



CAIRN

RESEARCH

Engineered for Discovery

Diamond

DMD Spatial Illuminator

Introducing the Diamond

The Cairn Diamond is a cutting-edge Digital Micromirror Device (DMD)-based pattern illuminator designed for high-precision, high-speed, and highly versatile optical applications.

Capable of switching illumination patterns at rates of up to 22kHz, it provides precise control over where and how light is delivered onto a sample. This enables researchers to selectively target individual cells, defined regions, or complex multi-site patterns, making it ideal for optogenetics, photostimulation, advanced imaging, and widefield microscopy.

Supports a 22 mm field of view as standard, with an optional folded relay for the Nikon Ti2 increasing the field of view to 24 mm.

Two independently controlled illumination paths enable simultaneous multi-wavelength and patterned illumination for optogenetics, photoactivation, photostimulation, and advanced imaging applications.

Suitable Applications

Optogenetics

FRAP and photoactivation

Photoconversion

Targeted stimulation

High-speed patterned illumination

Multi-region experiments

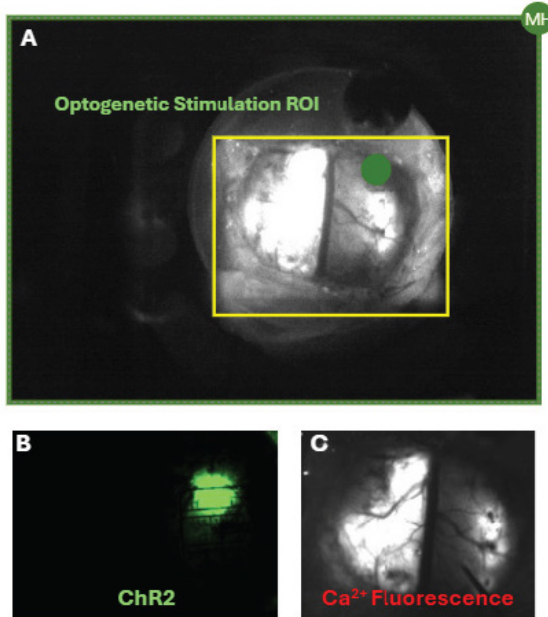
We were very privileged to work with the Institute of Neurology at UCL

Mouse cortical activity recorded using in vivo calcium imaging during optogenetic stimulation.

A) Widefield image of optical set up of mouse brain with headplate imaged using a 0.63x objective. Imaging set-up uses a custom-built optical system incorporating a digital micromirror device (DMD) to define regions of interest for targeted laser illumination (imaging ROI; yellow box) and optogenetic activation (stimulation ROI; green circle).

B) Image showing cortical region expressing Channelrhodopsin-2, as shown by GFP fluorescence.

C) Expansion of imaging ROI showing fluorescent calcium reporter expression.

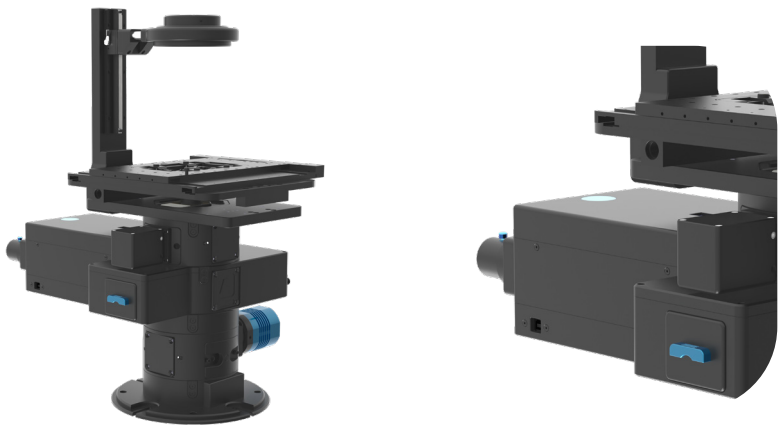


"At [UCL Institute of Neurology](#), we have collaborated with [Cairn](#) to build a custom system to perform widefield imaging of calcium fluorescence. Using this system, we can characterise the spatial dynamics of neuronal activity during seizures and advance our understanding of neurological disease and epilepsy. In addition, we have leveraged the [Cairn Diamond](#) to incorporate optogenetics, enabling flexible, spatially precise, and rapid stimulation of targeted cell populations.

