Spotlight White paper
Benefits of digital highlighting vs. laser
By Logitech, December 2017

EXECUTIVE SUMMARY

The new Logitech Spotlight Presentation Remote with digital highlighting solves the laser visibility issues on LCD screens as well as enabling highlighting on shared screens during remote presentations. It also stabilizes the user's movement on the screen by removing noticeable hand shaking when using the highlighting feature.

INTRODUCTION

Currently, in order to focus the audience's attention to a specific point or area on a slide, people have used lasers pointers or a simple stick. Laser pointers while effective, have some risk associated to them, in particular for the eyes.

A laser's light is concentrated into a narrow beam. If aimed at a person's eye from close up, most or all of the light goes through the pupil. The already-concentrated light is further focused by the lens onto a sharp ("diffraction-limited") dot on the retina.

The power density from a 1 milliwatt laser, focused to a point, is brighter than the equivalent area of the sun's surface. This can cause a detectable change (injury) to the retina, if the laser stays in one spot for a few seconds. This is why in some countries such as the U.K., laser pointers are limited to 1 milliwatt or less.[1]

Presentations are high stakes situations in people's lives and are important to their careers. Managing nerves can be difficult but is important in order to convey confidence and mastery of the presentation and subject. When using a laser pointer, even slight hand shaking will show up on the screen and will be visible to the audience.

Today, presentations are shifting from the traditional white screens to TV's and LCD screens. In fact, 20% of presentations today are done on a using a TV screen or monitor [2]. However current presentation remotes only offer lasers as a way to point out information which is an issue on LCD screens and for remote presentations. The

laser's light is not bright enough for high contrast screens and is not transmitted through the digital screen sharing.

PROBLEM – VISIBILITY OF LASER

Current lasers are not very visible on LCD screens, even green lasers, and are not visible during remote presentation. The laser light is absorbed by the LCD screen and make the laser dot barely noticeable by the audience. For a remote presentation, as the content shared is the slide screen and not a camera filming the screen, the remote audience can't see the laser.

SOLUTION

We created digital highlighting for our new Spotlight Presentation Remote to overcome current issues related to lasers. The digital highlighting is an overlay that comes on top of your slides. The digital highlighting is then shared via screen sharing.

TECHNOLOGICAL ADVANCEMENTS

We create a transparent overlay window which comes on top of the application which is displayed on the screen. This enable us to create a virtual highlighting on top of the slide. It works independently of the presentation software used. This overlay is generated by the Software and triggered by the Logitech Spotlight presentation remote.

The Logitech Spotlight Presentation Remote is also using sensor fusion to convert the hand/wrist motion on motion of the screens. Contrary to a laser where the light goes from the device directly to the screen by transmitting light, Spotlight uses an advanced algorithm to convert in-built accelerometer and gyroscope motion to move the highlighting on the screen,

