

# Background Documents for an Independent Assessment of the LHC's Safety

Compiled by LHCSafetyReview.org for TELEPOLIS

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## 1 General Information about the LHC

### **LHC: The Large Hadron Collider**

CERN (2010)

A brochure about the LHC.

en (2010)	<a href="http://cdsweb.cern.ch/record/1278169/files/CERN-Brochure-2010-006-Eng.pdf">http://cdsweb.cern.ch/record/1278169/files/CERN-Brochure-2010-006-Eng.pdf</a>
ca (2008)	<a href="http://cdsweb.cern.ch/record/1107573/files/CERN-Brochure-2008-003-Cat.pdf">http://cdsweb.cern.ch/record/1107573/files/CERN-Brochure-2008-003-Cat.pdf</a>
da (2010)	<a href="http://cdsweb.cern.ch/record/1287869/files/CERN-Brochure-2010-006-Dan.pdf">http://cdsweb.cern.ch/record/1287869/files/CERN-Brochure-2010-006-Dan.pdf</a>
de (2008)	<a href="http://cdsweb.cern.ch/record/1106350/files/CERN-Brochure-2008-003-Ger.pdf">http://cdsweb.cern.ch/record/1106350/files/CERN-Brochure-2008-003-Ger.pdf</a>
es (2008)	<a href="http://cdsweb.cern.ch/record/1106077/files/CERN-Brochure-2008-003-Spa.pdf">http://cdsweb.cern.ch/record/1106077/files/CERN-Brochure-2008-003-Spa.pdf</a>
fr (2010)	<a href="http://cdsweb.cern.ch/record/1278167/files/CERN-Brochure-2010-006-Fre.pdf">http://cdsweb.cern.ch/record/1278167/files/CERN-Brochure-2010-006-Fre.pdf</a>
it (2008)	<a href="http://cdsweb.cern.ch/record/1106352/files/CERN-Brochure-2008-003-Ita.pdf">http://cdsweb.cern.ch/record/1106352/files/CERN-Brochure-2008-003-Ita.pdf</a>
no (2008)	<a href="http://cdsweb.cern.ch/record/1160257/files/CERN-Brochure-2008-003-Nor.pdf">http://cdsweb.cern.ch/record/1160257/files/CERN-Brochure-2008-003-Nor.pdf</a>
pl (2008)	<a href="http://cdsweb.cern.ch/record/1136917/files/CERN-Brochure-2008-003-Pol.pdf">http://cdsweb.cern.ch/record/1136917/files/CERN-Brochure-2008-003-Pol.pdf</a>
sv (2008)	<a href="http://cdsweb.cern.ch/record/1136921/files/CERN-Brochure-2008-003-Swe.pdf">http://cdsweb.cern.ch/record/1136921/files/CERN-Brochure-2008-003-Swe.pdf</a>

### **CERN FAQ – LHC the guide**

CERN (2009)

A collection of basic facts about the LHC.

en (2009)	<a href="http://cdsweb.cern.ch/record/1165534/files/CERN-Brochure-2009-003-Eng.pdf">http://cdsweb.cern.ch/record/1165534/files/CERN-Brochure-2009-003-Eng.pdf</a>
cs (2008)	<a href="http://cdsweb.cern.ch/record/1155902/files/CERN-Brochure-2008-001-Cze.pdf">http://cdsweb.cern.ch/record/1155902/files/CERN-Brochure-2008-001-Cze.pdf</a>
de (2009)	<a href="http://cdsweb.cern.ch/record/1214401/files/CERN-Brochure-2009-003-Ger.pdf">http://cdsweb.cern.ch/record/1214401/files/CERN-Brochure-2009-003-Ger.pdf</a>
fr (2009)	<a href="http://cdsweb.cern.ch/record/1164451/files/CERN-Brochure-2009-003-Fre.pdf">http://cdsweb.cern.ch/record/1164451/files/CERN-Brochure-2009-003-Fre.pdf</a>
pl (2008)	<a href="http://cdsweb.cern.ch/record/1156847/files/CERN-Brochure-2008-001-Pol.pdf">http://cdsweb.cern.ch/record/1156847/files/CERN-Brochure-2008-001-Pol.pdf</a>

## 2 Documents Supporting the LHC's Safety

### 2a Information for the General Public about the LHC's Safety

#### The safety of the LHC

CERN (2008)

CERN's official public presentation about the safety of the LHC.

en <http://public.web.cern.ch/Public/en/LHC/Safety-en.html>

fr <http://public.web.cern.ch/public/fr/LHC/Safety-fr.html>

#### The safety of the LHC

CERN (2008)

A summary of the [official safety report](#) for the LHC.

en <http://environmental-impact.web.cern.ch/environmental-impact/Objects/LHCSafety/LSAGSummaryReport2008-en.pdf>

de <http://environmental-impact.web.cern.ch/environmental-impact/Objects/LHCSafety/LSAGSummaryReport2008-de.pdf>

el <http://environmental-impact.web.cern.ch/environmental-impact/Objects/LHCSafety/LSAGSummaryReport2008-el.pdf>

es <http://environmental-impact.web.cern.ch/environmental-impact/Objects/LHCSafety/LSAGSummaryReport2008-es.pdf>

fr <http://environmental-impact.web.cern.ch/environmental-impact/Objects/LHCSafety/LSAGSummaryReport2008-fr.pdf>

it <http://environmental-impact.web.cern.ch/environmental-impact/Objects/LHCSafety/LSAGSummaryReport2008-it.pdf>

jp <http://environmental-impact.web.cern.ch/environmental-impact/Objects/LHCSafety/LSAGSummaryReport2008-jp.pdf>

no <http://environmental-impact.web.cern.ch/environmental-impact/Objects/LHCSafety/LSAGSummaryReport2008-no.pdf>

pl <http://environmental-impact.web.cern.ch/environmental-impact/Objects/LHCSafety/LSAGSummaryReport2008-pl.pdf>

ru <http://environmental-impact.web.cern.ch/environmental-impact/Objects/LHCSafety/LSAGSummaryReport2008-ru.pdf>

#### The LHC is safe [video]

Prof. John R. Ellis (2008)

Prof. Ellis' presentation of the [LSAG report](#) to CERN staff members.

