

Electronic supplementary information

**Direct AFM Observation of an Opening Event of a DNA Cuboid Constructed
via a Prism Structure**

Masayuki Endo,^{*a,c} Kumi Hidaka^b and Hiroshi Sugiyama^{*a,b,c}

^a*Institute for Integrated Cell-Material Sciences (iCeMS), Kyoto University, Yoshida-ushinomiya-cho Sakyo-ku, Kyoto 606-8501, ^bDepartment of Chemistry, Graduate School of Science, Kyoto University, Kitashirakawa-oiwakecho, Sakyo-ku, Kyoto 606-8502, and ^cJapan Science and Technology Corporation (JST), CREST, Sanbancho, Chiyoda-ku, Tokyo 102-0075, Japan.*

endo@kuchem.kyoto-u.ac.jp, hs@kuchem.kyoto-u.ac.jp

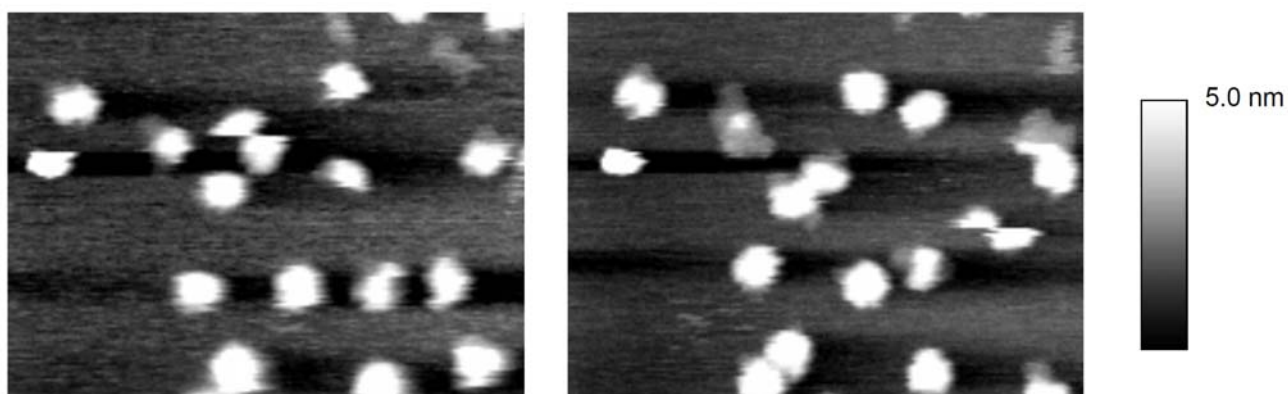


Fig. S1 AFM images of the 3D structures after annealing of the connected six rectangles with corresponding linkers. Image size: 1000 x 750 nm.

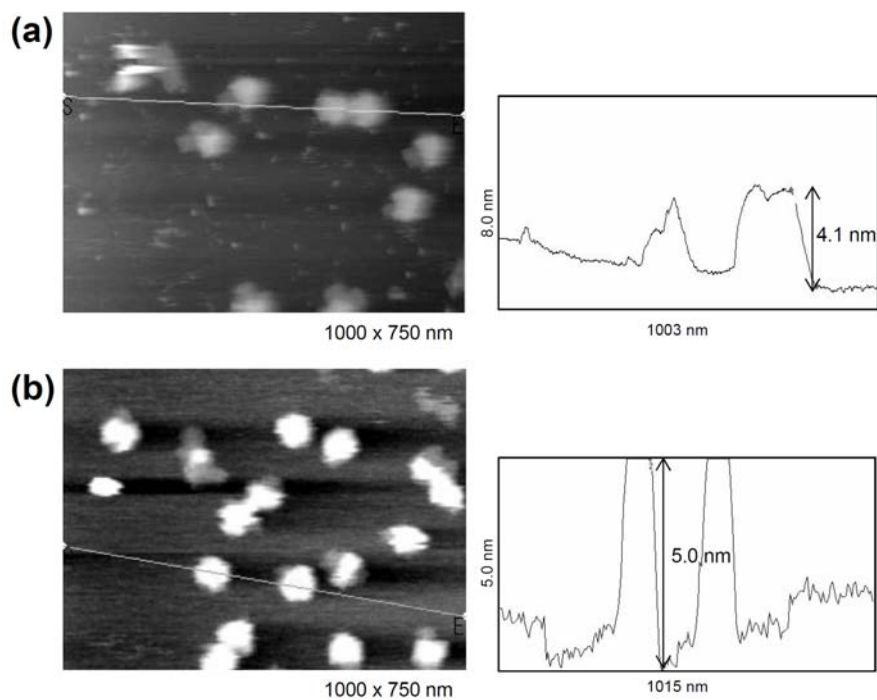


Fig. S2 Cross sectional analyses of the particles. In the case of Fig. S2b, the estimated height of the particles should be around 5-8 nm.

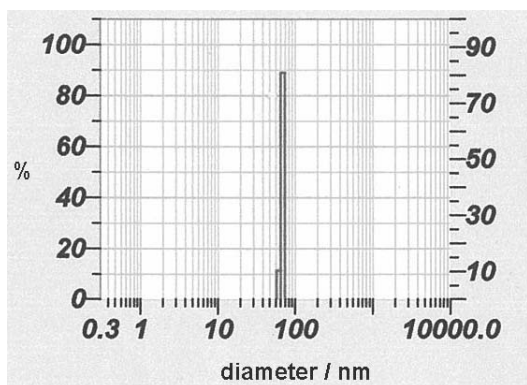


Fig. S3 Dynamic light scattering analysis of a cuboid structure. DLS analysis was carried out on a Horiba nanopartica SZ-100 instrument using the same concentration of DNA cuboid (10 nM) and the same buffer solution.

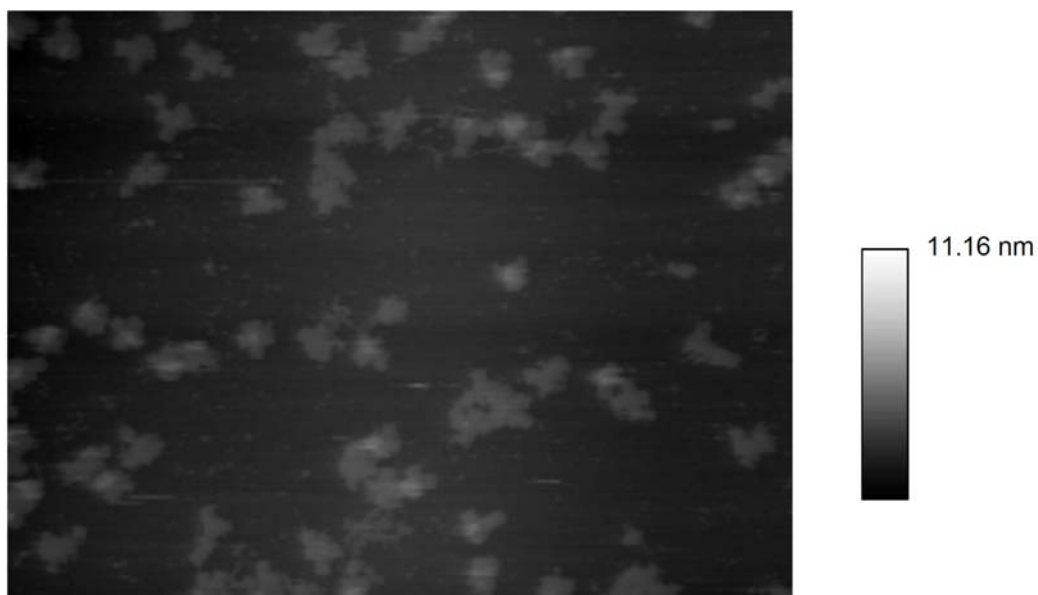


Fig. S4 AFM images of the opened 3D structures after 20 times AFM scanning. Image size: 2000 x 1500 nm.

