

UV-C Dosage vs. SARS-CoV-2 Research – Baseline Dosage Performance Levels

Press Release

June 16, 2020

Signify and Boston University validate effectiveness of Signify's UV-C light sources on inactivating the virus that causes COVID-19

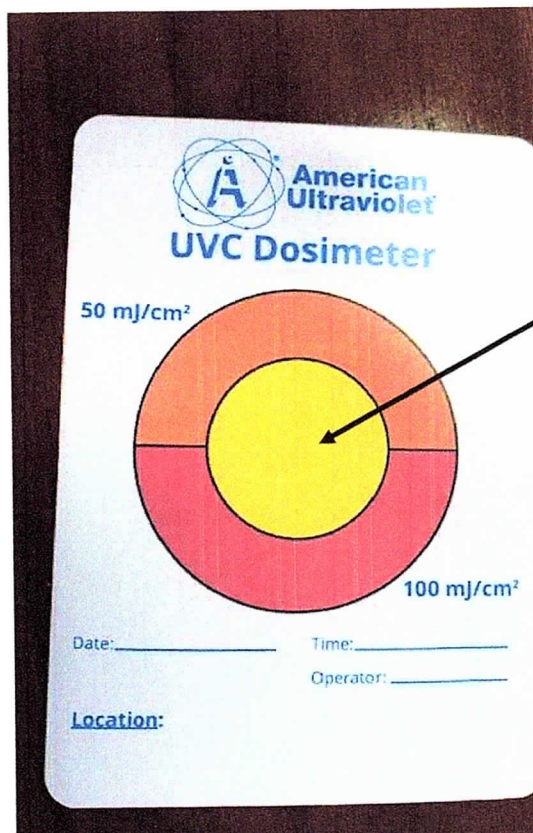
- Test results show that the virus could no longer be detected after seconds of exposure
- Signify to make its UV-C lighting technology widely available to other lighting companies
- Signify has been at the forefront of UV technology for more than 35 years

Eindhoven, the Netherlands – [Signify](#) (Euronext: LIGHT), the world leader in lighting, together with the National Emerging Infectious Diseases Laboratories (NEIDL)¹ at Boston University in the US have conducted research that validates the effectiveness of Signify's UV-C light sources on the inactivation of SARS-CoV-2, the virus that causes COVID-19.

Since the start of the SARS CoV-2 pandemic, Dr. Anthony Griffiths, Associate Professor of Microbiology at Boston University School of Medicine and his team have been working on developing tools to support scientific advancement in this field.² During their research they have treated inoculated material with different doses of UV-C radiation coming from a Signify light source and assessed the inactivation capacity under various conditions. The team applied a dose of $5\text{mJ}/\text{cm}^2$, resulting in a reduction of the SARS-CoV-2 virus of 99% in 6 seconds. Based on the data, it was determined that a dose of $22\text{mJ}/\text{cm}^2$ will result in a reduction of 99.9999% in 25 seconds.³

UVC DOSIMETER TESTING

- Used by hospitals to assure disinfection level
- Center turns color based on accumulated UVC band dosage (254nm)
- Testing placed dosimeters around wheelchair and verified performance at various dosage times (30, 70, 100 seconds)
- Results show 50 – 100 mJ/cm² can be obtained at various locations on the wheelchair.



INSTRUCTIONS FOR USE:

The UVC dose indicators are designed to provide a visual indication of applied UVC energy.

- 1) Place the unexposed card(s) at desired locations in the area on a substrate to go through a conveyor. Cards can be used in horizontal or vertical positions. Always make sure the color change area faces towards the UVC source.
- 2) Verify exposure of the card and make any additional notes. Always record exposure level within 24 hours for accurate results.
- 3) Compare the dose indicated by the card to the designed dose of your system or application and take appropriate action, if needed. The UVC dosimeter cards are one time use only and should not be used more than once each.

Note: The UVC Dosimeter is only intended as a visual reference to accumulated UV dose, not to determine level of cleanliness. If a card has been pre-exposed to light before use, the card should be disposed of. The following is a short list of some common pathogens and the dosimetric reading that would indicate that energy exceeding a lethal dose for the pathogen has been delivered.

