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Supplemental Information

**Correlation of Synaptic Inputs
in the Visual Cortex of Awake, Behaving Mice**

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Supplemental Information

Supplemental Figure 1: Sign of Vm lags is preserved across behavioral states. Related to Figure 3.

(A) Mean Vm lags between simultaneously recorded cells during spontaneous activity. Lags for moving epochs are plotted against lags for stationary epochs for 10 pairs. Spearman's rank correlation was used to determine r and p values.

(B) Same as in (A) but for visually-evoked activity.

Supplemental Figure 2: Inhibition-excitation lags during transition from "up" to "down" states. Related to Figure 4.

(A) Averaged waveforms of excitation (gray) and inhibition (cyan) on manually identified transitions to "up" (left) and "down" (right) states. Inhibitory traces inverted for clarity.

(B) Excitation-inhibition lags calculated from analysis in (A) for population of pairs ($n = 8$; *, $p < 0.05$)

Supplemental Figure 3: Correlation as a function of stimulus preference disparity. Related to Figure 2 and Figure 5.

(A) The Vm correlation during visual stimulation (filtered at > 3 Hz to remove F1 modulation) is plotted against orientation tuning disparity ($n=13$).

(B) The correlation between Vm and excitation is plotted against orientation tuning disparity ($n=7$).

Supplemental Figure 4: High-amplitude, low-frequency fluctuations during visual stimulation. Related to Figure 5.

(A) Example paired recording illustrating the temporal lag between two neurons during spontaneous (left) and visual stimulation (right) epochs. Shaded box is expanded below to better illustrate the temporal lag between the waveforms. Spikes are truncated for clarity.

(B) CCG offset during visual stimulation plotted against the CCG offset during spontaneous activity for 10 pairs of L2/3 neurons. Traces were high-pass filtered (>3 Hz) before computing the CCG to remove F1 modulation.

(C) CCG offset filtered at 15-50 Hz plotted against CCG offset filtered at >3 Hz.

Supplemental Figure 5: Examples of post-stimulation fluctuations. Related to Figure 7.

(A-J) Examples of post-stimulation Vm fluctuations for 10 pairs. Each plot represents a single trial for a different pair. Timing of the visual stimulus is represented by a black bar (above each column). Gray and cyan scale bars represent 20 mV throughout the figure.

Supplemental Figure 6: Majority of depolarization leading up to spikes is not shared across neurons. Related to Figure 8.

(A) Unfiltered PSD for spiking and paired cell during spontaneous (left) and visually-evoked (right) activity. PSD was calculated during stationary (black) and moving (red) epochs.

(B) Population summary of data in (A).

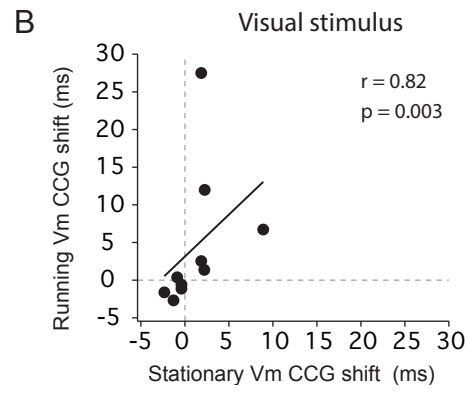
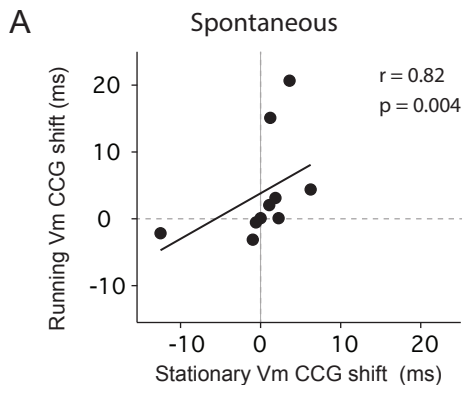
(C) PSD for non-spiking cell triggered on spikes of paired cell calculated after band-pass filtering (15-40 Hz). PSD is plotted for spontaneous (black) and visually-evoked (blue) activity against orientation tuning disparity for neurons in each pair.