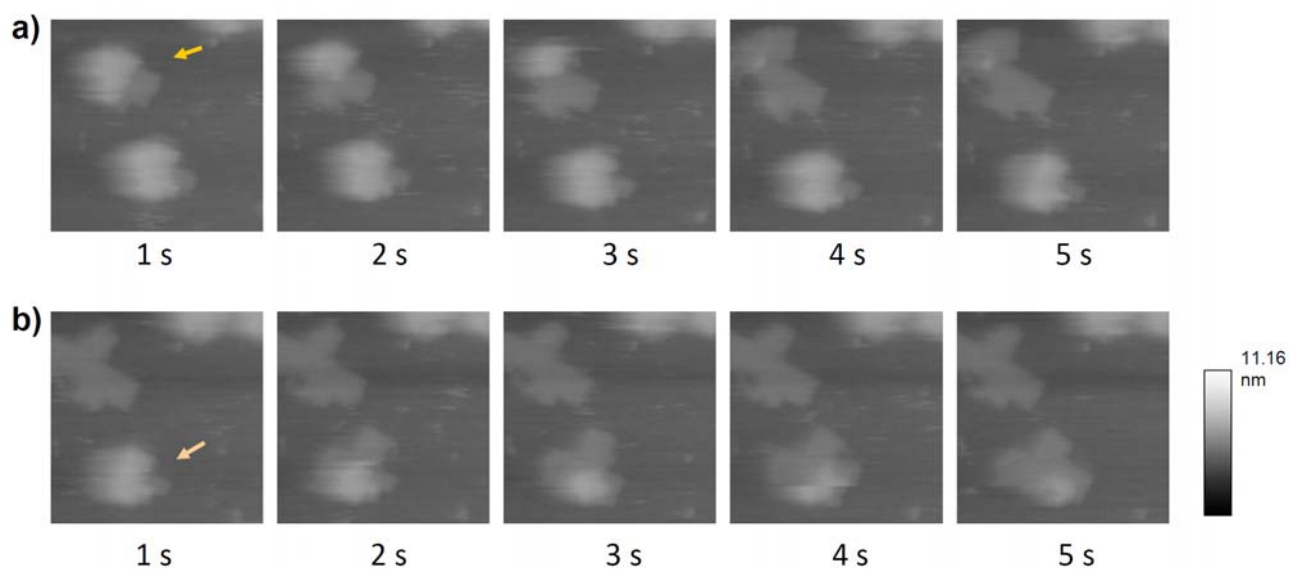
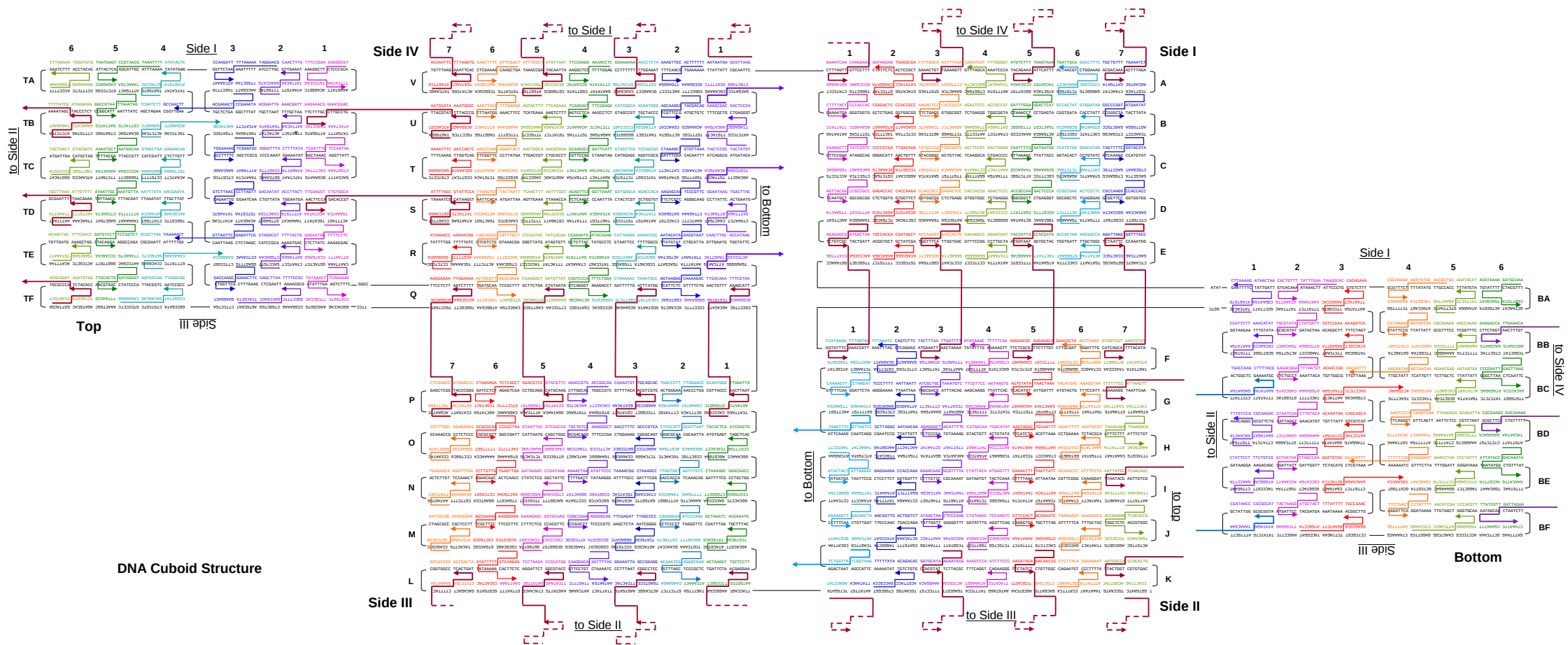
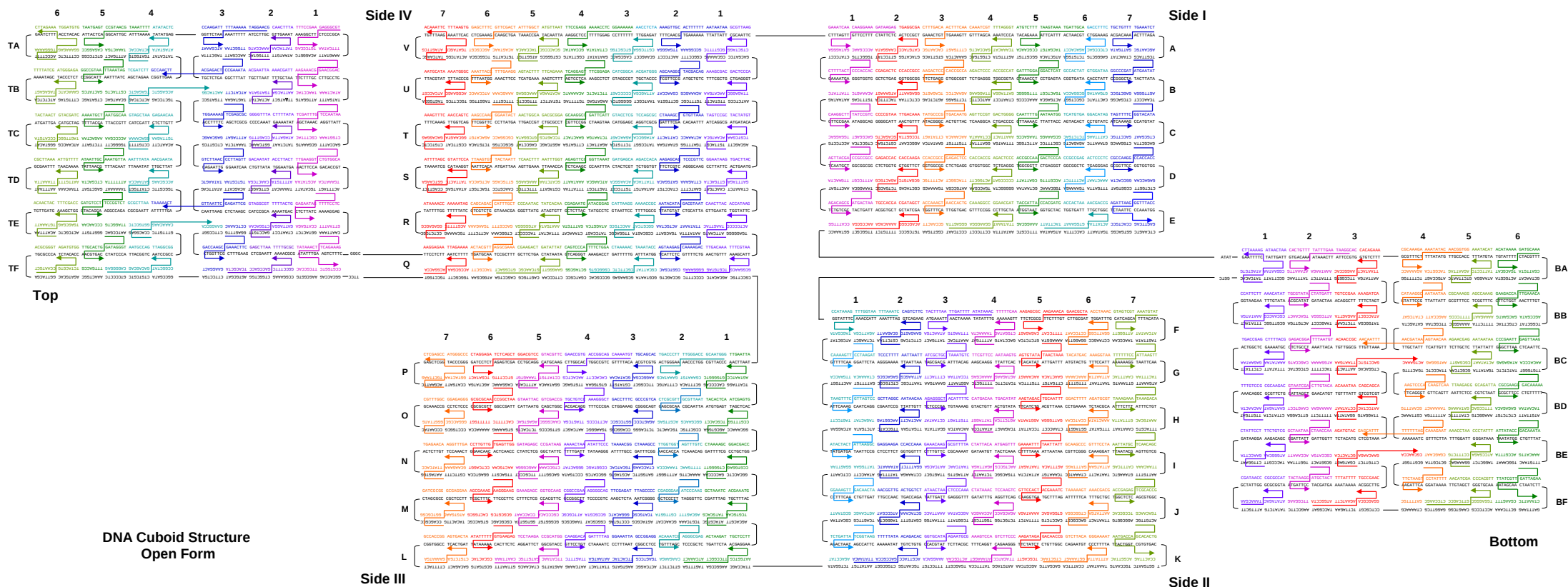


