was also completed. Finally, we fit the model to actual data on Usutu virus titers. Our study provides new insights into the dynamics of Usutu virus infection.

## Microsecond scale 3D real time motion correction for in-vivo brain imaging

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In-vivo imaging of the central nervous system is inherently hampered by the motion of behaving animals, particularly when using voltage sensitive dyes where the signal is acquired from small regions of interest to get maximal temporal resolution. Here we present an FPGA-based acousto-optical scanning solution for 3D online motion correction for signal extraction with a high temporal resolution of 100 kHz within a volume of $900 \times 900 \times 400$ um up to 0-100 Hz of motion with a residual motion under 1 um at a sufficient signal-to-noise ratio. The timescale of the intervention loop is shorter than 500 $\mu$s. The correction can be applied on somatic and dendritic measurements, including volumetric imaging. The mathematical algorithm had to be optimized for the very low amount of memory in the FPGA.

The closed-loop online motion compensation has been validated with recordings in the cortex of awake mice, via 3kHz voltage imaging of Parvalbumin neurons using the Jedi2P sensor, and acquisition of 4D datasets (3 space + time) in collaboration with the *German Center for Neurodegenerative Diseases*. The project has won a Hungarian Innovation Award in March 2024.