MICRO BLACK HOLES

DISCUSSIONS ON THE HYPOTHESIS THAT COSMIC RAY EXPOSURE ON SIRIUS B NEGATES TERRESTRIAL MBH CONCERNS FROM COLLIDERS

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Abstract

This paper serves to document discussions held in public forum [1] with Prof. Otto E Rössler, chaos theory expert and outsider academic on Large Hadron Collider (LHC) safety procurement. Whereas a recent paper [2] written by Prof. Otto E. Rössler on further implications to Einstein's equivalence principle suggest that if MBH were created on Earth due to LHC experiments, a topic explored in the earlier work of Giddings & Mangano [3], that these would pose an existential risk to planet Earth though an exponential accretion processes, these discussions serve to countering such claims through hypotheses on stable TeV-scale MBH in such conditions.

Whereas G&M have already explored the existence of neutron stars and white dwarfs in their safety assurances on LHC experiments [3], these discussions focused on Sirius B as a simple case study - the white dwarf companion of our closely-proximate Sirius pair – and nearest white dwarf to Earth - with a casual overview on the rate of CR flux on the Sirius pair –and gravitational capture of the products of CR exposure on Sirius B.

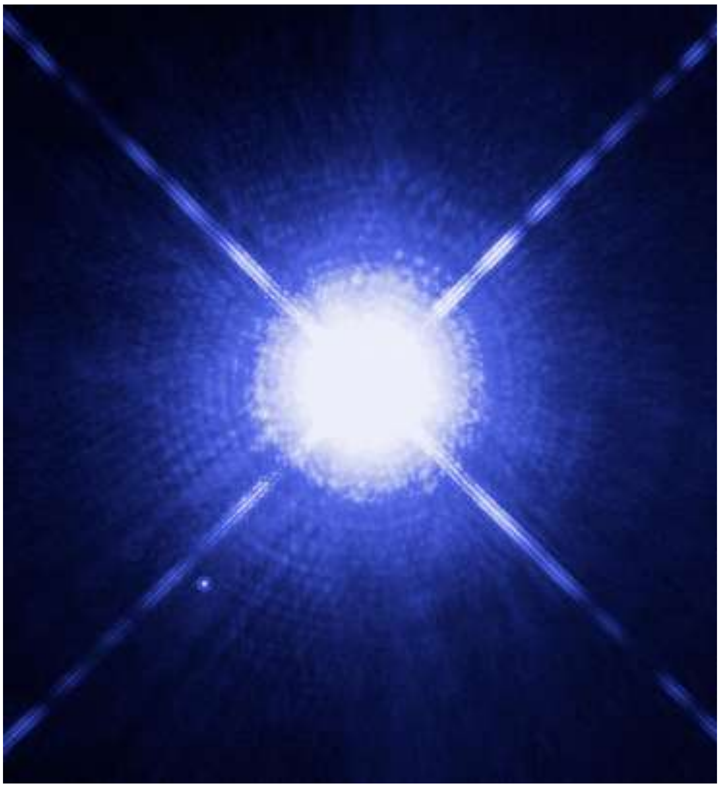
1. Introduction

Although p-p collisions at the LHC are often compared with CR exposure on Earth, where such CR exposure includes collisions of similar centre-of-mass energies [3] it has been derived that the relative flux of hypothetical stable MBH as products of such would be far greater in the LHC than that which occurs naturally on Earth [4]. For equivalence one needs to consider astrophysical phenomena such as white dwarfs and neutron stars, where a gravity capture of such CR products would be expected, as previously derived by G&M [3], elevating the flux.

A detailed analysis of CR exposure on white dwarfs and neutron stars has already been conducted [3] and here the focus is on a case study of Sirius B, which although newer than those considered by G&M, was theorised to also have secondary exposure due to the proximity of Sirius A to warrant it a suitable case study for discussion.

2. Quantification of the CR Exposure on Sirius B

The white dwarf Sirius B provides a unique case study for safety procurement discussions which concern an analysis of white dwarfs or neutron stars – in that it is proximate to our local surrounding in space - just a few light years away. The following image of Sirius B with its parent star Sirius A herein as captured via Hubble:



This image of Sirius A and Sirius B was taken Oct. 15, 2003, with Hubble's Wide Field Planetary Camera 2. WFPC2 NASA.

It is for this reason Sirius B was chosen as a case study – as provides a more understood object than alternatives.

One can reason that Sirius B, just a few light years from Earth, is subjected to similar levels of background CR, and so one can approximate the total exposure through a simple age ratio of the two bodies, giving in the region of 8.82×10^(20) CR at LHC correlated energies over its lifetime - an estimate based on 3×10^(22) on Earth.

1. 3×10^(22) CR of similar centre-of-mass energy or more have struck he Earth since formation. [3]
2. The estimated age of the Earth: 4.54 +/- 0.05 billion years (4.54 x 10^9 years +/- 1%). [11]
3. The estimated age of Sirius B: 1.6 x 10^8 years. [7]
4. The radius of Sirius B: R= 0.0084 +/- 0.00025 solar radius = 5,842 km. [7]
5. The mean radius of Earth: 6,371 km. [8]
6. Magnetic Field of Sirius B: Estimated at 200,000 to 400,000 Tesla. [10]
7. Magnetic Field of Earth: Range between 25,000 and 65,000 nano-Tesla (0.25 – 0.65 G). [9]

⇨ Relative age of Sirius B to Earth (approximate): (1.6 x 10^8) / (4.54 x 10^9) = 3.5 x 10^(-2).

⇨ Relative size of Sirius B disc to Earth's disc (approximate): 5,842km ^2 / 6,371km ^2 = 8.4 x 10^(-1).

⇨ Sum of collisions: φ(3×10^(22) x 3.5 x 10^(-2) x 8.4 x 10^(-1)) = φ(8.82 x 10^20).

Therefore the number of similar centre-of-mass energy CR collisions on Sirius B over its lifetime can be defined as φ(8.82 x 10^20) where φ(M) is the reduction factor due to screening from a 400,000 Tesla magnetic field.