METHODOLOGY AND VALIDATION

As an overall methodology, we took pictures of the screen where the screen is visible: Beamer white screen or TV LCD screen.
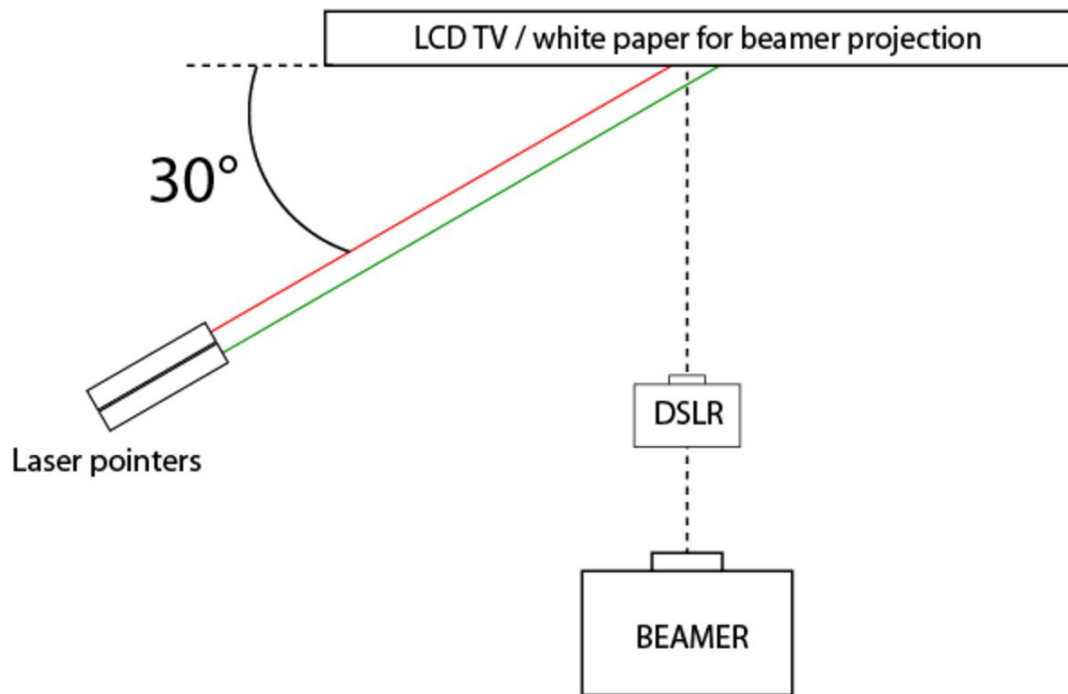
We use these pictures to simulate what the human eye sees when assisting at a presentation. We analysed the pictures taken and plotted a luminosity histogram. A bar represent the number of pixel with a certain level of luminosity in the picture.
All pixels of the image are separated with their luminance level in 256 bins (8 bits scale)
X axis represents those 256 categories
Y axis represents the cumulated amount of pixels in each categories.
Dark pixels are in the left part of the plot, whereas bright pixels are on the right.

