Particles Colliders:

Black holes produced on Earth could destroy planet

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In a few words: Black holes could be produced on Earth in the beginning of the year 2008 in the LHC accelerator, using "collisions with opposite speed particles". This way of experiments means that black holes could be captured by Earth gravity. Evaporation of black holes has never been tested. In case of evaporation-failure we could have a risk of complete destruction of the whole planet. If we count also others accelerator incertitude, this risk could be estimated to more than 4%

You will find in this text :
A "Summary" *(2 pages)*
A "Study: Risk with LHC" *(8 pages)*
A "Complement" with discussions, calculus, ideas and comments *(20 pages)*

See also references available on http://www.risk-evaluation-forum.org
http://www.risk-evaluation-forum.org/links.htm

First we must thank all the physicists we have disturbed in their work and in there life, with all ours questions, and who had the kindness to answer. We believe that there could be danger for Earth and this was the reason for our so invasive questioning!

Summary (2 pages):

The LHC particle accelerator will be the most powerful in the world. It will smash fundamental particles into one another at energies like those of the first trillionth of a second after the Big Bang, when the temperature of the Universe was about ten thousand trillion degrees Centigrade [from Ref.11].

1/ Micro black holes (**MBH**) could be produced in the LHC [Ref.1].
CERN [Ref.9 & Ref.11] indicates a possible rhythm of producing "one micro black hole every second".
The probability of MBH production depends of validity of physical theories with more than 4 space-time dimensions (String theory needs 10 dimensions, M theory and branes theories need 11dimensions, etc..).
The probability of validity of these theories could be estimated at 50%.
That means that ***black holes could have a 50 % probability to be produced in LHC***.

2/ CERN study 2003-001 [Ref.1] and also [Ref.2] are risk-evaluation studies from "LHC Safety Study Group". These evaluations are very important because a ***risk*** *could exist* of a possible *complete destruction of planet Earth.*
CERN study [Ref.1] indicates *"Black hole production does not present a conceivable risk at the LHC due to the rapid decay of the black hole through thermal process"*.

The problem is that the thermal process (that means evaporation of the black holes described by Stephen Hawking) ***is totally theoretical*** and no experiment has proved its truth.

This evaporation is contested et could only be valid in case of specials and atypical black holes [Ref.43].

In several surveys, physicists have estimated a non-trivial probability that Hawking evaporation will not work. [Ref.32]

Every good physical theory could be wrong until it has been tested!
A minimal estimation of Hawking evaporation failure could be of 20%.

3/ Accelerator experiences of shooting high-energy particles with opposite speeds create on Earth *conditions different from natural collisions due to cosmic rays* because the speed of the particles resulting of the collision in this case is close to zero.
This means that the particles created *could more easily be captured by Earth gravity*.

4/ LHC physicists agree that in case of non-evaporation black holes could be captured by Earth gravity [Ref.3] and [Ref.39].
Using LHC during ten years calculus from [Ref.3] indicate that 3.160 (US notation 3,160) MBH could be captured by Earth and from [Ref.39] that only 10 MBH would basically get trapped, orbiting around the centre of Earth.
LHC physicist indicate that even in these case there will be non-danger because these black holes will need a very long time to capture atoms.
From [Ref.3] we see that are needed "*3 hours to gobble a single atom*" and from [Ref.39] "*100 hours would be needed to gobble a single proton*". With this last evaluation, LHC physicists indicate that *it would take much more than the age of universe to destroy even one milligram of Earth material*".

This calculation has also never been tested and could have to be modified using others calculus factors as we will indicate in this study (***see very important discussion*** *about processes for absorption of Earth matter).*

We have to consider that in any case, *as for all the calculus and the theories non tested, the minimal estimation* ***of failing of such calculation could be of 20 %.*** We can then calculate the global risk:
Using a probability of black holes production of 50%, non evaporation 20% and 20% for failure in evaluation of absorption of matter, we will have *50% x 20% x 20%* which means ***risk of 2%***

If we count also others accelerator incertitude, ***this risk*** could be estimated ***more than* 4%** *(See* ***important discussion*** *in the study and the complement).*

In any case, ***even a risk of 2%*** *is an important risk for the global planet and* **cannot be accepted.**

In this times when is proposed lasting development for the planet, the precaution principle indicates strongly not to experiment, with opposites speed particles collisions.

Study: Risk with LHC (8 pages)**:**

See the more complete discussion in the Complement that is following of this study

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I ** BLACK HOLES IN LHC: ARGUMENTS OF DANGER

*1 ** Risk of Evaporation failure:*

CERN study [Ref.1] indicates *"Black hole production does not present a conceivable risk at the LHC due to the rapid decay of the black hole through thermal process"*.
The problem is that the thermal process (that means evaporation of the black holes described by Stephen Hawking) is ***totally theoretical*** and no experiment has proved its truth.

In several surveys, physicists have estimated a non-trivial probability that Hawking evaporation will not work. [Ref.32]

We can quote the opinion of the physicist Lee Smolin specialist of space-time and particles theory. Lee Smolin has doubt about the validity of chord theory but explain that even if it was valid the black holes evaporation proposed in that theory and there ability to emit even a weak radiation has to be contested and is applicable only for specials and atypical black holes [Ref.43] :

I can quote also Andrew Hamilton :
15 Apr 2003 update. Adam Helfer (2003) "Do black holes radiate?" (gr-qc/0304042)
" This delightfully readable review paper does an excellent job of convincing the reader that Hawking radiation is still far from being an established prediction of the quantum physics of black holes".
See the opinions and doubt of Adam D. Helfer and C.A. Belinski in [Ref .35, Ref.36].

Comment: The brightness theory could reveal false when tested.
Hawking theory is a brightly constructed theory and that means that evaporation could have 80 % chances to work. As all the non-tested theories, it would be wise to consider a probability of failure of 20% risk (and maybe 30 % risk if we want to get insurance in a risk evaluation).

CERN 2003-001 considers evaporation is sure acquiring of science. This is dangerous presumption. CERN 2003-01 [Ref.1] equations (Eq.18) (Eq.19) (Eq.20) (Eq.21) (Eq.22), and

by the way, the conclusions that LHC does not represent any danger, have a 20 % or 30 % risk to be wrong!
Risk of evaporation failing has not been discussed in the risk study CERN 2003-001.

*2 ** No conclusions of safety from the cosmic rays.*

We all have believed that cosmic rays with high energies level, greatest than any accelerator energies, prove that accelerators are safe.

With cosmic rays (mainly protons in cosmic rays) creating a collision with a planet or with a star, restricted relativity indicates that we need a speed of 299.999,9 km/sec to create a micro black hole of "1 TeV" (the energy of LHC will be of 1 TeV) and after the interaction the "MBH who is in the centre of mass" will have a speed of 299.700 km/sec.
With such a *quick move* (if we refer to the planet or the star), if the MBH are not strongly reactive they will "always" cross planets or stars and loose in space.

If a cosmic ray has not a sufficient energy it will not produce MBH.
If a cosmic ray has sufficient energy to produce MBH, "the MBH will have enough speed to cross the Earth and loose in space".

In the case of LHC with **opposite speed collisions** the rapidity distribution is **centred on the speed value zero** and this is very different from cosmic rays rapidity distribution.
Slow speed particles could be created and then be captured by Earth gravity.

*3 ** Micros Black holes could be captured by Earth gravity*

LHC physicists agree that in case of non-evaporation black holes could be captured by Earth gravity [Ref.3] and [Ref.39].
Using LHC during ten years calculus from [Ref.3] indicate that 3.160 (US notation 3,160) MBH could be captured by Earth and from [Ref.39] that only 10 MBH would basically get trapped, orbiting around the centre of Earth.

*4 ** Accretion processes in case of low speeds*

LHC physicists indicate that even in the case of capture by Earth gravity, there will be non-danger because these black holes will need a very long time to capture atoms.

LHC Physicists indicate from [Ref.3] "*3 hours to gobble a single atom*" and from [Ref.39] "*100 hours would be needed to gobble a single proton*". With this last evaluation, LHC physicists indicate that *it would take much more than the age of universe to destroy even one milligram of Earth material*".

We propose here to indicate possibility of greatest accretion factors:

1… The accretion process is exponential (Note: accretion = absorption of matter).

Calculus in [Ref.1], [Ref.3] and [Ref.39] using cross section accretion consider that accretion increase is linear and proportional to time.
When the MBH capture Earth material, it's radius and it's mass are increasing.

If we compare the increase of the cross section surface and the increase of mass of the MBH (even if we consider the fact that the MBH speed will decrease after capture of matter), we notice that the accretion increase is ***exponential*** and not linear!

2… Cross section and Radius of accretion

Calculus for accretion in [Ref.3] and [Ref.39] are using cross section accretion with the classical radius of black holes the *Schwarzschild radius.*
We remark that if MBH has slow speed, we must *no more use Schwarzschild* radius for calculus of accretion.
As an example, if MBH speed were zero and the MBH had got electrical charges, the electrostatic forces would mean accretion at a distance greatest than the Schwarzschild radius.

If a particle is not bind in an atom *it will fall in the black hole vortex if its speed is smaller than the escape velocity* (gravitational or electrical).
If a particle is bind by electric forces to atom and could not move, that means, by reciprocity that it is the black hole which will try to get in orbit and then could fall on the bind particle.
If the radius for accretion was in the range of atom distance 10^{-10} meters, accretion could be important.

