How to find the right LED

Who drives a vehicle with 6v power supply probably despaired for years at the weak light yield and the associated risk in today's dense traffic. One is seen badly by other drivers or drives half blind through the night. This is especially true for motorcyclists without crumple zone. The development of modern LED lighting promises to change this situation in the form of high light output with low power consumption - so the battery could look forward to a relaxed life. So I started looking for usable 6V LED bulbs for both my 1946 BSA C11 and my 1937 Sunbeam Model 9 very early on, and then decided for the "LD" LED from Paul Geoff[1] (Fig. 1). The light has a micro lens on the two LEDs and a solid heatsink against overheating. These bulbs were available with a BPF and a BA15d socket. Now Paul Geoff offers a new LED called "Daylighter" with a BPF or BA15d socket and a stronger heatsink (Fig. 2). He says that it allows much more powerful LEDs to be fitted.

Figure 1: The Paul Geoff "LD" LED with a massive heatsink and one LED on each side covered by a microlens. Here with a BPF socket.

Setup

For the comparison between the regular filament bulbs, "LD" LED and the "Daylighter" I used a LUMIX DMC-LX7 camera at identical aperture 1.4 for 1/8 seconds for every picture. This delivers reasonably adjusted pictures of all illumination situations. The motorcycles and head lamp positions were not changed or adjusted so that a realistic comparison could be achieved. One might believe that separate tests for the BSA and the Sunbeam are not necessary because we are basically talking about the same illuminants. However, one should note that the light cone is generated by the bulb AND the lamp. Different results for both machines/lamps are hence expected. As we will see, these differences are more striking than expected.

The BSA light

I started with a regular 6V filament bulb with a BPF socket in the BSA illuminating a wall in our garden with high beam (the low beam shows the same illumination cone which is only shifted downwards). The situation is shown in figure 3. Then I switched to the "LD" LED as can be seen in 4. The 6W "LD" LED delivers not only a much brighter but also a wider illumination cone than the 30W filament bulb (both in high beam). Then I changed to the "Daylighter" LED. One might expect that the recently developed "Daylighter" LED will deliver a brighter light, especially because of its higher number of LED emitters. But this is not the case as one can see from figure 5. The light cone is not larger but also slightly dimmer than the one of the "LD" LED (although still much brighter that of the filament bulb). In contrast to my espectations the "LD" LED delivers a significantly brighter light than the "Daylighter". We need to note that for the BPF socket the low beam the upper emitting sides of both LEDs are activated whereas for high beam both sides are in operation. A change from

[1] http://www.norbsa02.freeuk.com

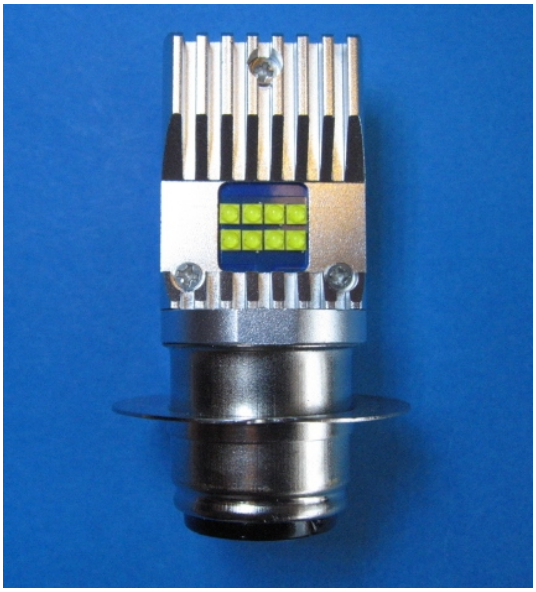

Figure 2: The Paul Geoff "Daylighter" (here with BPF socket) with a stronger heatsink and eight single LEDs on each side.

low to high beam then simply extends the beam cone upwards. As we will see, this is different for the BA15d socket in the Sunbeam lamp.

The Sunbeam light

I then performed the comparison with the same camera setup for the Sunbeam. The basic difference to the BSA is a much bigger lamp diameter and a BA15d socket. But there is another difference which I discovered during the test. As for the BPF socket the BA15d "LD" LED shines on the upper side for low beam and at both sides for high beam. The BA15d "Daylighter", however, shines with only four emitters LEDs on both sides at low beam and with all eight LEDs on both sides at high beam. As a result, the light cone does not change its position or size between high and low beam but only its brightness. One has to keep this difference in mind for the comparison.

As expected, the filament bulb delivers a very dimm light in both beams (fig. 6, high beam is almost identical to fig. 3) significantly inferior to the "LD" LED (fig. 7 and 8). According to its operation the high beam of the "LD" LED is simply added to the low beam cone when activated. Its low beam is very bright but also very narrow which is certainly a disadvantage on the road. The BA15d "Daylighter" with its different operation mode, though, deliver a wide and bright low beam. High beam is almost identical in its form but again brighter because the other half of emitters is activated. This operation is

Figure 3: High beam of a 30W filament bulb in a BSA C11 lamp.

Figure 4: High beam of a 6W "LD" LED bulb in a BSA C11 lamp.

different to the regular situation in modern vehicles where low and high beam are geometrically separated.

Resume

It is obvious that for the BSA the "LD" LED is the first choice with respect to the overall brightness whereas for the Sunbeam the "Daylighter" is the Silver Bullet because of similar brightness but larger beam widths. The reason for this difference is, of course, the peculiar BA15d "Daylighter" operation. But it must be also because of the two different lamps and LED design. It is not clear if the reason can be found in a possibly deviating lamp focal point deviation, LED with lenses, the form of the reflector or the front glass (cut into form at the BSA, flat at the Sunbeam). A smaller or bigger heat sink is obviously not the primary indicator for better LED light but the overall combination of LED and lamp design.

Figure 5: High beam of a 10W "Daylighter" LED bulb in a BSA C11 lamp.

Figure 6: Low beam of a 30W filament bulb in a Sunbeam Model 9 lamp.

Figure 7: Low beam of a 6W "LD" LED in a Sunbeam Model 9 lamp.

Figure 8: High beam of a 6W "LD" LED in a Sunbeam Model 9 lamp.

Figure 9: Low beam of a 10W "Daylighter" LED in a Sunbeam Model 9 lamp.

Figure 10: High beam of a 10W "Daylighter" LED in a Sunbeam Model 9 lamp.