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Supporting Information

Supracolloidal Self-Assembly of Divalent Janus 3D DNA Origami via Programmable Multivalent Host/Guest Interactions

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Materials

Single stranded DNA (ssDNA) staples were bought from Integrated DNA Technologies IDT and shipped in pH 8 buffer. HPLC purified functional ssDNAs were bought from IDT (Amine) or biomers.net (DBCO-oligomers) and shipped as lyophilized products. Mono-azido beta cyclodextrin was bought from cyclolab.hu. 1-Adamantanecarbonyl chloride, magnesium acetate tetrahydrate, *N*-hydroxysuccinimide, sodium phosphate monobasic and sodium phosphate dibasic were bought from Sigma Aldrich. Agarose (low EEO) was bought from AppliChem. SYBR® gold stain for gel-electrophoresis, nuclease free water (ambion), 1 M $MgCl_2$ solution, 5 M NaCl solution and TE buffer (biomolecular grade, pH 8.0) were purchased from Thermo Fisher Scientific. Uranyl acetate (>98 %) and carbon-coated copper TEM grids were purchased from EMS.
The modified TE5 buffer consists of Tris(hydroxymethyl)-aminomethan (5 mM Tris, 1 mM EDTA, pH 8.4, 5 mM NaCl, 5 mM Mg^{2+}). The PB10 phosphate buffer consists of a mixture of phosphate monobasic and phosphate dibasic set to a pH of 7.2 at 10 mM total concentration.

Table 1. List of ssDNA strands used for the attachment of adamantane and βCD functionality.

Sequence	5'-modification	3'-modification
GCT GTG CGA CAA	DBCO	
AAC AGC GTG TCG		DBCO
GCT GTG CGA CAA	/5AmMC6/	
AAC AGC GTG TCG		/3AmMC6/

DNA concentrations were determined by a ScanDrop spectrophotometer (and a Hellma TrayCell® 0.2 and 1 mm path length), using the corrected absorption at 260 nm and an averaged extinction coefficient.

HPLC purification was performed on a Dionex HPLC UltiMate 3000 Liquid Chromatography system with integrated single wavelength UV detection unit. Oligomers were separated on a DNAPac™ RP HPLC column bought from Thermo Fisher Scientific. Functional ssDNA oligomers were purified using a gradient of two on-line degassed solvents (A, B). The injection volume was usually around 100 µL aqueous solution.
Solvent A: triethylamin/acetic acid pH 7.8 at 100 mM (TEAA) with 5% acetonitrile (MeCN)
Solvent B: MeCN

The commonly used gradient ran from 100% A and 0% B to 50% A and 50%B for 45 minutes and following to 10% A and 90% B in another 15 minutes. The flowrate was 0.2 mL/min at 60 °C while the detection of oligomers was done at 260 nm continuous flow absorption. Collected sample were freeze-dried and resuspended in the desired buffer and final concentration was determined by UV-VIS spectroscopy.

MALDI-ToF measurements were performed using a matrix of 3-hydroxypicolinic acid on a Bruker Autoflex III TOF/TOF in linear mode.

3D DNA Origami folding

Stock solutions of core-staple strands and functional strands were prepared (50 µM). The amount for a final staple strand concentration of 100 nM was added into a tube containing the scaffold for a final concentration of 20 nM. NaCl was added to a final concentration of 5 mM and $MgCl_2$ to 20 mM and remaining volume was added as MQ-water. A typical folding reaction was performed on a scale of 100 µL using a thermal ramp in the thermocycler: 80 °C for 15 min, 79-66 °C at 5 min/°C, 65-61 °C at 30 min/°C, 60-30 °C at 2 h/°C, final temperature 4 °C. The folded reaction mixture was purified by spin-filtration using Amicon 100k MWCO filters (10k rcf, 5 min, 25 °C and recover at 3k rcf, 2 min) and washed against TE5 buffer. The folded origami were analyzed by agarose gel electrophoresis (1 wt%, roti-safe dye, 5 V/cm for 180 min, 10 °C). Agarose gels were post-stained using SYBR® gold DNA stain.

Imaging of the origami was performed by transmission electron microscopy using a FEI Talos 120C at 120 kV operating voltage. Origami were deposit on glow discharged TEM grids and were negatively stained employing uranyl acetate (1wt%) directly onto the grid.

Synthesis of host/guest ssDNA motifs

To a stirred suspension of 1-adamantanecarbonyl chloride (80 mg, 0.4 mmol) and *N*-hydroxy succinimide (230 mg, 2.0 mmol) in anhydrous DCM (2 ml) triethylamine (40 mg) was added at room temperature under argon. After 45 min, the precipitated urea was removed by filtration and the solvent removed in vacuo. The white solid was used without further purification.

Amine-terminated ssDNA oligomers (300 µM) in phosphate buffer pH 7.2/DMSO (20:80v/v%) were coupled to adamantane-NHS (7.5 mM, 25 equiv.) in presence of triethylamine (10 µL) at 37 °C for 24 h. The DMSO was removed by freeze-drying and the functional ssDNA oligomers were dissolved with MQ-water and subsequently purified by HPLC.

DBCO-modified oligomers (100 µM) in phosphate buffer (10 mM at pH 7.2) were incubated with mono-azide βCD (1.6 mM, 20 equiv.) for 24 h at 37 °C. The reaction was purified by HPLC.

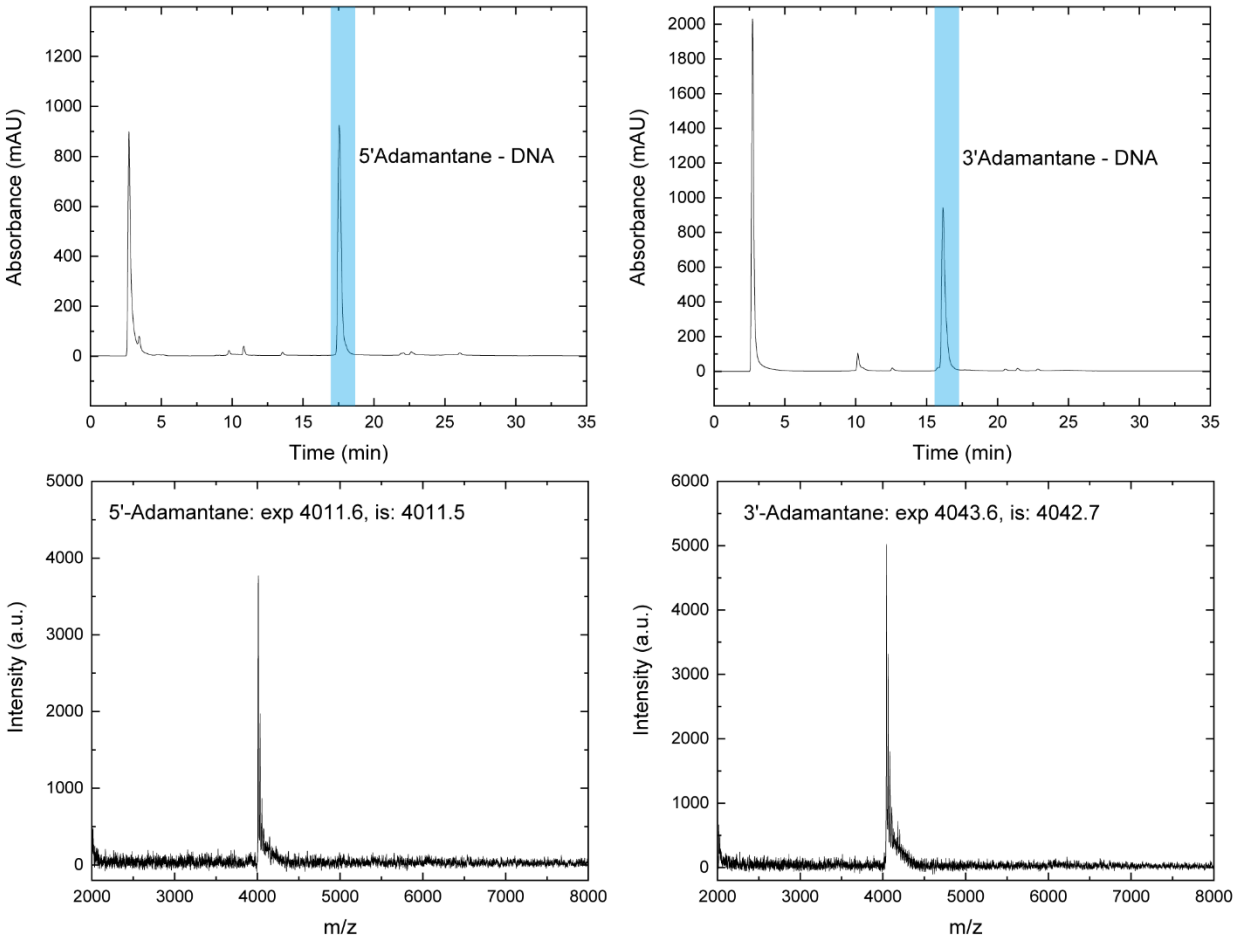


Figure S1. Top: 5' and 3' adamantane functionalized ssDNA HPLC traces. Blue shaded rectangle depicts collected fraction during purification. Bottom: Respective MALDI-ToF mass spectra.

