Q1: Please review 1) the author affiliation and footnote symbols, 2) the order of the author names, and 3) the spelling of all author names, initials, and affiliations and confirm that they are correct as set.

please change Yulong Li's affiliation from Yulong Li,cto *Yulong Li c,d*

Q2: Please review the author contribution footnote carefully. Ensure that the information is correct and that the correct author initials are listed. Note that the order of author initials matches the order of the author line per journal style. You may add contributions to the list in the footnote; however, funding may not be an author’s only contribution to the work.

Checked.

Q3: Please review your open access and license selection and confirm that it is correct.

Checked

Q4: Certain compound terms are hyphenated when used as adjectives and unhyphenated when used as nouns. This style has been applied consistently throughout where (and if) applicable.

In significance, please add 'acetylcholine' before 'ACh', in the sentence '.... of a key neurotransmitter'.

Q5: If you have any changes to your Supporting Information (SI) file(s), please provide revised, ready-to-publish replacement files without annotations.

No changes.

Q6: Please add a postal code for affiliation b.

 We have added the postal code for affiliation b : 200241

Q7: Please add a department, laboratory, section, or division to affiliation d.

Affiliation d is an institute only for neuroscience, it doesn't have division.

Q8: In the Abstract, is “simulation” correct, or should it be “stimulation”?

It should be 'stimulation'.

Q9: Claims of priority or primacy are not allowed, per PNAS policy (https://www.pnas.org/authors/submitting-your-manuscript); therefore, the term “newly developed” has been deleted. If you have concerns with this course of action, please reword the sentence or explain why the deleted term should not be considered a priority claim and should be reinstated.

Have been removed, thanks.

Q10: Please indicate whether “waking” is the intended term in the sentence beginning with “We show that…” If so, please revise as needed.

‘walking’ is the intended term

Q11: Please confirm that the abbreviation “AAV” has been properly expanded to “adeno-associated viruses.”

Yes, it has been properly expanded.

Q12: Please confirm that the change from “5.4e-9” to “5.4 × 10−9” retains your intended meaning.

Yes, it is.

Q13: Please confirm that the abbreviation “LFP” has been properly expanded to “local field potential.”

Yes, it is.

Q14: Please confirm that the change from “5.58e-8” to “5.58 × 10−8” retains your intended meaning.

Yes, it is.

Q15: Please confirm that the abbreviation “MEG” has been properly expanded to “magnetoencephalography.”

Yes, it is

Q16: Please confirm that the change from “is” to “in” in the sentence beginning with “Our experiments support…” retains your intended meaning or revise as needed.

Yes, It retains our intended meaning.

Q17: Please indicate whether “(460 to 490 F(500 to 550)” indicates a unit of measurement. If so, please add the desired unit abbreviation.

Its orignial meaning is the unit of wavelength (nm), but in this sentence, it means the product's serial number, in this case, there is no need to change.

Q18: PNAS articles should be accessible to a broad scientific audience; as such, please spell out the abbreviation “FLS.”

FLS: Fluorescence Module Including Light Source. It has been revised in manuscript

Q19: Please indicate what the en dash in “(FLS-475 nm–20 mW; DIPSI)” denotes.

It showes features of the laser diode light source we were using.

Q20: PNAS articles should be accessible to a broad scientific audience; as such, please spell out the abbreviation “DIPSI.”

DIPSI: Diffraction Image Phase Sensing Instrument. It has been revised in manuscript.

Q21: Please confirm that the abbreviation “IR” has been properly expanded to “Infrared.”

Yes, it is

Q22: Please confirm that the abbreviation “PFA” has been properly expanded to “perfluoroalkoxy alkanes” or revise as needed.

PFA should be 'paraformaldehyde'

Q23: Please confirm that the abbreviation “GFP” has been properly expanded to “green fluorescent protein.”

Yes, it is

Q24: Please clarify the meaning of “(444)” in the Data Availability Statement.

The mean of 444 was the folder of the data in this paper. It has been corrected as ***https://buzsakilab.com/wp/ dataset/ 444***

Q25: Please clarify the following numbers in *Acknowledgments*: NIH MH122391, MH107396, U19 NS107616, and U19 NS104590. Are these grants, awards, or some other form of support?

Yes, correct

Q26: Please provide editor name(s) for ref. 13.

S.J. Enna

Q27: Please provide editor name(s) for ref. 14.

Kara Federmeier

Q28: Please confirm that the change from “4.55e-18” to 4.55 × 10−18” retains your intended meaning or revise as needed.

Yes, it retains our intended meaning.

Q29: (\*\*) and (\*\*\*) appear in the Fig. 2G artwork but are not explained in the Fig. 2 Legend. Please either add an explanation to the legend or remove (\*\*) and (\*\*\*) from the Fig. 2G artwork.

\*\*, p<0.01; \*\*\*, p<0.001

Q30: PNAS articles should be accessible to a broad scientific audience; as such, please spell out the abbreviation SWS.

SWS: slow-wave sleep

Q31: Please provide an explanation for (\*) in Fig. 3F.

\*, p<0.05.

Q32: Please provide explanations for (\*) and (\*\*) in Fig. 4 A and B iii.

\*, p<0.05; \*\*, p<0.01.

Q33: Please confirm that the changes to the sentence beginning with “Note the steady…” retain your intended meaning or revise as needed.

Yes, it retain our intended meaning.

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Bottom of Form

PNAS articles should be accessible to a broad scientific audience; as such, please spell out the abbreviation SWS.PNAS articles should be accessible to a broad scientific audience; as such, please spell out the abbreviation SWS.PNAS articles should be accessible to a broad scientific audience; as such, please spell out the abbreviation SWS.\*, p<0.05; \*\*, p<0.01; \*\*\*, p<0.001\*, p<0.05; \*\*, p<0.01; \*\*\*, p<0.001Bottom of Form