3… Accretion of nucleons:

Cross-section is not the only way for accretion.
If a slow speed MBH accretes an electron, it will acquire a charge and then probably accrete a proton.
If a MBH accretes a quark it will then probably accrete the all nucleon: the black hole would have acquired a charge that is not complete, charge 1/3 or 2/3 and that would be unstable.
The MBH will be required to accrete other divided charges to reach a completed integer number of charges.

Does a MBH located in the atom nucleus and having caught a nucleon will catch the others neutrons and protons and finally will catch the entire nucleus with gravitational effects, gauge forces and electric forces?

If a low MBH is just touching a quark on it's "edge", the quark has a statistical risk to be caught (we must add the size of the nucleon in the calculus of the accretion radius).
All these processes could give an evaluation of greatest accretion (maybe several protons at every second).

We have not to take in account, only the low speed of the MBH, we have also to take in account *the quick speed of electrons turning around the nucleus and this will increase the probability of interaction* (this argument is also proposed by Blodgett in [Ref.13]). We must not forget that when an electron is caught the MBH will quickly catch a proton.
Calculus could indicate in this case a possible accretion of ***maybe twenty protons every second.***

4… "Butterfly" accretion process:

If the "capture radius" is in the range of atom distance 10^{-10} *m* we could have a dangerous process (I have called it the *"butterfly process"*). The MBH could go from an atom to the other like a butterfly goes from one flower to another, loosing it's speed after each interaction and after accretion falling slowly in terrestrial gravitational field.
Calculus could also indicate an accretion of several protons/sec.

5… Others factors increasing accretion:

The number of black holes depends of the supposed number of space-time dimensions. We must know that with a greatest number of space-time dimensions, the number of MBH will increase. The studies CERN 3849/1 and afterwards CERN 2003-001 have considered a 10 dimensions space-time (page 12 [Ref.1]), which fits with "string theory".
M theory for an example needs 11 dimensions and this would mean accretion ***36.000*** times more important. Others theories indicate the possibility of 26 dimensions [Ref.42] and that could means greatest accretion.

We must not forget to multiply accretion by the number of MBH (evaluated to more than 3.000 in [Ref.3])

In case of very short distances super-symmetrical theory indicates that strong gauge forces could occur and increase accretion. (see discussion in Complement).

6…Conclusion:

With all these factors calculus indicates that, from the beginning, MBH could present a capture more important than with classical cross-section, probably **several protons every second.**

*5 ** Micro Black Holes In the centre of Earth:*

A MBH captured by Earth will catch matter using different accretion processes. *The speed of the MBH will decrease* and its mass will increase. At the end the MBH will stop at rest in the precise gravitational centre of the Earth [Ref.18 p111]. All the MBH located in the centre of Earth will coalesce in only one Mini BH.

Calculus indicates than in case of 3160 MBH captured by Earth, this mini black hole mass estimation could be in the order of several hundredth grams of matter when it will stop in the centre of Earth.

In the centre of Earth new processes could happen. An impressive increase of accretion due to high pressure could favour the exponential process.

1. Very high-pressure in centre of Earth :

A classical pressure evaluation at the centre of earth is of 4.10^{11} Pa [Ref.28]. This pressure results from the weight of all the matter in Earth pushing on the electronic clouds of central atoms. The quick move of electrons in these clouds counterbalance that important pressure. Around a black hole there is no electronic cloud and there is nothing to counterbalance. Pressure is constant in a homogeneous liquid, but it is not the same in a heterogeneous medium composed of atoms mixed to a Mini BH.

To calculate the pressure on the Mini BH we must use the equation:
Pressure P = Force F / Surface S.
"F" is the weight of all the matter of Earth and this does not change. The surface of the Mini BH is very small in comparison with the surface of the electronic cloud of atoms, so If we

reduce the value of the surface "S" in the equation, we are obliged to notice that Pressure "P" will increase in an impressive manner.

With Mini BH of 0.02 g, *calculus indicates on it's surface* ***an impressive pressure, thousand billions times more important than the usual pressure in the centre of Earth*** *(we will have pressure of about* **7.10^{23}** *Pascal to compare with classical value of* **4.10^{11}** *Pascal).*
Such a high pressure couldl push strongly all the matter in direction of the central point where the MBH is.

When a heavy star begins to collapse in a black hole (implosion) [Ref.18 Page 443], in the beginning the black hole is only a micro black hole like those that could be created in the LHC. The Micro BH will grow there only because of the high gravitational pressure.
*In centre of Earth pressure is normally far to small for a black hole to appear****, but if we create,*** *with the artificial manner of opposite speeds, slow speed Micro BH that do not evaporate and if these MBH come at rest in the centre of Earth, the pressure in the centre of Earth could be sufficient for the growing of the central Mini BH.*
The same kind of pressure process than in heavy star could work there, but of course, in a slowest mode.

2. Accretion due to electrostatic forces in the centre of Earth:

The black hole in the centre of Earth will be located between two electrical atomic clouds of two iron atoms. Capture of all the electrons of these atoms will be easy, *facilitated by the high pressure*, and will charge negatively the black hole. When charged, the black hole will capture the nucleus. Calculus indicates than accretion could probably in this case be quickly estimated *in thousandth of gram, then grams, then kilograms, etc..*

3. Breaking atoms connexions forces:

When mass is growing, there would be a moment where gravitational forces would become greatest than atoms connexion forces and this could strongly increase the ***exponential*** process:

*6**Conclusion about black holes:*

In the centre of Earth, all these processes could *mean an important increase of capture* and the beginning ***of an exponential dangerous accretion process.***

Conclusion: *Accretion rate needs a more precise evaluation before any LHC test.*

II ** OTHERS PARTICULES AND SCIENCE INCERTITUDES

LHC will not only produce black holes, others particles created could also be dangerous in case of low speed.

1…LHC will produce quarks strange.

Some authors DDH cited in [Ref.14 page 21] affirm about RHIC accelerator, *that, in case of* production of quarks *strange with very low speeds (confined to central rapidity) and a production during a long time in RHIC accelerator, "***one** *dangerous quark strange» could be produced***!**

It is important to understand that *even « **one** » dangerous quark* ***strange could destroy the planet with a supernova-like effect***.

RHIC [Ref.14] and CERN studies [Ref.1 and Ref.2] estimate that a quarks strange production "*confined to central rapidity*" was "*hard to justify on any theoretical ground*»! (I quote the terms used in [Ref.14 p20]).

We present arguments that could indicate that such a production at central rapidity is not impossible:

Recently, in United States, the particle accelerator RHIC had success in producing a quarks-gluons plasma [Ref.33] (last step before creating black holes if highest energies).
The physicists were *amazed* to see that this plasma was thicker than expected, *acting like a "liquid drop" and not like a "gas" as predicted by theory*. [Ref.38] (Note: we see here how theories are relatives). It is noticed that the production of this quarks-gluons plasma reduces the speed and retains the particles created in the collision [Ref.33]. This phenomenon is called "particles beams suppression".
When this plasma is produced « quarks strange » are detected [Ref.33].

We can imagine that quarks strange produced in a liquid medium could be more retained by the plasma than if the medium had the comportment of a gas.
These arguments indicate that quarks strange could loose more speed than predicted and that a *production "confined at central rapidity" could be statistically possible in case of using RHIC accelerator during a long time (LHC idem?).*

A third argument could be described in using our own evaluation of very low speeds distribution (we had made this calculus for micro black holes). Calculus indicates that we could have statistically probability of very low speeds, between 4 m/sec and 0 m/sec. If these very low speeds could be applied to strange quarks rapidity distribution this *could mean possibility of danger in case of long period of use of the accelerator.*

2…Monopoles could be produced in the LHC [Ref. 1].

CERN's calculations indicate that one monopole produced in LHC could destroy 1.018 (US notation 1,018) nucleons in traversing the Earth "straightforward" and then will escape into space. In fact, monopoles produced in LHC could have low speed and that could mean zigzag trajectories.

Photons, as an example, produced in the centre of the Sun need thousand of years to arrive to cross the sun and loose in space after numerous interactions and a zigzag trajectory.
We can ask question of a possible danger if the result of interaction of the slow speed monopoles with the atoms was meaning *a zigzag trajectory.* In such a case we can imagine that *the monopoles produced in LHC could stay a very long time in Earth and be dangerous.*

3…LHC could produce unexpected particles.

LHC will reach [Ref.11] temperature of about ten thousand trillion degrees centigrade ».
In such a surrounding, it is possible to foresee **unexpected particles and unexpected phenomena.**

In LHC, new particles, or unexpected particles, could be created. Is there no danger?
Using our theories we can predict that the "new particles we suppose to detect with LHC" will present no danger except perhaps strangelets, micro black holes or monopoles

Nevertheless, it is important to notice that we have *not a final theory in physic*, that we ignore the composition of an enormous part of the matter of Universe (dark matter, dark energy, quintessence, vacuum energy, non-commutative geometry, and so many theories are *non-definitive theories* [Ref.37 et Ref.34]). As an example: vacuum energy is evaluated as $\mathbf{10^{-29}}$ g /cm^3 by the cosmologists and as $\mathbf{10^{91}}$ g/cm^3 by the physicists in particles theory [Ref.34, Ref.22].

There is also the problem of unexpected particles not predicted in our theories.
What is sure is that using opposite speed collisions means that all the heavy particles created could be ***captured by Earth in a non natural manner****.*
This can also particularly be applied to unexpected particles that could be created and in this case, we have no evaluation of the possible danger that they could present.