We look forward to future collaborations!" – [Liberty Roskrow](#)

Microscope Options

Inverted - Uses EPI port	Any inverted frame
Upright - Integrated Cairn Infinity Cube (single or dual)	Any upright frame
Cairn OpenFrame (inverted)	Standard Cairn coupling
Custom options available	Please contact Cairn



Shown on Cairn OpenFrame (inverted) microscope



Shown with Cairn Dual Infinity Cube for upright microscopes

The Diamond integrates seamlessly with both inverted and upright microscope frames.

DMD Specifications

Specification	Value
DMD type	Digital micro mirror device (DMD)
Native resolution	1024 x 768 pixels (XGA)
Number of mirrors	786,432
Micromirror (pixel) pitch	13.7 μ m
Active DMD width	14.0 mm
Active DMD height	10.5 mm
Active diagonal	17.8 mm
Maximum binary pattern rate	22,727 Hz (full array)
Grey Scale Pattern Rates	~1,091 Hz (6-bit) / 290 Hz (8-bit)
Pattern Switching Mode	Global array switching
Spectral Options	VIS: 400–700 nm (UV on request)
Triggering	Hardware trigger input/output for system synchronisation

Effective projected pixel size depends on microscope configuration, objective magnification, and relay optics.

Software Compatibility

Micro-Manager	Cairn REFLECT plugin
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Illumination Sources

LED	Any 3mm LLG based system
Laser	Fibre coupled lasers
Direct coupled LED	Cairn direct single LED
UV Sources	Available on request



3mm LLG port with blanking plate for dual sided illumination

Internal mirrors for dual-sided illumination are fitted as standard. Simply add a second light source to enable dual-sided operation. No internal modifications required.

