# SHADOWSENSE PERFORMANCE REPORT: OPERATING TEMPERATURES

## DOCUMENT REVISION HISTORY

| Revision | Date | Author | Comments |
|---|---|---|---|
| **1.0** | Oct\06\2016 | John La | Created the document |

## 1.0 Objective

The purpose of this experiment is to measure and evaluate the long term effects of high operating temperatures on the IR LEDs used in a ShadowSense touch frame.

## 1.1 Equipment

The equipment used during the entire test:

- Baanto SDW656W1 ShadowSense touch frame with firmware version 7.30
- Baanto Dashboard software
- Custom built temperature controlled heat chamber
- PC running Windows 8

## 1.2 Setup

A custom designed heat chamber was constructed using 2 inch thick foam insulation material to house various sizes of Baanto ShadowSense touch frames. The chamber is shown in Figure 1.

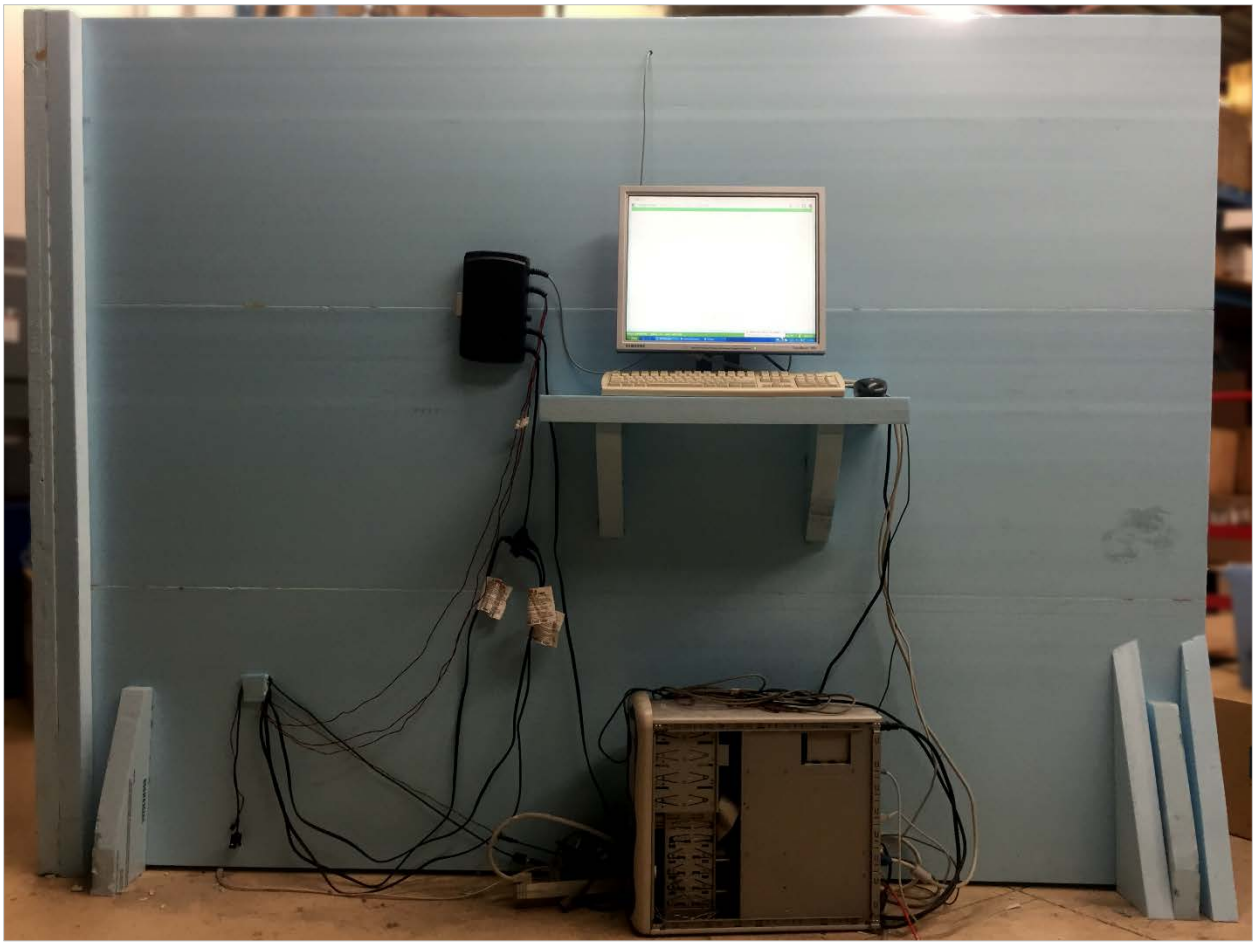

*Figure 1: Temperature Controlled Heat Chamber*

A temperature controller was then affixed to the chamber and a temperature probe was inserted through the side of the chamber to provide constant temperature readings. The controller was also connected to heaters placed inside the chamber to regulate the internal temperature of the chamber. The temperature controller is shown in Figure 2. The internal temperature of the chamber was maintained at 70° C at all times with minor fluctuations of no more than +/- 0.1° C.

*Figure 2: Temperature Controller*

Before placing the 65.5” SDW656W1 evaluation frame into the chamber it was tested to ensure that it worked properly. The frame was assembled and connected to the PC through a USB connection and powered with a 12V power supply. Dashboard was used to reset the configuration parameters to their default settings and the LED views were examined to confirm that there were no anomalies with the device under test. This was followed by some basic drawing tests to confirm the system performance.