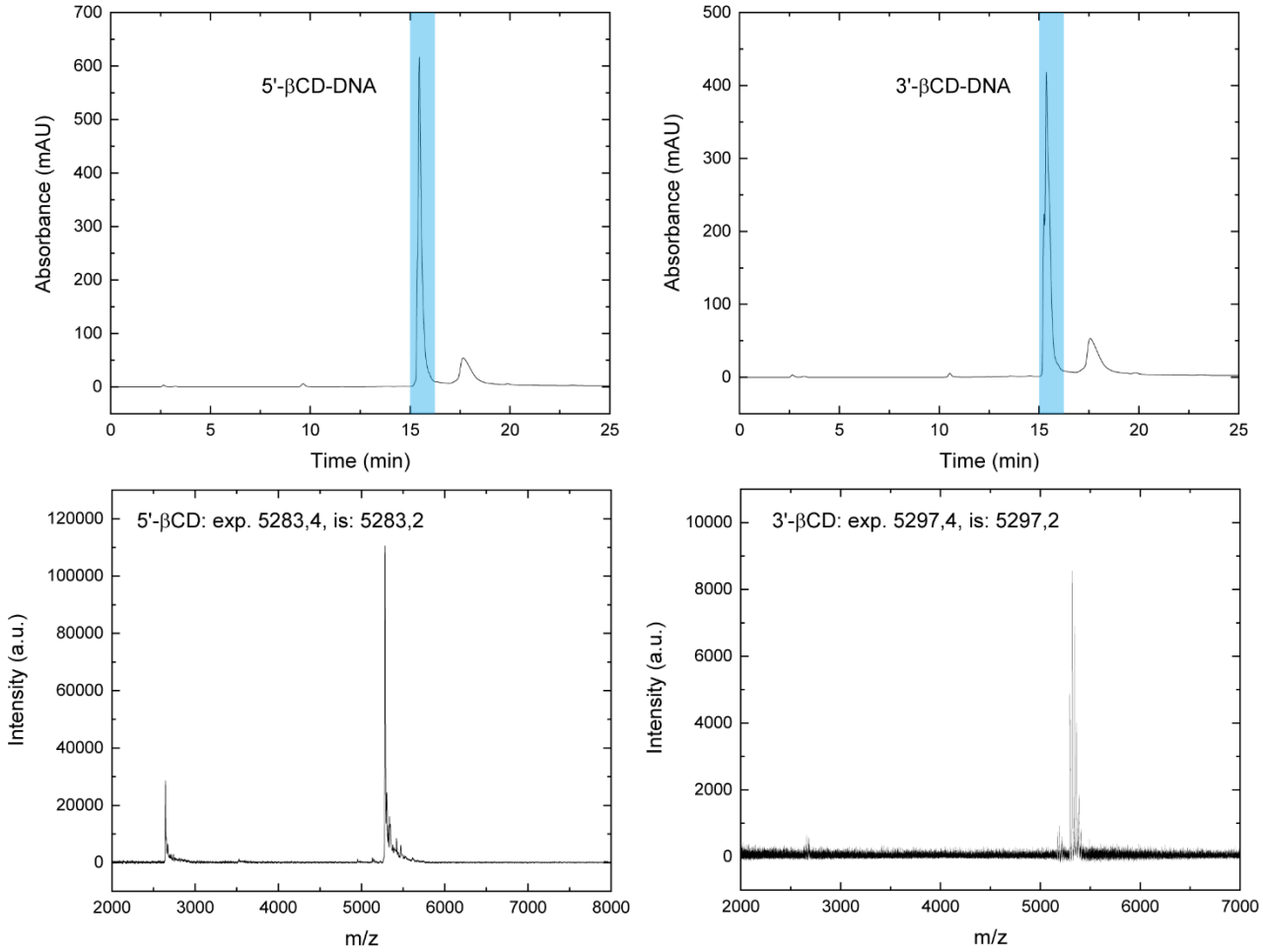


Figure S2. Top: 5' and 3' βCD functionalized ssDNA HPLC traces. Blue shaded rectangle depicts collected fraction during purification. Bottom: Respective MALDI-ToF mass spectra.

Supracolloidal self-assembly

Supracolloidal polymerization was triggered by addition of a twofold excess of both host- and guest functional ssDNA strands to purified DNA origami (20 nM) with different amounts of docking strands at the two patch sides. The solutions were incubated in a thermoshaker at 20 °C and 300 rpm.

Supracolloidal co-polymerization was done by splitting a purified solution of docking strand-modified origami solution in two (by volume) and addition of two functional host-ssDNA in one solution and two guest-ssDNA in the other solution. After incubation for 10 min the solutions were combined in the indicated volume ratios.

Break of formed assemblies by addition of Adm-PEG

Water soluble pegylated Adm was synthesized following a literature report.[1] The Adm-PEG was added as a concentrated solution in DMSO to the formed origami fibrils. A reference experiment adding only DMSO (5 v/v%) to the origami fibrils did not influence the degree of polymerization.

Salt-switch of Supracolloidal fibrils

The salinity was lowered by spin filtration to a concentration of Mg^{2+} (1 mM). After TEM imaging, the [Mg^{2+}] was increased again to 10 mM and after 1h the original degree of polymerization was restored. A reference experiment was conducted to exclude loss of fibrils during spin-filtration using a buffer containing 10 mM [Mg^{2+}]. Indeed spin filtration at 10 mM does not lead to breakage of fibrils.

Estimation of observed binding constants by statistical TEM analysis of dimers

Following a recently published method by Turberfield and co-workers[2] we estimated the binding constants of the four connector density origami by statistical analysis of dimer formation. To this end, we functionalized the origami only with Adm or βCD moieties on one side respectively (figure S3a) and removed excess of unbound host or guest strands. The origami where then mixed in equal ratios at 4 different concentrations (1, 2, 5, 10 nM total concentration, Figure S3b). After 24 h (near equilibrium condition) the ratio between monomers and dimers was analyzed by TEM (150-500 counted species per concentration) and fractions of dimers were plotted against free monomer origami. The K_d constant can be evaluated from a linear fit (in nM) (figure S3c). The value for K_a does not increase linearly with increasing number of connectors (figure S3d), but shows some upturn indicative of the cooperativity of the multivalent binding.

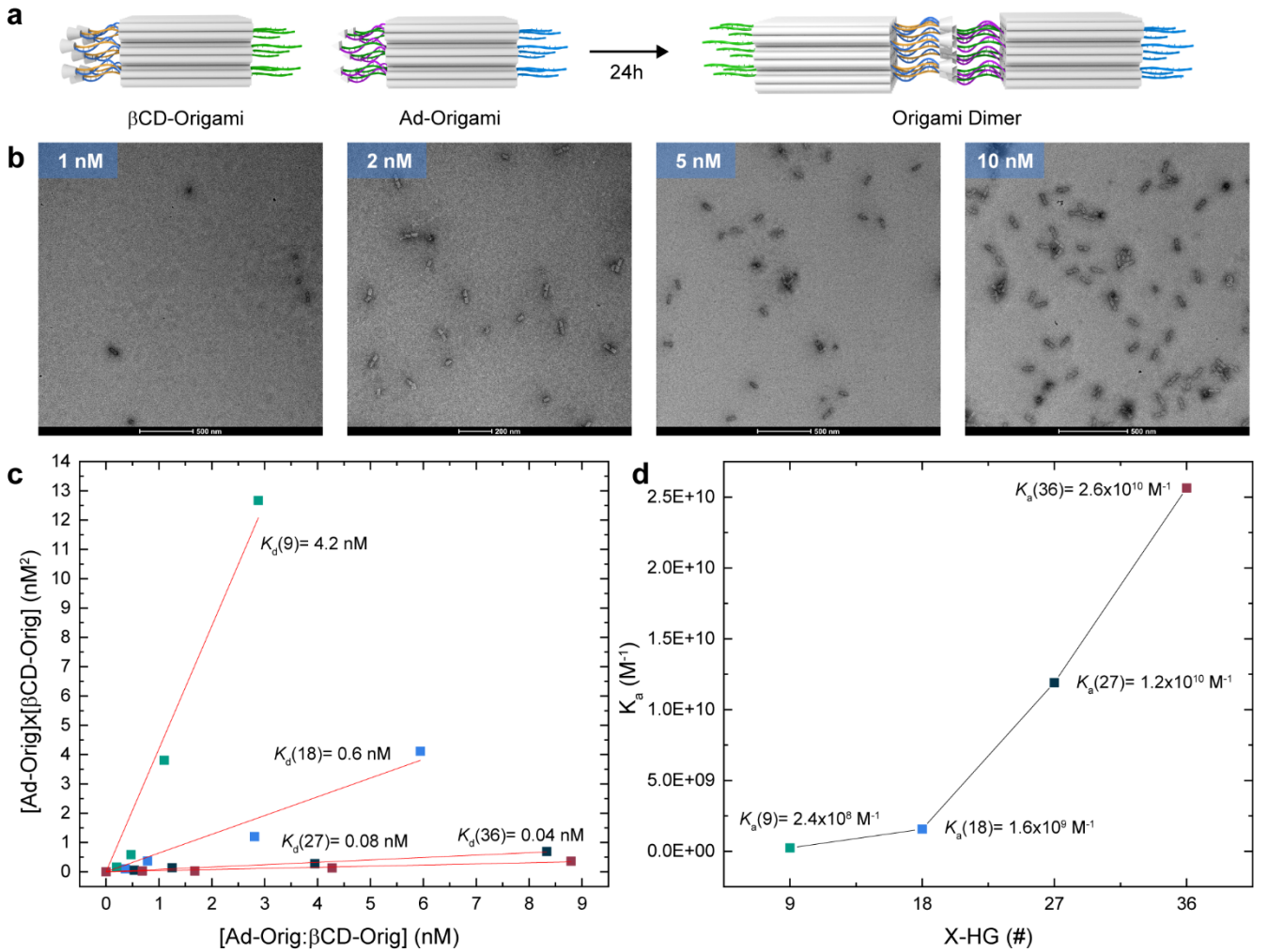
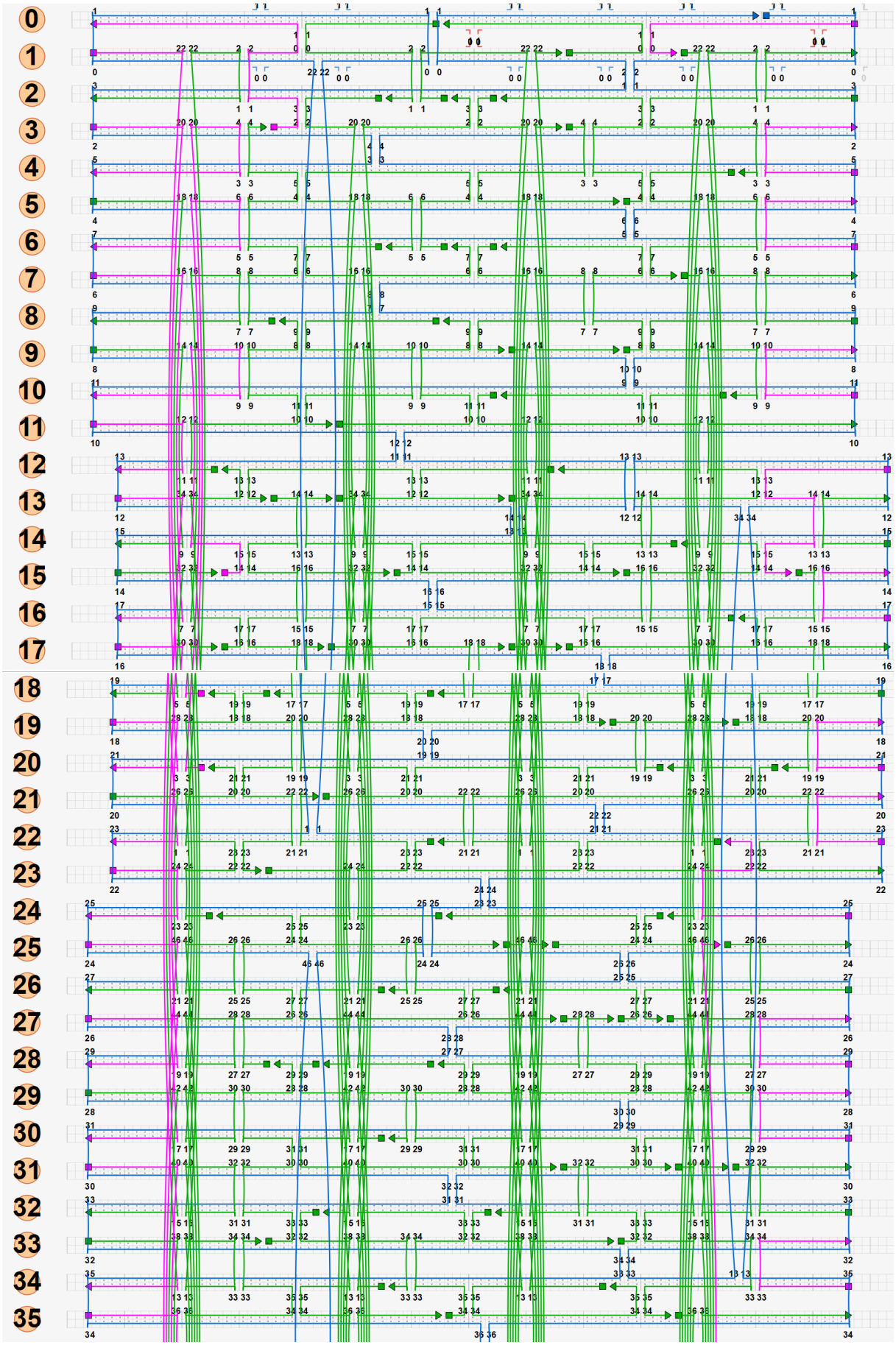


