Light Flashes in space: does low LET radiation have effects on brain functions?

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Astronauts in space have been observing phosphenes in the shape of *light flashes* (*LF*) in absence of known visual input. Investigations in space and on ground showed that *LF* can originate with the action of ionizing radiation on the eye.
We performed measurements on 3 astronauts in the International Space Station, monitoring the charged ionizing radiation impinging in their brain concurrently to their electrophysiological brain and retinal activity. The times at which the astronauts perceived a LF was signaled with the pressure of a pushbutton. The aim of the experiment was to demonstrate that these anomalous perceptions had associated electrophysiological potential and to individuate the particles causing their perceptions defining their charges and energies.
We show that these interactions triggers retinal potentials. All ions identified as responsible for these effects are of low Z and low LET.
While apparently in contrast to what often claimed in the literature, these results are supportive of the hypothesis that low LET radiation may indeed have a large impact on the visual sensory function. Following a recently described model we suggest that this low LET efficiency may depend on the lower concentration of radicals generated by the low LET radiation which increases the probability they diffuse and damage other cells, before recombining.
This “inverse LET” behavior may also help explaining a previously reported decay of the effectiveness in producing retinal responses in mice when increasing the radiation dose.
Inverse LET dependency will have an impact in the design of countermeasures, mainly shielding, for future space missions.