Once the baseline readings were recorded, the frame was placed inside the chamber and shut tightly. Conduits were provided to allow for power and USB connections to be connected to the frame at all times for the duration of the test. This allowed a computer to be connected to the frame so that Dashboard could be used to interrogate the frame throughout the testing period and to sample the LED data without removing the frame from the heat chamber and compromising the internal temperature.

## 2.0 Method

A standard ShadowSense frame consists of 6 sensors along the top of the frame and IR LEDs along the left, bottom and right edges. Each of the sensors is able to see each and every LED with the exception of the sensors in the top corners of the frame. The corner sensors cannot see the LEDs that are located directly below them on the sides of the frame.

With the ShadowSense frame isolated in the heat chamber, LED values for several LEDs were collected at random intervals throughout the testing process. The LED values were captured using Dashboard and the LED Data View shown in Figure 3.

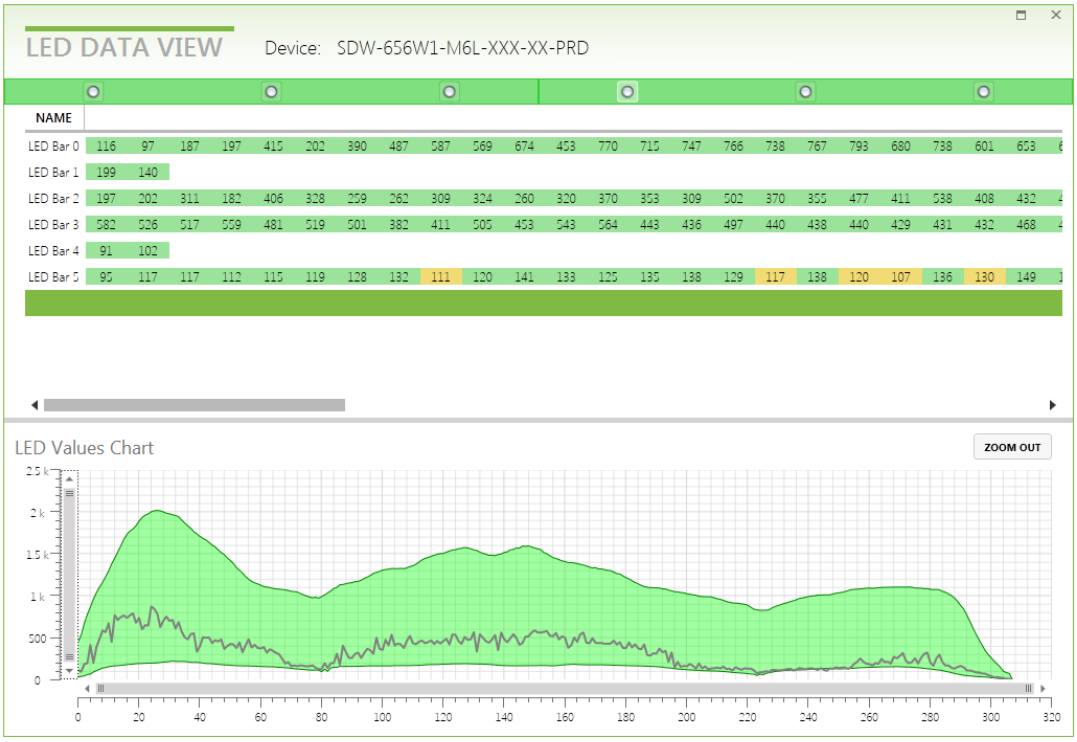


*Figure 3: LED Data View from Dashboard*

Only LEDs along the bottom edge of the frame were monitored since they are the only ones that are visible by all of the sensors.

This data was continuously collected during a span of over 10,000 hours. Each time, data for all 6 sensors was recorded for all LEDs under test. In the meantime, the internal temperature remained constant at 70° C.

## 2.1 Results

The LED data for several LEDs were collected for each of the 6 sensors and compiled in a spreadsheet. At the time of writing, over 10,389 hours had elapsed and during this time the frame was interrogated 232 times. Each time, the LED data was recorded and the average of all 6 sensors was calculated. A subset of the collected data taken at approximately 1,000 hour intervals for LED160 is shown in Table 1. For the complete set of results, refer to the table in the Appendix at the end of this document.

*Table 1: LED Data Collected at 1,000 Hour Intervals (LED160)*

| Hours | Average | Sensor0 | Sensor1 | Sensor2 | Sensor3 | Sensor4 | Sensor5 |
|---|---|---|---|---|---|---|---|
| **1** | 190.50 | 100 | 170 | 248 | 244 | 241 | 140 |
| **1014** | 194.33 | 98 | 172 | 253 | 250 | 248 | 145 |
| **2020** | 191.17 | 92 | 168 | 250 | 245 | 246 | 146 |
| **3001** | 187.50 | 84 | 158 | 246 | 241 | 246 | 150 |
| **4068** | 186.00 | 83 | 157 | 244 | 238 | 244 | 150 |
| **5016** | 184.33 | 83 | 155 | 243 | 236 | 240 | 149 |
| **6001** | 183.33 | 82 | 154 | 242 | 235 | 238 | 149 |
| **7007** | 182.00 | 82 | 154 | 241 | 233 | 235 | 147 |
| **8087** | 179.33 | 79 | 152 | 238 | 230 | 231 | 146 |
| **9001** | 179.00 | 80 | 151 | 238 | 229 | 230 | 146 |
| **10181** | 178.17 | 79 | 151 | 237 | 228 | 229 | 145 |

The LED data for each sensor and the average was then plotted to visualize the trend. This graph is shown in Figure 4. The line for each sensor is indicated in the legend while the thin black lines represent the best fit trend line for each respective set of data points.

