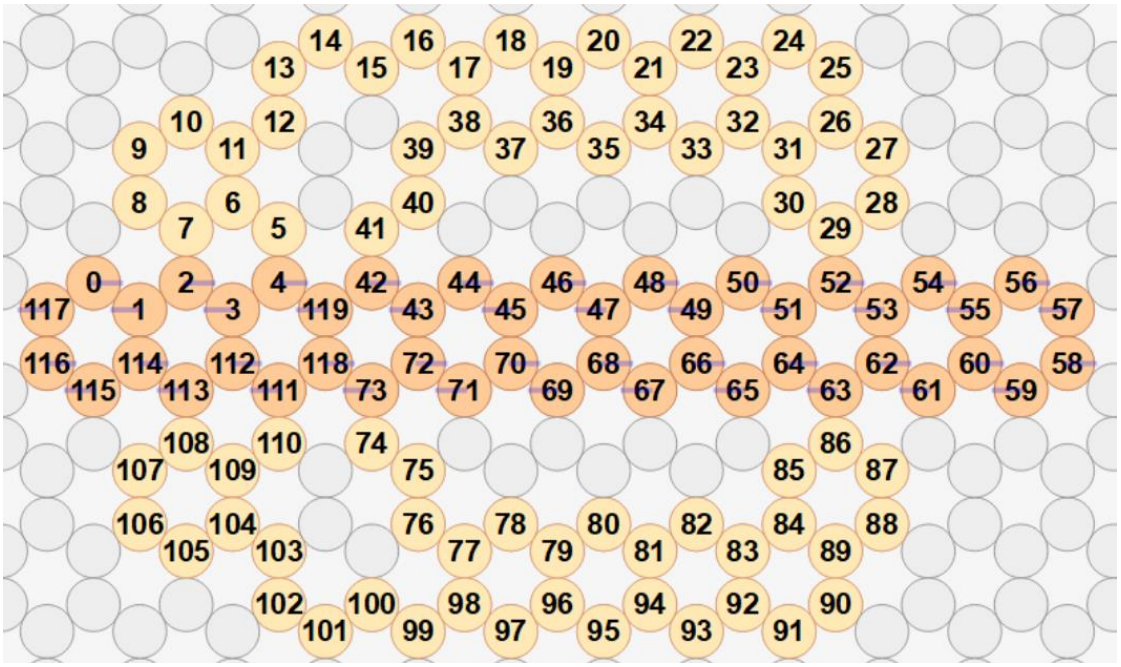
Supporting Information

Basic Component

Stopper

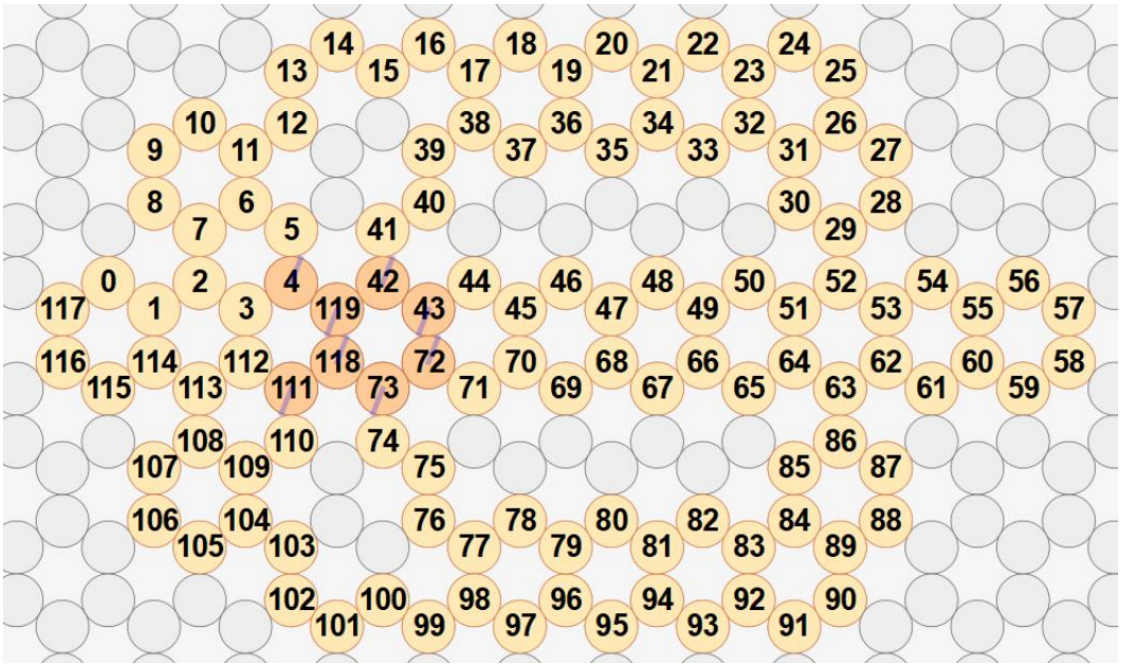
The stopper is a cuboid structure at the bottom of the monomer. It prevents the two interlocked monomers from sliding off each other.



S1. Stopper Structure. The deeper color represents the cross section of the stopper. Each circle represents a double helix DNA. The picture is a screenshot from CaDNAno[27].

Axle

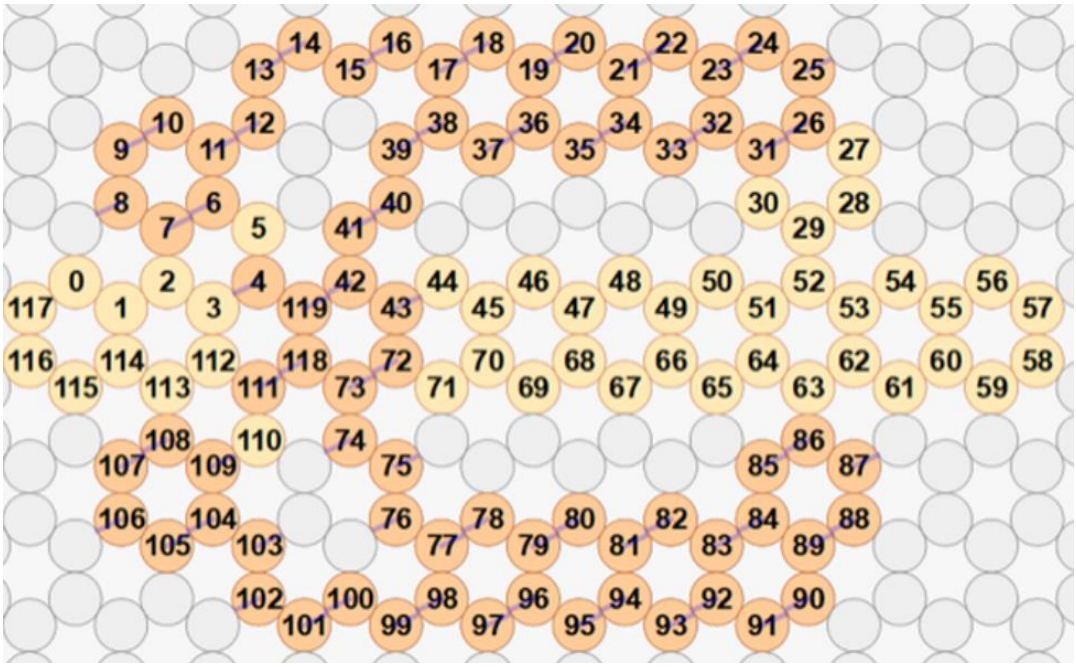
The axle is a 160 nm six-helix bundle, connecting the stopper and the ring. It plays the role as a track during sliding process. The sequences for dimerizing are on No. 72 of the Big and Small monomers (Fig. S2, S5). The two complementary sequences on Big monomer's axle are on No. 42 and 73 (Fig. S2, S5).



S2. Axle Structure. The deeper color represents the cross section of the axle. Each circle represents a double helix DNA. The picture is a screenshot from CaDNAno[27].

Ring

The ring ties two axles together in a restricted area and makes monomers slide along the direction paralleled to axle. There are two hinge zones at No. 39, 40, 41 and No. 74, 75, 76, flexible for the ring structure to change slightly when ring closing. There are two bulky zones at No. 6 - 11 and No. 104 - 109. These two zones generate steric effect and help ring closing. The two sequences on the two arms of Small monomer's ring, which are complementary to the designed sequences on Big monomer's axle, are on No. 36 and 79 (Fig. S3, S5). The sequences for ring closing are on No. 31, 86, 87(Fig. S3, S5).



S3. Ring Structure. The deeper color represents the cross section of the ring. Each circle represents a double helix DNA. The picture is a screenshot from CaDNAno[27].

3D structure

3D structure made by Autodesk Maya is displayed in Figure S4. It shows the stopper, the axle and the ring part in three figures, including top view (Figure S4a), side view (Figure S4b) and back view (Figure S4c).

