

Introduction to the Solid State Based Interior Lighting System for ISS

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SF3

NASA JSC

Introduction

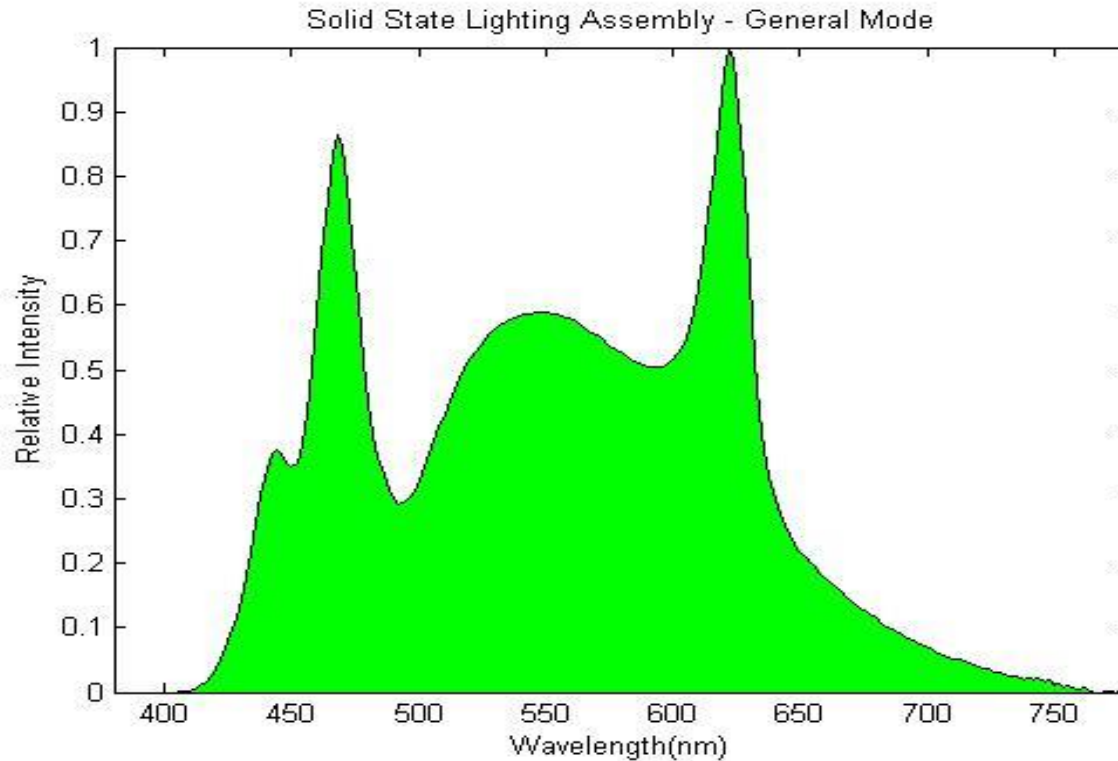
Solid state lighting assembly (SSLA) were designed to replace general luminaire assembly (GLA) for both general interior illumination and improved circadian rhythm through melatonin control using multiple spectrums.

To accomplish these goals, the light is design to operate in 3 modes with 3 distinct spectrum. The different spectrum provide control of the blue portion of the light which impacts melatonin production in humans which impacts sleep.

General mode is a 4500K “neutral” light spectrum intended to the be the default mode of operation for day to day operations.

Pre-sleep mode is a 2700K “warm” light spectrum intended to be used by the crew at the end of the work day.

