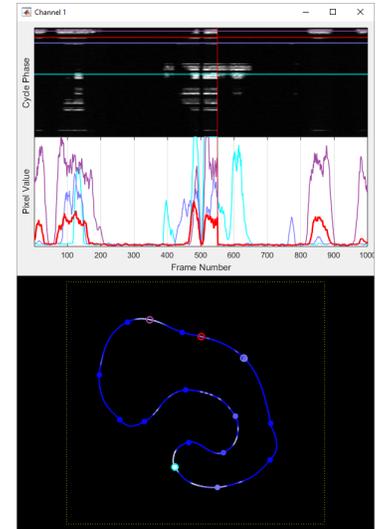


Arbitrary Line Scanning

Introduction

ScanImage 2016 introduces a new way to utilize a linear scanning (galvo-galvo) microscope for fast imaging. Building upon the robust ScanImage multi ROI core, Arbitrary line scanning enables high speed sampling of desired ROIs by reducing time spent scanning areas of little interest in the sample. If the locations of desired ROIs are already known and you are only interested in how the fluorescence at specified points is changing over time, an arbitrary path can be configured to sample the desired points at high speed, as opposed to raster scanning the entire field which is much slower. Depending on the duration of the scan path (dictated by the number and spread of ROIs to be scanned) arbitrary line scanning can sample the entire scan path at rates upwards of 200 Hz, allowing you to capture fluorescence transients. The scan path can be designed in 2D or 3D, enabling use of a fast Z actuator for arbitrary volume scanning. In addition to recording fluorescence signals, the line scanning feature includes the ability to record and show in real-time the actual positions of the scan mirrors to ensure that they are accurately hitting the desired ROIs.



ScanImage Arbitrary Line Scanning Hardware Requirements

The arbitrary line scanning scanning feature supports the same [hardware used for regular linear scanning](#). In order to utilize the scan mirror position recording, an auxiliary DAQ must be present and the galvo position signals must be on a different DAQ than the photo-detector signals.

Using Arbitrary Line Scanning in ScanImage

To utilize arbitrary line scanning, select a linear scanning system as the active imaging system on the [CONFIGURATION](#) interface, then select **Line Scan** as the scan type. To start a scan, a scan path must be configured. You can do so by selecting **Edit ROIs** (see links below for more details on designing a scan path). One scan of the complete path is referred to as a **cycle** or **frame**. The **Cycle Rate** on the [CONFIGURATION](#) interface indicates how fast cycles can be scanned (dictated by the total time duration of the path you have designed).

At this point you can start a **FOCUS**, **GRAB**, or **LOOP** from the [MAIN CONTROLS](#) interface. These operations function the same way they do for normal raster scanning. A **FOCUS** will run the scan path continuously to display data only. A **GRAB** will run the scan for the specified number of cycles and log data to disk if logging is enabled. You can specify the number of cycles to run by setting the number of frames to collect on the [MAIN CONTROLS](#) interface. A **LOOP** will execute multiple **GRAB** sessions. 3D scanning is enabled during **GRAB** and **LOOP** if the designed path is 3D and the fast Z feature is enabled from the [FAST Z CONTROLS](#) interface.

Position feedback can be enabled to log to disk and show in real time the actual path scanned by the mirrors. This can be useful to ensure the scan mirrors are achieving the desired path. Before using position feedback for the first time, the sensors must be calibrated by clicking **Calibrate Feedback Sensors** on the [CONFIGURATION](#) interface.

The following documentation pages will go into more detail about using ScanImage for line scanning.

- [Configuring the arbitrary scan path](#)
- [Line scanning live data display](#)
- [Reading line scanning data files](#)