Figure S3. Estimation of the binding constant by statistical analysis of dimer formation. (a) Monofunctional Adm- and βCD-Origami can form dimers in solution. (b) A concentration series was made with [Adm-Orig]=[bCD-Orig]= x nM and ratios of monomer/dimer were analyzed by TEM. (c) The dissociation constant was estimated by a linear fit of dimer vs. monomer fractions. (d) $K_a = (1/K_d)$ plotted as a function of the connector densities.

DNA Origami Cuboid Folding Map



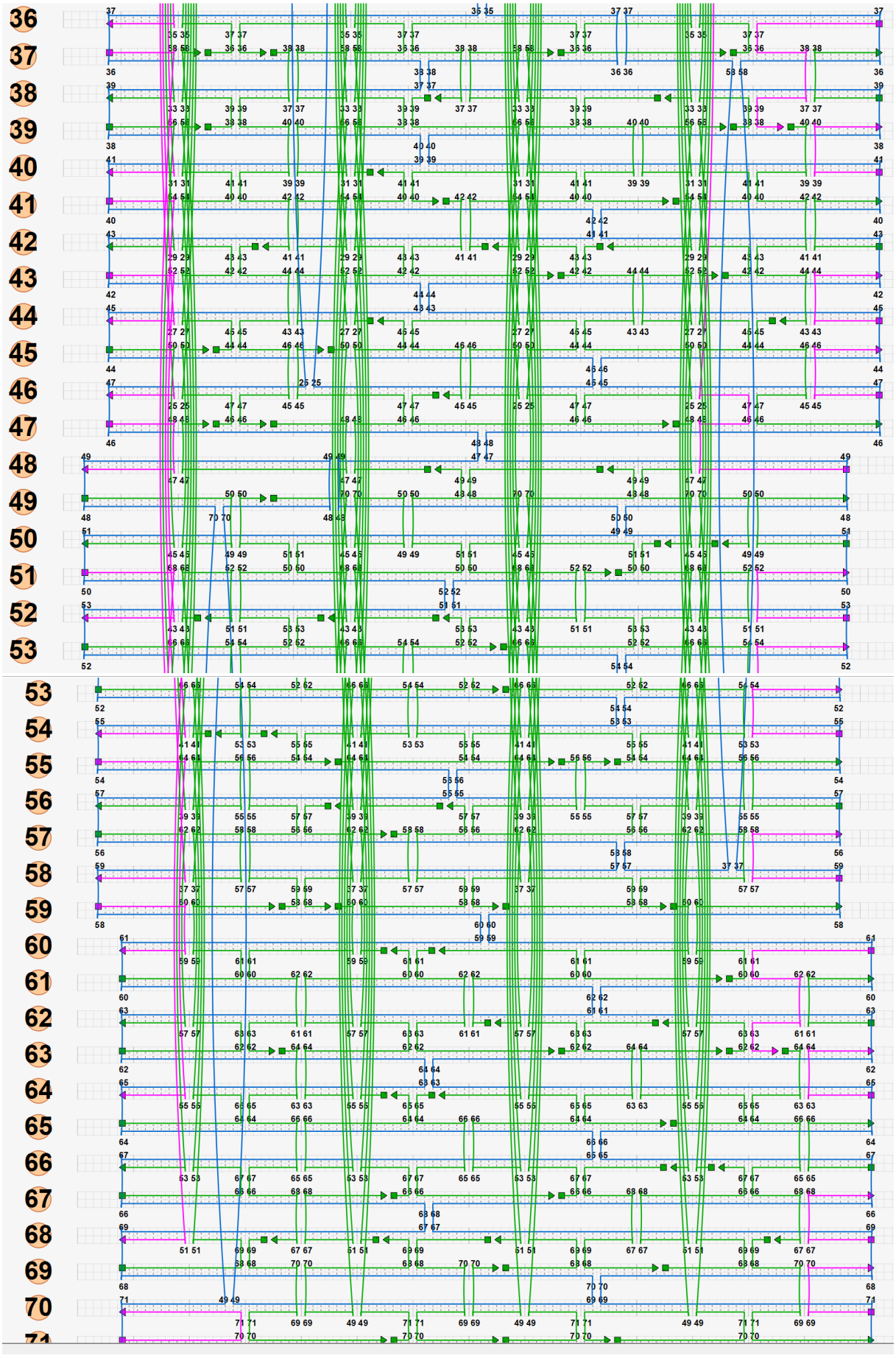


Figure S4. Overview of the strand design of an exemplary 3D DNA origami colloid used in this study.

Staple Strands

Table 2. Sequences of used ssDNA staple strands.

Sequences (5'-3')	#Bases
ATA AGT GCC GAT ATG TAA GAG ACT ACC TTT TAT AG	35
CGT GCC CGC TTT CCA GAA TCG GCC AAG GAG TCT TT	35
CCA TCG GCT ATA ATA TGA ACG CGC CTG TTT ACA AA	35
CTG ACT ATT TTG CAC CCA TTC ATT CTT GAT TCC CA	35
AAA GTC TTT CCC CTC AGA GCC ACC ACC CTC AAT CA	35
AAG TGC CCT GAC ATT GTA CAA TTT TAG GAT AAT AG	35
ATT ATT TGC AAT ACT TCA TCT AAA AGC GGA GTG AG	35
AGG TCA GAA ATA AAG AAA ATA ATC CCC AGA CGT AA	35
CAA CAG TTG ACA AAT ATA GCC AGC TGA GGC GAC TG	35
AGA GAG ATA GGG CGA CAG GTG AAT TAT CAC CCA GCA AAA ATA GCA ATA A	49
CTA ACG AGC GCC TTA ACG CGA GGT AGC AAG CAA AT	35
GCA TTA GCA AAC GCC TGA TAA ATT GCG CGA CCT GCT	36
GCC AAA AGG AAA CCC TCG GTT TTC CGA AAG GGG GA	35
ATC ATT GTG AAC CCT GAC GAG AAA CCA ACG TAC ATC AAG CCA	42
ACA ACA AGT GCA TCA TGG TCA TAG CGT AGA TTA TT	35
GTT AAC CGA GTG AAA TGG ATT ATT GAT TCA CCA GC	35
TGA AGA GGC TTT GAG GAT GCG GGA AAC ATC GAG AT	35
ACG TGC CCT AAT CGT CAC TCG GTC GCT GAG GCT TG	35
CTG AAC ACC TCA GAG GAC TTA GAA ATT TCG AAG CC	35
CTA AAC GAT TTT TTG TTT TCC CAA TCC AAA TAA TC	35
TTA GCG AAC CCG GGA GGC CAT CGA TAG CAG CGT AG	35
AAT GCC CCC TGT GAT AAA TTT TCA AAT ATA TTT AT	35
ATA AGC AGA TAA AAC ACT TTT GTC ACA ATC AGA CA	35
CAT TAT AAT GCT TGA TAA AGC ATG TCA ATC ATA TT	35
TCA TTG GAT TCG TAA AAT TAA CGT CAG ATG AAA AC	35
ACC GAT AGT GTG AAT TCA AAA GGC GAA TAA TAA TT	35
TTG TTC ATA TTC CTG ATT GAA CGT TTT CAC GTC AA	35
AAC TCA TCA GTC AGG TCG GGC CAG TGC CAA GCT TT	35
CGA TAG ACG CCA GAT ACA TAG GAA TAT GAA TTA GC	35
TTA AGG CAG AAG TAC CGA TCA ACA CCT GAA CAA GA	35
ACA ACT TTC AAC AGT TTC GTT TTG TCG TCT TTT GA	35
CCG GTG GCA TTT TCG GTC CAC TTT TGA TAA GAG GT	35
AAT TGA TGG CAT AAA GTG TCA CAT TGA TTT TAT TA	35
AAA ACA GAG GAG CAA ATG AAA AAT ACC TTG CTG AA	35
GCT CAA TTC GCG TCT GGC CCA GCT TTC ATC AAG AG	35
GAT TAT AAA CGT TAC TGT ATG GGC TTA TGC AAT TG	35
AAC AGG ATA AAA CCC TCA TAT ATT TGA TTC AAC TG	35
TTA TTA ATT GTA TTA AAT CCT TTA ACT AAT CAG AAT ATC AGT GCT TGA T	49
TAT CAA GGC GTT ACC GCA TTC CAA GAG TAA GTA TA	35
AAT TCC ACA GAA CAC TGA GTT TCG TTC AGG GAA AT	35
ATC AGC TCG AAT TCG TAA TGC CTG TGA GAT TTA AC	35
AAA AAA GGC TCT CTT AAA AGA TTA GTG AGG AAG GT	35
TGG GCC GTG CAT CTG CCA ACG ACG ACA GTA TCA GA	35
ATT TTT GAT TGT ACT GGT AAT AAG TTT TAA GCG TC	35

