

Multi-charged particles search: current status and plans for the 2015 data analysis

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for the multi-charge analysis team**

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8 TeV paper status

Regular Article - Experimental Physics

The European Physical Journal C

August 2015, 75:362

Open Access

Search for heavy long-lived multi-charged particles in pp collisions at $\sqrt{s} = 8$ TeV using the ATLAS detector

G. Aad, H. Abbott, B. Abbott, J. Abdallah, O. Abdinov, R. Aben, M. Abolins, O. S. AbouZeid, H. Abramowicz,

F. Abt, and 214 more



[arXiv:1504.04188](https://arxiv.org/abs/1504.04188)

[Eur. Phys. J. C 75 \(2015\) 362](https://doi.org/10.1140/epjc/s10052-015-2362-2)

Team

O. Bulekov (Moscow MEPHI)

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← left ATLAS in 2014

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Yu. Smirnov (Moscow MEPHI)

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← left ATLAS in 2013

Our result on the Exotics “mass reach” summary plot

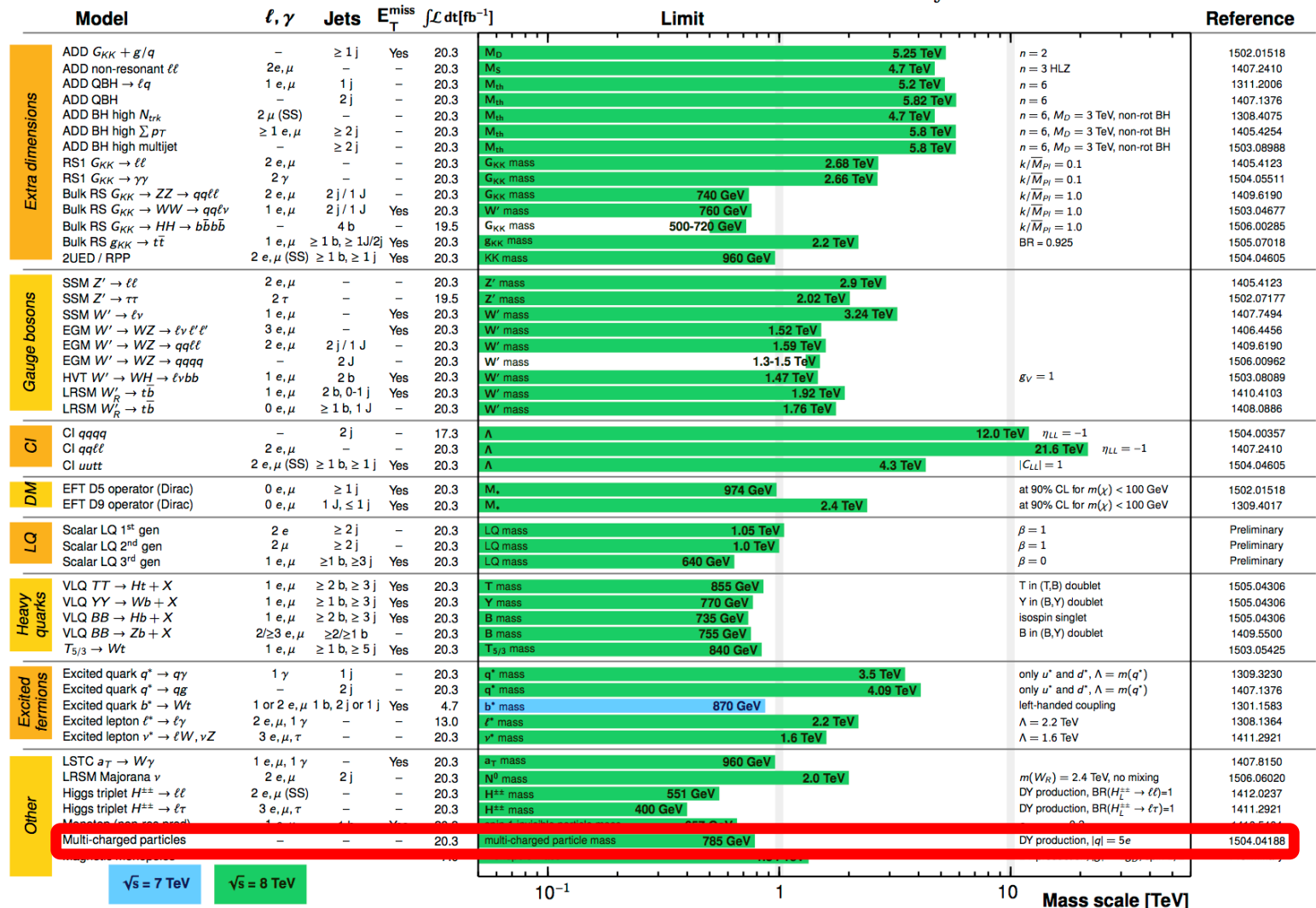
ATLAS Exotics Searches* - 95% CL Exclusion

