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Supplemental Information

Optogenetic Inhibition of Synaptic Release with Chromophore-Assisted Light Inactivation (CALI)

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Inventory of Supplemental Materials

Figure S1. Representative images of SYP1-eGFP fluorescence and FM4-64 dye uptake in cultured cortical neurons.

This supplemental figure shows the representative images of the data used in Figure 1E.

Figure S2. Additional examples and summaries of whole-cell patch-clamp recording of electrically-evoked EPSC and miniature EPSC in organotypic hippocampal slices and primary cultured neurons.

This supplemental figure provides additional representative electrophysiological recordings and summary graphs not shown Figure 2.

Figure S3. Expression of miniSOG-Citrine and SNT-1-miniSOG-Citrine in *C. elegans*.

This supplemental figure provides the representative fluorescent images of miniSOG-Citrine and SNT1-miniSOG-Citrine worms that are acquired similarly to Figure 4A.

Figure S4. Analysis of spontaneous EPSCs recorded from miniSOG-VAMP2-Citrine (miniSOG-VAMP2) expressing worms and non-expressing (Wt) N2 worms.

This supplemental figure provides the properties of the spontaneous EPSC recorded from non-expressing (Wt) worms and miniSOG-VAMP2-Citrine expressing worms prior to light illumination to demonstrate the over-expression of miniSOG-VAMP2-Citrine in Wt worms does not significantly changed the vesicular release. This supplemental figure complements the data shown in Figure 4B.

Table S1. Analysis of spontaneous EPSCs recorded from miniSOG-VAMP2-Citrine (miniSOG-VAMP2) expressing worms and non-expressing (Wt) N2 worms.

This supplemental table provides values shown in **Figure S4**.

Movie S1. An example of the inhibition of *C. elegans* movements with light illumination.

This movie shows the typical movies used for the quantification shown in **Figure 3A-C**.

Additional Supplemental Material

Protein and DNA sequences of InSynC

- miniSOG-VAMP2-T2A-mCherry
- miniSOG-VAMP2-Citrine
- SYP1-miniSOG-T2A-mCherry
- SYP1-miniSOG-Citrine
- SNT-1-miniSOG-Citrine

Supplemental Material

Optogenetic inhibition of synaptic release with chromophore-assisted light inactivation (CALI)

John Y. Lin *et al.*

Figure S1

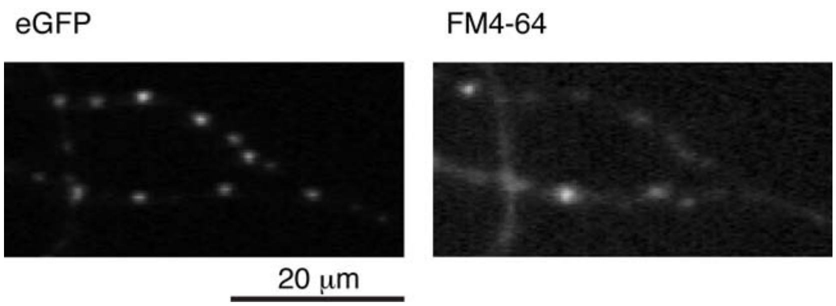

Figure S1. Representative images of SYP1-eGFP fluorescence and FM4-64 dye uptake in cultured cortical neurons.

Fluorescence images of eGFP puncta (left) and the corresponding FM4-64 dye uptake (right) after stimulation with 40 mM KCl. Not all eGFP positive puncta had detectable dye uptake, and FM4-64 on the plasma membrane was not removed completely after washout. Fluorescence was quantified to produce the graph shown in Figure 1E.

