**Mixtures of slow, mid-frequency and fast gamma oscillations in *stratum pyramidale* of mouse CA1­**

Concurrent local field potentials (LFPs), reflecting the synchronous synaptic activity at distinct input-defined anatomical locations within the mouse CA1 region of dorsal hippocampus were recorded using 32-ch linear silicon electrode array (Neuronexus, Ann Arbor, MI) in order to demonstrate the presence of three distinct gamma bands within *stratum pyramidale* (sp) as shown previously in rat [1, 2] and mouse [3, 4]. LFPs were first localized (Fig S2A) using sharp-wave associated ripples (SWR). The maximum amplitude of the ripple identified *stratum pyramidale*, themaximum amplitude of the sharp wave identified *stratum radiatum*, and the sharp wave reversal identified *stratum lacunosum moleculare*. CSD analysis [5] was then performed in order to separate individual oscillatory CSD components (Fig S2B). Theta (5-12 Hz) phase was then used to construct theta-averaged CSD power profiles (Fig S2C). While *stratum radiatum* and *stratum lacunosum moleculare* CSDs show the presence of two distinct oscillatory bands (slow gamma 30-60 Hz and mid-frequency gamma 60-120 Hz), *stratum pyramidale* shows three distinct gamma bands (slow gamma 30-60 Hz, mid-frequency gamma 60-90 Hz and fast gamma > 100 Hz). Similar results were obtained when power profiles were constructed using band specific LFPs from *stratum pyramidale* (Fig S2D) during running (speed ≥ 2cm/s) and stillness (speed < 2cm/s). Notably, slow gamma (30-60 Hz) oscillations were distinguished more clearly than in CSD power profiles, while fast gamma (> 100 Hz) was harder to distinguish in LFP power profiles. The ability to detect both slow and mid-frequency gamma oscillations in *stratum pyramidale* is important for two reasons. First, the SG/MG ratio associated with recollection can be sufficiently estimated from the electrodes located in the *stratum pyramidale*. Second, since hippocampal place cell recordings target *stratum pyramidale*, the LFPs recorded together with single units can be used to estimate the SG/MG ratio.

**Mixtures of slow and mid-frequency gamma oscillations during single theta cycles**

It was reported that in rat, slow and mid-frequency gamma oscillations tend to occur mutually exclusively during theta cycles [6], but we find instead that slow and mid-frequency gamma oscillations detected as discrete events (Fig S2E) are often mixed in mouse, as reported by others [4; see Fig S4]. It is possible however, that the common, non-exclusive appearance of slow and mid-frequency gamma oscillations in single theta cycles might be specific to mouse.

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