<http://cdsweb.cern.ch/record/1120625/>

#### Debunking the Danger of the LHC [video]

Prof. Frank Wilczek (2008)

Prof. Wilczek's presentation of his basic arguments for the safety of the LHC and [RHIC](#).

[http://fora.tv/2008/09/25/Frank\\_Wilczek\\_The\\_LHC\\_and\\_Unified\\_Field\\_Theory#Frank\\_Wilczek\\_-\\_Debunking\\_the\\_Danger\\_of\\_the\\_LHC](http://fora.tv/2008/09/25/Frank_Wilczek_The_LHC_and_Unified_Field_Theory#Frank_Wilczek_-_Debunking_the_Danger_of_the_LHC)

\* For a transcript, see:

<http://www.achtphasen.net/index.php/plasmaether/2011/02/07/p1933>

## 2b Current Official Reports Supporting the LHC's Safety

### Review of the Safety of LHC Collisions

LHC Safety Assessment Group (LSAG - Prof. John Ellis, Dr. Gian Giudice, Dr. Michelangelo Mangano, Prof. Igor Tkachev, and Prof. Urs Wiedemann) (2008)

The current official safety report for the LHC.

en <http://arxiv.org/abs/0806.3414v2>

de <http://lsag.web.cern.ch/lsag/LSAG-Report-German.pdf>

fr <http://lsag.web.cern.ch/lsag/LSAG-Report-French.pdf>

### Astrophysical implications of hypothetical stable TeV-scale black holes

Prof. Steven B. Giddings and Dr. Michelangelo L. Mangano (2008)

CERN's primary reference for the safety of possible black hole production at the LHC.

<http://arxiv.org/abs/0806.3381v2>

### SPC Report on LSAG Documents

A panel of CERN's Scientific Policy Committee (Prof. Peter Braun-Munzinger, Prof. Matteo Cavalli-Sforze, Prof. Gerard 't Hooft, Prof. Bryan Webber, and Prof. Fabio Zwirner) (2008)

The formal endorsement of the LSAG documents by CERN's Scientific Policy Committee.

<http://cdsweb.cern.ch/record/1113558/files/cer-002766289.pdf>

## 2c Previous Official Reports Supporting the LHC's Safety

### Review of Speculative "Disaster Scenarios" at RHIC

Prof. Robert L. Jaffe, Prof. Wit Busza, Prof. Jack Sandweiss, and Prof. Frank Wilczek (1999-2000)

The official safety report for the Relativistic Heavy Ion Collider (RHIC). (While this report only briefly mentions the LHC, it is cited on the LHC's safety page as the "specialist report published in the United States".)

<http://arxiv.org/abs/hep-ph/9910333v3>

### Study of Potentially Dangerous Events During Heavy-Ion Collisions at the LHC: Report of the LHC Safety Study Group

LHC Safety Study Group (LSSG - Prof. Jean-Paul Blaizot, Prof. John Iliopoulos, Prof. Jes Madsen, Prof. Graham G. Ross, Prof. Peter Sonderegger, and Prof. Hans J. Specht) (2003)

The first official safety report for the LHC.

<http://cdsweb.cern.ch/record/613175/files/p1.pdf>

## 2d Statements and Summaries Supporting the LHC's Overall Safety

### **Experten bestätigen: Der LHC ist sicher**

Komitee für Elementarteilchenphysik (KET) (2008)

A statement by KET, citing independent experts such as Prof. Nicolai and the members of LSAG, which criticizes Prof. Rössler and argues that cosmic ray showers prove that the LHC is safe.

[http://www.ketweb.de/pressemitteilungen/20080801\\_PM\\_Der\\_LHC\\_ist\\_sicher.pdf](http://www.ketweb.de/pressemitteilungen/20080801_PM_Der_LHC_ist_sicher.pdf)

### **Statement by the Executive Committee of the DPF on the Safety of Collisions at the Large Hadron Collider.**

Executive Board of the Division of Particles and Fields of the American Physical Society (2008)

A very brief statement endorsing the findings of CERN's official safety report for the LHC.

[http://www.aps.org/units/dpf/governance/reports/upload/lhc\\_safety\\_statement.pdf](http://www.aps.org/units/dpf/governance/reports/upload/lhc_safety_statement.pdf)

### **Das LHC-Projekt am CERN: Gefahr durch Schwarze Löcher? Mögliche Umweltauswirkungen des neuen Beschleuniger-Projekts am CERN**

Dr. Daniel Lübbert (2008)

A review of the background to the LHC controversy and a summary of some of the basic arguments for the safety of the LHC.

<http://www.bundestag.de/dokumente/analysen/2008/LHC-Projekt.pdf>

## 2e Papers Supporting the Safety of Black Hole Production

### **Astrophysical implications of hypothetical stable TeV-scale black holes**

Prof. Steven B. Giddings and Dr. Michelangelo L. Mangano (2008)

\* See the listing [above](#)

### **The end of the world at the Large Hadron Collider?**

Prof. Michael E. Peskin (2008)

A brief summary for the public of the key points from the [Giddings/Mangano paper](#).