Figure S2

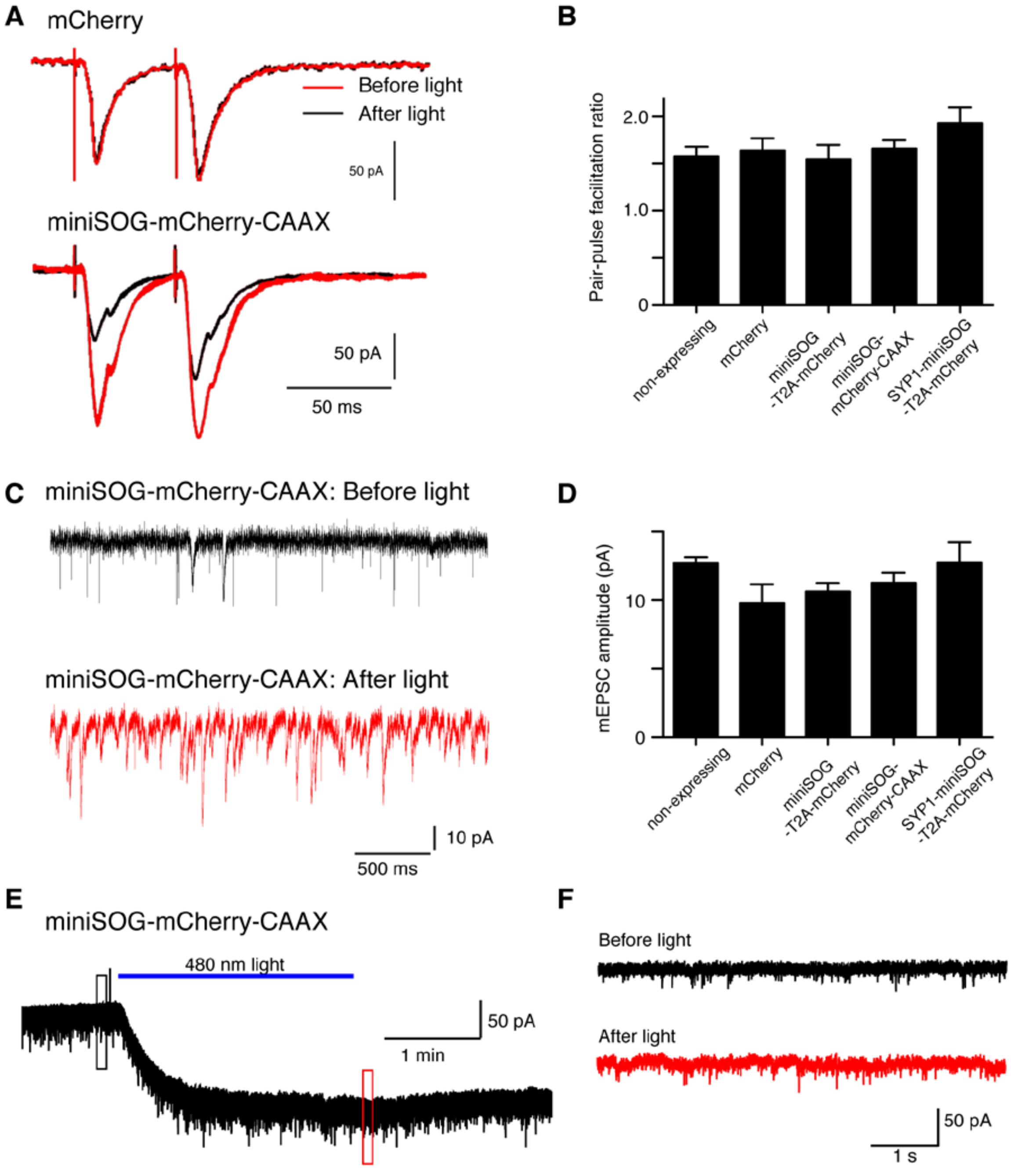

Figure S2. Additional examples and summaries of whole-cell patch-clamp recording of electrically-evoked EPSC and miniature EPSC in organotypic hippocampal slices and primary cultured neurons.

(A) In the organotypic hippocampal slices infected with rAAV expressing mCherry alone, the electrically-evoked EPSC was not inhibited after 480 nm light illumination. In the organotypic hippocampal slices infected with rAAV expressing membrane tethered miniSOG and mCherry (miniSOG-mCherry-CAAX), the electrically-evoked EPSC was sometimes increased after 480 nm light illumination. (B) Expression of mCherry, miniSOG-T2A-mCherry, miniSOG-mCherry-CAAX and SYP1-miniSOG-T2A-mCherry did not significantly change the pair-pulse facilitation ratio. (C) In the organotypic hippocampal slices infected with rAAV expressing miniSOG-mCherry-CAAX, light illumination increased the frequency mEPSC. (D) The mean mEPSC amplitudes in the slices expressing the different constructs prior to light illumination were not significantly different. (E) Voltage-clamp recording of miniSOG-mCherry-CAAX-expressing cortical neurons before and after light illumination (illumination indicated by blue horizontal bar). A long-lasting inward current is observed after light illumination. (F) Higher magnification of the boxed area in (E). Both graphs are shown as mean ± S.E.M.. This supplemental figure provides additional representative electrophysiological recordings and summary graphs not shown Figure 2.

