

GEVI Sensor Comparison

Mursel Karadas

2026-05-31

Measurement in non-neuronal cell culture unless otherwise stated.

Name	τ_{fast} (ms)	% τ_{fast}	τ_{slow} (ms)	$\% \Delta F / F /$ 10mV	λ_{ex} (nm)	Mouse	Drosophila	Zebrafish	Source Notes
Jarvis	N/A			2.9	470/940	3		X	(Grimm et al., 2024)
pAce	0.5	82	1.5	3.1	505/940	X	X		(Grimm et al., 2024; Kannan et al., 2022)
pAceR	2.4	54	5.4	2.8	565	X	X		(Kannan et al., 2022)
Jedi-2P	0.5	88c	7.8c	-4.8	501/940	X			(Liu et al., 2022)
Jedi-1P	0.53	89c	10.3c	-5.4	470	5			(Ludwig et al., 2023)
ASAP6b	3.7	100		16	470/960	X			(Lee et al., 2024)
ASAP6.14.0		100		20	470/960	X			(Lee et al., 2024)

Name	τ_{fast} (ms)	% τ_{fast}	τ_{slow} (ms)	$\% \Delta F / F /$ 10mV	λ_{ex} (nm)	Mouse	Drosophila	Zebrafish	Source Notes
Voltron20.7			3.3	-3.5	525f/1135	X	X	X	(Abdelh-tah et al., 2023; Brooks et al., 2024)
Positron				1.8	525f			X	(Abdelh-tah et al., 2020)
Positron2				3.7				X	(Schre-f, h iter et al., 2023; Wang et al., 2023)
QuasAr6h8		90	6.3	7.3g	635	X			(Tian et al., 2023)
QuasAr6h8		87	6.6	2.4c	635	X			(Tian et al., 2023)
Archon1.61		88	8.1	4.3h	637	X		X	(Piatke-b vich et al., 2019, 2018)

Footnotes

- **b**: Half rise time: 1.9 ms
- **c**: Organotypic slices
- **d**: At 32 C - 35 C
- **e**: Only widefield w/o single cell resolution reported
- **f**: With dye JF525, other dyes possible
- **g**: In cultured neurons: 4.7% / 10 mV