(a)

(b)

(c)

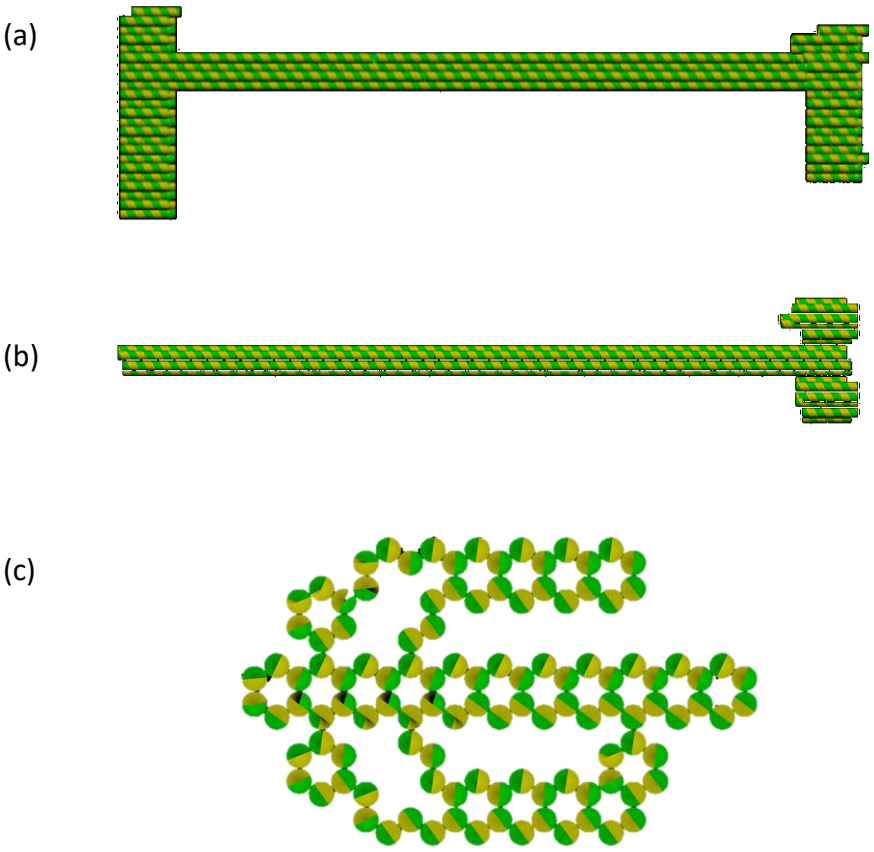
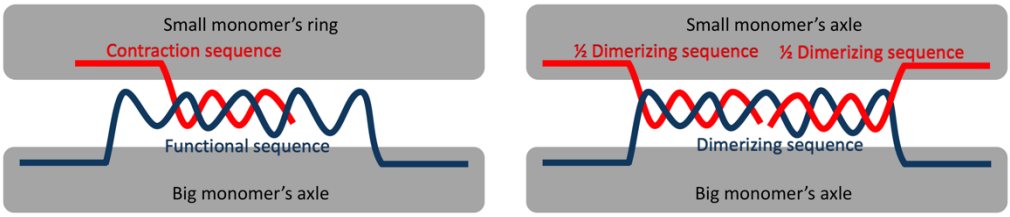


Figure S4. (a)Top view, (b) side view, (c) back view of NanoMuscle. (Maya image).

Special design

Dimerizing sequence design

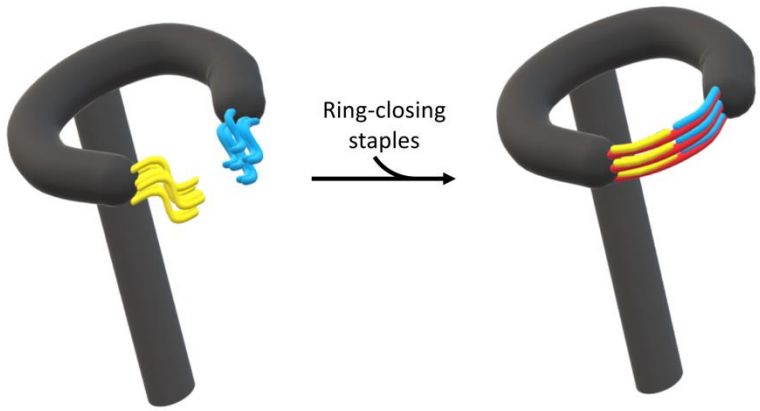
On Big monomer's axle, the dimerizing sequence and the functional sequences are annealed with the axle at both ends. The functional sequences will combine with staples that are free at one or both ends without causing DNA supercoiling. However, Big monomer's dimerizing sequence will anneal with Small monomer's dimerizing sequence. If the two ends of Small monomer's dimerizing sequence are buried in the axle, DNA supercoiling may prevent the complementary dimerizing sequences from hybridizing. Therefore, we split the Small monomer's dimerizing sequence into two parts, each of which contains five bases stretching out from the axle. With one free end, the dimerizing sequences can anneal without supercoiling.



S5. Difference in free ends of contraction sequence and dimerizing sequence.

Ring-closing design

Initially, monomers' rings are not closed. Seven sequences are designed to stretch out from the arms of the unclosed ring. The rings are closed after dimerizing Big and Small monomers. To bridge the unclosed gap, we added Ring-Closing staples, which are complementary to the sequences stretched out from the arms of the unclosed rings. The closed ring can therefore lock the axle in it and constrain NanoMuscle's movement in one dimension.



S6. Ring closing design. The red Ring-closing staples are complementary to the blue and yellow staples that stretch out from the two arms of the unclosed rings.

Functional staples

Ring-closing related sequences

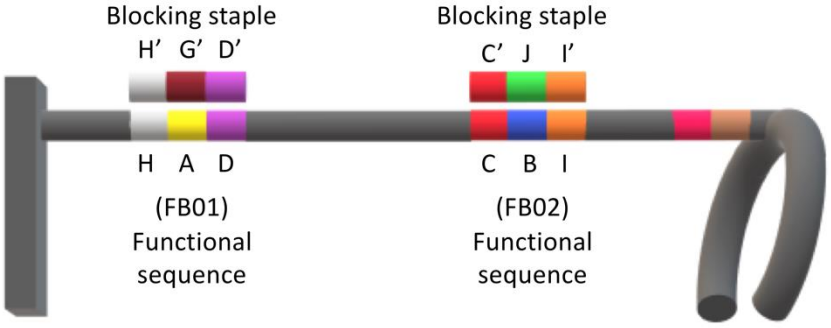
RB01 to RB14 are the sequences related to ring-closing. One end (black letters) of these sequences are annealed to the scaffold, while the other 20 bases (blue letters) are free and complementary to the Ring-closing staple. RB01 to RB07 are the seven sequences at one arm of the ring, and RB08 to RB14 are at the other arm. RB01 to RB14 contain either 20 cytosine (C) or guanine (G), and the Ring-closing staple has 20 cytosine (C) and guanine (G) to bridge the two sets of staples.

Dimerizing sequence

The Dimerizing sequence CB01 contains 10 base pair. The one on the Big monomer is complementary to the one on Small monomer. However, the sequence on the Big monomer has 10 extra base pair. This design ensure that as the releasing staple ReB01 is added, ReB01 displaces Small monomer's Dimerizing sequence due to higher affinity, and thus releases the dimerization of the two monomers.

Blocking and anti-blocking staples

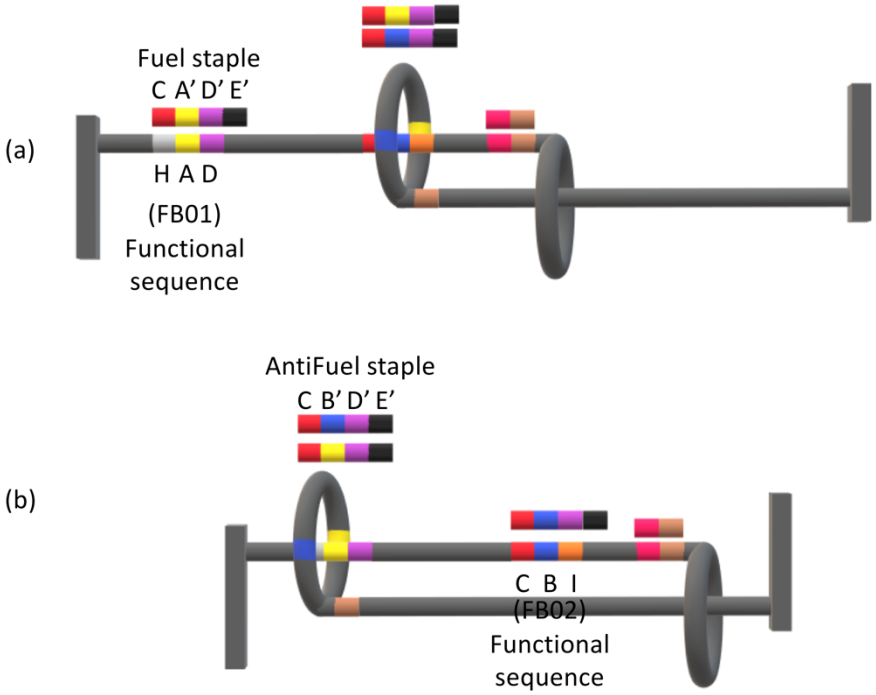
The functional sequences FB01 (HAD) and FB02 (CBI) are located at Big monomer's axle. Both of them contain 30 base pairs, and their two ends are buried in the axle. The blocking staples (H'G'D' and C'JI') has 30 base pairs, 20 of which are complementary to the function staple. Blocking staples prevent FB01 or FB02 from annealing with the contraction and extension sequences on Small monomer's ring. After closing the rings, anti-blocking staple is added. Since both anti-blocking staples have all 30 base pairs complementary to the blocking staples, blocking staples are removed from the functional staples.