ATA CAT GGC AAA GCC AAA GCC TGT TTA GTA GAC CGT GCC TAT	42
CAG GCC GCT TTC TAC GGT CGC AGA AAA CAA AGC AA	35
TAA ATG GGA TAG GTC ACG ACG GCG GAT TGA CCC AA	35
GTA GCC AGT AAC GGG GTC	18
AAT AAC TAA AAA CAT TAT TAC AAA CAA TTC GAA TA	35
TTT AAT ACA TTT CGC AAA TGA AAT AAA GGT GTC AA	35
ATT TTC GAG CCA GAA TGT CAT TAT AAT AAG AGC TA	35
TAT GTA GAA AAA AGG TGG TAC AAC GGA GAT TTG TA	35
CGG AGG TAA ATA AAT GCT TAT	21
TCG CAC TCC AGA CCA GGC AAA GCG CTC AGG CTC CTC TTC CAG CTG GCC A	49
ACA CCG CCA CTT ATC ACT CAT CGA GAA CAA GCA AG	35
CGA CAG AAT CAA GTT TGC CTT TAG AGC GTT TGC CA	35
TCA CTT TGA CTA TAC CAA GCG CGA AGA CTT TTT CA	35
GCT GGA AAA CTT AAG GCG CTA GAA AAC GCT CAA AC	35
CCA GAG AGT ACA TAA ACG ATT GTT AAA CCA AGA CC	35
ATG ACG CTG AGC AAA CCC TCA ATC AAG TT	29
TAA ACA TCA ATG AGC AAT CGG GAG ATA TAC ACA AA	35
AGA AAT CAA GAC CGG AAA AGT AGC ATC ATT AAA TT	35
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ACC AGA GCC GCA CCA CCG GAA CCG CCT CCC TCA GA	35
ACA GTG CTC ATA GGC TTG TTA TCT CTG AAA ACA TT	35
ATC ATC AAT TTG CTG TTT CCT GTG TGA AAT AGC CG	35
ACA GCA TAT TTG CGT TTT CAT CGT AGC TCA ACT GG	35
ACA GCC ATA TTA TTT AAA CGT CAC ATT AGA ATA TC	35
AAT AGC TGA AAA GGT GGC ATC AAT TTA GTA GCA TT	35
AAC TTC GAG AGA GTA TAG AAC CGC CCC TCA TTT CA	35
GGG GCA AAA TCC CTT ATA AAT CAA AAT ACC TGA AAG GGA GTT	42
AGG AGG CAG ATA AAT CCT CAT TAA AGC CAG ATT GA	35
ACG TGA ATA ACC AGA AGG AGC GGA TTT GAG TGG AA	35
GGA ACC GAA CTT GTT ACT TAG CCG GCG AGA TAG GG	35
GAA CCG GTG TCA TGT TTT GCT GAA TTT TGC GGG GAT	36
TAT CAC GCA TCC TAA AGG CAG CAG ACC ATT AAA AT	35
AGG GGC TGC AAT TGG GTA ACG CCA GGT TTA CCA AAA ACC AAA ATA GGG G	49
GAA AGA GCA AGA AAC AAT GAA ATA AAA AGT AAC GG	35
AGA AAC ATG ACG TCC AAC CTA GGT CGG CTG CTT CT	35
TAA TTT AAT GGA AAC AGT GCT TCT TAG GTG TGC GG	35
CGA GTA ACA ACC TCC GTG GGA ACA ATT GGT GTA GA	35
ATA GTT TTT ATT TTC ATA TTA CCG CGC CCA ACG TT	35
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AAT ACA TTT TGA CGC TCA ATC GTC GAA ACG CAA TA	35
ACC CGT CAC CAA TGA AAT TTT GAA GTC TTT CCA GAG CCG TTA	42
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ACT GGC ATG ATT AAG ATT ATG ACC CAA CGC AAT CC	35
CAA CAA GTT TAT CGA AAC TAA AAA TTG GAA ATG GC	35
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TGT GCG ATC GAT AGT AAG AAT CGT TTA AAC AGT TC	35
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AGT GAG GCG GAT GTG CTG CAA GAT ACC ATA TAA AT	35
CCA GAA AAA TAT GCA GAT CGA GCC AGT AAT ATT CC	35
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CGC GAG CTG AGT TTG ACT TCC ATA AAG AAT ATA AT	35
GGT TTC AAT CAA CCA GAC CGG AAA AAG AGA GAA AG	35
TCA ATT GTT ATG GTC ATA GCT GTT TTG CCC GAA CG	35
GGC GGG GTT TAG GGT TGC TCA GAA AGG GAT ACT GA	35
TAA TCG TAA GAG TGG TTC CGA AAA GAT TCA CCT TCT GAC TTC AGG TAA G	49
ATT CAT TGA ATC CCC GTA AAG AAA TCC AGA CTA AC	35
TTA ACC GGA AAA TAA GAC GAG CGT AGT AGC GTT TC	35
AGA GCC GTC TGT GTG AAG TTG GCA CCT TGC TAA TG	35
GCG CTT TTA TTC TTT CCT TAT CAT TAT TTA CGA AT	35
ACA CCA ACG TAG TCC ACT ATT AAA CCG AGA TGG CG	35
CAT AAG ATC GAA TCG ATC AAA GGC AGC TTA ATT GC	35
AAA TCG TCA TGT AAT AGA TGA CAA CAA CCT GTA TC	35
GGG ACG CCA GTT TCC CAT CAA AAG TCA TAT AGG GG	35
TCA CAG AGC CAT CAG ATC ATC GAG CGG GTA TTA AA	35
AAA TTA TTC ATT AAC ATA CAA TCC ATC ATA ATA TA	35
GGT GAT TAG CTG AGA CTC CTC AAG GTT AAT GAC CC	35

GAA CGG AAT AGC CAC CCA AAC AGC ATC GGA ACG AG	35
AAT GCA AAA TGA ATT ATT GAG GGA TAT GGT TCT AA	35
GCA CGA GAA ACA AAT AAC ATC CCC AGA ACG AGT AG	35
CTA TTT ATC CAA GCA AAC TCC AAC AGC AAC ATA GC	35
GCT ATC AGT TAT AAA ACC ACT CAT GTA TCA TCG CC	35
ACG CTG AGA AGG CCC TTT AAA TAG CAA TAG CTA TA	35
ACA ACT TTA ATT TCT GTA GAC AGC CCT CAT ACA TG	35
AGG TCA CCA GTC GCC ACC ATA TAA GTA TAG CCG GA	35
TAC TAA ATA TTG ACG ATT CAC AAT ACA TAT AAG AA	35
ACT ACC CGT CGG ATT AAA ATT CGC GTC TGG CCA GC	35
CTA CGA AGG CAC TAA AAG AAC TAA GCG ATT TTA CA	35
ATC CAA ATC CTT CCA ATA GAT AAT ACA TTT GAC GA	35
TAT GAT TAG AGA GCT TCT GAA AGC GGA TTG CTG CC	35
AAG AAT GAA TGG TGG CAC AAT AGA TAA TAT CCA GG	35
GAG CTA TGT AAA TAT ATT GCG CAT TGA GAG AAT AA	35
CTT CTG ACC TAA CGG ATG TAG ATT CTG AAA GGC GC	35
GAT CTA AAG TTC ACC CTC TCG TTT TAG TAA GAG GT	35
AAA ATA CCA CAA GAT TCG TAG CTC GTC TGG ACT AG	35
TCA AAA CGT TAT AGT CAG AAG CAG AAA CAG TTC AG	35
CGC AAA TTC AGG GAA GGC GTA ACA GCA AGC CCA AT	35
GTT ATT CCA CAT GGG ATC CAA AAA AAA GGC TCC AA	35
AAG TAG TAC CGG TGT ATC ACC GTA CCC CAG CAA AA	35
ACG GTA ACA GAG AGC CAC CAC CAT TGG CTC ATA CG	35
GTT TTT TTC AAA TGC TGA CCG AGG ATT AAG AAA AG	35
TTT AAC TAA CAA CTA ATA AGG AAT TAA TGA AAG TA	35
GTG CCT AAT GCA CAC AAG CCT TTA TTA ATT CGT AA	35
ATT AAA TTC TAT CAC CAT GAT TCC CAA TTA TGA GC	35
ACT AAA AAG AAC TGA TTG GCT CGG CAA AAT CCC AG	35
AAT TGG CTT AGT ATC AGG CTA TTT TTG CGC AAC GC	35
GTA GCC TCT TCT GTT GGT GCC GGA GCC AGC TCG TT	35
AGC TTG CTT TCG AGG TGG CCG ACA TAA AAT GGA AG	35
GTT TTT TAA CCT CCG GCC ATC AAG GTG CAT CAT CA	35
CTC CCT ATT AAT TTT AAT TGC GAT TAA GTT GGA GA	35
GTA AAA TAC CAA GCA ACG GGG ATC GTT ATC GCC CA	35
TTA GAA CCA ATG AAA CCA GTT ACA TAA CAG TTC AA	35
CAG TAT CCT CAT TAA AGC CCA CCA CGA ACC GCA CA	35
ACA GGA AAA ATA CAT TGC TTT GAA AAA CAA TAA AT	35
CGC ATA ACC GAA AGG CCG AAA ACC AGC CAA AAT TT	35
CCA TAT AAA CTA TCG GCC AAT TAC AAA ACA AAT TA	35
GAC GGA CGG AAT AAG TTC AAG AAT AAA GCG ATA TG	35
AAT CGG CCA GGC GGT CAA ATC TAA AGT AAC ATC GT	35
AGC ATT AGC AAA CCT CAA ATG CTT TTT AAG CCG AG	35
TAA CTC TGA ATT TAC CGT ACA GGA CCT ATT TAA GA	35
AAA GCA TTG ACC CTC AGT CAT AAT TCG GCA TAC AG	35
TGA GTT ACT TTT TCA ACA AAA ATT GGG CTT GGT AA	35
GAA CTG ATA GAC AGA GGT GGC AAT CAT CAT AAG AG	35
TAT TTG GTT TTT TTC CAG TCG GGA AAG CTA ACC AG	35
TTT ATC AAA ATC GCG TTA GAA AAG ACA AGA GCA CT	35