Figure S3

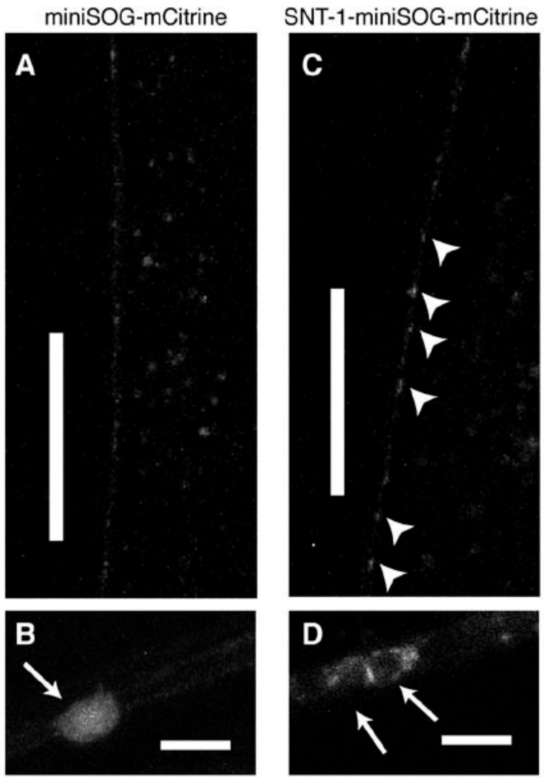

Figure S3. Expression of miniSOG-Citrine and SNT-1-miniSOG-Citrine in *C. elegans*.

Confocal images of Citrine fluorescence in miniSOG-mCitrine- (A and B) and SNT-1-miniSOG-Citrine (C and D)-expressing worms. (A) In miniSOG-Citrine-expressing animals, punctate fluorescence signals corresponding to presynaptic terminals were not observed at the dorsal cord (A) although fluorescence is observed in the motor neuron somas located ventrally (B; arrowed). (C) In SNT-1-miniSOG-Citrine-expressing worms, punctate fluorescence signals at the dorsal cord (indicated by arrowheads) were consistent with synaptic localization along axonal projections (C). Somatic fluorescence signals (arrowed) were also observed in SNT-1-miniSOG-Citrine-expressing worms, presumably from newly synthesized protein prior to axonal trafficking (D). The animals expressing miniSOG-VAMP2-Citrine show similar expression pattern to SNT-1-miniSOG-Citrine-expressing animals. Scale bar: 25 μm for (A) and (C) and 5 μm for (B) and (D). These images were acquired similarly to Figure 4A