Fig. S5 Successive AFM images of two different opening events of DNA cuboids. Image size: 300 x 300 nm.

Structures and sequences of a DNA cuboid with connection linkers and an open form without linkers.

The sequences and positions of the staple strands in the DNA cuboids and the open form without linkers are listed in the SI. The positions of the strands are shown in the figures of the DNA cuboid and the open form without linkers.





DNA cuboid structure

No.	Position	Sequence 5'-----3'
1		GCTTGATACCGATAGTGTGAATTTCTTAACA
2	connector	S4-U7+TB1 CTTTGAAATtttTGCCACTACGAAGGCACGGGTAAATACGTAattttCAGGCAAGGCAAGAACATCCAAT
3		S4-T7 GAGGACAGATGAACGGCTGACCAA
4	connector	S4-S7+TD1 CCAAAATAttttAGAACTGGCTCATTATACCTTATGCGATTTTAttttACGGGTGCTGGAAGTTAATATGCA
5		S4-R7 AAGAGGAAttttGCGGAGAGGCTTTTGCGAGATAAAAA
6	connector	S4-Q7 CCGAGCTCTTACCAGGCAAAAGCGCAAAAGATT
7		S4-V6 TCAGCTTGCTTTGCGATGCGCCGA
8		S4-U6 CAATGACAGGAAGTTTCCATTAAACCAACCTA
9		S4-T6 AAACGAAATCATAAGGGAACCGAATGTACAGA
10		S4-S6 CCAGGCGCTTAATCATTGTGAATTACCAAGTCA
11		S4-R6 GGACGTTGTGCTTTACCAGACGACAAAGAAGT
12		S4-Q6 TTTGCCAGAAAGCGGATTGCATCATTGCGCATTACGGCTG
13		S4-V5 TTTTCATGAACAACATCGCCACGTAATTGTA
14		S4-U5 ACGGTCAAGAGGCAAAAGAAATACAAAGACTT
15		S4-T5 TTTCAACTATAGGCTGGCTGACCTAGGCGCAG
16		S4-S5 CATAACCCGGAAGAAAAATCTACGTGGTTAA
17		S4-R5 TCAGAAGCAGGGGGTAAATAGTAAAAACACTAT
18	connector	S4-Q5 CCTGCAGGTTTCGCAACTGTTGGGAAGTATTATAG
19		S4-V4 CTCCAAAAGGAGCCTTCATAACCG
20		S4-U4 ATATATTCAGAGGCTTTGAGGACTCTAAAACA
21		S4-T4 CTCATCTTTTACTTAGCCGGAACGTCAATAG
22		S4-S4 AGTAATCTTAAATTTGGGCTTGAGATTAAATAA
23		S4-R4 ACGAAGTAGAGGCATAGTAAGAGCATGTTTAG
24		S4-Q4 ACTGGATAAGGTCTTTTACCCTGACGGCGATCGGTGCGGGC
25		S4-V3 ACGGCTACGGTCGCTGAGGCTTGATCTCCAA
26		S4-U3 GCTCCATGTGACCCCGACGATTAGGGTAGCA
27		S4-T3 ACGAGTAGTGACAAGAACCGGATACGCGACCT
28		S4-S3 GGAATTACACGGAACAACATTATTACACCAGA
29		S4-R3 CAAAAATCGCGTCCAATACTCGGCGCCAAAA
30	connector	S4-Q3 TGTAAACCTTCTCTTCGCTATTACGCCATAAAAT
31		S4-V2 TTTTTTCACGTTGAAAAGGGAGTT
32		S4-U2 AAAGGCCGGACAGCATCGGAACGATACCAAGC
33		S4-T2 GCGAAACAAAATTTGTGCGAAATCTTCATTAC
34		S4-S2 CCAATCACTTGCCCTGACGAGAAACAGGTAG
35		S4-R2 AAAGATTCTAATGCAGATACATAAAATCGTCA
36		S4-Q2 TAAATATTCAGAAAACGGAATGACAGCTGGCGAAAAGGG
37		S4-V1 CAGCGAAACTTTTGCGGGATCGCTTTTACAAAGTTACCAGAAGGTAAGCAG
38		S4-U1 TGTATCATCGCCTGATAAGTACAACGGAGATTACCCCTCAG
39		S4-T1 GAATAAGGACGTAACAAAGCTGCTTTTAAAAACAGGGAAGCGCACAGAGAG
40		S4-S1 GAATACCACATTCAACATCAGTTGAGATTAGCATTTCAGT
41		S4-R1 AAACAGTTCATTGAAATCCCTCATTTTAAAGATTAGTTGCTATTTTTGAAGCCTTAAATC
42	connector	S4-Q1 GGGTAACGTTGATGTGCTGCAAGGCGAATGCTTT
43	connector	S1-A1 GAATTGCGAATAATAATTAAAGGAACAACATAAGAGGGATAG
44		S1-B1 CAAGCCACACCCACCTCATTTTCTtttCTATTATT
45		S1-C1 CTGAAACACTGCCATTTCGGAACtttCAGGAGGT
46		S1-D1 TGAGGCAGCCGCCGACGATTGattttATCAAGTT
47		S1-E1 TGCCTTTAAATCAGTAGCGACAGattttGGTTTACC
48		S1-A2 CTCAGAGCATAGGAACCCATGTACAGCGGAGTGAGAATAG
49		S1-B2 AATGCCCTGAAAAGTATTAAAGAGGCGCCACCC
50		S1-C2 CACCAGAGGTCAGACGATTGGCCTAAACAGTT
51		S1-D2 AGCACCGTGCTCAGACTGTAGCGGAACACC
52		S1-E2 AGACAAAAGGGCGACATCGATAGC
53		S1-A3 AAAAAAGGTTTAACTTTCAACAGTTTCCGTAACAC
54		S1-B3 TGAGTTTACCGCCACCTCAGAACTGAGACT
55		S1-C3 CCTCAAGAGTAACAGTGCCCGTATTGATATTC
56		S1-D3 ACAAACAACCTCAGAGCGCCACCCGTTTTCA
57		S1-E3 TCGGCATTGTACCAATGAAACCATTAACCG
58		S1-A4 CCCTCAGAGTCACAGTACAACCTTGGGATTTTGCTAAAC
59		S1-B4 TGCCCTGAGAAGGATTAGGATTAGTACCGCCA
60		S1-C4 GCCACCACATAAATCCTATTAAAGGGGTCAG
61		S1-D4 CCGGAAACTTCGGTCATAGCCCCCCTCAGA
62		S1-E4 AGGGAAGGTAAATATTTAGCAAGG
63	connector	S1-A5 TCGGTTTATTTTAGTTTGACCATTAACACGCC
64		S1-B5 TGTAGCATTTACTCAGGAGGTTTAGCGGGGTTT
65		S1-C5 TGCTCAGTGGTAATAAGTTTTAACGCCGAAT
66		S1-D5 GGAAAGCGACCTCAGAACCGCCATTATTAGC
67		S1-E5 GTTTGCCAGTAGCACCATTAACCATGACGGAAA

