

The Public Review of CERN/LHC Safety

An overview of recent initiatives

By “LHC-Critique”
<http://www.lhc-concern.info>

Introduction

The “Large Hadron Collider” LHC is the most powerful physical experimental apparatus ever built by men; it's located at the French/Swiss border near Geneva (Switzerland); the particle accelerator LHC

- has a circumference of about 27 km
- is placed in an artificial underground cavern deep inside the Alps
- has an expected power consumption equivalent to the consumption of the whole Geneva region
- has yet produced costs of several Billions

“CERN” expands to “Conseil Européen pour la Recherche Nucleaire”, the European Nuclear Research Council. It's a scientific organization in Europe that manages and owns the LHC. CERN receives financial funding by its 20 European member states and has been granted super-national status and immunity. According to CERN the LHC hosts

- “The hottest spots in the galaxy”
- “[spots] even colder than outer space”
- “The emptiest space in the Solar System”

Only one of the proton beams - including its whole source of protons that should be accelerated nearly to the speed of light, to be collided head on, would reach the energy of a high speed train traveling at 150 km/h. According to calculations of CERN it could smash a 30m deep hole in a block of solid copper.

So due to the unprecedented nature of the experiments planned for the apparatus, severe scientific and public concern has been raised about the safety of the experiments. Experts are discussing not less than 4 possible scenarios, initiated only by the experiments at the LHC, that could pose a global threat:

- possible production of stable or semi-stable “**micro black holes**” by the LHC which could possibly grow into a planet-killer for Earth
- possible production of “**strangelets**” by the LHC which could initiate a chain-reaction of strange quarks and turn Earth into a non-inhabitable stellar object and kill all living beings on Earth
- possible production of “**magnetic monopoles**” by the LHC which could have a cataclysmic effect on nuclear matter thus killing all living beings on Earth
- possible production of a “**vacuum bubble**” by the LHC which would devastate earth and then expand in light speed in the entire universe and transform it into a cosmic wasteland incapable of sustaining life

In 2008 CERN has, as a reaction to public concerns, issued a 15-page document with small changes compared to a paper from 2003 claiming there was “no conceivable danger”. The authors of this paper serve the CERN-internal LSAG safety group, consisting of *five* people.

Now CERN plans to proceed on its own discretion without further discussion. Amazingly enough, due to the legal immunity CERN has gotten for itself, CERN can in fact do so without any legal reprimand. This is a highly dangerous legal loophole.

Until now, no independent and external risk evaluation has been made. Institutes of risk research and Technology Assessment have been informed by us. They are mostly not very familiar with the problem but agree that this is an issue for risk research.

Public critique of CERN/LHC proceedings is, most regrettably, generally either ignored by the authorities of CERN or met cynically and with hubris. As reported in the New Yorker (May 14, 2007), CERN’s Chief Scientific Advisor said that CERN officials are now instructed, with respect to the LHC’s world-destroying potential, “not to say that the probability is very small but that the probability is zero.”

Despite the obstacles, several attempts have been made to make CERN stop on its potential harm-bearing course of action.

The Current Situation

After an explosion shortly after LHC’s last years test-run the device is expected to restart operations in November 2009, aiming to reach 50% capacity within this year.

There has - still - no external risk evaluation been scheduled.

As a reaction to public critique, several old hypothetical security arguments became outdated, as nowadays CERN strongly relies on an a hypothetical astronomical analogy, namely the LHC experiments being directly comparable to the natural phenomenon of so-called "cosmic rays"

But there's still very little known about the cosmic rays phenomenon; in fact, its referenced high-energy flavor has not even been observed directly.

There is indeed an experiment scheduled for 2010, the AMS 2 experiment on the ISS (International Space Station) which could provide new evidence; so it's bewildering CERN authority does not wait for the outcome of this consolidating experiment.

In addition high-energy collisions would much more frequently occur at the LHC as they do on Earth; ten years of LHC operation would be equivalent to 400.000 years of natural phenomena.

That is, given high-energy cosmic rays do actually exist of the compositions they suggest and that the analogy is actually valid.