Low visibility of red and green laser on TV/LCD screen

On the below luminosity histograms, we clearly see the amount of high luminosity pixels due to high brightness of laser spot is higher with beamer than on LCD TV Even if general brightness of picture is lower, we still see that amount of pixel with high luminosity is decreasing slowly to reach 0 on the right part of the histogram.
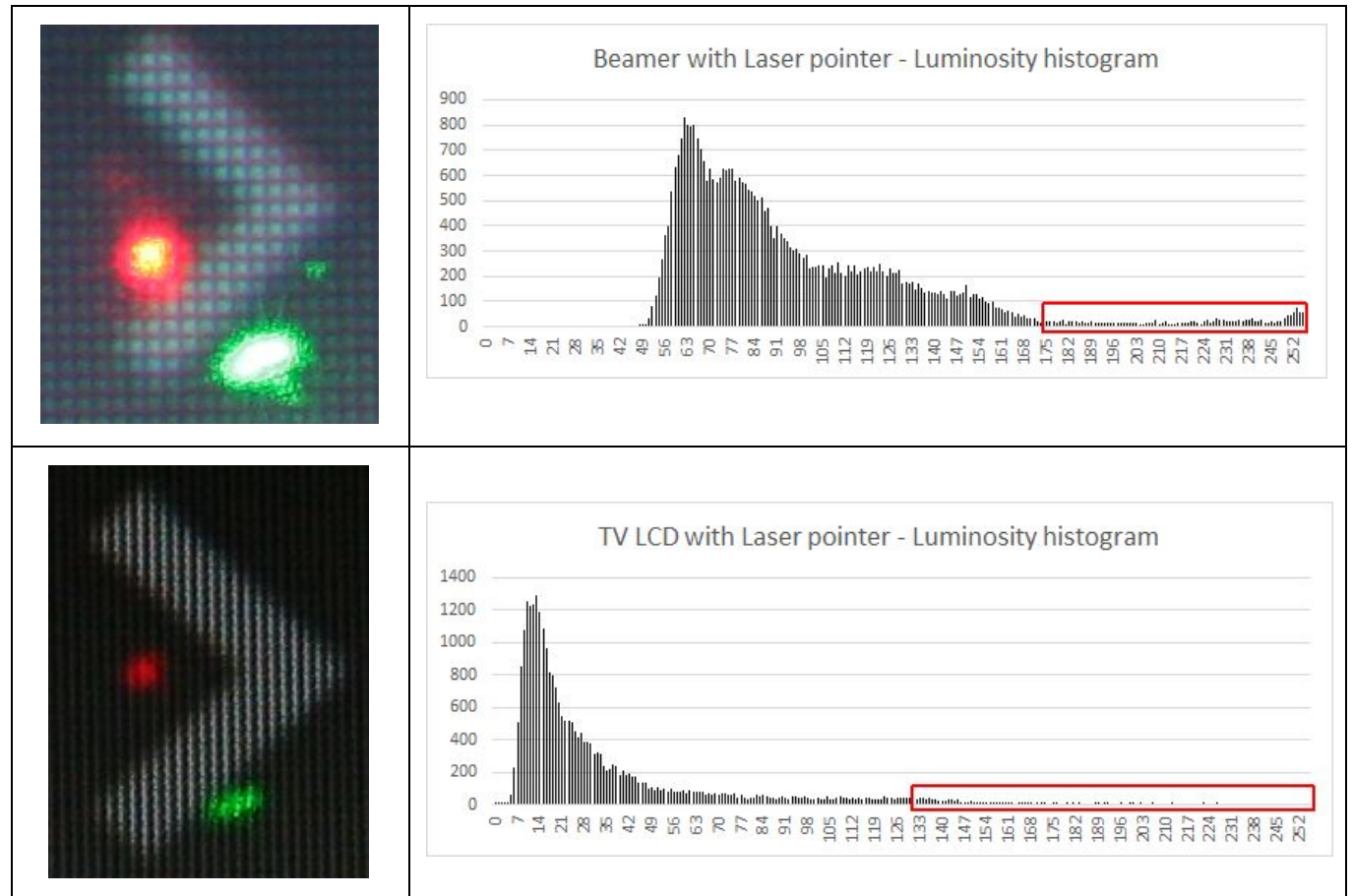
Digital highlighting is always visible

The plots below, show the luminosity histograms of the same picture, without and with digital highlighting, taken in the same condition with identical camera parameters (shutter speed, aperture, ISO)

Pink plot shows the original picture, with a medium average brightness, but also dark pixels (rocks) and more bright pixels as well (snow & sky)
When digital highlighting is on (Blue plot), overall picture luminosity is shifted to the dark (left side), and only a small amount of pixels are bright, corresponding to the highlighted area. It is the area where the audience will focus its attention.
The gap between dark & bright pixels increased drastically.