Figure S4

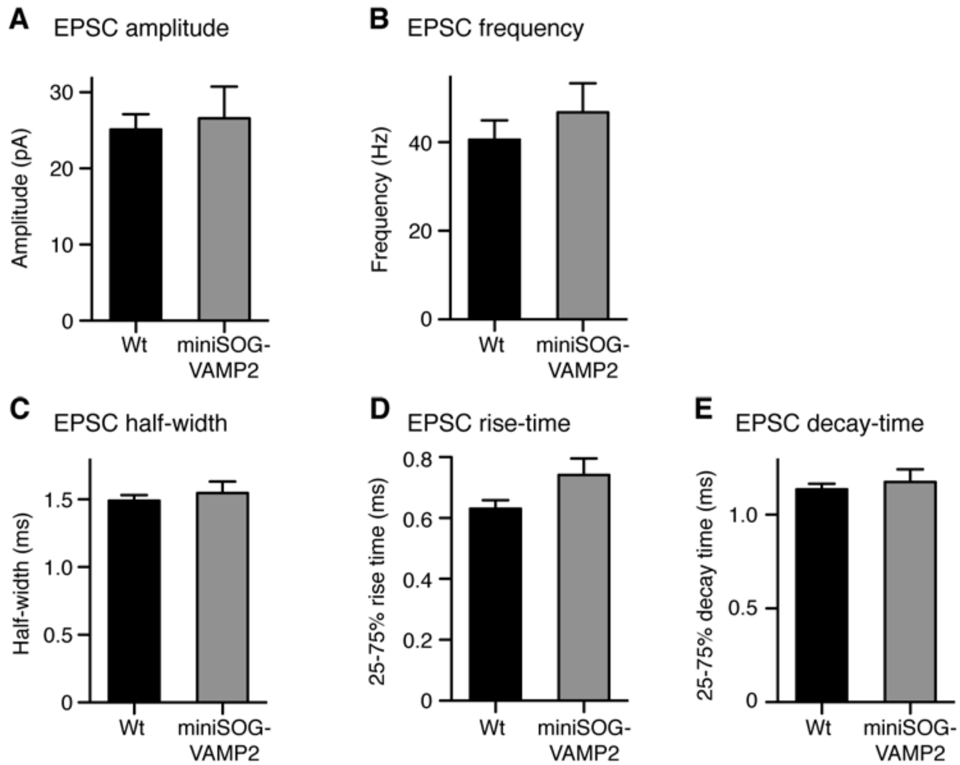

Figure S4. Analysis of spontaneous EPSCs recorded from miniSOG-VAMP2-Citrine (miniSOG-VAMP2) expressing worms and non-expressing (Wt) N2 worms prior to light illumination.

Analysis of the mean spontaneous EPSC amplitudes (A), frequency (B), half-width (C), rise time (D) and decay time (E) of whole-cell patch-clamp recordings from the muscle of miniSOG-VAMP2 (n = 11) and wild-type (n = 15) worms. None of the parameter compared were significantly different between the two groups. All graphs are shown as mean ± S.E.M..

Table S1. Analysis of spontaneous EPSCs recorded from miniSOG-VAMP2-Citrine (miniSOG-VAMP2) expressing worms and non-expressing (Wt) N2 worms.

	Amplitude (pA)	Frequency (Hz)	Half-width (ms)	Rise-time (ms)	Decay-time (ms)
Wt (N2)	25.10 ± 2.01	40.57 ± 4.39	1.492 ± 0.041	0.063 ± 0.028	1.137 ± 0.029
miniSOG-VAMP2	26.57 ± 4.18	46.73 ± 6.55	1.548 ± 0.083	0.742 ± 0.054	1.175 ± 0.068

Movie S1. An example of the inhibition of *C. elegans* movements with light illumination.

This composite movie shows the inhibition and the recovery of the movements of a miniSOG-VAMP2-mCitrine expressing worm (N2 wild-type background) on a bacteria-free agar surface after the illumination of light. The movie is shown in real time.

Protein and DNA sequences of InSynC

miniSOG-VAMP2-T2A-mCherry

```
 miniSOG
 Linker
 VAMP2
 T2A sequence
 mCherry

gctagc NheI restriction site
cgtacg BsiWI restriction site


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2508 gccgagggccgccactccaccggcggcatggacgagctgtacaagtaa 2555
```

miniSOG-VAMP2-Citrine

```
 miniSOG
 Linker
 VAMP2
 Citrine

ACCGGT AgeI restriction site
ATCGAT ClaI restriction site

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SYP1-miniSOG-T2A-mCherry

```
Synaptophysin (SYP1)
Linker
miniSOG
T2A sequence
mCherry

accggt AgeI restriction site
gctagc NheI restriction site
cgtacg BsiWI restriction site

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 461  D  N  M  A  I  I  K  E  F  M  R  F  K  V  H  M  E  G  S  V  480
2463 gataacatggccatcatcaaggagttcatgcgcttcaaggtgcacatggagggctccgtg 2522

 481  N  G  H  E  F  E  I  E  G  E  G  E  G  R  P  Y  E  G  T  Q  500
2523 aacggccacgagttcgagatcgagggcgagggcgagggccgcccctacgagggcacccag 2582

 501  T  A  K  L  K  V  T  K  G  G  P  L  P  F  A  W  D  I  L  S  520
2583 accgccaagctgaaggtgaccaagggtggccccctgcccttcgcctgggacatcctgtcc 2642

 521  P  Q  F  M  Y  G  S  K  A  Y  V  K  H  P  A  D  I  P  D  Y  540
2643 cctcagttcatgtacggctccaaggcctacgtgaagcaccccgccgacatccccgactac 2702

 541  L  K  L  S  F  P  E  G  F  K  W  E  R  V  M  N  F  E  D  G  560
2703 ttgaagctgtccttccccgagggcttcaagtgggagcgcgtgatgaacttcgaggacggc 2762

