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| **Indicator** | **Brief description** | **Type** | **Applications** | **Expression** | **Source** |
| *genetic* |  |  |  |  |  |
| Actin-GCaMP2 | Calcium imaging reporter fused to beta actin. Enriched at spines | activity | *In vivo* live imaging | Constitutive | Addgene 18928 |
| GCaMP3 | Calcium imaging reporter | activity | *In vivo* live imaging.Applied to image *Drosophila* pre-synaptic boutons activity. Tuft dendritic potentials in mice.  | Constitutive | Tian et al. (2009)Addgene 43917, 32644 |
| GCaMP6s | Calcium imaging reporter with sufficient SNR to detect synaptic events | activity | *In vivo* live imaging. Cortical areas, deeper regions with chronic windows (hippocampus). Pre- and postsynaptic structures. Extensively tested in rodents, zebrafish and *Drosophila.* | Constitutive and floxed forms. Suitable for AAV delivery and in utero electroporation. Transgenic animals available. | Chen et al. (2013)Addgene 40753, Addgene 100842 (AAV vector), and othersTransgenic mouse lines available: Camk2a-tTA (B6.Cg-Tg(Camk2a-tTA)1Mmay/DboJ, Jax #007004, RRID:IMSR\_JAX: 007004, and others |
| jGCaMP7b | Calcium imaging reporter with sufficient SNR to detect synaptic events | activity | *In vivo* live imaging. Cortical areas, deeper regions possible with chronic windows (hippocampus). Pre-and postsynaptic structures (mostly rodents) | Constitutive and floxed forms. Suitable for AAV delivery and, likely, in utero electroporation. | Dana et al. (2019)Addgene 104489, 104497Addgene 135419 (variant enriched at axons) |
| jRECO1a | Red fluorescent calcium imaging reporter with sufficient SNR to detect synaptic events | activity | *In vivo* live imaging. Cortical areas like visual cortex. Tested in rodents, *Drosophila*, and zebrafish. | Constitutive for AAV delivery. Floxed versions available. Other methods possible. | Addgene 100852, 100853, 100854*Drosophila* strain PBac{20XUAS-IVS-NES-jRCaMP1a-p10}VK00005 Flybase ID FBti0180188 |
| XCaMP series:XCaMP-YXCaMP-R | Multicolour variants of calcium imaging reporters with sufficient SNR to detect synaptic events | activity | *In vivo* live imaging. Cortical areas like visual cortex. Imaging in the hippocampus is possible with longer wavelength sensors. | Constitutive | Inoue et al. (2019) |
| Syntagma | Photoconvertible CAMPARI variant (green to red) The photoconversion requires calcium influx and UV light (via either an optic cannula or imaging objective). | activity | *In vivo* live imaging.Fixed tissue. Pre- (PSD95.FingR fusion) and postsynaptic (synaptophysin fusion) variants available. Tested in rodents. | Constitutive. AAV delivery. | Perez-Alvarez et al. (2020)Addgene 119738 (pre)Addgene 119736 (post) |
| SF-iGluSnFR A184S (higher SNR) or S72A (higher temporal fidelity) variants | Fluorescent reporter for glutamate release  | activity | *In vivo* live imaging. Cortical areas, tested in the rodent and ferret visual and sensory cortex. | Constitutive. AAV delivery. | Marvin et al. (2018)Addgene 106200 (S72V variant), Addgene 106198 (A184S variant) |
| SEP-GluA1 | AMPA receptor trafficking and exposure | Plasticity (E-LTP) | *In vivo* live imaging | Constitutive. In utero electroporation. Knock-in mouse line reported. | Addgene 24000, Addgene 64942.Transgenic line: Graves et al. (2020) |
| GFP-GluA1 | AMPA receptor trafficking and exposure | Plasticity (E-LTP) | *In vivo* imaging. Fixed tissue. | Constitutive and inducible | Addgene 34857 |
| AS-PaRac1 | Local translation of light-sensitive Rac1 | Plasticity (L-LTP) | *In vivo* live imaging. Fixed tissue. | Constitutive or activity-dependent. AAV delivery and in utero electroporation reported  | Hayashi-Takagi et al. (2015) |
| SA-Ch | Local translation of ChR2 variant | Plasticity (L-LTP) | Live imaging. Fixed tissue. | Inducible. In utero electroporation. | Gobbo et al. (2017) |
| diffusible fillers | Fluorescent fillers of the GFP and RFP families can be used to image changes in dimensions and new spine formation or elimination. Membrane-anchored fluorescent proteins can also be used to increase signal. | Structural plasticity (changes in dimension and formation/removal of spines) | Live imaging. Validated in multiple models including rodents, *Drosophila*, zebrafish  | Any method of delivery. Multiple transgenic lines are available.  | Multiple commercial sources. Transgenic lines: B6.Cg-Tg(Thy1-YFP)HJrs/J Jax #003782, and many others |
| PSD-95 fluorescent variants (or Homer1c fusions) | Fluorescent postsynaptic proteins (excitatory synapses) | Structural plasticity (mainly formation/loss) | Live imaging | Multiple methods of delivery. Transient or inducible expression may be preferable | Addgene 125694, 125693, 133785 and others |
| Gephyrin fluorescent variants | Fluorescent postsynaptic proteins (inhibitory synapses) | Structural plasticity (mainly formation/loss) | Live imaging | Multiple methods of delivery. Transient or inducible expression may be preferable | Addgene 126217, 73918 and others |
| e-GRASP | Complementation system to visualise synapses between defined pre- and postsynaptic neuron populations. It can be activity-dependent. It can be applied to inhibitory connections (Test needed).  | Structural plasticity (changes in dimensions and numbers), plasticity of connections | Live imaging possible. Fixed tissue.  | Constitutive via AAV delivery. Activity-dependent expression is dependent the tetON system (cfos-tTA) | Addgene 111579 (cyan pre-eGRASP) 111582 (tet-dependent yellow pre-eGRASP), 111580 (yellow pre-eGRASP), 111584 (post-eGRASP)Addgene 120309 (cfos-tTA) |
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| *chemical* |  |  |  |  |  |
| FM dyes | Neurotransmitter exocytosis | activity | live imaging | Injected | Commercial sources available |
| Oregon Green 488 BAPTA-1, Fluo-4 (and others) | Pre- or postsynaptic activity  | activity | *In vivo* live imaging | Injected, delivered with patch pipettes or cell electroporation | Commercial source available |