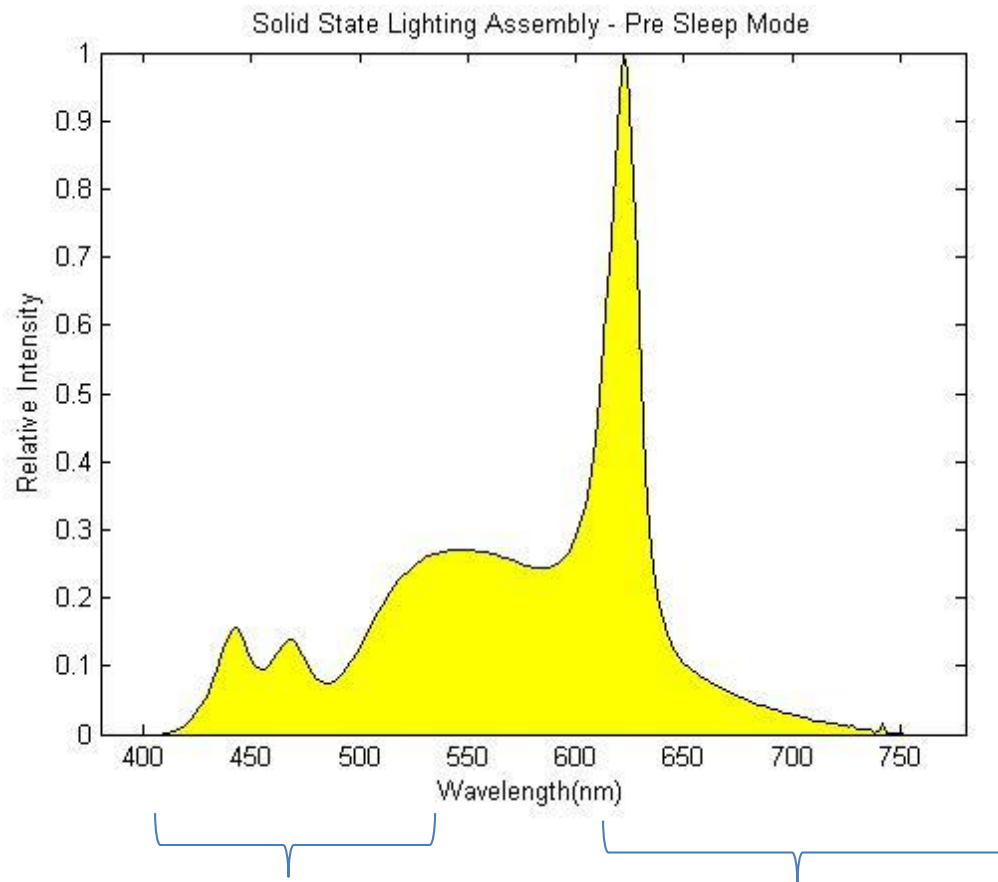
Phase-shift mode is a 6500K “cool” light spectrum intended to be used for altering the crew’s sleep patterns.



