The Planetary Heating Aspects of High Energy Physics Experiments

TECHNICAL NOTE

Environmental Safety Assessment

EMMISSIONS OF A DIFFERENT NATURE

Although the majority of attention on the safety of particle collider operations (BNL, Fermilab and CERN), have involved assessment of highly exotic and catastrophic outcomes [1], one needs to also consider more typical concerns from industry, and in particular the effect on global heating.

The concerns of 'global warming' from industry is of course not new to debate, but it has not been considered a relevant proposition to date as regards the particle collider industry – as it is not viewed as an industry of emissions. However, it could be considered as an industry of emissions of a different nature. One should consider the heating effect of the potential products of such collisions.

ELEVATED FLUX OF PERSISTENT COLLISION PRODUCTS

In a recent analysis on the potential flux of LHC collision products [2], it was determined, that the flux of hypothetically stable micro black holes from collision experiments could be significantly higher than that which results from natural cosmic ray exposure (as much as $6.049 \times 10^5 : 1$ km/km greater), of which there could be a heating property. This possible side-effect of an elevated flux is equally applicable to other forms of hypothesised collision products, which may persist, yet avoid detection - such as weakly interacting massive particles (WIMPs - among the leading hypothetical particle physics candidates for dark matter), and strangelets with high surface tension properties [4].

While most collision products from cosmic ray exposure are easily observed in nature, in the form of Hadronic showers in the upper atmosphere, WIMPs, micro black holes and strangelets can be considered more evasive to detection, and as such are considered reasonable theoretical products.

ATTRIBUTED HEATING EFFECTS

The aforementioned flux is most applicable to the direct heating effect attributable to micro black hole remnants as explored in other research [3] where concern is raised of the risk that the energy generated by accreting black holes could disturb the internal heat balance of the Earth. A far more dramatic scenario was also proposed some years ago, citing a concern for explosive potential on the micro black hole products on reaching the Eddington limit [5] where the energy released would compare to that of major thermonuclear explosions. Occurring deep in the interior of the Earth, one can imagine that this could not only cause a heating effect, but influence seismic or volcanic events.

One does not readily find potential for heating effects attributable to persistent dark matter or strangelets in research, as particularly in the latter case, outcomes are considered more apocalyptic.

ABSENCE OF ASTROPHYSICAL REASSURANCES

While astrophysical reassurances have been offered as regards the more apocalyptic outcomes theorised, less can be said of astrophysical reassurances as regards potential global heating effects.

Observance of distant neutron stars and white dwarfs, while an effective reassurance against micro black hole accretion of such bodies, due to their longevity (and by inference, against micro black hole accretion of the Earth), provide no feasible means of measuring a temperature attributable to trapped CR collision products, as any such effects would be dwarfed by the stars own internal heat source. Similarly, it is not feasible to measure any temperature attributable to CR exposure on Earth, as this would also be dwarfed by both the Sun's heat, and the internal heat source of the Earth.

Temperatures at the Earth's inner core are typically estimated at 6,000 K, with the outer core range from 4,000 K in the outer regions to 6,000 K near the inner core. The mantle is estimated somewhat lower at between 1,000 K at the upper boundary with the crust to 4,000 K nearer the core.

If one assumed a basic linear relationship between flux increase km/km and a resulting temperature increase in the Earth's core, a ratio of $6.049 \times 10^5 : 1$ km/km implies that if CR collision products on Earth even subject our planet to a mere 0.01 Kelvin temperature increase, collisions at the LHC could comparatively result in an eventual increase of 6,000 K, a doubling of the planet's core temperature.

It would be reasonable to assume that significant increase in the temperature of the Earth's magma and core could easily result in significantly increased volcanic and tectonic activity in typical regions.

In essence, one can categorically state that there is no scientific reassurance against heating effects, and as such further analysis on such theoretical constructs are advisable, prior to frequent collisions.

FURTHER READING / REFERENCES

[1] Astrophysical implications of hypothetical stable TeV-scale black hole. Giddings, Mangano. 2008. http://arxiv.org/abs/0806.3381

[2] Micro black holes - Hypothetical terrestrial flux and a re-visitation of astrophysical safety assurances. Thomas B. Kerwick. 2015. http://vixra.org/abs/1503.0066

[3] Black Hole Production at the LHC: A review of the Risks - Draft (Rev 0.03) (A. Rahman, 2010) http://www.lhcsafetyreview.org/docs/black-hole-review.pdf

[4] Medium effects on the surface tension of strangelets in the extended quasiparticle model. Wen, Liang, Peng. 2010. http://journals.aps.org/prc/abstract/10.1103/PhysRevC.82.025809

[5] On the potential catastrophic risk from metastable quantum-BH produced at particle colliders – Plaga, 2009. http://arxiv.org/abs/0808.1415

[6] Black hole state evolution and Hawking radiation (D. Ahn, 2010) http://arxiv.org/pdf/1006.2198v3.pdf

[7] Thermal convection in Earth's Inner Core with Phase Change at its Boundary. Deguen, Alboussiere, Cardin. 2013. http://arxiv.org/abs/1306.2482

[8]Rifting, Lithosphere Breakup and Volcanism: Comparison of Magma-Poor and Volcanic Rifted Margins. Franke. 2012. http://dx.doi.org/10.1016/j.marpetgeo.2012.11.003