S/B

Reduction of the statistical uncertainties
Improved measurement of Higgs boson mass

Last Mass measurement (July 2013)

Measurement limited by systematic uncertainties on $e/\gamma$ energy scale

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</table>

Combination

Use profile likelihood ratio defined in terms of $m_H$ and treating $\mu_{\gamma\gamma}$ and $\mu_{4\ell}$ as independent nuisance parameters

Considerable reduction of systematic uncertainties on individual measurements

$\Delta m_H = 1.47 \pm 0.67$ (stat) $\pm 0.28$ (sys) GeV $= 1.47 \pm 0.72$ GeV

Compatibility: $2.0\sigma$ (was $2.5\sigma$) corresponding to a probability of 4.8%

Shown at LHCP this week for first time; paper to be submitted shortly

Monica D’Onofrio, 118th Open LHCC Session

4/06/2014
Beyond SM Higgs searches

- Search for resonant ($X \rightarrow hh$) and non-resonant Higgs pair production in $\gamma\gamma bb$
  - $X$ could be heavy Higgs in 2HD Models
  - Non resonant: SM $hh$ production NLO xsect = 9.22 fb (includes interference between trilinear Higgs couplings and box diagrams)
  
  95% CL upper limit on $\sigma x BR$ of non-resonant production:
  Obs: 2.2pb
  (Exp: 1.0$^{+0.6}_{-0.3}$pb)

  Limit for narrow resonance: 0.8 - 3.5 pb as function of its mass

- Search in low/high $\gamma\gamma$ mass
  - Explore region between 65 and 600 GeV
  - SM Higgs production treated as background
  - Model-independent limit at the 95% CL on the production cross-section x BR($\rightarrow \gamma\gamma$) in a fiducial volume
Several new results on searches for SUSY strong production: gluinos, squarks including top squarks

**arXiv:1404.2500**

2 same sign leptons (e/mu) + (b-) jets (/ 3-leptons + (b-)jets).

Background estimate mostly data-driven

Several interpretations → gluino pair production

0 leptons, 2-6 jets + Missing $E_T$ → several SR targeting many strong production scenarios.

Example: squark pair production

Background estimate from control regions.

**arXiv:1405.7875**
SUSY searches: top squarks

2-lepton (e/μ) + b-jet: targets different mass hierarchies. Uses $M_{T2}$ variable to suppress the background.

OR decay via stau: ATLAS-CONF-2014-014

0 leptons + 4/5/6 jets + Missing $E_T$: sensitive to various scenarios.

Shown TODAY for first time; paper to be submitted shortly.
SUSY Searches: Electroweak production

4-lepton (e, μ, τ) - many interpretations (R-parity violating and EWK scenarios).

Example of SR with 1τ

2-lepton (e, μ) - many interpretations. (a) Exclusion of chargino pair production decaying via W’s (b) combined chargino-neutralino exclusion in WZ final states
Searches in dilepton final states

- Resonant dilepton production
  - $ee, \mu\mu$

- Non resonant dilepton production

Use also the $ll$ decay angle, $\cos\theta^*$

Lower limits on:

- Scale for Contact Interaction: $\Lambda > 26.3$ TeV
- Large Extra Dimension: $M_s > 6.1$ TeV for $n=3$ ADD
Towards Run 2
IBL insertion and Pixel status

- IBL (new inner pixel layer being added during LS1) completely inserted on Wednesday May 7!
  - Smooth operations, followed by installation of N₂ lines and flushing in IBL sealed volume

- In addition:
  - Pixel detector reconnected and cooling restarted
    - All 82 Pixel loops operated successfully

On-going:

- IBL service connections
- Further extensive cooling trials in July for IBL, Pixel and SCT systems
**M-weeks**

**Milestone weeks:**
- get all sub detectors up and running for Run-2
- 6 milestone weeks foreseen until October 2014
- Since last LHCC meeting: two more M-weeks completed

**M3 (just two weeks ago):**
- Huge progress on all systems!
- Could run with combined system at 100+ kHz level-1 rate using random triggers
- **Overnight Cosmic Trigger Run** TRT Fast OR + RPC + MDT (HV nominal) and CSC (~side A HV nominal)

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**Table:**

<table>
<thead>
<tr>
<th></th>
<th>M1</th>
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*Cosmic run Nov 24-Dec 5*
A busy ATLAS Control Room
M3 Participating Components and Runs

- Include BCM, TRT, CSC, MDT, TGC and RPC (new in M3!):
  - Tested with 100+ kHz level-1 rate
  - Sector 5 A RPC providing trigger

- Also include HLT (New in M3!):
  - For the first time in ATLAS partition since Run 1!