Higher spike
suppressing melatonin,
increases alertness

Higher spike in red and
yellow regains balances
the blue spike

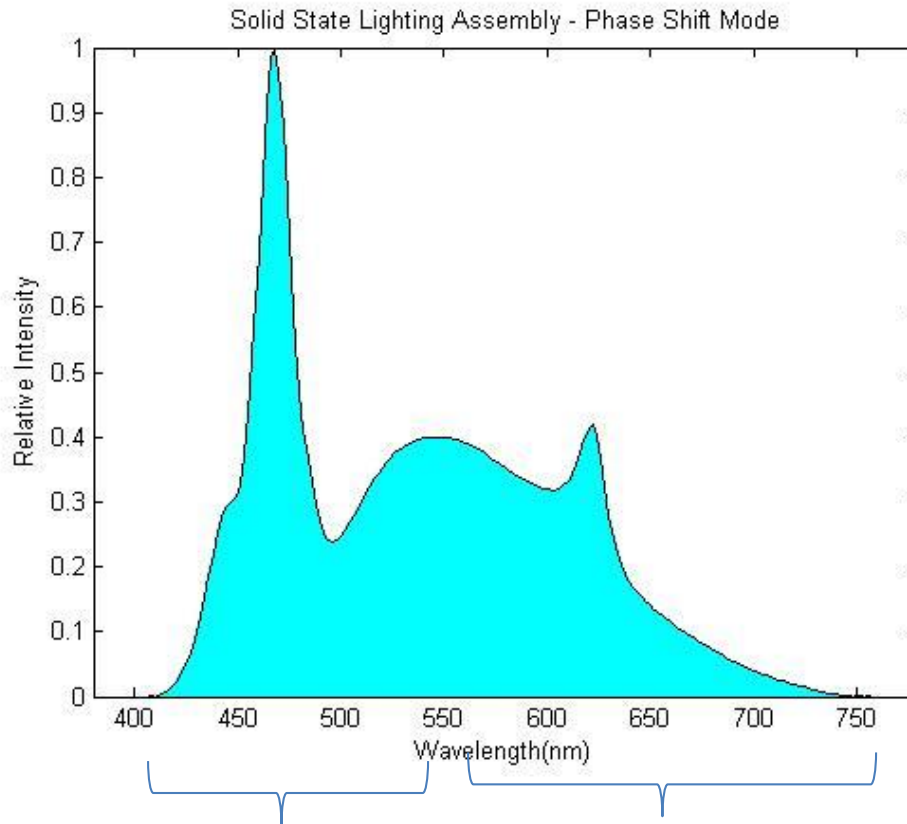
General mode spectrum is broad. It has a correlated color temperature of 4500K. It is intended to be neutral in suppression of melatonin



Low in blue spike removes suppression of melatonin needed for sleep.

Higher spike in red and yellow provides for warmer color.

Pre-sleep spectrum is intended to remove as much melatonin suppression as possible to prepare the crew for sleep.