In the detailed analysis of black hole production on white dwarfs in G&M's 2008 paper [3], it is suggested that to avoid significant magnetic screening we must consider white dwarfs with magnetic fields Bp <= N x 10^5 G.

In the G&M derivation for an effective maximum energy for CR that penetrates to the surface of such a star, for protons, normalising to white dwarf parameters similar to Sirius B (i.e. radius circa 5,000km):

$$E_{max}(\theta = \pi/2) = 3.6 \times 10^{18}\mathrm{eV}\frac{5000\mathrm{km}}{R_0}\left(\frac{10^6 G}{B_p}\right)^2 .$$

This equates to a requirement for a field far weaker than that of Sirius B, by perhaps a factor of 10,000:1 for an assurance that CR exposure is not significantly deflected. In this context, one could postulate that magnetic field effects on Sirius B ensure that no such CR collisions occur despite an estimated 8.82 x 10^20 CR exposure.

This sets a dilemma in such LHC safety assurances [12], as the most well understood of white dwarfs, Sirius B, therefore has characteristics which run against safety arguments presented in the G&M 2008 paper [3], where examples of more distant white dwarf stars were chosen - for which magnetic field estimates can be less certain.

If one considers exposure on Sirius A, which has a relatively weak magnetic field of no greater than 2 G [17], a small portion of MBH produced on Sirius A could subsequently become captured in Sirius B, although at an average distance of 19.8 AUs of an orbital semi-major axis [6], that portion is quite low. The ratio of MBH produced on Sirius A to those which can be expected to reach Sirius B can be approximated based on the size of the disc of Sirius B relative to the area of a sphere 19.8 AU from Sirius A:

⇨ (2π × 5,842km) / (4π x (19.8 x 149,597,870km)^2) = 3.33 x 10^(-16).

It is also noted that the production of MBH due to equivalent centre-of-mass CR exposure may be less efficient than in LHC conditions, with CR estimated to include heavy elements at a ratio in the region 1:2 [19].

This does not compare favourably to the expected number of MBH produced on Sirius A over its lifetime, and so consideration of hypothetical production of MBH due to CR exposure on WD shall remain the focus instead.

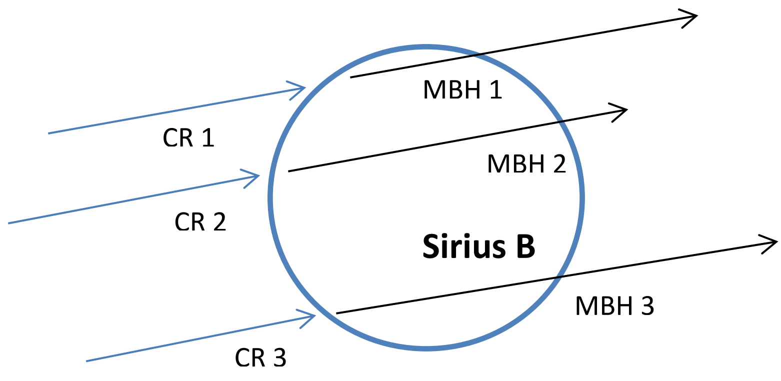
3. The Hypothetical Production of MBH on Sirius B

With an estimated exposure of 8.82 x 10^20 such CR over its lifetime (equating to approx. 10,000 such CR per second), herein the consequence of just one such MBH product per year on Sirius B is considered.

This is considered despite it deemed implausible that CR collisions of equivalent centre-of-mass energy to LHC collisions can occur on Sirius B due to magnetic screening – as discussed in the previous section.

The purpose of this exercise is to explore the durability of the white dwarf safety assurance when applied to the more distant white dwarf discussed in G&M [3] which are believed to have far weaker magnetic fields.

An MBH production on Sirius B would initially travel at near-luminal speed, and follow a near-linear path - so in order to consider such to have a lasting effect on the white dwarf which would be comparable to a production of sub-keplerian MBH in the LHC on Earth, it must be reduced to a sub-keplerian speed on at maximum one full traversal through Sirius B. That is, the near-luminal MBH must reduce to less than 5,200 km/sec, the escape velocity of the white dwarf on at most a full traversal, i.e. at most 11,684 km. As it has been proposed that MBH would be uncharged [2], such an MBH deceleration must to be achievable through gravitational effects alone.



A diagram of CR collision with Sirius B (radius 5,842km) at various approach angles: Regardless of approach angle, an MBH product would typically require to traverse far longer than the calculated stopping distance of 1.5 km.

Taking the hypothetical scenario of one such MBH product per year on Sirius B, this would result in 10 million such MBH traversals in the first 10 million years of Sirius B's existence. These CR collision products would be expected to follow vectors in the approximate direction of the colliding CR due to conservation of momentum.

If one can consider at least one such MBH reducing to such sub-keplerian speed on traversal, then we can reduce our analysis of white dwarf durability to the accretion rate of an MBH in rotation through Sirius B for the past 150 million years, based on the estimate age of Sirius B at approx. 160 million years [7].

One should note in this context, that Sirius B is considered a 'young' white dwarf – in that more distant cousins are estimated to be considerably older – the oldest often cited in the region of 1.27 +/- 0.7 billion years [13].

MBH deceleration due to gravitation effects can be caused by both a Coulomb effect where collisions result in a particle scattering and by accretion slow-down where the MBH absorbs particles [3]. A stopping distance in the region of 1.5 km was derived in G&M 2008 [3] on detailed analysis of such processes. It has been suggested [1] that a smaller initial MBH radius could result in a longer stopping distance in white dwarfs, though to date there has been no credible challenge to the derivation of stopping distances as determined in the G&M 2008 paper, in which is it derived to be inversely proportional, not to the radius, but to the mass density near the capture radius.

It has been determined [3] that as an MBH increases in size such that it is no longer smaller than the particles it accretes, the capture radius becomes more significant to the rates of accretion. Therefore although capture radius is not significant in the initial accretion slowdown phase, it must be considered for subsequent MBH accretion.