The data obtained by taking the average of all 6 sensors was also used to calculate the exponential fit diming curve for an LED. This curve along with the actual measured data is shown in Figure 5 for comparison.

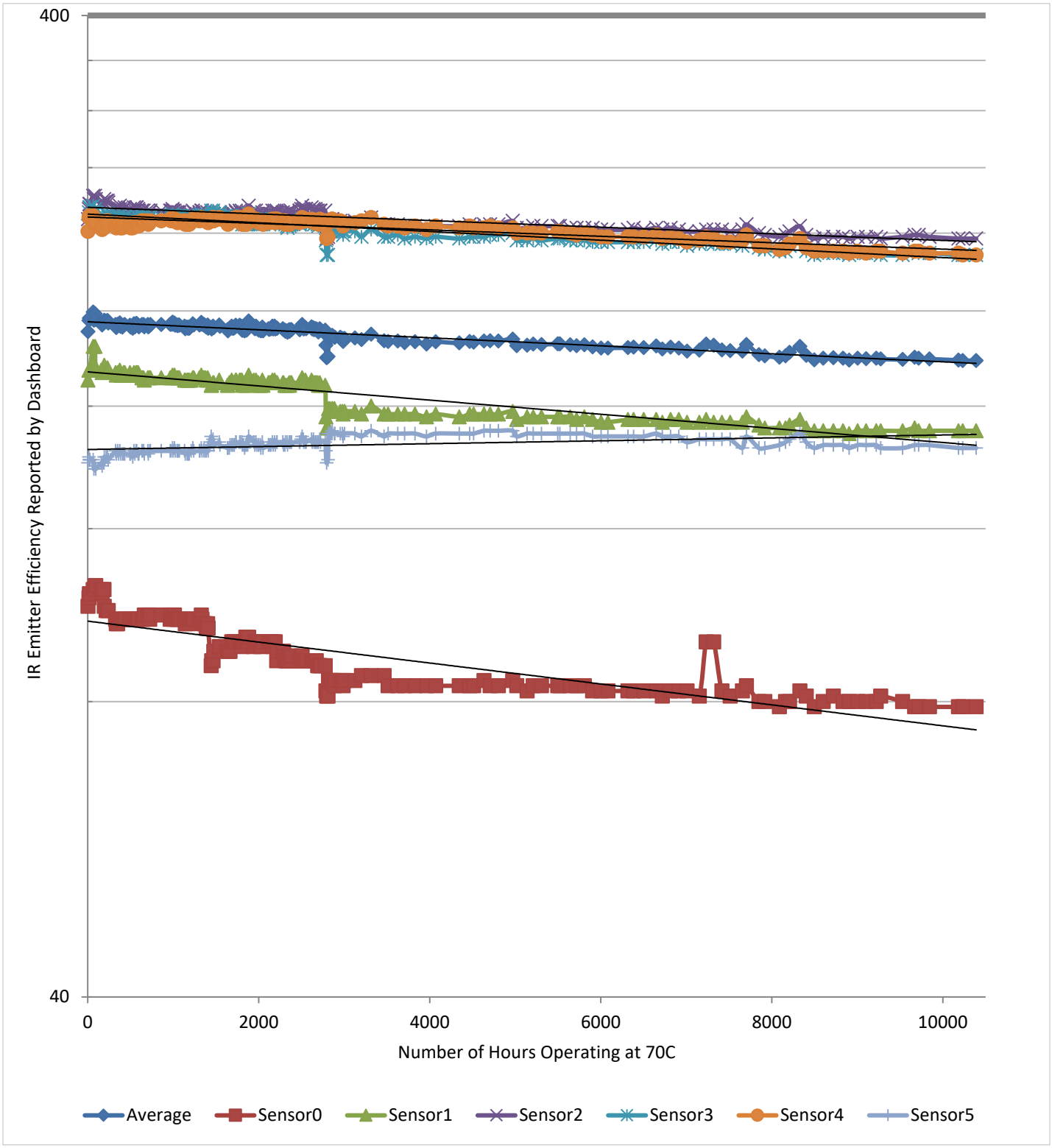


*Figure 4: Graph of IR Emitter Efficiency vs. Number of Hours Operating at 70° C*