But the validity of reassurance based on a cosmic ray analogy is still highly disputed.

In addition, LHC’s astronomical analogy partially relies on very dense matter, so-called "neutron

stars", and assumes they would have been consumed by cosmic ray produced black holes if there was any danger. But the structure of these extreme objects is still highly disputed, so it's not suited for any analogy.

For different good reasons, prominent scientists refute reassurances offered by the astronomical analogy CERN/LHC deploys.

Let alone that the analogy has to rely on correlating the differing energies involved with the particles for two way and one way collisions; through equalising the energy available for particle production at the impact. To then equate what type of product emerges from these different collision types is speculative by its very nature.

Graduated scientists from many fields of research seriously consider public concerns and a broad community of LHC critics has evolved who are closely following recent developments and exchange thoughts efficiently.

Some national institutes, namely in German-speaking countries, who are officially conducting technology review and risk assessment, have not been consulted by CERN authorities, and were mainly unaware of the above mentioned risks until they were informed by the signatories of this document.

Although incapable of quickly reacting on those concerns due to lack of resources or a mandate, some officers were seriously concerned and promised to closely monitor further developments.

The Swiss Green Party issued a petition which received a smoothing but nevertheless interesting answer making liabilities resulting from any damage a topic:

- Famous risk researcher Prof. Wolfgang Kromp proposed an extraordinary assessment of environmental agreeableness
- Australian risk researcher Dr. Mark Leggett openly criticizes the LHC project

Legal actions

- Scientists have issued a claim at a US District Court aiming to stop the experiments until regulatory procedures would have been established. The claim has been rejected due to missing jurisdiction over the CERN. This is now in appeal.
- The European based scientific network "LHC-Critique" has filed a detailed complaint at the European Court of Human Rights in summer 2008. A linked application for interim measures to stop CERN from operating the LHC has been rejected for unknown reasons whereas the main cause is still pending.

Documentation of this complaint is provided at

<http://www.LHC-concern.info>

separating legal from scientific content those papers are well-suited for getting an overview of the current debate; foremost the first complaint, foremost the English translation of the main part of the "First Statement of LHC-Kritik" from September 2008.

Recent Initiatives and Publications

- The "Future of Humanity Institute" of the renowned University of Oxford (United Kingdom) in December 2008 have published an analysis for proper assessment of low-percentage/high-stake situations

<http://arxiv.org/ftp/arxiv/papers/0810/0810.5515.pdf>

which clearly concludes that even risk-assessment for the yet second-most powerful apparatus "RHIC" located in Brookhaven, Long Island, NY, USA have been insufficient and a correction of the yet underestimated negative expected value is urgently required.

The Oxford experts also point out that the above mentioned LSAG-Report for the 10-fold more powerful LHC was inappropriate to settle the issue:

"However, our analysis implies that the current safety report should not be the final word in the safety assessment of the LHC.[...]

Such work would require expertise beyond theoretical physics, and an interdisciplinary group would be essential."

- Independent analysis of legal aspects has been provided by Prof. Eric E. Johnson (University of North Dakota, School of Law)

<http://prawfsblawg.blogs.com/prawfsblawg/2008/10/could-bad-judgi.html>

- In January 2009 US-physicist and well known author Mark Buchanan published another approach for proper quantitative risk assessment

<http://www.newscientist.com/article/mg20126926.800-how-do-we-know-the-lhc-really-is-safe.html>

- Prominent particle physicists Roberto Casadio, Sergio Fabi and Benjamin Harms, published another study considering that hypothetical "evaporation" of "micro black holes", which is based on a somewhat disputed and unevicenced theory called "Hawking Rradiation", could take much longer than previously expected:

In their paper "On the Possibility of Catastrophic Black Hole Growth in the Warped Brane-World Scenario at the LHC", submitted on 19 Jan 2009, Casadio et al. conclude that "the expected decay times are much longer (and possibly \gg sec) than is typically predicted by other models".

In particle physics, this difference (in other words: "nearly nothing" compared to "much more than one second") is a giant amount of time.