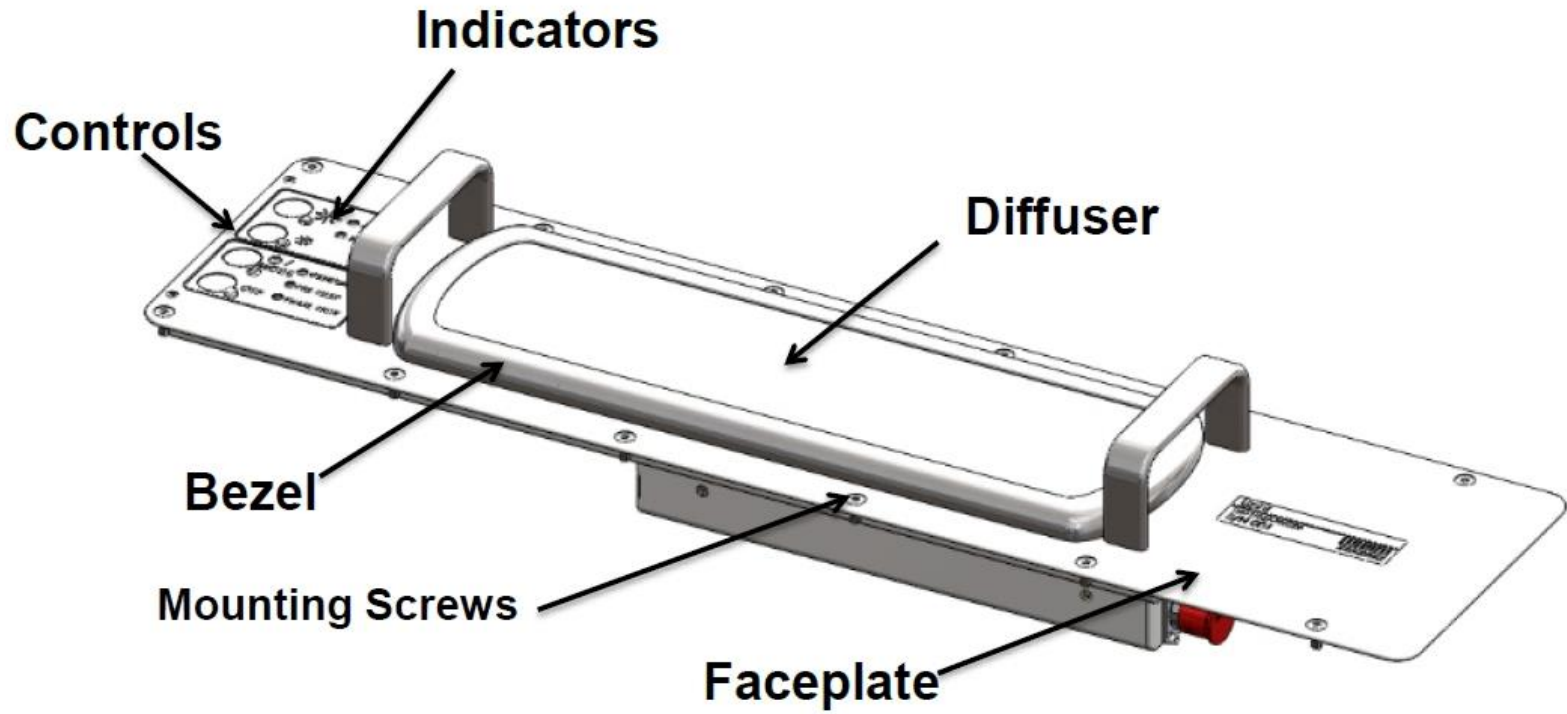


High spike in blue intended to suppress melatonin and increase alertness.

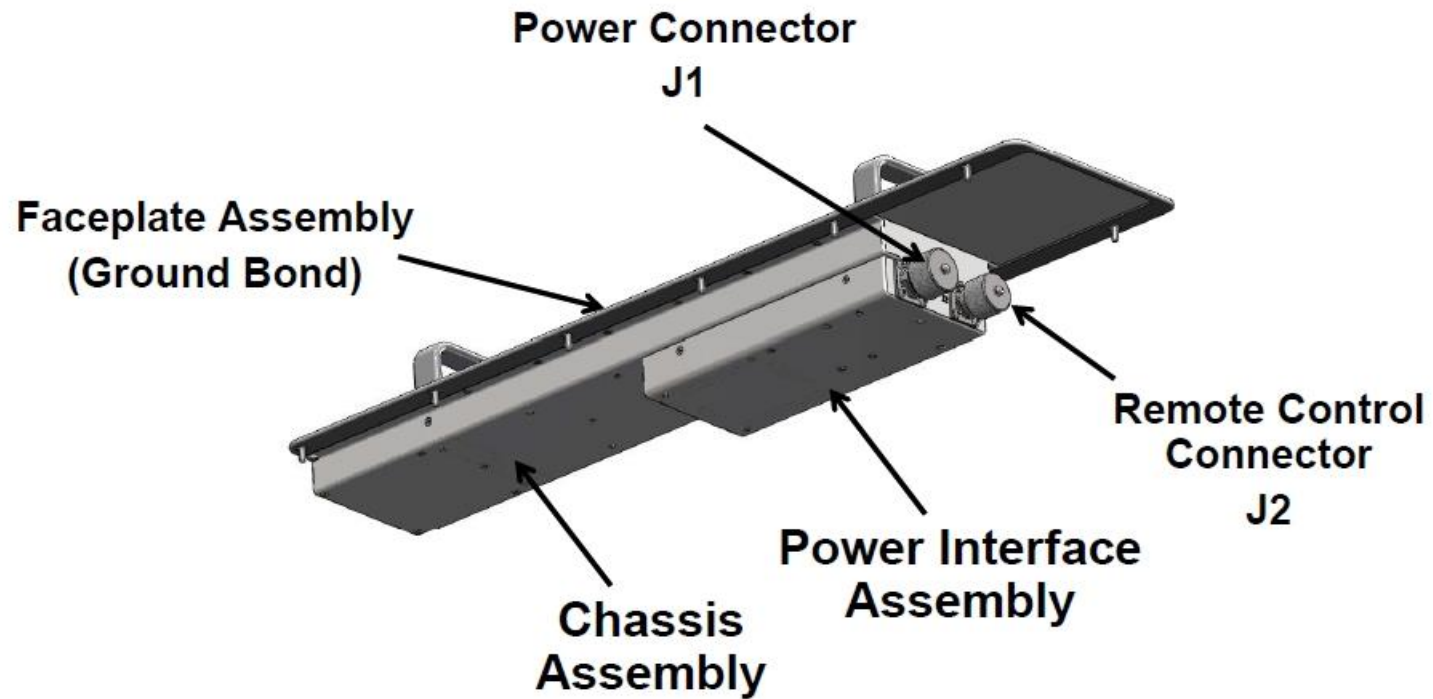
Low in red and yellow to amplify blue light effects.