Native image, non projected, as reference

Matterhorn picture - Luminosity histogram
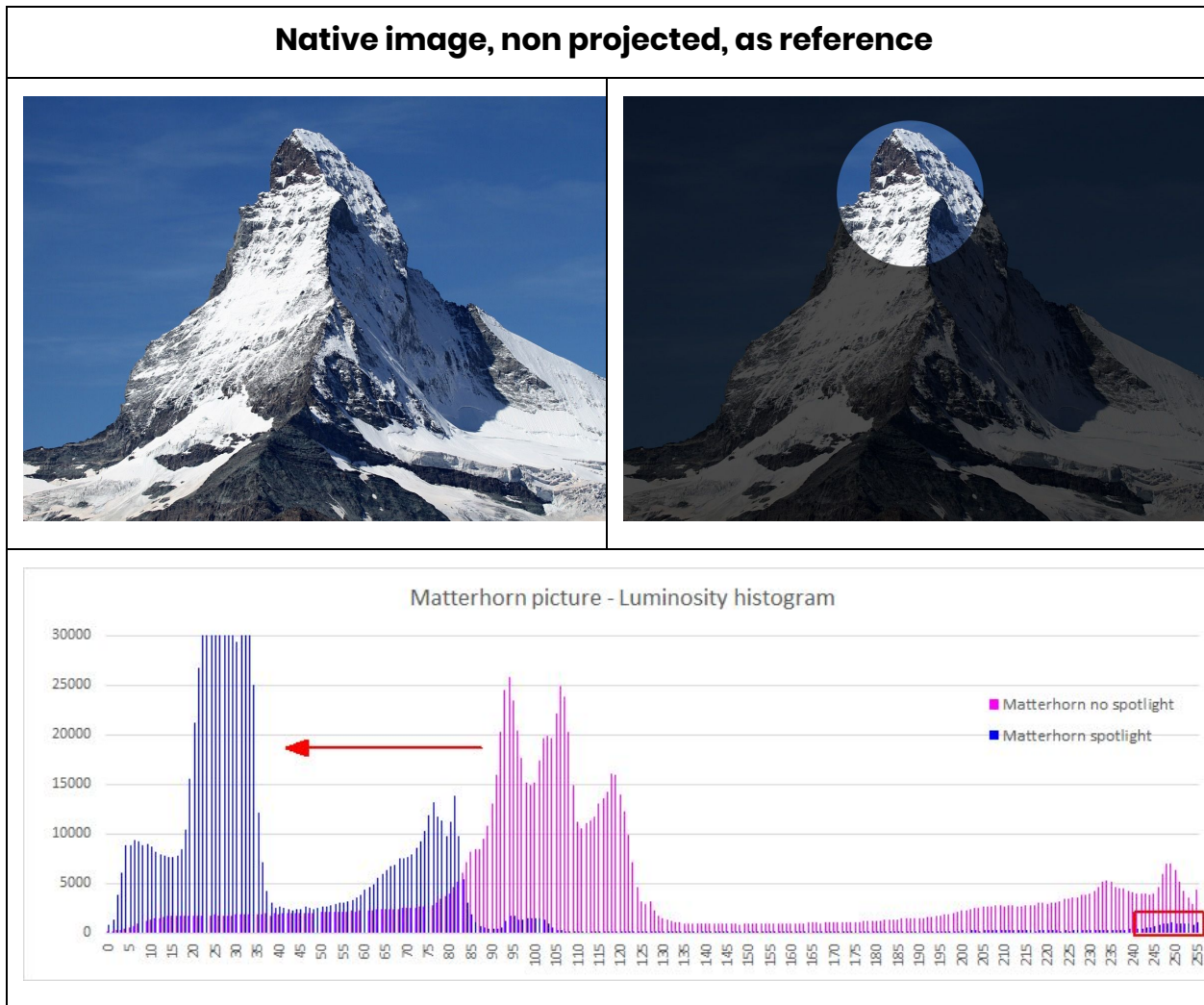
Note : For this picture, SpotLight area has been simulated with Photoshop (70% darkness outside of vignette area.

LCD TV projection and camera capture

Matterhorn picture - Luminosity histogram
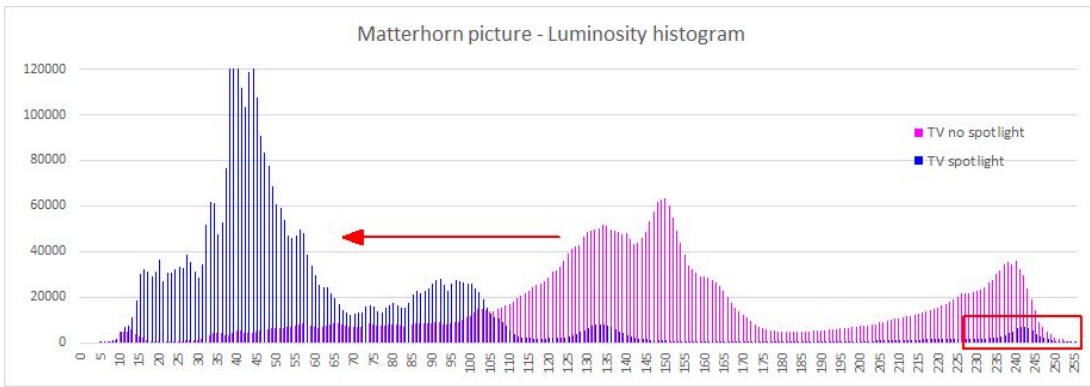
Beamer projection on white paper and camera capture

