

COMMENT

Cosmic rays, heavy ions, and the safety of the LHC

Alam Rahman

57 College Hostel Road, Thanapara, Gaibandha Sadar, Gaibandha 5700, Bangladesh

E-mail: feedback@lhcsafetyreview.org

Abstract.

This comment notes that the LHC's main cosmic ray safety argument does not apply to its heavy ion programme.

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One of the main safety arguments for the LHC is that Nature has already conducted the LHC experiment many times over. The current official safety report [1] states that:

... Nature has already completed about 10^{31} LHC experimental programmes since the beginning of the Universe. Moreover, each second, the Universe continues to repeat about 3×10^{13} complete LHC experiments. There is no indication that any of these previous 'LHC experiments' has ever had any large-scale consequences.

This calculation is relevant only for the LHC's programme of proton-proton collisions, with a design energy of 14 TeV. The safety report includes no comparable calculation for the LHC's programme of lead-lead collisions, with a design energy of 1148 TeV [2]. The report estimates that once it reaches peak luminosity, one month of the LHC's heavy ion programme each year for ten years will result in up to 8×10^{10} lead ion collisions. The report presents no compelling evidence that even one lead-lead collision at a centre-of-mass energy of 1148 TeV has ever taken place before, let alone that 2.4×10^{24} such collisions occur each and every second.

References

- [1] Ellis J *et al* (LSAG) 2008 *J. Phys. G: Nucl. Part. Phys.* **35** 115004 (arXiv:0806.3414)
- [2] Evans L and Bryant P (eds) 2008 *JINST* **3** S08001