**M3 Menu:**
- LVL1: latest Run 1 Physics menu
- HLT: basic L1 streamers (e.g. L1_TRT)

**Cosmic Run** with all the above systems participating

- Event Display and Monitoring working at Point1.
- Tier0 processing of the data streamlined
- Data Quality Web-displays produced automatically for incoming data
Cosmics through ATLAS again!

TRT Fast-OR

RPC Trigger Event
Further preparation for Run 2

Detector consolidation and repair work ongoing, e.g.

- LAr low voltage power supplies being re-installed on the detector after capacitor replacements done at the company (Wiener)
- **Tile**: replacement of LVPS and check of HV boards (235/256 drawers done)
- **RPC** leak chasing: more than half done
- **MDT/RPC**: new BME chambers installed

New functionalities in run-2:

- 1 crate of new L1Calo input processor MCMs installed & under test
- L1Topo trigger on schedule through production readiness review
- new CSC ROD commissioning to start in June, to go to 100 kHz L1 rate

Software and Analysis preparation:

- new Geant version (4.9.6) for simulation fully validated
- new reconstruction software based on "xAOD" in final validation stage (format readable by both ROOT and Athena)
- tuning of clustering for IBL layer ongoing
- major improvements to grid-related software on track (ProdSys2, Rucio)
- tutorials on new analysis model have started (and are fully booked!)

**Major testing of new SW components and analysis model during the summer ("DC14")**

See more detail in March LHCC talk (A. Salzburger)
Conclusions

- Many new results released in the last few months based on heavy ions and proton-proton collisions!
  - Emphasis on finalising Run-1 papers.
- Re-analysis of 2011 and 2012 data using improved energy scale calibration for $e$, $\gamma$ and $\mu$ led to a new precision measurement of the Higgs mass
  - Improves systematic uncertainties on individual channel measurements:
    - $H\to\gamma\gamma$: from 700 MeV to 280 MeV; $H\to4\ell$: from +500/-300 MeV to 40 MeV
  - Detailed groundwork opens door to further precision measurements
- Preparations for Run-2 continue to progress well
  - IBL successfully inserted into ATLAS
  - Pixel reconnected and testing in progress, much other work across many detectors well advanced
  - Cosmic rays recorded again during the last M-week (M3), with high-level trigger and several detectors included
- Upgrade work on Phase-1 and Phase-2 ongoing, as reported yesterday by P. Allport in the upgrade session
Back-up
B-Physics highlights: charmonium

New B-physics results since March LHCC:

- Study of heavy quarkonium production → unique insight into dynamics of strong interaction.
  - prompt and non-prompt production cross-sections for the $\chi_{c1}$ and $\chi_{c2}$ charmonium states where $\chi_c$ are reconstructed through the radiative decay $\chi_c \rightarrow J/\psi(\rightarrow \mu\mu) + \gamma$

$$\frac{d\sigma}{dp_T^J}(|y^J\psi| < 0.75)$$

$$10^{10} \times |Ldt| = 4.5 \text{ fb}^{-1}$$

$BR(B^\pm \rightarrow \chi_c K^\mp) = 4.9 \pm 0.9 \text{(stat)} \pm 0.6 \text{(syst)} \times 10^{-4}$
Other SM highlights

- More and more precision measurements but also study challenging or rare final states with 7 and 8 TeV data:
  - e.g. Z boson

\[ Z \rightarrow b\bar{b} \]

\[ Z \rightarrow 4l (e, \mu) \]

\[ \sigma (\text{fid}) = 2.02 \pm 0.33 \text{ pb} \]

Consistent with SM predictions
Search for top pair production assuming:

- one top in $W_b$ (with $W \rightarrow j j$ or $\rightarrow l v$)
- one top in $H_q$, $H \rightarrow \gamma \gamma$

Limits on $t q H$ coupling assuming equal sensitivity to $q = u$ and $q = c$:

$$\sqrt{\lambda_{tcH}^2 + \lambda_{tuH}^2} < 0.17$$

arXiv:1403.6293

Monica D’Onofrio, 118th Open LHCC Session
Fitted values of most relevant nuisance parameters

95% CL upper limits on $\sigma(tt\bar{b}H)$
### Details on Higgs boson mass measurement