Matterhorn picture - Luminosity histogram
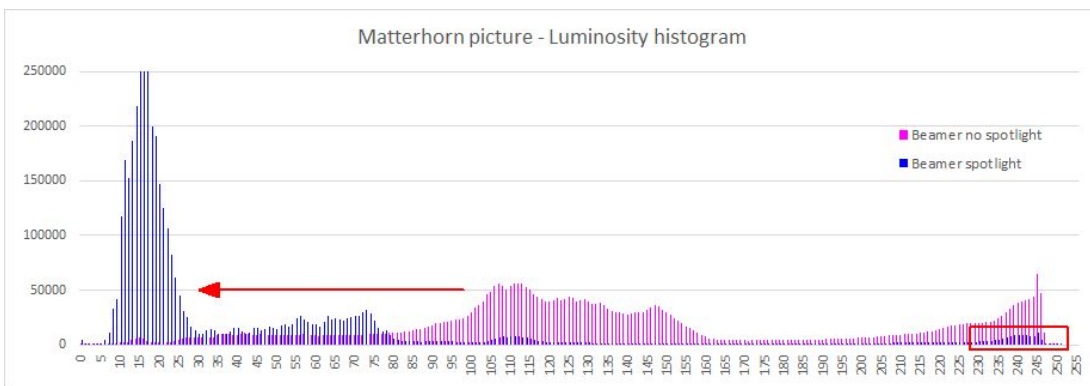
In both scenarios, the audience will have a much smaller bright area where they will focus their attention whether it is displayed on a white screen with a beamer or a TV LCD screen. The result will be similar with any method used to project/display the slide content as we can see with the native image on photoshop. The digital nature of the highlight make the result reproducible as it does not depend of the brightness or contrast of the screen.

PROBLEM – HAND TREMOR

Current devices used to highlight content show the presenter's nervousness through hand tremor. Indeed whether you use a laser or a stick, the hand tremor is immediately visible to the audience as there is no physical stabilization and it is not possible to hide it.

SOLUTION

We created digital highlighting for our new Spotlight Presentation Remote to overcome current hand tremor issues. Combine with hand tremor filter in the sensor fusion algorithm and the digital highlighting we are able to remove hand tremor to make you look more confident.

TECHNOLOGICAL ADVANCEMENTS

The Logitech Spotlight Presentation Remote uses sensor fusion to convert the hand/wrist motion on motion of the screens. We can digitally stabilize the motion by removing all motion below 1 inch/s. The result visible on screen is much more stable than a handheld laser or stick.

CONCLUSION

The Logitech Spotlight Presentation Remote with digital highlighting brings many improvements compared to the laser highlighting experience.
There is no risk to the human eye; it works with both modern screens and across remote presentations. Any hand tremor is also hidden, therefore allowing for more fearless presenting.

Reference

1. http://www.laserpointersafety.com/laser-hazards_head-eyes/laser-hazards_head-eyes.html
2. Logitech Consumer Research- US, April 2016 - Sample: 300 young professionals
3. http://www.stralsakerhetsmyndigheten.se/Global/Publikationer/Rapport/Stralskydd/2013/SSM-Rapport-2013-30.pdf
4. http://socialanxietyshortcuts.com/why-your-hands-shake-when-nervous-and-how-to-stop-it/