S7. Big monomer with blocking staples. Each alphabet represents 10 base pairs.

Fuel/AntiFuel staples

Fuel and AntiFuel staples each contains 40 base pairs. The Fuel staple (CA'D'E') has 20 base pairs complementary to functional sequence FB01 (HAD). When Fuel staples block FB01 and contraction sequence (yellow) on Small monomer's ring, the extension sequence (blue) on Small monomer's ring binds to FB02 (CBI). When AntiFuel staples (C'B'DE), which have 30 base pairs complementary to the Fuel staples, are added, the AntiFuel staples remove the Fuel staples from FB01. In addition, the AntiFuel staple replaces the extension sequence Small monomer's ring and combines to FB02, since it has 20 base pairs complementary to FB02, while the extension sequence (blue) only has 10. We can, again, add excess Fuel staples to extend NanoMuscle. Excess Fuel staples removes AntiFuel staples from FB02, and blocks FB01 and contraction sequence (yellow) on Small monomer's ring. Hence, by repeatedly adding excess Fuel/AntiFuel staples, NanoMuscle achieves reversible contraction and extension.



S8. (a) ExtendedNanoMuscle (Fuel staples added). (b) Contracted NanoMuscle (AntiFuel staples added). Each alphabet represents 10 base pairs.

Sequences for future application

MB01 to MB04 and MS01 to MS05 are at the bases of the monomers. These sequences have one end annealed to the base, and the other end free with 12 base pairs. These sequences are designed for future applications. For example, they may be applied to connect NanoMuscles into series, forming a larger structure that contract and extend at longer length.

Big Monomer

Structural Staples

No.	Start	End	Sequence (5’ to 3’)	Length
SB001	118[290]	73[275]	TTAATAGAATCCGTATTGGGCGCCAAATGCTGCGAAACAAAGTACAACA	49
SB002	118[93]	72[102]	ATAATAGCAATAGCTATTTC	20
SB003	58[36]	59[36]	GAAAGATTCATCAGTTTTCATTATTACAGGTA	32
SB004	111[369]	43[368]	ATAGATAAGGCAAATCTATAATCCGCTCACTCCGCTCTGC	40
SB005	111[134]	119[146]	CTGTTTAGTATCAATTTTTTGAAGAAA	27
SB006	46[32]	46[2]	CGTCCAATACTGCGGAAACATTATCATTTTG	31
SB007	118[199]	119[212]	GCCAAAAAGAACTGGCATAGCCGGAATTAGAGAGTACCTGAGAGAGCCC	49
SB008	42[164]	73[149]	CTGTTTGATGGTTCGAGCACTTTGAAAGAGGACAA	35
SB009	73[291]	4[293]	AAGCCAAGCGTAGCTCAACATGTTCGGTTTGAGAGCGGAGTAATAA	46
SB010	72[15]	42[2]	ATCGCTTTAAACAGTTAACCGTCTATCACGACAACTCGTATT	42
SB011	10[463]	6[436]	AATATTTAACATTAAAACCGTAAATTTTTTAACCAATAGGAA	42
SB012	111[45]	119[60]	CCTAAATTTAATGGTTTGATTAACTTAAAG	30
SB013	73[213]	118[228]	TAAGTTTCCAGTCGCCATATTTAACAACGCCACGC	35
SB014	18[463]	36[436]	AGTCTGGAGCAAACAACAGGTCAAAGTACCGAGCTCGAATTC	42
SB015	112[36]	113[36]	TTTTTCAAATATATAAACGAACGCGAGAAAAC	32
SB016	104[466]	109[463]	AGGAGGTTTAGTGGATAAGTG	21
SB017	119[213]	118[200]	GCCGTGAATGGCTATTAGTCTTTAAGCGTAACTTT	35
SB018	72[466]	118[444]	CATCGGAACGAGGGTAGCAACGGCTATCGTCACCCGC	37
SB019	111[108]	42[114]	CCGGAATCATAATTACTAATGAAAAGAACGTGAAATCAAAAGAA	44
SB020	42[351]	72[347]	AAACCTGTCATATAACACG	19
SB021	75[432]	74[432]	CCGACTTGAGCCATTTCGCTTTTGCGCCGTCA	32
SB022	73[276]	118[291]	TATATTAGTTGGAATATAAAGTACCGACAAAAGCC	35
SB023	73[303]	43[319]	AATAAGTTTATTCTTTGACTGCAACTAAAGT	31
SB024	83[432]	82[432]	GAATCAAGTTTGCCTTTAAATCAGTAGCGACA	32
SB025	42[330]	73[317]	TTAATGAATGGTGTCTACTAAAACACTCATTTG	33
SB026	118[437]	72[431]	CGAGTACTTCTGGAAGCATAAAGTGTAGCTATTTT	35
SB027	73[404]	42[415]	TTTAGGAATTCCCATCCTAATTTACGAGCATTTTATTGCAAATTTGGGG	49
SB028	60[36]	61[36]	AACTAACGGAACAAAAACACGTTAATAAAACG	32
SB029	116[39]-116[16]	FREE	TATAACTATATGTAAATAGGTCTGAAACTCGGCTCA	36
SB030	42[239]	111[242]	ATAGGTCATTTGTGTCGAAATCCAGTATGTTTACCAAACATGTAATTTA	49
SB031	54[32]	54[2]	GAATTACGAGGCATAGTACTTCTGAATAATG	31
SB032	103[439]	102[439]	TGCCCGTATAAACACGACGCCTTGAGTAACAG	32
SB033	21[432]	20[432]	AACTGTTGGGAAGGGACTCATTCAGGCTGCGC	32

SB034	4[41]	111[25]	TGCTGAACCTCAAAAATCAAGAGGGTAATTGAGTCAGTTT	40
SB035	73[409]	4[424]	GGAAATTATTCACTTTTTGTCAATAACCTGTTTAAAGCCAACCGTTAAT	49
SB036	4[402]	119[389]	AGCCATTGCAACAGGAAACCACC	23
SB037	26[437]	31[406]	GGTAACGCCAGGGTTTTCCCAGTCACGACGTTGTAAA	37
SB038	113[10]	3[32]	CTTAGATTAAGTCCTTGAATAATCAATATCTGGTCAG	37
SB039	115[5]	1[16]	TGAATTTATCAAAATCTGAGAAGGAG	26
SB040	43[304]	73[297]	AATACCCCAGCGATTATAACAC	22
SB041	52[32]	52[2]	AACCCTCGTTTACCAGATCAATATAATCCTG	31
SB042	72[44]	111[44]	CTGACCCACACTGAACATGA	20
SB043	53[2]	62[5]	ATTGTTTGGATTAACAATAAC	21
SB044	41[436]	41[466]	TACGAGAGTAGCATTAACATCCAATAAATCA	31
SB045	72[363]	42[361]	GGCACCAACCTAAAAGTTGATTCCCAATTTT	31
SB046	44[32]	44[2]	TGAATCCCCCTCAAATGAACGTTATTAATTT	31
SB047	12[470]	13[470]	AACAGGAAGATTGTGGGAAGAAAAGCCCCAAA	32
SB048	111[201]	72[198]	AATTGAGAAAGCCTAACACCACATTGCAGCAAGCGGTGGTCAGGACGAG	49
SB049	19[432]	18[432]	AAAGCGCCATTCGCATGAGCCGGAAACCAGGC	32
SB050	38[466]	17[463]	ATAAAGCCTCAGAACGGTAAT	21
SB051	20[463]	34[436]	GAGAGATCTACAAAGGGAGGGTAGGGCTTGTTACCTCGATAA	42
SB052	16[463]	38[436]	CGTAAAACTAGCATGTATCGATGAGTGTTTCCTGTGTGAAAT	42
SB053	102[470]	103[470]	CACCCTCAGAACCGCCCCACCCTCAGAACCGC	32
SB054	42[360]	4[346]	CCAGCTGAGAAATTTTGACGCTCAATCGT	29
SB055	111[297]	43[303]	AAAGTAATTCTGTCCAGACGACTTGACAGGAGCGCGCGGGGAGAGGTTA	49
SB056	2[32]	2[2]	TTGGCAAATCAACAGTTGCCGTCAATAGATA	31
SB057	105[436]	105[466]	ATTTCGGAACCTATTATGTATCACCGTACTC	31
SB058	91[436]	91[466]	AGCCGCCGCCAGCATTGAAAGTTTTGTCGTC	31
SB059	9[440]	8[439]	TGTAGCCAGCTTTCATCCGCGTCTGGCCTTC	31
SB060	73[150]	42[165]	AGTTAGAAACGTATGCGTTATACAAATTCTTATCCCAATCGCTAGGATC	49
SB061	24[463]	25[463]	GTCAAATCACCATCAAAGAAAGGCCGGAGACA	32
SB062	72[430]	111[424]	GAGGACTAAAGATTAAAGAAGCCGTTGTAG	30
SB063	73[378]	111[389]	ACCGATTATAGCAATCCTGAACAAGA	26
SB064	118[261]	72[270]	CCAACATAAAGGTGGCAACG	20
SB065	32[466]	23[463]	CAACGCAAGGATACCGTTCTA	21
SB066	111[425]	118[438]	AAACCAATCAATAATCCAT	19
SB067	119[431]	73[437]	CAAAACAAGCGTGAATTATCA	21
SB068	64[36]	65[36]	ACTGGCTCATTATATGTTATGCGATTTTAAGA	32
SB069	100[466]	100[436]	CCCTCATTTTCAGGGAGTGTACTGGTAATAA	31
SB070	43[115]	111[107]	TAAGTAGGCTGGCTGACCCTTACCGCTTTACAACA	35

