LightCube
Interplanetary Initiative Lab
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Payload Flash Tube Measurements

Edits:

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Summary:
The payload flash tube is measured to be about 1/10th as bright as a standard DSLR flash.

Background and Specifications:
An initial question for Lightcube posed by Nanoracks was the unknown flash potential to the payload. To clear some of the unknown, the payload consists of a circuit board which has two large capacitors and a xenon flash tube. When triggered through a specific radio dial tone these capacitors charge and then discharge causing the xenon bulb to flash. The main concern with the flash is the safety of the astronauts when it is in the International Space Station (ISS) and the deployer from Nanoracks. After completing multiple tests, the flash bulb properties (shown in Table 1A) have been calculated by using a 3M-Photodyne Model 22 photometer at a short distance from the flash to measure direct flux. We have established inhibit switches to prevent charges and discharges of the payload to prevent the possibility of a random flash. Based on the values in Table 1A and the random discharge safety, we can comfortably conclude that there is no danger to the astronauts if a flash were to occur, since it will not hinder an eye or cause damage to a nearby person. For additional reference, the flash of the payload is comparable to that of a DSLR camera flash shown in Tables 2A and 3A. In terms of the astronomical interference concern, further analysis is needed to determine the impact.

Table 1A: Lightcube Payload
(Initial Measurement of Flash Tube from 3M-Photodyne Model 22 photometer)

Measured Properties	Values
Peak Illuminance	$5.0 \cdot 10^5\ lux$ (@$1m\ distance$)
Peak Luminous Power	$6.22 \cdot 10^6\ lumen$
Peak Luminous Intensity	$5.0 \cdot 10^5\ cd$
Peak Luminance (Brightness)	$4.63 \cdot 10^5\ cd/cm^2$= 2.9 suns
Duration of Flash	2 ms

Duration of Peak	$400\ \mu s$

Table 2A: DSLR Camera Flash

(Measurement of Canon 580EXII from 3M-Photodyne Model 22 photometer)

Measured Properties	**Values**
Peak Illuminance	$1.24 \cdot 10^6\ lux$ *(@ 1m distance)*
Peak Luminous Power	$7.18 \cdot 10^5\ lumen$
Peak Luminous Intensity	$4.69 \cdot 10^6\ cd$
Peak Luminance (Brightness)	$5.86 \cdot 10^5\ cd/cm^2$ = 3.7 suns
Duration of Flash	$4\ ms$
Duration of Peak	$1.5\ ms$

Table 3A: DSLR Camera Flash

(Measurement of Nikon SB800 from reference)

Measured Properties	**Values**
Illuminance	$9 \cdot 10^6\ lux$
Luminous Power	$1.4 \cdot 10^6\ lumen$
Duration of Flash	$0.952\ ms$
Duration of Peak	*N/A*

Reference: https://www.candlepowerforums.com/threads/output-of-a-camera-flash-in-lumens.170622/

Conclusion:

Based on the tables above, a clear conclusion can be seen that the flash tube on the payload has a higher luminous power by a multitude of 6, but it has a lower illuminance by a factor of 10. This is most likely due to the reflector and the Fresnel lens in the DSLR flash causing it to be more directional versus the flash bulb emitting in all directions when taking the initial measurement. Based on these measurements, it should be clear that the flash tube poses no harm to astronauts. Further analysis is needed to determine the astronomical interference.