Table S1: Responsiveness of central-complex neurons to the plane of polarized blue light and the azimuth of an unpolarized green and UV light spot. n_{total}, total number of neurons; $n_{sig.}$, number of neurons with significant responses to all stimuli repetitions; $n_{n.s.}$, number of neurons that did not respond to any of the stimulus repetitions; N_{total}, total number of stimulus presentations; $N_{sig.}$, number of significant responses; $\%N_{sig.}$, percentage of significant responses.

	n_{total}	$n_{sig.}$	$n_{n.s.}$	N_{total}	$N_{sig.}$	$\%N_{sig.}$
polarized blue						
TL1	2	0	0	18	8	44
TL2	7	6	0	43	33	77
TL3	2	1	0	12	10	83
CL1	20	7	3	118	65	55
TB1	16	9	2	86	54	63
CPU1	19	4	2	130	84	65
CPU2	11	3	2	87	31	36
CP1	2	1	0	12	11	92
CP2	4	2	0	30	12	40
unpolarized green						
TL1	2	0	1	18	7	43
TL2	7	5	1	32	28	88
TL3	2	0	0	10	5	50
CL1	20	10	1	108	79	73
TB1	16	8	1	76	55	72
CPU1	19	10	2	113	79	70
CPU2	11	3	0	73	50	68
CP1	2	1	0	8	6	75
CP2	4	2	0	16	12	75
unpolarized UV						
TL1	2	0	1	8	1	12
TL2	7	5	1	24	18	75
TL3	2	0	0	8	3	38
CL1	18	10	2	60	44	73
TB1	10	5	3	36	20	56
CPU1	16	8	4	60	36	60
CPU2	8	4	0	26	20	77
CP1	2	0	0	6	2	33
CP2	4	0	0	14	6	43