- **h:** In cultured neurons

Bibliography

- Abdelfattah, A.S., Valenti, R., Zheng, J., Wong, A., Podgorski, K., Koyama, M., Kim, D.S., Schreiter, E.R., 2020. A general approach to engineer positive-going eFRET voltage indicators. *Nat. Commun.* 11, 3444. <https://doi.org/10.1038/s41467-020-17322-1>
- Abdelfattah, A.S., Zheng, J., Singh, A., Huang, Y.-C., Reep, D., Tsegaye, G., Tsang, A., Arthur, B.J., Rehorova, M., Olson, C.V.L., Shuai, Y., Zhang, L., Fu, T.-M., Milkie, D.E., Moya, M.V., Weber, T.D., Lemire, A.L., Baker, C.A., Falco, N., Zheng, Q., Grimm, J.B., Yip, M.C., Walpita, D., Chase, M., Campagnola, L., Murphy, G.J., Wong, A.M., Forest, C.R., Mertz, J., Economo, M.N., Turner, G.C., Koyama, M., Lin, B.-J., Betzig, E., Novak, O., Lavis, L.D., Svoboda, K., Korff, W., Chen, T.-W., Schreiter, E.R., Hasseman, J.P., Kolb, I., 2023. Sensitivity optimization of a rhodopsin-based fluorescent voltage indicator. *Neuron* 111, 1547-1563.e9. <https://doi.org/10.1016/j.neuron.2023.03.009>
- Brooks, F.P., Davis, H.C., Park, P., Qi, Y., Cohen, A.E., 2024. Photophysics-informed two-photon voltage imaging using FRET-opsin voltage indicators. <https://doi.org/10.1101/2024.04.01.587540>
- Grimm, C., Sims, R.R., Tanese, D., Lafirdeen, A.S.M., Chan, C.Y., Faini, G., Putti, E., Bene, F.D., Papagiakoumou, E., Emiliani, V., 2024. Two-photon voltage imaging with rhodopsin-based sensors. <https://doi.org/10.1101/2024.05.10.593541>
- Kannan, M., Vasan, G., Haziza, S., Huang, C., Chrapkiewicz, R., Luo, J., Cardin, J.A., Schnitzer, M.J., Pieribone, V.A., 2022. Dual-polarity voltage imaging of the concurrent dynamics of multiple neuron types. *Science* 378, eabm8797. <https://doi.org/10.1126/science.abm8797>
- Lee, S., Zhang, G., Gomez, L.C., Testa-Silva, G., Hao, Y.A., Hiramoto, A., Jiang, D., Roth, R.H., Ding, J., Clandinin, T.R., Roska, B., Feldman, D., Ji, N., Lin, M.Z., 2024. Improving positively tuned voltage indicators for brightness and kinetics. <https://doi.org/10.1101/2024.06.21.599617>
- Liu, Z., Lu, X., Villette, V., Gou, Y., Colbert, K.L., Lai, S., Guan, S., Land, M.A., Lee, J., Assefa, T., Zollinger, D.R., Korympidou, M.M., Vlasits, A.L., Pang, M.M., Su, S., Cai, C., Froudarakis, E., Zhou, N., Patel, S.S., Smith, C.L., Ayon, A., Bizouard, P., Bradley, J., Franke, K., Clandinin, T.R., Giovannucci, A., Tolia, A.S., Reimer, J., Dieudonne, S., St-Pierre, F., 2022. Sustained deep-tissue voltage recording using a fast indicator evolved for two-photon microscopy. *Cell* 185, 3408-3425.e29. <https://doi.org/10.1016/j.cell.2022.07.013>
- Lu, X., Wang, Y., Liu, Z., Gou, Y., Jaeger, D., St-Pierre, F., 2023. Widefield imaging of rapid pan-cortical voltage dynamics with an indicator evolved for one-photon microscopy. *Nat. Commun.* 14, 6423. <https://doi.org/10.1038/s41467-023-41975-3>
- Piatkevich, K.D., Bensussen, S., Tseng, H., Shroff, S.N., Lopez-Huerta, V.G., Park, D., Jung, E.E., Shemesh, O.A., Straub, C., Gritton, H.J., Romano, M.F., Costa, E., Sabatini, B.L., Fu, Z., Boyden, E.S., Han, X., 2019. Population imaging of neural activity in awake behaving mice. *Nature* 574, 413-417. <https://doi.org/10.1038/s41586-019-1641-1>
- Piatkevich, K.D., Jung, E.E., Straub, C., Linghu, C., Park, D., Suk, H.-J., Hochbaum, D.R., Goodwin, D., Pnevmatikakis, E., Pak, N., Kawashima, T., Yang, C.-T., Rhoades, J.L., Shemesh, O., Asano, S., Yoon, Y.-G., Freifeld, L., Saulnier, J.L., Riegler, C., Engert, F., Hughes, T., Drobizhev, M., Szabo, B., Ahrens, M.B., Flavell, S.W., Sabatini, B.L., Boyden, E.S., 2018. A robotic multidimen-

sional directed evolution approach applied to fluorescent voltage reporters. *Nat. Chem. Biol.* 14, 352-360. <https://doi.org/10.1038/s41589-018-0004-9>

- Schreiter, E.R., Abdelfattah, A., Hasseman, J., Reep, D., Tsegaye, G., Tsang, A., Kolb, I., Wong, A., Chuong, A., Zheng, J., Arthur, B., Korff, W., Team, G.P., 2023. Optimization of Ace2N based voltage indicators. <https://doi.org/10.25378/janelia.22325446.v1>
- Tian, H., Davis, H.C., Wong-Campos, J.D., Park, P., Fan, L.Z., Gmeiner, B., Begum, S., Werley, C.A., Borja, G.B., Upadhyay, H., Shah, H., Jacques, J., Qi, Y., Parot, V., Deisseroth, K., Cohen, A.E., 2023. Video-based pooled screening yields improved far-red genetically encoded voltage indicators. *Nat. Methods* 1-13. <https://doi.org/10.1038/s41592-022-01743-5>
- Wang, Z., Zhang, J., Symvoulidis, P., Guo, W., Zhang, L., Wilson, M.A., Boyden, E.S., 2023. Imaging the voltage of neurons distributed across entire brains of larval zebrafish. <https://doi.org/10.1101/2023.12.15.571964>