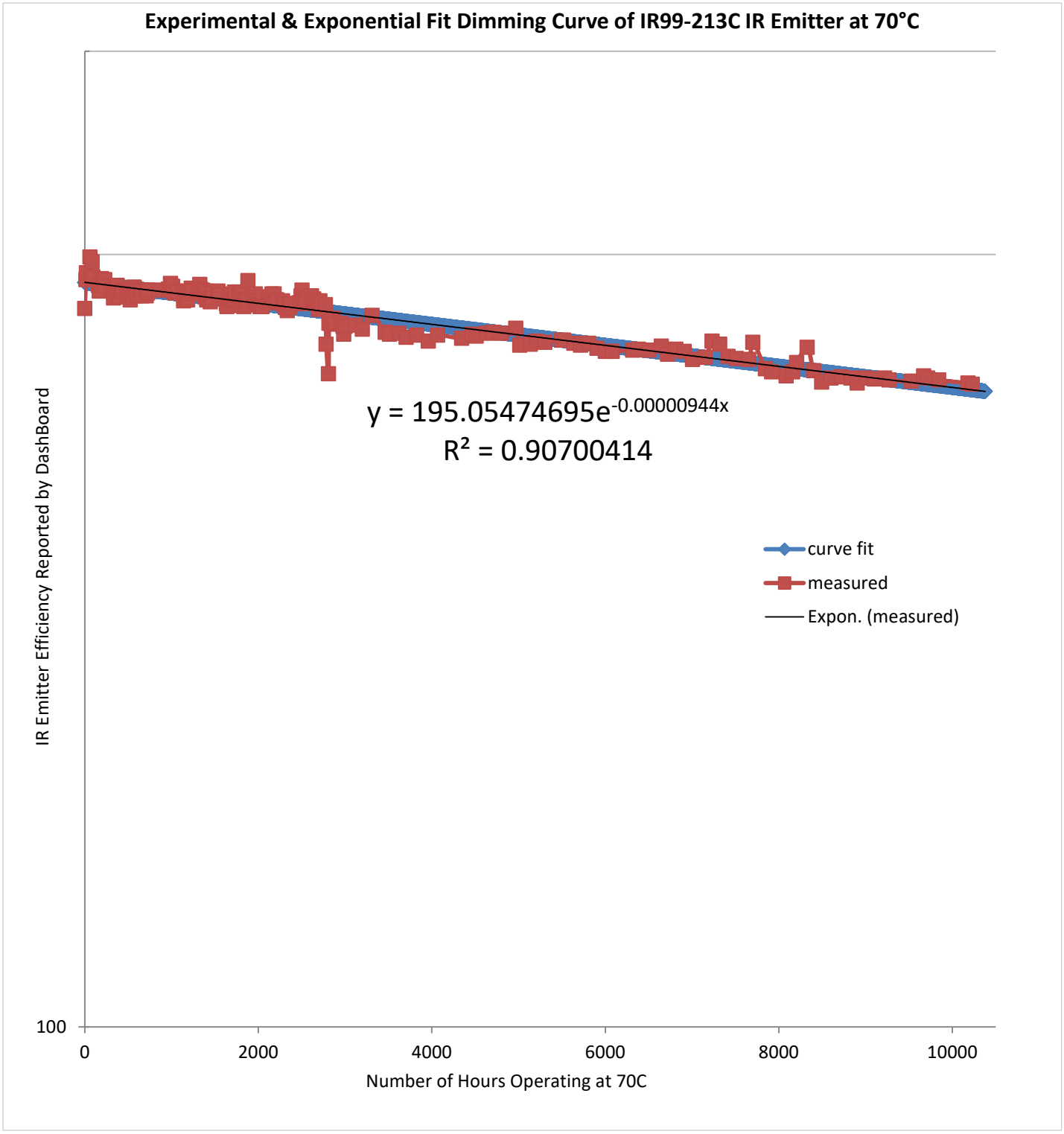


*Figure 5: Graph of Experimental and Exponential Fit Dimming Curve*

## 3.0 Conclusion

When subjected to constant operating temperatures of 70° C the IR LEDs in a ShadowSense frame have been shown to perform consistently for over 10,000 hours. During the span of this time, the efficiency of the LEDs only diminished slightly at a rate of 0.00095% per hour on average. More importantly, none of the 308 IR LEDs used within the SDW656 frame under test failed during the experiment.

Using the exponential fit diming curve, the LED life at various diming levels can be predicted when operating at 70° C. The predicted life at L70 (the point in which the LED has dimmed to 70% of its original output) is approximately 38,000 hours while at L20, the predicted life is over 171,000 hours.