<http://physics.aps.org/articles/v1/14>

### **Exclusion of black hole disaster scenarios at the LHC**

Dr. Benjamin Koch, Prof. Marcus Bleicher, and Prof. Horst Stöcker (2008)

A summary of different possible black hole scenarios and the presentation of arguments for why none of them pose any risk.

<http://arxiv.org/abs/0807.3349>

## 2f Papers Supporting the Safety of Previous Particle Colliders

### **Position Paper: Creation of Super-Dense Neutral Matter in the Bevalac**

Prof. Luis Alvarez, Prof. Kinsey Anderson, Prof. Alfred S. Goldhaber, Dr. Miklos Gyulassy, Dr. Bernard G. Harvey, Prof. Arthur Kerman, and Prof. Tsung-Dao Lee (1979)

The conclusions of a one and a half day select committee meeting discussing whether super-dense, super-stable neutral matter could be formed in the Bevalac particle accelerator.

reprinted in:

### **Accelerator Disaster Scenarios, the Unabomber, and Scientific Risks**

Prof. Joseph I. Kapusta (2008)

<http://arxiv.org/pdf/0804.4806v1>

(see pp. [21-22](#))

### **How stable is our vacuum?**

Prof. Piet Hut and Dr. Martin J. Rees (1983)

A paper presenting the argument that the hypothetical collision of high-energy cosmic rays establishes an upper bound on the risk that particle collisions could trigger a vacuum transition.

<http://dx.doi.org/10.1038/302508a0>

(The full text of this article is not freely accessible.)

### **Is it safe to disturb the vacuum?**

Prof. Piet Hut (1984)

A paper presenting more detailed calculations for the argument proposed [above](#), while noting the need for further direct or indirect observations of cosmic rays of the required masses and energies.

[http://dx.doi.org/10.1016/0375-9474\(84\)90555-4](http://dx.doi.org/10.1016/0375-9474(84)90555-4)

(The full text of this article is not freely accessible.)

### **Will relativistic heavy-ion colliders destroy our planet?**

Prof. Arnon Dar, Prof. Alvaro De Rújula, and Prof. Ulrich Heinz (1999)

A paper from CERN's Theory Division arguing why the Relativistic Heavy Ion Collider is safe. The paper notes that further arguments are needed for the safety of heavy ion collisions at the LHC.

<http://arxiv.org/abs/hep-ph/9910471v1>

### **Review of Speculative “Disaster Scenarios” at RHIC**

Prof. Robert L. Jaffe, Prof. Wit Busza, Prof. Jack Sandweiss, and Prof. Frank Wilczek (1999/2000)

\* See the listing [above](#).

### **Taking Serious Risks Seriously**

Prof. Sheldon L. Glashow and Prof. Richard Wilson (1999)

A letter to *Nature* summarizing the arguments of the papers by [Jaffe et al.](#) and [Dar et al.](#), and assuring the public that the risks associated with physics experiments are being responsibly managed.

<http://www.physics.harvard.edu/~wilson/publications/ppaper746.pdf>

<http://www.nature.com/nature/journal/v402/n6762/full/402596a0.html>

## 3 Documents Criticizing the LHC's Safety Arguments

### 3a Critique of CERN's Method of Risk Calculation

#### **Probing the Improbable: Methodological Challenges for Risks with Low Probabilities and High Stakes**

Dr. Toby Ord, Dr. Rafaela Hillerbrand, and Dr. Anders Sandberg (2008)

A paper describing methodological problems which arise when assessing global catastrophic risks, using the LHC as an example.

<http://arxiv.org/abs/0810.5515>

### 3b Critiques of CERN's Safety Arguments for Black Holes

#### **On the potential catastrophic risk from metastable quantum-black holes produced at particle colliders**

Dr. Rainer Plaga (2008-2009)

A paper identifying specific flaws in CERN's safety arguments for black holes.

Version 1 (2008) <http://arxiv.org/abs/0808.1415v1>

Version 2 (2008) <http://arxiv.org/abs/0808.1415v2>

Version 3 (2009) <http://arxiv.org/abs/0808.1415v3>

#### **No risk no fun? Die Experimente am Large Hadron Collider bei Genf. Könnten kleine Schwarze Löcher für die Erde gefährlich werden?**

Dipl.-Ing. Martin Faßbender and Dr. Georg Petera (2009)

A powerpoint presentation reviewing the safety arguments and counterarguments for black hole production at the LHC.

<http://wissensnavigator.com/documents/Norisknofun.pdf>

#### **A Critical Review of Safety Papers Concerning Black Holes at the LHC**

Eric Penrose (2009)

A paper identifying the flaws in CERN's black hole safety arguments based on the statements of other published scientific papers.

[http://www.risk-evaluation-forum.org/LHC\\_safety.pdf](http://www.risk-evaluation-forum.org/LHC_safety.pdf)

#### **Metastable LHC black holes - Review of Safety**

Eric Penrose (2010)

A critical review of the [black hole safety paper by Giddings and Mangano](#), the [safety paper by Koch et al.](#), and the [response of Giddings and Mangano to the paper by Dr. Plaga](#).

[http://www.achtphasen.net/miniblackhole/Eric/march2010/Metastable\\_LHC\\_black\\_holes-Review\\_of\\_Safety.pdf](http://www.achtphasen.net/miniblackhole/Eric/march2010/Metastable_LHC_black_holes-Review_of_Safety.pdf)

### **Black Hole Production at the LHC: A Review of the Risks**

Alam Rahman (2010)

A summary of the numerous flaws in CERN's safety arguments for possible black hole production.