One should consider the thermal velocity of an MBH growing at the core of Earth (5700K) relative to an MBH growing in a typical white dwarf core (10 million K) [20] as such has a direct impact on the capture radius ($R_c = R_s/vT$) [3][20]. As such the capture radius of an MBH in a white dwarf core would be significantly smaller to an equivalent mass MBH at the core of Earth, by a factor of sqrt(10 million K) / sqrt(5,700 K) = 41.9. Therefore, consideration of thermal velocity effects on capture radius of MBH in white dwarfs relative to Earth decreases any safety assurance based on the longevity of white dwarfs – where the capture radius is considerably smaller.

Returning to the case study, the accretion rate of an MBH in rotation through Sirius B for the past 150 million years through matter of density of 1×10^9 kg/m^3 [14], compared to Earth's 5,520 kg/m^3 (5.52 g/cm^3), and taking into account that MBH growth is proportional to the square of the capture radius here [3], gives a safety assurance of $150 \times 10^6 \times 10^9 / 5.52 \times 10^3 / 41.9$^2, or 1.5×10^{10} years – a figure comparable to the current estimated age of the Universe at 13.7×10^9 years. Therefore one would be assured that an MBH capture in a white dwarf such as Sirius B for as short a period as 150 million years, provides a reasonable safety assurance on such MBH capture in Earth, without requiring to consider the absolute accretion rates specific to either body.

4. Conclusions

The case study of cosmic ray exposure on Sirius B as a safety assurance on stable MBH products of LHC experiments was found to be non-reliable due to the magnetic screening, and secondary capture from production on Sirius A was also determined to be a non-reliable assurance due to the distances involved between the two bodies. The hypothetical production of MBH on Sirius B was explored despite this in order to demonstrate the effectiveness of MBH capture on similar white dwarf stars with weaker magnetic fields, and in this case it was found that such MBH capture on white dwarf would provide the safety assurance required. It is the recommendation of this paper that the reliability of magnetic field strength estimates of white dwarf stars be assessed, as that of our most understood of such star classification has a field which prohibits such capture.

In order for the white dwarf analysis by G&M [3] to be considered a viable safety assurance to LHC collision experiments, the accuracy of the magnetic field strengths to within the range applied to such stars used for safety assurances in the LSAG 2008 safety report should be within the standard industrial safety tolerances, though the examples sampled [18] conclude a mere 99% confidence - L745-46A (WD0738-172) at 7 kG with 99% confidence interval of ±6 kG, and GD 40 (WD0300-013) with an upper limit of 12 kG with 99% confidence. A return to such spectroscopic and polarimetric surveys should determine confidence to industrial safety standards with an upper limit of 100 kG [3], over which significant magnetic screening occurs, for such safety assurance.

One could consider that such estimates of magnetic field strengths on distant white dwarf stars cannot be validated to within such ranges to an industrial standard – as are based on indirect measurements and theory on the aging process of such bodies, and insufficient as an industrial safety assurance for such experiments.

It has also been acknowledged in scientific research [16] that no white dwarf with a surface magnetic field under 3 MG has been found in a close binary system, wherein it has been suggested that therefore all such highly magnetic white dwarfs have a binary origin. However, one could also be open to the possibility that any such white dwarfs with weaker magnetic fields in binary systems may be prevented from forming due to MBH and a production influence from its companion star. A similar argument could be applied to the absence of sub-millisecond pulsars as discussed in A3, though whether the accretion of such ultra-dense bodies as white dwarfs and neutron stars due to MBH production poses a risk to MBH capture on Earth is not conclusively determined.

APPENDICES:

A1: The Cosmic-Rays-versus-White-Dwarfs Safety Argument – Prof. O. E. Rössler.

The following was posted by Prof Otto E. Rössler on Lifeboat Foundation Forums 30/07/2012 - Reproduced here with kind permission.

Tom Kerwick challenged my warnings by claiming that the observed longevity of white dwarfs, in spite of the constant bombardment by cosmic rays, provides a convincing safety argument regarding the currently running nuclear collisions experiment at CERN. This claim is important but, unfortunately, inconclusive as I shall try to demonstrate. It is true that the collisions performed at CERN are relatively meagre compared to cosmic-ray energies. The current, approximately 10 TeV collisions between equal-momentum particles at CERN correspond to 10.000 TeV cosmic ray protons hitting a stationary proton on earth or a white dwarf. The thousand-fold increase is a consequence of the relativistic energy-momentum law being applicable.

If 10.000 TeV (= 10 to the 16 electron volt) look like much, cosmic ray energies up to 10 to the 22 electron volt (a million times more) have been measured. However, if the latter are translated back into symmetric collisions of the CERN type, they are "only" a thousand times more energetic than CERN's (owing to the square-root rule implicit in the mentioned law). The fact that white dwarfs appear to be resilient to this bombardment is living proof that the cross section of CERN-generated miniature black holes (as well as their up to a thousand times more massive cosmic-ray generated analogs) must be minuscule.

Specifically, their diameter must lie below that of a lepton (electron or quark). While an electron's diameter is often supposed to be zero, neutrino absorption in solid matter yields a finite value (about ten to the negative 24 meter). In addition, the Telemach theorem guarantees a non-zero electron diameter. So far, the cosmic rays cannot be shown not to be generating ultra-fast miniature black holes.

When generated, the latter need to be rare enough not to leave a black hole get stuck inside the white dwarf in question. Otherwise white dwarf stars would no longer exist, as Tom stresses. The difference between earth and a white dwarf lies in the latter's by 5 orders of magnitude higher density. It renders the white dwarf by so many orders of magnitude more vulnerable to ultra-fast natural black holes. Hence we have 3 numbers which jointly limit the lifespan of white dwarfs: The collision rate of CERN-like (or stronger) cosmic rays impinging on their surface; the fraction of these events leading to the formation of a black hole; and the free path length of an ultrafast miniature black hole inside white-dwarf matter.

None of these three parameters is currently known. Nevertheless as long as the black hole is markedly smaller than a lepton, it is the latter's diameter alone that determines the cross section. Therefore, it is possible to draw a conclusion: White-dwarf longevity is limited by cosmic rays if the energy of the latter (CERN size or larger) suffices to generate black holes. In this case, "very old" white dwarfs cannot exist. This is a testable prediction.