 561  G  V  V  T  V  T  Q  D  S  S  L  Q  D  G  E  F  I  Y  K  V  580
2763 ggcgtggtgaccgtgacccaggactcctccctgcaggacggcgagttcatctacaaggtg 2822

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2823 aagctgcgcggcaccaacttcccctccgacggccccgtaatgcagaagaagaccatgggc 2882

 601  W  E  A  S  S  E  R  M  Y  P  E  D  G  A  L  K  G  E  I  K  620
2883 tgggaggcctcctccgagcggatgtaccccgaggacggcgccctgaagggcgagatcaag 2942

 621  Q  R  L  K  L  K  D  G  G  H  Y  D  A  E  V  K  T  T  Y  K  640
2943 cagaggctgaagctgaaggacggcggccactacgacgctgaggtcaagaccacctacaag 3002

 641  A  K  K  P  V  Q  L  P  G  A  Y  N  V  N  I  K  L  D  I  T  660
3003 gccaagaagcccgtgcagctgcccggcgcctacaacgtcaacatcaagttggacatcacc 3062

 661  S  H  N  E  D  Y  T  I  V  E  Q  Y  E  R  A  E  G  R  H  S  680
3063 tcccacaacgaggactacaccatcgtggaacagtacgaacgcgccgagggccgccactcc 3122

 681  T  G  G  M  D  E  L  Y  K  *  690
3123 accggcggcatggacgagctgtacaagtaa 3152
```

SYP1-miniSOG-Citrine

SYP1
miniSOG
Linker

Citrine

ACCGGT AgeI restriction site
ATCGAT ClaI restriction site

```
   1  M  D  V  V  N  Q  L  V  A  G  G  Q  F  R  V  V  K  E  P  L  20
1065 ATGGACGTGGTGAATCAGCTGGTGGCTGGGGGTCAGTTCCGGGTGGTCAAGGAGCCCCTT 1124

  21  G  F  V  K  V  L  Q  W  V  F  A  I  F  A  F  A  T  C  G  S  40
1125 GGCTTCGTGAAGGTGCTGCAGTGGGTCTTTGCCATCTTCGCCTTTGCTACGTGTGGCAGC 1184

  41  Y  T  G  E  L  R  L  S  V  E  C  A  N  K  T  E  S  A  L  N  60
1185 TACACCGGGGAGCTTCGGCTGAGCGTGGAGTGTGCCAACAAGACGGAGAGTGCCCTCAAC 1244

  61  I  E  V  E  F  E  Y  P  F  R  L  H  Q  V  Y  F  D  A  P  S  80
1245 ATCGAAGTTGAATTCGAGTACCCCTTCAGGCTGCACCAAGTGTACTTTGATGCACCCTCC 1304

  81  C  V  K  G  G  T  T  K  I  F  L  V  G  D  Y  S  S  S  A  E  100
1305 TGCGTCAAAGGGGGCACTACCAAGATCTTCCTGGTTGGGGACTACTCCTCGTCGGCTGAA 1364

 101  F  F  V  T  V  A  V  F  A  F  L  Y  S  M  G  A  L  A  T  Y  120
1365 TTCTTTGTCACCGTGGCTGTGTTTGCCTTCCTCTACTCCATGGGGGCCCTGGCCACCTAC 1424

 121  I  F  L  Q  N  K  Y  R  E  N  N  K  G  P  M  M  D  F  L  A  140
1425 ATCTTCCTGCAGAACAAGTACCGAGAGAACAACAAAGGGCCTATGATGGACTTTCTGGCT 1484

 141  T  A  V  F  A  F  M  W  L  V  S  S  S  A  W  A  K  G  L  S  160
1485 ACAGCCGTGTTCGCTTTCATGTGGCTAGTTAGTTCATCAGCCTGGGCCAAAGGCCTGTCC 1544

 161  D  V  K  M  A  T  D  P  E  N  I  I  K  E  M  P  M  C  R  Q  180
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 181  T  G  N  T  C  K  E  L  R  D  P  V  T  S  G  L  N  T  S  V  200
1605 ACAGGGAACACATGCAAGGAACTGAGGGACCCTGTGACTTCAGGACTCAACACCTCAGTG 1664

 201  V  F  G  F  L  N  L  V  L  W  V  G  N  L  W  F  V  F  K  E  220
1665 GTGTTTGGCTTCCTGAACCTGGTGCTCTGGGTTGGCAACTTATGGTTCGTGTTCAAGGAG 1724