<http://www.risk-evaluation-forum.org/LHCrisk.pdf>

### **Unzureichende Sicherheitsanalysen zum LHC-Experiment beim CERN**

Dipl.-Ing. Rudolf Uebbing (2010)

A paper highlighting the limitations of CERN's safety analysis for possible black hole production.

[http://www.achtphasen.net/miniblackhole/Rudolf/mai2010/Begruendete-Zweifel\\_LHC\\_V18.pdf](http://www.achtphasen.net/miniblackhole/Rudolf/mai2010/Begruendete-Zweifel_LHC_V18.pdf)

## **3c Critiques of the Theory of Hawking Radiation**

### **Do black holes radiate?**

Prof. Adam D. Helfer (2003)

A review article describing the known problems with the theory of Hawking radiation and highlighting the key unresolved challenges to the theory. (This paper was not written specifically for the LHC.)

<http://arxiv.org/abs/grqc/0304042>

### **On the Universality of the Hawking Effect**

Prof. William G. Unruh and Prof. Ralf Schützhold

A paper describing how Hawking radiation is dependent on the laws of physics at the Planck scale and concluding that whether real black holes emit Hawking radiation or not remains an open question. (This paper was not written specifically for the LHC.)

<http://arxiv.org/abs/gr-qc/0408009>

### **Abraham-like return to constant $c$ in general relativity: “ $\mathfrak{R}$ -theorem” demonstrated in Schwarzschild metric**

Prof. Otto E. RöSSLer (2007-2009)

An interpretation of General Relativity which no longer gives rise to Hawking radiation.

<http://www.wissensnavigator.com/documents/Chaos.pdf>

see also:

<http://www.wissensnavigator.com/documents/ottoroesslerminiblackhole.pdf>

<http://www.wissensnavigator.com/documents/GreatRisk.pdf>

[http://www2.hu-berlin.de/leibniz-sozietat/journal/archive/08\\_10/roessler.pdf](http://www2.hu-berlin.de/leibniz-sozietat/journal/archive/08_10/roessler.pdf)

<http://www.achtphasen.net/index.php/plasmaether/2010/08/19/p1772>

### **Black hole state evolution and Hawking radiation**

Prof. Doyeol Ahn (2010)

A paper describing circumstances in which Hawking radiation could be suppressed.

<http://arxiv.org/abs/1006.2198>

### **3d Critique of CERN's Safety Arguments for Strangelets**

#### **How CERN's Documents Contradict its Safety Assurances: Plans for 'Strangelet' Detection at the LHC**

Eric Penrose (2010)

A presentation of the contradictions between CERN's claims about possible strangelet production and the public statements of CERN-affiliated physicists.

<http://www.heavyionalert.org/docs/CERNContradictions.pdf>

### **3e Critique of the Safety of the LHC's Beam Dump and Collimators**

#### **Studies of Nuclear Hazards and Constitutional Law**

Dr. Richard E. Webb (2010)

A description of how the LHC's beam striking carbon or helium materials could theoretically initiate a nuclear fusion chain reaction.

[http://www.achtphasen.net/Webb/LHC-FederalCounsel-LetterPetition/March\\_30\\_3rd-Draft\\_6.doc](http://www.achtphasen.net/Webb/LHC-FederalCounsel-LetterPetition/March_30_3rd-Draft_6.doc)

(see pp. 21-33)

### **3f Critique of a Hypothetical "Bosenova" Risk**

#### **Superfluids, BECs And Bosenovas: The Ultimate Experiment**

Alan Gillis (2008)

A presentation of the theory that the LHC's beam could trigger a "Bosenova" event in the superfluid helium used to cool the LHC's magnets.

[http://www.science20.com/big\\_science\\_gambles/superfluids\\_becs\\_and\\_bosenovas\\_the\\_ultimate\\_experiment](http://www.science20.com/big_science_gambles/superfluids_becs_and_bosenovas_the_ultimate_experiment)



### **3g Critiques of Scientific, Ethical, or Legal Aspects of the LHC's Risk Management**

#### **A Rational and Moral and Spiritual Dilemma**

Prof. Otto E. Rossler (2008)

A review of scientific and ethical aspects of possible black hole production at the LHC.

<http://www.wissensnavigator.com/documents/spiritualottoeroessler.pdf>

see also:

<http://www.wissensnavigator.com/documents/CERNTRIGGER.pdf>

<http://www.heise.de/tp/r4/artikel/34/34033/1.html>

#### **Review of the risk assessment process used for the 2008 LHC safety study**

Dr. Mark Leggett (2009)

A comparison of the LHC's safety approval process with best practices in risk management.

[http://lhc-concern.info/wp-](http://lhc-concern.info/wp-content/uploads/2009/09/leggett_review_of_lsag_process_sept_1__09.pdf)

[content/uploads/2009/09/leggett\\_review\\_of\\_lsag\\_process\\_sept\\_1\\_\\_09.pdf](http://lhc-concern.info/wp-content/uploads/2009/09/leggett_review_of_lsag_process_sept_1__09.pdf)

#### **No Canary in the Quanta: Who Gets to Decide if the Large Hadron Collider is Worth Gambling Our Planet?**

Harry V. Lehmann (2009)

A review of scientific, legal, and ethical aspects of the decision to proceed with the LHC.