Pathogen	Dose (mJ/cm ²)	Pathogen	Dose (mJ/cm ²)
<i>Escherichia coli</i>	50	<i>Salmonella typhimurium</i>	5
<i>Salmonella typhimurium</i>	50	<i>Bacillus subtilis</i>	5
<i>Listeria monocytogenes</i>	50	<i>Penicillium</i>	5
<i>Pseudomonas aeruginosa</i>	50	<i>Brewer's/Baker's Yeast</i>	5
<i>Acinetobacter baumannii</i>	50	<i>Serratia marcescens</i>	5
<i>Staphylococcus aureus</i>	50	<i>Aspergillus flavus</i>	10

For more information on UVC and Dosimeters, please visit www.americanultraviolet.com

R&D Results to Date

SQA Unit with Engineering Changes

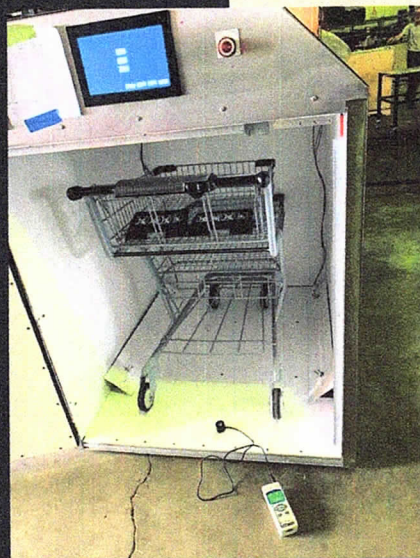
July 29 (WC) & September 01, 2020 (SC)

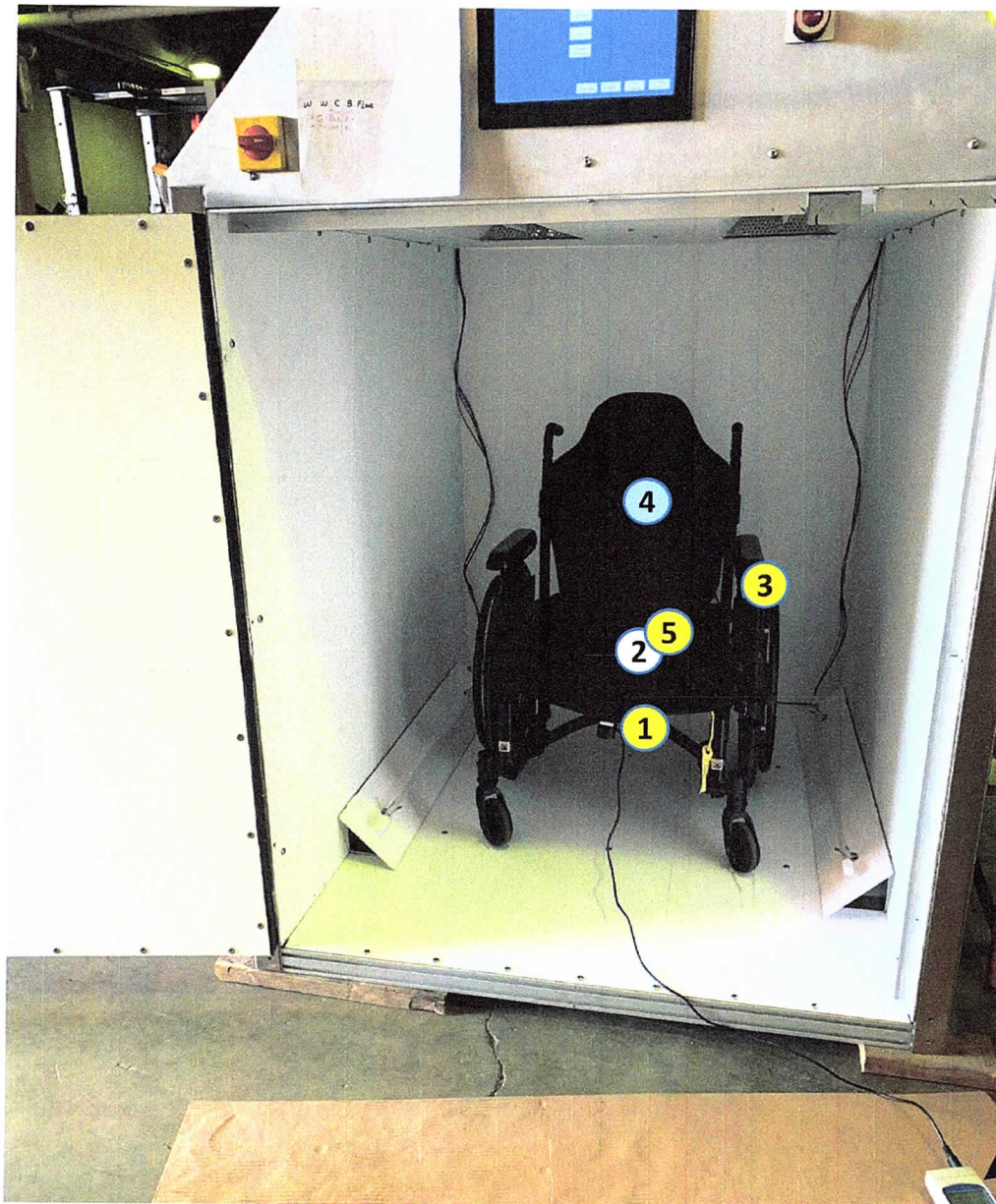
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SQA

