Replacing the Lambda DG-4 with the Lambda 721

After nearly 30 years of production, the DG-4 and DG-5 wavelength switchers have been discontinued. Increasing costs, discontinuation of several key components, and the market's broader adoption of LED light sources gave us no choice but to end production. To fill that gap, the Lambda 721 Optical Beam Combining System was designed as a next-generation, drop-in replacement for the DG-4. The Lambda 721 is faster, smaller, and quieter than its predecessor, and for most wavelengths, is even more powerful. In this white paper we will highlight a few of the key features and updates the Lambda 721 offers:

Intuitive Software and Equipment Interfacing:

The Lambda 721 retains the communication protocol capabilities of the DG-4, but also adds direct triggering of each channel with an individual digital input via BNC. There are 8 BNC connectors on the back of the instrument: one for each of the 7 channels, and an 8th BNC for Ring Buffer triggering. This allows the user to define and advance through a sequence of LEDs every time a TTL pulse is received. There is also a USB input, which communicates with all major third-party software suites using the same, ubiquitous Lambda command set. Additionally, several third-party software suites have already implemented commands that allow the user to independently control the intensity of each LED wavelength.

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Refined Optics:

While the DG-4 and DG-5 each held a maximum of 5 bandpass filters, the Lambda 721 can hold a total of 7 pre-collimated LED filter cubes. The high-intensity LEDs were sourced to offer comparable or greater power at each filtered wavelength than the broadband arc lamp used in the DG-4. The Lambda 721 enables programmable attenuation of each LED, allowing the user to power match each of the 7 LEDs independently to approximate the relatively flat spectral output of the DG-4 in the visible range, if desired. The Lambda 721 transmits light to your microscope via the same liquid light guide as the DG-4, so coupling optics remain identical.

Silent Operation:

The DG-4's arc lamp required massive cooling using a high-flow fan, resulting in considerable noise. Cooled by just three low-RPM, speed-controlled fans, the Lambda 721 typically runs at a hushed 50 dB whisper.

Stability and Longevity:

The state-of-the-art LED technology has also freed the Lambda 721 from the intrinsic stability limitations of the arc lamp, which capped the short-term stability rating of the DG-4 at ~4%. Arc lamps also typically lose 40% of their output capacity in the first 100 hours of use, while the bulb is "burning in". This fluctuation makes it difficult to perform quantitative intensity measurements during this burn-in time. By comparison, the short-term stability of the Lambda 721 was measured at 0.01%, and the time scale for long-term stability is on the order of thousands, rather than hundreds, of hours before notable degradation. For this reason, quantitative measurements can be made immediately after setting up the Lambda 721.

The Lambda 721 with thermal management in mind. Through careful engineering efforts, the lifetime of the Lambda 721 light source has been extended to over 50,000 hours. This far surpasses the lifetime of the DG-4's arc lamp, which requires replacement every 1,000 hours.

Speed:

Clocking in at a mere 4 µs, the Lambda 721's LED filter cubes can be switched well over 100 times faster than the DG-4, with its maximum speed of 500 µs.

Ozone Free:

In contrast to arc lamps, the LED filter cubes produce no ozone, which needs to be vented. This is true even of our 285nm ultraviolet LED cube.

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Compact Footprint:

The Lambda 721 takes up much less space than the DG-4. It can easily be installed on a wall shelf above your microscope.

Summary:

The Lambda 721 was designed to be seamlessly interchangeable with the DG-4 in any experimental setup. The technological advantages of LED sources over arc lamps are manyfold, with no downsides. If you choose to purchase a Lambda 721 for your experimental setup, Sutter Instrument's legendary technical support is always available to you, should there be any questions regarding installation, drivers, or setup. You can also rest assured that as long as components remain available, Sutter will continue to support existing DG-4 and DG-5 units in the field.

For ordering information and further technical specifications, please visit:

https://www.sutter.com/IMAGING/lambda721.html

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