[http://www.lehmannlaw.com/pdf/no\\_canary\\_in\\_the\\_quanta.pdf](http://www.lehmannlaw.com/pdf/no_canary_in_the_quanta.pdf)

<http://www.amazon.com/No-Canary-Quanta-Collider-ebook/dp/B002W5RAYA>

#### **The Black Hole Case: The Injunction Against the End of the World**

Prof. Eric E. Johnson (2009)

A review of the legal aspects of the LHC's approval, along with comments on unresolved safety issues.

<http://arxiv.org/abs/0912.5480>

#### **"Honey I Blew Up the World!": One Small Step Towards Filling the Regulatory "Black Hole" at the Intersection of High-Energy Particle Colliders and International Law**

Samuel J. Adams (2009)

A review of the controversy surrounding the start up of the LHC and a presentation of possible approaches from improving the legal framework for such cases.

[https://litigation-essentials.lexisnexis.com/webcd/app?](https://litigation-essentials.lexisnexis.com/webcd/app?action=DocumentDisplay&crawlid=1&doctype=cite&docid=38+Ga.+J.+Int'l+%26+Comp.+L.+131&srctype=smi&srcid=3B15&key=a9b5a587770fdc0eb9f5faf8e9b25c55)

[action=DocumentDisplay&crawlid=1&doctype=cite&docid=38+Ga.+J.+Int'l+%26+Comp.+L.+131&srctype=smi&srcid=3B15&key=a9b5a587770fdc0eb9f5faf8e9b25c55](https://litigation-essentials.lexisnexis.com/webcd/app?action=DocumentDisplay&crawlid=1&doctype=cite&docid=38+Ga.+J.+Int'l+%26+Comp.+L.+131&srctype=smi&srcid=3B15&key=a9b5a587770fdc0eb9f5faf8e9b25c55)

(The full text of this article is not freely accessible)

### 3h Critiques of the Safety Arguments for Earlier Particle Colliders

#### **Review of the RHIC Safety Review**

Dr. Richard J. Wagner (2000)

A critique of the safety arguments given for possible strangelet production at the Relativistic Heavy Ion Collider (RHIC).

<http://rjwagner49.com/Science/Physics/LHC/ReviewOfReview03.pdf>

#### **Problems with empirical bounds for strangelet production at RHIC**

Prof. Adrian Kent (2000)

A critique of the [official safety report for RHIC](#) and the [paper from CERN's Theory Division in support of RHIC](#).

<http://arxiv.org/abs/hep-ph/0009130v2>

#### **A critical look at risk assessments for global catastrophes**

Prof. Adrian Kent (2000-2003)

A paper critiquing the previous safety arguments for RHIC and asking the question, "What risk of catastrophe could be acceptable?"

<http://arxiv.org/abs/hep-ph/0009204v6>

#### **Might a laboratory experiment destroy planet earth?**

Prof. Francesco Calogero (2000)

A brief review of the scientific, ethical, political and sociological issues associated with the approval of potentially catastrophic scientific experiments.

<http://www.nettime.org/Lists-Archives/nettime-bold-0103/msg00090.html>

<http://www.ingentaconnect.com/content/maney/isr/2000/00000025/00000003/art00006>

#### **How Unlikely is a Doomsday Catastrophe?**

Prof. Max Tegmark and Prof. Nick Bostrom (2005)

A paper describing how "selection bias" should be incorporated into catastrophic risk calculations.

<http://arxiv.org/abs/astro-ph/0512204>

## 4 Responses to Critiques of the LHC's Safety Arguments

### 4a Responses to Prof. Otto E. Rössler's $\mathfrak{R}$ -Theorem

**Comments from Prof. Dr. Hermann Nicolai, Director, Max Planck-Institut für Gravitationsphysik (Albert-Einstein-Institut) Potsdam, Germany on speculations raised by Professor Otto Roessler about the production of black holes at the LHC.**

Prof. Hermann Nicolai (2008)

A one-page collection of comments criticizing Prof. Rössler's  $\mathfrak{R}$ -Theorem.

<http://environmental-impact.web.cern.ch/environmental-impact/Objects/LHCSafety/NicolaiComment-en.pdf>

#### **On the arguments of O.E. Rössler**

Prof. Domenico Giulini and Prof. Hermann Nicolai (2008)

A more detailed paper criticizing Prof. Rössler's  $\mathfrak{R}$ -Theorem.

en <http://environmental-impact.web.cern.ch/environmental-impact/Objects/LHCSafety/NicolaiFurtherComment-en.pdf>

de

[http://www.ketweb.de/stellungnahmen/20080730\\_Antwort\\_von\\_Prof\\_Dr\\_Hermann\\_Nicolai\\_und\\_Prof\\_Dr\\_Domenico\\_Giulini.pdf](http://www.ketweb.de/stellungnahmen/20080730_Antwort_von_Prof_Dr_Hermann_Nicolai_und_Prof_Dr_Domenico_Giulini.pdf)

fr

<http://environmental-impact.web.cern.ch/environmental-impact/Objects/LHCSafety/NicolaiFurtherComment-fr.pdf>

#### **Experten bestätigen: Der LHC ist sicher**

Komitee für Elementarteilchenphysik (KET) (2008)

\* See the listing [above](#).

#### **Commentary on two papers by O.E. Roessler on black holes**

Prof. Gerhard W. Bruhn (2008)

A critique by Prof. Bruhn of Prof. Rössler's  $\mathfrak{R}$ -Theorem.

<http://www.mathematik.tu-darmstadt.de/~bruhn/CommRoesslerPaper.html>

### 4b Response to Dr. Plaga's Critique of the LHC's Black Hole Safety Arguments

#### **Comments on claimed risk from metastable black holes**

Prof. Steven B. Giddings and Dr. Michelangelo L. Manganò (2008)

A response by Prof. Giddings and Dr. Manganò to some of the criticisms raised in [version 1](#) of Dr. Plaga's paper.