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(330) 360.8748 (m)





Testing Configuration

Date: July 29, 2020

Location: Surface to Surface

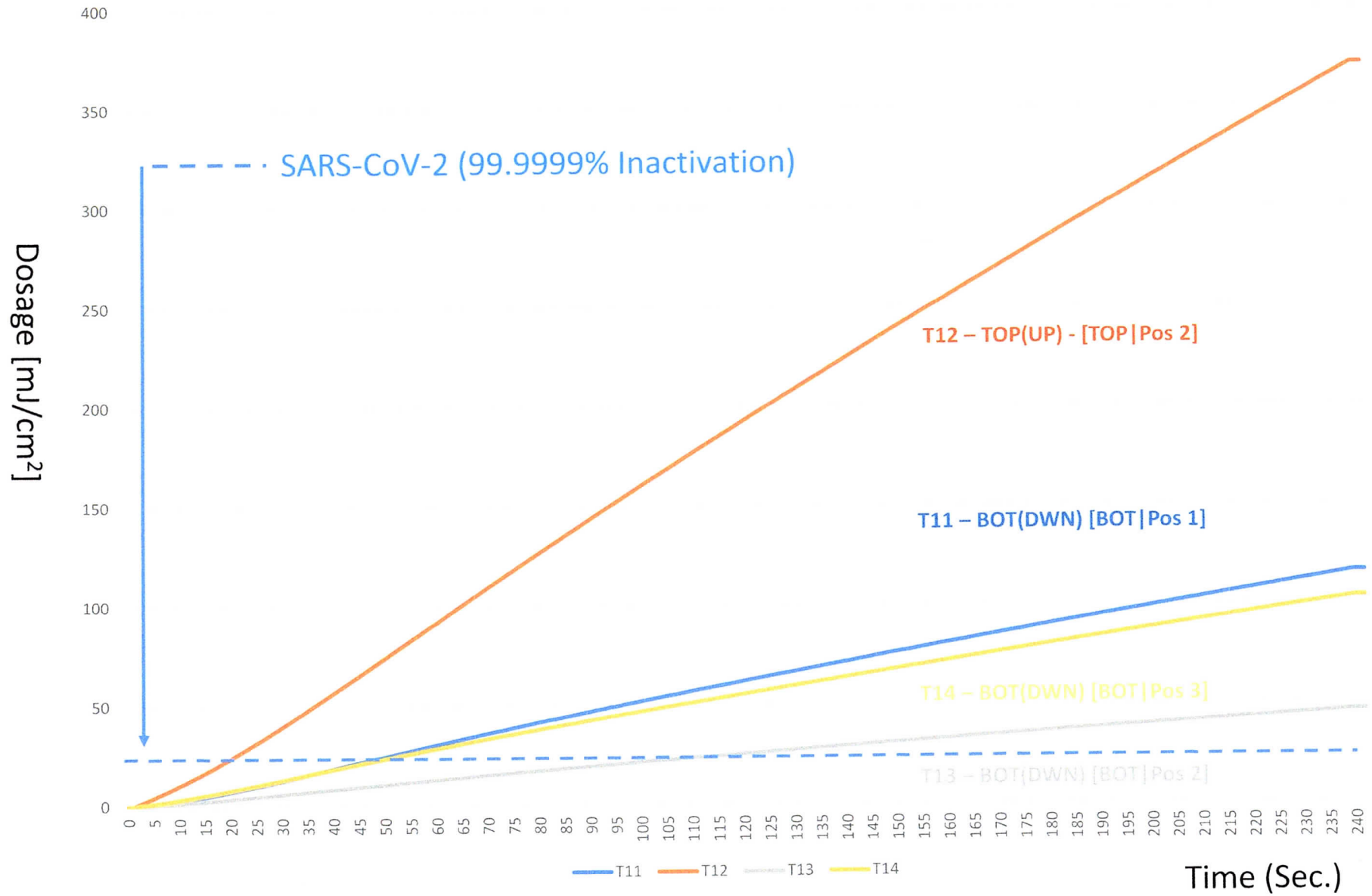
TEMP: Not Recorded

HUMIDITY: Not Recorded

- # Sensor Facing Down (Bot mount in all)
- # Sensor Facing Up (on top of seat)
- # Sensor Facing Back (on back)