SB071	79[432]	78[432]	GGCCGGAAACGTCAAACAATTACCATTAGCAA	32
SB072	72[260]	111[263]	ATCATCGCCAATACATGCTACAAATTTTCGAGCCA	35
SB073	96[466]	79[463]	TTCGTCACCAGTATACCGATA	21
SB074	106[470]	107[470]	GTATAGCCCGGAATAGACGAGGGTTGATATAA	32
SB075	3[2]	119[19]	ATACATTTGAGGAAACATAATTAATTTTCCCTTTGTAAATTTAACC	46
SB076	97[436]	97[466]	CTCTGAATTTACCGTTCCCGTAACACTGAGT	31
SB077	73[178]	42[193]	AATAATAACGGGTCAATCAGCAAACTCCAACACCA	35
SB078	13[441]	10[441]	GCATCTGCCAGTTTATAGGTCACGTTGGCGGATTGTGTGAGC	42
SB079	42[144]	72[133]	AATCGGCAAAATACTTCAAACGGTGT	26
SB080	34[466]	21[463]	AATACTTTTGCGGCTATTTTT	21
SB081	61[5]	60[16]	AGTAACAGTACCTTTTCGTCA	21
SB082	42[78]	73[67]	GAACAAGAGCCTGACTGGATATTCATTACCCCCAA	35
SB083	47[2]	68[5]	CGGAACAAAGAACAAGAAAAC	21
SB084	73[157]	4[172]	AGAAGGAAACCCTGACCATTCAAAGCGAACCAGGCGAAAGCGCTGGAAC	49
SB085	68[36]	69[36]	TGAGATGGTTTAATAAAATAGTAAATTGGGCT	32
SB086	14[463]	15[463]	GATAATCGGGGACGACCATATGTACCCCGGTT	32
SB087	33[436]	33[466]	GGCTTAAGCTACGTGGTAGAAGCCTTTATTT	31
SB088	6[466]	11[463]	TTAAATCAGCTCTGATAAGCA	21
SB089	119[61]	72[45]	CATTAAAGAACGTGGAAATCAAAACGTAACAAAG	34
SB090	88[466]	88[436]	GATTTTGCTAAACAACTCAGAGCCACCACCC	31
SB091	42[178]	72[171]	AGCAGACCGGAATAAGGGAACC	22
SB092	4[372]	73[368]	AATACCTACGTGTTTTAGATATAAAGGG	28
SB093	43[2]	70[17]	AAATCCTTTGCCCAATATATTTTTAATGGAAACATTT	37
SB094	1[17]	1[32]	AAAGGAATTGAGGAAG	16
SB095	74[463]	75[463]	GCAGGGAGTTAAAGGCGGGGTCGCTGAGGCTT	32
SB096	119[20]	4[2]	ATCACCCATATCAAACCCTCTTAGAAGTATTAGA	34
SB097	42[192]	73[177]	CGCTACGCTGCTGCGCGAACTGATAGCCCTAACAAGTGTAGCCATACGC	49
SB098	72[101]	43[114]	ATCAGATTGCATCAAAAAGAT	21
SB099	36[466]	19[463]	GGTTGTACCAAATTGCCTGAG	21
SB100	55[2]	60[5]	GAAGGGTTAGAATGAATATAC	21
SB101	86[406]	87[428]	GAGCCACCACCGGAACCGCCTCCCTCAGAGCCGC	34
SB102	62[36]	63[36]	GGGAAGAAAAATCTATTTCCAGTCAGGACGTT	32
SB103	70[36]	71[36]	AACACCAGAACGAGCAAGTTGCCCTGACGAGA	32
SB104	73[26]	43[46]	TAATATCAGAGAGATACTCATTCCGAGAATGACCA	35
SB105	77[432]	76[432]	TCACCAGTAGCACCACATTAGAGCCAGCAAAA	32
SB106	42[255]	119[240]	AGACTGCTTTGCTGACCTGAAAGCGTAAGAATGCG	35
SB107	73[346]	111[368]	TACCAGCGCGACAAGAAGGCTTGTTTATCAACA	33

SB108	4[463]	119[430]	CCTGAGTAGAAGAACTCAAACTATCGGCCTTGCTGGTGTAG	41
SB109	0[32]	117[39]	GTTATCTAAAATTCCGGCTTAGGTTGGGTTA	31
SB110	17[432]	16[432]	GCACCGCTTCTGGTGACACAGCCAGCTTTCCG	32
SB111	108[463]	104[436]	CCGTCGATCCTCAAGAACCAGGCACGTTAATGCCCCCTGCCT	42
SB112	78[463]	96[436]	GTTGCGCCGACAATGACAGCTTGACAGAATGGAAAGCGCAGT	42
SB113	63[5]	53[32]	GGATTCGCCTGATTGCCGGGAGAATAAGAGCAACACTATCAT	42
SB114	72[387]	73[377]	TAAAAAATGCCACTCGACATTCA	23
SB115	40[466]	40[436]	TACAGGCAAGGCAAAGAAATTCCACACAACA	31
SB116	101[436]	101[466]	GTTTTAACGGGGTCAGTCCTCAGAGCCACCA	31
SB117	119[136]	42[150]	AAGGGTTTAACAGCAGATAGCCGAACAGATGAATATCGCGTTTTAATGGT	50
SB118	60[15]	55[32]	GACCATACATAACGCCAAAAG	21
SB119	111[330]	42[331]	ACATGTGAGGCGTTTTTAGACTGCA	25
SB120	107[439]	106[439]	GTATTAAGAGGCTGAGGTTCTGAAACATGAAA	32
SB121	111[96]	42[93]	TAAGAATAAGAGAGAAAGCTTGAATAGGGTTGAGT	35
SB122	42[234]	119[219]	CCTTCTACAGGACGTGGCACAGACAATATTTTCGC	35
SB123	72[269]	4[277]	GAGATAATTGCTGAATATGGGTGGTCGTGCTTGCC	35
SB124	99[436]	99[466]	GGCTTTTGATGATACAGGATAGCAAGCCCAA	31
SB125	48[32]	48[2]	GAGGGGGTAATAGTAAACACCAGAAGGAGCG	31
SB126	111[264]	72[261]	GTAATAAGACTATTTTCGTATAATTTTCTTTTCACCATAGAGCTTTTGT	49
SB127	98[466]	77[463]	TAGGAACCCATGGCCCACGCA	21
SB128	111[243]	42[240]	GGCAGAGGCTTTTATCCTATGGTGGGCAACAGCTG	35
SB129	43[369]	43[398]	GAACGAGTAGATTTTTTGACCATTAGAT	28
SB130	4[423]	73[408]	ATCCAGAACAATATTACCCCATCACTTCATCGGAC	35
SB131	119[52]	42[67]	GCCGGAACACCAGAATTGAGTTAAGCAAATCAAATCAGGTCTTTACTCC	49
SB132	92[466]	83[463]	TAGCGTAACGATAGGCTCCAA	21
SB133	76[463]	98[436]	TAACCGATATATTCGAAACCATCTACAGTAAGCGTCATACAT	42
SB134	22[463]	32[436]	GCTGATAAATTAATGCATATTCAAAGTGTAATGAGTAAACAG	42
SB135	111[348]	42[352]	GAACGCGCCTATCCGGCAGAATCTCGGG	28
SB136	43[320]	4[319]	ACCGGCCAAGCCGATTAGA	19
SB137	42[463]	119[463]	GGCATCAATTCTACTAATAGTCCTTGATTAGTAATAACATCACTTG	46
SB138	86[449]	86[481]	ATCTTTCAACAGTTTCAGCGGAGTGAGAATAGAAAGGAACAAC	43
SB139	42[33]	73[25]	GCGAAACAGAAAAAGTGAATAAGGCTACTCGC	32
SB140	49[2]	66[5]	GAATTATCATCAAATTACCTG	21
SB141	4[339]	73[332]	TGGATTATTTACATTGGCAAAGGGATTTAGCGAATCAATAGAA	43
SB142	119[220]	42[235]	TTAAGAGCGTCACTCCTTATTACGCGCGACCTCTCCTTTTGATAAGTGC	49
SB143	15[432]	14[432]	GGAAGATCGCACTCATGACAGTATCGGCCTCA	32
SB144	73[318]	111[329]	TCACAACCTCCCGACGACAATAAACA	26