It would be wise to consider that the more powerful the accelerator will be, the more unpredicted and dangerous events may occur in case of opposite particles collisions.

III ** RISK EVALUATION AND CONCLUSION:

CERN 2003-001 does not evaluate completely the different risks with LH.
Non-evaporation of black holes, slow speeds of strangelets in plasma, possibilities of unknown phenomena are not considered in this study.
CERN 2003-01 evaluate the risk as a choice between « 0 % risk or 100 % risk » and the risk of « 0 % » has been chosen. This is not the good evaluation of a risk percentage!

Risk evaluation is difficult:
1. Previous accelerators, less powerful, had never produced a catastrophic event and we can easily imagine that this will always be the rule. This could be more evident if we believe that cosmic rays are a proof of safety for accelerators. We must consider that all these arguments are *illusion of safety* in case of opposite speeds collisions. Such an illusion can mistake the best of our physicists.
It would be wise to consider that, using this ***non-natural technique*** of opposite speeds collisions, ***the more powerful the accelerator will be, the more unpredicted and dangerous events may occur.***

2. The risk evaluation means for a physicist to know about a very large number of theories in physic. As an example, the particles physical theories are different of black holes physic, branes physic, Astrophysics etc…
Calculus are difficult if we want a complete evaluation, in the limit of relativity, quantum theory, branes and string theories with unknown size and unknown number of rolled dimensions etc..

3. Quick evolution of theories shows also the need of prudence and a theory or also a risk evaluation could be obsolete in a few years or in a few mouth.
Tomorrow another theory could indicate a greatest number of dimensions and that could mean that MBH production could occur with lower energies or be more important that predicted.

4. Risk evaluation is always *subjective*. We can only propose our own evaluation of probability for danger. Here as an example we have supposed that a non-tested theory had 20% risk to be false. The estimation is also subjective because it depends of the evaluation of unknown part on human knowledge.

Risk Evaluation is of crucial importance, because "***safety of Earth is concerned***".

We can try an estimation of the risk for LHC:
2% for micro black holes + 2% for the others particles and the uncertainty in physical theories.
So we will have a **4% risk for Earth**.
We must consider this value as a minimal value and a simple approach of evaluation, the risk for Earth could perhaps be more important (maybe 10% or more).

CONCLUSION:

Opposite speed collisions in accelerators are creating on Earth very specific conditions, different from the natural cosmic rays collisions.
The risk evaluation indicates for LHC more than 4% risk (perhaps 10% risk or more).

It would be better to wait for safe data coming from astronomical source etc. and not oblige knowledge with an enormous accelerator *using opposite speed particles to get more power in the collisions*, but surrounded with incertitude zones.

The study for the "RHIC" accelerator had concluded that "no black hole would be created".
For "LHC" conclusions are very different: *"Black holes could be created»!*
The main danger could be "now just behind our door" with the possible "death in blood of ***6.000.000.000*** *peoples" and* ***complete destruction of our beautiful planet.***

Such a danger shows the need of a greatest number of studies before any experiment!
The caution principle indicates not to experiment with opposite speed particles collisions.

Even LHC "test" *could reveal a main danger!*

We must have reflexions about the limits of our knowledges.
1/ We must create a **"*special critical team*"** coming from various physical disciplines, (*with no particular interest in these experiments*) who will try again and again to have reflections about the possible danger of accelerators, work and discuss on every hypothesis.

2/ We must experiment in a safe way (Exemple : without this technique of opposite collisions or observing the black holes created by the cosmic rays with appropriate detectors) and wait for a more sure and complete physical global theory.

New studies to realize before producing "low speeds" heavy particles:
** Detection of MBH created by cosmic rays and detection of evaporation.
** Detection of primordial MBH created after the Big Bang
** Interactions in case of with a greatest number of space-time dimensions.
** Interactions in case of rolled dimensions with different sizes.
** Precise evaluation of accretion rate in case of slow speeds
** Precise evaluation of accretion rate in the centre of Earth
** Astronomical search of strange quarks stars
** Complete theories of space-time unifying quantum theory and relativity, *using astronomical data or non-dangerous experiments.*
** etc..

1957 Fire in WINDSCALE reactor
1957-58 Explosion of a nuclear stock at KYCHTYM
1954 1960 Explosions in Idaho
1979 WINDSCALE contamination
1979 Fusion in THREE MILES ISLAND reactor
1986 **TCHERNOBYL**
2007 2008 ….**LHC** ……….. **and then** ……………………….. **Nothing !!!**

I hope these sentences will not prove to be premonition:
« Prehistoric men hit stones and discover fire. It was beginning of civilisation! Modern men hit stones and discover Strangelets and Micro Black Holes. It was the end of civilisation! »

The best calculus, the best theory could reveal to be wrong when tested.
We must remember the basic wisdom proverbs about human possible mistakes:
"Errare Humanum Est", "It is better to prevent than to cure", "When in doubt, don't"!

« Science without conscience is a ruin of soul! »

See also calculus and discussion in the Complement.

Complement to the study LHC Risk:

This complement is including calculus, discussions, ideas, etc..

See also *http://www.risk-evaluation-forum.org*

Used in Complement LHC Risk evaluation study :

Γ_A Accretion rate
v Speed of the black hole
Rs Black hole radius (Schwarzschild radius) $Rs = GM/c^2$ in 4D
ρ Mean density of the matter through which the black hole passes (iron).
G Newton constant $G = 6{,}67.\ 10^{-11}\ N\ m^2 /kg^2$
g Acceleration of Gravitation on Earth $g = 9{,}81\ m/sec^2$.
K Coulomb force coefficient $= 9.10^{9}\ N\ m^2 /C^2$
m MBH mass if one TeV = 10 gold atom mass in the beginning $= 10 \times 197 \times 1{,}7\ 10^{-27}$ kg
M Concentration of matter
M* Fundamental Mass Scale in a (4+d) space time
R Size of rolled dimensions.
r Distance
d Number of rolled dimensions
a Acceleration
q Electric charge $q = 1{,}6\ 10^{-19}$ Coulomb
Δt Falling time of MBH from a nucleus to another
c Speed of light $c = 3.\ 10^{8}$ m/sec
h Planck constant $h = 6{,}62\ 10^{-34}$ J.sec
mp Mp Planck mass Mp = (hc/G)^ 1/2 =1,2 . 10^{19} GeV = 2,17 10^{-8} kg
lp Lp Planck length Lp = (hG/C3)^1/2 = 1,62 10^{-35} m
tp Tp Planck time Tp = (hG/c5)^1/2 = 5,4 10^{-44}sec.
me Masse of electron me = 9,109. 10^-31 kg = 0,511 MeV
Number of charges of iron : 26
Atomic Mass of iron : 56
Atomic Mass of Gold : 197
Mass of 10 gold atoms : 10 . 197. 1,661 . 10^{-27} kg = 3,27 . 10^{-24} kg ≈ 2 TeV
Atomic mass unity (1u) = 931,5 MeV = 1,661 . 10^{-27} kg
1 TeV = 10^{3} GeV = 10^{6} MeV = 1,78 . 10^{-24} kg = Energy distributed on 10^{-17} cm.
G Mp = 6,67. $10^{-11}\ N\ m^2 /kg^2$. 2,17 10^{-8} kg = 1,45. 10^{-18}
K q q'= $9.10^{9}\ N\ m^2 /C^2 \times (1{,}6\ 10^{-19}\ \text{Coulomb})^2 = 23 .\ 10^{-29}$.

Warning: you will find in this study only simple and basic calculus. As an example, very few relativistic calculus are needed (I quote CERN physicists: "*black hole formation is dominated by the classical effects*").
Some calculus and discussions have been removed from this text to facilitate reading.
These calculus and evaluations have been made in the context of a private study and could be wrong.
Even in these case, this would not mean that there is no danger!

If you have serious knowledge in physic, please, make your own calculus and evaluations of risk, have a look at the studies proposed in the annex of the forum, and address your results to James Blodgett the responsible of the forum on : email@risk-evaluation-forum.org.

I ***Arguments About Failing of Hawking Evaporation:

Black holes will evaporate ! Evidence could be a dangerous believing nowadays !

Some ask questions as James Blodgett: [Ref.3] "*Hawking radiation does not work. Micro Black Holes (MBH) do not dissipate. (This has a non-zero probability. Hawking radiation has never been seen.)*"

Kip S. Thorne who has been working on evaporation with Hawking tells us [Ref.18 page 479-480] : *"It's possible, we understand quantum fields far less that what we believe and it's a mistake when we think black holes evaporate. We resist to such a scepticism because of the appearance of perfection in which standard laws of curved space time join quantum fields. It is however true that* ***we should feel more in ease if astronomers could effectively observe clues of black holes evaporation****"*.

Black holes in Astronomy have an important mass, so the evaporation is very tiny and cannot be detected. Primordial micros black holes (from the Big-Bang) effects could be detected, but we are far from a proof of Hawking evaporation.

<u>*Some CERN physicians believe that there is no danger to test evaporation on Earth:*</u>

I quote [Ref.7] :"*The correlation between the BH mass and its temperature, deduced from the energy spectrum of the decay products,* ***can test*** *Hawking' s evaporation law and determine the number of large new dimensions and the scale of quantum gravity"*. ©2001 The American Physical Society".