68	S1-A6	TATCACCGTCCACAGACAGCCCTCCTTTCCAGACGTTAGT
69	S1-B6	AGTGACTACCAGGCGGATAAGTGAATAGGTG
70	S1-C6	GAGCCGCCAGCTCTGAAATTTACGATACAGG
71	S1-D6	AATCACCATCTTTTATATATCAAACTCCCTCA
72	S1-E6	TAAAGGTGAATTTATCAGCCAGCAA
73	connector	S1-A7 CTTAACCATTTCTAAAGTTTTGTCGTATAGTTAG
74	S1-B7	CGTAACGAttttTATAAGTATAGCCGGCCGTCGAG
75	S1-C7	AGGGTTGAttttATACATGGCTTTTATCGTTCCAG
76	S1-D7	TAAGCGTcttttCCACCACCGGAACCGCATCACC
77	S1-E7	AACCAGAGttttCCATTTGGGAATTAGACCGTACC
78	Bot-BA1	TTCTTACCTttttGTGTGATAAATAGGCAATCAATAGAAAAATTC
79	Bot-BB1	GAGCCAGTttttAGTATAAAGCCAAACGCTATACAAA
80	Bot-BD1	TCCTTATCTTTTATCAACAATAGATAAGCAGAACGCGCTGTTT
81	Bot-BE1	CCAATAGcttttATTCCAAGAACGGGTAGCTGTCTT
82	Bot-BA2	CACGGAATAAGTTTATTTTGTACGTTAAATA
83	Bot-BB2	AGAATAAATTAGTATCATATGCGTTCAACAGT
84	Bot-BC2	AGGGCTTATGTAATTTAGGCAGAGGTACCGAC
85	Bot-BD2	AAAAGGTAAACATGTTACGCTAATGTCTGAAC
86	Bot-BE2	AAGAAAAAACCAATCAATAATCGTTAAACCA
87	Bot-BF2	AGTACCGCTCATCGTAGGAATCATGAAGGCTT
88	Bot-BA3	AAGCCTGTCCCGGAATCATAATTAAAGACAC
89	Bot-BB3	CGCCAAACAATTGAGAATCGCCATAACTAGAAA
90	Bot-BC3	AATAAACAAAGTAATTTGTGCCAGCAAGTCA
91	Bot-BD3	CATGTAGATAAATCCCATCTCTAAACGAGCAG
92	Bot-BE3	TTTTATTACTCATCGAGAACCAAGCAACGC
93	Bot-BF3	ATCCGGTATTCTAAGAACCGGAGGCAAGCCGT
94	Bot-BA4	GGTGGCAACATATAAAAGAAACGCCAAAAGA
95	Bot-BB4	ACTGGCATATAAATAACGGAATACGTATC
96	Bot-BC4	TTACCGAAAACAATGAATAGCAATTTAACA
97	Bot-BD4	GAGGGTAAAACTGAACCCCTGAAGTTTAAACG
98	Bot-BE4	TCAAAAATTAAAGAACGATTTTTTTTATCGAG
99	Bot-BF4	TAACGAGCTTTTATCCTGAATCTTCGTTTTAG
100	Bot-BA5	GGAAACGCGATTAAAGACTCCTTATTACATAA
101	Bot-BB5	GAGCAAGAGCCCTTTTAAAGAAAAGAACCGA
102	Bot-BC5	GGAGAATTTTGAGCGCTAATATCAAAATAAA
103	Bot-BD5	AATCCAAAGAAAAATAGCAGCCTTTATTAGACG
104	Bot-BE5	AGCTACAAGCTTTTCCAGAGCCTATTATCCC
105	Bot-BF5	CGAACCTCCCGACTTGCGGGAGGTTTGACCC
106	Bot-BA6	AAACGTAGAAAAACATACGCAAGTATGTTAGC
107	Bot-BC6	ATAGCCGAttttGAATTGAGTTAAGCCCGAGAGATAACCCACAA
108	Bot-BE6	AATAACATttttATAAACAGCCATATTAATTTGCCAGTTACAAA
109	connector	S2-F1 AGCGCCAATTAATGGTTTGAAATACCTTTTATAGCGAT
110	S2-G1	AGCTTAGATAGAATCCTTGAAAACTtttACCAAGTT
111	S2-H1	ACAAAACTCCTGATTGCTTTGAATTTTTAATAAGAGAATATAAAGCATTTTC
112	S2-I1	TTCTGTATTATCAGATCGGAATTATCATCATATTTTAAATTGAGG
113	S2-J1	AAGGTTATATCAACAGTTGAAAGGttttTAAATGCG
114	S2-K1	CGAACTGAGAATGGCTATTAGTCTTTTAAAGCAATCAGATATATACCGCGC
115	S2-F2	TTTTCCCTTTTAAAGACGCTGAGAAGCTTTGACCTAAATTT
116	S2-G2	CGGATTGCGCGCAGAGGCGAATTATTAATTA
117	S2-H2	AGAAGGAGGATGGCAATTCATCAAAACAATA
118	S2-I2	GTTGGCAACTAAAAATATCTTTAGGAAACCAAC
119	S2-J2	ATATTTTTTAGCCCTTAAACATCGTCTGTCTCA
120	S2-K2	ACCGCCAGCCATTGCACACAGACA
121	connector	S2-F3 ATTGAGGGTTTTTATGTTAATTTTCATAGTCAATA
122	S2-G3	GTGAATTTCTGTAATTCGTCGCTATTCTTTC
123	S2-H3	AATTACCTCTTTTACATCGGGAGATATAATCC
124	S2-I3	TGATTGTTATTTTGCAGAACAAAGAGCACTAA
125	S2-J3	CAACTAATAAACCTCAATCAATACCATTA
126	S2-K3	AATACCGAGGTAAGAAATACGTGGACAGGAAA
127	S2-F4	CCTTGCTTTATCAAAATCATAGGTCAACTTTTTCAAATATA
128	S2-G4	AACAGTACGAGCAAAAGAGATGAGTGAATA
129	S2-H4	ACATTATCTGGATTATACCTTCTGATATACAGT
130	S2-I4	CAAAATATCAGATTAGAGCCGTCATTTGAGTA
131	S2-J4	ACCTGAAAACGAACCAACGAGAGTGAACCT
132	S2-K4	TGGAATACCTACATTTCCCTCTG
133	S2-F5	TTATTCTTTTACAAAGAACGCGAGAAATGAGAGAC
134	S2-G5	TACCTTTTTAAATCAATATATGTGATGAAACAA
135	S2-H5	ACATCAAGTTTAACTGCAGATGAAATATGGA