<http://arxiv.org/abs/0808.4087>

### **Possibility of Catastrophic Black Hole Growth in the Warped Brane-World Scenario at the LHC**

Prof. Roberto Casadio, Dr. Sergio Fabi, and Prof. Benjamin Harms (2009)

A paper calculating the black hole accretion and evaporation rates for certain parameters and concluding that the catastrophic growth of black holes produced at the LHC is not possible.

<http://arxiv.org/abs/0901.2948v3>

### **4c Response to Concerns about the LHC's Beam Dump**

#### **Memorandum: Interaction of the CERN Large Hadron Collider (LHC) Beam with the Beam Dump Block**

Dr. Ralph W. Aßmann, Dr. Alfredo Ferrari, Dr. Brennan Goddard, Dr. Rüdiger Schmidt, and Dr. Naeem A. Tahir (2008)

A response from CERN to concerns that the LHC's beam dump could undergo a fusion reaction.

<http://lsag.web.cern.ch/lsag/BeamdumpInteraction.pdf>

### **4d Response to Concerns about a Hypothetical "Bosenova" Event**

#### **There is no explosion risk associated with superfluid Helium in the LHC cooling system**

Prof. Malcolm Fairbairn and Dr. Bob McElrath (2008)

A response from CERN to concerns that the LHC's beam could ignite the superfluid helium used to cool the LHC magnets.

<http://arxiv.org/abs/0809.4004>

## 5 Other Relevant Documents

### 5ai Documents Related to Black Hole Growth

#### **Can black holes and naked singularities be detected in accelerators?**

Dr. Roberto Casadio and Prof. Benjamin Harms (2001-2002)

A paper presenting a more careful calculation of the radiation from microscopic black holes and reporting that such black holes would live much longer than previously expected.

<http://arxiv.org/abs/hep-th/0110255v2>

#### **On the Stability of Black Holes at the LHC**

Prof. Marcos D. Maia and Prof. Edmundo M. Monte

A paper arguing that in 5-dimensional scenarios based on the ADS/CFT correspondence any black hole produced at the LHC would have an unstable horizon which would grow in proportion to the square of the distance from the collision point. The paper notes that in scenarios with more than 5 dimensions it is possible that black holes do not grow in this way.

<http://arxiv.org/abs/0808.2631v1>

### 5aai Documents Related to Black Hole Remnants

#### **Schwarze Löcher im Labor?**

Prof. Marcus Bleicher and Prof. Horst Stöcker

A background article on black holes, their possible production at the LHC, and the use of black hole remnants as a possible energy source.

<http://www.forschung-frankfurt.uni-frankfurt.de/dok/2006/2006-4/14-18-Schwarze-Loecher-im-Labor.pdf>

#### **Mini Black Holes in the first year of the LHC: Discovery Through Di-Jet Suppression, Mono-Jet Emission and ionising tracks in ALICE**

Prof. Horst Stöcker (2006)

A research paper discussing the detection of stable black hole remnants at the LHC and describing their possible use as an energy source.

<http://arxiv.org/abs/hep-ph/0607165v3>

#### **Deutsches Patent- und Markenamt DE 10 2006 007 824 A1**

Prof. Horst Stöcker (2006-2007)

A German patent for the use of black hole remnants to convert ordinary matter into energy.

[http://publikationen.dpma.de/DPMApublikationen/pdf\\_any\\_all.do?docId=DE102006007824A1&id=8903446](http://publikationen.dpma.de/DPMApublikationen/pdf_any_all.do?docId=DE102006007824A1&id=8903446)

**(WO/2007/093434) Method for Production of Energy by Conversion of Mass into Energy**

Prof. Horst Stöcker (2007)

An international patent application for the use of black hole remnants to convert ordinary matter into energy.

<http://www.wipo.int/patentscope/search/en/detail.jsf?docId=WO2007093434>

## **5b Documents Related to Strangelets**

**New solutions for the color-flavor locked strangelets**

Prof. Guang Xiong Peng, Xin Jian Wen and Yuede Chen (2005)

A paper reporting that the charge of color-flavor locked strangelets can be positive, negative, or nearly neutral.

<http://arxiv.org/abs/hep-ph/0512112>

see also:

<http://arxiv.org/abs/hep-ph/0612253>

## 6 Documents from Court Cases

### 6a Sancho v. U.S. Department of Energy

#### 6ai Documents Submitted for the Plaintiffs

##### **Complaint for Temporary Restraining Order, Preliminary Injunction, and Permanent Injunction**

Luis Sancho and Walter Wagner (2008)

<http://lhcddefense.com/pdf/Sancho%20v%20Doe%20-%20Complaint.pdf>

##### **Affidavit of James R. Blodgett in Support of TRO and Preliminary Injunction**

James R. Blodgett (2008)

<http://lhcddefense.com/pdf/Sancho%20v%20Doe%20-%20Affidavit%20of%20James%20Blodgett%20in%20Support%20of%20TRO.pdf>

##### **Affidavit of Paul W. Dixon in Support of TRO and Preliminary Injunction**

Prof. Paul W. Dixon (2008)

<http://lhcddefense.com/pdf/Sancho%20v%20Doe%20-%20Affidavit%20of%20Paul%20W.Dixon.pdf>

##### **Affidavit of Mark Leggett in Support of TRO and Preliminary Injunction**

Dr. Mark Leggett (2008)