 221  T  G  W  A  A  P  F  M  R  A  P  P  G  A  P  E  K  Q  P  A  240
1725 ACAGGCTGGGCAGCCCCATTCATGCGCGCACCTCCAGGCGCCCCGGAAAAGCAACCAGCA 1784

 241  P  G  D  A  Y  G  D  A  G  Y  G  Q  G  P  G  G  Y  G  P  Q  260
1785 CCTGGCGATGCCTACGGCGATGCGGGCTACGGGCAGGGCCCCGGAGGCTATGGGCCCCAg 1844

 261  D  S  Y  G  P  Q  G  G  Y  Q  P  D  Y  G  Q  P  A  S  G  G  280
1845 GACTCCTACGGGCCTCAGGGTGGTTATCAACCCGATTACGGGCAGCCAGCCAGCGGTGGC 1904

 281  G  G  Y  G  P  Q  G  D  Y  G  Q  Q  G  Y  G  Q  Q  G  A  P  300
1905 GGTGGCTACGGGCCTCAGGGCGACTATGGGCAGCAAGGCTATGGCCAACAGGGTGCGCCC 1964

 301  T  S  F  S  N  Q  M  K  T  G  G  G  G  S  G  G  G  S  M  E  320
1965 ACCTCCTTCTCCAATCAGATGaaaaccggtGGTGGCGGCAGTGGTGGCGGCAGCATgGAG 2024

 321  K  S  F  V  I  T  D  P  R  L  P  D  N  P  I  I  F  A  S  D  340
2025 AAAAGTTTCGTGATAAcTGATCCACGGCTGCCAGACAATCCCATCATCTTCGCATCCGAT 2084

 341  G  F  L  E  L  T  E  Y  S  R  E  E  I  L  G  R  N  G  R  F  360
2085 ggCTTCCTGGAGCTGACCGAGTATTCCAGAGAGGAGATCCTGGGCCGCAATGgCCGCTTT 2144

 361  L  Q  G  P  E  T  D  Q  A  T  V  Q  K  I  R  D  A  I  R  D  380
2145 CTGCAGGGACCAGAGACAGACCAGGCCACAGTGCAGAAGATTCGCGATGCCATTAGAGAT 2204
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 381  Q  R  E  I  T  V  Q  L  I  N  Y  T  K  S  G  K  K  F  W  N  400
2205 CAGCGCGAGATTACCGTGCAGCTGATAAACTACACAAAAAGCGGGAAGAAATTCTGGAAC 2264

 401  L  L  H  L  Q  P  M  R  D  Q  K  G  E  L  Q  Y  F  I  G  V  420
2265 CTCcTgCACCTCCAGCCCATGAGGGACCAGAAGGGTGAGCTCCAGTATTTCATCGGAGTG 2324

 421  Q  L  D  G  S  G  G  G  S  G  G  G  G  A  G  I  D  M  V  S  440
2325 CAGCTGGATGGATCAGGAGGAGGCTCAGGAGGAGGAGGCGCGggAATCGATatggtgagc 2384

 441  K  G  E  E  L  F  T  G  V  V  P  I  L  V  E  L  D  G  D  V  460
2385 aagggcgaggagctgttcaccggggtggtgcccatcctggtcgagctggacggcgacgta 2444

 461  N  G  H  K  F  S  V  S  G  E  G  E  G  D  A  T  Y  G  K  L  480
2445 aacggccacaagttcagcgtgtccggcgagggcgagggcgatgccacctacggcaagctg 2504

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2505 accctgaagttcatctgcaccaccggcaagctgcccgtgccctggcccaccctcgtgacc 2564

 501  T  F  G  Y  G  L  M  C  F  A  R  Y  P  D  H  M  K  Q  H  D  520
2565 accttcggctacggcctgatgtgcttcgcccgctaccccgaccacatgaagcagcacgac 2624

 521  F  F  K  S  A  M  P  E  G  Y  V  Q  E  R  T  I  F  F  K  D  540
2625 ttcttcaagtccgccatgcccgaaggctacgtccaggagcgcaccatcttcttcaaggac 2684

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2685 gacggcaactacaagacccgcgccgaggtgaagttcgagggcgacaccctggtgaaccgc 2744