ACA AGT GAA TTT GCC ATC AAA AAT CAA AAT TTT GC	35
TTA GCA TAG CCC CCT TGT GCA GCA CTT ACC ATC TG	35
TAG ATT CTA ATG CGG GAA TTT TGC ACG CTA AAA CG	35
CAG ACG CGC CGC ATC AAA GTA GTA ACC AGA ACA TG	35
GTT AGT TTC ACA TTA GAT AAG AAC GGT TTA AAG CC	35
AAA AGT TTT AAT AAA CAA GCG CGA AAC AAA GTA CA	35
GCA AAG GGG GTT TGC GTG TGC CAG CTG CAT TGA AC	35
AAG AAC TGC GAA CGA GTA GTC AGG CAC CCT CTG CC	35
CTG TAA AGA TGT CAC GAA TGC CTG TCA CAT TTG GG	35
TGA CAA TAA TTA ACC CAT ATT TTG CAT AAC CCA GC	35
ACG TTC GGG AGT ACC AAG TCA ATT ATC CCT TAA AG	35
TTT GCC CCA GCC GCC TGG CAA AGC GCC ATT TAC CT	35
AAA CAT AAA GTC ATG TAA CAA CAG TAA TAA ACA TG	35
AGA TAA GTC CGT ACC GAG CTC GTC ACT CTA GCC AG	35
TCT ACG GTG TAC AGA CCT TGC GCA GAC GGT CAA TC	35
AAT ACA TAC ACA GTA TGA GAA ACA ATG AAC GTG AG	35
GGT GGA GGT TGC CGG AAA CGT CGA CGA GGC AAC CA	35
CAA CTT ATC ATG AAT TAT TCA TCA AAT AAT GGT TA	35
TAT AAG GCC GGG TAA CGA GGA TCC AAA TAT CAA AC	35
CTT TAG CCG CCC CCC CTG GTG TAC TGG TAA TAG CG	35
AAT CTT AAT TCG AGT ACC GGA ATT ATT TAG GAC GG	35
GAA TTA GTT AAT TTC TGG GGT TAT ATT CAT AGG TC	35
CGC CTT ATA ATG CCA GTT TGA GGC GAT GAT GTT TA	35
CGT ACG GGG TCA GTG CCA GGC GCA TAG GCG AAT GG	35
AGC GAA AGC CGT TAG CGG TTA GTA GAG CCT TTA AT	35
CCT TAT TAC GTA CAA CAG TTT CAG CGG AGT GTG AT	35
CGG AAA CAG TAC ATA AAA TTT ACC TTT TTT ATG CA	35
GGA ACG AGG AGA GAT TTC TTT GAC CTG TAA TGC CA	35
GCT GAC CTT CAT CAA GAA GCT CAG AGC CGC CGC AT	35
AAA AAT CCT GTT TGA TGA TAC GTG AAT AAA GCA AA	35
AGG TCA GAA CAG CAC CAC GTA ATC CTT TCC ACA AG	35
AAC TTA CCG AAA GTC AAT ATT TCA TTT GAA TTC CT	35
TAA AAC GGA AAA GGA AAT GCA AAT ATT CAT TTT AC	35
AAT AAC ATG TAT CCG GTC AAG CAA GCC GCC ACA AA	35
ATT CAT CCT ACC AAG AAA ACA AGC AAG CCG TCC AA	35
AAC AGG CGA AGA ATA GCG ATC CAG AAC AAT ATT AC	35
TTT CTT ACC AAC CCA GCA CGC CAA ACC GAC AAG GA	35
TTG AGA ATA CAC CAA CCA AGT TTC GAG GAC TGG AG	35
GAC TGA ACG CGC GAC GAC AGC ATG TAA CAA TTG GA	35
GGT TCA ACG CTT TTA GGC AGT TGC TGG TTT TGC AT	35
CAG AAA CAG CTG TTT AGT ATC ATA GAA CGG TCC CG	35
TCA TCC GCT CAC AAT TCA GCT CAA TCA ATA TCT GG	35
ACC GGT GAG AGA TAT TCT CTA TGC GTT ATA CAT TT	35
GGT CTG GCG ACG CGC CAT TCA GGC TGA GAG AAA CC	35
GTC TAG CAG CTT TTG TTA AAT AAG AGG GCT TCT TC	35
CTG ACC TGT CAT TGG GCT CTT TTT GAA TGG CTA TT	35
AAT GTA CGG TAA CAT GTT GCG GAT GCT CCT TTC AA	35
ACT ACC TTT GTT TTT TTA ACC AAT AGG AAC ATC AA	35

TAA ATC ATA CAG GCA TAC CGC ACT ATC TAA TTT CT	35
TAC AAT CGT AGT ATC GGA AAC AGA GCA CAG ACA AT	35
AGA GAC GAT ACT TTT GCG CTA CAG AGG CTT TCA TT	35
CCA AAC CAG GCC CTG AGC AGC TGA TTG CCC TGC CA	35
ATT CTT TAC AAG ACG GGG GGT AAT CAA TAA TGA CT	35

Table 3. 9-HG poly-T staple sequences.

Sequences (5'-3')	#Bases
GGT GGA TTG AGT GAG CGT AGC CAG CTT TCA TCA TTT TTT TTT	42
ATA AGA TTA ATT ACC CTT GAC CAT AAA TCA AAA TTT TTT TTT	42
TTT TTT TTT CGA AAG ACT TTG ATA AGA TTT TTT TTT	36
TTT TTT TTT TGA GAC GGG CAA AGA GTT GCA GCA TTT TTT TTT	42
TTT TTT TTT CGC TTC TGG GAA GGG CGA TTT TTT TTT	36
TTT TTT TTT CCT GTA ATA CTT TTG CCC AAA AAA GCT TGC CGT T	43
TTT TTT TTT AGT CTG GAG CAA CCC CAA AAA CAG TTT TTT TTT	42
TTT TTT TTT ATT ACA GGT AGA ATT CAA CTA ATG TTT TTT TTT	42
ATA CAG ATG ATG ACA AGA ACC GGA TAT TCT TTT TTT TT	38
TTA TAT ATT CTA GTT GCA ATT TCT TAA ACA GCT TTT TTT TTT	42
TTT TTT TTT AAC CGT CTA TCA TTG ATT AGT AAT AAG TGG	39
GTC GAA CGC AAG GAT ATA GGG AGA ACA TAC GAG CCG GAA GCA TAT TTT TTT TT	53
TTT TTT TTT GCT TTT GCA AAA TTT AGA CTG GAT TTT TTT TTT	42
TTT TTT TTT ACA TTA AAT CCG TAA TGG TTT TTT TTT	36
TTT TTT TTT GAA TTA CCT TAT CGG AAC AAC ATT TTT TTT TTT	42
TCG GCC CTG AAT AAA GCC TCA GAG CAT AAT TTT TTT TT	38
TTT TTT TTT CCA GTG CCA CAT TAT GAC TTT TTT TTT	36
TTT TTT TTT CAA CTT TGA AAG AGG AAG GGA ACG CTC CAT TAA A	43
TTT TTT TTT CGG AGA GGG TAG TCA TTG CCT GAG TTT TTT TTT	42
TTT TTT TTT AGC GGT CCA CGC AGT GTT GTT CCA TTT TTT TTT	42
TTT TTT TTT CTC ACT GCC CGC TCT TTT CAC CAG TTT TTT TTT	42
TTT TTT TTT TTC ATG AGG TAA AAC GAA TTT TTT TTT	36
TTT TTT TTT CCT GTT TAG GCT GCT CAT TTT TTT TTT	36
TTT TTT TTT CAG ATA CAT AAC AAA TAG CGA GAG TTT TTT TTT	42
TTT TTT TTT TCA GTG AAT AAG GCT TTA ACA AAC TAT ATT CGC A	43
TTT TTT TTT CCA TAT TTA ACA TAC AAT TTT TTT TTT TTT	39
TTT TTT TTT AAA TGA AAA ACC GAC TTG AGC TTT TTT TTT	39
GCG TTT GCG GAG CAG CAG AGG AAG GTT ATC TAA AAT TTT TTT TTT	45
TTT TTT TTT ATC CTG AAT GCC TTT AGC GTC TTT TTT TTT	39
TTT TTT TTT CAC CAC CCT CAT TTT CCC GCC ACA GAG CCA CAA G	43
TTT TTT TTT GAT AAG TGC CGT CGA GTG CTC AGG TTT TCA CAA AAT CCC C	49
TTT TTT TTT ATA ATC GGC TGT TTC ATC GTA TTT TTT TTT	39
TTT TTT TTT ATC TTT AGG AGC GAA GTA TTA TTT TTT TTT	39
TTT TTT TTT CAA AGA ACG CGA ACT GAA CAC TTT TTT TTT	39
TTT TTT TTT CAA AGT TAC CAG TAC CCA AAA TTT TTT TTT	39
TTT TTT TTT TGG ATT ATA AAT TGA GAA TCG TTT TTT TTT	39
TGA CAG AGA TAC ATC GCC ATT AAA AAT ACT TTT TTT TT	38
TAA GTT AGA TTG AAT CCT GTC GCT AGG AAA TAC CTA CAT TTT GAT TTT TTT TT	53
TTT TTT TTT AGA CGA TTG GCC AAG CGT CAT TTT TTT TTT	39
TAT TCG CTC ATT TAA TTA TCA ATA TAT GTG AGT GAA TAA CCT TGT TTT TTT TT	53

