

Description of Additional Supplementary Files:

Supplementary Movie 1. EMs were induced by optogenetic activation of nIII^{ChAT} neurons at 3.3 Hz (100 ms pulse duration, 200 ms pulse width, 2 mW) (Affiliated to Supplementary Fig.8)

Supplementary Movie 2. EMs were induced by optogenetic activation of nIII^{ChAT} neurons at 20 Hz (10 ms pulse duration, 40 ms pulse width, 2 mW) (Affiliated to Supplementary Fig.8)

Supplementary Movie 3. Laser-evoked EMs (3.3 Hz, 100 ms pulse duration, 200 ms pulse width, 2 mW) recorded prior to the ablation of EOMs-projecting nIII^{ChAT} neurons (Affiliated to Fig.3)

Supplementary Movie 4. Laser-evoked EMs (3.3 Hz, 100 ms pulse duration, 200 ms pulse width, 2 mW) recorded after the ablation of EOMs-projecting nIII^{ChAT} neurons (Affiliated to Fig.3)

Supplementary Movie 5. In vivo single-cell calcium imaging of nIII^{ChAT} neurons across the spontaneous sleep-wake cycle at 16 Hz sample rate (Affiliated to Fig.4)

Supplementary Movie 6. Optogenetic activation of nIII^{ChAT} neuronal terminals within the vIPAG at 20 Hz resulted in the termination of REMs (10 ms pulse duration, 40 ms pulse width, 2 mW) (Affiliated to Fig.5).