Phase shift spectrum is intended to suppress melatonin, increase alertness. Used when circadian rhythm needs be phased shifted.

Basic Design View - Front



Basic Design View - Rear



For all Modes
Hold buttons down to

Make
Brighter

Make
Dimmer



New General Illumination

For all Modes
Press button to

Change
mode

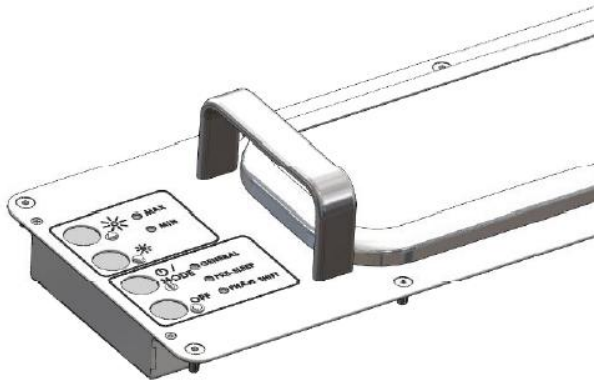
Turn
on/off



New Pre-Sleep

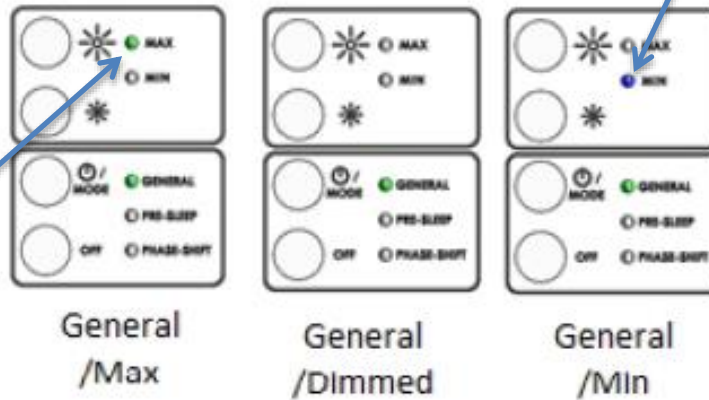


New Phase Shift



Indicator light turns blue at minimum brightness

Examples for general



Indicator light turns green at maximum brightness

Defaults and Maximum Brightness Settings

Defaults occur on power up. All modes are dimmable to 35% max.