136	S2-I5	AGGGTTAGTTATTAATTTTAAAGTAGATAAT
137	S2-J5	ACATTTGACTAAAGCATCACCTTGAGATAAAA
138	S2-K5	CAGAGGTGGCCAACAGAGATAGAATTGACGCT
139	S2-F6	CAGTACATTAACCTCCGGCTTAGGCAAAATCCAATCGCAAG
140	S2-G6	TTTTCAGGAAAACAAAATTAATTAATGGAAG
141	S2-H6	CCCGAACGAACCTACCATATCAAATGCGTAGA
142	S2-I6	TGAAAAATGGATTAGAAGTATTAATCCTTTG
143	S2-J6	ACATTCGAGGCGGTCAGTATTAAAGCAGCAAA
144	S2-K6	TGAAATGGATTATTTATAAAAGGG
145	connector S2-F7	GACTTGAGTTTATGTAAATGCTGATGTTGGGTTATATAACTA
146	connector S2-G7+TB6	TCAATCATttttTGAGAGATCTACAAAGAGAGGGTAGCTATTTTTTTTTTGAAATTACCTTTTTTCATTTAAC
147	S2-H7	AATTTTCATTTTTACAGAAATAAGAAATATTATTTGCACGTAAA
148	connector S2-I7+TD6	CATCAACATtttATTAAATTTTTGTTAATTTTGTTAAATTCGCTTTTCGACAACCTCGTATTAAAGACTTTAC
149	S2-J7	AAACAATTTTTTGCCACGCTGAGAGCCACACCGCTGCAACAGT
150	S2-K7	TGGGCGCATTTTGTACACGACCAAGTAACATTGGCA
151	S3-P1	ACTCACATCTGGGGTGCCTAATGATtttATTAAGTT
152	S3-O1	CGAAATCTCCACGCTGGTTTGCCttttGTGAGCTA
153	S3-N1	CTAAATCGTTGGGGTCGAGGTGCtttCCAGCAGG
154	S3-M1	TAGAATCAGCACGTATAACGTGCTtttGTAAAGCA
155	connector S3-L1	TATCCAGAACAAATTTTTTCGGCCTTGCTGGTAATTTTTCTCTCGT
156	S3-P2	CCAGGGTTTTCCAGTGCATAAAG
157	S3-O2	TGTAAGCTAATTGCGTTGCGCTCGAGTTGCA
158	S3-N2	GCAAGCGGCTGTTTGATGGTGGTTACCCAAAT
159	S3-M2	CAAGTTTTGAACCTAAAGGGAGCATGGTTGC
160	S3-L2	TTTGACGAGAGCGGGAGCTAAACAAGAAGAACTCAAACCTA
161	S3-P3	CTTTCCAGAACATACGAGCCGGAACACGACGT
162	S3-O3	GGCAAAATCCGCCTGGCCCTGAGAACTGCCCG
163	S3-N3	TAGAGCTTCACTACGTGAACCATCCCGAAATC
164	S3-M3	ATTAAAGGCTACAGGGCGCGTACTCCCCGATT
165	connector S3-L3	AACGCTCATTCACTTGCCTGAGTGGAGGCCG
166	S3-P4	GACGGCCAGTGCCAAGGCTCACAA
167	S3-O4	TTCCACACTCGGGAAACCTGTCTGAGCTGATT
168	S3-N4	GCCCTTACCCCTTATAAATCAAATATCAGGG
169	S3-M4	CGATGGCCGACGGGAAAGCGCGCGCGCTTA
170	S3-L4	ATGCGCCGGATTTTAGACAGGAACCTTTGATTAGTAATAA
171	S3-P5	CATTAATGTGTGAAATTGTTATCCCTTGCAATG
172	S3-O5	CGAGATAGCAGTGAGACGGGCAACGCCAGCTG
173	S3-N5	CGAGAAAGAGGGCGAAAAACCGTCGAATAGCC
174	S3-M5	AGAATCCTTAACCACCACACCCGCGAACGTGG
175	connector S3-L5	CAATCGCTCTCGTTGTAGCAATACTTGGTACGCC
176	S3-P6	TCGACTCTAGAGGATCTCATAGCT
177	S3-O6	GTTTCCTGAATCGGCCAACGCGCGTGTTTTT
178	S3-N6	CTTTTCACGGTTGAGTGTGTTCTGGAATCC
179	S3-M6	AACGTCAAGAAGGGAAGAAAGCGAGCGGTCAC
180	S3-L6	GCTGCGCGGAGAAAGTGTATATACATCACGCAAAATTAAC
181	S3-P7	CGGTTTGcttttGAATTGTAATCATGGCCCCGGTA
182	S3-O7	ACAAGAGTttttGTATTGGGCGCAGGGGGAGAGG
183	S3-N7	GGCGCTAGttttCCACTATTAAGAACGAGTTGGA
184	S3-M7	GGCCACCGttttGGCGCTGGCAAGGTAAAGGAGCG
185	connector S3-L7	GATTACACTTAGTAAAAGAGTCTGTATCAGTGA
186	Top-TA1	TGCGGGAGAAGCCTTTGACCTGTAACTATT
187	Top-TC1	AAATCATAttttAAATAACCTGTTAGCTCATTTCGCAATGGTC
188	Top-TE1	ACTAAAGTttttCTCCTTTTGATAAGAGAGAGTACC
189	Top-TF1	TTTAATTGttttGAAAGACTTCAAATATACCGCTTCTGGTGCC
190	Top-TA2	ATTAAGCAGTACCAAAAACATTATATTTCAAC