TTT TTT TTT CTA CAA CGC CTG TAG CTC GTC ACA ACC GAT CAC C	43
TTT TTT TTT GAA ACA TGA AAG TAT TCG GAA CCA CCG CCT CAG GAG GAC C	49
TTT TTT TTT ACA TGG CTT TTG ATG ATT CCA GTT TGA TAT TCA C	43
TTT TTT TTT CAT TTG GGA ATT CCT CAG AGC TTT TTT TTT	39
TTT TTT TTT AAC AGT ACC CGA CCG TGT GAT TTT TTT TTT	39
TTT TTT TTT AAC AAC TAA AGG AAT TGT GTA CCA GCA GTC	39
TGA TAT AAT CCA GCA GAC ACC GCC TGC AAC AGT GCC TTT TTT TTT	45
AAA TGA AAT GCG ACC AGT AAT AAA AGG GAT TTT TTT TT	38
TTT TTT TTT CAT TCT GGC CAA ATA TAC AGT TTT TTT TTT	39
TTT TTT TTT ATT CTG TCC AGA AGG CGT TTT TTT TTT TTT	39
TTT TTT TTT TTC ACG TTG AAA ATC TTT CGA AT	32
TTT TTT TTT CCT GAA CAA GCC AAA GAC AAA	30
TTT TTT TTT AGC GAA CCT ACC GGA ACC AGA	30
AGG CGA ATT CCA ATC GCA AGA TTT TTT TTT	30
GCC ACC ACC GGA TAT TAT TCT TTT TTT TTT	30
TTT TTT TTT CTT CTG TAA ATC TGA AAA CAT	30
ACC ACC AGA AAA GGT AAA GTA TTT TTT TTT	30
TTT TTT TTT ACG CTG AGA GCC AAC AAA GAA	30
AAT AAT TTT TTT TTT TTT	18
TTT TTT TTT GTA ATG TGT AGG ATA AAT TAA TGC	33
TTT TTT TTT CCG CGA CCT CGA ACT GAC	27
TTT TTT TTT TGA TAC CGA GGT CGC TGA	27
ATC AGG TCT GAG GAA GCC TTT TTT TTT	27
GTT TGG AAC AAG CAA AGG GCG AAA TTT TTT TTT	33
TTT TTT TTT GAA GAT TGT ATA TGT TAA AAT TCG	33
AAG TGT AAA GCC AAT TGC GTT GCG TTT TTT TTT	33
GCA ACT AAA GGT CAA TAA TTT TTT TTT	27

Table 4. 9-HG docking strand sequences.

Sequences (5'-3')	#Bases
TTT TTT TTT CGA ACG AAC CAC CTG ATT GTT TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT CGC TCA ATC GTC ATC GCG CAG TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT AGC GAT AGC CAG ATA GCC GAA TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT GAC TTT ACA AGA AAC CAA TCA TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT GAA CTG GCA AGA ATA GAA AGG TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT GGA ATC ATT TTG AGG CAG GTC TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT AGA CTG TAG CGC TAC CAG GCG TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT AGG GCG ACA TTC CAG TAC AAA TTT TTT TTG TCG CAC AGC	48
CGA CAC GCT GTT TTT TTT TCG GTG CGG AAA CGA CGG TTT TTT TTT	45
CGA CAC GCT GTT TTT TTT GAT AGG TCA TTC CGG CAC TTT TTT TTT	45
CGA CAC GCT GTT TTT TTT CAT TAA ATT TTT GTT AAA TCT TCC TGA GTA	48
CGA CAC GCT GTT TTT TTT AGC TAA ATC GGT TGC AAT GCC TGA TTT TTT TTT	51
CGA CAC GCT GTT TTT TTT AGC GTC CAA TAC TGC GGA AAC GAG AAG ACT ATT AAT	54
CGA CAC GCT GTT TTT TTT ATT ACC CAA ATC TTT AAT CAT TGT TTT TTT TTT	51
CGA CAC GCT GTT TTT TTT AGA GGC AAA TGT CGA AAT TTT TTT TTT	45
CGA CAC GCT GTT TTT TTT GGC TTG CAG AAA GAC TTT TTT TTT TTT	45
TTC CGC GAC GTA AAT AAG GCG TTT AAC GTC AAT TTT TTT TGT CGC ACA GC	50
CGA CAC GCT GTT TTT TTT GGT CAT TTT TTT AAA TAT TGC AGC GCC TT	47

Table 5. 18-HG poly-T staple sequences.

Sequences (5'-3')	#Bases
GGT GGA TTG AGT GAG CGT AGC CAG CTT TCA TCA TTT TTT TTT	42
ATA AGA TTA ATT ACC CTT GAC CAT AAA TCA AAA TTT TTT TTT	42
TTT TTT TTT CGA AAG ACT TTG ATA AGA TTT TTT TTT	36
TTT TTT TTT CGC TTC TGG GAA GGG CGA TTT TTT TTT	36
TTT TTT TTT CCT GTA ATA CTT TTG CCC AAA AAA GCT TGC CGT T	43
TTT TTT TTT AGT CTG GAG CAA CCC CAA AAA CAG TTT TTT TTT	42
TTT TTT TTT ATT ACA GGT AGA ATT CAA CTA ATG TTT TTT TTT	42
ATA CAG ATG ATG ACA AGA ACC GGA TAT TCT TTT TTT TT	38
TTA TAT ATT CTA GTT GCA ATT TCT TAA ACA GCT TTT TTT TTT	42
GTC GAA CGC AAG GAT ATA GGG AGA ACA TAC GAG CCG GAA GCA TAT TTT TTT TT	53
TTT TTT TTT ACA TTA AAT CCG TAA TGG TTT TTT TTT	36
TCG GCC CTG AAT AAA GCC TCA GAG CAT AAT TTT TTT TT	38
TTT TTT TTT CCA GTG CCA CAT TAT GAC TTT TTT TTT	36
TTT TTT TTT CGG AGA GGG TAG TCA TTG CCT GAG TTT TTT TTT	42
TTT TTT TTT AGC GGT CCA CGC AGT GTT GTT CCA TTT TTT TTT	42
TTT TTT TTT CTC ACT GCC CGC TCT TTT CAC CAG TTT TTT TTT	42
TTT TTT TTT CCT GTT TAG GCT GCT CAT TTT TTT TTT	36
TTT TTT TTT CAG ATA CAT AAC AAA TAG CGA GAG TTT TTT TTT	42
TTT TTT TTT TCA GTG AAT AAG GCT TTA ACA AAC TAT ATT CGC A	43
TTT TTT TTT CCA TAT TTA ACA TAC AAT TTT TTT TTT TTT	39
TTT TTT TTT AAA TGA AAA ACC GAC TTG AGC TTT TTT TTT	39
TTT TTT TTT ATC CTG AAT GCC TTT AGC GTC TTT TTT TTT	39
TTT TTT TTT CAC CAC CCT CAT TTT CCC GCC ACA GAG CCA CAA G	43
TTT TTT TTT GAT AAG TGC CGT CGA GTG CTC AGG TTT TCA CAA AAT CCC C	49
TTT TTT TTT ATA ATC GGC TGT TTC ATC GTA TTT TTT TTT	39
TTT TTT TTT ATC TTT AGG AGC GAA GTA TTA TTT TTT TTT	39
TTT TTT TTT CAA AGA ACG CGA ACT GAA CAC TTT TTT TTT	39
TTT TTT TTT CAA AGT TAC CAG TAC CCA AAA TTT TTT TTT	39
TTT TTT TTT TGG ATT ATA AAT TGA GAA TCG TTT TTT TTT	39
TAA GTT AGA TTG AAT CCT GTC GCT AGG AAA TAC CTA CAT TTT GAT TTT TTT TT	53
TTT TTT TTT CTA CAA CGC CTG TAG CTC GTC ACA ACC GAT CAC C	43
TTT TTT TTT GAA ACA TGA AAG TAT TCG GAA CCA CCG CCT CAG GAG GAC C	49
TTT TTT TTT ACA TGG CTT TTG ATG ATT CCA GTT TGA TAT TCA C	43
TTT TTT TTT AAC AGT ACC CGA CCG TGT GAT TTT TTT TTT	39
TTT TTT TTT AAC AAC TAA AGG AAT TGT GTA CCA GCA GTC	39
TGA TAT AAT CCA GCA GAC ACC GCC TGC AAC AGT GCC TTT TTT TTT	45
AAA TGA AAT GCG ACC AGT AAT AAA AGG GAT TTT TTT TT	38
TTT TTT TTT CAT TCT GGC CAA ATA TAC AGT TTT TTT TTT	39
TTT TTT TTT ATT CTG TCC AGA AGG CGT TTT TTT TTT TTT	39
TTT TTT TTT TTC ACG TTG AAA ATC TTT CGA AT	32
GCC ACC ACC GGA TAT TAT TCT TTT TTT TTT	30
TTT TTT TTT CTT CTG TAA ATC TGA AAA CAT	30
TTT TTT TTT ACG CTG AGA GCC AAC AAA GAA	30
AAT AAT TTT TTT TTT TTT	18
TTT TTT TTT CCG CGA CCT CGA ACT GAC	27

TTT TTT TTT TGA TAC CGA GGT CGC TGA	27
ATC AGG TCT GAG GAA GCC TTT TTT TTT	27
GTT TGG AAC AAG CAA AGG GCG AAA TTT TTT TTT	33
GCA ACT AAA GGT CAA TAA TTT TTT TTT	27

Table 6. 18-HG docking strand sequences.