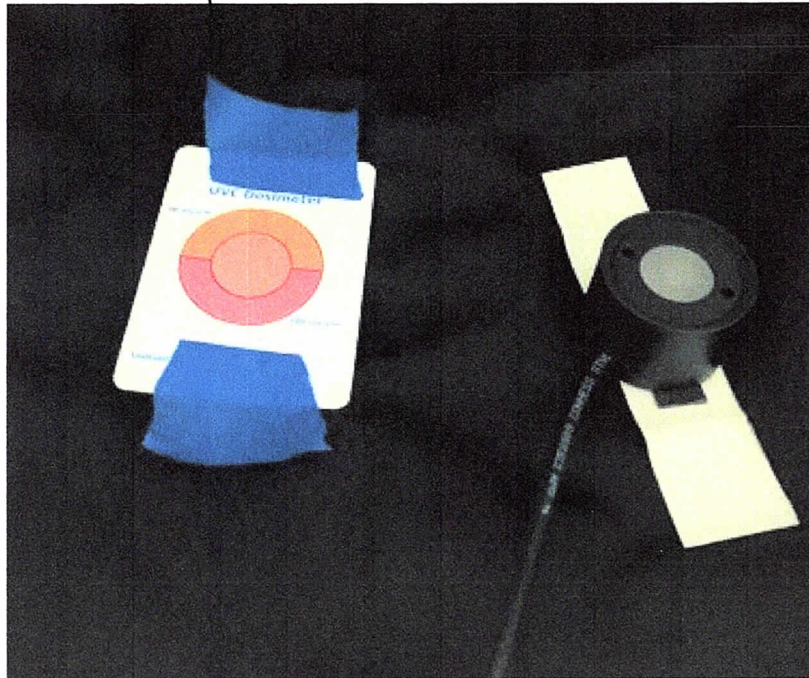
UV-C Meter (1-s sampling rate)
- Narrow Band around 254 nm

WC – Top&Bot Lights w/ECR 4



Reading (center) – Yellow to start

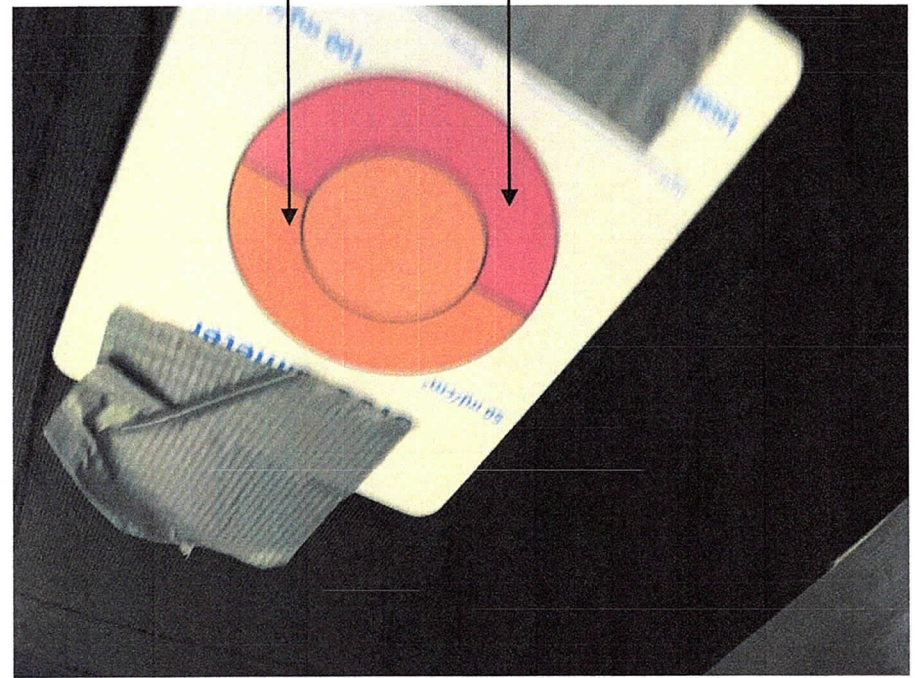
T = 30 Seconds



T12 – TOP(UP) - [TOP | Pos 2]