SB145	1[2]	113[9]	ACTAATAGATTAAGTCAATTAG	22
SB146	90[466]	90[436]	TTTCCAGACGTTAGTAAAGAACCACCACCAG	31
SB147	42[66]	119[51]	ACTACTAAATCAGCAAATGAAAAATCTAAAGCGGT	35
SB148	119[2]	72[16]	CTTTACAAACAACGTCGCTAGTGAATAACCTTGCATAA	38
SB149	4[345]	73[345]	CTGGGTACGCTATTCTAGTT	20
SB150	72[337]	4[340]	AAAGAATACGGAAGTTTCATTCCGTGCCAGCAGGAACAAA	40
SB151	50[32]	50[2]	ATAGCGAGAGGCTTTTGTTCCTGATTATCAG	31
SB152	94[466]	81[463]	GTAGCATTCCACCAGCTTGCT	21
SB153	93[436]	93[466]	GTCAGACGATTGGCCTTACAGCCCTCATAGT	31
SB154	8[470]	9[470]	AATATTTTGTTAAAATTCAAATTGTAAACGTT	32
SB155	45[2]	70[5]	TAAAAGTTTGAGTTGAATTAC	21
SB156	43[399]	4[403]	ACATTTCAGTGAGCAGTCTGTGCC	24
SB157	43[47]	4[42]	TACTCCAACGGGTCGAATCACCT	23
SB158	72[170]	111[179]	GAAGAGGAAATTATTTACCAGTATAAAGC	29
SB159	66[36]	67[36]	TTGTGAATTACCTTATGATTCAACTTTAATCA	32
SB160	118[465]	73[466]	CGGGTATTAAACCAAGTACCTCAGCAGCGAAAGACAG	37
SB161	67[5]	49[32]	AGCAAAAGAAGATGATTCATTTCTACAAAAGAAGTTTTGCCA	42
SB162	39[436]	39[466]	TGTTATCCGCTCACATTAGCAAAATTAAGCA	31
SB163	119[390]	72[393]	GAGCGCCCAGAGGGAGGGAAGGTCATTAA	29
SB164	72[122]	4[130]	CGCAAGGAAGCCCGAAAGCCCTTATGCGAGAATAA	35
SB165	37[436]	37[466]	GTAATCATGGTCATAGCCATAAAGCTAAATC	31
SB166	4[171]	73[156]	ATCGCCATTAAAAATACCGAGCGGGCCAAATAACC	35
SB167	111[390]	119[398]	AAAATAATACATTACCGTAAAAG	23
SB168	89[436]	85[454]	TCAGAGCCGCCACGTTTTCATGGCATTTTCGGTCAT	36
SB169	69[5]	47[32]	AAAATTAATTACATTTCAAACATACATGTTTAGACTGGATAG	42
SB170	119[241]	42[256]	CGTACTGAATCTAGCAAACGTAGAATGATAAATTTTGCGGATGGCTGTG	49
SB171	42[108]	118[94]	CGAGCGGGGAAAGTATTAACACCGCCTGCAACGATTTAGTAAC	43
SB172	4[129]	72[123]	AACAGAGGTGAGGCGGTCAGCCGGCTAGCAGCAAGCCCTTTTTAAGAGG	49
SB173	118[227]	73[212]	TAACTGCGCCGCACCGCCTGGCCCTTTAATTGGCTCCATGTTACTTGAT	49
SB174	70[16]	45[32]	CATTATCGTCATAAATATTCAT	22
SB175	84[454]	89[466]	TGTAGCGCCATGAATTTTCTGTATGG	26
SB176	80[463]	94[436]	TTCGAGGTGAATTTCTGGTTTATAGGATATTCACAAACAAAT	42
SB177	35[436]	35[466]	AGACGGAGGATCCCACCCTGT	21
SB178	111[26]	42[34]	AGTTAATTTCATCTTCAAGTCAGTTTTTTGGTCAAAGG	38
SB179	4[276]	118[262]	AACAGAGATAGAACCCTTACGAGCAGCAC	29
SB180	119[147]	119[135]	GCGAAAGGAACGAACCACCAGCAGAAGAAGG	31
SB181	42[92]	111[95]	GTCAAAGCGAGAGTAATCTTGACCAATGAAAAAACAGTAAGGCGTTAAA	49

SB182	119[73]	42[88]	ACCCCATTAGAATAAGAGCAAGAAAAAGAACCATTATAGTCAGAAGTGT	49
SB183	65[5]	51[32]	ATCGCGCAGAGGCGAAAATACCACACGACGATAAAAACCAAA	42
SB184	84[470]	85[470]	TCTCCAAAAAAAAGACAGTTTCACGTTGAAAA	32
SB185	111[180]	42[179]	CAACGCTCAAATAAACAGCGGTCGGTTTGCCCC	33
SB186	25[432]	24[432]	AGGGGGATGTGCTGCATACGCCAGCTGGCGAA	32
SB187	82[463]	92[436]	AAGGAGCCTTTAATTGTAGCGTCCTACAGGAGGTTGAGGCAG	42
SB188	109[432]	108[432]	CGGGGTTTTGCTCAGTGAAGGATTAGGATTAG	32
SB189	51[2]	64[5]	ATGATGGCAATTAGTTACAAA	21
SB190	72[197]	111[200]	GCGCAGACGAATACCCGTTACAAACAGTAGGGCTT	35
SB191	26[480]	31[447]	TAATGTGTAGGTAAAGATTCAAAAGGGTGAGGCGACT	37
SB192	95[436]	95[466]	AAATCCTCATTAAAGCCAAACTACAACGCCT	31
SB193	42[87]	119[72]	TCCAAGCCCCCAGTGCCACGCTGAGAGCCAGCGGA	35
SB194	73[438]	43[463]	GGACAGAGGCATTTTCATTTGGGGCGCGAGCTGAAAAGGT	40
SB195	42[398]	4[373]	TAACTCACACGTTGAGTGAGGAACGCTCATGGA	33
SB196	118[443]	111[466]	ACTGGCTGTCTTTCCTTATCATTCCAAGA	29
SB197	13[430]	12[430]	ATCGTAACCGTTGTAGATGGGC	22
SB198	81[432]	80[432]	GATAGCAGCACCGTTCTACCAATGAAACCATC	32
SB199	7[436]	7[466]	CGCCATCAAAAATAATTGCATTAAATTTTTG	31
SB200	42[414]	73[403]	TGCCTAATGGCAAATGCATGAGGAAGTTTCAAATA	35
SB201	11[423]	10[423]	CTCCGTGGGAACAAACGGGAGTAACAACCCGTCGGA	36
SB202	73[68]	42[79]	TACGGGAGAAAATACCGACCGTGTGATAAAGGAAGCGTAAAGGGGTTTG	49
SB203	56[32]	56[2]	ACATTCAACTAATGCAGTACCATATCAAAAT	31
SB204	4[292]	73[290]	AAGGGACATTCTGTCCTCGTATCAAGAAAAGAAACGCA	38
SB205	4[318]	111[296]	TTCACCAGTCACACGACCGAGCTAACGGGAGGTTGAAGGT	40
SB206	72[132]	111[133]	ACAGACCAAAAGTAGTCAAAAGAAAAAGC	29
SB207	114[36]	115[36]	AATCGCAAGACAAAGCATGCTGATGCAAATCC	32
SB208	23[432]	22[432]	CCTCTTCGCTATTATGCGGCGATCGGTGCGGG	32

Functional Staples

No.	Start	End	Sequence (5' to 3')	Length	Function
CB01	72[392-388]	72[368-364]	ACGGGAAGCATCCTACGGCGTAATGCGAAACGAA	34	Dimerize
FB01	42[149-145]	42[113-109]	TCCGAAATGGTGGTGGTAGAGAGAGAGTTCCTTCCTTAATAGCC	44	Function
FB02	73[298-302]	73[333-337]	CACGGAACACACACACACCTGAAGTCCGGGGAAGGGGAAAATTC	44	Function
RB01	86[417-407]	FREE	CACCGGAACCACCCCCCCCCCCCCCCCCC	31	Ring
RB02	86[427-418]	FREE	TAATCAAAATCCCCCCCCCCCCCCCCCC	30	Ring
RB03	86[438-428]	FREE	CCATCTTTTCACCCCCCCCCCCCCCCCCC	31	Ring
RB04	86[460-450]	FREE	ATTTCCCCCTTCCCCCCCCCCCCCCCCCC	31	Ring
RB05	86[469-461]	FREE	CGAATAATACCCCCCCCCCCCCCCCCCC	39	Ring
RB06	86[480-470]	FREE	TAAAGGAATTGCCCCCCCCCCCCCCCCCC	31	Ring
RB07	87[429-439]	FREE	CACCCTCAGAACCGCCACCTAGCGTTTGCCCCCCCCCCCCCCCCCCCC	48	Ring
RB08	FREE	31[428-437]	GGGGGGGGGGGGGGGGGGGTCTCCGAACT	30	Ring
RB09	FREE	31[448-458]	GGGGGGGGGGGGGGGGGGGTCTCCGAACT	31	Ring
RB10	FREE	31[459-469]	GGGGGGGGGGGGGGGGGGGTTAGAACCCTC	31	Ring
RB11	FREE	31[417-427]	GGGGGGGGGGGGGGGGGGGGTGCCAAGCTT	31	Ring
RB12	FREE	31[438]-26[438]	GGGGGGGGGGGGGGGGGGGGCTGACCTCTTAAGTTG	36	Ring
RB13	FREE	31[407-416]	GGGGGGGGGGGGGGGGGGGGACGACGGCCA	30	Ring
RB14	FREE	31[470]-26[481]	GGGGGGGGGGGGGGGGGGGGATATATTTTAAATGCAACCTGAG	43	Ring
MB01	FREE	117[10]-0[2]	ACTCGGCTCAAACCTTTTTAACCATCTTTAGGAGCACTAACA	42	Modification
MB02	59[5]-58[10]	FREE	GCGTAGATTTTCAGGTGAGAAATAAAGAAATCGGGGCTA	39	Modification
MB03	FREE	57[4]-57[32]	ATCGGGGCTAAATTTGCACGTAAAACAGATTTAGGAATACC	41	Modification
MB04	FREE	72[346]-111[347]	GATACCATAGAAAAAGAGGCAATATGAGAACGCTCAGCTAATGCA	45	FRET_1