Sequences (5'-3')	#Bases
TGA CAG AGA TAC ATC GCC ATT AAA AAT ACT TTT TTT TGT CGC ACA GC	47
GCG TTT GCG GAG CAG CAG AGG AAG GTT ATC TAA AAT TTT TTT TTG TCG CAC AGC	54
TTT TTT TTT CGA ACG AAC CAC CTG ATT GTT TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT CGC TCA ATC GTC ATC GCG CAG TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT AGC GAT AGC CAG ATA GCC GAA TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT GAC TTT ACA AGA AAC CAA TCA TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT GAA CTG GCA AGA ATA GAA AGG TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT GGA ATC ATT TTG AGG CAG GTC TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT AGA CGA TTG GCC AAG CGT CAT TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT AGA CTG TAG CGC TAC CAG GCG TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT AGG GCG ACA TTC CAG TAC AAA TTT TTT TTG TCG CAC AGC	48
CGA CAC GCT GTT TTT TTT TGA GAC GGG CAA AGA GTT GCA GCA TTT TTT TTT	51
CGA CAC GCT GTT TTT TTT AAG TGT AAA GCC AAT TGC GTT GCG TTT TTT TTT	51
CGA CAC GCT GTT TTT TTT TCG GTG CGG AAA CGA CGG TTT TTT TTT	45
CGA CAC GCT GTT TTT TTT GAT AGG TCA TTC CGG CAC TTT TTT TTT	45
CGA CAC GCT GTT TTT TTT CAT TAA ATT TTT GTT AAA TCT TCC TGA GTA	48
CGA CAC GCT GTT TTT TTT AGC TAA ATC GGT TGC AAT GCC TGA TTT TTT TTT	51
CGA CAC GCT GTT TTT TTT AGC GTC CAA TAC TGC GGA AAC GAG AAG ACT ATT AAT	54
CGA CAC GCT GTT TTT TTT ATT ACC CAA ATC TTT AAT CAT TGT TTT TTT TTT	51
CGA CAC GCT GTT TTT TTT CAA CTT TGA AAG AGG AAG GGA ACG CTC CAT TAA A	52
CGA CAC GCT GTT TTT TTT AGA GGC AAA TGT CGA AAT TTT TTT TTT	45
CGA CAC GCT GTT TTT TTT GGC TTG CAG AAA GAC TTT TTT TTT TTT	45
TTT TTT TTT AGG CGA ATT CCA ATC GCA AGA TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT ACC ACC AGA AAA GGT AAA GTA TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT CAT TTG GGA ATT CCT CAG AGC TTT TTT TTG TCG CAC AGC	48
TTC CGC GAC GTA AAT AAG GCG TTT AAC GTC AAT TTT TTT TGT CGC ACA GC	50
TTC CGC GAC GTC CTG AAC AAG CCA AAG ACA AAT TTT TTT TGT CGC ACA GC	50
TTC CGC GAC GTA GCG AAC CTA CCG GAA CCA GAT TTT TTT TGT CGC ACA GC	50
CGA CAC GCT GTT TTT TTT GAA GAT TGT ATA TGT TAA AAT TCG TTT TTT TTT	51
CGA CAC GCT GTT TTT TTT GTA ATG TGT AGG ATA AAT TAA TGC TTT TTT TTT	51
CGA CAC GCT GTT TTT TTT CCG CGA CCT CGA ACT GAC TTT TTT TTT	45
CGA CAC GCT GTT TTT TTT GGT CAT TTT TTT AAA TAT TGC AGC GCC TT	47
CGA CAC GCT GTT TTT TTT GCT TTT GCA AAA TTT AGA CTG GAT TGC AGC GCC TT	53
CGA CAC GCT GTT TTT TTT GAA TTA CCT TAT CGG AAC AAC ATT TGC AGC GCC TT	53
TAT TCG CTC ATT TAA TTA TCA ATA TAT GTG AGT GAA TAA CCT TGT TTT TTT TGT CGC ACA GC	62
CGA CAC GCT GTT TTT TTT AAC CGT CTA TCA TTG ATT AGT AAT AAG TGG	48

Table 7. 27-HG poly-T staple sequences.

Sequences (5'-3')	#Bases
GGT GGA TTG AGT GAG CGT AGC CAG CTT TCA TCA TTT TTT TTT	42

ATA AGA TTA ATT ACC CTT GAC CAT AAA TCA AAA TTT TTT TTT	42
TTT TTT TTT CGA AAG ACT TTG ATA AGA TTT TTT TTT	36
TTT TTT TTT CGC TTC TGG GAA GGG CGA TTT TTT TTT	36
ATA CAG ATG ATG ACA AGA ACC GGA TAT TCT TTT TTT TT	38
TTA TAT ATT CTA GTT GCA ATT TCT TAA ACA GCT TTT TTT TTT	42
GTC GAA CGC AAG GAT ATA GGG AGA ACA TAC GAG CCG GAA GCA TAT TTT TTT TT	53
TCG GCC CTG AAT AAA GCC TCA GAG CAT AAT TTT TTT TT	38
TTT TTT TTT CCA GTG CCA CAT TAT GAC TTT TTT TTT	36
TTT TTT TTT AGC GGT CCA CGC AGT GTT GTT CCA TTT TTT TTT	42
TTT TTT TTT CTC ACT GCC CGC TCT TTT CAC CAG TTT TTT TTT	42
TTT TTT TTT CCT GTT TAG GCT GCT CAT TTT TTT TTT	36
TTT TTT TTT CCA TAT TTA ACA TAC AAT TTT TTT TTT TTT	39
TTT TTT TTT CAC CAC CCT CAT TTT CCC GCC ACA GAG CCA CAA G	43
TTT TTT TTT GAT AAG TGC CGT CGA GTG CTC AGG TTT TCA CAA AAT CCC C	49
TTT TTT TTT CAA AGA ACG CGA ACT GAA CAC TTT TTT TTT	39
TAA GTT AGA TTG AAT CCT GTC GCT AGG AAA TAC CTA CAT TTT GAT TTT TTT TT	53
TTT TTT TTT CTA CAA CGC CTG TAG CTC GTC ACA ACC GAT CAC C	43
TTT TTT TTT GAA ACA TGA AAG TAT TCG GAA CCA CCG CCT CAG GAG GAC C	49
TTT TTT TTT ACA TGG CTT TTG ATG ATT CCA GTT TGA TAT TCA C	43
TTT TTT TTT AAC AAC TAA AGG AAT TGT GTA CCA GCA GTC	39
TGA TAT AAT CCA GCA GAC ACC GCC TGC AAC AGT GCC TTT TTT TTT	45
AAA TGA AAT GCG ACC AGT AAT AAA AGG GAT TTT TTT TT	38
TTT TTT TTT CAT TCT GGC CAA ATA TAC AGT TTT TTT TTT	39
TTT TTT TTT ATT CTG TCC AGA AGG CGT TTT TTT TTT TTT	39
TTT TTT TTT TTC ACG TTG AAA ATC TTT CGA AT	32
TTT TTT TTT ACG CTG AGA GCC AAC AAA GAA	30
AAT AAT TTT TTT TTT TTT	18
TTT TTT TTT TGA TAC CGA GGT CGC TGA	27
GTT TGG AAC AAG CAA AGG GCG AAA TTT TTT TTT	33
GCA ACT AAA GGT CAA TAA TTT TTT TTT	27

Table 8. 27-HG docking strand sequences.

Sequences (5'-3')	#Bases
TGA CAG AGA TAC ATC GCC ATT AAA AAT ACT TTT TTT TGT CGC ACA GC	47
GCG TTT GCG GAG CAG CAG AGG AAG GTT ATC TAA AAT TTT TTT TTG TCG CAC AGC	54
TTT TTT TTT ATC TTT AGG AGC GAA GTA TTA TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT CGA ACG AAC CAC CTG ATT GTT TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT CGC TCA ATC GTC ATC GCG CAG TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT CTT CTG TAA ATC TGA AAA CAT TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT AGC GAT AGC CAG ATA GCC GAA TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT AAC AGT ACC CGA CCG TGT GAT TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT TGG ATT ATA AAT TGA GAA TCG TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT GAC TTT ACA AGA AAC CAA TCA TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT ATA ATC GGC TGT TTC ATC GTA TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT CAA AGT TAC CAG TAC CCA AAA TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT GAA CTG GCA AGA ATA GAA AGG TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT AAA TGA AAA ACC GAC TTG AGC TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT ATC CTG AAT GCC TTT AGC GTC TTT TTT TTG TCG CAC AGC	48

TTT TTT TTT GGA ATC ATT TTG AGG CAG GTC TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT AGA CGA TTG GCC AAG CGT CAT TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT AGA CTG TAG CGC TAC CAG GCG TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT AGG GCG ACA TTC CAG TAC AAA TTT TTT TTG TCG CAC AGC	48
CGA CAC GCT GTT TTT TTT TGA GAC GGG CAA AGA GTT GCA GCA TTT TTT TTT	51
CGA CAC GCT GTT TTT TTT AAG TGT AAA GCC AAT TGC GTT GCG TTT TTT TTT	51
CGA CAC GCT GTT TTT TTT CCT GTA ATA CTT TTG CCC AAA AAA GCT TGC CGT T	52
CGA CAC GCT GTT TTT TTT TCG GTG CGG AAA CGA CGG TTT TTT TTT	45
CGA CAC GCT GTT TTT TTT GAT AGG TCA TTC CGG CAC TTT TTT TTT	45
CGA CAC GCT GTT TTT TTT ACA TTA AAT CCG TAA TGG TTT TTT TTT	45
CGA CAC GCT GTT TTT TTT CAT TAA ATT TTT GTT AAA TCT TCC TGA GTA	48
CGA CAC GCT GTT TTT TTT AGT CTG GAG CAA CCC CAA AAA CAG TTT TTT TTT	51
CGA CAC GCT GTT TTT TTT CGG AGA GGG TAG TCA TTG CCT GAG TTT TTT TTT	51
CGA CAC GCT GTT TTT TTT AGC TAA ATC GGT TGC AAT GCC TGA TTT TTT TTT	51
CGA CAC GCT GTT TTT TTT TCA GTG AAT AAG GCT TTA ACA AAC TAT ATT CGC A	52
CGA CAC GCT GTT TTT TTT ATC AGG TCT GAG GAA GCC TTT TTT TTT	45
CGA CAC GCT GTT TTT TTT AGC GTC CAA TAC TGC GGA AAC GAG AAG ACT ATT AAT	54
CGA CAC GCT GTT TTT TTT CAG ATA CAT AAC AAA TAG CGA GAG TTT TTT TTT	51
CGA CAC GCT GTT TTT TTT ATT ACA GGT AGA ATT CAA CTA ATG TTT TTT TTT	51
CGA CAC GCT GTT TTT TTT ATT ACC CAA ATC TTT AAT CAT TGT TTT TTT TTT	51
CGA CAC GCT GTT TTT TTT CAA CTT TGA AAG AGG AAG GGA ACG CTC CAT TAA A	52
CGA CAC GCT GTT TTT TTT AGA GGC AAA TGT CGA AAT TTT TTT TTT	45
CGA CAC GCT GTT TTT TTT GGC TTG CAG AAA GAC TTT TTT TTT TTT	45
TTT TTT TTT AGG CGA ATT CCA ATC GCA AGA TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT ACC ACC AGA AAA GGT AAA GTA TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT CAT TTG GGA ATT CCT CAG AGC TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT GCC ACC ACC GGA TAT TAT TCT TTT TTT TTG TCG CAC AGC	48
TTC CGC GAC GTA AAT AAG GCG TTT AAC GTC AAT TTT TTT TGT CGC ACA GC	50
TTC CGC GAC GTC CTG AAC AAG CCA AAG ACA AAT TTT TTT TGT CGC ACA GC	50
TTC CGC GAC GTA GCG AAC CTA CCG GAA CCA GAT TTT TTT TGT CGC ACA GC	50
CGA CAC GCT GTT TTT TTT GAA GAT TGT ATA TGT TAA AAT TCG TTT TTT TTT	51
CGA CAC GCT GTT TTT TTT GTA ATG TGT AGG ATA AAT TAA TGC TTT TTT TTT	51
CGA CAC GCT GTT TTT TTT CCG CGA CCT CGA ACT GAC TTT TTT TTT	45
CGA CAC GCT GTT TTT TTT TTC ATG AGG TAA AAC GAA TTT TTT TTT	45
CGA CAC GCT GTT TTT TTT GGT CAT TTT TTT AAA TAT TGC AGC GCC TT	47
CGA CAC GCT GTT TTT TTT GCT TTT GCA AAA TTT AGA CTG GAT TGC AGC GCC TT	53
CGA CAC GCT GTT TTT TTT GAA TTA CCT TAT CGG AAC AAC ATT TGC AGC GCC TT	53
TAT TCG CTC ATT TAA TTA TCA ATA TAT GTG AGT GAA TAA CCT TGT TTT TTT TGT CGC ACA GC	62
CGA CAC GCT GTT TTT TTT AAC CGT CTA TCA TTG ATT AGT AAT AAG TGG	48

Table 9. 36-HG poly-T staple sequences.