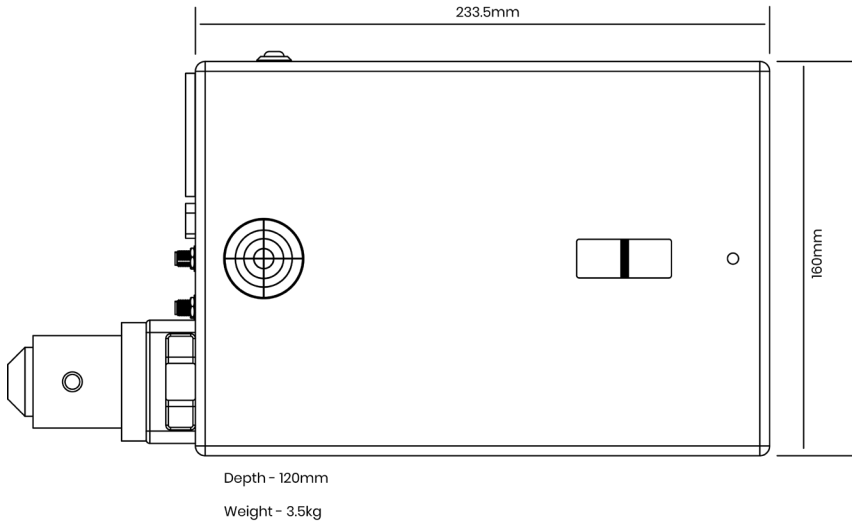
Optical Specifications

Transmission range	400nm to 700nm
UV	Available on request

Electrical Specifications

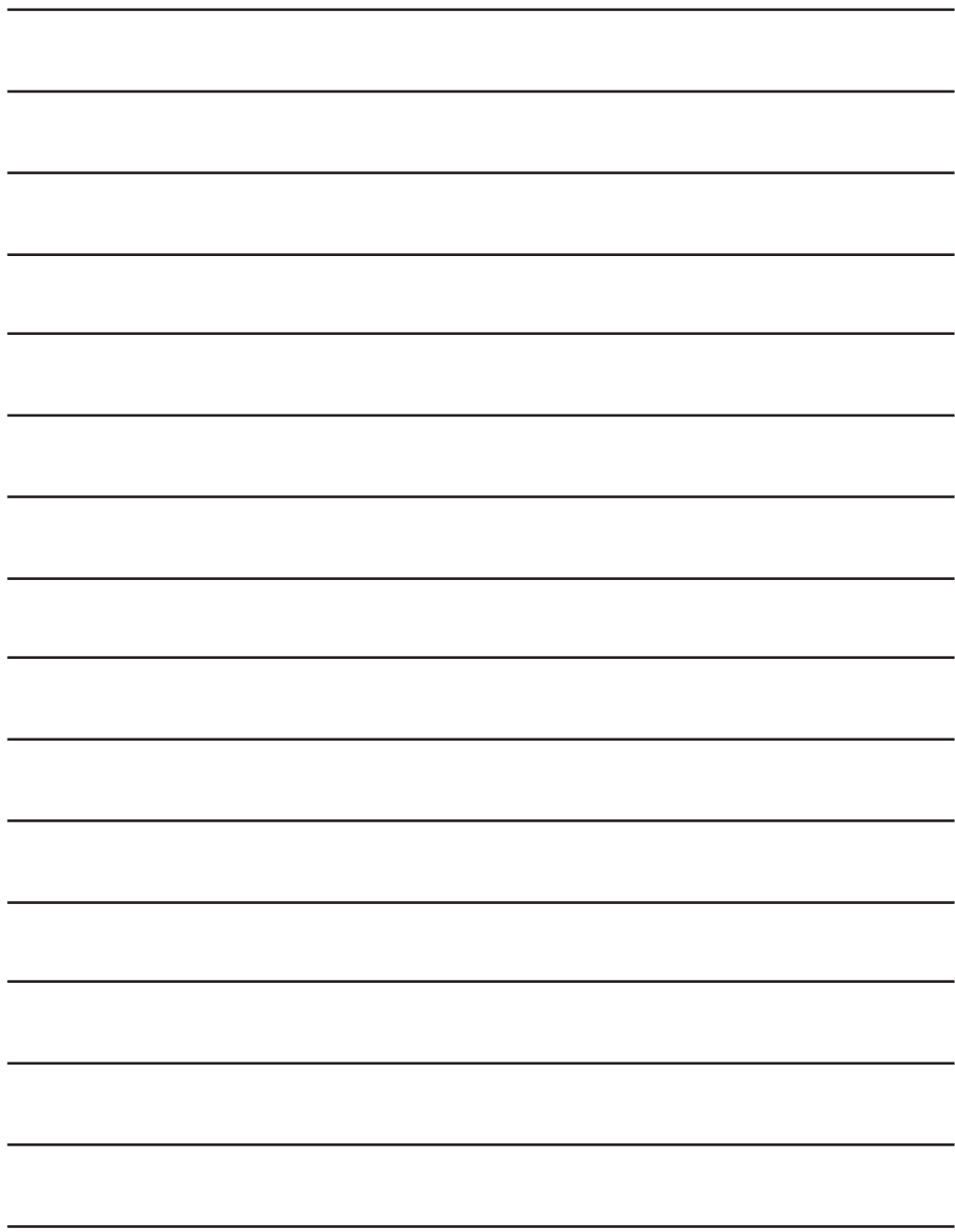
Input	5 V DC
Power consumption	7-10W
Control interface	USB 2.0

