Figure S1) Histological verification of electrode position in hippocampus & analysis of principle cells, related to STAR Methods A) Example photomicrograph of electrode penetration of the hippocampus. Penetration points of CA1 and dentate gyrus/CA3 are indicated with red arrows. B) Schematic of electrode tracks for all mice. Vertical lines indicate location of damage produced by electrode penetration through areas CA1, CA3, & the Dentate Gyrus. Dashed lines represent control mice while solid lines represent tilted mice. Coherence and Information Content calculated over entire population of principle cells (control n=146, tilted n=370) Principle cells were classified as having spike widths > 200µs and average firing rates under 10hz. C) represents a cumalitive density function of coherence over the entire population of principle cells. D) represents a cumalitive density function of information content over the entire population of principle cells. Note that control cells have greater coherence and information content compared to tilted cells, (both p=.001). A-B) Black lines represent cells from control mice and red lines represent cell from tilted mice. E) Example average waveforms from an interneuron (left) and a pyramidal cell (right).
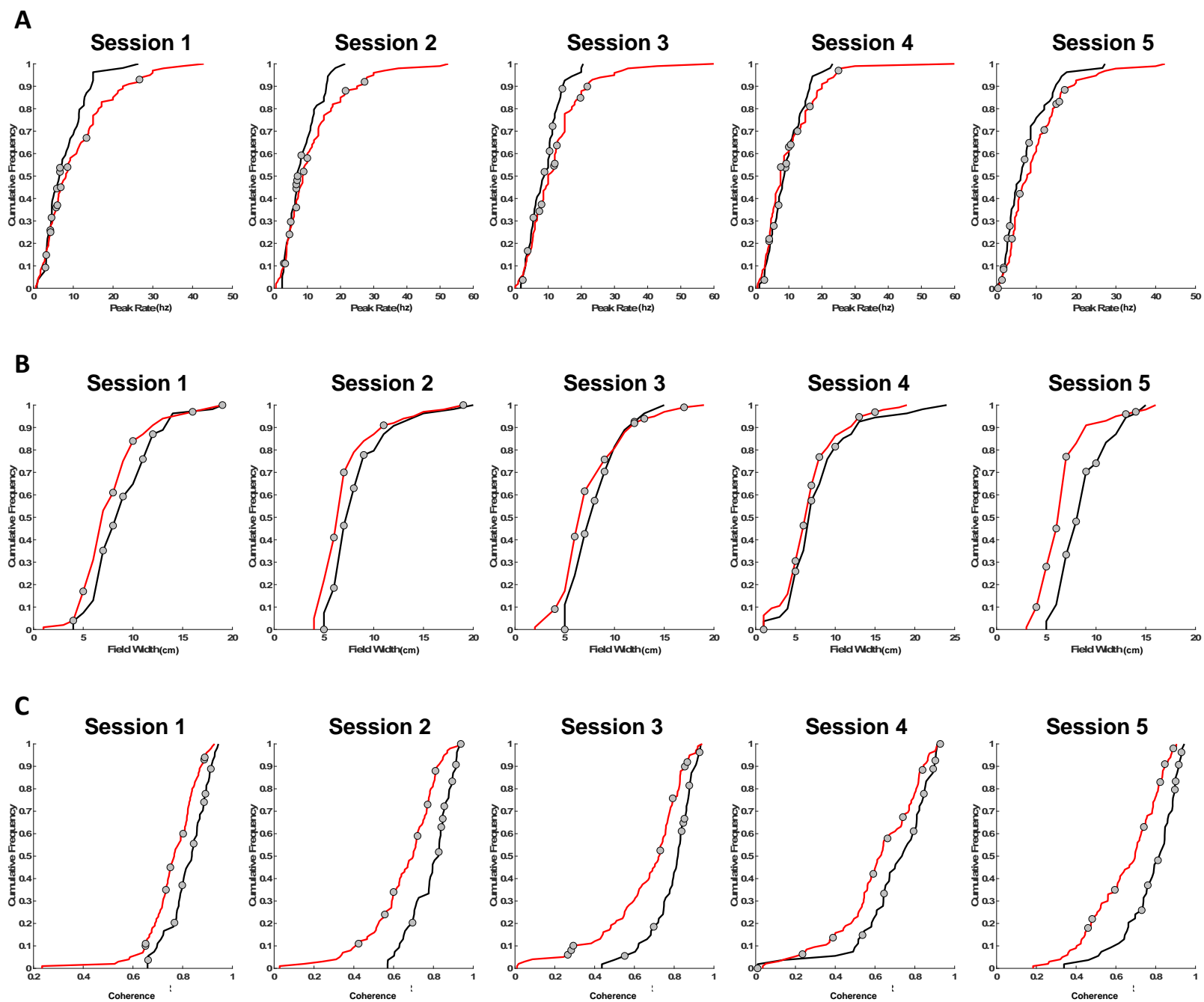
Figure S2) Illustration example cells in comparison to the full distribution of place cells, related to Figure 1B. A-C depicts cumulative density functions over 5 sessions for peak rate, field width, and coherence respectively. Black lines represent cells from control mice and red lines represent cell from tilted mice. Each gray dot along the lines represents a single example cell from figure 1B. Note that example cells are approximately representative of our sample of place cells.
