

Field-Adjustable Light Distribution Example:

Integral FALD with Color-Tuning & Field-Adjustable Output listed in 1 Primary Use and General Application

Introduction

In March 2019, DLC released a policy to address solid-state lighting products with field-adjustable light distribution (FALD). For the details of this policy, please see the details [here](#).

To add clarity to this new policy approach, DLC has developed a number of illustrative examples to highlight how the policy can be used to qualify products with these field adjustable features. This example covers a scenario where a manufacturer is seeking to qualify a luminaire that adjusts its distribution via “integral” means, **is able to adjust its light output setting in the field, is able to adjust its chromaticity (CCT) in the field**, and is applying to be listed on the GPL in **one primary use designation (PUD)**.

The following is provided for illustration purposes only and is not intended to mimic any specific known product or manufacturer.

Product Description

A manufacturer produces and sells a dynamic high-bay-style luminaire. The optical distribution is adjustable via a remote control, which alters the relative current through specific LEDs and their associated optics, which in turn alters the overall beam spread of the luminaire. In this product, there are two beam settings, one appropriate for the High-Bay aisle primary use and the other appropriate for the general High-Bay luminaire or Low-Bay luminaire primary uses. These two beam settings are referred to as “Beam 1” and “Beam 2” where Beam 1 refers to a 50 degree beam and Beam 2 refers to a 120 degree beam in the product literature. The remote control product is also capable of adjusting the light output “set point” of the product, again by changing the current to the LED, to either a higher output setting, or a lower output setting (that is, the product meets DLC’s definition of field adjustable light output, or “FALO”). Finally, the luminaire is made with clusters of LEDs of different CCTs, and the remote control is able to direct differing amounts of current to each CCT type, thereby creating a color tunable product where a user is able to select from a range of CCTs.

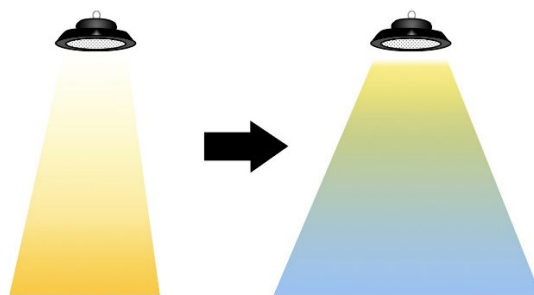


Figure 1: Model ABC-123, with adjustable beam spreads, light output, and CCT

A summary of the product performance is presented in the following table:

Model, Setting	Light Output (lm)	Wattage (W)	Efficacy (lm/W)
ABC-123, Beam 1-High Output-3000K	12,000	100	120
ABC-123, Beam 2-High Output-3000K	12,100	100	121
ABC-123, Beam 1-Low Output-3000K	6,000	48	125
ABC-123, Beam 2-Low Output-3000K	6,050	48	126.04
ABC-123, Beam 1-High Output-4000K	12,200	100	122
ABC-123, Beam 2-High Output-4000K	12,300	100	123
ABC-123, Beam 1-Low Output-4000K	6,100	48	127.08
ABC-123, Beam 2-Low Output-4000K	6,150	48	128.13
ABC-123, Beam 1-High Output-5000K	12,100	100	121
ABC-123, Beam 2-High Output-5000K	12,200	100	122
ABC-123, Beam 1-Low Output-5000K	6,050	48	126.04
ABC-123, Beam 2-Low Output-5000K	6,100	48	127.08

Table 1: Basic summary of performance for product ABC-123, at each beam-light output setting

Scenario Description

Due to the differences in distribution, Beam 1 (the narrower setting) is marketed for aisle applications and Beam 2 (wider setting) is marketed for non-aisle high-bay applications. Additionally, the product is marketed to be appropriate for various height ceilings, with lower light output set points for low-bay applications. In this scenario, the manufacturer desires to have the product listed on the QPL **in only the high-bay luminaire primary use**.

Let us assume that Beam 1 has lower lumens and efficacy, as well as a hotter thermal environment, relative to Beam 2, for any particular light output and CCT setting. Assume worst-case overall efficacy and thermal conditions are at the combined Beam 1-highest light output setting, at the lowest overall CCT. We will also assume that this product is only offered at one nominal maximum wattage, at only one range of CCT, and one nominal CRI.