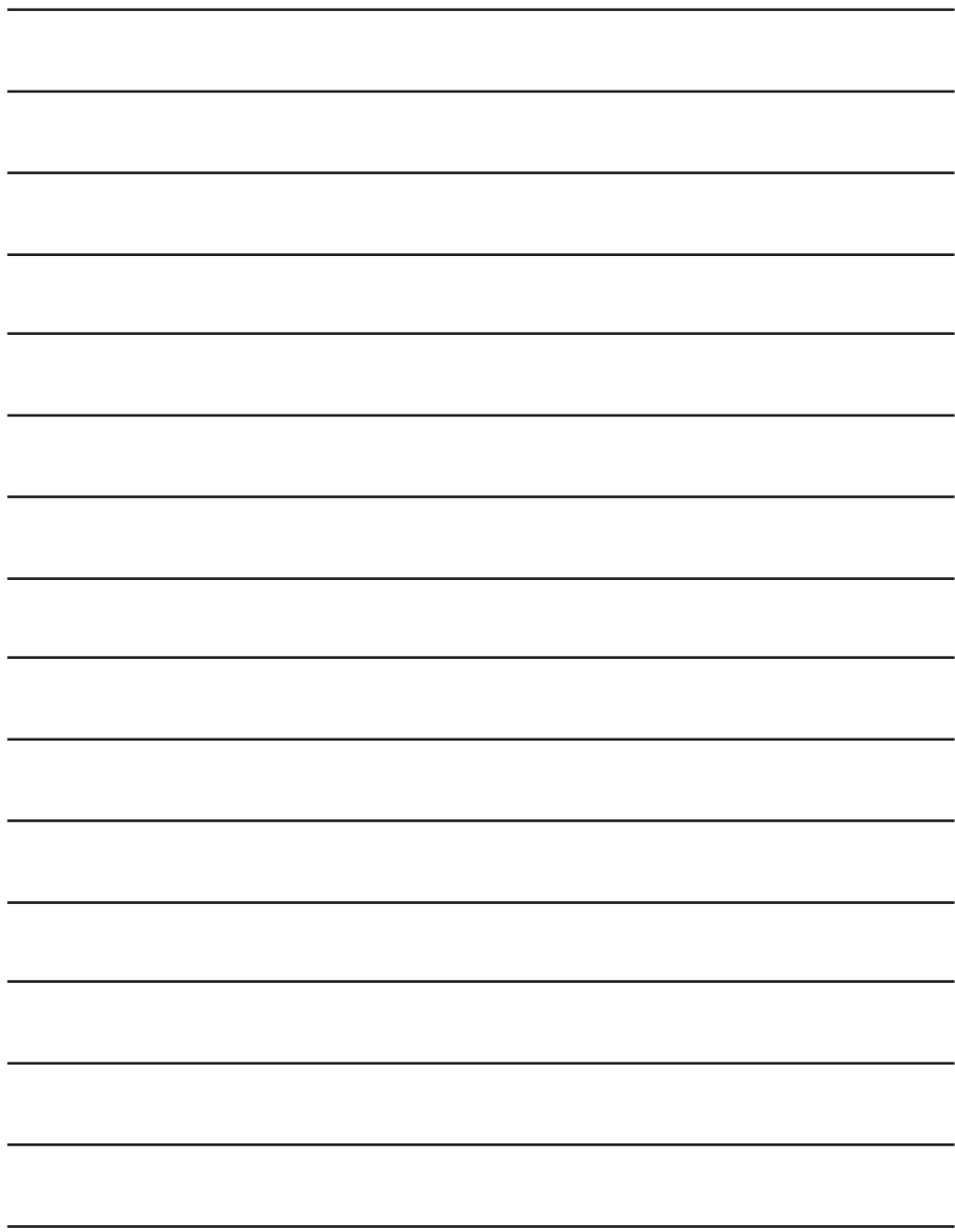
Product dimensions



Notes:

[illegible]







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