<table>
<thead>
<tr>
<th>Systematic</th>
<th>Uncertainty on $m_H$ (MeV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAr syst on material before presampler (barrel)</td>
<td>70</td>
</tr>
<tr>
<td>LAr syst on material after presampler (barrel)</td>
<td>20</td>
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<tr>
<td>LAr electronics non-linearity (layer 2)</td>
<td>60</td>
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<tr>
<td>LAr electronics non-linearity (layer 1)</td>
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<tr>
<td>LAr layer calibration (barrel)</td>
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<td>Lateral shower shape (conv)</td>
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<td>Presampler energy scale (barrel)</td>
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<tr>
<td>ID material model ($</td>
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<tr>
<td>$H \rightarrow \gamma \gamma$ background model (unconv rest low $p_T$)</td>
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<td>$Z \rightarrow ee$ calibration</td>
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<tr>
<td>Primary vertex effect on mass scale</td>
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<tr>
<td>Muon momentum scale</td>
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<tr>
<td>Remaining systematic uncertainties</td>
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Details on Higgs mass measurement

ATLAS Preliminary

\[ \int L dt = 4.5 \text{ fb}^{-1}, \sqrt{s} = 7 \text{ TeV} \]
\[ \int L dt = 20.3 \text{ fb}^{-1}, \sqrt{s} = 8 \text{ TeV} \]

\[ -2 \ln \Lambda \]

\[ m_H [\text{GeV}] \]

Monica D’Onofrio, 118th Open LHCC Session

4/06/2014
Details on Higgs boson mass measurement

- Difference, $\Delta_i$, between the mass measured in a given $\gamma\gamma$ sub-sample and the combined $\gamma\gamma$ mass, using three different alternative categorizations to define the sub-samples. The top three points show a categorization based on the photon conversion status: UU is the sub-sample with both photons unconverted, UC the sub-sample with one converted and one unconverted photon, CC the sub-sample with two converted photons. The middle three points show a categorization based on the number of reconstructed primary vertices ($N_{PV}$) in the event. The bottom three points show a categorization based on the photon impact points on the calorimeter: BB is the sub-sample with both photons detected in the barrel calorimeter, BE the sub-sample with one photon in the barrel calorimeter and one photon in the end-cap calorimeter and EE the sub-sample with both photons in the end-cap calorimeter.
Details on Higgs boson mass measurement

- Pulls and impact on $m_H(\hat{m})$ for the principal constrained nuisance parameters in the $H \rightarrow \gamma\gamma$ and $H \rightarrow 4l$ channels. The fitted value and $\pm 1\sigma$ uncertainties are shown for each parameter by the points and error bars (lower scale). The relative change in $m_H(\hat{m})$ as a result of varying each parameter by its fitted uncertainty (upper scale) is shown in yellow. Parameters are selected and ordered according to their impact on $m_H(\hat{m})$. 

ATLAS Preliminary

- $\sigma = 7$ TeV, $\int L dt = 4.5$ fb$^{-1}$
- $\sigma = 8$ TeV, $\int L dt = 20.3$ fb$^{-1}$
W’ searches

- \( W' \rightarrow l\nu \)
- \( W' \rightarrow WZ \) (3 leptons)

**ATLAS-CONF-2014-017**

**ATLAS-CONF-2014-015**

- \( W' \rightarrow l\nu \)
- \( W' \rightarrow WZ \) (3 leptons)
Other exotic searches highlights

- **Mono-Z production: window to Dark Matter**

  ![Diagram of Mono-Z production](image1)

  - **Mono-Z production: window to Dark Matter**
    - **Figure 1:** ATLAS data and theoretical predictions for W/Z production in the mono-Z channel.
    - **Figure 2:** ATLAS data and theoretical predictions for W/Z production in the mono-Z channel.

- **Microscopic Black-holes: gravity**

  ![Diagram of Microscopic Black-holes](image2)

  - **Microscopic Black-holes: gravity**
    - **Figure 3:** Plot showing the exclusion limits for microscopic black holes with mass thresholds of 4.8-6.2 TeV at 95% CL.
    - **Figure 4:** Plot showing the exclusion limits for microscopic black holes with mass thresholds of 4.8-6.2 TeV at 95% CL.

  **In high pT leptons and jets final state events**

  ![Plot of high pT leptons](image3)

  - **Plot of high pT leptons and jets final state events**
    - **Figure 5:** Plot showing the exclusion limits for microscopic black holes with mass thresholds of 4.8-6.2 TeV at 95% CL.

