npi
Electronic Instruments
for the Life Sciences

made to measure

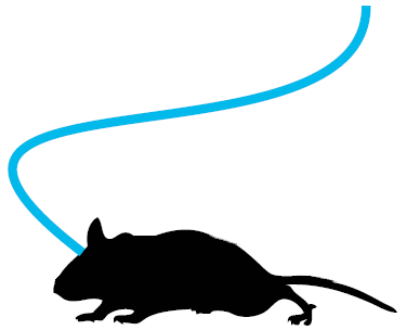
FOM-02M
FiberOptoMeter II

The "optical multimeter" for probing brain circuits

NEW **FOM-02M/2 Dual Excitation/Dual Fluorescence Detection**

FOM-02M Dual Excitation/Single Fluorescence Detection

Optogenetic Stimulation &
Fluorescence Measurement
via the Same Fiber



Features

- **Dual-band excitation:**
  450 – 490 nm (OGB1, GCamP, ChR2)
  550 – 590 nm (ArchT)
  Fluorescence recording in 500 – 540 nm band.
- **short pulses at high power** (optogenetics)
  on top of
- **constant low power illumination** (fluorescence)
- **Ultrafast photodetector:**
  high robustness against high-dose irradiation
  detecting fluorescence signal immediately after optogenetic stimulation
- can also be used as **supplemental photodetector** channel for **multiphoton microscopy**.
- compatible with multi-mode SMA fibers
  incl. **non-magnetic fibers** for **fMRI.**

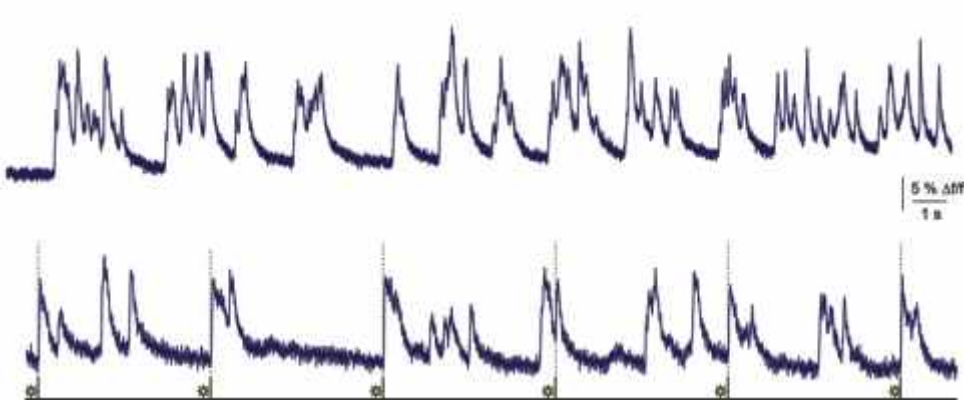
Applications

- Localized measurement of physiological fluorescence signals (e.g. Ca^{2+} signals) from multiple sites in **freely behaving animals including primates**
- **Multi-color optogenetic** stimulation
- **Near simultaneous optical measurement of cellular activity and optogenetic stimulation**
- **Chronic monitoring** of physiological signals in disease model animals and drug testing
- **Enhanced localized photodetection for deep-tissue multiphoton imaging**
- **Combined fluorescence recording with fMRI imaging**

Examples of Fluorescence Measurement *via* a 200 µm Fiber

Upper trace:
Slow calcium waves (isolfluorane 1.5%) spontaneous activity (200 µm fiber)

Lower trace:
Same measurement as above, visually evoked (*) and spontaneous slow calcium waves



Ca^{2+}-Traces
Ca^{2+} fluorescence indicator OGB-1 was injected into the visual cortex of a mouse. Data kindly provided by Dr. A. Stroh and M. Schwalm.

REF: **Justus et al.** (2016), Glutamatergic synaptic integration of locomotion speed via septoentorhinal projections. *Nat. Neurosci. http://dx.doi.org/10.1038/nn.4447*

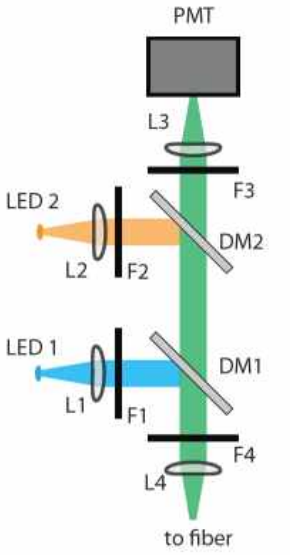
Fuhrmann et al. (2015), Locomotion, theta oscillations, and the speed-correlated firing of hippocampal neurons are controlled by a medial septal glutamatergic circuit. *Neuron, http://dx.doi.org/10.1016/j.neuron.2015.05.001*

Adelsberger et al. (2014), In vivo calcium recordings and channelrhodopsin-2 activation through an optical fiber. *Cold Spring Harb Protoc. http://dx.doi.org/10.1101/pdb.prot084145*

Stroh et al. (2013), Making Waves: Initiation and Propagation of Corticothalamic Ca^{2+} Waves In Vivo. *Neuron, http://dx.doi.org/10.1016/j.neuron.2013.01.031*

Technical Specifications:

Available central wavelengths (LED):	450 nm, 470 nm, 570 nm, 617 nm, 625 nm
Excitation band:	450 – 490 nm (blue) 540 – 590 nm (orange)
Max. light power at 200 µm fiber tip:	110 mW/mm^2 (blue) 65 mW/mm^2 (orange)
Fiber interface:	SMA or FC/PC
Fluorescence detection band:	500 – 540 nm (green)
Fluorescence signal output filter:	200 Hz low-pass (add-on block)
Fluorescence signal output range:	0 ~ -5 V (negative polarity)
Dimensions:	Requires 2 module slots (FOM-02M) or 5 module slots (FOM-02M/2) of EPMS chassis (npi electronic)
Power consumption:	20 W



L1 - L4: collimation lenses
F1 - F4: bandpass filter plates
DM1 - DM2 : dichroic mirrors
PMT: photomultiplier module

The optogenetic stimulation and fluorescence measurement via the same fiber was developed in the Konnerth Lab, TU München, Germany (Adelsberger et al Nat Neurosci. 2005, (8):988-90). The FOM-02M was designed in collaboration with Dr. Hongbo Jia, Suzhou Institute of Biomedical Engineering and Technology.

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