

### Time for a Change

With Lumencor's **SPECTRA®**, **SPECTRA X®** or **AURA®** light engines installed on your microscope, the time for a change can be very short indeed — less than one millisecond.

Fast switching between color channels is a key requirement for applications such as multicolor fluorescence microscopy, optogenetics and “virtual color” transmitted light imaging (superimposed red, green and blue images taken with a monochrome camera). Switching via serial commands is limited to around 50 ms by factors including the host computer operating system, processor speed and serial port baud rate. Faster switching requires TTL hardware control.

In the example shown here, the cyan (485/25 nm) and green (560/32 nm) channels of an AURA light engine are triggered by TTL signals from two synchronized pulse generators. The resulting light output is detected by a photodiode connected to a digital oscilloscope. In a typical optogenetics application, the alternating cyan (~0.5 ms) and green (~3 ms) output pulses would be directed through an optical fiber for cyclical activation and inhibition of neurons expressing channelrhodopsin-2 (ChR2) and halorhodopsin (NpHR).

Find many more fast switching applications of Lumencor light engines on our [website](#).

#### Cyan/Green Fast Switching