 561  I  E  L  K  G  I  D  F  K  E  D  G  N  I  L  G  H  K  L  E  580
2745 atcgagctgaagggcatcgacttcaaggaggacggcaacatcctggggcacaagctggag 2804

 581  Y  N  Y  N  S  H  N  V  Y  I  M  A  D  K  Q  K  N  G  I  K  600
2805 tacaactacaacagccacaacgtctatatcatggccgacaagcagaagaacggcatcaag 2864

 601  V  N  F  K  I  R  H  N  I  E  D  G  S  V  Q  L  A  D  H  Y  620
2865 gtgaacttcaagatccgccacaacatcgaggacggcagcgtgcagctcgccgaccactac 2924

 621  Q  Q  N  T  P  I  G  D  G  P  V  L  L  P  D  N  H  Y  L  S  640
2925 cagcagaacacccccatcggcgacggccccgtgctgctgcccgacaaccactacctgagc 2984

 641  Y  Q  S  A  L  S  K  D  P  N  E  K  R  D  H  M  V  L  L  E  660
2985 taccagtccgccctgagcaaagaccccaacgagaagcgcgatcacatggtcctgctggag 3044

 661  F  V  T  A  A  G  I  T  L  G  M  D  E  L  Y  K  *  677
3045 ttcgtgaccgccgccgggatcactctcggcatggacgagctgtacaagTAG 3095
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SNT-1-miniSOG-Citrine

```
miniSOG
Linker
SNT-1
Citrine

accggt AgeI restriction site
ATCGAT ClaI restriction site
```

```
   1  M  V  K  L  D  F  S  S  Q  D  E  E  N  D  E  D  L  T  K  E  20
 692 ATGGTGAAATTAGACTTTTCGTCGCAAGACGAAGAGAACGACGAAGACTTGACAAAAGAG 751

  21  F  V  R  D  E  A  P  M  E  E  T  T  S  E  A  V  K  Q  I  A  40
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752 TTTGTAAGGGATGAAGCACCAATGGAAGAAACAACATCGGAAGCAGTAAAGCAAATAGCA 811

41 T T T K E T L K D V V V N K V I D V K D 60
812 ACAACGACAAAGGAGACGCTGAAAGATGTGGTTGTAAATAAAGTGATTGATGTGAAAGAC 871

61 V V K E K V M Q Q T G M P E W A F V F L 80
872 GTTGTGAAAGAAAAGGTTATGCAACAAACTGGGATGCCTGAATGGGCGTTCGTATTTCTT 931

81 G F V F I L L V L A C A F C L I R K L F 100
932 GGATTCGTATTTATTCTGCTGGTTCTCGCGTGTGCATTCTGTCTCATTCGGAAGTTATTT 991

101 G K K R H G E K N K K G G L K G F F G K 120
992 GGAAAAAAGCGGCATGGTGAGAAGAACAAAAAGGGTGGATTGAAAGGATTCTTTGGTAAA 1051

121 G Q D V V D G K N I Q G M A Q D L E E L 140
1052 GGACAGGATGTCGTTGATGGAAAAAATATTCAAGGGATGGCTCAAGACTTGGAAGAACTT 1111

141 G D A M E Q N E K E Q A E E K E E V K L 160
1112 GGTGATGCGATGGAACAAAATGAAAAAGAACAAGCTGAAGAAAAAGAAGAAGTGAAACTT 1171

161 G R I Q Y K L D Y D F Q Q G Q L T V T V 180
1172 GGAAGGATACAATATAAACTTGATTATGATTTCCAACAAGGTCAACTAACTGTAACTGTA 1231

181 I Q A E D L P G M D M S G T S D P Y V K 200
1232 ATTCAAGCAGAAGATTTACCAGGAATGGACATGTCAGGAACATCAGATCCATATGTAAAA 1291

201 L Y L L P E K K K K V E T K V H R K T L 220
1292 TTGTATTTGTTACCGGAGAAAAAGAAGAAGGTTGAGACGAAAGTACATCGAAAAACTCTT 1351

221 N P V F N E T F I F K V A F N E I T A K 240
1352 AATCCAGTATTCAATGAGACATTCATTTTTAAAGTCGCTTTCAACGAAATTACGGCAAAA 1411

241 T L V F A I Y D F D R F S K H D Q I G Q 260
1412 ACTCTTGTCTTTGCAATTTATGATTTCGATCGGTTCAGTAAGCACGATCAAATCGGACAA 1471

261 V L I P L G K I D L G A V I E E W K D I 280