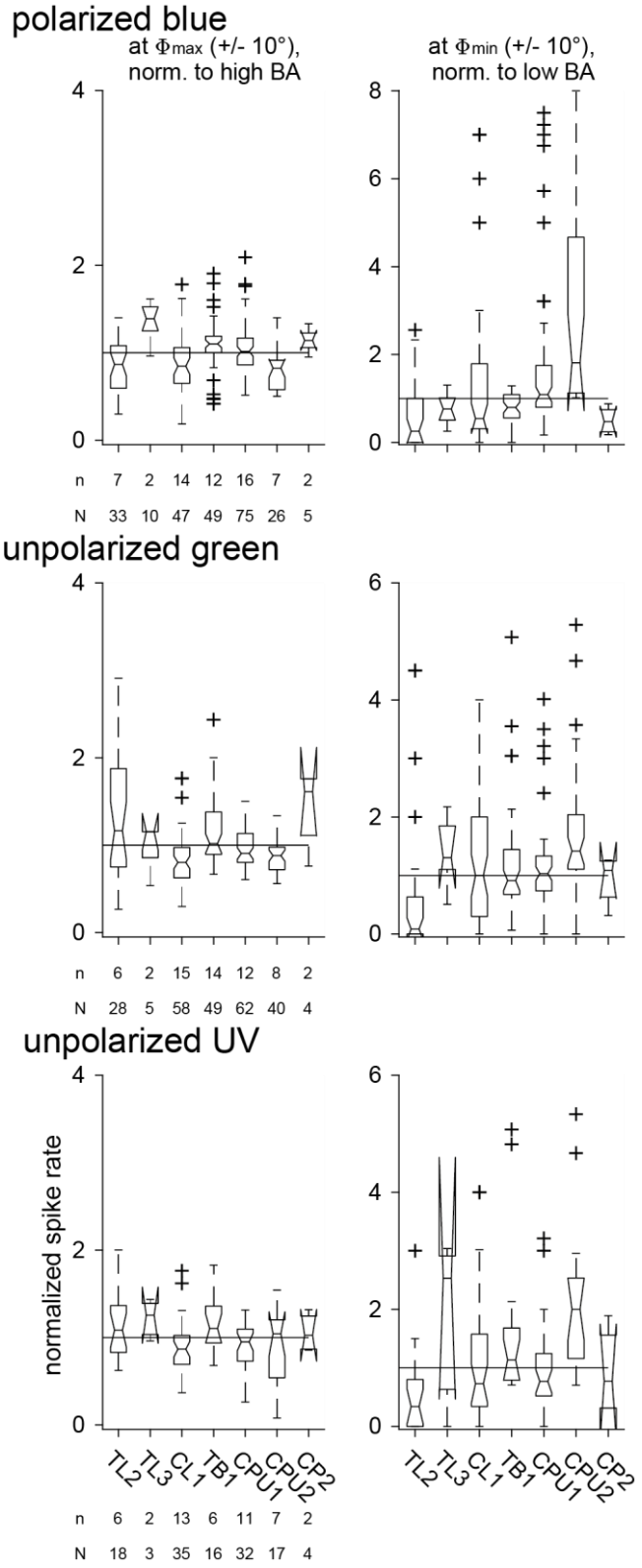

Fig. S1. Effective amplitudes of tunings to the plane of polarized blue light and the azimuth of an unpolarized green and UV light spot. Mean spiking activities at Φ_{max} +/- 10° and Φ_{min} +/- 10° are plotted from *N* responses of *n* neurons to polarized blue light, unpolarized green light, and unpolarized UV light. Spike rates are normalized to very high BA (the 97.5th percentile) or very low BA (the 2.5th percentile), respectively. Solid lines mark a value of 1. The upper limit of confidence interval exceeding unity in the left panels indicates excitation at Φ_{max}, the whole confidence interval exceeding unity indicates robust excitation at Φ_{max}. The lower limit of confidence interval undershooting unity in the right panels indicates inhibition at Φ_{min}, the whole confidence interval undershooting unity indicates robust inhibition at Φ_{min}.