191	Top-TB2	ATTTGGGGATAGTAGTAGCATTAAATAGCAAA
192	Top-TC2	TATAACAGGTTTGACCATTAGATAAATTTTTTC
193	Top-TD2	TGCGGATGAGCTCAACATGTTTTATCATTTCCA
194	Top-TE2	AATTCGAGAACAGGTCAGGATTAGGTCATTTTT
195	Top-TF2	ATCGCACTCCAGCCAGCTTTCCGGCGCGTTTT
196	Top-TA3	GCAAGGATAAAAAATTTTAGAACCTAAAGCTA
197	Top-TB3	AATCGGTTATAAAGCCTCAGAGCATTCAACCG
198	Top-TC3	TTCTACTACGCGAGCTGAAAAGGTCGAACGAG
199	Top-TD3	TAGATTTATTGATTCCCAATTCTGCTGAATAT
200	Top-TE3	AATGCTGTGCTTAGAGCTTAATTGTCAAAAAAT
201	Top-TF3	CAAACCTCCCTTCAAAGCGAACCAAGTCAGGAAG
202	Top-TA4	TTCTAGCTCACCATCAATATGATACTCATATA
203	Top-TB4	AATCGATGCTGAGAGTCTGGAGCAGGCATCAA
204	Top-TC4	ATATTTAAAAAACAGGAAGATTGTAACAAGAG
205	Top-TD4	AATTCGCGACCAATAGGAACGCCAATAAGCAA
206	Top-TE4	GACCGTAACTCCGTGGGAACAAACCCGGAAG
207	Top-TF4	GAGGGGACGACGACAGTATCGGCCGCGGATT
208	Top-TA5	TTTTAAATGCAATGCCTGAGTAATCCGGAGAC
209	Top-TB5	AGTCAAATGATAAATTAATGCCGGGCTATCAG
210	Top-TC5	GTCAATTGCAACGGTAATCGTAAAAAATCAGAA
211	Top-TD5	AAGCCCCAATTGTAACAGTTAATAATCAGCTC
212	Top-TE5	ATTTTTTATCTGGCCTTCTGTAGAACAAACCC
213	Top-TF5	GTGCGATTGGGATAGGTCACGTTGCCAGTTT
214	Top-TA6	AAAAGGGTGAGAAAGGGGTAGGTAAAGATTTC
215	Top-TB6	TCAATCATttttTGAGAGATCTACAAAGAGAGGGTA
216	Top-TC6	ATGTACCCCGTTGATCTAGCATG
217	Top-TD6	CATCAACAttttATTAAATTTTGTTAATTTTGTTA
218	Top-TE6	TTAAATGTGAGCGAGTCCAGCTTT
219	Top-TF6	TCGTAAACGTGCATCTGGTGTAGA

DNA cuboid structure open form

No.	Position	Sequence 5'----3'
1	S4-V7	GCTTGATACCGATAGTGTGAATTTCTTAAACA
2	S4-U7	CTTTGAAAttttTGCCACTACGAAGGCACGGGTAAA
3	S4-T7	GAGGACAGATGAACGGCTGACCAA
4	S4-S7	CCAAAATAttttAGAACTGGCTCATTATACCTTATG
5	S4-R7	AAGAGGAAttttGCGAGAGGCTTTTGAGATAAAAA
6	S4-Q7	CCGAGCTCTTACCAGGCAAAAGCGCAAAAAAGATT
7	S4-V6	TCAGCTTGCTTTGAGTGCGCCGA
8	S4-U6	CAATGACAGGAAGTTTCCATTAAACCAACCTA
9	S4-T6	AAACGAAATCATAAGGGAACCGAATGTACAGA
10	S4-S6	CCAGGCGCTTAATCATTGTGAATTACCACTCA
11	S4-R6	GGACGTTGTGCTTTACCAGACGACAAAGAAGT
12	S4-Q6	TTTGCCAGAAAGCGGATTGCATCATTGCGCATTCAGGCTG
13	S4-V5	TTTCATGAACAACCATCGCCACGTAATTGTA
14	S4-U5	ACGGTCAAGAGGCAAAAGAATAACAAAGACTT
15	S4-T5	TTTCAACTATAGGCTGGCTGACCTAGGCGCAG
16	S4-S5	CATAACCCGGAAGAAAAATCTACGTGGTTTAA
17	S4-R5	TCAGAAGCAGGGGTAAATAGTAAAAACACTAT
18	S4-Q5	CGCAACTGTTGGGAAGTATTATAG
19	S4-V4	CTCCAAAAGGAGCCTTCATAACCG
20	S4-U4	ATATATTCAGAGGCTTTGAGGACTCTAAAAACA
21	S4-T4	CTCATCTTTTACTTACCGGGAACGTCAATG
22	S4-S4	AGTAATCTTAAATTTGGGCTTGAGATTAAATAA
23	S4-R4	ACGAACTAGAGGCATAGTAAGAGCATGTTAG
24	S4-Q4	ACTGGATAAGGTCTTTACCCTGACGGCGATCGGTGCGGGC
25	S4-V3	ACGGCTACGGTGCTGAGGCTTGCAATCCAA
26	S4-U3	GCTCCATGTGACCCGAGCGATTAGGGTAGCA
27	S4-T3	ACGAGTAGTGACAAGAACCGGATACGCGACCT
28	S4-S3	GGAAATACACGGAACAACATTATTACACCAGA
29	S4-R3	CAAAAATCGCGTCCAATACTGCGGCGCAAAA
30	S4-Q3	CTCTTCGCTATTACGCCATAAAAT
31	S4-V2	TTTTTTTACGTTGAAAAGGGAGTT
32	S4-U2	AAAGGCCGGACAGCATCGGAACGATACCAAGC
33	S4-T2	GCGAAACAAAATTTGTGCGAAATCTTCATTAC
34	S4-S2	CCAAATCACTTGCCTGACGAGAAACAGGTAG
35	S4-R2	AAAGATTCTAATGCAGATACATAAAATCGTCA
36	S4-Q2	TAAATATTAGAAAAACGAGAATTGACAGCTGGCGAAAGGG
37	S4-V1	CAGCGAAACTTTTGCGGGATCGTC
38	S4-U1	TGTATCATCGCTGATAAGTACAACGGAGATTACCTCAG
39	S4-T1	GAATAAGGACGTAAACAAAGCTGCT
40	S4-S1	GAATACCACATTCAACATCAGTTGAGATTAGCATTCACT
41	S4-R1	AAACAGTTCAATTGAATCCCTCA
42	S4-Q1	GATGTGCTGCAAGGCGAATGCTTT
43	S1-A1	AAAGGAACAACATAAGAGGGATAG
44	S1-B1	CAAGCCACACCAACCTCATTTTCTtttCTATTATT
45	S1-C1	CTGAAACACTGCCATTATTCGGAACttttCAGGAGGT
46	S1-D1	TGAGGCAGCGCGCCAGCAATTGAttttATCAAGTT
47	S1-E1	TGCCTTTAAATCAGTAGCGACAGAttttGGTTTACC
48	S1-A2	CTCAGAGCATAGGAACCCATGTACAGCGGAGTGAGAAATAG
49	S1-B2	AATGCCCTGAAAGTATTAAAGAGGCCGCCACC
50	S1-C2	CACCAGAGGTCAGACGATTGGCCTAAACAGTT
51	S1-D2	AGCACCCTGCGTCAGACTGTAGCGAGAACCCAC
52	S1-E2	AGACAAAAGGGCGACATCGATAGC
53	S1-A3	AACTTTCAACAGTTTCCGTAACAC
54	S1-B3	TGAGTTTACCAGCCACCTCTAGAACTGAGACT
55	S1-C3	CCTCAAGAGTAACAGTGCCCGTATTGATATTC
56	S1-D3	ACAAACAACCTCAGAGCCGCCACCCGTTTCA
57	S1-E3	TCGGCATTGTCAACCAATGAAACCATTCACCCG
58	S1-A4	CCCTCAGAGTCACCACTACAACTTTGGGATTTTGCTAAAC
59	S1-B4	TGCTTGAGAAGGATTAGGATTAGTACCGCCA
60	S1-C4	GCCACCACATAAAATCTCATTTAAAGGGGTGAG
61	S1-D4	CCGGAACCTTCGGTCATAGCCCCCCCCCTCAGA
62	S1-E4	AGGGAAGGTAAATATTAGCAAGG
63	S1-A5	TTTAGTTTGACCATTAACACGCC
64	S1-B5	TGTAGCATTACTCAGGAGGTTTACGGGGTTT
65	S1-C5	TGCTCAGTGGTAATAAGTTTAAACGCCAGAAT
66	S1-D5	GGAAAGCGACCCCTCAGAACCAGCATTTATGAG
67	S1-E5	GTTTGCCAGTAGCACCATTAACATGACGGA