1472 GTTCTCATTCCGCTTGGAAAAATTGATTTGGGAGCTGTTATCGAAGAATGGAAGGATATT 1531

281 A P P P D D K E A E K S L G D I C F S L 300
1532 GCACCACCACCAGATGACAAAGAAGCTGAGAAGAGTCTTGGTGACATTTGCTTCTCACTT 1591

301 R Y V P T A G K L T V V I L E A K N L K 320
1592 CGGTACGTCCCAACTGCTGGTAAATTGACAGTGGTCATTCTGGAAGCAAAAAATCTTAAG 1651

321 K M D V G G L S D P Y V K I V L M Q G G 340
1652 AAAATGGACGTCGGTGGTTTATCAGATCCTTATGTGAAGATTGTGTTGATGCAAGGTGGA 1711

341 K R L K K K K T S I K K C T L N P Y Y N 360
1712 AAACGACTGAAAAAGAAGAAGACATCAATCAAAAAGTGTACACTTAACCCATATTATAAC 1771

361 E S F S F E V P F E Q I Q K V S L M I T 380
1772 GAATCGTTCAGCTTTGAAGTGCCTTTCGAACAAATTCAGAAAGTTTCCCTTATGATCACT 1831

381 V M D Y D K L G S N D A I G R C L L G C 400
1832 GTGATGGATTATGATAAACTTGGATCCAATGACGCTATTGGAAGGTGTCTATTGGGATGT 1891

401 N G T G A E L R H W M D M L A S P R R P 420
1892 AATGGAACCGGTGCCGAGCTGAGGCATTGGATGGATATGTTGGCTTCACCACGTCGTCCA 1951

421 I A Q W H T L G P V E E E G D K K D D K 440
1952 ATTGCTCAATGGCATACACTTGGACCAGTTGAAGAAGAAGGTGATAAGAAAGATGATAAG 2011

441 K T G G G G S G G G S M E K S F V I T D 460

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2012 AAAaccggtGGTGGCGGCAGTGGTGGCGGCAGCATgGAGAAAAGTTTCGTGATAAcTGAT 2071

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2072 CCACGGCTGCCAGACAATCCCATCATCTTCGCATCCGATggCTTCCTGGAGCTGACCGAG 2131

 481  Y  S  R  E  E  I  L  G  R  N  G  R  F  L  Q  G  P  E  T  D  500
2132 TATTCCAGAGAGGAGATCCTGGGCCGCAATGgCCGCTTTCTGCAGGGACCAGAGACAGAC 2191

 501  Q  A  T  V  Q  K  I  R  D  A  I  R  D  Q  R  E  I  T  V  Q  520
2192 CAGGCCACAGTGCAGAAGATTCGCGATGCCATTAGAGATCAGCGCGAGATTACCGTGCAG 2251

 521  L  I  N  Y  T  K  S  G  K  K  F  W  N  L  L  H  L  Q  P  M  540
2252 CTGATAAACTACACAAAAAGCGGGAAGAAATTCTGGAACCTCcTgCACCTCCAGCCCATG 2311

 541  R  D  Q  K  G  E  L  Q  Y  F  I  G  V  Q  L  D  G  S  G  G  560
2312 AGGGACCAGAAGGGTGAGCTCCAGTATTTCATCGGAGTGCAGCTGGATGGATCAGGAGGA 2371

 561  G  S  G  G  G  G  A  G  I  D  M  V  S  K  G  E  E  L  F  T  580
2372 GGCTCAGGAGGAGGAGGCGCGGGAATCGATatggtgagcaagggcgaggagctgttcacc 2431

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2432 ggggtggtgcccatcctggtcgagctggacggcgacgtaaacggccacaagttcagcgtg 2491

 601  S  G  E  G  E  G  D  A  T  Y  G  K  L  T  L  K  F  I  C  T  620
2492 tccggcgagggcgagggcgatgccacctacggcaagctgaccctgaagttcatctgcacc 2551

 621  T  G  K  L  P  V  P  W  P  T  L  V  T  T  F  G  Y  G  L  M  640
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2672 gaaggctacgtccaggagcgcaccatcttcttcaaggacgacggcaactacaagacccgc 2731

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 801  T  L  G  M  D  E  L  Y  K  *  810
3092 actctcggcatggacgagctgtacaagTAG 3121
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