News

LHC Update: Chamonix Conference Considers LHC Running Parameters

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Abstract

This news article contains LHC updates for the period of December 22, 2010 to January 31, 2011 which appeared in viXra Log at http://blog.vixra.org . In other news, Tevatron will not have extended run.

Key Words: LHC, Update, Tevatron.

January 25, 2011: Chamonix conference considers LHC running parameters

As the Large Hadron Collider once again cools down ready for its 2011 startup in February, the collider directorates are at Chamonix to discuss how they will operate in 2011 and beyond. The presentation slides for the 5 day meeting that started yesterday are being put online as the week progresses. Most of these are technical discussions of limited interest to an outsider but a couple of them at least are worth looking at.

The opening talk was about how the teams from the detector side saw the progress during 2010. The message is mixed with obvious pleasure that the main luminosity goal was exceeded at the end of the years run, but also some frustration at just how slow the build-up process was. For example they ask why 100/pb could not have been collected rather than 45/pb. In fact 100/pb could easily have been collected either by pushing the build-up of luminosity faster, or simply by doing more physics runs after the target luminosity was met. However, the beam directorate decided to use the time to try out bunch trains with shorter gaps between. This gave them valuable information about limitation factors that are essential to making the decisions about how to run the machine this year. However, the main message from the detectors seems to be that they would like things to move much quicker this year.

The most significant decisions that need to be made before the collider starts up are what energy to run at, and what bunch separation to use. The currently favoured energy for 2011 is 8TeV compared with 7TeV last year. This may not look like a big difference but in fact it provides a significant increase in production rates for heavy particles. For example, it will mean 40% more Top quarks produced. That will be very important because some of the most promising signals for new physics seen at the Tevatron require top production. The improvements in sensitivity for heavier SUSY particles are even better. A talk this evening on the LHC potential will give all the detailed analysis. That will be followed by other talks that consider the operational consequences and risks of running with energies of 8Tev, 9TeV or even 10 TeV, but the conclusion is likely to be that anything above 8 TeV is too risky.

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How much luminosity will they collect next year? 1/fb is still the official target and 1/fb-3/fb is the official estimate, but some people are thinking optimistically about up to 5/fb. It depends on factors such as the bunch separation they will use. This is likely to be 75ns compared to last year's 150ns. 50ns was tried last year but found to produce too many side effects.

The next decision will be whether or not to continue the 2011 run into 2012. That would provide much more data, probably enough to get first positive observations of the Higgs sector. But the longer run would delay the upgrade to the full 14TeV. It would also make components more radioactive which is bad news for the engineers who have to carry out the upgrade. The directorate announced earlier that it was in favour of the longer run but the technicalities may get in the way. It's a tough call.

Update 28-Jan-2011: With the Chamonix conference drawing to a close the proposal is that the LHC will run at 3.5TeV during 2011, not 4 TeV as hoped. However, the physics runs will continue into 2012 and it is hoped that after the normal end-of-year break they will be able to increase the energy for 2012 to "Hopefully higher than 4TeV".

The 4TeV energy was seen as too much of a risk in exchange for the extra physics it will produce for 2011. Thermal amplifier development during 2011 could make the higher energies possible during 2012. The target integrated luminosity remains at 1/fb per experiment, but estimates put the actual figure at about 3/fb. This depends very much on how quickly they can recommission the beam and how efficiently they can run during the rest of the year.

In Other News:

January 10, 2011: Tevatron will not have extended run

In September we reported that the Tevatron would continue running until 2014 in order to discover the Higgs Boson. Some of us thought this was not a great idea because the LHC will soon overtake the Tevatron and continuing to run the Tevatron would detract from other important physics projects at Fermilab. In fact the main question mark over the continuation was the lack of funds. Now it has been confirmed that there is indeed insufficient funds to cover the extra expense and the Tevatron will end its search for the Higgs and other new physics at the end of 2011 as planned.

Meanwhile physicists at the LHC are trying to make up their minds whether or not it would be a good idea to extend next years run into 2012 to delay the long shutdown. This would give the LHC a better chance of finding the Higgs earlier. Without the extended life of the Tevatron some of the will to do this may have faded, but there is still good reason to do it if the LHC can produce significantly more luminosity in 2011 than previously anticipated. In the end it may come down to technicalities such as the problem of extra radiation that would make repairs during the long shutdown more dangerous if the LHC runs for longer. These are issued due to be discussed soon in Chamonix this month.