Also [Ref.11] : "*This would also confirm Hawking' s prediction,* ***which has never yet been put to the test****. Even more intriguingly, this 'Hawking radiation' might hold clues about the fabric of space itself"*.

<u>*Some physicians believe evaporation could fail:*</u>

Andrew Hamilton :
« 15 Apr 2003 update. Adam Helfer (2003) "Do black holes radiate?" (gr-qc/0304042) opens with the statement: ``The prediction that black holes radiate due to quantum effects is often considered one of the most secure in quantum field theory in curved space-time. ***Yet this prediction rests on two dubious assumptions ...****''. This delightfully readable review paper does an excellent job of convincing the reader that Hawking radiation is still far from being an established prediction of the quantum physics of black holes. The paper gives the clearest exposition of Hawking radiation that I know of, emphasizing the physical concepts while simplifying the mathematics to its barest essentials (not that the mathematics is simple even in stripped form). »*

See also the complete opinion of Adam D. Helfer and C.A. Belinski in [Ref .35, Ref.36]

<u>*Is Hawking evaporation totally reliable?*</u>

Hawking work about evaporation was first based on Jacob Bekenstein work which assert (to save the second thermo-dynamical principle) that black hole entropy was equivalent to the black hole surface.

In the beginning of his study Hawking himself and all the black holes experts where admitting the idea that thermodynamic principle could not be applied to black holes [Ref.18 page 454]. We can read also Kip's Thorne who has been working with Hawking [Ref.18 page 472, 473] :
"Hawking was prudent in the beginning of his career, but in 1974 he had changed and he told him : "I prefer to prove I am right that be rigorous".
And so in 1974 after having solidly demonstrated that a black hole emit radiation, Hawking will go further and affirm without a real proof that the similitude between thermodynamic laws and black holes mechanic were more than coincidence".

Recently in July 2004 [Ref.40] Hawking *has been obliged to admit the fail of his hypothesis about the retaining of information by black holes.*
His evaporation theory was ***contradictory with one of the main principle of the quantum mechanic***.
I translate some sentences from the text of [Ref.40]:
« *it is contradictory with the principle of* ***unitarity****, which means that if a quantum object is described in the beginning with an initial state and than after that it is changing, it could always be described by only one quantum state.*
In the Hawking case, one black hole evaporating, is not different of a simple carbon piece heated to red and producing heat, where the final state can only be described by a superposition of incoherent states".
"*Hawking had even bet on this subject with the physicians Kip Thorne et John Preskill that no information on what had been swallowed by the black hole could escape even if the black hole had evaporated."*
"with this change of Hawking opinion, we see that the actual theory is less exotic that the one proposed in years 1970. ***With the actual theory, the matter that enters in a black hole has always no chance to escape***. ***Only the information relatives to the elements of this matter could slowly escape."***
"*With the string theory calculus are longs and difficult. Steven Hawking continues to use the theories and the tool of the physic in the years 70. it seems that he succeed an approach of results of string theory with classical tools using clever short cuts*"

Comment: We must evaluate the reasons of the change of Hawking opinions in July 2004.
We must first notice that evaporation theory does not fit well with one of the main principle in quantum theory.
To satisfy the second principle of thermodynamic, Hawking had imagined the evaporation of black holes. When doing this he did not knew that it was contradictory with another principle of physic the unitarity principle. With humour, we could say "to save the cat, we kill the dog"!

Years after the string physicists have indicated him the paradox and finally, Hawking has been obliged to admit he was wrong.

It is important to notice that *the paradox can only appear in the context of the theory of black hole "evaporation"*. During years Hawking had preference to admit the paradox as a fact and had not imagined, only one moment, that evaporation theory could be wrong.
Is it not more simple to admit that it is the evaporation theory that is to evaluate?

The unlimited confidence in Hawking evaporation seems dangerous !

Note: Another hypothesis would be that MBH evaporation will exist but less than predicted and this also could be dangerous.

Anyway, it is dangerous to believe that there is no danger ***to test*** *Hawking evaporation in greatness size on our planet!*

Trying some arguments:

As evaporation is crucial for the safety of LHC, we propose to create teams of specialists in physics of black holes who will indicate in a report the possible arguments for a possible failing.

The risk of a 20% failing of evaporation is for me sufficient to stop experiments.
In spite of my level of knowledge strongly limited, I will try to indicate some arguments.
All these arguments could be ridiculous but some could tell us to question ourselves.
Even if all were wrong, this will not indicate that the risk is excluded !

1. Is the Hawking theory of quantum fields in curved space time the final theory ?:

Hawking [Ref.17] has been obliged to mix quantum theory (fluctuation of vacuum, tunnel effect, Hilbert space, negative energy, …) and relativity, each one based in a separate space time in extreme conditions Prudence tells us before any LHC experiment to wait for a more complete unified theory (M theory , Brane theory, non-commutative theory etc.. are … in elaboration).

2. There is no inside of black hole and so no tunnel effects :

In 1958 David Finkelstein had proposed a space-time diagram of implosion from a star to a black hole ([Ref.18] Page 265).
This diagram is including different referential as the referential of the watcher falling in the black hole and the referential of watcher non moving (with reference to the black hole).
With such diagrams we could have *confusion* because they are mixing different referential and this confusion could lead to the false conclusions that there is an inside of black holes.

If we refer to relativity the watchers observes different lengths and times, depending of speed.
Observing a black hole, if a first watcher is *not moving* (with reference to the black hole), he will observe creation of an horizon at the Schwarzschild radius and he will observe a time stopping on this horizon.

If a second watcher is *falling in the black hole*, it is different ([Ref.18] page 254).
For him there will be no Schwarzschild radius. He will fall until he reaches the "singularity".

If the first watcher observes particles falling with decreasing speed., on his point of view, these particles will never reach the horizon because of slowing time and of complete time stopping on horizon [[Ref.18] page 271 relativist equations of Oppenheimer and Snyder [Ref.18 page 229]].
For such a watcher the falling particles will increase black hole radius but will never be absorbed in the inside of the black hole because *for him there is no inside of the black hole* !

The two points of view seen from different referential are all true and each one depends of the referential we have chosen.
The Schwarzschild radius could only be observed by the watcher not moving (with reference to the black hole) and does not exist for a falling observer.

The use of Finkelstein diagram could lead to false conclusions about "*what is inside the black hole*", as inversed time, inversed space etc..
For the first watcher horizon is the limit and *for him the horizon is the discontinuity* !

We should come back to the old name of "discontinuity of Schwarzschild" used during the years 1920 to 1950 [Ref.18 page 266] if we are located in a space zone *not moving* (with reference to the black hole). If we change this, we must precise the referential we use.
We should never speak of "inside the black hole", this has no meaning in any referential we can refer !

Hawking evaporation is mixing what happens "in the inside of the black hole with what could happen in the outside" adding tunnel effect from quantum mechanic to cross the horizon.

In such a context we have seen that if *there is no inside* of the black hole, *there is no tunnel effect* and so that *Hawking evaporation can not work !*

J.A.Wheeler had discussed with KipThorne and David Sharp of possibility of tunnel effect in years sixty and he admitted this could not occur ([Ref 18] page 269).

3. Slowing time on horizon problems :

In their proper time the particles are falling toward black holes, but "general relativity" tells us that in our relative position of non moving observant, we will see a slowing of time of the falling matter near the BH horizon [Ref.18 page 229].
a... Hawking evaporation needs " quantum vacuum fluctuations" near the horizon:
If we are in the "non moving observant position" and if we observe the stopping time on horizon we will notice that the stopping time could prevent vacuum fluctuations.
The vacuum fluctuations are in relation with Heisenberg equations.
Equation like $\Delta E \, \Delta t >= h / 4 \pi$ includes time and is not valid if time stops.
This is contradictory with Hawking affirmation of "fluctuations particles" changing in "evaporation particles".
b…. Hawking evaporation needs two particles, one with negative energy.
Such negative energy particle cannot exist in our universe [Ref.6].
The creation of such a particle cannot occur in the outside of the black hole because it would be in our universe.
It could only occur on the horizon and as time is stopped there, it could not occur.

4. Entropy problem :

Evaporation theory is based on the fact that entropy of a black hole could be equivalent to it's surface.
In the beginning of his study Hawking himself and all the black hole experts where admitting the idea that thermodynamic principle could not be applied to black holes [Ref.18 page 454].
If we have reference to a theory like the *emergence theory*, defended by the Nobel price Robert Laughlin [Ref.41], we can notice that it is normal to find the same kind of equations at different level of reality and this does not mean that these levels are similar.
In 1974 Hawking having been questioned by the similarity of equations affirms that the black holes laws are thermodynamic laws in disguise.
We can read Kip's Thorne who has been working with Hawking [Ref.18 page 472, 473] :
"And so in 1974 Hawking will affirm without a real proof that the similitude between thermodynamic laws and black holes mechanic were more than coincidence".
Even if equations seems similar , we must notice, as an example, that entropy is measured in Joule/Kelvin and this is different from surface measure which is m^2 .
Hawking could be wrong. If entropy is different of black hole surface, then there will be no evaporation !

5. No experiment has ever measure scattering of particles issued from the vacuum fluctuations.

Calculus with Heisenberg equations gives time of recombination of particles issued from the vacuum fluctuations, but no "experiment" has measured it and no scattering of particles has been observed.