Although those scientists do think that a growth to catastrophic size of micro black holes at the LHC "does not seem possible". However, this calculation is based on not calculating the implications of the parameters accepted in this paper itself as 'Another possibility' and given by an earlier published paper of Casadio and Harms. The lightning-fast evaporation of these objects has been used as a major CERN safety argument. Problems with the CERN method of rapid evaporation calculation have been explained in such ways as this in the literature; 'the standard statistical-mechanical canonical ensemble [rapid decay] cannot be applied when gravitational

interactions are important'. (http://prola.aps.org/abstract/PRD/v13/i12/p191_1)

- German physicist Rainer Plaga, PhD, who developed a prominent and alarming risk-scenario with semi-stable Black Holes, refers a lot to Casadio and others. Beside CERN's Giddings, Plaga is also mentioned in the acknowledgments of this new paper.

<http://arxiv.org/abs/0901.2948>

Rainer Plaga has provided more substantial analysis on the issue in his famous paper "On the potential catastrophic risk from metastable quantum-black holes produced at particle colliders"

http://arxiv.org/PS_cache/arxiv/pdf/0808/0808.1415v2.pdf

providing detailed analysis suitable for a general audience; non-physicists might consider Part 3 for the sake of its instructiveness.

- Amazingly enough, leading particle physicist Prof. Horst Stoecker (Frankfurt, Germany) applied for a patent containing the specs for a reactor of CERN-officially yet-hypothetical residues of black holes evaporating by the before-mentioned "Hawking Radiation".

<http://www.wipo.int/pctdb/en/wo.jsp?IA=EP2007001364&DISPLAY=DESC>

The basic idea of this bizarre and hypothetical machine is that capturing those "black hole relics" could result in producing energy in a black hole reactor.

Aside of the fact that this might appear as a clownery of physics in comedy-context, the very issue that such a patent is pending demonstrates clearly that the idea of micro black holes being produced at the CERN LHC is far from being delusional. It also gives another evidence that micro black holes produced at the LHC could be extremely reactive, radiating and undestroyable particles.

Of course, this pending patent is a strong implication for black hole production, so the before-mentioned European Human Right Court complaint mentions the issue:

(unofficial transcript of "LHC-Kritik, erste EGMR-Beschwerdeschrift vom 8.08, Punkt 9, S. 22")

"After thoroughly considering of the risks the complainants conclude, that as a result of continuing experiments with increasingly powerful particle accelerators, total destruction of Earth being more probable than the result of operational "black hole reactors". This realistic estimation, made without exaggeration and likely to be accepted by a majority of physicists, has yet failed to get noticed by those people in charge of national funding of such gargantuan projects."

This paper of prominent particle physicists close to CERN predicts one micro black hole per second produced at the LHC:

<http://arxiv.org/abs/hep-ph/0106295>

- Paul Virilio, famous "philosopher of speed" has criticized the LHC in a recent TV-portrait on himself. Here's a recording:

<http://www.youtube.com/watch?v=mLW9L29n0nA>

All mentioned links and papers are just examples of many more. Please find more information about recent activities of third-party LHC risk considerations at

<http://www.lhc-concern.info>

Outlook

The signatories of this document demand independent risk assessment to be established and standardized, to avoid CERN having exclusive discretion over its potential devastating actions.

The United Nations, due to the potential Global consequences of increasingly powerful collider experiments, should play a prominent role in the standardization process.

People contributing to the publisher's site as well as other international high-profile critics intend to issue another human rights complaint at the United Nations Office in Geneva (Switzerland).

The main demands are:

1. No re-deployment of the experimental sub-nuclear reactor "LHC" without the appropriate, external and inter-disciplinary risk evaluation, which is both to be expected by common sense and long overdue
2. Postponement of all experiments until results of AMS 2 experiment at the International Space Station (ISS) in 2010 will help substantiate or refute thesis concerning cosmic rays and therefore could provide necessary preconditions for the validity of CERN's major safety argument
3. Development of a internationally mandatory, standardized regulatory procedure for high-energy experiments similar to those procedures of the international atomic energy authorities which have been effective for a significant time.

Please feel invited to contribute and stay up-to-date on the issue by visiting us at

<http://www.LHC-concern.info>