(D) Same as in (A) but for unfiltered PSD.

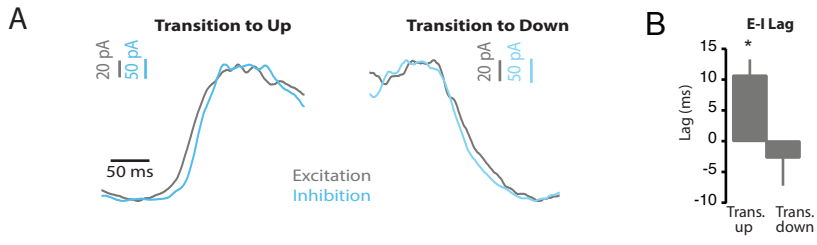
Supplemental Table 1: LFP and current clamp data. Related to Figures 1, 2, 3 and 5.

Supplemental Table 2: Voltage clamp data. Related to Figures 4 and 6.

Supplemental Figure 1

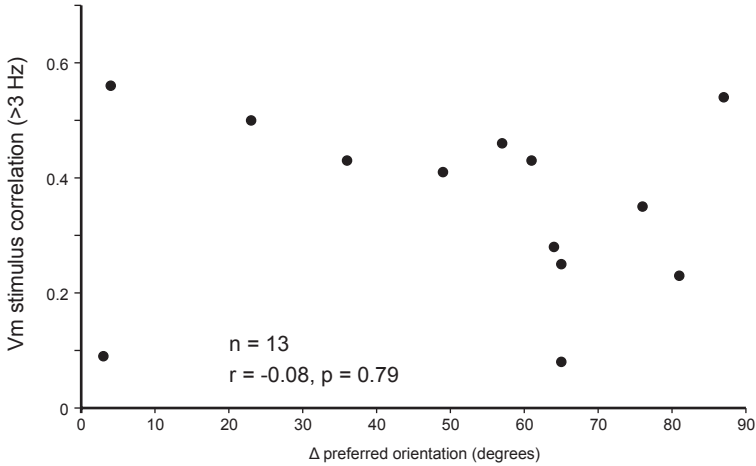


Supplemental Figure 2

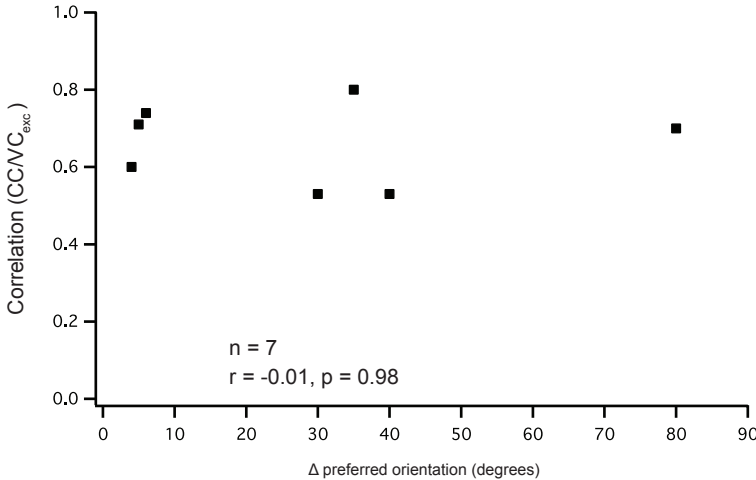


Supplemental Figure 3

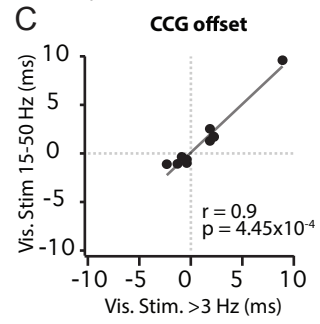
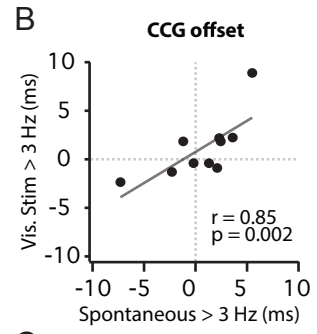
