

Fiber-Coupled Fluorescence Monitoring & Optogenetic Stimulation



Features

- ⇒ **Short pulses at high power** (optogenetics) on top of
- ⇒ **Constant low power illumination** (fluorescence)
- ⇒ **Ultrafast photodetector:** **robust against high-intensity illumination** detecting fluorescence signal immediately after optogenetic stimulation
- ⇒ Compatible with multi-mode SMA fibers incl. **non-magnetic fibers** for **fMRI**.

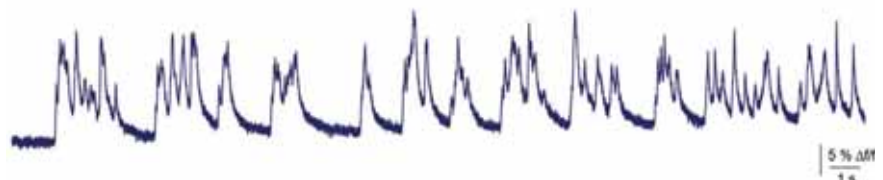
Applications

- ⇒ Fiber based fluorescence monitoring (e.g. for Ca^{2+} signals) in **freely behaving animals**
- ⇒ **Multi-color optogenetic** stimulation
- ⇒ **Near simultaneous optical measurement of cellular activity and optogenetic stimulation**
- ⇒ **Combined fluorescence recording with fMRI imaging**

Examples of Fluorescence Measurement *via* a 200 μm Fiber

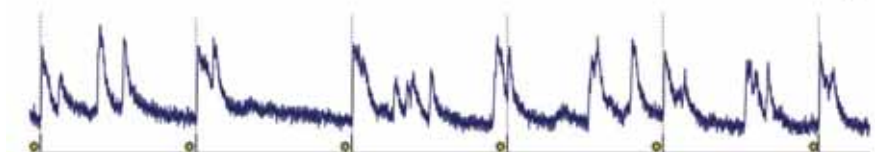
Upper trace:

Slow calcium waves (isoflurane 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. Strohm and M. Schwalm.



FOM-02M

- ⇒ module for npi's EPMS-07 systems
- ⇒ fixed filter settings
- ⇒ 1 or 2 LEDs
- ⇒ 1 detector



FOM-02D

- ⇒ stand-alone device
- ⇒ exchangeable filter cubes
- ⇒ 1 or 2 LEDs
- ⇒ 1 or 2 detectors
- ⇒ optional: Bessel filter with gain and offset

Technical Specifications:

Typical light power at 200 μm fiber tip: (depends on filters, LED wavelength and fiber type)	80 - 120 mW/mm ² (465 nm) ~25 mW/mm ² (560 nm)
Detector type:	Silicon Photomultiplier SiPM
Fluorescence signal output range:	0 ~ -1 V (negative polarity)
Fluorescence signal output filter:	340 Hz low-pass (-6 dB/octave)
Fiber interface:	SMA or FC/PC
Dimensions:	FOM-02M: 2 module slots wide FOM-02D: 365 x 260 x 130 mm ³

References:

- Justus et al.** (2016), *Nat. Neurosci.*
DOI: 10.1038/nn.4447
- Fuhrmann et al.** (2015), *Neuron*,
DOI: 10.1016/j.neuron.2015.05.001
- Adelsberger et al.** (2014), *Cold Spring Harb
Protoc.* DOI: 10.1101/pdb.prot084145
- Stroh et al.** (2013), *Neuron*,
DOI: 10.1016/j.neuron.2013.01.031

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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