The cooling rate of white dwarfs happens to be very low owing to their minuscule surface-to-mass ratio. Our cosmos is currently assumed to be only 14 billion years old (about the age of globular star cluster in our galaxy). Ultra-old white dwarfs should not be observable for that reason alone.

As it happens, the new prediction is theory-independent, however. Ultra-old cold white dwarfs are therefore worth looking for empirically. If they are found, two important implications follow: (i) our universe is older than generally anticipated; (ii) the LHC experiment is safe. If, on the other hand, ultra-old white dwarfs prove empirically absent, this fact confirms the big bang theory at face value.

However, if the recent theory of cryodynamics holds true (which implies a very much larger age of the universe), a measured absence of ultra-old white dwarfs implies that cosmic rays produce white-dwarf eating black holes. In that case, there is a high probability that the LHC is currently producing earth-eating black holes. Therefore an astronomical test of the safety of the LHC experiment, based on white dwarf longevity, exists. The same claim was made by Tom. The difference lies alone in the fact that he assumes that the collision rate of micro black holes with leptons is much higher (due to a higher lepton diameter being apparently assumed). This difference led him to predict a very much shorter lifespan for white dwarfs. Since that prediction is defied by observation, his conclusion was that CERN is safe.

It will be important for everyone to learn if Tom Kerwick (perhaps in conjunction with Giddings and Mangano whom he quotes) can defend his prediction of a much higher collision rate with leptons for ultrafast natural mini-black holes inside white dwarfs. If so, CERN can perhaps be exculpated for its public refusal to update its 4-year-old safety report while continuing at a nonlinearly increased collision rate.

I thank Henry Gebhardt, Boris Hagel and Tobias Muller for discussions. For J.O.R.

A2: A Good Word about CERN's Homegrown Old Safety Report – Prof. O. E. Rössler.

The following was posted by Prof Otto E. Rössler on Lifeboat Foundation Forums 26/03/2012 - Reproduced here with kind permission.

These collapsed old stars in the galaxy have (with a finite fraction of their population at least) proved immune to the onslaught of nature's own ultra-fast analogs to CERN's anticipated artificial ultra-slow mini black holes. This fact imposes constraints on the level of danger imparted by the artificial ones on our earth if successfully produced there. A white dwarf contains about 100.000 times the mass of earth at the latter's volume. The fact that it remains unscathed has consequences for an artificial black hole that is slow enough not to fly away but stay inside earth to circulate there. It must circle 30.000 times at its near-Keplerian speed of 10 km/sec, in order to have equally many passages through nucleons, before it starts to grow. Since one full circling takes about 1 hour, 30.000 circling make up 30.000 hours or about 1.000 days or 3 years. The increased residence time inside the passed-through nucleons (with their inherently ultrafast quark motions) reduces the equivalence time by a factor of perhaps 1.000 to the order of 1 day.

On the other hand, we need safety margins of perhaps 100 in view of the vast number of safe passages of ultrafast mini black holes during the lifetime of a white dwarf. Therefore, the exponential growth phase inside earth (miniminiquasar formation) can only begin after a delay of several months.

It follows that the minimal survival time of earth, in case CERN's cherished dream of black-hole production is vindicated (note that its detectors are blind to this success), is about 5 years. This low number owes its existence to the counterintuitive nature of exponential growth – the fact that it "suddenly" jumps up after a seemingly silent phase. The sad fact that CERN consciously incurs this risk needs to be discussed by an independent panel during the collision-free 10 days that CERN still grants our planet.

The following are extracts of Kerwick-Rössler discussions on Lifeboat Foundation Forums - Reproduced again with kind permission:

Tom Kerwick on March 27, 2012 9:11 am:

Otto — seeing as you mention flux — the topic of that short paper I mashed together the other week, I feel obliged to comment. I calculated equivalence for terrestrial flux every 5,000 years or so. If a white dwarf 100,000 times more massive was subjected to similar levels of CR exposure, the LHC would reach an equivalence at 100,000 x 5,000 = 500,000,000 years. Perhaps, in white dwarfs we trust then? I'd like you to peer review my paper, which references your work… Also — apologies if I missed your point on equivalence — though I noted you did not include number of LHC collisions in your calculation above.

Though if you apply a small percentage to f(M) then of course you pull back in the estimates considerably. If you've done it, please show the math on what rate relativistic products can slow to sub-Keplerian speed on white dwarf traversal… and back to the dashboard argument.

Otto E. Rössler on March 27, 2012 2:27 pm:

Dear Tom: Thank you for the concrete questions. Your analysis is broader. I do not yet see exactly the relationship. Is it tiresome if I ask you to explain your question in different words again (since our independent intuitions need to be juxtaposed in a way everyone can follow easily)? Since your thinking is more complex, I think it is more easy for you to incorporate my (by comparison trivial) musings than vice versa. There is a decisive point in your thinking which I may have missed so far.

Tom Kerwick on March 27, 2012 3:48 pm:

Thanks Otto — I am over in China this week on work so not a lot of free time for lateral thinking, but maybe we can bring you to that happy conclusion next week that White Dwarfs are a reasonable safety argument. I mostly think in terms of flux as relates close to my work area.

Tom Kerwick on March 27, 2012 10:12 pm:

Quick thought — could do with example of a white dwarf with a close companion, i.e. in a tight binary star system — to find example of one with a good high level of CR exposure — Sirius B too young, though surely plenty out there… and as mentioned on another thread re neutron stars might need to consider magnetic field effects such that cosmic rays could be significantly deflected by the Lorentz force — though G&M have looked at that a bit already…

PS: In your calculations above Otto you fail to consider the escape velocity of the White Dwarf is much greater than that of the Earth. Therefore the figures from your musings are way out.

Otto E. Rössler on March 29, 2012 7:13 am:

Misunderstanding, dear Tom: I did not consider white-dwarf-generated mini black holes but surface-generated ones, which all have near-luminal velocities just as on earth. Or did I misunderstand your point?