Small Monomer

Structural Staples

No.	Start	End	Sequence (5’ to 3’)	Length
SS001	42[92]	111[95]	GTCAAAGCGAGAGTAATCTTGACCAATGAAAAAACAGTAAGGCGTTAAA	49
SS002	92[466]	83[463]	TAGCGTAACGATAGGCTCCAA	21
SS003	18[463]	36[444]	AGTCTGGAGCAAACAACAGGTCAAAGTACCGAGC	34
SS004	72[260]	111[263]	ATCATCGCCAATACATGCTACAAATTTTCGAGCCA	35
SS005	1[2]	113[9]	ACTAATAGATTAAGTCAATTAG	22
SS006	73[346]	111[368]	TACCAGCGCGACAAGAAGGCTTGTTTATCAACA	33
SS007	76[463]	98[436]	TAACCGATATATTCGAAACCATCTACAGTAAGCGTCATACAT	42
SS008	73[404]	42[415]	TTTAGGAATTCCCATCCTAATTTACGAGCATTTTATTGCAAATTTGGGG	49
SS009	42[78]	73[67]	GAACAAGAGCCTGACTGGATATTCATTACCCCCAA	35
SS010	73[213]	118[228]	TAAGTTTCCAGTCGCCATATTTAACAACGCCACGC	35
SS011	66[36]	67[36]	TTGTGAATTACCTTATGATTCAACTTTAATCA	32
SS012	8[470]	9[470]	AATATTTTGTTAAAATTCAAATTGTAAACGTT	32
SS013	113[10]	3[32]	CTTAGATTAAGTCCTTGAATAATCAATATCTGGTCAG	37
SS014	118[199]	119[212]	GCCAAAAAGAACTGGCATAGCCGGAATTAGAGAGTACCTGAGAGAGCCC	49
SS015	4[292]	73[290]	AAGGGACATTCTGTCCTCGTATCAAGAAAAGAAACGCA	38
SS016	51[2]	64[5]	ATGATGGCAATTAGTTACAAA	21
SS017	72[377]	73[377]	AATGCCACTACGGCGACATTCA	22
SS018	86[406]	87[428]	GAGCCACCACCGGAACCGCCTCCCTCAGAGCCGC	34
SS019	73[378]	111[389]	ACCGATTATAGCAATCCTGAACAAGA	26
SS020	119[73]	42[88]	ACCCCATTAGAATAAGAGCAAGAAAAAGAACCATTATAGTCAGAAGTGT	49
SS021	26[445]	26[422]	TTAAGTTGGGTAACGCCAGGGTTT	24
SS022	58[36]	59[36]	GAAAGATTCATCAGTTTTCATTATTACAGGTA	32
SS023	43[304]	111[296]	AATACCCCAGCGATTATAACACCACTTTTGAAGGT	35
SS024	111[330]	42[331]	ACATGTGAGGCGTTTTTAGACTGCA	25
SS025	43[54]	111[44]	AAACGTAACAAAGCTGACCCACACTGAACATGA	33
SS026	22[463]	32[436]	GCTGATAAATTAATGCATATTCAAAGTGTAATGAGTAAACAG	42
SS027	109[432]	108[432]	CGGGGTTTTGCTCAGTGAAGGATTAGGATTAG	32
SS028	10[463]	6[436]	AATATTTAACATTAAAACCGTAAATTTTTTAACCAATAGGAA	42
SS029	111[243]	42[240]	GGCAGAGGCTTTTATCCTATGGTGGGCAACAGCTG	35
SS030	42[414]	73[403]	TGCCTAATGGCAAATGCATGAGGAAGTTTCAAATA	35
SS031	72[15]	42[2]	ATCGCTTTAAACAGTTAACCGTCTATCACGACAACTCGTATT	42
SS032	21[432]	20[432]	AACTGTTGGGAAGGGACTCATTCAGGCTGCGC	32
SS033	73[409]	4[424]	GGAAATTATTCACTTTTTGTCAATAACCTGTTTAAAGCCAACCGTTAAT	49
SS034	94[466]	81[463]	GTAGCATTCCACCAGCTTGCT	21

SS035	72[269]	4[277]	GAGATAATTGCTGAATATGGGTGGTCGTGCTTGCC	35
SS036	36[466]	19[463]	GGTTGTACCAAATTGCCTGAG	21
SS037	118[93]	72[102]	ATAATAGCAATAGCTATTTC	20
SS038	65[5]	51[32]	ATCGCGCAGAGGCGAAAATACCACACGACGATAAAAACCAAA	42
SS039	42[234]	119[219]	CCTTCTACAGGACGTGGCACAGACAATATTTTCGC	35
SS040	42[62]	43[53]	TTAAAGAACGTGGAAATCA	19
SS041	73[318]	111[329]	TCACAACCTCCCGACGACAATAAACA	26
SS042	115[5]	1[16]	TGAATTTATCAAAATCTGAGAAGGAG	26
SS043	50[32]	50[2]	ATAGCGAGAGGCTTTTGTTCCTGATTATCAG	31
SS044	42[330]	73[317]	TTAATGAATGGTGTCTACTAAAACACTCATTTG	33
SS045	60[36]	61[36]	AACTAACGGAACAAAAACACGTTAATAAAACG	32
SS046	42[164]	73[149]	CTGTTTGATGGTTCGAGCACTTTGAAAGAGGACAA	35
SS047	0[32]	117[39]	GTTATCTAAAATTCCGGCTTAGGTTGGGTTA	31
SS048	42[344]	111[347]	TCATATAACACGAAAGAGGCAAATCATATGAGAACGCTCAGCTAATGCA	49
SS049	89[436]	85[454]	TCAGAGCCGCCACGTTTTCATGGCATTTTCGGTCAT	36
SS050	43[47]	4[42]	TACTCCAACGGGTCGAATCACCT	23
SS051	111[45]	119[62]	CCTAAATTTAATGGTTTGATTAACTTAAAGCA	32
SS052	111[369]	43[375]	ATAGATAAGGCAAATCTATAATCCGCTCCCGCTCTGCAG	39
SS053	42[138]	111[133]	CAAAATACTTCAAACGGTGTACAGACCAAAAGTAGTCAAAAGAAAAAGC	49
SS054	106[470]	107[470]	GTATAGCCCGGAATAGACGAGGGTTGATATAA	32
SS055	7[436]	7[466]	CGCCATCAAAAATAATTGCATTAAATTTTTG	31
SS056	72[332]	4[340]	ATACGGAAGTTTCATTCCGTGCCAGCAGGAACAAA	35
SS057	4[171]	73[156]	ATCGCCATTAAAAATACCGAGCGGGCCAAATAACC	35
SS058	54[32]	54[2]	GAATTACGAGGCATAGTACTTCTGAATAATG	31
SS059	4[372]	73[366]	AATACCTACGTGTTTTAGATATAAAG	26
SS060	98[466]	77[463]	TAGGAACCCATGGCCCACGCA	21
SS061	104[466]	109[463]	AGGAGGTTTAGTGGATAAGTG	21
SS062	88[466]	88[436]	GATTTTGCTAAACAACTCAGAGCCACCACCC	31
SS063	119[2]	72[16]	CTTTACAAACAACGTCGCTAGTGAATAACCTTGCATAA	38
SS064	14[463]	15[463]	GATAATCGGGGACGACCATATGTACCCCGGTT	32
SS065	11[423]	10[423]	CTCCGTGGGAACAAACGGGAGTAACAACCCGTCGGA	36
SS066	19[432]	18[432]	AAAGCGCCATTCGCATGAGCCGGAAACCAGGC	32
SS067	97[436]	97[466]	CTCTGAATTTACCGTTCCCGTAACACTGAGT	31
SS068	33[436]	33[466]	GGCTTAAGCTACGTGGTAGAAGCCTTTATTT	31
SS069	4[402]	73[387]	AGCCATTGCAACAGGAAACCACCGAGCGCCCAGAG	35
SS070	38[466]	17[463]	ATAAAGCCTCAGAACGGTAAT	21
SS071	101[436]	101[466]	GTTTTAACGGGGTCAGTCCTCAGAGCCACCA	31