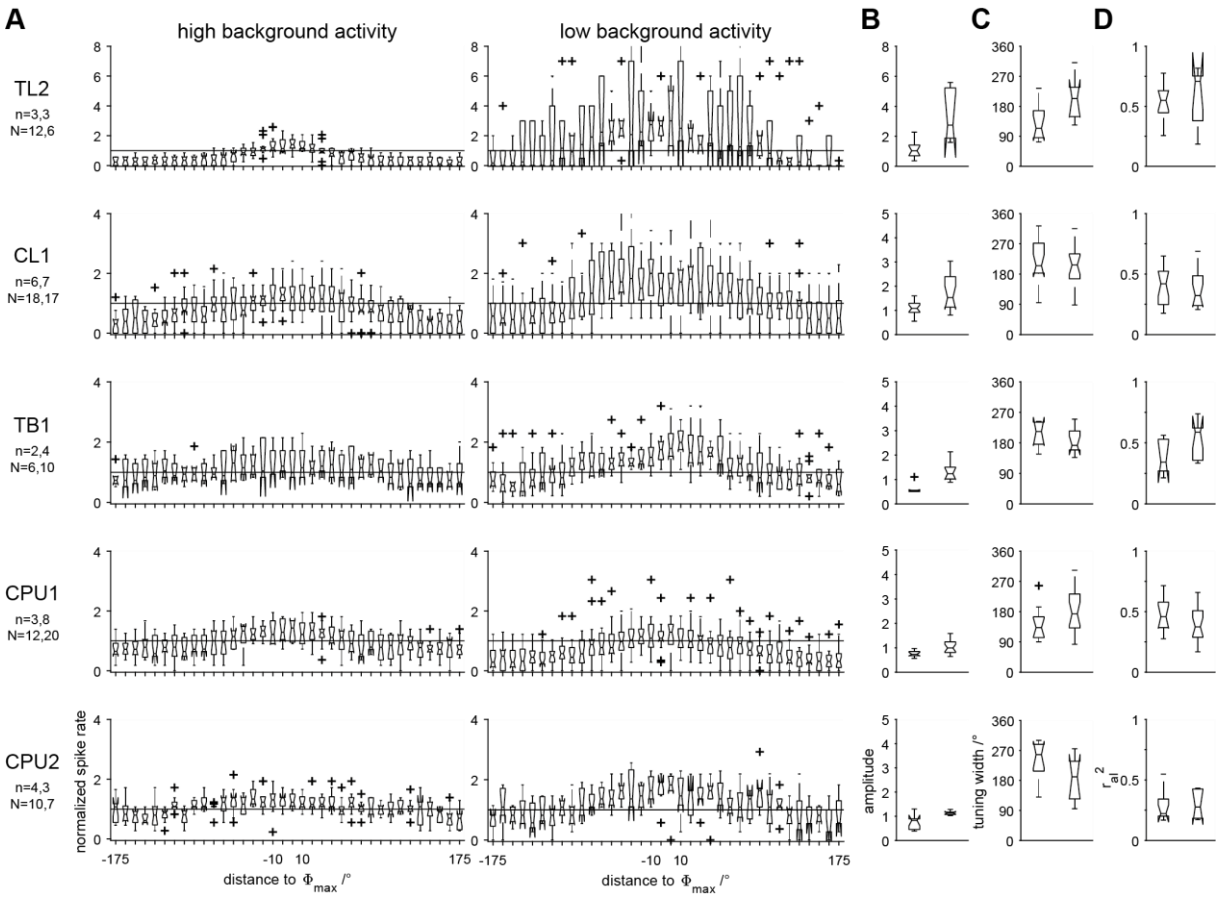

Fig. S2. Comparison of tuning characteristics to unpolarized UV light during high and low background activity. (A) Normalized stimulus response curves of *N* responses and *n* neurons to unpolarized UV light during high and low neuronal background activity. Spike angles (i.e. were shifted to Φ_{max} and binned in 10° wide bins. Stimulus response curves were normalized to the median neuronal BA (solid line at value 1). (B-D) Box plots showing amplitude, width and r_{al}^2 of each response in (A) for each cell type during high and low BA.