Tom Kerwick on March 29, 2012 7:39 am:

Hmmm… I think so Otto. You seemed to compare MBH on Earth to that of a White Dwarf by just comparing equivalent number of passages through nucleons, though in the latter case there is a much greater escape velocity to consider as well as the traversal.

I would have considered any White Dwarf will be quite successful at slowing down the initially near-luminal MBH, so you cannot compare a terrestrial sub-keplerian MBH to White Dwarf traversal. I'd consider many White Dwarf to capture if MBH were stable…

Peter Conant on March 30, 2012 2:15 pm:

You would think that a White Dwarf would also slow down one of Telemach's predicted "micro quasars" which would capture a charged particle after it hit the second atom while passing through the White Dwarf…it might stop before the quark or whatever fell into the "charge neutralization" region.

Therefore, White Dwarfs might not be so safe from accretion. Keep in mind that in Starburst galaxies, cosmic ray fluxes are 1000 times higher than near the Solar System, so accretion estimates must be revised accordingly.

Shortly after the Big Bang, particle collisions might have generated lots of slow moving mini black holes.

Otto E. Rössler on March 30, 2012 3:32 pm:

Very interesting remarks, Mr. Conant.

1) It is not microquasars that white dwarfs would slow down: the latter attractor can only form after the first increase in attraction by about 35 orders of magnitude has taken place. Until then, all celestial bodies remain

immune. 2) Exciting idea with the starburst galaxies. One could measure white-dwarf occurrence rates in their neighbourhood in principle, to get a better hand on the dangerousness of micro black holes. 3) Yes, but here further estimates with many unknowns would be needed (very many unknowns according to some).

Tom Kerwick on April 4, 2012 10:44 am:

Otto —sticking to the Sirius B example— assume 100,000 times the mass of earth at the latter's volume. 5,200 km/sec escape velocity vs 11.2 km/sec escape velocity. Taking the growth of a single MBH captured in Sirius B at 5,000 km/sec with one captured in Earth at 10 km/s, the MBH which is captured in Sirius B will traverse nucleons at a rate 100,000 x 5,000/10 faster. That's 50,000,000 times faster. Now Sirius B is 120 million years old, and in a binary pair — so will have a LOT of CR exposure.

Even if one MBH was captured within the first 20 million years of its existence, a ridiculously conservative estimate, it would be accreting for 100,000,000 years, at a rate 50,000,000 times faster. Therefore it would take an MBH on Earth at least 5,000,000,000,000,000 years to have any reason for concern…

Otto E. Rössler on April 4, 2012 1:51 pm:

Dear Tom: Thank you for thinking hard.

But there is a misunderstanding here, I believe: Only ultraslow black holes can be captured inside earth. Right?

Ultrafast black holes must be passing right through white dwarfs unstopped. The rates I calculated yield a minimum circling for ultraslow artificial mini black holes inside earth. Of the size I indicated.

In your new argument you assume a continuum of black-hole speeds in the cosmic variety, if I understand correctly. Right? So this is two different scenarios, only one of which is realistic, I am afraid. Right?

Tom Kerwick on April 5, 2012 2:17 am:

Otto—thanks for responding. I think you have the misunderstanding in this case. Yes—I assume only ultra-slow black holes — produced by the LHC — can be captured inside Earth. The ultra-fast black holes created from cosmic ray bombardment of Sirius B in this case, will be initially at near luminal speed, but I assume the traversal of the white dwarf of such a black hole is sufficient to slow this black hole to sub 5,200 km/sec.

Therefore I compare a single captured MBH at a nominal 5,000 km/s in Sirius B caused by cosmic ray bombardment with a captured MBH at a nominal 10 km/s in Earth caused by LHC collisions. If you do not believe that cosmic ray bombardment of white dwarfs can result in MBH capture, why do you then argue there is a need for superfluidity to explain the non-capture of MBH by a similar process in neutron stars…

Otto E. Rössler on April 5, 2012 2:44 am:

"I assume the traversal of the white dwarf of such a black hole is sufficient to slow this black hole to sub 5,200 km/sec."

Dear Tom: Thank you for making this clear. This is a no doubt an interesting assumption, but to make this assumption is tantamount to assuming that the cross section between the ultra-fast miniature black holes and quarks is large enough to kill all white dwarfs with a companion.

I avoided making this assumption by assuming that the white dwarfs are traversed without essentially stopping the mBHs. I had to make this assumption on phenomenological grounds, or did I not?

Tom Kerwick on April 5, 2012 4:02 am:

Otto — agreed, in order to argue that there is a risk you would have to debate that such white dwarfs cannot capture MBH produced from cosmic ray exposure despite their densities in the region of 1 × 10^(9) kg/m3 and escape velocities over 5,000 km/sec. The figure I derived of at least 5,000,000,000,000,000 years to have any reason for concern testifies to this… Let me play devil's advocate for a second so and assume you are correct that white dwarfs cannot capture such MBH -

I would then have to agree that Sirius B has not had sufficient CR flux over its lifetime (as I suggested in an earlier comment) to provide a safety assurance on LHC collisions.

If one could derive the probability of a single MBH capture in Sirius B to validate the safety argument, it would be appreciated —given that Sirius B has had 3×10^(19) CR at LHC energies over its lifetime (estimate based on 3×10^(21) on Earth). 100% probability?

Otto E. Rössler on April 5, 2012 5:51 am:

You are right, we have to assume that the probability that all the very many [you say 1019) cosmic ray particles with a centre-of-mass energy equivalent to that achieved at the LHC (which I would doubt at the moment, but this is not our concern here] natural bombardments of Sirius B have not entailed enough of a braking force on a single one of them for the putative miniature black hole formed to have gotten stuck inside Sirius B. For otherwise, the star would long have been eaten inside out by the exponentially growing black hole stuck inside.

I agree that this (apart from the exact yet to be determined numbers) is what we have to assume.

Tom Kerwick on April 5, 2012 7:06 am:

Otto — No. Not what we have to assume. It is what should be determined. The point of debating the issue is not to 'prove' there is a risk, no more than it should be to 'confirm' there is no risk… but to determine if there is any risk. Therefore please offer an explanation or proof as to why you think such MBH cannot be captured by white dwarf, or you should not continue this debate.