68	S1-A6	TATCACCGTCCACAGACAGCCCTCCTTCCAGACGTTAGT
69	S1-B6	AGTGTAATACAGGCGGATAAGTGAATAGGTG
70	S1-C6	GAGCCGCCAGTCTCTGAATTTACGATACAGG
71	S1-D6	AATCACCATCTTTTCATAATCAAACCTCCCTCA
72	S1-E6	TAAAGTGAAATTATCAGCCAGCAA
73	S1-A7	TCTAAAGTTTTGTCGTATAGTTAG
74	S1-B7	CGTAACGAttttTATAAGTATAGCCCGGCCGTCGAG
75	S1-C7	AGGGTTGAttttATACATGGCTTTTGATCGTTCCAG
76	S1-D7	TAAGCGTcttttCCACCACCGGAACCGATCACC
77	S1-E7	AACCAGAGttttCCATTGGAATTAGACCGTCAAC
78	Bot-BA1	TTCTTACCttttTGTTGATAAATAAGGCAATCAATAGAAAAATTC
79	Bot-BB1	GAGCCAGTttttAGTATAAGGCCAACGCTATACAAA
80	Bot-BC1	AATAAGAGAATATAAAGCATTTTTC
81	Bot-BD1	TCCTTATCTTTTATCAACAATAGATAAGCAGAACGCGCTGTTT
82	Bot-BE1	CCAATAGCttttTATTCCAAGAACGGTAGCTGTCTT
83	Bot-BF1	AAGCAAATCAGATATATACCGCGC
84	Bot-BA2	CACGGAATAAGTTTATTTTGTGTCAGGTTAAATA
85	Bot-BB2	AGAATAAAATAGTATCATATGCGTTCAACAGT
86	Bot-BC2	AGGGCTTATGTAATTTAGGCAGAGGTACCGAC
87	Bot-BD2	AAAAGGTAACATGTTTACGCTAATGTCTGAAC
88	Bot-BE2	AAGAAAAAACCAATCAATAATCGTTAAACCA
89	Bot-BF2	AGTACCGCTCATCGTAGGAATCATGAAGGCTT
90	Bot-BA3	AAGCCTGTCAACCGGAATCATAATTAAAGACAC
91	Bot-BB3	CGCCAACAATTGAGAATCGCCATAACTAGAAA
92	Bot-BC3	AATAAACAAAGTAAATCTGTGTCAGCAAAAGTCA
93	Bot-BD3	CATGTAGATAAATATCCCATCTTAACGACGAC
94	Bot-BE3	TTTTATTTACTCATCGAGAACAAAGACCAACGC
95	Bot-BF3	ATCCGGTATTCTAAGAACGCGAGGCAAGCGT
96	Bot-BA4	GGTGGCAACATATAAAAGAAACGCCAAAAAGA
97	Bot-BB4	ACTGGCATAATAAACGGAACTACTAGCTATC
98	Bot-BC4	TTACGAAAAACAATGAAATAGCAATTTAAACAA
99	Bot-BD4	GAGGGTAAACCTGAACACCTCGAAGTTTAAACG
100	Bot-BE4	TCAAAAATTAAAGAACGATTTTTTTTACGAG
101	Bot-BF4	TAACGAGCTTTTATCCTGAATCTTCGTTTATG
102	Bot-BA5	GGAAACGGGATTAAAGACTCCTTATTACATAAA
103	Bot-BB5	GAGCAAGAGCCCTTTTAAAGAAAAAGAACCGCA
104	Bot-BC5	GGAGAATTTTGAGCGCTAATATCAAAATATAA
105	Bot-BD5	AATCCAAGAAAAATAGCAGCCTTTATTAGACG
106	Bot-BE5	AGCTACAAGCTTTTCCAGAGCCTATTTATCCC
107	Bot-BF5	CGAACCTCCCGACTTTCGGGGAGGTTTGACCC
108	Bot-BA6	AAACGTAGAAAAATACATACGAGTATGTTAGC
109	Bot-BB6	ACAAAGTTTACCAGAAAGGTAAAGCAG
110	Bot-BC6	ATAGCCGAttttGAATTGAGTTAAGCCCGAGAGATAACCCACAA
111	Bot-BD6	AAAAACAGGGAAGCGCACAGAGAG
112	Bot-BE6	AATAACATttttATAAACAGCCATTAATTTGCCAGTTACAAA
113	Bot-BF6	AAGATTAGTTGCTATTTTGAAGCCTTAAATC
114	S2-F1	AGCGCCAATTAAATGGTTTGAAATACCTTTTATAGCGAT
115	S2-G1	AGCTTAGATAGAATCCTTGAAACttttACCAAGTT
116	S2-H1	ACAAAATCCCTGATTGCTTTGAAT
117	S2-I1	TTCTGATTATCAGATCGGAATTATCATCATTTTAATTGAGG
118	S2-J1	AAGGTTATATCAACAGTTGAAAGGttttTAATGCG
119	S2-K1	CGAACTGAGAAATGGCTATTAGTCT
120	S2-F2	TTTTCCCTTTAAGACGCTGAGAAGCTTCTGACCTAAATTT
121	S2-G2	CGGATTGCGCGCAGAGGCGAATTATTAAATTA
122	S2-H2	AGAAGGAGGATGGCAATTCATCAAAACAATAA
123	S2-I2	GTTGGCAACTAAATATCTTTAGGAAACCAACC
124	S2-J2	ATATTTTTTAGCCCTAAACATCGTCTGGTCA
125	S2-K2	ACCGCCAGCCATTGCACACAGACA
126N	S2-F3	TTTTAGTTAAATTTTATAGTCAATA
127	S2-G3	GTGAATTTCTGTAATCTGTCGCTATTCATTTC
128	S2-H3	AATTACCTCTTTTACATCGGGAGATATAATCC
129	S2-I3	TGATTGTTATTTTGGGGAACAAGAGCACTAA
130	S2-J3	CAACTAATAAACCTCAATCAATACCATTA
131	S2-K3	AATACCGAGCGTAAGAATACGTGGACAGGAA
132	S2-F4	CCTTGCTTATCAAAATCATAGGTCACCTTTTCAAAATATA
133	S2-G4	AACAGTACGAGCAAAAGAAGATGAGTGAATAA
134	S2-H4	ACATTATCTGGATTATCTTCTGATATACAGT
135	S2-I4	CAAAATCAGATTAGAGCCGTCATTTGAGTA
136	S2-J4	ACCTGAAACGAACCCACAGCAGACTGAACCT