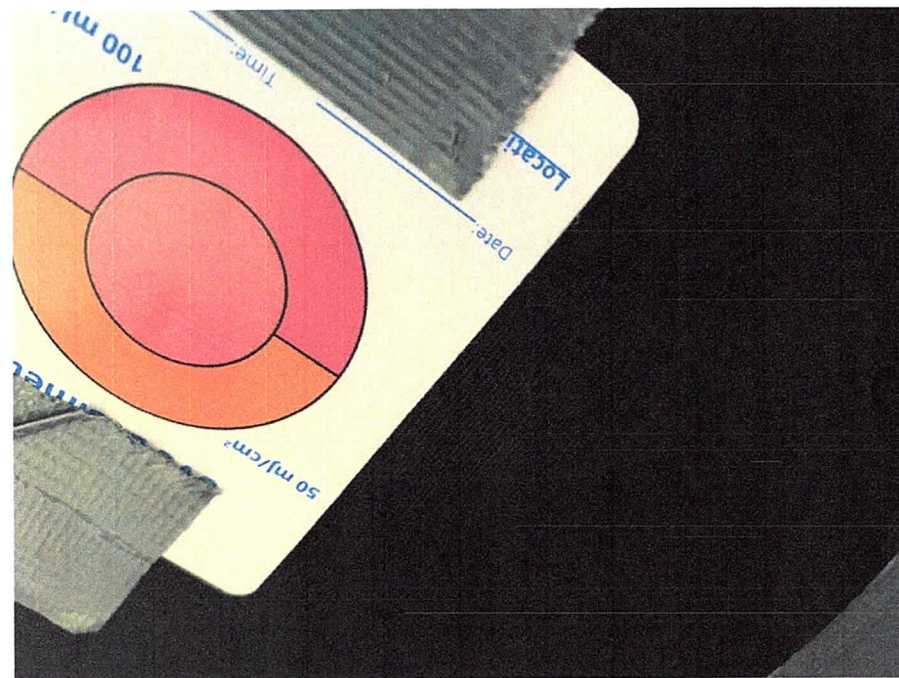
100 mJ/cm²

50 mJ/cm²



T13 – BOT(DWN) [BOT | Pos 2]

T = 70 Seconds

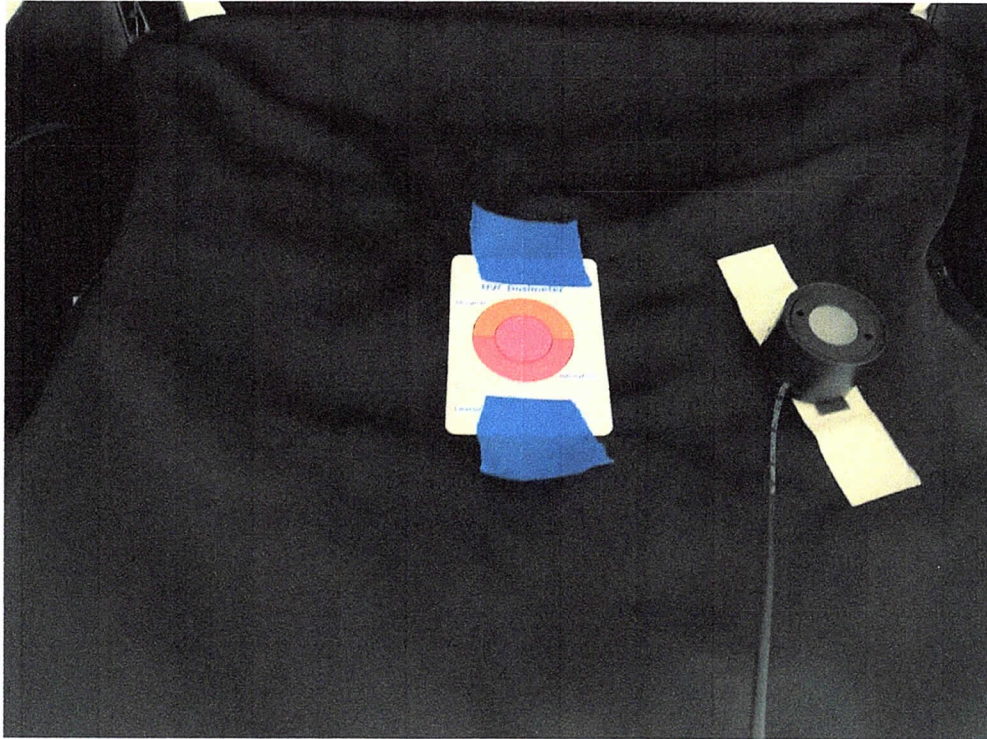


T13 - BOT(DWN) [BOT|Pos 2]

