

Preliminary flashlight test results

The purpose of this testing was to examine illumination quality, light intensity, discharge and recovery characteristics of premium performance tactical handheld lights. Lights selected for testing:

- Streamlight Stinger
- Streamlight Ultra Stinger
- Streamlight TL-2LED
- Streamlight TL-3LED
- Streamlight TL-2
- Streamlight TL-3
- Streamlight Strion
- Streamlight Night fighter
- Inova XO3 LED 3 Watt - 82 Lumens
- Streamlight Scorpion
- Luxeon Star 5 Watt
- Surefire Nitrolon
- Surefire L2
- TAC STAR T6, 65 lumens
- Pelican M6 Lithium Flashlight
- Pelican M6 LED Flashlight
- Pelican M9 Rechargeable Flashlight System
- Brinkman MaxFire

Although we will be performing cycle testing soon, so far we have completed continuous rundown tests on the following lights:

Streamlight:

- UltraStinger - rechargeable
- Stinger - rechargeable
- Strion - rechargeable
- TL3
- TL3 LED
- TL2 LED

Pelican M9 - rechargeable

We used light meters that measures light intensity in foot-candles, data acquisition systems and computers to capture the intensity of the flashlights and discharge characteristics. While discharge characteristics are fairly straight forward to measure, there are a number of reasons why accurate, absolute light intensity measurements are difficult to acquire.

One issue is the effect of light beam color (light wavelength) and available, affordable light measuring equipment. We use Extech light meter adaptors for multimeters to measure the light. However, the instrument has to be corrected according to the "color" of the light being measured and there is no color correction factor available for flashlights. Further, Extech can not "vouch" for LED intensity measurements.

Another issue is beam shape and focus. We learned very early, that flashlight focus and beam shape can dramatically influence the reading of the light meter. Lights that are nicely focused beyond 6 feet tend to be out of focus at the very short 4 inch – 6

inch ranges required to focus the light onto the sensor. For example, the Streamlight TL3 LED light has an impressive, nicely focused and uniform beam at 6 feet, but at 4 – 6 inch distance required to focus the beam onto the sensor, there is a distinct shadow centered in the beam which affects the intensity measurement. Ostensibly some of the shadow effect is reduced by the sensor's diffuser lens, but how much is unknown.

Then there is the issue of the primary and secondary beams. The primary beam is the smaller, very bright beam in the center of the lighted area and the secondary beam is a much dimmer and much larger beam around the primary beam. Typically, at 20 feet and beyond, the primary beam will generally determine what you can see. The secondary beam does provide usable "area" light nearer the light. We only measure the primary beam.

Although the Extech meter is not "verified" for LED illumination, the readings obtained from the LED lights do seem agree with visual observations.

So, what all this means is that the tests are a good indicator of discharge characteristics and the "relative" intensity of the lights. However the absolute foot-candle intensity values may not be as accurate as desired. It is possible that the different colors of the LED light beams impacts the measurements, but the data should be a fairly good indicator of relative intensity. For example, the second graph indicates that the TL3-LED is about 25% brighter than the TL2-LED and the TL2 LED maintains its illumination just a bit longer than the TL3 LED. We can see and claim general characteristics from the data like the UltraStinger is much brighter than any other light and runs for about 60 minutes. What we cannot claim is that the UltraStinger curve represents exact candle-power, because there are just too many variables beyond our control.

An interesting characteristic readily seen on the chart is how the intensity of each light decays over time. NiCad (rechargeable w/Xenon bulb) lights hold their light intensity better than dry cell (e.g. TL3 with Sanyo CR123 batteries) but they die rather abruptly. The dry cell loses intensity almost linearly over time as can be seen by the TL3 curve.

From both visual observation and measured results, the LED lights simply don't produce anywhere near the intensity that the Xenon bulb lights do, but the LEDs last about 2.5 times as long and die very slowly. Even after some 17 hours of continuous burning, the TL3 LED still produced very useable light; it certainly wasn't "tact" light intensity but it was enough to readily see things in a dark room. In contrast, when the TL3 (Xenon bulb) light died, it died! No light whatsoever.

After using and testing, here are some of my personal early conclusions:

- 1- It is clear that the brighter the light, the more detail you can see; that's obvious perhaps, but worth mentioning.
- 2- Colors appear more intense or brighter with the Xenon bulb lights than with LED lights. I don't know if that's because Xenon bulb lights are so much brighter, or the color of the light beam or both.
- 3- Rechargeable lights, UltraStinger, Stinger, Strion, will continuously run for about an hour and then they die in a hurry! From the "knee" of the curve, the

lights are dead in about 2-3 minutes. So if you carry a rechargeable, it would be a good idea to carry a back-up.

- 4- Dry cell lights with CR123 batteries reach about half of their initial intensity in about 60 minutes and still provide some useable light after 60 minutes.
- 5- Lights with CR123 batteries can produce a very bright light initially (e.g. the TL3), but the intensity decays almost linearly with use. E.g. after 30 minutes of use, the light will be down to 81% of its initial intensity. After 45 minutes it will be down to 67% of its initial intensity. In contrast, a rechargeable light that runs about 65 minutes will be at about 89% of its initial intensity in 30 minutes and in 45 minutes it will be still be at about 82%.

So if you've got 45 minutes of run time built up on your CR123 powered, Xenon light, be it hand held or weapon mount, it will only produce about 67% of those magical "65 lumens" or about 43 lumens!

One note in closing: in one test, after running continuously for 20 minutes with Sanyo CR123 batteries, the Surefire L2 (LED) became so hot that it began to flash rapidly on and off. It was quite uncomfortable to hold. I ran a second test with Surefire CR123 batteries and it lasted a bit longer before it started to overheat and flash. I e-mailed Surefire Monday (2005Apr11) about the problem but haven't heard back from them as of today (2005Apr13). I'm sure this will turn out to be a defective LED controller in the flashlight; but we'll have to wait on Surefire to know for sure.

Below are two preliminary charts. One shows the discharge characteristics and relative output intensity of seven flashlights. The second chart is a comparison of the Streamlight TL2 LED and TL3 LED lights.