# Appendix: Complete Results of Temperature Analysis

| Column | Hours | Average | Sensor0 | Sensor1 | Sensor2 | Sensor3 | Sensor4 | Sensor5 |
|---|---|---|---|---|---|---|---|---|
| **5** | 1 | 190.5 | 100 | 170 | 248 | 244 | 241 | 140 |
| **6** | 14 | 195.5 | 102 | 174 | 254 | 252 | 249 | 142 |
| **7** | 20 | 196.6667 | 103 | 174 | 257 | 255 | 250 | 141 |
| **8** | 23 | 196.6667 | 103 | 174 | 257 | 255 | 250 | 141 |
| **9** | 24 | 196.6667 | 103 | 174 | 257 | 255 | 250 | 141 |
| **10** | 62 | 199.5 | 104 | 184 | 262 | 256 | 250 | 141 |
| **11** | 72 | 195.6667 | 104 | 174 | 260 | 252 | 246 | 138 |
| **12** | 86 | 198.6667 | 105 | 184 | 262 | 254 | 248 | 139 |
| **13** | 94 | 196 | 105 | 175 | 260 | 252 | 246 | 138 |
| **14** | 157 | 194.5 | 104 | 174 | 258 | 248 | 243 | 140 |
| **15** | 167 | 193.5 | 103 | 173 | 257 | 247 | 242 | 139 |
| **16** | 184 | 194.5 | 104 | 174 | 258 | 248 | 243 | 140 |
| **17** | 190 | 194.5 | 104 | 174 | 258 | 248 | 243 | 140 |
| **19** | 193 | 195.6667 | 100 | 176 | 260 | 250 | 246 | 142 |
| **21** | 215 | 195.3333 | 99 | 174 | 259 | 251 | 247 | 142 |
| **22** | 230 | 195.5 | 99 | 175 | 259 | 251 | 247 | 142 |
| **23** | 238 | 194.3333 | 99 | 174 | 258 | 249 | 245 | 141 |
| **24** | 325 | 193.6667 | 97 | 173 | 255 | 249 | 244 | 144 |
| **25** | 334 | 192.3333 | 96 | 172 | 253 | 247 | 243 | 143 |
| **26** | 349 | 193.8333 | 96 | 173 | 255 | 250 | 245 | 144 |
| **27** | 357 | 193.3333 | 97 | 173 | 254 | 249 | 244 | 143 |
| **28** | 374 | 194.5 | 97 | 174 | 256 | 250 | 246 | 144 |
| **29** | 383 | 192.8333 | 97 | 172 | 254 | 248 | 243 | 143 |
| **30** | 405 | 192.5 | 97 | 172 | 253 | 247 | 243 | 143 |
| **31** | 419 | 193.3333 | 97 | 173 | 254 | 249 | 244 | 143 |
| **32** | 432 | 193.6667 | 97 | 173 | 255 | 249 | 245 | 143 |
| **33** | 493 | 193.3333 | 97 | 173 | 254 | 248 | 245 | 143 |
| **34** | 501 | 192.5 | 97 | 172 | 253 | 247 | 243 | 143 |
| **35** | 525 | 192 | 97 | 172 | 252 | 246 | 243 | 142 |
| **36** | 540 | 194 | 97 | 173 | 255 | 249 | 246 | 144 |
| **37** | 550 | 192.6667 | 97 | 172 | 253 | 247 | 244 | 143 |
| **38** | 564 | 194.1667 | 97 | 173 | 255 | 250 | 246 | 144 |
| **39** | 572 | 194.1667 | 97 | 173 | 255 | 250 | 246 | 144 |
| **40** | 590 | 193.5 | 97 | 173 | 254 | 249 | 245 | 143 |
| **41** | 598 | 192.6667 | 97 | 172 | 253 | 247 | 244 | 143 |
| **43** | 634 | 193.6667 | 97 | 171 | 253 | 250 | 247 | 144 |
| **44** | 636 | 193.5 | 97 | 171 | 253 | 249 | 247 | 144 |
| **45** | 653 | 193.6667 | 97 | 171 | 253 | 250 | 247 | 144 |
| **46** | 660 | 192.6667 | 98 | 170 | 251 | 248 | 246 | 143 |
| **47** | 701 | 193.6667 | 98 | 171 | 253 | 249 | 247 | 144 |
| **48** | 708 | 192.6667 | 98 | 171 | 251 | 248 | 245 | 143 |
| **49** | 725 | 193.1667 | 97 | 171 | 252 | 249 | 246 | 144 |
| **50** | 732 | 193.6667 | 98 | 171 | 253 | 249 | 247 | 144 |
| **51** | 860 | 193.6667 | 98 | 171 | 253 | 249 | 247 | 144 |
| **52** | 965 | 193.8333 | 97 | 171 | 253 | 250 | 248 | 144 |
| **53** | 975 | 193.8333 | 98 | 171 | 253 | 250 | 247 | 144 |
| **54** | 990 | 194.8333 | 98 | 172 | 254 | 251 | 249 | 145 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **55** | 998 | 193.8333 | 97 | 171 | 253 | 250 | 248 | 144 |
| **56** | 1014 | 194.3333 | 98 | 172 | 253 | 250 | 248 | 145 |
| **57** | 1022 | 193.3333 | 97 | 171 | 252 | 249 | 247 | 144 |
| **58** | 1043 | 193.5 | 97 | 171 | 252 | 250 | 247 | 144 |
| **59** | 1048 | 193.1667 | 97 | 171 | 252 | 249 | 246 | 144 |
| **60** | 1063 | 193.5 | 97 | 171 | 252 | 250 | 247 | 144 |
| **61** | 1072 | 193.3333 | 97 | 171 | 252 | 249 | 247 | 144 |
| **62** | 1133 | 193 | 97 | 170 | 251 | 249 | 247 | 144 |
| **63** | 1140 | 191.8333 | 96 | 170 | 250 | 247 | 245 | 143 |