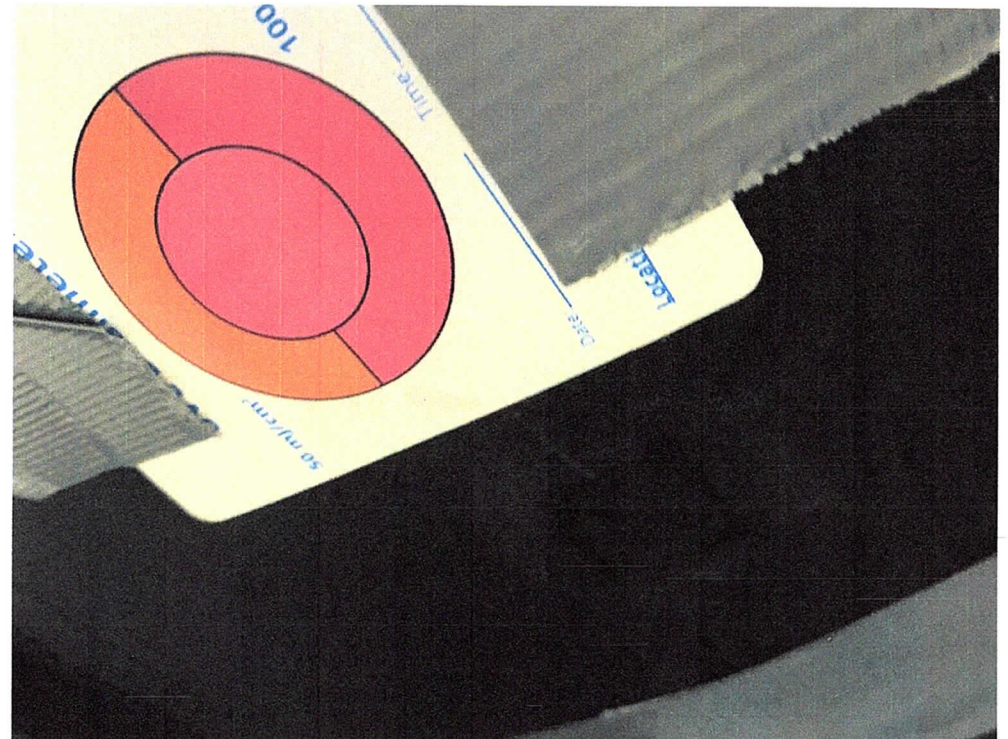


T12 - TOP(UP) - [TOP|Pos 2]

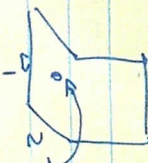
T = 100 Seconds



T12 – TOP(UP) - [TOP | Pos 2]



T13 – BOT(DWN) [BOT | Pos 2]



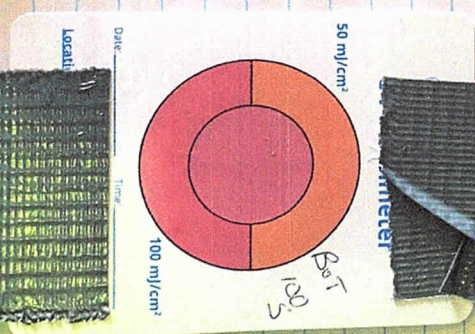
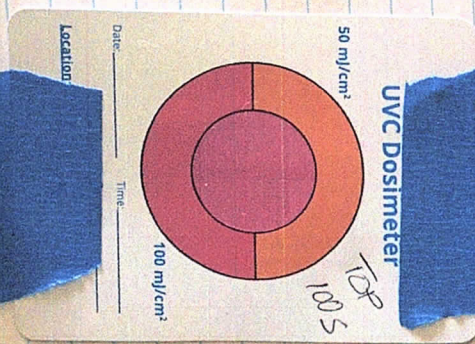
(2) Top (up)