If the recombination was quickest than evaluated, we will not have scattering of particles due to the tide effect and this would be contradictory with evaporation.
In his third conclusion Hawking [Ref.17] admits that "*no particle scattering situation as predicted has been observed for the moment* "(even if he supposes they will be).
We can also remark that, even if particles (for an example electrons and positrons) created from vacuum fluctuations are separated by tide effect, gravitational forces near horizon are strong enough to make these particles fall one after the other toward the black hole. Such an enormous energy would be necessary to escape, that it could barely been provided by the vacuum fluctuations.

6. Unruh radiation would indicate that entropy and temperature are relative notions :

Unruh radiation is the equivalent of Hawking radiation but seen by a watcher in a constant acceleration. This radiation has also never be observed because of its very tiny effect.
This radiation would mean that a non moving thermometer will not indicate the same temperature as a thermometer moving with constant acceleration. This could mean that temperature and entropy are not absolute notions, but are relative notions depending of the watcher and of it's acceleration [Ref.31]. Such a concept that could change physic proves that temperature and entropy are not enough secure notions to comfort black holes evaporation.
Djordje Minic from Virginia Tech [Ref.31] indicates that "*the interpretation of entropy in a quantum gravity context is already very complex but the Unruh radiation in the context of an accelerated watcher is less clear*".

We would like to have a little more "clearness", before testing the evaporation on our beautiful planet.

7. Also about negative energy problem :

Hawking evaporation process needs negative energy [Ref.6].
Such energy which is a theoretical prediction has been experimented with Casimir effect [Ref.23]. It is also in relation with anti-gravitation. Such notions are not enough experimented to assure Hawking evaporation reality!

8. Hawking evaporation is based on uncertain values of vacuum energy:

The value of vacuum energy is something uncertain. As an example : vacuum energy is evaluated as 10^{-29} g /cm^3 by the cosmologists and as 10^{91} g / cm^3 by the physicists in particles theory [Ref.34]. In such a context, how can we be sure of Hawking calculus ?

II*** No conclusions of safety from the cosmic rays.

We all have believed that cosmic rays with high energies level, greatest than any accelerator energies, prove that accelerators are safe.
We will point out the differences between MBH produced by cosmic rays and MBH produced in LHC.

Cosmic rays in interaction with the matter of a planet (or a star):

With cosmic rays (mainly protons in cosmic rays) creating a collision with a planet or with a star, restricted relativity indicates that we need a speed of 299.999,9 km/sec to create a micro black hole of "1 TeV" (energy of LHC could be of 1 TeV) and after the interaction the "MBH who is in the centre of mass" will have a speed of 299.970 km/sec.

With such a *quick move* (if we refer to a planet or a star), we can notice that if the MBH are not very reactive they will "always" cross planets or stars and loose in space.
If a cosmic ray has not a sufficient energy it will not produce MBH.
If a cosmic ray has sufficient energy to produce MBH, "the MBH will have enough speed to cross the Earth and loose in space".

Note: Calculus of Micro Black hole speed after of cosmic rays collisions ?

With ΔE variation of energy we have: $\Delta E = [m_0c^2 / (1-v^2/c^2)^{1/2}] - m_0c^2$.
If we need 1 TeV for MBH production, as for proton $m_0c^2 \approx 1$ GeV , we can calculate speed for MBH production with cosmic rays :
$\Delta E = 1$ TeV $= 10^3$ GeV $= [1 \text{ GeV} / (1-v^2/c^2)^{1/2}] - 1$ GeV and *v = 0,999999501 c.*
If we needed 2 TeV for MBH production we would have:
$\Delta E = 2$ TeV $= 2.10^3$ GeV $= [1 \text{ GeV} / (1-v^2/c^2)^{1/2}] - 1$ GeV and *v = 0,9999998751 c.*
In case of quarks interactions producing a MBH, if we refer to the mass centre we observe, from this position, the two quarks coming with the same speed but from opposite sides. After the interaction the black hole has a speed zero in this referencial. With reference of the planet, with Lorentz equation of speed $u' = (u - v) / (1 - v/c^2)$ u we have for the centre of mass of interaction an important remaining speed. For an example a cosmic ray with speed of « 0.9999995 c » will left after the interaction a black hole with a speed of « 0.999 c ».

Rapidity distribution in case of cosmic rays :

In case of cosmic rays or accelerators shooting *on a not moving target* the rapidity distribution of the particles created could approximately be described as a Gauss curb located in the high speed region:

0_______________________________________******_______c   Speed

Note: If N is the number of MBH, v speed, V speed of centre of mass, a, b' parameters we have with Cosmic rays (or Accelerator shooting on a zero speed target) rapidity distribution centred on high speed.
Rapidity distribution is given with Gauss curb dispersion : $N = a \cdot e \wedge (- b' (v - V)^2)$.

Case of LHC with opposite speed collisions :

In this case the rapidity distribution is represented with a Gauss curb centred on the speed value zero and this is very different. *Slow speed* particles could be created.

0***____ c   Speed

Note: With N number of MBH, v speed, V speed of centre of mass, a, b parameters we have:
Rapidity distribution is given with Gauss curb dispersion : $N = a \cdot e \wedge (- b v^2)$.

Conclusion : ***Cosmic rays are not a good model for LHC experiments with opposite speeds!***

Calculus to test persistence of stars with black holes created by cosmic rays

If speed is important we can use cross-section accretion with Schwarzschild radius and such a MBH crossing Earth will only accrete 200 nucleons.
As minimal mass of MBH is of 2000 nucleons we see that speed and mass of MBH will not change much and these suits with hypothesis that Cosmic rays MBH could not destroy a planet like Earth and will loose in space.
Calculus can be extended to stars and neutrons stars !
Crossing the sun it would catch 5600 nucleons and crossing a neutron star it would catch 11.200 nucleons. With relativistic speed it will cross and loose in space.

Remark: If cosmic rays were producing natural black holes when then collide with Earth matter, why haven't we observe these black holes ?
Maybe three reasons :
1/ We have not prepared experiences to find them.
2/ They are perhaps quickly decreasing with Hawking evaporation
3/ They are not much reactive and they cross Earth and escape in space.

We propose to *"built a detector of black holes produced by cosmic ray"* so we can study them without any danger. Such an experiment is to do, before any use of LHC with opposite speeds collisions.

Calculus of atoms swept by a MBH created by cosmic rays crossing Earth and stars :

Earth density is 5,52 g/cm^3 and Earth diameter is 12756 km.
Earth diameter is of $1{,}2.10^{7}$ m $(\pi/4)$ $/.10^{-10}$ m $\approx 10^{17}$ atoms.
As speed is important *we can use cross-section accretion with Schwarzschild radius.*
With radius of $1{,}7.\ 10^{-19}$ m (proposed by CERN physicists [Ref.3]) accretion will be of :
10^{17} atoms x 3 x 56 x $\pi(1{,}7.\ 10^{-19}\ m)^2 / \pi(0{,}5\ .\ 10^{-10}\ m)^2$ = ***200 nucleons***

Sun density is 1,4 g/cm^3 and Sun diameter is $14\ .\ 10^{5}$ km.
If MBH crossing Earth catches $2.\ 10^{2}$ nucleons, the MBH crossing Sun will catch :
$2.\ 10^{2}$ x 1,4 g/cm^3 x $14\ .\ 10^{5}$ km / (5,52 g/cm^3 x 12756 km) ≈ ***5600 nucleons***.

Neutron stars [Ref.18 page 213,214] have a mass between 0,1 to 2 solar mass.
In a neutron star of 2 solar mass the MBH will catch :
$5{,}6\ .\ 10^{3}$ x 2 ≈ ***11.200 nucleons***.
So the increase of mass will be of : 11.200 / 2000 = ~ 5,6 times.
A cosmic ray with relativistic speed gives a MBH located at the centre of mass of the interaction who keeps a relativistic speed [See Calculus of MBH speed after collisions].
If MBH mass increases of 5,6 times in crossing a neutron star, it will have enough speed left to escape from the gravitational capture.

III ** MBH produced with LHC could be captured by Earth

In case of opposite speed collisions in LHC, rapidity distribution is centred on speed zero and this could mean that some low speed MBH could be captured by terrestrial gravity.
I quote in March 2003 [Ref.3], CERN Physicists in the hypothesis of Hawking evaporation failing:
*"Perhaps you missed the fact that black hole at the LHC is never produced at 0 velocity. It typically moves with the velocity of 0.1c or so. The reason is that the black holes are produced not in the interaction of protons, but in the interaction of quarks! Each quark carries a random (and small) fraction of proton energy, so the sum of the two momenta is always large. One can easily calculate what's the probability of producing a black hole with the velocity less than escape velocity, i.e. with beta < $2x10^{-5}$ or gamma = 1.0000000002. That implies that the momentum of the black hole after collision is < $2x10^{-5}$*M ~ 100 MeV, which happens with **<** 10^{-5} probability".*

Using the fact that one black hole could be produced every second and using this calculations [Ref.3] of probability of producing black hole with velocity less than escape velocity from Earth, we find *one MBH could be captured by Earth every 10^{5} sec* .
Using LHC during ten years we could have ***3160 Micro Black Holes captured by Earth.***

IV ***Accretion processes in case of low speed

1…Black holes: Radius to use for capture of matter.

Classical calculus in CERN study [Ref.1 & Ref 2] use cross section accretion:
Cross-section accretion is made by calculation of the volume of the cylinder swept in one second by the moving black hole.