SS072	2[32]	2[2]	TTGGCAAATCAACAGTTGCCGTCAATAGATA	31
SS073	108[463]	104[436]	CCGTCGATCCTCAAGAACCAGGCACGTTAATGCCCCCTGCCT	42
SS074	69[5]	47[32]	AAAATTAATTACATTTCAAACATACATGTTTAGACTGGATAG	42
SS075	43[115]	111[107]	TAAGTAGGCTGGCTGACCCTTACCGCTTTACAACA	35
SS076	111[134]	42[139]	CTGTTTAGTATCAATTTTTTGAAGAAAGAAATCGG	35
SS077	73[68]	42[79]	TACGGGAGAAAATACCGACCGTGTGATAAAGGAAGCGTAAAGGGGTTTG	49
SS078	84[454]	89[466]	TGTAGCGCCATGAATTTTCTGTATGG	26
SS079	42[150]	119[135]	TTCCGCGAAAGGAACGAACCACCAGCAGAAGAAGG	35
SS080	79[445]	78[432]	AAACAATTACCATTAGCAA	19
SS081	42[192]	73[177]	CGCTACGCTGCTGCGCGAACTGATAGCCCTAACAAGTGTAGCCATACGC	49
SS082	42[463]	119[463]	GGCATCAATTCTACTAATAGTCCTTGATTAGTAATAACATCACTTG	46
SS083	37[436]	37[466]	GTAATCATGGTCATAGCCATAAAGCTAAATC	31
SS084	13[430]	12[430]	ATCGTAACCGTTGTAGATGGGC	22
SS085	49[2]	66[5]	GAATTATCATCAAATTACCTG	21
SS086	24[463]	25[463]	GTCAAATCACCATCAAAGAAAGGCCGGAGACA	32
SS087	93[436]	93[466]	GTCAGACGATTGGCCTTACAGCCCTCATAGT	31
SS088	72[361]	42[361]	CACCAACCTAAAAGTTGATTCCCAATTTT	29
SS089	72[430]	111[424]	GAGGACTAAAGATTAAAGAAGCCGTTGTAG	30
SS090	42[39]	73[25]	CAAAGGGCGAAACAGAAAAAGTGAATAAGGCTACTCGC	38
SS091	15[432]	14[432]	GGAAGATCGCACTCATGACAGTATCGGCCTCA	32
SS092	118[261]	72[270]	CCAACATAAAGGTGGCAACG	20
SS093	72[101]	4[109]	ATCAGATTGCATCAAAAAGCCCGAGCGGGGAAAGT	35
SS094	118[227]	73[212]	TAACTGCGCCGCACCGCCTGGCCCTTTAATTGGCTCCATGTTACTTGAT	49
SS095	39[436]	39[466]	TGTTATCCGCTCACATTAGCAAAATTAAGCA	31
SS096	112[36]	113[36]	TTTTTCAAATATATAAACGAACGCGAGAAAAC	32
SS097	111[96]	42[93]	TAAGAATAAGAGAGAAAGCTTGAATAGGGTTGAGT	35
SS098	107[439]	106[439]	GTATTAAGAGGCTGAGGTTCTGAAACATGAAA	32
SS099	42[360]	4[346]	CCAGCTGAGAAATTTTGACGCTCAATCGT	29
SS100	44[32]	44[2]	TGAATCCCCCTCAAATGAACGTTATTAATTT	31
SS101	73[178]	42[193]	AATAATAACGGGTCAATCAGCAAACTCCAACACCA	35
SS102	77[432]	76[432]	TCACCAGTAGCACCACATTAGAGCCAGCAAAA	32
SS103	41[436]	41[466]	TACGAGAGTAGCATTAACATCCAATAAATCA	31
SS104	72[122]	4[130]	CGCAAGGAAGCCCGAAAGCCCTTATGCGAGAATAA	35
SS105	119[241]	42[256]	CGTACTGAATCTAGCAAACGTAGAATGATAAATTTTGCGGATGGCTGTG	49
SS106	43[2]	70[17]	AAATCCTTTGCCCAATATATTTTTAATGGAAACATTT	37
SS107	52[32]	52[2]	AACCCTCGTTTACCAGATCAATATAATCCTG	31
SS108	55[2]	60[5]	GAAGGGTTAGAATGAATATAC	21

SS109	118[443]	111[466]	ACTGGCTGTCTTTCCTTATCATTCCAAGA	29
SS110	73[276]	118[291]	TATATTAGTTGGAATATAAAGTACCGACAAAAGCC	35
SS111	90[466]	90[436]	TTTCCAGACGTTAGTAAAGAACCACCACCAG	31
SS112	32[466]	23[463]	CAACGCAAGGATACCGTTCTA	21
SS113	84[470]	85[470]	TCTCCAAAAAAAAGACAGTTTCACGTTGAAAA	32
SS114	34[466]	21[463]	AATACTTTTGCGGCTATTTTT	21
SS115	56[32]	56[2]	ACATTCAACTAATGCAGTACCATATCAAAAT	31
SS116	73[157]	4[172]	AGAAGGAAACCCTGACCATTCAAAGCGAACCAGGCGAAAGCGCTGGAAC	49
SS117	42[178]	118[172]	AGCAGACCGGAATAAGGGAACCGAAGAGGAAATTA	35
SS118	72[197]	111[200]	GCGCAGACGAATACCCGTTACAAACAGTAGGGCTT	35
SS119	86[449]	86[481]	ATCTTTCAACAGTTTCAGCGGAGTGAGAATAGAAAGGAACAAC	43
SS120	118[171]	111[179]	TTTACCAGTATAAAGC	16
SS121	105[436]	105[466]	ATTTCGGAACCTATTATGTATCACCGTACTC	31
SS122	42[87]	119[72]	TCCAAGCCCCCAGTGCCACGCTGAGAGCCAGCGGA	35
SS123	119[220]	42[235]	TTAAGAGCGTCACTCCTTATTACGCGCGACCTCTCCTTTTGATAAGTGC	49
SS124	73[26]	43[46]	TAATATCAGAGAGATACTCATTCCGAGAATGACCA	35
SS125	12[470]	13[470]	AACAGGAAGATTGTGGGAAGAAAAGCCCCAAA	32
SS126	118[429]	72[437]	AGCGTGAATTATCAGGACAGA	21
SS127	80[463]	94[436]	TTCGAGGTGAATTTCTGGTTTATAGGATATTCACAAACAAAT	42
SS128	70[16]	45[32]	CATTATCGTCATAAATATTCAT	22
SS129	111[297]	43[303]	AAAGTAATTCTGTCCAGACGACTTGACAGGAGCGCGCGGGGAGAGGTTA	49
SS130	40[466]	40[436]	TACAGGCAAGGCAAAGAAATTCCACACAACA	31
SS131	4[318]	73[303]	TTCACCAGTCACACGACCGAGCTAACGGGAGGGGA	35
SS132	42[239]	111[242]	ATAGGTCATTTGTGTCGAAATCCAGTATGTTTACCAAACATGTAATTTA	49
SS133	61[5]	60[16]	AGTAACAGTACCTTTTCGTCA	21
SS134	73[304]	4[319]	ATAAGTTTATTCTTTGACTGCAACTAAAGTACCGGCCAAGCCGATTAGA	49
SS135	4[339]	72[333]	TGGATTATTTACATTGGCAAAGGGATTTAGCGAATCAATAGAAAATAGA	49
SS136	99[436]	99[466]	GGCTTTTGATGATACAGGATAGCAAGCCCAA	31
SS137	118[465]	73[466]	CGGGTATTAAACCAAGTACCTCAGCAGCGAAAGACAG	37
SS138	35[436]	35[466]	GGCTTAAGCTACGTGGTAGAAGCCTTTATTT	31
SS139	73[388]	72[383]	GGAGGGAAGGTCATTAAACGGGTAAAA	27
SS140	103[439]	102[439]	TGCCCGTATAAACACGACGCCTTGAGTAACAG	32
SS141	95[436]	95[466]	AAATCCTCATTAAAGCCAAACTACAACGCCT	31
SS142	43[376]	4[403]	TAGATTTGACCATTAGATACATTTCAGTGAGCAGTCTGTGCC	42
SS143	9[440]	8[439]	TGTAGCCAGCTTTCATCCGCGTCTGGCCTTC	31
SS144	25[432]	24[432]	AGGGGGATGTGCTGCATACGCCAGCTGGCGAA	32
SS145	64[36]	65[36]	ACTGGCTCATTATATGTTATGCGATTTTAAGA	32

