

Study of an Exit Sign’s Light Output in EIC DIRC’s Laser Test Area

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This note presents the dilemma caused by the OSHA requirement of an unobstructed and lighted exit sign in the laser test area, which must be kept dark for the EIC DIRC laser acceptance tests, and the solution to this issue.

A requirement for the EIC DIRC quartz bar acceptance tests is that the laser test area be dark. However, an exit sign is in the test area in compliance with OSHA Standard 1910.37, which states that any room able to be occupied by personnel must have a lighted exit sign that can not be covered or turned off.

The exit sign emits light from two sources—a series of red LEDs behind red, transparent lettering, and a green LED indicating the sign is receiving AC power. To determine whether the light from the LEDs is constant as a function of time, and can be treated as a constant background, the output of each LED type was measured as a function of time, using one of the acceptance test photodiodes, model SM1PD2A, in series with a 10-kOhm resistor and an oscilloscope, Fig. 1.

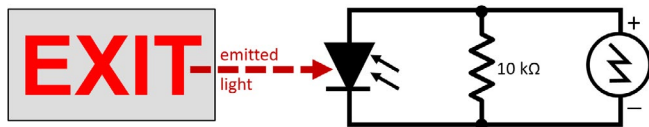


FIG. 1. System diagram of setup used to study the light output of the exit sign.

With the photodiode pointing at the green LED, the oscilloscope captured traces showing that the light output from the LED varies over time, Fig. 2. Using the oscilloscope’s math capability, the frequency of the LED’s light output was measured to be ~120 Hz generated by the AC/DC converter. The test of the red LED through the “E” in the sign showed that the light output as a function of time is a constant, Fig. 3.

Per Jefferson Lab’s safety group, and in compliance with OSHA Standard 1910.37, light from the green LED can be covered with opaque, black, aluminum foil tape after the personnel sweep of the test area. Since the red LED light output is a constant, data from the red LED light acquired by at least one set of measurements without the laser being powered on, can be, depending on the signal to noise ratio, subtracted from the data of the subsequent test runs.

In summary, a solution for eliminating the background caused by the green and red LEDs of the exit sign has been conceived.

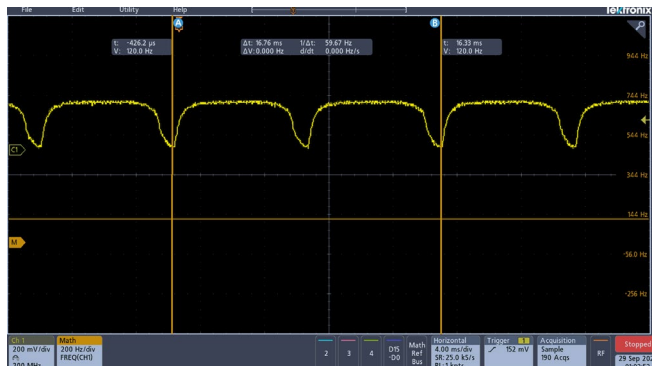


FIG. 2. Oscilloscope screenshot. Variations in signal indicate that output power of the green LED tested is not constant and changes at a 120-Hz rate.

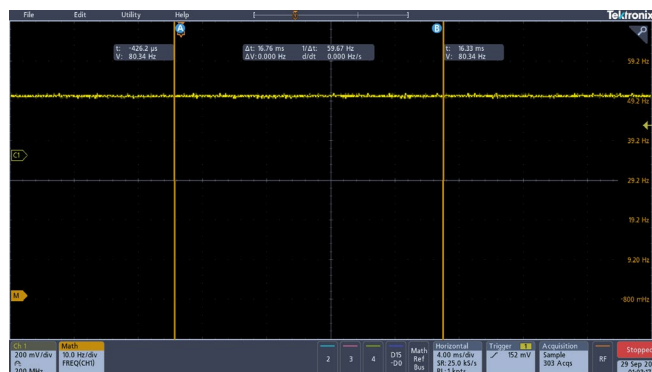


FIG. 3. Oscilloscope screenshot of when the photodiode is pointed at a red LED inside the exit sign. The constant signal is an indicator that the LEDs are powered by DC voltage.