CERN 2003-001 [Ref.1 & Ref 2] using this "Schwarzschild radius " had also supposed that the MBH had the greatest speed possible (speed of light c = 300.000 km/sec).

With speed v into the Earth matter with density ρ and with Rs the radius of the black hole ("Schwarzschild radius"), the accretion rate is given by $\Gamma_A \approx \pi . Rs^2 \rho \; v$. With speed of light c = 1 we have in Eq.12 [Ref.1] $\Gamma_A \approx \pi . Rs^2 \rho$.

MBH Cross section in LHC depends of MBH mass and could vary from a fraction of 10^{-37} m^2 to 10^{-43} m^2. Using cross section of MBH of 10^{-37} m^2 instead of cross-section of 10^{-38} m^2 used in [Ref.3] we notice that *this could mean an* ***increase of cross section with factor 10 .***

If a low MBH is just touching a quark "on it's edge", the quark could have a probability to be caught. We must enlarge the radius used for cross-section, adding the radius of the quark and this means an ***increase of cross section of factor 15.***

With [Ref.29] a quark radius of 5. 10^{-19} m we will have an interaction radius of :1,7. 10^{-19} m + 5. 10^{-19} m = *6,7. 10^{-19} meter, so the volume swept for interaction is to multiply with a factor* **15**.

If MBH *speed is low*, we will see that we have to take also in account others different parameters. If MBH has very slow speed, *"we must no more use Schwarzschild radius for calculus of accretion."*
As an example, if MBH speed was zero and had get charges, the electrostatic forces could mean accretion at a distance greatest than the Schwarzschild radius.
We must find a new definition of the MBH radius for accretion that depends of the speed, the charge, etc.. We could use the term of *"capture radius*".

Note: Calculus of capture radius of a electrically charged MBH:
If the MBH get charges, "capture radius" could be important.
Particle will be caught if we have:
centrifuge acceleration in trajectory < acceleration due to electrostatic forces.
Using Coulomb law we will have:
$F = K q_1 q_2 / r^2 = m a = m v2 / r$ → the *capture radius will be* ***of*** $r < K q_1 q_2 / m v^2$.
Note : the gravitational capture radius is far smaller (gravitational forces are small in comparison).
With G Newton constant we have $r < G m / v^2$ *[Eq. GCR]*

2…Exponential accretion process.

In case of evaporation failure and capture of the MBH by Earth, calculus indicates that accretion of matter will be exponential.

Calculus in [Ref.1] and [Ref.3] using cross section accretion consider that accretion increase is linear and proportional to time.
When the MBH capture Earth material, it's radius and it's mass are increasing. If we compare the increase of the cross section surface and the increase of mass of the MBH, even if we count that MBH speed will decrease after capture of matter, we notice that the accretion increase is *exponential* and not linear!

With mass of just created MBH in LHC of 2000 nucleons, accretion of 2,4 protons /sec and using relation between radius and mass of MBH as [Eq.8] in [Ref.1] R =2GM we have:
Accretion rate will be of $\Gamma_A = 2{,}4 \, . \, 3^{t/830}$ and with k = constant we have :
Accretion rate will be exponential as $\Gamma_A \approx k \, . \, 3^t$.
An exponential process could begin only with cross-section accretion!

3…Accretion of Nucleons in case of low speeds:

If a MBH accretes a *quark* it will then probably accrete a proton. *When a quark is caught, the whole nucleon can be expected to be caught* because otherwise the black hole would have acquired a charge which is not complete (example charges of quarks of 1/3 or 2/3). In a nucleon a fractional charge is unstable and is not allowed. This strongly suggests that the MBH will be required to accrete other divided charges to reach a completed integer number of charges. So if one quark caught, means 3 quarks caught, this gives ***an increase of accretion with factor 3*** *in comparison with the classical calculus with cross section.*

Note: As MBH is in the atom nucleus it could perhaps with gravitational effects, gauge forces and electric forces catch quickly the others neutrons and protons and finally all the nucleus.

If a MBH accretes an *electron*, it will acquire a negative charge, then will go toward the nearest positive charges and accrete a proton.
As iron has 26 electrons, with [Ref.3] calculation of "*3 hours to gobble a single atom*" this means that MBH will catch ~9 electrons every hour.

In case of low speed MBH, we have also to take in account the quick speed of electrons turning around the nucleus and this will increase the probability of interaction (this argument is also proposed by Blodgett in [Ref.13]). We suppose here that when an electron is caught the MBH will quickly caught a proton. Only with such process, evaluation of accretion could reach ***20 protons/sec*** *(or as much as 20 atoms/sec if accreting a proton the MBH could accrete the all nucleus).*

4…If we add these different factors:

We will use the classical evaluation of [Ref.3] "*3 hours to catch the equivalent of weight of only one atom"*. In CERN calculations [Ref.1] the classical atom caught is iron atom.
With iron mass of 56 nucleons we see that in 3 hours, 56 nucleons will be caught.
If we add factor "3" (on quark caught means all the nucleon caught), factor "10" (the largest cross-section radius) and factor "15" (cross-section radius has to be enlarge adding the radius of a quark) *we have a possible increasing factor for accretion of 3 x 10 x 15 =* 450 .
This would mean that *the MBH will catch* **150** ***atoms every hour***.
(This is equivalent to ***2 nucleons / sec****) !*

With the other process of capture (one electron caught, means on proton caught)we see that accretion is acting in a strongest manner. ***Such a process could mean capture of 20 protons/sec (1500 atoms every hour) !***

5…Falling in terrestrial gravitational field : (butterfly process).

If the speed is low and the capture radius in the range of 10^{-10} *meters (which is the distance between atoms) we could have a dangerous process that could be called "butterfly process, the MBH going from an atom to the other, with at each time complete accretion.*

If a nucleus of an atom was not bind, *it would fall in the black hole vortex if its speed was smaller than the escape velocity* (gravitational or electrical).
If a nucleus is bind by electric forces to others atoms and could not move, that means, by reciprocity that it is the black hole that could fall on the bind nucleus.

As atoms are bind the black hole could go from a bind atom to the other, *like a butterfly goes from one flower to the other,* loosing it's speed after each interaction (that mean a new increase of capture accretion radius) and so the process could repeat. the MBH loosing it's speed will be slowly falling in terrestrial gravitational field .

6…About Gauges forces

In case of *very short distances* super symmetrical theory indicates that strong gauge forces could occur and increase accretion.

When a black hole appears in the crushing of a star, that means that the strong force which is repulsive in very short distances as been broken by gravitational force. In this case nothing can prevent the star from crushing into a black hole. For MBH also, we can suppose that approaching of the horizon, gravitational force becomes at a moment as strong as "strong force"!

About reality of gauge forces in short distances, I had send to CERN references of an article from French literature [Ref.25] :
"It is possible that at very small scales of distance as Planck scale, gravity could get values as electric force. That will give a value 10 ^{43} times bigger".

The answer of CERN was :
" L.. quotes an article which refers to hypothetical theories in which gravity can be as strong as gauge forces at LHC energies. I do not know if these theories are believable, but they do not provide a loophole to the argument, since the analysis in CERN 2003-001 has also considered this case. L.. is worried that effects of quantum gravity may lead to lethal phenomena. Even assuming the very speculative case of a low quantum gravity scale, black hole formation is dominated by the classical effects. The process actually screens the short-distance part of the theory, making quantum gravity phenomena (which are not lethal!) unobservable".

Comment : CERN 2003-001 has considered this case, but with active Hawking evaporation and high speed MBH (accretion with Schwarzschild radius at speed c). We will see that gauge force will help accretion in the final phase of electrical or gravitational accretion.

I now cite another article [ref.24]:
"In a 6, 10 or 11 dimensions space-time :
The gravitational interactions are growing with energy et quantum effects produced by gravitation are more important close to Planck energy.
In this energy gravitation becomes equal to others forces".

Also from CERN physicist [Ref.30 page 4] we can read :
"In the models with large extra special dimensions (ADD), gravity is ~10^{38} times stronger than conventionally thought, and will exhibit its full strength at the distance less than the size of extra dimensions (~1nm, n =3 to ~ 1fm, n =7)"

We must also notice: Gauge forces are not the only reason of increase of accretion forces.
General relativity indicate :
"If we refer to a non moving (with reference to the horizon) person on the horizon the gravitation force becomes infinite".
In case of MBH we will be "not moving" (with reference to the MBH horizon), so we must expect strong gravitation forces and probably Gauge forces in case of short distances !

When a MBH is arriving at very short distance of the bind nucleus, using gravitational and electrical forces, gauge forces will at the end oblige the MBH to *go quickly and directly toward the nucleus* and so the MBH will capture it. If the MBH is of a low weight and the atom strongly bind with "metallic connexions forces" an hypothesis could be that, after the capture, the MBH will have it's speed return to zero .

7…Others accretion factors:

We present here plenty of others factors, some are very important, some are less important, but all of them have to be considered in the case of evaporation failing.

The number of black holes is to consider: With calculus from [Ref.3] that indicate 3160 MBH captured by Earth, using LHC during 10 years, we have to multiply the accretion rate by a ***3160*** *factor.*

A greatest number of dimensions means more accretion:
The studies CERN 3849/1 and afterwards CERN 2003-001 consider a 10 dimensions space-time (page 12 [Ref.1]) and that fits with "string theory".
M theory for an example which is as valid as string theory needs 11 dimensions and ***this would mean accretion 36.000 times more important.***
CERN questioned about this problem, answers:
"In contrast to earlier studies, the study in CERN 2003-01 has considered a generic number of dimensions and its conclusions are valid even if this number is sent to infinity".
It is very important to precise that this answer is valid only if Hawking evaporation works. *If Hawking evaporation do not work, or is weaker, a greatest number of dimensions has an influence*: The number of dimensions is directly bind to the easy creation and the stability of MBH.