| **64** | 1163 | 192.5 | 97 | 170 | 251 | 248 | 246 | 143 |
| **65** | 1170 | 192 | 97 | 170 | 250 | 247 | 245 | 143 |
| **66** | 1181 | 192.5 | 97 | 170 | 251 | 248 | 246 | 143 |
| **67** | 1188 | 192 | 96 | 170 | 250 | 248 | 245 | 143 |
| **68** | 1208 | 193 | 97 | 170 | 251 | 249 | 247 | 144 |
| **69** | 1229 | 194 | 97 | 171 | 253 | 250 | 248 | 145 |
| **70** | 1238 | 193.5 | 97 | 171 | 252 | 250 | 247 | 144 |
| **71** | 1306 | 193.5 | 97 | 171 | 252 | 250 | 247 | 144 |
| **72** | 1311 | 193.6667 | 97 | 171 | 252 | 250 | 248 | 144 |
| **73** | 1328 | 194.6667 | 98 | 172 | 253 | 251 | 249 | 145 |
| **74** | 1336 | 193.8333 | 97 | 171 | 253 | 250 | 248 | 144 |
| **75** | 1359 | 193.3333 | 96 | 171 | 252 | 249 | 248 | 144 |
| **76** | 1361 | 193.6667 | 96 | 171 | 252 | 250 | 248 | 145 |
| **77** | 1378 | 193 | 96 | 171 | 251 | 249 | 247 | 144 |
| **78** | 1384 | 192.5 | 95 | 170 | 251 | 248 | 247 | 144 |
| **79** | 1401 | 193.5 | 96 | 171 | 252 | 249 | 248 | 145 |
| **80** | 1408 | 192 | 95 | 170 | 250 | 247 | 246 | 144 |
| **82** | 1443 | 192.3333 | 87 | 168 | 249 | 253 | 248 | 149 |
| **83** | 1449 | 191.6667 | 88 | 168 | 249 | 251 | 247 | 147 |
| **84** | 1464 | 193 | 88 | 169 | 251 | 253 | 249 | 148 |
| **85** | 1472 | 192.3333 | 90 | 169 | 251 | 251 | 247 | 146 |
| **86** | 1537 | 193.5 | 91 | 170 | 252 | 252 | 249 | 147 |
| **87** | 1545 | 192.8333 | 91 | 169 | 252 | 251 | 248 | 146 |
| **88** | 1634 | 191.3333 | 90 | 168 | 250 | 249 | 246 | 145 |
| **89** | 1640 | 190.8333 | 90 | 168 | 249 | 248 | 245 | 145 |
| **90** | 1656 | 191.8333 | 90 | 169 | 250 | 250 | 247 | 145 |
| **91** | 1663 | 192.1667 | 90 | 169 | 251 | 250 | 247 | 146 |
| **92** | 1682 | 193 | 92 | 170 | 252 | 250 | 248 | 146 |
| **93** | 1687 | 192 | 92 | 169 | 251 | 247 | 247 | 146 |
| **94** | 1705 | 192 | 92 | 169 | 251 | 247 | 247 | 146 |
| **95** | 1712 | 192.1667 | 92 | 169 | 251 | 248 | 247 | 146 |
| **96** | 1729 | 193.3333 | 92 | 170 | 253 | 249 | 249 | 147 |
| **97** | 1735 | 192.8333 | 92 | 170 | 252 | 248 | 248 | 147 |
| **98** | 1777 | 193.3333 | 92 | 170 | 253 | 249 | 249 | 147 |
| **99** | 1785 | 192.8333 | 92 | 170 | 252 | 248 | 248 | 147 |
| **100** | 1800 | 192.8333 | 91 | 170 | 253 | 248 | 248 | 147 |
| **101** | 1808 | 191 | 92 | 168 | 250 | 245 | 245 | 146 |
| **102** | 1823 | 192 | 92 | 169 | 251 | 247 | 247 | 146 |
| **103** | 1834 | 190.8333 | 92 | 168 | 250 | 245 | 245 | 145 |
| **104** | 1848 | 191.8333 | 93 | 169 | 251 | 246 | 246 | 146 |
| **105** | 1855 | 191.1667 | 93 | 168 | 250 | 245 | 245 | 146 |
| **106** | 1871 | 191.8333 | 92 | 169 | 251 | 246 | 247 | 146 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **107** | 1881 | 195.3333 | 93 | 172 | 256 | 251 | 251 | 149 |
| **108** | 1943 | 192.8333 | 91 | 170 | 253 | 248 | 248 | 147 |
| **109** | 1952 | 191.8333 | 92 | 169 | 251 | 246 | 247 | 146 |
| **110** | 1967 | 193 | 92 | 170 | 253 | 248 | 248 | 147 |
| **111** | 1976 | 191.8333 | 92 | 169 | 251 | 246 | 247 | 146 |
| **112** | 1993 | 191.8333 | 92 | 169 | 251 | 246 | 247 | 146 |
| **113** | 1999 | 191.1667 | 92 | 168 | 250 | 245 | 246 | 146 |
| **114** | 2020 | 191.1667 | 92 | 168 | 250 | 245 | 246 | 146 |
| **115** | 2023 | 190.8333 | 91 | 168 | 250 | 245 | 246 | 145 |
| **116** | 2040 | 192.5 | 92 | 170 | 252 | 247 | 247 | 147 |
| **117** | 2048 | 190.8333 | 92 | 168 | 250 | 245 | 245 | 145 |
| **118** | 2112 | 191.8333 | 92 | 169 | 251 | 246 | 247 | 146 |
| **119** | 2121 | 191.5 | 92 | 169 | 251 | 245 | 246 | 146 |
| **120** | 2135 | 191.8333 | 92 | 169 | 251 | 246 | 247 | 146 |
| **121** | 2143 | 191.8333 | 92 | 169 | 251 | 246 | 247 | 146 |
| **122** | 2160 | 193 | 92 | 170 | 253 | 248 | 248 | 147 |