SS146	82[463]	92[436]	AAGGAGCCTTTAATTGTAGCGTCCTACAGGAGGTTGAGGCAG	42
SS147	4[463]	118[430]	CCTGAGTAGAAGAACTCAAACTATCGGCCTTGCTGGTGTAGCAAAACA	48
SS148	62[36]	63[36]	GGGAAGAAAAATCTATTTCCAGTCAGGACGTT	32
SS149	63[5]	53[32]	GGATTCGCCTGATTGCCGGGAGAATAAGAGCAACACTATCAT	42
SS150	118[437]	72[431]	CGAGTACTTCTGGAAGCATAAAGTGTAGCTATTTT	35
SS151	111[390]	42[385]	AAAATAATACATTACCGTAAAAGTAACTCACATTAAT	37
SS152	114[36]	115[36]	AATCGCAAGACAAAGCATGCTGATGCAAATCC	32
SS153	4[345]	73[345]	CTGGGTACGCTATTCTAGTT	20
SS154	31[480]	26[475]	AATGCAACCTGAGTAATGT	19
SS155	45[2]	70[5]	TAAAAGTTTGAGTTGAATTAC	21
SS156	68[36]	69[36]	TGAGATGGTTTAATAAAATAGTAAATTGGGCT	32
SS157	3[2]	119[19]	ATACATTTGAGGAAACATAATTAATTTTCCCTTTGTAAATTTAACC	46
SS158	111[201]	72[198]	AATTGAGAAAGCCTAACACCACATTGCAGCAAGCGGTGGTCAGGACGAG	49
SS159	78[463]	96[436]	GTTGCGCCGACAATGACAGCTTGACAGAATGGAAAGCGCAGT	42
SS160	6[466]	11[463]	TTAAATCAGCTCTGATAAGCA	21
SS161	20[463]	34[436]	GAGAGATCTACAAAGGGAGGGTAGGGCTTGTTACCTCGATAA	42
SS162	73[291]	4[293]	AAGCCAAGCGTAGCTCAACATGTTCGGTTTGAGAGCGGAGTAATAA	46
SS163	4[276]	118[262]	AACAGAGATAGAACCCTTACGAGCAGCAC	29
SS164	26[421]	31[406]	TCCCAGTCACGACGTTGTAAA	21
SS165	102[470]	103[470]	CACCCTCAGAACCGCCCCACCCTCAGAACCGC	32
SS166	4[423]	73[408]	ATCCAGAACAATATTACCCCATCACTTCATCGGAC	35
SS167	74[463]	75[463]	GCAGGGAGTTAAAGGCGGGGTCGCTGAGGCTT	32
SS168	23[432]	22[432]	CCTCTTCGCTATTATGCGGCGATCGGTGCGGG	32
SS169	1[17]	1[32]	AAAGGAATTGAGGAAG	16
SS170	119[52]	42[67]	GCCGGAACACCAGAATTGAGTTAAGCAAATCAAATCAGGTCTTTACTCC	49
SS171	72[436]	43[463]	GGCATTTTCATTTGGGGCGCGAGCTGAAAAGGT	33
SS172	83[432]	82[432]	GAATCAAGTTTGCCTTTAAATCAGTAGCGACA	32
SS173	26[474]	31[458]	GTAGGTAAAGATTCAAAAGGGATTT	25
SS174	111[26]	42[40]	AGTTAATTTCATCTTCAAGTCAGTTTTTTGGT	32
SS175	4[108]	118[94]	ATTAACACCGCCTGCAACGATTTAGTAAC	29
SS176	70[36]	71[36]	AACACCAGAACGAGCAAGTTGCCCTGACGAGA	32
SS177	17[432]	16[432]	GCACCGCTTCTGGTGACACAGCCAGCTTTCCG	32
SS178	72[466]	118[444]	CATCGGAACGAGGGTAGCAACGGCTATCGTCACCCGC	37
SS179	111[180]	42[179]	CAACGCTCAAATAAACAGCGGTCGGTTTGCCCC	33
SS180	75[432]	74[432]	CCGACTTGAGCCATTTCGCTTTTGCGCCGTCA	32
SS181	111[264]	72[261]	GTAATAAGACTATTTTCGTATAATTTTCTTTTCACCATAGAGCTTTTGT	49
SS182	81[432]	80[439]	GATAGCAGCACCGTTCTACCAATGA	25

SS183	16[463]	38[436]	CGTAAAACTAGCATGTATCGATGAGTGTTTCCTGTGTGAAAT	42
SS184	13[441]	10[441]	GCATCTGCCAGTTTATAGGTCACGTTGGCGGATTGTGTGAGC	42
SS185	111[425]	118[438]	AAACCAATCAATAATCCAT	19
SS186	46[32]	46[2]	CGTCCAATACTGCGGAAACATTATCATTTTG	31
SS187	4[129]	72[123]	AACAGAGGTGAGGCGGTCAGCCGGCTAGCAGCAAGCCCTTTTTAAGAGG	49
SS188	100[466]	100[436]	CCCTCATTTTCAGGGAGTGTACTGGTAATAA	31
SS189	73[150]	42[165]	AGTTAGAAACGTATGCGTTATACAAATTCTTATCCCAATCGCTAGGATC	49
SS190	47[2]	68[5]	CGGAACAAAGAACAAGAAAAC	21
SS191	111[348]	42[345]	GAACGCGCCTATCCGGCAGAATCTCGGGAAACCTG	35
SS192	67[5]	49[32]	AGCAAAAGAAGATGATTCATTTCTACAAAAGAAGTTTTGCCA	42
SS193	42[255]	119[240]	AGACTGCTTTGCTGACCTGAAAGCGTAAGAATGCG	35
SS194	42[384]	4[373]	TGCGTTGAGTGAGGAACGCTCATGGA	26
SS195	119[213]	118[200]	GCCGTGAATGGCTATTAGTCTTTAAGCGTAACTTT	35
SS196	96[466]	79[463]	TTCGTCACCAGTATACCGATA	21
SS197	4[41]	111[25]	TGCTGAACCTCAAAAATCAAGAGGGTAATTGAGTCAGTTT	40
SS198	48[32]	48[2]	GAGGGGGTAATAGTAAACACCAGAAGGAGCG	31
SS199	118[290]	73[275]	TTAATAGAATCCGTATTGGGCGCCAAATGCTGCGAAACAAAGTACAACA	49
SS200	91[436]	91[466]	AGCCGCCGCCAGCATTGAAAGTTTTGTCGTC	31
SS201	119[20]	4[2]	ATCACCCATATCAAACCCTCTTAGAAGTATTAGA	34
SS202	111[108]	43[114]	CCGGAATCATAATTACTAATGAAAAGAACGTGAAATCAAAAGAATAGAT	49
SS203	53[2]	62[5]	ATTGTTTGGATTAACAATAAC	21
SS204	119[136]	42[151]	AAGGGTTTAACAGCAGATAGCCGAACAGATGAATATCGCGTTTTAATGG	49
SS205	42[66]	119[51]	ACTACTAAATCAGCAAATGAAAAATCTAAAGCGGT	35
SS206	60[15]	55[32]	GACCATACATAACGCCAAAAG	21

Functional Staples

No.	Start	End	Sequence (5' to 3')	Length	Function
CS01	FREE	72[366-362]	TACGCAAGAAGG	12	Dimerize
CS02	72[382-378]	FREE	TACGTAACGCAT	12	Dimerize
FS01	36[443-436]	FREE	CTCTCTCTCTAATCGAATTC	25	Function
FS02	FREE	79[432-444]	GGACTTCAGGAAGGCCGGAAACGTC	20	Function
MS01	FREE	117[10]-0[2]	CTAGTTGATCAACCTTTTTAACCATCTTTAGGAGCACTAACA	42	M4
MS02	116[39]-116[16]	FREE	TATAACTATATGTAAATAGGTCTGAACTAGTTGATC	36	M4
MS03	FREE	57[4]-57[32]	TTGACCAGTTAATTTGCACGTAAAACAGATTTAGGAATACC	41	M3
MS04	59[5]-58[10]	FREE	GCGTAGATTTTCAGGTGAGAAATAAAGAATTGACCAGTT	39	M3
MS05	80[432]	80[438]	TTGCAACGTTAAAACCATC	19	FRET_2
RS01	86[417-407]	FREE	CACCGGAACCACGCGCGCGCGCGCGCGCG	31	Ring
RS02	86[427-418]	FREE	TAATCAAAATCGCGCGCGCGCGCGCGCG	30	Ring
RS03	86[438-428]	FREE	CCATCTTTTCACGCGCGCGCGCGCGCGCG	31	Ring
RS04	86[460-450]	FREE	ATTTCCCCCTTCGCGCGCGCGCGCGCGCG	31	Ring
RS05	86[469-461]	FREE	CGAATAATACGCGCGCGCGCGCGCGCG	39	Ring
RS06	86[480-470]	FREE	TAAAGGAATTGCGCGCGCGCGCGCGCGCG	31	Ring
RS07	87[429]-86[439]	FREE	CACCCTCAGAACCGCCACCTAGCGTTTGCGCGCGCGCGCGCGCG CGCG	48	Ring
RS08	FREE	31[438-448]	GGCCGGCCGGCCGGCCGGCCCTGACCTCCTG	31	Ring
RS09	FREE	31[428-437]	GGCCGGCCGGCCGGCCGGCCTCTCCGAACT	31	Ring
RS10	FREE	31[417-427]	GGCCGGCCGGCCGGCCGGCCGTGCCAAGCTT	31	Ring
RS11	FREE	31[459-469]	GGCCGGCCGGCCGGCCGGCCTTAGAACCCTC	31	Ring
RS12	FREE	31[407-416]	GGCCGGCCGGCCGGCCGGCCACGACGGCCA	30	Ring
RS13	FREE	31[470-479]	GGCCGGCCGGCCGGCCGGCCATATATTTTA	30	Ring
RS14	FREE	31[449]-26[446]	GGCCGGCCGGCCGGCCGGCCGTTGAATGAGGCGA	34	Ring

Additional Function Staple

No.	Sequence (5’ to 3’)	Length	Function	Sequence Symbol (5' to 3')
RcB01	CCCCCCCCCCCCCCCCCCCCGGGGGGGGGGGGGGGGGGGG	40	Ring Closing	
ReB01	CGCATTACGCCGTAGGATGC	20	Releasing	Z'F'
FUEL	CACACACACACTCTCTCTCTACCACCACCACCTAGC	36	Fuel	CA'D'E'
A-FUEL	GCTAGGTGGTGGTGGTGGACTTCAGGTGTGTGTGTG	36	Anti-Fuel	EDB'C'
AbB01	TGGTGGTGGTAAAAAGGGGGTTCCTTCCTT	30	anti-blocking	DGH
AbB02	CACACACACAATCCAACCTAGGGGAAGGGG	30	anti-blocking	IJ'C
BB01	CCCCTTCCCCTAGGTTGGATTGTGTGTGTG	30	Blocking staple	C'JI'
BB02	AAGGAAGGAACCCCCTTTTTACCACCACCA	30	Blocking staple	H'G'D'

Full length of single-stranded scaffold DNA type p7560

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