**For 6 extra dimensions, mass thresholds of 4.8-6.2 TeV excluded at 95% CL, depending on the fundamental gravity scale and model assumptions.**

Monica D’Onofrio, 118th Open LHCC Session 4/06/2014
SUSY searches: top squarks

\[ \tilde{t}_1 \to c \tilde{\chi}_1^0 / \tilde{t}_1 \to W b \tilde{\chi}_1^0 / \tilde{t}_1 \to t \tilde{\chi}_1^0 \]

**ATLAS** Preliminary

- Observed limits
- Expected limits

All limits at 95% CL

\[ \tilde{t}_1 \to b \tilde{\chi}_1^\pm, \tilde{\chi}_1^\pm \to W(t) \tilde{\chi}_1^0 \]

\[ m_{\tilde{t}_1} < m_{\tilde{\chi}_1^0} + 100 \text{ GeV} \]

**CDF** 2.6 fb^{-1 \cdot 1203.4171}

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Status: Moriond 2014

\[ L_{\text{int}} = 20 - 21 \text{ fb}^{-1} \ \text{\(\sqrt{s}\) = 8 TeV} \]

\[ L_{\text{int}} = 4.7 \text{ fb}^{-1} \ \text{\(\sqrt{s}\) = 7 TeV} \]
SUSY searches: top squarks

$Z(ll^{'}) + b$-jets + Missing $E_T$: targets heavier stop (stop2), as window for difficult regions (stop mass close to top mass).

$\tilde{t}_2 \tilde{t}_2$ production, $\tilde{t}_2 \rightarrow Z \tilde{t}_1$, $\tilde{t}_1 \rightarrow t\tilde{\chi}_1^0$
### SUSY Searches: Weak production summary

**ATLAS Preliminary**  
**20.3-20.7 fb⁻¹, √s=8 TeV**  
**Status: Moriond 2014**

#### Results:

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<td>$3l$, arXiv:1402.7029</td>
<td>$3l$, arXiv:1402.7029</td>
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<td>$pp \rightarrow \tilde{\chi}_1^+ \tilde{\chi}_1^-$, via $\tilde{l}_L / \tilde{\nu}_L$</td>
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<td>$2e/\mu+3l$, arXiv:1403.5294</td>
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<td>$2e/\mu$, arXiv:1403.5294</td>
<td>$2e/\mu$, arXiv:1403.5294</td>
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**Equation:**  
$m_{\tilde{\tau}_L / \tilde{\nu}_L} = 0.5 (m_{\tilde{\chi}_1^0} + m_{\tilde{\chi}_2^0})$  

**Inequality:**  
$m_{\tilde{\chi}_1^0} < m_{\tilde{\chi}_2^0}$  
$m_{\tilde{\chi}_2^-} = m_{\tilde{\chi}_1^-} + m_{\tilde{\nu}_\tau}$  
$m_{\tilde{\chi}_2^-} = m_{\tilde{\chi}_1^0} + m_{\tilde{\tau}_\tau}$  
$m_{\tilde{\chi}_2^-} = 2m_{\tilde{\chi}_1^0}$
### M-weeks

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### Cosmic Run Nov 24th - Dec 5th

1. TDAQ integration, using events simulated at ROD
2. Test with frontend, detector cold

### Notes

- **M4:**
  - Calorimeters, PIX, SCT, IBL
  - Readout only. 2. Full legacy triggering with TIL + LAR
  - CMX triggering both CP/JEP systems, L1Topo Readout Commissioned. 4. L1Topo Commissioned fully in trigger system. Possibly TGC trigger

- **M3:**
  - TRT and RPC Cosmic Trigger
  - LAr moved to M4 (PS refurbishment)
  - Validation of M2 sub-systems
  - HLT chain

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All information in P1 Twiki:
https://atlasop.cern.ch/twiki/bin/view/Main/Run2Preparation

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Monica D’Onofrio, 118th Open LHCC Session

4/06/2014
Towards Run 2: DC14

- Technical and Physics improvements in offline areas being tested during a **data-challenge in 2014 (DC14)**.
- **The goal is to get ready for Run-2 analyses** and engage a large fraction of the collaboration in the preparation:
  - 500 M of MC events with the run-1 conditions have been simulated.
  - Software has been migrated to the new ROOT-readable Event Data Model (xAOD) and the reconstruction is now about two times faster than run-1 release, thanks to the migration from CLHEP to Eigen libraries, (auto-)vectorization and careful rewriting and optionization of the code.

- **Next steps are:**
  - Reconstruction of the MC with new software and run-1 conditions and reprocessing of 25% of the 2012 data.
  - Test of the new analysis model by the Combined Performance groups and selected physics analyses.
  - Production of MC at 13 TeV and run-2 conditions