| **123** | 2168 | 191.6667 | 91 | 169 | 251 | 246 | 247 | 146 |
| **124** | 2184 | 193 | 92 | 170 | 253 | 248 | 248 | 147 |
| **125** | 2192 | 191.6667 | 92 | 169 | 251 | 246 | 246 | 146 |
| **126** | 2208 | 192 | 88 | 169 | 253 | 247 | 248 | 147 |
| **127** | 2215 | 192 | 90 | 169 | 252 | 246 | 248 | 147 |
| **128** | 2281 | 191.8333 | 90 | 169 | 252 | 246 | 247 | 147 |
| **129** | 2289 | 191.3333 | 90 | 169 | 251 | 246 | 246 | 146 |
| **130** | 2304 | 191.1667 | 89 | 168 | 251 | 246 | 247 | 146 |
| **131** | 2312 | 190.6667 | 88 | 168 | 251 | 245 | 245 | 147 |
| **132** | 2329 | 190.8333 | 88 | 168 | 252 | 244 | 246 | 147 |
| **133** | 2336 | 190.1667 | 88 | 168 | 251 | 243 | 245 | 146 |
| **134** | 2355 | 191.3333 | 89 | 169 | 252 | 245 | 246 | 147 |
| **135** | 2360 | 190.6667 | 88 | 168 | 252 | 244 | 245 | 147 |
| **136** | 2375 | 191.3333 | 88 | 169 | 253 | 245 | 246 | 147 |
| **137** | 2383 | 191.3333 | 89 | 169 | 252 | 245 | 246 | 147 |
| **138** | 2476 | 191.5 | 88 | 169 | 253 | 245 | 247 | 147 |
| **139** | 2480 | 191.3333 | 88 | 169 | 253 | 245 | 246 | 147 |
| **140** | 2495 | 192.6667 | 89 | 170 | 254 | 247 | 248 | 148 |
| **141** | 2506 | 193.6667 | 89 | 171 | 256 | 248 | 249 | 149 |
| **142** | 2519 | 192.5 | 88 | 170 | 254 | 247 | 248 | 148 |
| **143** | 2526 | 191.6667 | 88 | 169 | 253 | 246 | 247 | 147 |
| **144** | 2544 | 192.3333 | 88 | 170 | 254 | 247 | 248 | 147 |
| **145** | 2552 | 191.8333 | 88 | 169 | 254 | 246 | 247 | 147 |
| **146** | 2616 | 192.6667 | 88 | 170 | 255 | 247 | 248 | 148 |
| **147** | 2625 | 191.6667 | 88 | 169 | 253 | 246 | 247 | 147 |
| **148** | 2639 | 192.1667 | 88 | 169 | 254 | 247 | 247 | 148 |
| **149** | 2648 | 191.3333 | 88 | 169 | 253 | 245 | 246 | 147 |
| **150** | 2663 | 191.8333 | 88 | 169 | 254 | 246 | 247 | 147 |
| **151** | 2672 | 191.6667 | 88 | 169 | 253 | 246 | 247 | 147 |
| **152** | 2687 | 191.3333 | 87 | 169 | 253 | 245 | 247 | 147 |
| **153** | 2696 | 190.3333 | 87 | 168 | 251 | 244 | 245 | 147 |
| **154** | 2712 | 191.8333 | 87 | 169 | 253 | 246 | 248 | 148 |
| **155** | 2722 | 191.1667 | 87 | 168 | 253 | 245 | 247 | 147 |
| **156** | 2775 | 191.1667 | 87 | 168 | 253 | 245 | 247 | 147 |
| **157** | 2784 | 184.5 | 82 | 156 | 245 | 236 | 244 | 144 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **158** | 2792.5 | 179.1667 | 81 | 152 | 237 | 228 | 237 | 140 |
| **159** | 2809 | 179.6667 | 81 | 152 | 238 | 228 | 238 | 141 |
| **160** | 2816 | 188 | 84 | 159 | 247 | 241 | 247 | 150 |
| **161** | 2832 | 188.1667 | 84 | 159 | 247 | 242 | 247 | 150 |
| **162** | 2839 | 187.8333 | 84 | 158 | 247 | 241 | 247 | 150 |
| **163** | 2855 | 188.5 | 84 | 159 | 248 | 242 | 248 | 150 |
| **164** | 2859 | 188.8333 | 84 | 159 | 248 | 243 | 248 | 151 |
| **165** | 2883 | 188 | 83 | 159 | 247 | 242 | 247 | 150 |
| **166** | 2888 | 188 | 84 | 158 | 247 | 242 | 247 | 150 |
| **167** | 2952 | 188 | 84 | 158 | 247 | 242 | 247 | 150 |
| **168** | 2977 | 187.5 | 84 | 158 | 246 | 241 | 246 | 150 |
| **169** | 2985 | 186.1667 | 83 | 157 | 245 | 239 | 244 | 149 |
| **170** | 3001 | 187.5 | 84 | 158 | 246 | 241 | 246 | 150 |
| **171** | 3123 | 187.6667 | 84 | 158 | 247 | 241 | 246 | 150 |
| **172** | 3201 | 187 | 85 | 157 | 246 | 238 | 247 | 149 |
| **173** | 3314 | 189.3333 | 85 | 160 | 249 | 242 | 249 | 151 |
| **174** | 3464 | 186.5 | 85 | 157 | 245 | 238 | 245 | 149 |
| **175** | 3512 | 186.1667 | 83 | 157 | 245 | 238 | 244 | 150 |
| **176** | 3624 | 186.3333 | 83 | 157 | 245 | 239 | 244 | 150 |
| **177** | 3706 | 185.6667 | 83 | 157 | 244 | 237 | 243 | 150 |
| **178** | 3825 | 186 | 83 | 157 | 244 | 238 | 244 | 150 |
| **179** | 3960 | 185 | 83 | 156 | 243 | 237 | 242 | 149 |