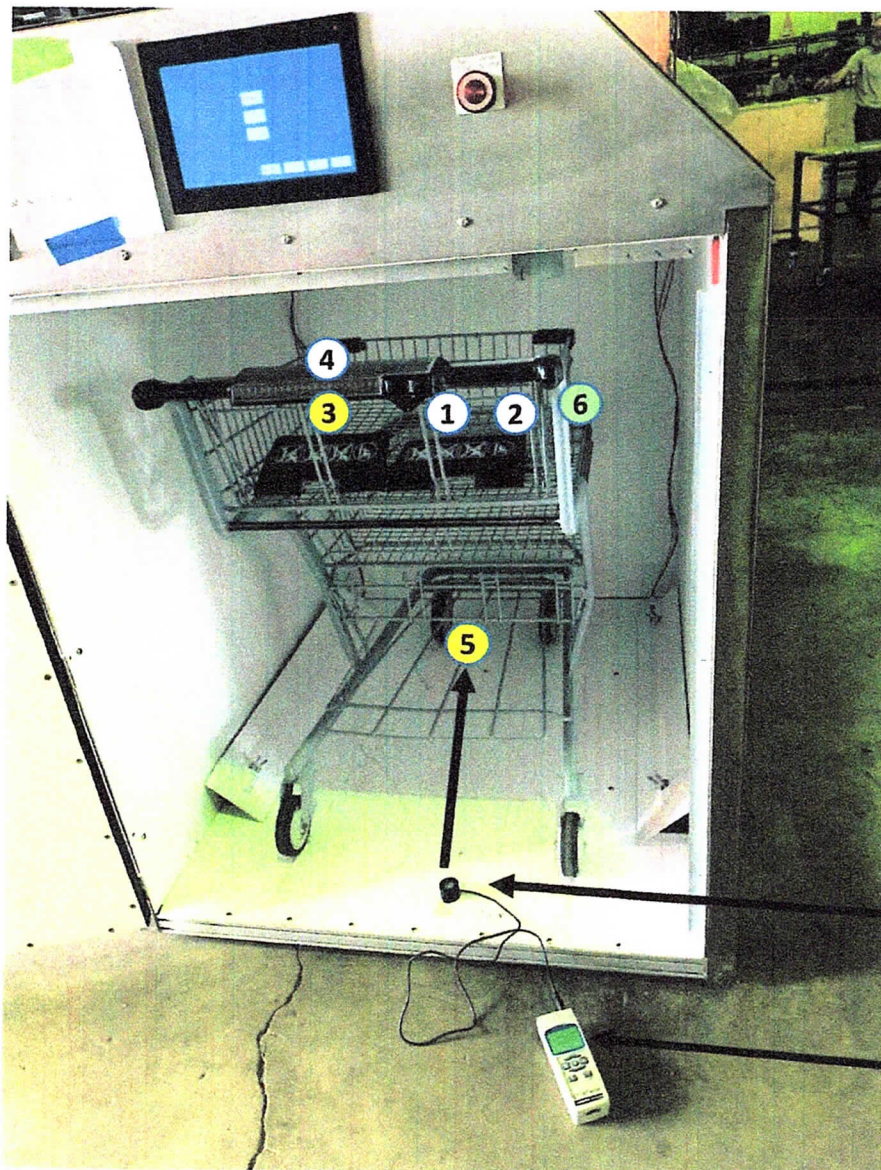
50 100
(30s) (70s)

(1) Bot (Down)

(100s) (240)

2:40 PM
115
116
117
30
40
30
140
70
100
240





Testing Configuration

Date: September 01, 2020

Location: Surface to Surface

TEMP: Not Recorded

HUMIDITY: Not Recorded

Sensor Facing Down

Sensor Facing Up

Sensor Facing Side

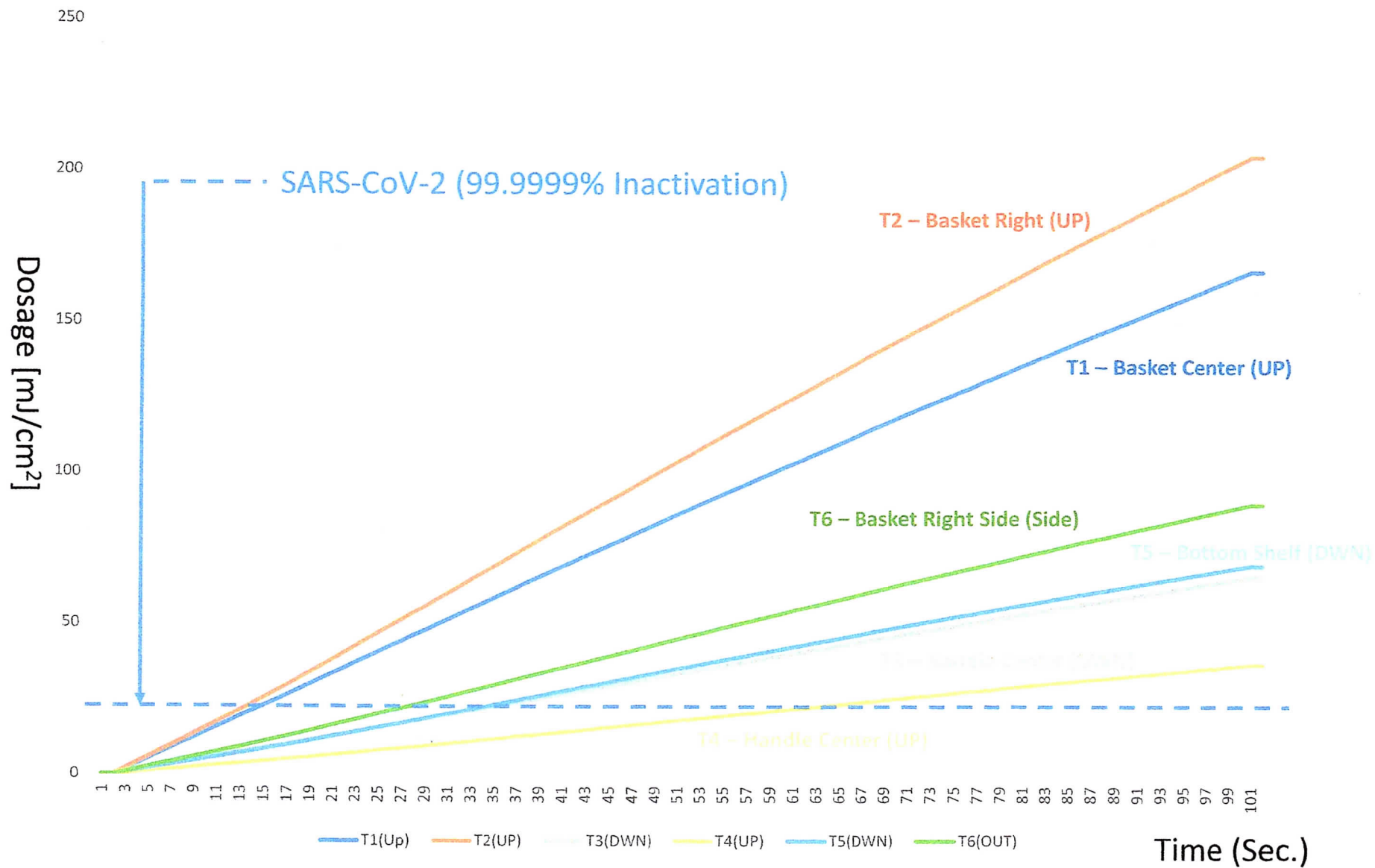
UV-C Meter (PROBE)