Sequences (5'-3')	#Bases
GGT GGA TTG AGT GAG CGT AGC CAG CTT TCA TCA TTT TTT TTT	42
ATA AGA TTA ATT ACC CTT GAC CAT AAA TCA AAA TTT TTT TTT	42
ATA CAG ATG ATG ACA AGA ACC GGA TAT TCT TTT TTT TT	38
TTA TAT ATT CTA GTT GCA ATT TCT TAA ACA GCT TTT TTT TTT	42
TCG GCC CTG AAT AAA GCC TCA GAG CAT AAT TTT TTT TT	38
TTT TTT TTT CAC CAC CCT CAT TTT CCC GCC ACA GAG CCA CAA G	43

TTT TTT TTT GAT AAG TGC CGT CGA GTG CTC AGG TTT TCA CAA AAT CCC C	49
TTT TTT TTT CTA CAA CGC CTG TAG CTC GTC ACA ACC GAT CAC C	43
TTT TTT TTT GAA ACA TGA AAG TAT TCG GAA CCA CCG CCT CAG GAG GAC C	49
TTT TTT TTT ACA TGG CTT TTG ATG ATT CCA GTT TGA TAT TCA C	43
TTT TTT TTT AAC AAC TAA AGG AAT TGT GTA CCA GCA GTC	39
TTT TTT TTT TTC ACG TTG AAA ATC TTT CGA AT	32
AAT AAT TTT TTT TTT TTT	18
TTT TTT TTT TGA TAC CGA GGT CGC TGA	27

Table 10. 36-HG docking strand sequences.

Sequences (5'-3')	#Bases
AAA TGA AAT GCG ACC AGT AAT AAA AGG GAT TTT TTT TGT CGC ACA GC	47
TGA CAG AGA TAC ATC GCC ATT AAA AAT ACT TTT TTT TGT CGC ACA GC	47
GCG TTT GCG GAG CAG CAG AGG AAG GTT ATC TAA AAT TTT TTT TTG TCG CAC AGC	54
TTT TTT TTT ATC TTT AGG AGC GAA GTA TTA TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT CGA ACG AAC CAC CTG ATT GTT TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT CGC TCA ATC GTC ATC GCG CAG TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT CTT CTG TAA ATC TGA AAA CAT TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT AGC GAT AGC CAG ATA GCC GAA TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT AAC AGT ACC CGA CCG TGT GAT TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT TGG ATT ATA AAT TGA GAA TCG TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT GAC TTT ACA AGA AAC CAA TCA TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT ATA ATC GGC TGT TTC ATC GTA TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT CCA TAT TTA ACA TAC AAT TTT TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT CAA AGA ACG CGA ACT GAA CAC TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT CAA AGT TAC CAG TAC CCA AAA TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT GAA CTG GCA AGA ATA GAA AGG TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT AAA TGA AAA ACC GAC TTG AGC TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT ATC CTG AAT GCC TTT AGC GTC TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT GGA ATC ATT TTG AGG CAG GTC TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT AGA CGA TTG GCC AAG CGT CAT TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT AGA CTG TAG CGC TAC CAG GCG TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT AGG GCG ACA TTC CAG TAC AAA TTT TTT TTG TCG CAC AGC	48
CGA CAC GCT GTT TTT TTT AGC GGT CCA CGC AGT GTT GTT CCA TTT TTT TTT	51
CGA CAC GCT GTT TTT TTT TGA GAC GGG CAA AGA GTT GCA GCA TTT TTT TTT	51
CGA CAC GCT GTT TTT TTT AAG TGT AAA GCC AAT TGC GTT GCG TTT TTT TTT	51
CGA CAC GCT GTT TTT TTT CCT GTA ATA CTT TTG CCC AAA AAA GCT TGC CGT T	52
CGA CAC GCT GTT TTT TTT TCG GTG CGG AAA CGA CGG TTT TTT TTT	45
CGA CAC GCT GTT TTT TTT GAT AGG TCA TTC CGG CAC TTT TTT TTT	45
CGA CAC GCT GTT TTT TTT ACA TTA AAT CCG TAA TGG TTT TTT TTT	45
CGA CAC GCT GTT TTT TTT CAT TAA ATT TTT GTT AAA TCT TCC TGA GTA	48
CGA CAC GCT GTT TTT TTT AGT CTG GAG CAA CCC CAA AAA CAG TTT TTT TTT	51
CGA CAC GCT GTT TTT TTT CGG AGA GGG TAG TCA TTG CCT GAG TTT TTT TTT	51
CGA CAC GCT GTT TTT TTT AGC TAA ATC GGT TGC AAT GCC TGA TTT TTT TTT	51
CGA CAC GCT GTT TTT TTT TCA GTG AAT AAG GCT TTA ACA AAC TAT ATT CGC A	52
CGA CAC GCT GTT TTT TTT GCA ACT AAA GGT CAA TAA TTT TTT TTT	45
CGA CAC GCT GTT TTT TTT CGA AAG ACT TTG ATA AGA TTT TTT TTT	45
CGA CAC GCT GTT TTT TTT ATC AGG TCT GAG GAA GCC TTT TTT TTT	45

CGA CAC GCT GTT TTT TTT AGC GTC CAA TAC TGC GGA AAC GAG AAG ACT ATT AAT	54
CGA CAC GCT GTT TTT TTT CAG ATA CAT AAC AAA TAG CGA GAG TTT TTT TTT	51
CGA CAC GCT GTT TTT TTT ATT ACA GGT AGA ATT CAA CTA ATG TTT TTT TTT	51
CGA CAC GCT GTT TTT TTT ATT ACC CAA ATC TTT AAT CAT TGT TTT TTT TTT	51
CGA CAC GCT GTT TTT TTT CAA CTT TGA AAG AGG AAG GGA ACG CTC CAT TAA A	52
CGA CAC GCT GTT TTT TTT AGA GGC AAA TGT CGA AAT TTT TTT TTT	45
CGA CAC GCT GTT TTT TTT GGC TTG CAG AAA GAC TTT TTT TTT TTT	45
TAA GTT AGA TTG AAT CCT GTC GCT AGG AAA TAC CTA CAT TTT GAT TTT TTT TGT CGC ACA GC	62
TGA TAT AAT CCA GCA GAC ACC GCC TGC AAC AGT GCC TTT TTT TTG TCG CAC AGC	54
TTT TTT TTT ACG CTG AGA GCC AAC AAA GAA TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT AGG CGA ATT CCA ATC GCA AGA TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT ACC ACC AGA AAA GGT AAA GTA TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT ATT CTG TCC AGA AGG CGT TTT TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT CAT TTG GGA ATT CCT CAG AGC TTT TTT TTG TCG CAC AGC	48
TTT TTT TTT GCC ACC ACC GGA TAT TAT TCT TTT TTT TTG TCG CAC AGC	48
TTC CGC GAC GTC ATT CTG GCC AAA TAT ACA GTT TTT TTT TGT CGC ACA GC	50
TTC CGC GAC GTA AAT AAG GCG TTT AAC GTC AAT TTT TTT TGT CGC ACA GC	50
TTC CGC GAC GTC CTG AAC AAG CCA AAG ACA AAT TTT TTT TGT CGC ACA GC	50
TTC CGC GAC GTA GCG AAC CTA CCG GAA CCA GAT TTT TTT TGT CGC ACA GC	50
CGA CAC GCT GTT TTT TTT GTT TGG AAC AAG CAA AGG GCG AAA TTT TTT TTT	51
CGA CAC GCT GTT TTT TTT CTC ACT GCC CGC TCT TTT CAC CAG TTT TTT TTT	51
CGA CAC GCT GTT TTT TTT CCA GTG CCA CAT TAT GAC TTT TTT TTT	45
CGA CAC GCT GTT TTT TTT GAA GAT TGT ATA TGT TAA AAT TCG TTT TTT TTT	51
CGA CAC GCT GTT TTT TTT GTA ATG TGT AGG ATA AAT TAA TGC TTT TTT TTT	51
CGA CAC GCT GTT TTT TTT CCT GTT TAG GCT GCT CAT TTT TTT TTT	45
CGA CAC GCT GTT TTT TTT CCG CGA CCT CGA ACT GAC TTT TTT TTT	45
CGA CAC GCT GTT TTT TTT TTC ATG AGG TAA AAC GAA TTT TTT TTT	45
CGA CAC GCT GTT TTT TTT CGC TTC TGG GAA GGG CGA TGC AGC GCC TT	47
CGA CAC GCT GTT TTT TTT GGT CAT TTT TTT AAA TAT TGC AGC GCC TT	47
CGA CAC GCT GTT TTT TTT GCT TTT GCA AAA TTT AGA CTG GAT TGC AGC GCC TT	53
CGA CAC GCT GTT TTT TTT GAA TTA CCT TAT CGG AAC AAC ATT TGC AGC GCC TT	53
TAT TCG CTC ATT TAA TTA TCA ATA TAT GTG AGT GAA TAA CCT TGT TTT TTT TGT CGC ACA GC	62
CGA CAC GCT GTT TTT TTT AAC CGT CTA TCA TTG ATT AGT AAT AAG TGG	48

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