Status: July 2015

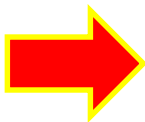
ATLAS Preliminary

$\int \mathcal{L} dt = (4.7 - 20.3) \text{ fb}^{-1}$

$\sqrt{s} = 7, 8 \text{ TeV}$



*Only a selection of the available mass limits on new states or phenomena is shown.



$\sqrt{s} = 7 \text{ TeV}$ $\sqrt{s} = 8 \text{ TeV}$

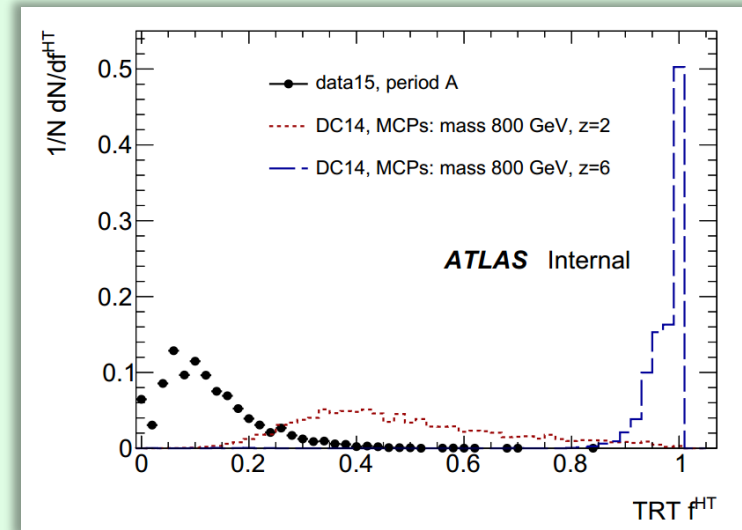
10⁻¹ 1 10 Mass scale [TeV]

Plans for the 13 TeV data analysis

- Expand the range of sought charges up to $|q| = 9e$ or $10e$ (it was up to $6e$ in the 8 TeV analysis);
- Include non-integer charges: $2.5e$, $3.5e$, $4.5e$ etc.;
- Expand the mass range: 50 – 1600 GeV (it was 50 – 1000 GeV in the 8 TeV analysis);
- Increase the efficiency:
 - Consider jet-associated production to make use of a jet trigger;
 - Exploit the calorimeters shower shape (a.k.a. energy dispersion) as a signal/bkg discriminating variable for new charges ($6e - 10e$);
 - Exploit the BCID L1 topo (a.k.a. “late muon”) trigger, which triggers on MET in an in-time BC and a late muon in BC+1;
 - Make use of the new ‘Number of overflown IBL clusters’ variable;
 - ...

What's already done

- Preliminary DC14 studies this summer:
 - ✓ general infrastructure to analyze [D]xAODs is set up;
 - ✗ no HLTs available in xAODs;
 - ✗ no analysis-specific dE/dx quantities either (in progress now);
- data15 periodA is processed with not-yet-optimized selection (for testing purposes);
- Analysis derivation is chosen: [EXOT9](#) ← keeps an event with ≥ 1 combined muon with $p_T > 50$ GeV, keeps all ID tracks around this muon in a $\Delta R = 0.4$ cone, keeps truth info about all BSM particles;
- Limits setting:
 - ✓ transition from MCLimit tool to RooStats is completed;
 - ✓ 8 TeV limits (initially computed with MCLimit) were reproduced with RooStats;
- MC15 signal samples request was finished yesterday: [JIRA ATLMCPROD-1946](#), now we're waiting for derivation jobs to finish.



THANKS!