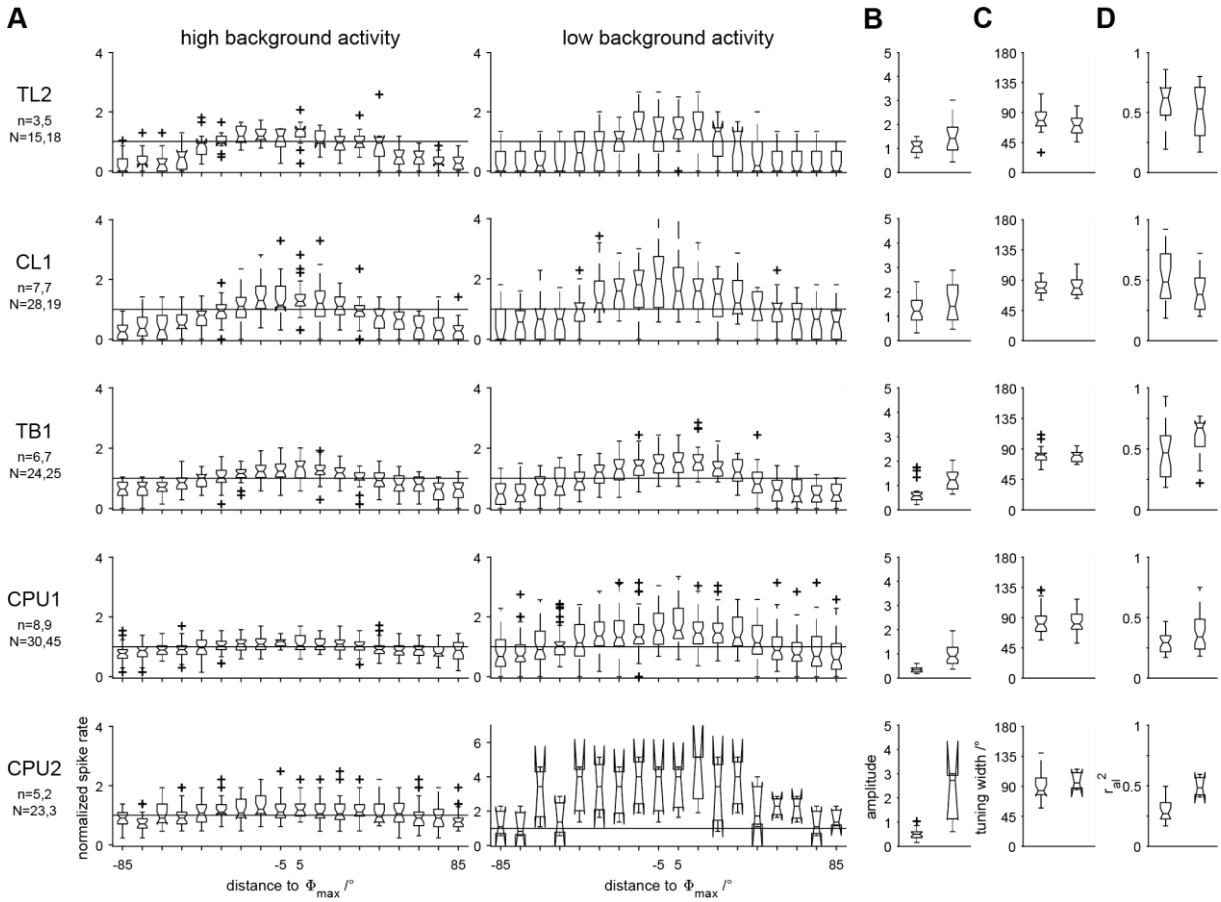

Fig. S3. Comparison of tuning characteristics to polarized light during high and low background activity. (A) Normalized stimulus response curves of *N* responses and *n* neurons to polarized blue light during high and low neuronal background activity. Spike angles were shifted to Φ_{max} and binned in 10° wide bins. Stimulus response curves were normalized to the median neuronal BA (solid line at value 1). (B-D) Box plots showing amplitude, width and r_{al}^2 of each response in (A) for each cell type during high and low BA. Note that in (D) r_{al}^2 of responses during high BA decreases from TL toward CPU2 neurons.