| **180** | 4068 | 186 | 83 | 157 | 244 | 238 | 244 | 150 |
| **181** | 4345 | 185.5 | 83 | 156 | 244 | 237 | 243 | 150 |
| **182** | 4466 | 186.1667 | 83 | 157 | 245 | 238 | 244 | 150 |
| **183** | 4512 | 185.8333 | 83 | 157 | 244 | 238 | 243 | 150 |
| **184** | 4632 | 186.3333 | 84 | 157 | 245 | 238 | 243 | 151 |
| **185** | 4704 | 186.5 | 83 | 157 | 245 | 239 | 244 | 151 |
| **186** | 4800 | 186.3333 | 83 | 157 | 245 | 239 | 243 | 151 |
| **187** | 4968 | 187.1667 | 84 | 158 | 247 | 240 | 243 | 151 |
| **188** | 5016 | 184.3333 | 83 | 155 | 243 | 236 | 240 | 149 |
| **189** | 5136 | 184.5 | 82 | 156 | 243 | 236 | 240 | 150 |
| **190** | 5208 | 185 | 83 | 156 | 244 | 237 | 240 | 150 |
| **191** | 5304 | 184.8333 | 83 | 156 | 244 | 236 | 240 | 150 |
| **192** | 5496 | 185.1667 | 83 | 156 | 244 | 237 | 241 | 150 |
| **193** | 5520 | 185.1667 | 83 | 156 | 244 | 237 | 241 | 150 |
| **194** | 5640 | 184.6667 | 83 | 156 | 243 | 236 | 240 | 150 |
| **195** | 5716 | 184.3333 | 83 | 155 | 243 | 236 | 239 | 150 |
| **196** | 5808 | 184.6667 | 83 | 156 | 243 | 236 | 240 | 150 |
| **197** | 5904 | 183.8333 | 82 | 155 | 243 | 235 | 239 | 149 |
| **198** | 6001 | 183.3333 | 82 | 154 | 242 | 235 | 238 | 149 |
| **199** | 6081 | 183.3333 | 82 | 154 | 242 | 235 | 238 | 149 |
| **200** | 6317 | 183.5 | 82 | 155 | 242 | 235 | 238 | 149 |
| **201** | 6382 | 183.6667 | 82 | 155 | 243 | 235 | 238 | 149 |
| **202** | 6502 | 183.5 | 82 | 155 | 242 | 235 | 238 | 149 |
| **203** | 6647 | 184.1667 | 82 | 155 | 243 | 236 | 239 | 150 |
| **204** | 6719 | 182.8333 | 81 | 154 | 242 | 234 | 237 | 149 |
| **205** | 6814 | 183.6667 | 82 | 155 | 243 | 235 | 238 | 149 |
| **206** | 6911 | 183.3333 | 82 | 155 | 242 | 235 | 237 | 149 |
| **207** | 7007 | 182 | 82 | 154 | 241 | 233 | 235 | 147 |
| **208** | 7150 | 182.3333 | 81 | 154 | 241 | 234 | 236 | 148 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **209** | 7232 | 185 | 92 | 155 | 242 | 235 | 238 | 148 |
| **210** | 7319 | 184.5 | 92 | 154 | 242 | 234 | 237 | 148 |
| **211** | 7415 | 182.5 | 82 | 154 | 242 | 234 | 235 | 148 |
| **212** | 7511 | 182.1667 | 81 | 154 | 241 | 234 | 235 | 148 |
| **213** | 7654 | 182 | 82 | 154 | 242 | 233 | 236 | 145 |
| **214** | 7702 | 184.8333 | 83 | 156 | 245 | 237 | 239 | 149 |
| **215** | 7847 | 180.5 | 80 | 153 | 240 | 232 | 233 | 145 |
| **216** | 7918 | 180 | 80 | 152 | 239 | 231 | 233 | 145 |
| **217** | 8087 | 179.3333 | 79 | 152 | 238 | 230 | 231 | 146 |
| **218** | 8160 | 180 | 80 | 152 | 239 | 230 | 232 | 147 |
| **219** | 8207 | 181.5 | 80 | 153 | 241 | 233 | 234 | 148 |
| **220** | 8327 | 184 | 82 | 155 | 244 | 236 | 237 | 150 |
| **221** | 8401 | 180.1667 | 81 | 152 | 239 | 230 | 232 | 147 |
| **222** | 8495 | 178.3333 | 79 | 151 | 237 | 228 | 230 | 145 |
| **223** | 8601 | 179 | 80 | 151 | 238 | 229 | 230 | 146 |
| **224** | 8719 | 179.1667 | 81 | 151 | 238 | 229 | 230 | 146 |
| **225** | 8832 | 179 | 80 | 151 | 238 | 229 | 230 | 146 |
| **226** | 8903 | 178.1667 | 80 | 150 | 237 | 228 | 229 | 145 |
| **227** | 9001 | 179 | 80 | 151 | 238 | 229 | 230 | 146 |
| **228** | 9102 | 178.8333 | 80 | 151 | 238 | 229 | 229 | 146 |
| **229** | 9220 | 179 | 80 | 151 | 238 | 229 | 230 | 146 |
| **230** | 9272 | 178.6667 | 81 | 151 | 237 | 228 | 230 | 145 |
| **231** | 9527 | 178.5 | 80 | 151 | 238 | 228 | 229 | 145 |
| **232** | 9669 | 179.3333 | 79 | 152 | 239 | 230 | 230 | 146 |
| **233** | 9717 | 179 | 79 | 151 | 239 | 229 | 230 | 146 |
| **234** | 9842 | 178.6667 | 79 | 151 | 238 | 229 | 229 | 146 |
| **235** | 10181 | 178.1667 | 79 | 151 | 237 | 228 | 229 | 145 |
| **236** | 10230 | 178 | 79 | 151 | 237 | 228 | 228 | 145 |
| **237** | 10389 | 178 | 79 | 151 | 237 | 228 | 228 | 145 |