Increase of dimensions number = increase of MBH production and of MBH stability.

The study CERN 2003-001 [Ref.1] indicates that with 4 dimensions we have no MBH produced and that with 10 dimensions (CERN study was realised with 10 dimensions and with energy of ≈1 TeV) MBH could be produced. This indicates clearly that an increase in the number of dimensions increases the probability of producing MBH.

What would be the consequences if the number of space-time dimensions was greatest than 10, which is the hypothesis in the CERN study? M theory, as an example needs 11 dimensions ?
The answer is that a smallest energy would be needed to create black holes!
This could mean *that black holes could perhaps be created with energy < 1 TeV.* ***This could happen in RHIC or also in the LHC test****. It is not impossible that the RHIC experiments have already created MBH with slow accretion since the year 2000 and that MBH are slowly growing inside the Earth. In RHIC it seems, they have only detected quarks-gluons-plasma for the moment. Let us be optimistic !!!*

Note: Calculus of the increase of accretion due to 11 dimensions instead of 10:
Using CERN 2003-001 [Ref.1] (Eq.17) of Scharzschild radius:
$R_s = (K' / M^*) . (M / M^*)^{1/1+d} \approx TeV^{-1} (M/ M^*)^{1/1+d}$
Calculus gives a comparison between the radius in 10 dimensions R_{S10} [calculated with a number of 6 rolled dimensions d = 6 in the study CERN 2003-001] and the radius in 11 dimensions R_{S11} [d =7].
We find here: $R_{S11} / R_{S10} = 190$ *The black hole radius will be 190 times larger !*
With such a radius, the surface swept by the black hole will be to multiply with a factor of :
$(R_{S11} / R_{S10})^2 = 36.000$.
Accretion of matter with cross-section process will be 36.000 times more important.
A complete study should have to take this in account.

V*** Micro Black Hole Accretion In the centre of Earth:

We have seen that in ten years a certain number of MBH (with the minimal value of 10 to maybe more than 3000) could be captured by Earth.
All these MBH will progressively loose they speed because of numerous interactions.
After numerous interactions all these MBH will go toward "the *precise* gravitational centre" of Earth as proposed by Kip Thorne [Ref.18 pp111] and they will stop there at rest. Then

they will coalesce in only one black hole. We could call it now ***mini black hole*** instead of MBH.

A first idea of calculus could indicate for this unique mini black hole a possible mass of some hundredth of gram *(maybe 0,02 g or more) in the beginning.*

For this evaluation we must suppose that MBH arrives in the centre of Earth with speed zero, crossing only one Earth radius. This would be the case if the MBH crossing one Earth radius had caught all nucleus on his way using butterfly process. We multiply the result by the number of MBH that could be of 3160.
Radius of such Mini BH of 0.02 g would be of $\approx 4 .10^{-17}$ m .

In the centre of Earth new processes could happen:

In centre of Earth a dangerous process due to the high pressure will give an *impressive increase of accretion.*

1. A Dangerous Process of Pressure:

A classical pressure evaluation at the centre of earth is of 4×10^{11} Pa [Ref.28]. This pressure results from the weigh of all the matter in Earth pushing on the electronic cloud of central atoms. The quick move of electrons in the clouds is responsible of a pressure (called degenerate pressure) that counterbalance this important Earth pressure.

Around a black hole there is not an electronic cloud and there is no pressure to counterbalance. Pressure is constant in an homogeneous liquid, but it is not the same case in an heterogeneous medium composed of atoms mixed to a mini black hole.

The surface of the mini black hole is very small in comparison with the surface of the electronic clouds of atoms (which is the surface normally used in calculus).
To calculate the pressure in this heterogeneous medium we must use the equation :
Pressure P = Force F / Surface S .
"F" is the weight of all the matter of Earth and this does not change.
As surface of the mini black hole is very small, *we have to reduce the value of the surface "S" in the equation. In such a case, we are obliged to notice* ***that Pressure "P" will increase in an impressive manner.***

With mini black hole of 0.02 g, *calculus indicates on it's surface,* ***pressure thousand billions times more important that the usual pressure.***
Pressure will be of $\approx 7 \times 10^{23}$ Pascal to compare with usual pressure in the centre of Earth of 4×10^{11} Pascal.
Such a high pressure will push strongly all the matter in direction of the central point where the mini black hole will be.

When a star begins to collapse in a black hole (implosion) [Ref. 18 Page 443], at the beginning the black hole created is only a micro black hole, the same kind of micro black hole that LHC will produce. In the star, the MBH will appear when the strong force is broken by the gravitational force. *In the centre of the crushing star, the MBH will grow only because of the high gravitational pressure that exist in the centre of the star.*

In centre of Earth pressure is normally *far to small for such a process*, **but if we create** *a slow speed MBH that does not evaporate and if this MBH comes at rest in the centre of Earth*, *the pressure in the centre of Earth could be sufficient for the growing of the MBH.*
On the horizon of the MBH the strong force is broken, etc.. and all the processes are the same than in a crushing star, in a slowest mode of course.

*A first approach of calculus indicates that the value for accretion of matter could be, in the beginning, in the range of a few grams/sec (maybe **1 g/sec** to 10 g/sec).*
Even if the accretion was only of a few hundredth of gram or less, we will quickly reach this range of values. Are this result questionable? Probably yes, but ***in any case they mean a possible impressive increase of accretion in the centre of the Earth.***

Conclusion: In the centre of Earth, all these processes could mean an important increase of capture and beginning of an* exponential *dangerous accretion process.

Note: Calculus for pressure in the centre of Earth :
Using the equation Pressure P = Force F / Surface S.
Using in the centre of Earth, pressure is of $4 .10^{11}$ Pascal [Ref.28] ,atom with radius of $0{,}5 . 10^{-10}$ meters.
In case of MBH with radius of $3{,}7 . 10^{-17}$ meters (MBH of 0,02 g), with a simple proportional calculus we find pressure of *$\approx 7.10^{23}$ Pascal*

Calculus of accretion rate due to high pressure in the centre of Earth :
First we calculate the time for accretion due to electrostatic forces of the iron atoms closes to the MBH without counting pressure effects et we calculate the mass accreted.
Accretion rate could be in this case of $\approx 6 . 10^{-9}$ g/ sec.
As a second calculus we evaluate the mass accreted in case of centre of Earth made of uranium.
Accretion rate could be in this case of $\approx 10^{-8}$ g/ sec.
Using a proportional law in case of very high pressure, as seen before, we can then evaluate a possible accretion in this case. Accretion in Earth centre could then be in the range of 10 to 20 grams/sec.
As Eddington limit indicates to reduce this value, we can propose for the evaluation an accretion range in centre of Earth in the range of 1g/sec (to 10 g /sec ?).

Electrostatic forces in the centre of Earth.
We consider here as an hypothesis for calculus that in centre of Earth the mini black hole will be exactly located between the two electric clouds of two atoms of iron.
First the mini black hole could catch quickly one electron from one of these atoms and will get negative charge.
This electron will then move no more because it will be captured by the high inertia mass mini black hole.
The electronic pressure due to others electrons around the nucleus will try to prevent the positively charged nucleus to be captured for a while but the price to pay will be the capture of all the electrons. This capture will be facilitated by *the very high pressure phenomena* we have indicated before).
When all the electrons of the electronic cloud will be captured, nothing could oppose the capture of the entire nucleus.
*First calculus (not including pressure processes) could indicate in this case, and in the beginning, accretion in the range **of** **10^{-6} g/ sec** (more than **10^{15}** atoms/sec).*
This value could be strongly increased by the high pressure in the centre of Earth and could reach several milligrams or grams.

Other accretion factors in the centre of the Earth:
a. High temperature means more accretion:
Theories describing the centre of Earth [Ref.28] indicate a possible presence in the heart of our planet of energetic radioactive atoms like uranium 235, uranium 238 and potassium 40 and this means high temperatures (> 6.000 degrees ? [Ref.28]).
High temperatures could reduce a little the high pressure but high temperatures also means an increasing of weakness of the atoms connexion binding forces. The high level of atoms vibrations because of temperature also increases probability of accretion [Ref.13].
The eventual presence of heavy atoms like uranium nucleus, instead of iron atoms, in the centre of Earth could also increase mass accreted.
b. The smallest, the black hole is the biggest the tide forces will be [Ref.18 page31,32] .
This means that in short distances the tide forces could disorganise the particles waves and could facilitate accretion.

2…Final and exponential process : Breaking atoms connections forces :

Note: calculus is not included in this study.

