LARGE FIELD-OF-VIEW TWO-PHOTON MICROSCOPY OF BIOLOGICAL SAMPLES

Stephan Junek[1], Florian Vollrath[1], Florian Huhn[2]

[1]Max Planck Institute for Brain Research, Frankfurt am Main, Germany
[2]Rapp OptoElectronic GmbH, Hamburg, Germany
E-mail: stephan.junek@brain.mpg.de

KEYWORDS: two-photon microscopy, Ca imaging, in vivo, remote focus

1. INTRODUCTION

The complex network structure of the brain is one of its most striking properties, and it is crucial for its ability to process signals from all sensory organs and to generate appropriate behaviors (motor output). In order to understand how the brain achieves this, monitoring brain activity cannot be restricted to local networks, but rather needs to be able to simultaneously observe nerve cells in various brain regions. We present a two-photon microscope that provides a large field-of-view (FOV, up to about 3 mm with a 10x objective). Using a combination of three scanning mirrors (RGG) and a remote focusing system, the user can address subvolumes in the sample in order to achieve high temporal and spatial resolution in regions of interest.

2. RESULTS

We present both technical characterizations of the microscope (size of FOV, field illumination, extent of remote scanning range) and a variety of biological applications, such as *in vivo* Ca^{2+}-imaging of zebrafish and mouse, as well as imaging Ca^{2+}-activity in reptile brain slices.

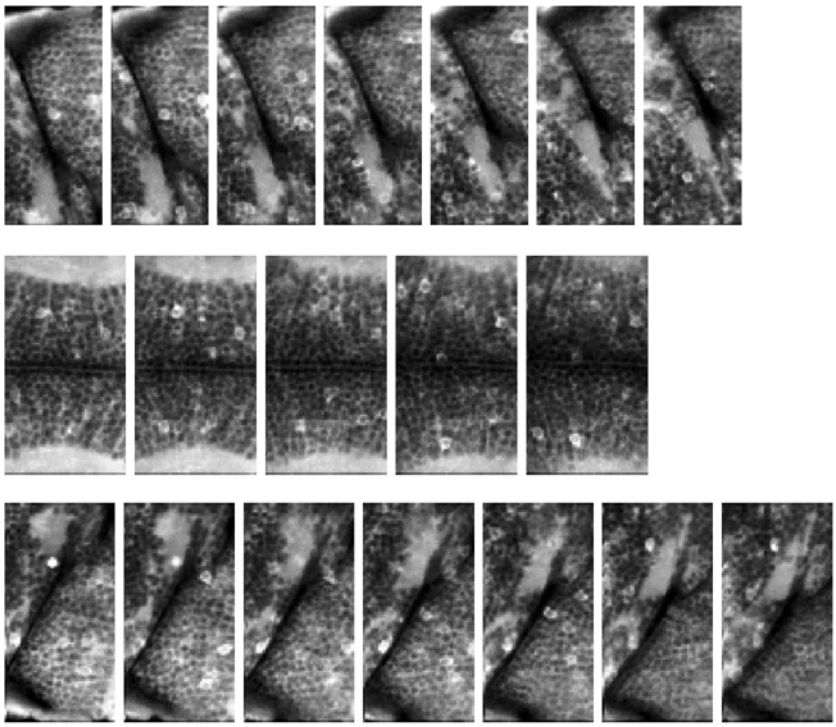

Fig. 1: Single frames from a time series consisting of image stacks from three regions of the zebrafish brain. The position and extent of the stack in each region is different. All shown positions were imaged within 200 ms.