

News

LHC Update: CMS Search for Exotics, Chamonix, Stop Rumours! & Running Parameters for 2012

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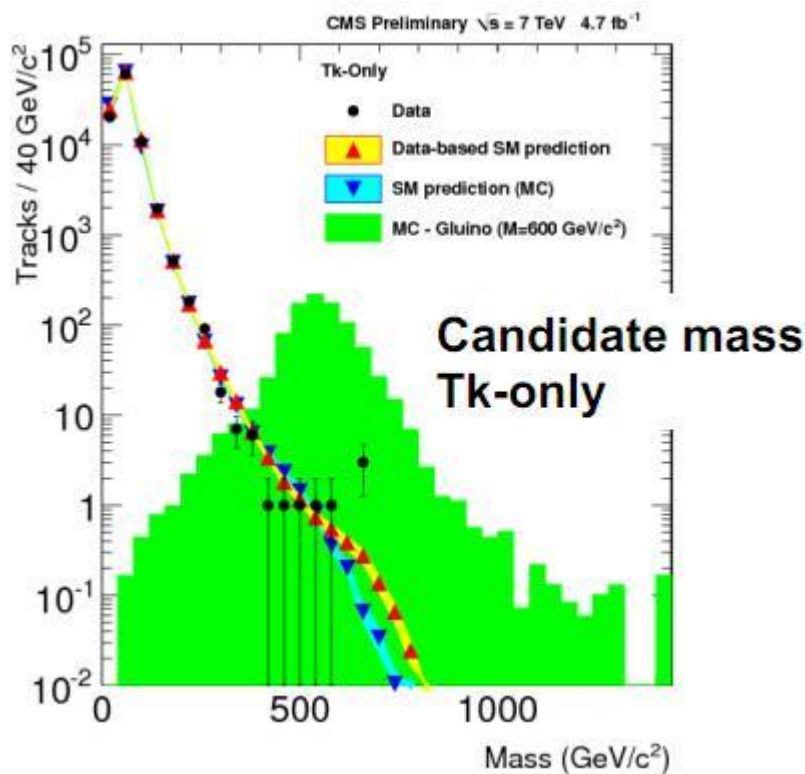
Abstract

This news is adapted from viXra log (<http://blog.vixra.org>) and contains LHC updates through February 25, 2012.

Key Words: LHC update, CMS, exotics, Chamonix, stop rumour, running parameter.

Jan. 31, 2012: [CMS search for exotics at 5/fb, is that a HSCP at 700 GeV?](#)

Today CMS have delivered a [new report](#) of searches for exotic particles including SUSY using datasets up to 5/fb. I dont think I have ever seen so many new results released in one presentation (Eva Halkiadakis). Sadly there are no new discoveries and nothing can be considered to be inconsistent with the standard model, but it would be exceptional if we could not pick at least one exceptional datapoint from so many plots and here it is.



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This is from a search for heavy stable charged particles and three isolated events were seen in the same bin at 700 GeV.

Update: A video of the talk has now been uploaded. Motl has posted a [useful analysis](#) for this plot.

February 6, 2012: [LHC Update: Chamonix](#)

This week the operations groups of the Large Hadron Collider are holding their annual [workshop in Chamonix](#) to determine how to run the collider during 2012 and beyond. Many technical slides are up giving us a good indication of the status of the machine with most of the winter maintenance completed.

Last year they were expected to produce 1/fb of integrated luminosity and they gave the experiments 5/fb, so this year we reward them with an expectation of at least 15/fb, no pressure. According to [Lamont](#), the tentative running parameters include a beta* of 60cm in ATLAS and CMS compared to 1m last year. This means a tighter squeeze at the collision points and potentially a 60% increase in luminosity, so they are already half way to the target. The rest depends on stability and the time they can keep it in stable beams. Last year 50% of fills lasted less than 3 hours and turnaround times were dominated by machine availability. Improving the efficiency will be key to getting more luminosity.

Will they stick with 50ns switch to 25ns to double the number of bunches? This wont double the luminosity as you might expect because the injector has to split the bunches resulting in lower intensity. They will also be limited by beam induced heating and emittance. Overall the smaller bunch spacing may *decrease* the luminosity but it would also provide some much wanted relief from the effects of pile-up in the experiments. There are other downsides to consider. The increased effects of the e-cloud at 25ns means lower luminosity lifetimes. To mitigate this problem they will need a lot of scrubbing runs taking about two weeks of machine running time compared to 2 or 3 days if they stick with 50ns. Will the extra uncertainty that this implies rule out 25ns operations for this year? See the talk by [Rumolo](#) for more details.