Otto E. Rössler on April 5, 2012 8:15 am:

Well taken. I give it a try. No one knows whether black holes can be generated at the centre-of-mass energies of the LHC. If so, they are presumably very small. No one knows how small.

But there are probabilities. If the smallest possible black hole is a Planck hole, its mass is about 0.02 milligram and its size is about 10 to the minus 35 meters. Its energy would exceed CERN's by about 16 orders of magnitude. So we are safe from this kind of a visitor emerging from Switzerland.

Only string theory allows for smaller black holes. But string theory is a mere figment of the imagination, and a mess at that. No one of the specialists speaks up although allegedly 98 percent of all theoretical physicists are string theorists (as I was told a decade ago).

Now my Telemach theorem proves string theory is right. All string theoreticians know about this but they do not want to be brought in connection with my fight with CERN.

Also Telemach does not prove all string theories right, or one of them, but only the basic assumption underlying all string (etc.) theories: That instead of point-shaped charges, nature makes only finite-size charged particles. So something "bores open" particles like electrons and quarks which up until now could be assumed to be point-shaped. Specifically, Telemach says that "since all black holes are uncharged, charged particles cannot be point-shaped or maximally small for then they would be black holes and hence uncharged.

So we suddenly know for sure that space is not maximally good-natured in the smallest. Electrons have a structure. This structure could still be "very small" — as it must be to judge from neutrino experiments. The same holds true for quarks (who have an almost three orders of magnitude larger mass).

No one has any idea about their size. But: black holes cannot be smaller but are bound to be larger. This larger size could still be well below the Planck mass and Planck size. But it is unlikely that nature's smallest black holes are Planck sized. For this Planck-sidedness would presuppose that nature is not affected by the new law which prevents small-mass objects from being charged. So we are allowed to assume “with high probability” that nature’s smallest black holes are not Planck-sized but bigger.

How much bigger than 10 to the minus 35 meters, we do not know. We have not the slightest hint. But we know that CERN can produce concentrated masses of about 10 to the minus 23 g (the mass of one hydrogen atom) times 8.000 times two, at CERN’s current energies, or about ten to the minus 19 grams. This is less than 16 orders of magnitude below the Planck mass.Or else of the 17 orders of magnitude between the last generation of particle colliders, and CERN’s collider, CERN covers about one order, or about 6 percent.

In other words, since we do not know how many orders of magnitude nature does go below the Planck size, with her new “bored-openness” at very small masses, each of the 17 orders of magnitude available has the same a priori weight. This yields 6 percent for each of the 17 mass ranges. Hence the probability of CERN producing black holes at its current energy is 1/17 or 6 percent.

Let me stop here and first await your next question.

Tom Kerwick on April 5, 2012 8:37 am:

Otto — you have yet to answer my first point in any way which would warrant continuation of the debate to a ‘next question’. The only substance to your response is that you do not know the BH size. Please then assume that a BH area is about 10^(-32)cm^2 (provided to me in emails from LSAG last year in safety discussion), or derive an alternative BH area. In either case, if you wish to continue the debate, first explain why you believe an MBH traversing such white dwarf cannot be captured…

Tom Kerwick on April 5, 2012 10:29 am:

Incidentally Otto, if you define an MBH as a point of infinite density, the MBH horizon still has a very definite size proportion to its mass based on escape velocity. You cannot escape that as a fact. So please do not say ‘we do not know’ as it is blatant confiscation.

Otto E. Rössler on April 5, 2012 1:01 pm:

Yes I knew I was not finished. First, very important, I do not “believe” that a mBH traversing a white dwarf cannot be captured, we all “know” it can’t from phenomenology. So this is a constraint that we must take into account. Any “estimate” of black hole size (like the number indicated to you by CERN) is absolute nonsense. We must take the few things that are known for sure and work forwards from there.

We know that white dwarfs are not being eaten (to a large percentage at least) over very large times. So this allows us to say something about the size, both of potentially existing mBHs, and of quarks which is likewise unknown (although it is finite as we saw).

Neutrinos could help, but unfortunately we do know virtually nothing about them. They very rarely collide with quarks. A star a light year thick would be needed to stop them, the standard saying goes. Since they are uncharged, they can potentially pass right through a quark. So the quarks might be larger than the neutrino observations would suggest.

But black holes also are uncharged. We cannot exclude that they, too, are smaller than quarks. Still one would guess that one passing through a quark would manage to bind and catch it by means of its gravity. So probably quarks are not larger than mBHs. Presumably, they are smaller. But then, why do mBHs (supposed they exist) pass through white dwarfs unimpressed (as we must assume given the mentioned fact of white star resilience)?

It means that both particles must be quite small indeed.

You could say that therefore it might just as well be the case that a thousand neutron stars lying in a row would still not brake an mBH. But this is unlikely. For we have this result that with a probability of 6 percent the mBHs live in the first — largest-size — bracket of 6 allowed equiprobable mass windows, of which only the lowest is dangerous owing to the "low" energies of CERN.

So it must be quite serendipitous that mBHs (a) do occur easily and (b) nevertheless do not yet get braked by white dwarfs so as to stay inside. Other authors do perhaps not know that mBHs must be fairly large to be generatable by the LHC. So our finding that they do pass through white dwarfs even though being fairly large implies that the survival of white dwarfs is a fairly precarious business. And hence it constitutes a very valuable piece of information for humankind (as you emphasized).

Does this second part of my ongoing attempt to answer your first — still not quite reached — question cause any problems so far? A dialogue is always unpredictable, and leads both partners invariably into new territory. Therefore I maximally appreciate your challenging me.

