

Closed-loop optoelectronic feedback scheme for metered dosage on the SPECTRA X light engine. All components within the red rectangle are internal to the light engine.

rPD = Reference photodiode

Measured Light Delivery for Quantitative Bioanalysis

Quantitative Microscopy • Photochemistry • Photolithography • Optogenetics

Photochemical processes are essentially chemical reactions in which light is a reagent. Just as in a classical solution chemistry experiment, the ability to control the input quantity of the light “reagent” is a critical factor in obtaining predictable and reproducible outputs. Controlled delivery requires a light source equipped with output monitoring and feedback systems. Lumencor’s SPECTRA X light engine can be optionally configured to incorporate these control systems today.

Open loop monitoring and closed loop monitoring and feedback schemes are available. Open loop monitoring generates a square wave signal whose frequency is proportional to light flux detected by an onboard reference photodiode. This reference signal is available for display or processing via a BNC connector on the rear panel of the SPECTRA X. For example, the reference signal may be displayed or recorded by a digital pulse counter.

In the closed loop metered dosage scheme (depicted above), activation of the selected light source starts an onboard counter that accumulates the active reference count from the photodiode and compares it to the

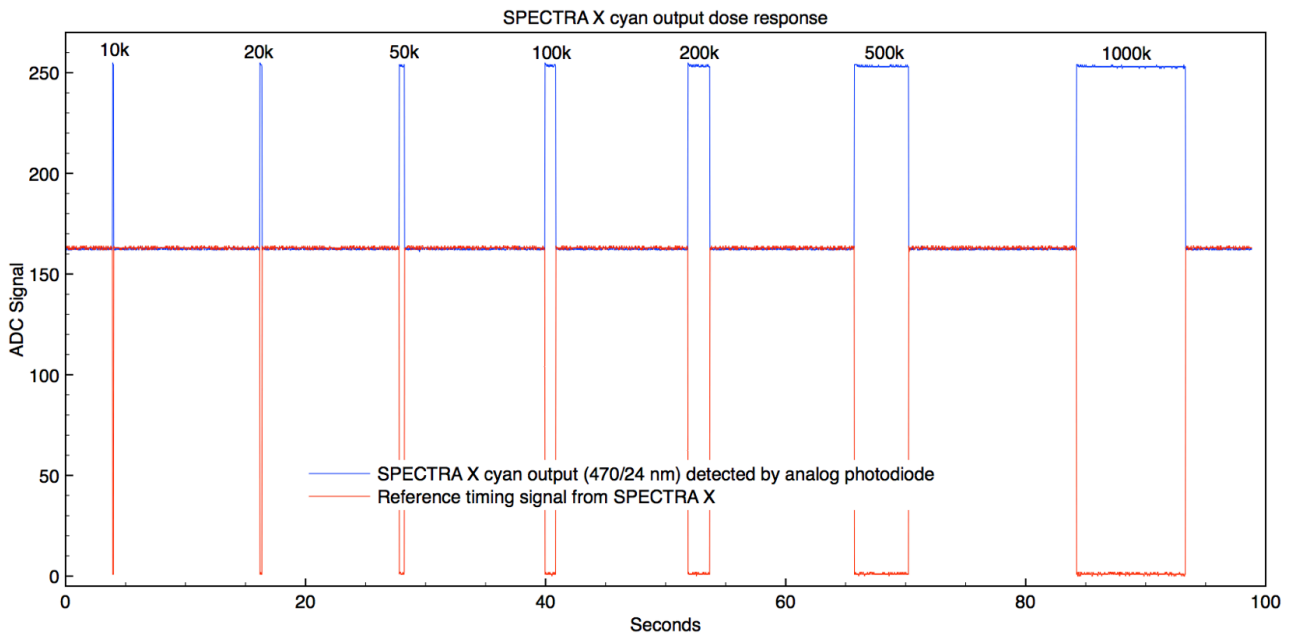
control count input by the user. When the reference count reaches the control value (i.e. when the metered light dose has been delivered), the light output automatically shuts off. The beginning and end of the dose are marked by reference timing signals supplied to a BNC connector on the rear panel of the SPECTRA X (see data on page 2). All closed loop metered dosage functions are controlled from a serially connected computer. A Windows GUI implementation is available free on request. The GUI also includes standard SPECTRA X source selection and intensity setting controls. Alternatively, a description of the serial command set is available for interfacing through programming environments such as LabVIEW and MATLAB.

Open loop and closed loop systems are available as optional add-ons for SPECTRA X light engines and can also be incorporated in customized OEM builds.

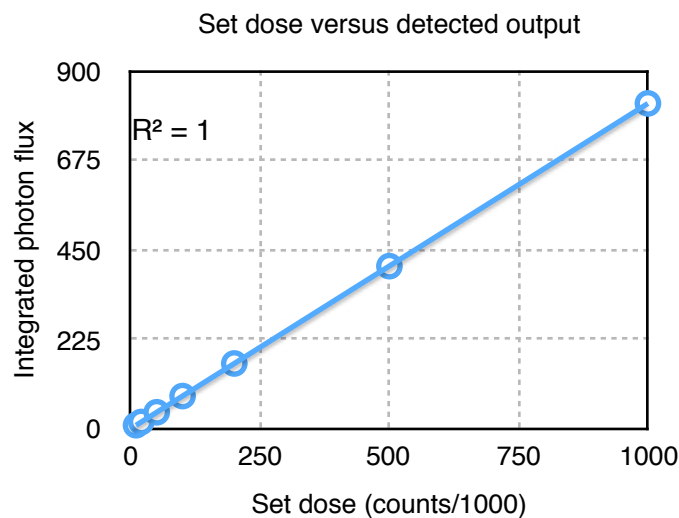
For more information on the SPECTRA X light engines please contact us at Lumencor, Inc. at info@lumencor.com.

SPECTRA X light engine®

Active Feedback Control



Closed loop metered dosage. The blue trace represents seven light doses corresponding to 10,000 to 1,000,000 reference counts delivered from the cyan channel of a SPECTRA X light engine. Doses were initiated by serial commands from the Lumencor metered dosage GUI and passed through a 3 mm liquid light guide to an analog photodiode detector. The output from the photodiode was input to channel 1 of a transient recorder with the reference timing signals generated by the SPECTRA X in channel 2 (red trace). The detected photon flux for each dose was calculated by integration of the respective portions of the blue trace and plotted against the input dose count setting (below).



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