Another decision concerns the beam energy. Last year they ran at 3.5TeV per beam, but this year they tentatively hope to increase this to 4 TeV. That would be great news for physics because it increases the discovery potential at the higher masses where new particles may be waiting to revolutionize our knowledge. Whether they can run safely at the higher energy this depends largely on the results of tests on defective busbar joints. This will be reported tomorrow so look out here for an update.

In July the biannual ICHEP conference is to be held in Melbourne. It is the biggest particle physics conference on the planet and it would make a big splash if they can produce some good results by then. The best hope is for a successful update on the Higgs search which would require doubling the total luminosity to add another 5/fb by mid-June. It's not impossible, but they have

already lost a week of runs due to a problem with RF in CMS as [reported in the CERN Bulletin](#). The start of beam operations is now scheduled for 21st March.

Update 7-Feb-2012: Today's talks indicate that 4TeV per beam will not present risks any larger than those accepted for 2011. this is due to the reduced number of quenches and results of checks on the splices. See [this talk](#) in particular. Final decisions are not yet in and as we saw last year nothing is settled until then.

February 7, 2012: [Stop rumours!](#)

Meaning that there are rumours going round about stops or scalar tops, not that we should stop spreading rumours. In SUSY theories stops are the lightest sfermions (scalar fermions are bosons not fermions) related to top quarks which are the heaviest leptons and indeed the heaviest particle in the standard model. If stops exist they would help stabilise the Higgs vacuum which could be too unstable if the Higgs mass is around 125 GeV as now expected, but noone has seen one yet and the situation for theorists has been getting a bit desperate because they had expected to see them at the LHC and the so the anti-SUSY bloggers have been poking fun and saying I told you so.



Now rumours have been squarked to the blogotwittersphere via [Motl at TRF](#) and [Jester of Resonaances](#) that a signal for the stop has been seen in the data. the story so far has been summed up by [Cliff Harvey on Google+](#) so look there for the details. There is a [seminar next week](#) that could be relevant to the rumour but Jester's last tweet says knowingly "*Caution: theorists rumoring about stops is fact, but what is now out on blogs is 100% false. Dont jump unless more reliable rumors appear*" so what is going on?

Sooner or later someone is going to start a rumour just to catch us out. So is the greatest news story in the history of science about to break or have we been duped by a revengeful experimentalist who saw the next seminar as an opportunity to get back at us for all those earlier leaks on the theory blogs? Is it indeed a slepton or something we should have slept on?

By the way there is an [LHCb seminar](#) about to be webcast and they are the only ones with plausible BSM signals so far so let's slide back to reality and enjoy that, until next week.

February 10, 2012: [LHC Running parameters for 2012](#)

The LHC performance workshop in Chamonix is over and the [summary talk](#) gives the proposed running parameters for this year (to be rubber stamped by the directorship) As expected the beam energy for this year will be 4 TeV.

As it turned out they never did do those thermal tests to see if the splices were up to it, but they formed a new risk assessment based on the fact that there have been no beam induced quenches in 2011. This was attributed to the successful use of snubber resistors (in case you needed to know such details)

To decide on whether they should run with 25ns or stick with 50ns they took completion of the Higgs search as the priority criterion. They figure this will require precisely 13.3 /fb at 4TeV so that ATLAS and CMS have enough data independently. Using the predictions for luminosity that were [reported on in December](#) they find that at 50ns they would collect 16.5/fb while at 25ns they could only reach 11.5/fb, so obviously they must run at 50ns. I suspect that if they added error bars to some of those numbers the conclusion would not be so clear cut. β^* will be 0.6m whereas the earlier luminosity estimates assumed β^* of 0.7m, never mind that this brings the estimate at 25ns up to 13.5 /fb, just enough to find the Higgs. 50ns is the right decision anyway.

They also have an option to run for an extra 2 months before the long shutdown if that is needed to complete the search. Don't be surprised if they do need it.

References

1. <http://blog.vixra.org/2012/01/31/cms-search-for-exotics-at-5fb/>
2. <http://blog.vixra.org/2012/02/06/lhc-update-chamonix/>
3. <http://blog.vixra.org/2012/02/07/stop-rumours/>
4. <http://blog.vixra.org/2012/02/10/lhc-running-parameters-for-2012/>