137	S2-K4	TGGAATACCTACATTCCTCTCG
138	S2-F5	ACAAAGAACGCGAAGATGAGAGAC
139	S2-G5	TACCTTTTAAATCAATATATGTGATGAAACAA
140	S2-H5	ACATCAAGTTTAAACGTCAGATGAAATAATGGA
141	S2-I5	AGGGTTAGTTATTAAATTTTAAAGTAGATAAT
142	S2-J5	ACATTTGACTAAAGCATCACCTTGAGATAAAA
143	S2-K5	CAGAGGTGGCCCAACAGAGATAGAATTGACGCT
144	S2-F6	CAGTACATTAACTTCGGCTTAGGCAAAATCCAATCGCAAG
145	S2-G6	TTTTCAGGAAAAACAAATTAATTAATGGA
146	S2-H6	CCCGAACGAACCTTACCATATCAAAATGCGTAGA
147	S2-I6	TGAAAAATGGATTTAGAAGTATTAATCCTTG
148	S2-J6	ACATTCTGAGGCGGTGAGTATTAAGCAGCAAA
149	S2-K6	TGAAATGGATTATTTATAAAAGGG
150	S2-F7	TATGTAAATGCTGATGTTGGGTTATATACTA
151	S2-G7	TTGAATTACCTTTTTTCATTTAAC
152	S2-H7	AATTTTCATTTTTACAGAAATAAGAAATATTATTTGCACGTAAA
153	S2-I7	CGACAACCTCGTATTAAGACTTTAC
154	S2-J7	AAACAATTTTTGCCACGCTGAGAGCCACACCGCTGCAACAGT
155	S2-K7	GTCACACGACCAGTAACATTGGCA
156	S3-P1	ACTCACATCTGGGGTGCCTAATGATtttATTAAGTT
157	S3-O1	CGAAAAATCTCCACGCTGGTTTGCCTtttGTGAGCTA
158	S3-N1	CTAAATCGTTGGGGTCGAGGTGCCtttCCAGCAGG
159	S3-M1	TAGAATCAGCACGTATAACGTGCTtttGTAAAGCA
160	S3-L1	TCGGCCTTGCTGGTAAATTTTTCTCTCGT
161	S3-P2	CCAGGGTTTTCCCAAGTGCATAAAG
162	S3-O2	TGTAAAGCTAATTGCGTTGCGCTCGAGTTGCA
163	S3-N2	GCAAGCGGCTGTTTGATGGTGGTTACCCAAAT
164	S3-M2	CAAGTTTTGAACCTAAAGGGAGCATGGTTGC
165	S3-L2	TTTGACGAGAGCGGGAGCTAAACAAGAAAGTCAAACTA
166	S3-P3	CTTTCAGAACATACGAGCCGGAACACGACGT
167	S3-O3	GGCAAAATCCGCTTGGCCCTGAGAACTGCCCG
168	S3-N3	TAGAGCTTCACTACGTGAACCATCCGAAATC
169	S3-M3	ATTAAAGGCTACAGGGCGGCTACTCCCGATT
170	S3-L3	CATCACTTGCCTGAGTGGAGGCCG
171	S3-P4	GACGGCCAGTGCCAAAGGCTCACAA
172	S3-O4	TTCCACACTCGGGAAACCTGTCGTAGCTGATT
173	S3-N4	GCCCTTACCCTTATAAATCAAAATATCAGGG
174	S3-M4	CGATGGCCGACGGGGAAGCCGGCCGCGCTTA
175	S3-L4	ATGCGCCGGATTTTAGACAGGAACCTTTGATTAGTAATAA
176	S3-P5	CATTAAATGTGTGAATTTGTTATCCCTTGCAATG
177	S3-O5	CGAGATAGCAGTGAGACGGGCAACGCCAGCTG
178	S3-N5	CGAGAAAGAGGGCGAAAAACGCTGCAATAGCC
179	S3-M5	AGAACTCTTAACCAACACACCCGCGAACGTGG
180	S3-L5	CGTTGTAGCAATACTTGGTACGCC
181	S3-P6	TCGACTCTAGAGGATCTCATAGCT
182	S3-O6	GTTTCTGAATCGGCCAACGCGCGTGGTTTTT
183	S3-N6	CTTTTCACGGTTGAGTGTGTTCTCGACTCC
184	S3-M6	AACGTCAGAAGGGAAGAAAGCGAGCGGTAC
185	S3-L6	GCTGCGCGGAGAAGTGTTTTATACATCACGCAATTAAC
186	S3-P7	CGGTTTGCTtttGAATTCGTAATCATGGCCGGGTA
187	S3-O7	ACAAGAGTtttGTATTGGGCGCCAGGGGGGAGAGG
188	S3-N7	GGCGCTAGtttCCACTATTAAAGAACGAGTTTGA
189	S3-M7	GGCCACCGtttGGCGCTGGCAAGTGTAAAGGAGCG
190	S3-L7	AGTAAAGAGTCTGTATCAGTGA
191	Top-TA1	TGCGGGAGAAGCCTTTGACCTGTAACTTT
192	Top-TB1	CAGGCAAGGCAAGAAACATCCAAT
193	Top-TC1	AAATCATAtttAATAACCTGTTAGCTCATTTGCAAAATGGTC
194	Top-TD1	ACGGTGTCTGGAAGTTAATATGCA
195	Top-TE1	ACTAAAGTtttCTCCTTTTGATAAGAGAGAGTACC
196	Top-TF1	TTTAATTGtttGAAAGACTTCAAAATATCACCGCTTCTGGTGCC
197	Top-TA2	ATTAAGCAGTACCAAAACATTATATTTCAAC
198	Top-TB2	ATTTGGGGATAGTAGTACATTAAATAGCAAA
199	Top-TC2	TATAACAGGTTTGACCATTAGATAAATATTTTC
200	Top-TD2	TGCGGATGAGCTCAACATGTTTTATCATTCCA
201	Top-TE2	AATTCGAGAACAGGTACAGGATTAGGTCATTTT
202	Top-TF2	ATCGCACTCCAGCCAGCTTTCCGGCGCGTTTT
203	Top-TA3	GCAAGGATAAAAAATTTTGAACCTAAAGCTA
204	Top-TB3	AATCGGTTATAAAGCCTCAGAGCATTCAACCG
205	Top-TC3	TTCTACTACGCGAGCTGAAAAGGTCGAACGAG

206	Top-TD3	TAGATTTATTGATTCCCAATTCTGCTGAATAT
207	Top-TE3	AATGCTGTGCTTAGAGCTTAATTGTCAAAAAAT
208	Top-TF3	CAAACCTCCCTTCAAAGCGAACCAGTCAGGAAG
209	Top-TA4	TTCTAGCTCACCATCAATATGATACTCATATA
210	Top-TB4	AATCGATGCTGAGAGCTGGAGCAGGCATCAA
211	Top-TC4	ATATTTAAAAAACAGGAAGATTGTAACAAGAG
212	Top-TD4	AATTCGCGACCAATAGGAACGCCAATAAGCAA
213	Top-TE4	GACCGTAACTCCGTGGGAACAAACACCGGAAG
214	Top-TF4	GAGGGGACGACGACAGTATCGGCCGCGGATT
215	Top-TA5	TTTTAAATGCAATGCGCTGAGTAATCCGGAGAC
216	Top-TB5	AGTCAAATGATAAATTAATGCCGGGCTATCAG
217	Top-TC5	GTCATTGCAACGGTAATCGTAAAAATCAGAA
218	Top-TD5	AAGCCCAATTGTAAACGTTAATAATCAGCTC
219	Top-TE5	ATTTTTTATCTGGCCTTCTGTAGAACAACCC
220	Top-TF5	GTCGATTGGGATAGTACGTTGCCAGTTT
221	Top-TA6	AAAAGGGTGAGAAAGGGGTAGGTAAAGATTTC
222	Top-TB6	TGAGAGATCTACAAAGAGAGGGTA
223	Top-TC6	ATGTACCCCGGTTGATCTAGCATG
224	Top-TD6	ATTAAATTTTGTAAATTTTGTTA
225	Top-TE6	TTAAATGTGAGCGAGTCCAGCTTT
226	Top-TF6	TCGTAAACGTGCATCTGGTGATGA