P.S. An aside: There are three learned enthusiastic texts about the LHC in the April issue of the "Physik-Journal" that is read by virtually all German physicists. I mention it here only because the word "black hole" is not mentioned even once. This proves to the eye that CERN is far from being certain about their stance on the issue; otherwise this austrich policy would not be necessary. The planet can see that they are lying-and-hoping that the gods be on their side. We live in a pre-scientific era again. But with the weapons of science lying around like the splinter bombs from the last wars — meant to kill children. (Forgive me: I still have in the back of my mind that the LHC was re-started in earnest only today. This is not polemics, this is only holy anger. (I would be their best friend if they helped me defuse the danger. No one loves their experiment more than me — but only once the proofs of danger lying on the table have been addressed and — in at least one instance — dismantled. Maybe you can save them by dismantling my arguments at a point where I would have never expected it.)

Tom Kerwick on April 6, 2012 6:21 am:

Otto — another confuscation on your part. We do not all 'know' this from phenomenology. If a white dwarf is proved capable of capturing such hypothetical stable MBH — and I believe it most certainly would be — then it would disprove the existence of such hypothetical stable MBH — and that is by your own logic. In this case, by your own logic, this same phenomenology therefore disproves Telemach. That is, unless you can prove that such hypothetic stable MBH always evade gravity capture traversing white dwarfs…

Otto E. Rössler on April 6, 2012 6:32 am:

Quote: "If a white dwarf is proved capable of capturing such hypothetical stable MBH — and I believe it most certainly would be — then it would disprove the existence of such hypothetical stable MBH"

I agree. Please, provide the proof.

Tom Kerwick on April 6, 2012 12:01 pm:

It is my understanding that the G&M report already provides such a proof. Please point out the weakness you see in this and we can discuss…

Otto E. Rössler on April 7, 2012 4:45 am:

Dear Tom: By "such a proof" you apparently mean "such a disproof." Can you specify?

Tom Kerwick on April 7, 2012 7:53 am:

No Otto — It is my understanding that the G&M report already provides such a proof of safety. You have agreed that if a white dwarf proved capable of capturing such hypothetical stable MBH — then it would disprove the existence of such hypothetical stable MBH at accretion rates that you suggest and/or Telemach. Please review the section in G&M and highlight the weakness in it for us to discuss…

Otto E. Rössler on April 7, 2012 9:23 am:

Dear Tom: As you know I described living proof why G&M are fraudulent scientists and hence must not be studied without a compelling reason. So please, spare me getting infected by the sweet poison they propagate in place of science, by your kindly telling me which page you have in mind.

I am subjectively sure I know why they are wrong in this context, too, but it would help if the point could be made to our readers, in case I am indeed right. I promise that if your suspicion proves correct, I shall apologize to you as well as to them and to the whole planet for having made such a circus in the absence of anyone telling me that here the solution was described in 2008 already. Including a heartfelt apology to G&M.

Otto E. Rössler on April 7, 2012 10:26 am:

They do not contradict to the reproach of having committed a fraud by withholding crucial safety information sent to them in time in both preprint and reprint form. But as I said, I give them every chance to be rehabilitated. And myself every chance to be recognized as the stupid person that I always was. For science is based on honesty and admitted weakness, nothing else.

Tom Kerwick on April 7, 2012 12:46 pm:

Otto — the official G&M position was that their 2008 paper already disproved your concern. They have stated this on a number of occasions. Please review over section 6.2 on production rates page 39–40 of section 6 on black hole production on white dwarfs, and highlight the weakness you see in it for us to discuss…. It is just two pages. Also then refer back to section 5.3 Stopping in white dwarfs and 5.3.2 Stopping bounds.

Otto E. Rössler on April 7, 2012 2:30 pm

Tom (quote): "They have stated this on a number of occasions": But not in a publication, or did they?

The reference you give is to a paper which was "revised on September 23, 2008?, several months after my two 2008 papers. And their paper on the pages named uses different-dimensional assumptions about a certain version of string theory.

These versions are pure fiction (no matter how ingenious). This is like making exact predictions out of a digital theory of the cosmos. Such things are absolutely allowed to do in theoretical physics. But only as speculation, not as empirically relevant physics.

In contrast, my unchargedness result of black holes implies as a certain implication that micro black holes can exist. Which Giddings and Mangano cannot and do not say. And it says that no one knows what size they will have (hence my 1/16 probability of their being formed).

Giddings and Mangano never contradicted me and cannot contradict me.

If someone can contradict me, it is you. Please, do.

Tom Kerwick on April 7, 2012 3:59 pm:

Otto — yes not in any publication, as your concerns did not require new debate. It was pre-refuted. If you have some misunderstanding that the size of an MBH event horizon is not known, please apply E=Mc^2 and the eq for escape velocity at r the distance from the centre of gravity, and apply it to hypothetical TeV black holes… you will find that the size of a TeV-scale MBH is very precise and known.… please stop the confuscations.

Otto E. Rössler on April 8, 2012 2:48 am:

The neologism of "pre-refutation" is the most important fruit so far of this blog. It will make history. It is good to have so powerful adversaries. This is all a scientist ever hopes for.

[Removed section of comments from other forum contributors as off-tone and/or off-topic]

Otto E. Rössler on April 11, 2012 11:06 am:

No substantial defense provided: against the historical evidence given on "Lifeboat" above that Giddings and Mangano pretended in their paper on the quoted two pages that string theory had any physically defensible quantitative predictions to make about the size of mini black holes.

And against the fact that they refused to quote the evidence given to them beforehand that all we can know physically about string theory so far is that electrons are not point-shaped but have a —so far inexplicable — finite size. This fact should have made them happy since no other physical proof for the existence of sub-Planckian black holes was ever provided. A "very general" form of string theory therefore has physical reality — a revolution in physics.

As fortunate this revolutionary fact is for string theory, it unfortunately does not so far allow us to make any quantitative predictions as to the minimum black hole diameter. The 6 percent probability of Armageddon being induced by CERN therefore stand undisputed.

G&M's silence for more than 4 years is the saddest fact in the history of physics. They are kindly asked to reply and explain this planet-startling fact. Maybe they had a good reason for staying silent after all? In this case they are kindly requested to come forward to explain.

I apologize in that case for having been unable to see their good reason up until now — which no one hopes for more dearly than I do.