Required Testing

First, per the FALO policy, all testing must be conducted at the highest possible light-output setting. Second, per the FALD policy, “testing shall be conducted in the light distribution settings that result in the worst-case performance for each of efficacy, wattage, lumen output, power quality, and thermal In-Situ Temperature Measurement Testing (ISTMT).” Third, via the color-tuning policy, the worst-case efficacy variation must conduct at the highest, lowest, and mid-points of the color control signal. Therefore manufacturer must conduct:

- An LM-79 for efficacy, wattage, and color properties conducted on the product in the combined Beam 1-highest light output-3000K setting. This satisfying FALD needs for testing at the overall worst-case efficacy.
- An LM-79 for efficacy conducted on the product in the combined Beam 2-highest light output-4000K setting. This test satisfies the FALO needs for testing the product at highest overall light output.

- An LM-79 for light output, efficacy, wattage, and color properties conducted on the product in the combined Beam 1-highest light output-4000K setting, and for light output, efficacy, wattage, and color properties conducted on the product in the combined Beam 1-highest light output-5000K setting. These test satisfy the remainder of the required LM-79's for the color tuning policy.
- An (LED) ISTMT on the product in the combined Beam 1-highest light output setting-3000K output setting.

Additionally:

- If the LM-79 described above does not include power quality metrics, electrical testing will need to be conducted either via LM-79 methods or via benchtop testing. This testing must be conducted at the highest light-output setting of the product, and for the optical and color setting that results in worst-case. In this scenario, that is assumed to be Beam 1, lowest CCT, due to thermal considerations.

For proving that the product meets the zonal-lumen distribution (ZLD) requirements, by policy the manufacturer must demonstrate that the product can meet the ZLD requirements of each PUD for which it is applying in at least one setting, via providing an IES file for the product in that setting that shows it passes the ZLD requirements. Additionally, manufacturers must submit a correlation sheet that directly associates products with an IES file corresponding to a distribution that they can achieve.

- In this scenario, since the manufacturer is only submitting the product in the high-bay luminaire primary use, an IES file for the Beam 2-highest light output setting should be provided. Any CCT setting would be acceptable in this IES file.
- Note that if the Beam 1 setting passed the requirements for high-bay luminaire ZLD, than an IES file describing the Beam 1-highest light output distribution would also be acceptable. Again, any CCT setting would be acceptable for this IES file. Please note, however, that the "Adjustable Distribution Setting" field on the application form must match whichever configuration for which the IES file is provided.

Finally, please see the sample application form for this scenario [here](#). Please note the following:

- The product model number, applying for one listing
- As the reported performance rules state that the product performance in the "reported" field must match the tested orientation, the "reported" performance data for product listing is the performance in the Beam 1-highest output setting. This is despite the likely use case that in the High-Bay Luminaire PUD, the product would be likely to be used in the Beam 2 setting.
- Additionally, the color-tuning policy stipulates that product be listed at worst-case efficacy, so the reported performance data must correspond with the 3000K setting.
- As the product is dimmable, default light output and default wattage performance fields have flexibility to allow the manufacturer to use as they would like, though they must match how the settings for how the product is shipped. In the example, they reflect the performance of the product in the Beam 2-high output setting.

- The “Adjustable Distribution Setting” field indicates the setting under which the product meets the ZLD requirements of the PUD that line corresponds with. In this case, the field may list either Beam 1 or Beam 2, so long as both settings pass the require, and must only correspond to the provided IES file, as noted above. This application form assumes providing the IES file for Beam 2.

What will the Application Fees Be?

Per policy, FALD and Color-Tuning products must submit as family grouping applications. The family grouping application fee scheduled is based on the number of LM-79s and ISTMTs needed to assess the product (“independent test reports” or “ITR”), as well as the number of additional family members and dimming variations.

In this application, there is one product, requiring 5 ITR’s (four complete LM-79, and one ISTMT), with no additional family members. Therefore the application fee for this application would be \$2500.

How will the Product End Up Getting Listed?

This application results in one listing: one product, with test data, appearing with listings confirming that it is qualified in the “High Bay Luminaires for Commercial and Industrial Buildings” PUD.

- Both the test data and the basic “reported” performance data would be for the performance of the product at the Beam 1-highest light output-3000K setting, as that is the worst-case configuration. This is true even though it is applied in a PUD more likely to be used at the Beam 2 setting.
- The listing would indicate that the “Adjustable Distribution Setting” for which the product meets the ZLD for the high-bay luminaire PUD, corresponding to the provided IES file. In this case, it is assumed the manufacturer provided the IES file for Beam 2, and therefore that would be listed in this field.

Note: the FALD and Color-Tuning policies state that products will be listed at the lowest-efficacy setting, while the FALO policy states they will be listed at the most consumptive setting. While in the scenario above these are the same, in the event that the lowest efficacy setting is NOT the maximum output setting, products will be listed at the lowest efficacy setting, with maximum wattage at the maximum output setting noted in the appropriate fields.