<http://lhcddefense.com/pdf/Sancho%20v%20Doe%20-%20Affidavit%20of%20Mark%20Leggett.pdf>

##### **Affidavit of Luis Sancho in Support of TRO and Preliminary Injunction**

Luis Sancho (2008)

<http://lhcddefense.com/pdf/Sancho%20v%20Doe%20-%20Affidavit%20of%20Luis%20Sancho.pdf>

##### **Affidavit of Rodney J. Skinner in Support of TRO and Preliminary Injunction**

Rodney J. Skinner (2008)

<http://lhcddefense.com/pdf/Sancho%20v%20Doe%20-%20Affidavit%20of%20Rod%20Skinner%20in%20Support%20of%20TRO.pdf>

##### **Affidavit of Richard J. Wagner in Support of TRO and Preliminary Injunction**

Dr. Richard J. Wagner (2008)

<http://lhcddefense.com/pdf/Sancho%20v%20Doe%20-%20Affidavit%20of%20Richard%20J.%20Wagner.pdf>

##### **Affidavit of Walter L. Wagner in Support of TRO and Preliminary Injunction**

Walter L. Wagner (2008)

<http://lhcddefense.com/pdf/Sancho%20v%20Doe%20-%20Affidavit%20of%20Walter%20L.%20Wagner%20in%20Support%20of%20TRO.pdf>

**Affidavit of Walter L. Wagner in Support of Permanent Injunction Re Defendant CERN**

Walter L. Wagner (2008)

<http://lhcddefense.com/pdf/Sancho%20v%20Doe%20-%20WLW%20Affidavit%20in%20Support%20of%20Default%20Injunction%20against%20CERN.pdf>

**Affidavit of Walter L. Wagner in Support of Opposition to “Motion for Leave to File Brief Amicus Curiae”**

Walter L. Wagner (2008)

<http://lhcddefense.com/pdf/Sancho%20v%20Doe%20-%20WLW%20Affidavit%20in%20Support%20of%20Opposition%20to%20Amicus%20Brief.pdf>

**Affidavit of Walter L. Wagner in Support of Opposition to “Combined Motion to Dismiss and for Summary Judgment”**

Walter L. Wagner (2008)

<http://lhcddefense.com/pdf/SANCHO%20v.%20DOE%20-%20WLW%20Affidavit%20in%20Opposition%20to%20Summary%20Judgment%20%20%20-%20%202.pdf>

**Reply Brief of Appellant Luis Sancho**

Luis Sancho (2009)

<http://rjwagner49.com/Personal/Politics/LHC/LuisSanchoReplyBrief.pdf>

**Reply Brief of Appellant Walter Wagner**

Walter L. Wagner (2009)

<http://rjwagner49.com/Personal/Politics/LHC/WalterWagnerReplyBrief.pdf>

For additional case documents, please see:

[http://www.lhcddefense.org/lhc\\_legal.php](http://www.lhcddefense.org/lhc_legal.php)



## 6aii Documents Submitted for the Defendants

### **Federal Defendants' Memorandum in Support of Combined Motion to Dismiss and Motion for Summary Judgment**

U.S. Department of Energy and National Science Foundation (2008)

<http://lhcddefense.com/pdf/Memorandum%20of%20Support%20-%20Wagner,%20Sancho%20v%20Dept%20of%20Energy%20-%20June%2024,%202008.pdf>

### **Federal Defendants' Declaration of Bruce P. Strauss**

Dr. Bruce P. Strauss (2008)

<http://lhcddefense.com/pdf/Strauss%20Declaration%20-%20Wagner%20v%20Dept%20of%20Energy%20-%20June%2024,%202008.pdf>

### **Federal Defendants' Declaration of Morris Pripstein**

Dr. Morris Pripstein (2008)

<http://lhcddefense.com/pdf/Pripstein%20Declaration%20-%20Wagner%20v%20Dept%20of%20Energy%20-%20June%2024,%202008.pdf>

### **Letter from CERN to the U.S. Department of Energy**

Dr. Maurizio Bona (2008)

<http://lhcddefense.com/pdf/Letter%20to%20Kovar%20from%20CERN%20-%20April%2015,%202008.pdf>

### **Federal Defendants' Declaration of Bruce P. Strauss in Response to August 5, 2008 Affidavit of Walter L. Wagner (Dkt. No. 30) and in Support of Federal Defendants' June 24, 2008 Motion to Dismiss (Dkt. No. 14)**

Dr. Bruce P. Strauss (2008)

[http://lhcddefense.com/pdf/66%201\\_Decl%20Strauss%20Main.pdf](http://lhcddefense.com/pdf/66%201_Decl%20Strauss%20Main.pdf)

### **Amended Brief Amicus Curiae of Sheldon Glashow, Frank Wilczek and Richard Wilson in Support of Federal Defendants**

Prof. Sheldon Glashow, Prof. Frank Wilczek, and Prof. Richard Wilson (2008)

<http://lhcddefense.com/pdf/Motion%20for%20Leave%20to%20File%20Amended%20Brief%20Amicus%20Curiae.pdf>

### **Brief *Amicus Curiae* of Sheldon Glashow, Frank Wilczek and Richard Wilson in Support of Federal Appellees**

Prof. Sheldon Glashow, Prof. Frank Wilczek, and Prof. Richard Wilson (2009)

[http://msnbcmedia.msn.com/i/MSNBC/Sections/Technology%20&%20Science/\\_2\\_Science/090413\\_Amicus.pdf](http://msnbcmedia.msn.com/i/MSNBC/Sections/Technology%20&%20Science/_2_Science/090413_Amicus.pdf)