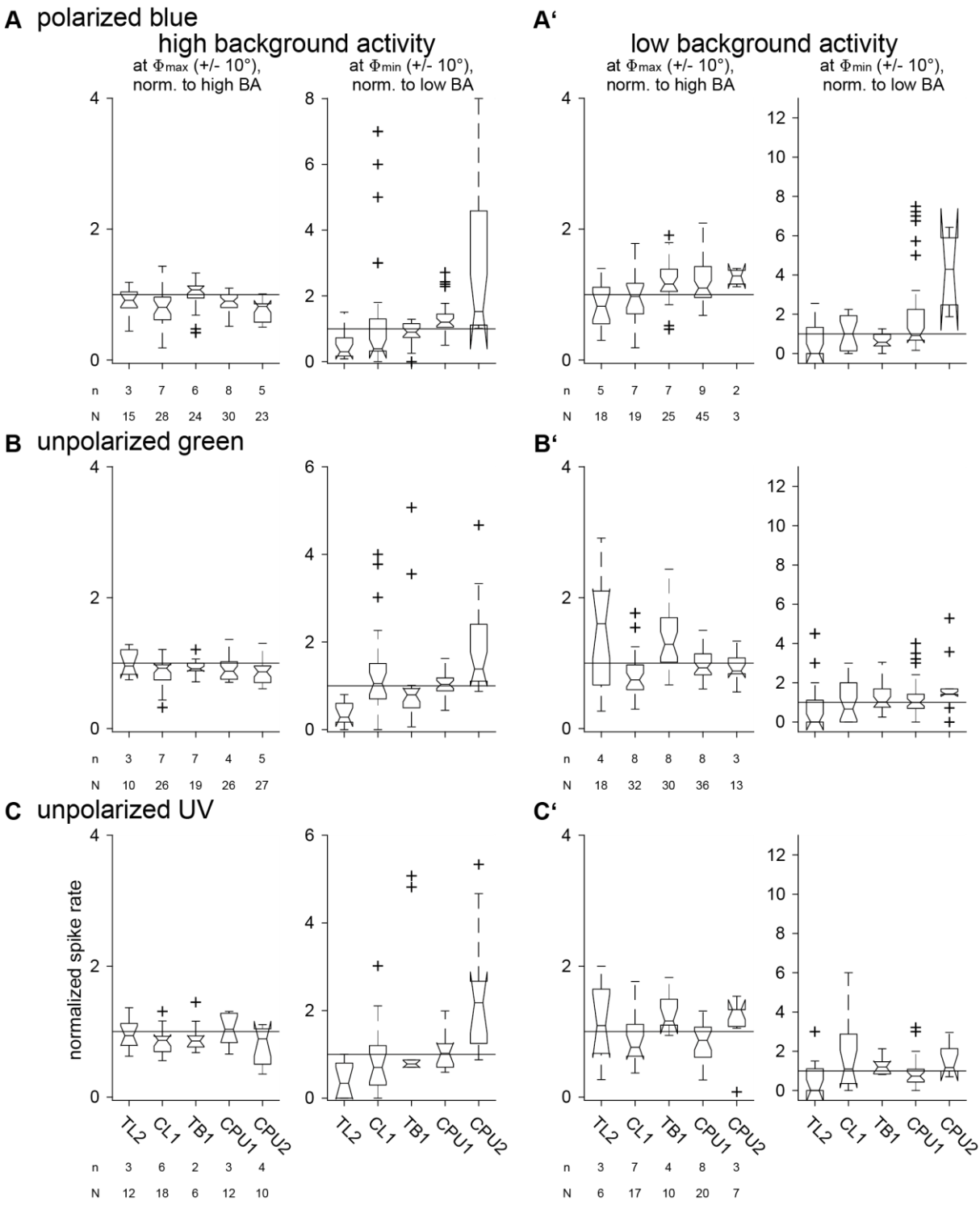

Fig. S4. Comparison of effective amplitudes of responses to three different stimulation regimes in neurons with high and low background activity. Mean spiking activities at Φ_{max} +/- 10° and Φ_{min} +/- 10° are plotted from *N* responses of *n* neurons to polarized blue light (A,A'), unpolarized green light (B,B'), and unpolarized UV light (C,C') during high and low BA. Spike rates were normalized to very high BA (i.e. the 97.5th percentile of BA), or very low BA (i.e. the 2.5th percentile of BA), respectively. Solid line marks a value of 1.

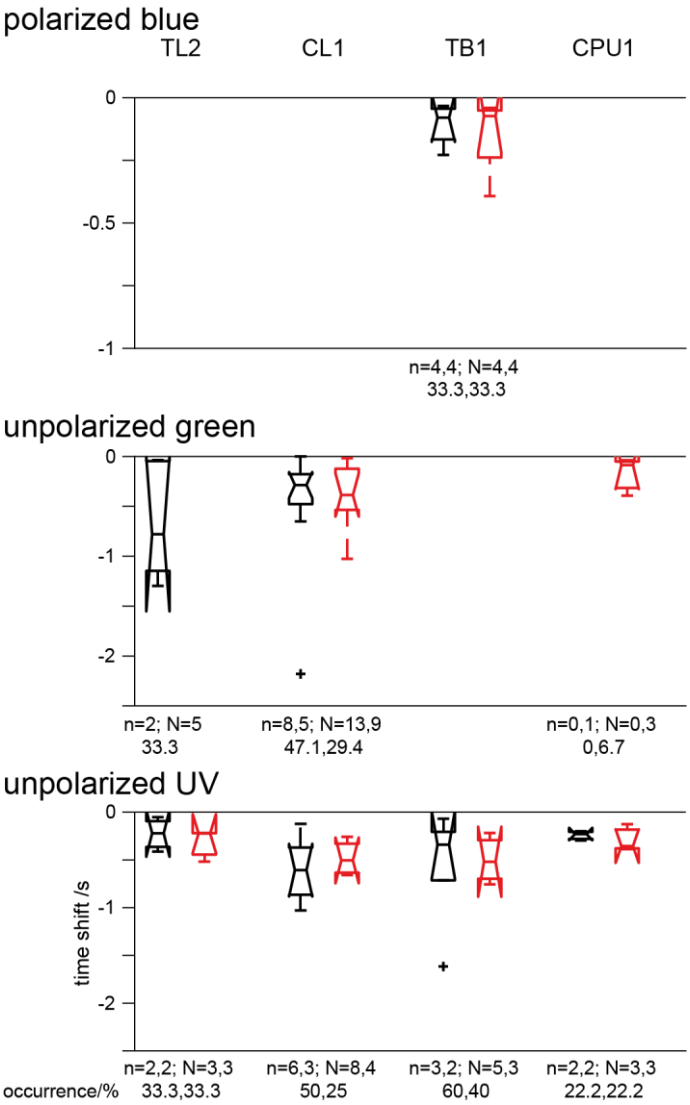

Fig. S5. Response delays in responses to clockwise and counterclockwise stimulation. Boxplots showing delays in Φ_{max} of individual responses to clockwise (black) and counterclockwise (red) rotations when compared to the pooled Φ_{max} of responses to all rotatons. *n*, number of neurons, *N*, number of clockwise and counterclockwise rotations. Only cell types with N>2 are included. In recordings with different numbers of clockwise and counterclockwise responses, redundant responses were randomly excluded from analysis.