When mass is growing will notice that *there is a moment where gravitational forces becomes greatest than atoms connexion forces and* **this will strongly increase the exponential process.**

3…Black holes: Conclusion about matter accretion rate :

CERN studies of danger do not include the case of non-evaporation of black holes.
Calculus seems to indicate that in case of non-evaporation, the micro black holes created in LHC and captured by Earth could present an *absorption of matter more important than what was predicted* in studies using the only cross-section accretion.
Such more important accretion could mean a slowing speed for these MBH.
At the end all the MBH could then coalesce in only one mini black hole in the centre of Earth.
Others calculus indicate in the centre of Earth *a possible increasing and* ***exponential*** *capture of matter.*

We must be conscious that such a process could have result ***in*** **complete destruction** ***of the planet*** **!**

To conclude, accretion rate needs a more precise evaluation before any LHC test *and also before increasing luminosity in RHIC.*

VI ** Danger with the Slow speed Quarks strange:

LHC will produce quarks strange.
In case of very low speeds, this kind of quarks could present a main danger for the planet itself, changing all the ordinary matter in strange matter, with liberation of an important quantity of energy.
It is important to understand that ***even « one » dangerous quark strange with very low speed could destroy the planet with a supernova-like effect***.

Some authors, DDH cited in [Ref.14 page 21] studying RHIC accelerator affirms *that, in case of production of quarks strange confined to central rapidity (with very low speed) and a production during a long time in RHIC, "****one dangerous strange quark****» could be produced!*
Note: DDH indicates in this case a use of RHIC during 6 mouth a year during 10 years with opposite collisions of gold atoms.

RHIC [Ref.14] and CERN studies [Ref.1 and Ref.2] estimate that a quarks strange production "*confined to central rapidity*" was "*hard to justify on any theoretical ground*»! (I quote the terms used in [Ref.14 p20]).
Even if the conclusions of this study are reassuring, it is good to be critical and examine arguments.
We must notice first that all the authors agree on the fact that the existence of high energy cosmic rays for billiards of years are is not a sufficient safety argument for RHIC [Ref 14. page 23] and LHC [Ref.1 page 5].
The strange quarks could only be dangerous in case of very low speed.
In the case of cosmic rays, the centre of mass keeps after the interaction a high speed and this is different from the accelerators experiments with "opposite speed collisions", in which the centre of mass speed is low with reference to the matter of Earth.

Strange quarks with slow speeds ?

We present arguments that could indicate that such a production at central rapidity is not impossible:

1…Speed between 0 m/sec and 4 m/sec :

We had made calculus for micro black holes and prove that we could have statistically probability of speeds less than 4 m/sec.
If this could be applied to strange quarks, we could find strange quarks with very low speeds, less than a few meters/sec and this could mean possibility of danger.

I quote [Ref.3] : *"The BH at LHC would typically moves with the velocity of 0.1c".*
That means that average speed of MBH will be of 0,1c.
As we see before, Gauss curb of speed distribution, in case of particles coming from opposite side, is described with N = a . e ^(– b v ^{2}).
An average speed of 0.1c indicates a Gauss curb with wide parameter "b".
That means that MBH with velocity < "Earth escape velocity" (speed < 0.00004c) are located in the middle of Gauss curb.

c______________________**0.1c***0***0,1c**______________________c   Speed

In the region surrounding the speed zero, the top of distribution curb is flat and we can approximate that probability of number of MBH with a specific range of speed is proportional to the speed interval.
If we have 3160 MBH located between 0 and 0.00004c (≈ 11.000 m/sec that is speed needed to escape from Earth gravity), calculus gives the scale of the probability range: 11.000 / 3160 ≈ 4 m/sec.
In this central region of the Gauss curb, we would have statistically one MBH at every range of 4 m/sec.
As an example, we will have probability of one MBH with speed between 4 m/sec and 8 m/sec and probability to have one MBH with speed very low between ***0 m/sec and 4 m /sec***.

2…Speed reduced by plasma

Recently, in United States, the particle accelerator RHIC had success in producing a quarks-gluons plasma [Ref.12, Ref.33] with experiments using opposite collisions of gold atoms.
Note: Such a plasma is the last step before creating black holes with highest energies.

The physicists were *amazed* to see that this plasma was thicker than expected with theory, *acting as a "liquid drop" and not as a "gas" as predicted* [Ref.38].
Note: we can notice here how theories are relatives and could then reveal as a danger source.
It has been noticed that the *production of the quarks-gluons plasma reduces the speed and retains the particles created in the collision* [Ref.33]. This phenomena is called "particles beams suppression" . When this plasma is produced « quarks strange » are detected.

One can easily imagine that quarks strange produced in a liquid medium could be more retained by the plasma than if the medium had the comportment of a gas.
This argument indicates that quarks strange could loose more speed than predicted and that a production of dangerous quarks *(confined at central rapidity)* ***could be statistically possible in case of using RHIC accelerator during a long time.***
This argument could also be valid for LHC. More studies are needed!

3…Discussion about quarks strange:

DDH (Dar, de Rujula and Heinz) has supposed that strangelets could have rapidity dispersion as equation [Ref.19]. This equation $d\Pi / dy = p\delta(y - Y/2)$ [Ref.14 page 20] and [Ref.2] indicates a strangelet production completely confined to central rapidity.

F. Calogero (Dipartimento di Fisica, Università di Roma "La Sapienza" Istituto Nazionale di Fisica Nucleare, Sezione di Roma) [Ref.4] in year 2000 who refers to DDH thinks there is a possible danger.
With such a rapidity distribution, the argument of persistence of the moon (cosmic rays have collision with the moon since millions of years and the moon is still here) is not appropriate.
We can read in his study (*"Might a laboratory experiment destroy planet Earth ?")*
" .... to take due account of an important difference among the impact of cosmic rays on the nuclei in the lunar soil, and the collisions of heavy ions in the planned experiments…
… have shown that the safety margin provided by the persistence of the Moon essentially evaporates".

We can read in [Ref.14 page 21] :
"If strangelets were produced only at zero rapidity in the centre of mass then strangelets produced on the Moon would not survive the stopping process".
I also remark study for LHC CERN 2003-001 [Ref.1 page 5], indicates that *"no safety conclusion can come from cosmic rays"*.
If a cosmic ray has not a sufficient energy it will not produce strangelets.
If a cosmic ray has sufficient energy to produce strangelets, "these will have enough speed (at the difference of strangelets in LHC or RHIC shooting with opposite speed particles) and they will present no danger".

The argument proposed in [Ref.14 page 22 to 24] is to reduce this "risk probability" in using data coming from evaluation of the number of supernovae in Astronomy. With these data [Ref 14. page 24] the risk probability is reduced with a 10^8 factor below the security value needed by RHIC.
Such value can be discussed because the explosive effect due to strange quarks could happen in a way different of a supernovae effect. As an example it could happen with explosives jolt.
As a second argument (from the authors of the risk study for RHIC), they indicate to reduce some more the probability of risk, in arguing that iron could be used instead of gold for the calculus. This argument could also be discussed because in RHIC experiment, it is with gold (more heavy) and not iron that we have obtained the strange quarks.
If the two latest arguments were wrong, then there could be risk for the security of Earth.
We must add that such a low probability could be under-estimated (we must remember the "challenger effect" when the NASA had predicted risk for a crash of 1/100.000).

CERN [Ref.1] study indicates that no star composed of strange quarks has been detected.
I give here a reference that seems to go against this opinion in [Ref.21] we can read :
"Chandra telescope looking at X rays has observed 3C58 and another star which could be composed with quarks up down and strange (their temperature is different from classical neutron star)."

4… Risk evaluation for Strangelets :

Cosmic rays are not good reference for LHC experiment or RHIC shooting with opposite speed particles. *Low speed dangerous strangelets could be produced*.
We remark in LHC study CERN 2003-001 [Ref.1 page 6] for strangelets, the use of terms like "*extrapolations*" and *possibility of "doubt*" and this is not so reassuring, but reveal the incertitude context that surround all these experiments.

It seems reasonable to consider a minimal value of 1% or 2% for strange quarks risk.

Conclusion: Strangelets could be a real potential danger

Important Note: LHC could perhaps be dangerous ***but also mainly RHIC experiments with opposite collisions during many years*** *[Ref.12].*

V ** Conclusion about LHC Risks:

Cosmic rays are not good reference for accelerators experiments if these accelerators are using opposite speeds particles collisions with a very high level of energy (RHIC, LHC).
If these techniques are used, cosmic rays do not bring insurance of accelerators safety.
LHC accelerator could produce potentially dangerous particles as *black holes, quarks strange, monopoles.*

For black holes CERN 2003-001 study of danger do not include the case of evaporation failing that could be extremely dangerous.

We have also seen that the extreme danger of very low speeds strangelet could have been under-estimated by CERN studies.
Danger of monopoles in case of very low speeds seems also questionable.

We have not a final theory in physic and this means that LHC could also create unexpected particles or unexpected phenomena with ***consequences we cannot evaluate***.

Using opposite speed collisions means that ***all the heavy particles*** *created could be* ***captured by Earth in a non natural manner***.
This could also particularly *be applied to unexpected particles* that could be created.

In case of use of opposite speeds collision technique, LHC accelerator could present a risk of **complete destruction of Earth !**

It would be wise to consider that, using this "***non-natural technique***", ***the more powerful the accelerator will be, the more unpredicted and dangerous events may occur***.

For Black Holes a risk of **more than 2 %**
For Strangelets, others particles and science incertitude, risk of **more than 2 %**

In the times when is proposed lasting development for the planet, the precaution principle indicates strongly not to experiment, with opposites speed particles collisions.

To finish, it is good to remind that at this very moment particles potentially dangerous as strange quarks are produced with opposite speed particles in the accelerator RHIC in United-States. If this production of strange quarks has not still given a catastrophic event, what will happen if this production continues during mouths and years ?

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