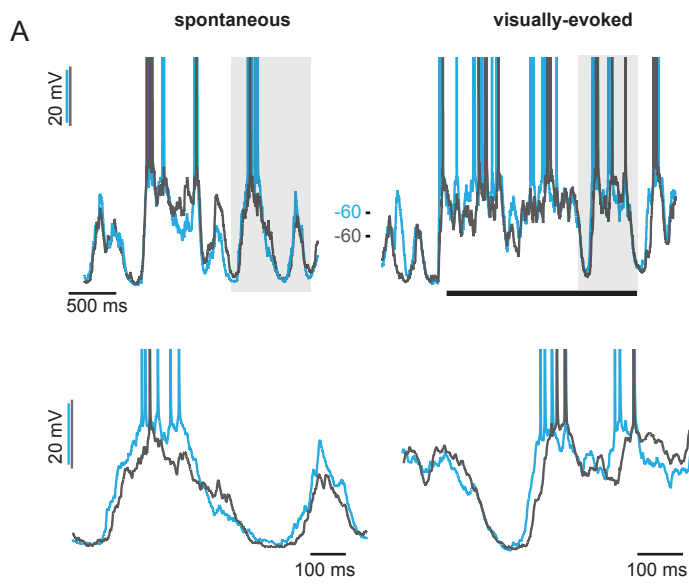
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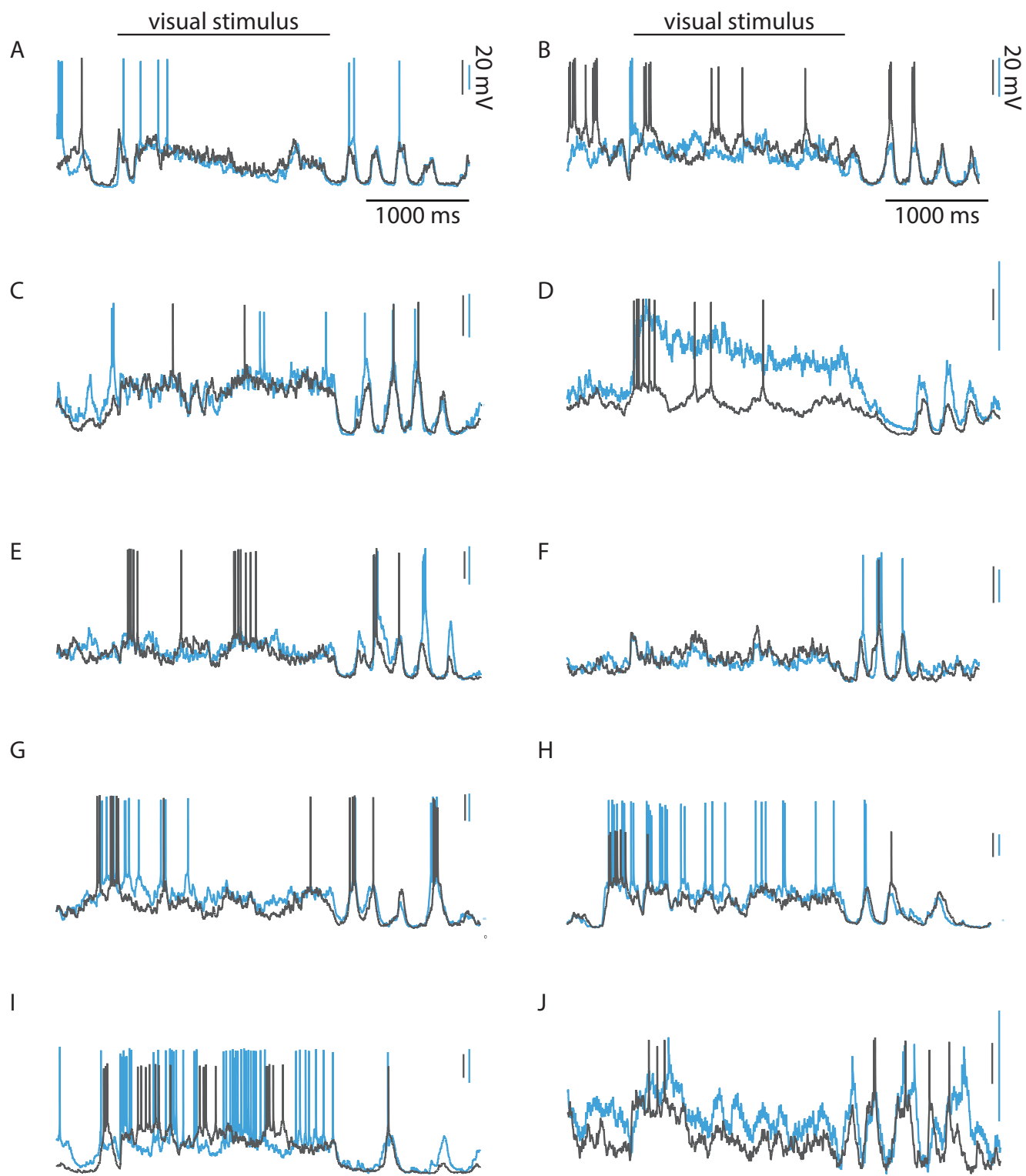
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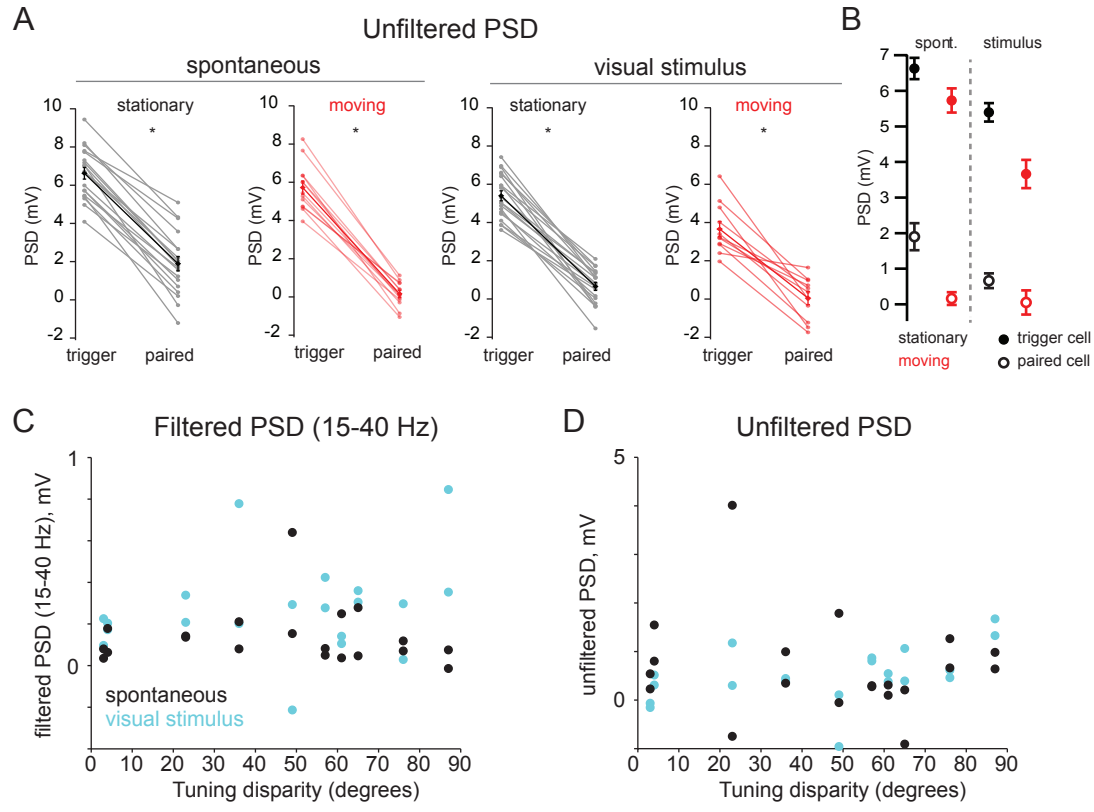