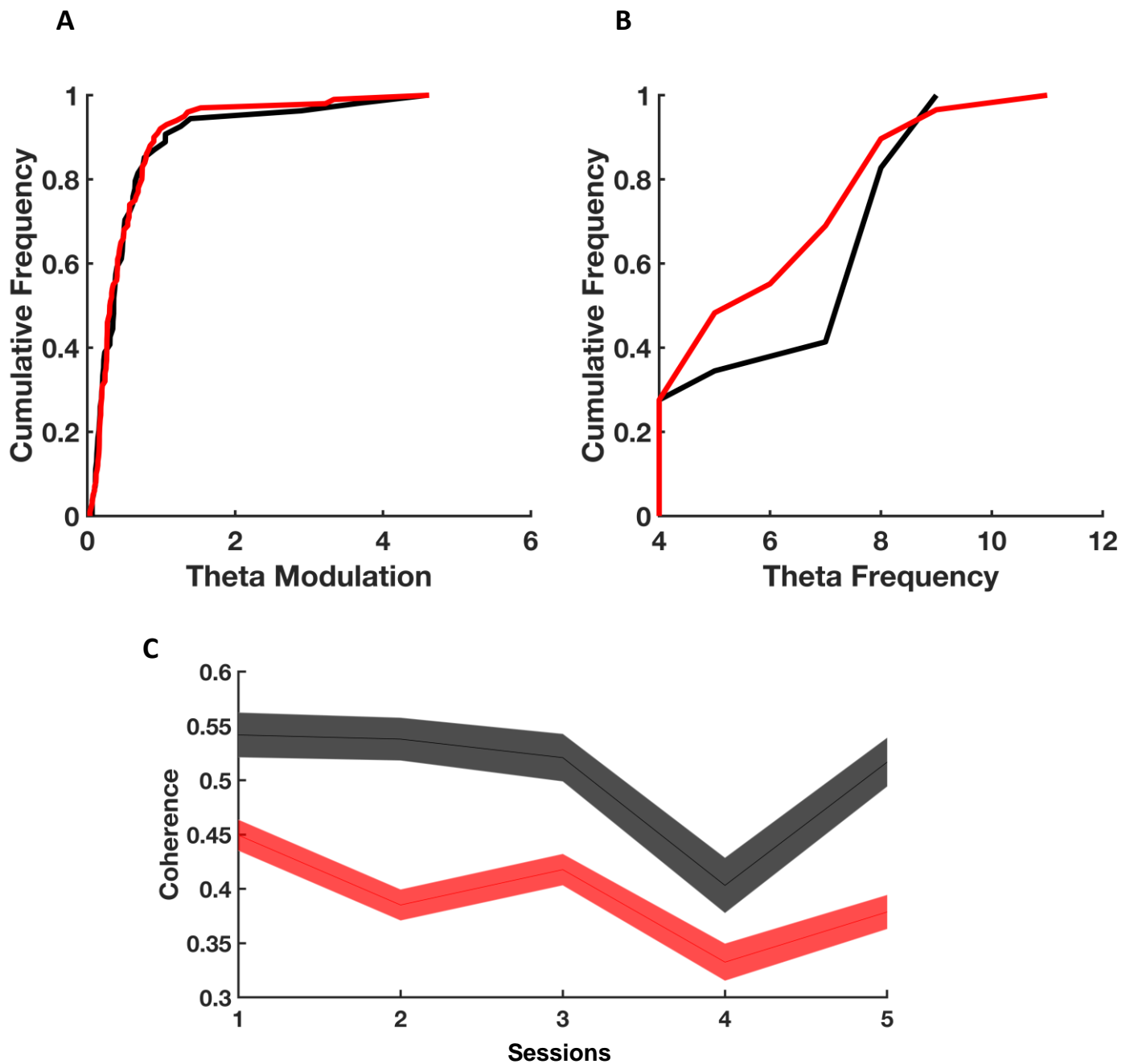
Figure S3) Theta modulation, theta frequency & spatial coherence values calculated from unsmoothed rate maps, related to Figure 1E. A) represents a cumalitive density function of theta modulation index for every place cell from each group. B) represents a cumalitive density function of peak theta frequency for theta modulated place cells. A-B) Black lines represent cells from control mice and red lines represent cell from tilted mice. Note the trend for lower theta freqencies in the tilted group, however this trend failed to reach statistical significance. C) The coherence values differ from those calculated from smoothed rate maps (figure 1E), but the pattern of group ($F(1,152)=33.207$, $p<.001$) and session ($F(4,149)=3.51$, $p=.008$) differences are similar. Mean ($\pm$ SEM) coherence values are presented for control (black) and tilted (red) mice across five recording sessions.