[Removed section of comments from other forum contributors as off-tone and/or off-topic]

Tom Kerwick on April 13, 2012 1:53 am:

Otto — you agreed in previous comment that if a white dwarf is proved capable of capturing such hypothetical stable MBH — then it would disprove the existence of such hypothetical stable MBH — based on your accretion estimates. The G&M paper calculates capture rates of such — ref sec 5.3.2 & sec 6.2. Therefore if you cannot find a weakness in their calculations — you should conclude such MBH cannot exist…

Otto E. Rössler on April 13, 2012 2:45 am:

Dear Tom: I told you already on this blog that these "calculations" are witchcraft. They use formulas taken out of a hat. Please, stop believing in what physicists tell you without checking what they say.

No honest physicist knows anything about the size or other properties of "strings" as they are being assumed without any justification by G&M in their beautiful equations.

G&M put the whole field of string theory into discredit. You may have realized that all string theorists have disappeared from visibility as a consequence of the LHC — more precisely, its behaviour of taking string theory hostage. The string theorists' silence is as appalling as that of the rest of the scientific community which behaves like a witchcraft community- were there not the almost uncountable many good scientists left on the planet who are no longer allowed to be seen by the media and the bribing institutions behind them like CERN – who are now openly threatening to take over Lifeboat. This is a very dangerous water in which you are swimming.

[Removed section of comments from other forum contributors as off-tone and/or off-topic]

Tom Kerwick on April 14, 2012 3:02 am:

If one chooses to dismiss the mathematical wizardry of G&M and do some basic calculations ignoring the complexities of quantum theory, one could assume the radius of black hole, r = 2GM/c^(2) = 2GE/c^(4) based on an escape velocity c. Filling in the numbers for a TeV-scale MBH = 2x10^(-19)/c^(4) = 5×10^(-51) meters… far below Planck size, and far below the figure used by LSAG which is of the order of 10^(-34).

As this would impact on the capture rates and accretion rates in WD, it is unfortunate Otto you do not attempt this approach to criticizing CERN rather than the strategy of your latest removed post-rant.

[Removed section of comments from other forum contributors as off-tone and/or off-topic]

Otto E. Rössler on April 15, 2012 3:29 am

All I ever requested was the benefit of the doubt. CERN refuses to defend itself against proven scientific evidence that it is risking the planet. I apologize that this doing of CERN's is considered criminal by humankind throughout its history. I never asked anything else from CERN than to do its scientific duty and show that the scientific proofs of danger presented and published in peer-reviewed scientific journals are ADDRESSED and refuted. No one wishes more that CERN can defuse the scientific proof of danger than I do. I am the best ally CERN has on the planet — because I still believe they can return to the rules of science.

[Removed section of comments from other forum contributors as off-tone and/or off-topic]

Otto E. Rössler on April 15, 2012 8:51 am:

Let me elaborate: CERN Is Conditionally Accused of Being "Worse than Hitler" for Years: This state of affairs cannot be left unaddressed and hence tolerated any longer.

Only Lifeboat can help CERN out of the impasse. The administration is on their side. So why not take the hand of friendship offered? After Lifeboat started picking on me and censoring my postings, the point had come to save them from ruin by joining their position – as I did. Now Lifeboat has a live occasion to save CERN.

It would be a great relief to the planet if CERN accepted. Even those on the planet who never believed in the danger in the first place would breathe more freely again if their reflex-like suspicion were to be confirmed at last. To show this is the aim of the "Joint CERN-Lifeboat Safety Conference," proposed today. The Cologne Administrative Court would be maximally pleased, too. Any objections from any side?

A3: Consideration for Sub-Millisecond Pulsars (or the Lack Thereof) – Tom Kerwick.

The following was posted by Tom Kerwick on Lifeboat Foundation Forums 14/05/2012 on the very closely related subject of neutron stars.

On a casual read of the appraised work of Duncan R. Lorimer on Binary and Millisecond Pulsars (2005) last week, I noted the reference to the lack of pulsars with $P < 1.5$ ms. It cites a mere suggestion that this is due to gravitational wave emission from R-mode instabilities, but one has not offered a solid reason for such absence from our Universe. As the surface magnetic field strength of such would be lower ($B \propto (P \dot{P})^{(1/2)}$) than other pulsars, one could equally suggest that the lack of sub millisecond pulsars is due to their weaker magnetic fields allowing CR impacts resulting in stable MBH capture…

Therefore if one could interpret that the 10^8 G field strength adopted by G&M is an approximate cut-off point where MBH are likely to be captured by neutron stars, then one would perhaps have some phenomenological evidence that MBH capture results in the destruction of neutron stars into black holes. One should note that more typical values of observed neutron stars calculate a 10^{12} G field, so that is a 10^4 difference from the borderline-existence cases used in the G&M analysis (and so much less likely to capture).

That is not to say that MBH would equate to a certain danger for capture in a planet such as Earth where the density of matter is much lower — and accretion rates much more likely to be lower than radiation rates — an understanding that is backed up by the 'safety assurance' in observational evidence of white dwarf longevity.

However, it does take us back to question — regardless of the frequently mentioned theorem here on Lifeboat that states Hawking Radiation should be impossible — Hawking Radiation as an unobserved theoretical phenomenon may not be anywhere near as effective as derived in theoretical analysis regardless of this.

This oft mentioned concern of 'what if Hawking is wrong' of course is endorsed by a detailed G&M analysis which set about proving safety in the scenario that Hawking Radiation was ineffective at evaporating such phenomenon. Though doubts about the neutron star safety assurance immediately makes one question how reliable are the safety assurances of white dwarf longevity – and my belief has been that the white dwarf safety assurance seems highly rational (as derived in a few short pages in the G&M paper and not particularly challenged except for the hypothesis that they may have over-estimated TeV-scale MBH size which could reduce their likelihood of capture). It is quite difficult to imagine a body as dense as a white dwarf not capturing any such hypothetical stable MBH over their lifetime from CR exposure – which validates the G&M position that accretion rates therein must be vastly outweighed by radiation rates, so the even lower accretion rates on a planet such as Earth would be even less of a concern. Pulsars are often considered one of the most accurate references in the Universe due to their regularity and predictability. How ironic if those pulsars which are absent from the Universe also provided a significant measurement.

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