For additional case documents, please see:

[http://www.lhcddefense.org/lhc\\_legal.php](http://www.lhcddefense.org/lhc_legal.php)

## **6aiii Court Transcripts and Rulings**

### **Transcript of Proceedings Before the Honorable Helen Gillmor Chief United States District Judge**

Debra Kekuna Chun, Official Court Reporter (2008)

<http://www.lhcdefense.org/pdf/080136%209-2-08.pdf>

### **Order Granting Federal Defendants' Motion to Dismiss**

Chief United States District Judge Helen Gillmor (2008)

[http://msnbcmedia.msn.com/i/msnbc/Sections/NEWS/PDFs/080926\\_LHCDecision.pdf](http://msnbcmedia.msn.com/i/msnbc/Sections/NEWS/PDFs/080926_LHCDecision.pdf)

### **Media for Case: Luis Sancho v. US Department of Energy, No. 08-17389 [audio file]**

United States Court of Appeals for the Ninth Circuit (2010)

[http://www.ca9.uscourts.gov/media/view\\_subpage.php?pk\\_id=0000005753](http://www.ca9.uscourts.gov/media/view_subpage.php?pk_id=0000005753)

<http://www.ca9.uscourts.gov/datastore/media/2010/06/17/08-17389.wma>

### **Unofficial transcript of hearing of 08-17389...**

"rpenner" (2010)

<http://67.205.94.94/showthread.php?s=a14994da8ca240a945f893122ba1d7a8&t=85716&page=15>

### **Appeal from the United States District Court for the District of Hawaii Helen Gillmor, Senior District Judge, Presiding**

United States Court of Appeals for the Ninth Circuit (2010)

<http://www.ca9.uscourts.gov/datastore/memoranda/2010/08/24/08-17389.pdf>

## 6b Schröter, Gabriele v. Federal Republic of Germany

### **In dem Verfahren über die Verfassungsbeschwerde der Frau S...**

Federal Constitutional Court (of Germany) (2010)

The Federal Constitutional Court's ruling against Ms. Schröter's appeal for an injunction restricting the operation of the LHC.

[http://www.bundesverfassungsgericht.de/entscheidungen/rk20100218\\_2bvr250208.html](http://www.bundesverfassungsgericht.de/entscheidungen/rk20100218_2bvr250208.html)

## 6c Appeal to the European Court of Human Rights

### **Application under Article 34 of the European Convention on Human Rights and Rules 45 and 47 of the Rules of Court + Antrag Auf Interim Measures nach Artikel 39 der Verfahrensordnung des Europäischen Gerichtshofes für Menschenrechte**

www.LHC-concern.info (2008)

The complaint filed with the European Court of Human Rights prior to the start of the LHC.

<http://lhc-concern.info/wp-content/uploads/2008/09/mr-beschwerde-cern-volltext.PDF>

### **Zusammenfassende Aktualisierung der EGMR-Beschwerde**

www.LHC-concern.info (2008)

A summary and follow-up document for the renewal of the complaint filed with the European Court of Human Rights.

[http://lhc-concern.info/?page\\_id=41](http://lhc-concern.info/?page_id=41)

see also:

[http://lhc-concern.info/wp-content/uploads/2009/09/brief\\_info\\_cern\\_lhc\\_critique\\_3909.pdf](http://lhc-concern.info/wp-content/uploads/2009/09/brief_info_cern_lhc_critique_3909.pdf)

## 6d Appeal to the UN Human Rights Committee

### **Communication under the Optional Protocol to the International Covenant on Civil and Political Rights**

conCERNed international and LHC Kritik (2009)

The formal complaint submitted to the United Nations Human Rights Committee about the safety of the LHC.

[http://lhc-concern.info/wp-content/uploads/2010/03/un-communication-lhc-cern\\_concerned-int.pdf](http://lhc-concern.info/wp-content/uploads/2010/03/un-communication-lhc-cern_concerned-int.pdf)

see also:

[http://lhc-concern.info/wp-content/uploads/2010/03/critical-revision-of-lhc-risks\\_concerned-int.pdf](http://lhc-concern.info/wp-content/uploads/2010/03/critical-revision-of-lhc-risks_concerned-int.pdf)

[http://lhc-concern.info/wp-content/uploads/2010/03/request-to-cern-council-and-member-states-on-lhc-risks\\_lhc-kritik-et-al\\_march-17-2010.pdf](http://lhc-concern.info/wp-content/uploads/2010/03/request-to-cern-council-and-member-states-on-lhc-risks_lhc-kritik-et-al_march-17-2010.pdf)

## 7 Books Discussing the Possible Risks Associated with Particle Colliders

A short list of some of the more notable books:

### **The End of the World: The Science and Ethics of Human Extinction**

Prof. John Leslie (1998)

<http://www.amazon.com/End-World-Science-Ethics-Extinction/dp/0415184479>

<http://www.amazon.com/End-World-ebook/dp/B000FBFKUY>

### **Our Final Century: Will Civilisation Survive the Twenty-First Century?**

Prof. Sir Martin J. Rees (2003)

<http://www.amazon.com/Our-Final-Century-Scientists-Environmental/dp/0434008095>

<http://www.amazon.com/Our-Final-Hour-Scientists-ebook/dp/B001JAH7QU>

### **Catastrophe: Risk and Response**

Prof. Richard A. Posner (2004)

<http://www.amazon.com/Catastrophe-Risk-Response-Richard-Posner/dp/0195178130>

<http://www.amazon.com/Catastrophe-Risk-and-Response-ebook/dp/B0013PTUSO>