- At sensor locations and orientations as shown

UV-C Meter (1-s sampling rate)

- Narrow Band around 254 nm

Shopping Cart – Dosage (mJ/cm²) vs. time – Positional Measurements



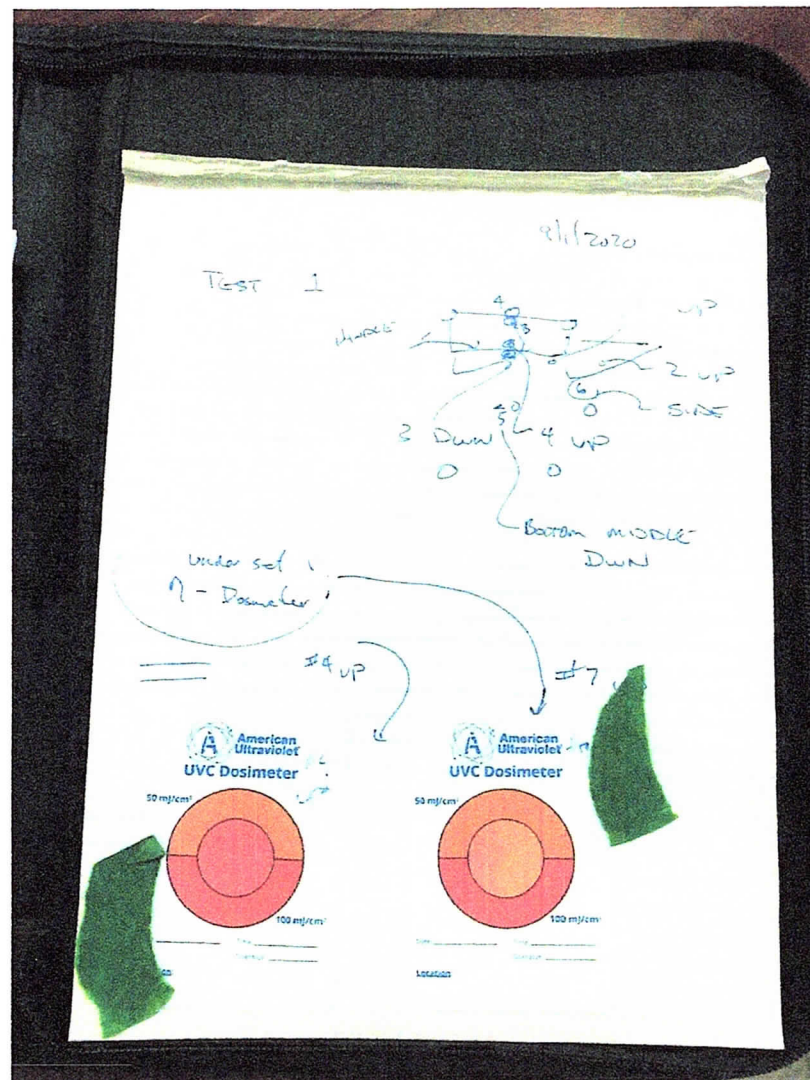


Photo taken September 01, 2020



T = 100 Seconds

Results

Position 7 – Under seat (UP)

- $\sim 40 \text{ mJ/cm}^2$

Position 4 – Handle (UP)

- $\sim 80 \text{ mJ/cm}^2$

Photo taken September 01, 2020