Place cell firing properties

Parameter	Group	Session 1 Standard	Session 2 Rotation	Session 3 Standard	Session 4 Dark	Session 5 Standard
Peak Firing Rate (spikes/s)	Control:	7.95 ± 0.71	8.53 ± 0.66	8.98 ± 0.65	7.58 ± 0.80	9.48 ± 0.72
	Tilted:	10.88 ± 0.98	11.63 ± 0.98	12.10 ± 0.92	9.77 ± 0.78	10.13 ± 0.84
Average Firing Rate (spikes/s)	Control:	0.52 ± 0.07	0.49 ± 0.06	0.53 ± 0.07	0.54 ± 0.08	0.56 ± 0.07
	Tilted:	0.53 ± 0.05	0.53 ± 0.06	0.52 ± 0.05	0.51 ± 0.06	0.50 ± 0.05
Infield Firing Rate (spikes/s)	Control:	3.67 ± 0.28	3.88 ± 0.29	4.17 ± 0.34	2.97 ± 0.29	3.86 ± 0.31
	Tilted:	4.43 ± 0.34	4.37 ± 0.38	4.48 ± 0.41	3.79 ± 0.35	3.83 ± 0.30
Outfield Firing Rate (spikes/s)	Control:	0.38 ± 0.06	0.39 ± 0.06	0.46 ± 0.07	0.53 ± 0.09	0.48 ± 0.08
	Tilted:	0.51 ± 0.05	0.55 ± 0.07	0.53 ± 0.06	0.60 ± 0.07	0.56 ± 0.07
Number Active Bins (bins)	Control:	14.18 ± 1.29	13.86 ± 1.36	13.46 ± 1.32	16.66 ± 2.17	14.06 ± 1.41
	Tilted:	12.76 ± 0.87	11.20 ± 0.94	11.53 ± 0.97	13.319 ± 1.23	12.20 ± 1.07
Field Width (cm)	Control:	22.81 ± 1.05	20.92 ± 1.01	20.42 ± 0.81	19.88 ± 1.43	21.91 ± 0.82
	Tilted:	19.91 ± 0.77	18.27 ± 0.72	19.10 ± 0.76	17.36 ± 0.86	16.95 ± 0.60
Sparsity	Control:	0.19 ± 0.01	0.21 ± 0.01	0.21 ± 0.01	0.26 ± 0.02	0.22 ± 0.01
	Tilted:	0.22 ± 0.01	0.26 ± 0.01	0.25 ± 0.01	0.27 ± 0.01	0.26 ± 0.01
Information Content (bits/spike)	Control:	2.12 ± 0.16	2.22 ± 0.14	2.04 ± 0.15	1.97 ± 0.22	1.98 ± 0.14
	Tilted:	2.12 ± 0.10	1.78 ± 0.11	2.02 ± 0.12	1.96 ± 0.15	2.04 ± 0.12
Coherence	Control:	0.81 ± 0.01	0.79 ± 0.01	0.79 ± 0.01	0.70 ± 0.02	0.82 ± 0.04
	Tilted:	0.75 ± 0.01	0.64 ± 0.01	0.65 ± 0.02	0.61 ± 0.02	0.64 ± 0.01
Field To Wall (cm)	Control:	11.69 ± 0.66	11.98 ± 0.65	11.71 ± 0.74	11.06 ± 0.72	12.37 ± 0.70
	Tilted:	8.82 ± 0.46	7.96 ± 0.39	8.02 ± 0.39	7.97 ± 0.41	8.14 ± 0.37
Peak Bin To Wall (cm)	Control:	11.74 ± 1.11	10.22 ± 1.14	12.69 ± 1.24	9.71 ± 1.30	11.25 ± 1.25
	Tilted:	5.20 ± 0.63	5.63 ± 0.62	6.45 ± 0.68	4.29 ± 0.55	5.27 ± 0.54
Border Score	Control:	-0.20 ± 0.10	-0.21 ± 0.11	-0.33 ± 0.10	-0.10 ± 0.11	-0.29 ± 0.11
	Tilted:	0.20 ± 0.071	0.19 ± 0.07	0.20 ± 0.07	0.11 ± 0.07	0.22 ± 0.07
Intra-Trail Stability (r)	Control:	0.53 ± 0.02	0.48 ± 0.03	0.48 ± 0.02	0.31 ± 0.02	0.48 ± 0.02
	Tilted:	0.35 ± 0.01	0.23 ± 0.02	0.27 ± 0.02	0.24 ± 0.02	0.25 ± 0.02
Displacement (°)	Control:	_____	87.65 ± 8.06	_____	_____	_____
	Tilted:		93.06 ± 8.83			
Displacement Correlation (r)	Control:	_____	0.54 ± 0.02	_____	_____	_____
	Tilted:		0.43 ± 0.01			

Table S1) Summary of place cell firing properties, related to Results & Figure 1. All Values are presented as Mean ± SEM.