General (neutral)

Default: 210 candela

Maximum: 340 candela

Minimum: 119 candela

Pre-Sleep (warm)

Default: 90 candela

Maximum: 130 candela

Minimum: 46 candela

Phase-Shift (cool)

Default: 420 candela

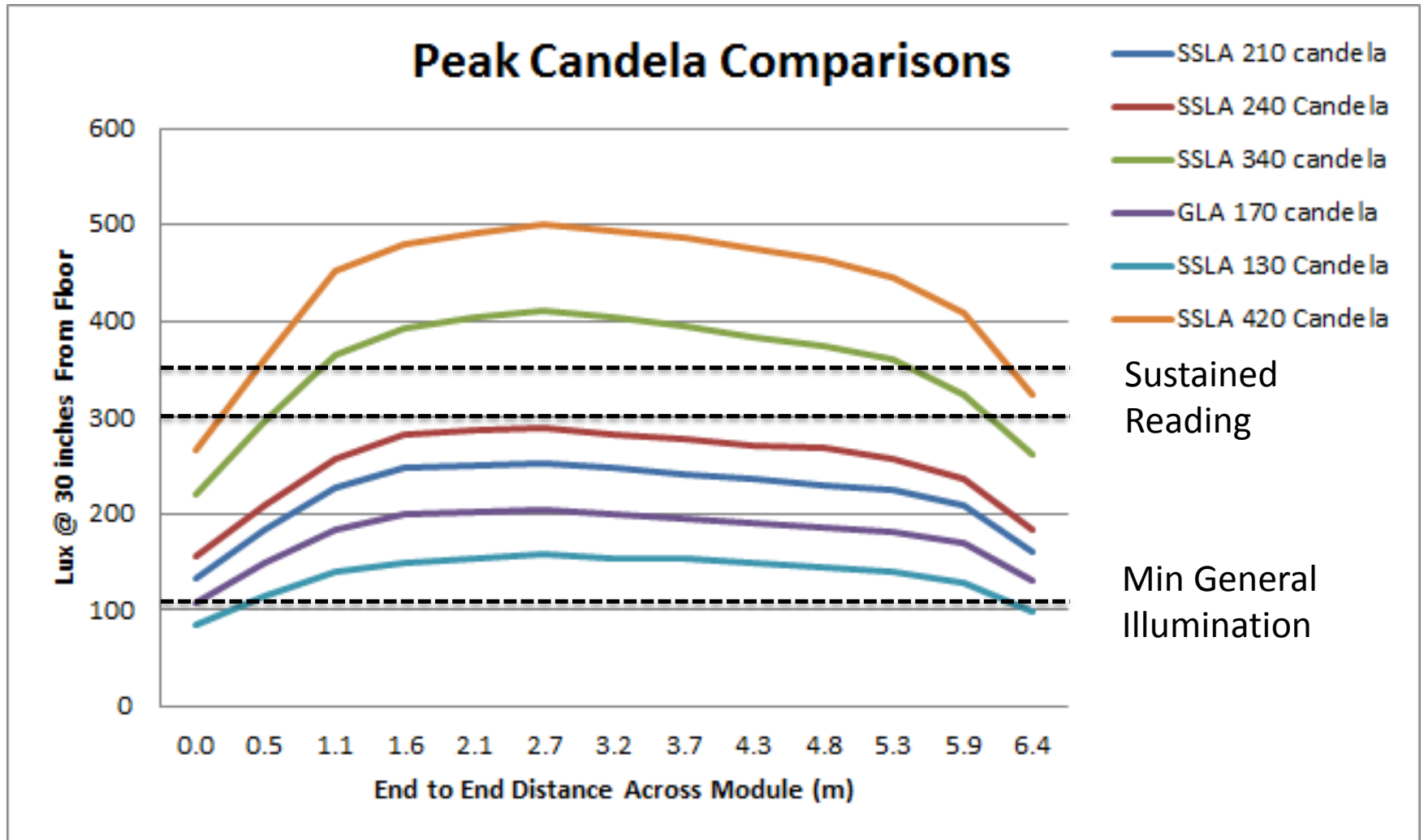
Maximum: 420 candela

Minimum: 147 candela

*In General Mode the SSLA output is approx. 25% more than the GLA.