Supplemental Figure 4



Supplemental Figure 5





Supplemental Table 1: LFP & Current Clamp Data

		mean	sem	N
spontaneous	Stationary LFP/WC correlation	0.34	0.03	17
	Moving LFP/WC correlation	0.18	0.05	6
	Stationary CC/CC correlation	0.67	0.04	13
	Moving CC/CC correlation	0.39	0.04	12
	Stationary correlation (>3 Hz)	0.51	0.05	10
	Moving correlation (> 3 Hz)	0.25	0.04	9
	Stationary correlation (>20 Hz)	0.11	0.01	13
	Moving correlation (>20 Hz)	0.17	0.02	12
	Stationary low frequency (1-10 Hz) coherence (CC/CC)	0.66	0.03	10
	Stationary high frequency (15-40 Hz) coherence (CC/CC)	0.45	0.01	10
	visual stimulation	Orientation selectivity index (OSI)	0.63	0.05
Direction selectivity index (DSI)		0.31	0.05	20
Stationary correlation (> 3 Hz)		0.39	0.05	10
Moving correlation (> 3 Hz)		0.18	0.03	9
Stationary correlation (> 20 Hz)		0.31	0.05	10
Moving correlation (> 20 Hz)		0.18	0.05	9
Low frequency (1-10 Hz) coherence (CC/CC)		0.59	0.02	10
High frequency (15-40 Hz) coherence (CC/CC)		0.5	0.02	10

Supplemental Table 2 : Voltage clamp data

Spontaneous				
		mean	sem	n
excitation	Up - Down Current (pA)	167.8	24.3	8
	Moving - Stationary Current (pA)	-7.1	12.5	7
	Stationary variance (pA ²)	14480.2	5491.7	7
	Moving variance (pA ²)	8388.3	3854.1	7
	Low frequency (1-10 Hz) coherence (VC/CC)	0.65	0.03	8
	High frequency (15-40 Hz) coherence (VC/CC)	0.44	0.01	8
inhibition	Up - Down Current (pA)	349	129.2	8
	Moving - Stationary Current (pA)	-43.1	30.1	8
	Stationary variance (pA ²)	50466.2	28938.7	8
	Moving variance (pA ²)	18302.2	6742.3	8
	Low frequency (1-10 Hz) coherence (VC/CC)	0.61	0.03	8
	High frequency (15-40 Hz) coherence (VC/CC)	0.46	0.01	8
Visual stimulation				
		mean	sem	n
excitation	Low frequency (1-10 Hz) coherence (VC/CC)	0.62	0.03	7
	High frequency (15-40 Hz) coherence (VC/CC)	0.51	0.03	7
inhibition	Low frequency (1-10 Hz) coherence (VC/CC)	0.61	0.02	6
	High frequency (15-40 Hz) coherence (VC/CC)	0.52	0.03	6
E/I Lag				
		mean	sem	n
	Median spontaneous E/I lag (ms)	4.9	1.1	8
	Median visual stimulation (15-40 Hz) E/I lag	4.01	0.52	8