**In General Mode the SSLA power consumption is approx. 20% less than the GLA.

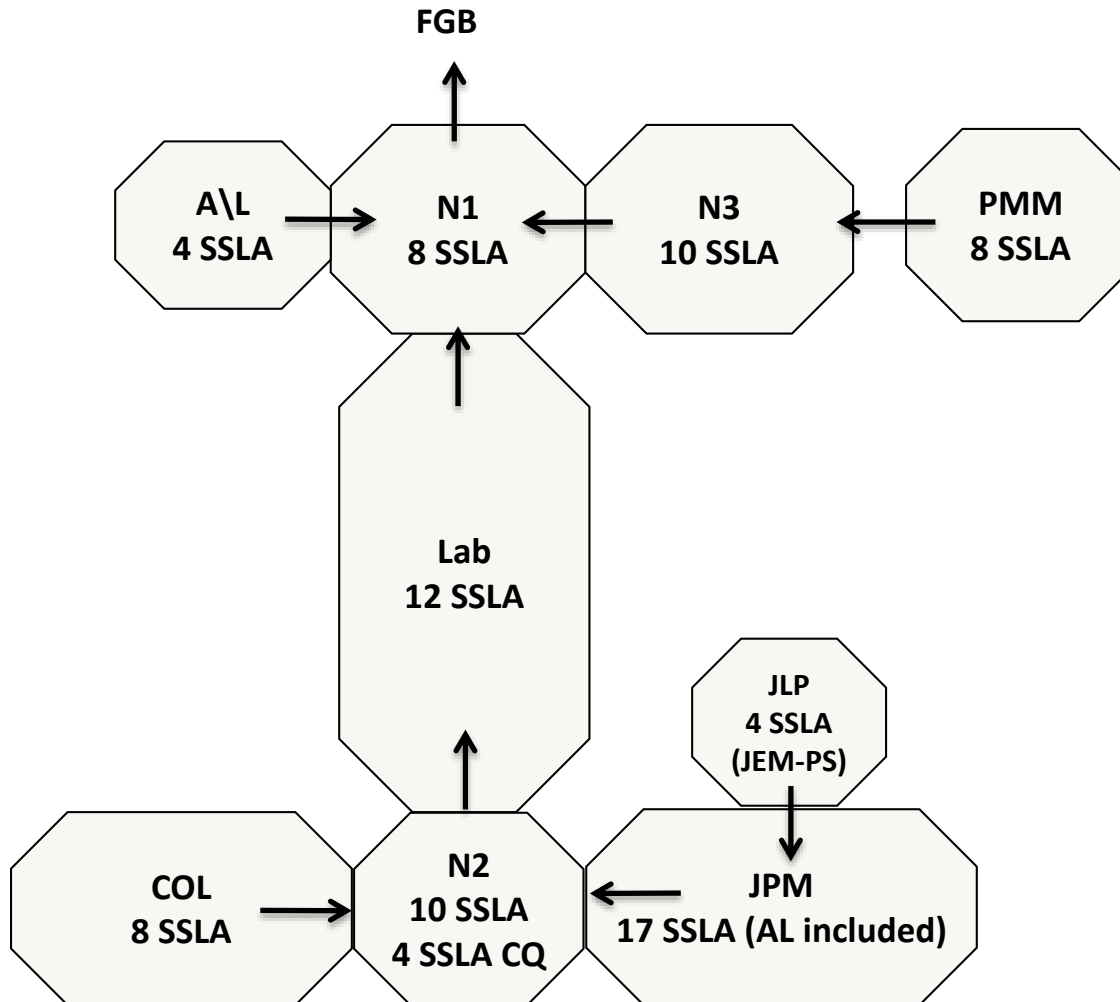


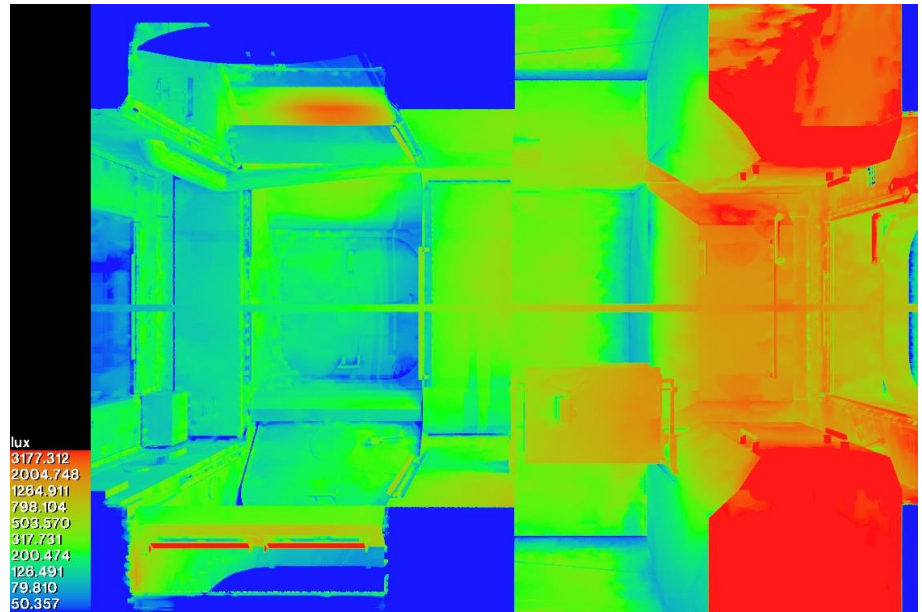
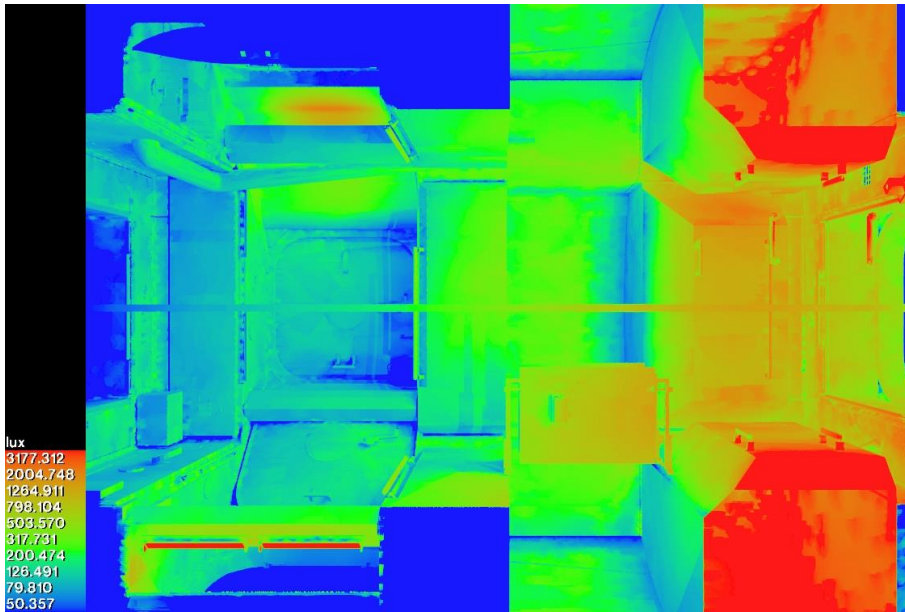


Model Estimation of U.S. Lab Module Illumination @ .762 m (30 inches) (41000 requirements)

ISS module distributions for SSLA

Total 85 + 15 spares





General Luminaire Assemblies (GLA)

Solid State Light Assemblies (SSLA)

Node 2 with 10 Lights

GLA at maximum brightness (170 cd) compared to SSLA at default brightness (210 cd General Mode).

Note:

SSLA was designed to maintenance free with a nominal design life of 40,000 hours with much more extended life expected when operating light at less than maximum power (the default for general mode is 60% of max).

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The End