Supplemental Table S1. All the parameters examined in this study.

(A) Parameters for target amplification. (B) Parameters for background amplification. The numbers in the last column correspond to the numbers in Supplemental Fig S3 and Fig S4.

A. Parameters for target amplification

parameter_name	description	coefficient	p-value	no.
dG_3end_complementarity_TP	-ΔG of 3'-anchored binding of two TPs within the same TP type	-9.73E-02	5.10E-26	44
Probability_non-paired_TP_5end_1_3	The probability for non-paired state in 1-3 bases of TP 5' end	1.75E-01	4.52E-03	53
dG_cTP_turnback_5end_1_6	-ΔG of binding of 1~6 base of cTP turn-back 5' end to its complementary sequence	7.97E-02	3.66E-02	25
Probability_non-paired_TP_3end_1_3	The probability for non-paired state in 1-3 bases of TP 3' end	1.41E-01	5.62E-02	48
| (X - Y) / X |	| (X - Y) / X | X : length of the annealing region Y : distance between the annealing and the turn-back region (excluding binding region) Too long Y makes TP loop formation hard. Too short Y does not make enough space in the TP loop for coming new TP.	-7.91E-02	1.22E-01	4
dG_TP_anneal_3end_1_3	-ΔG of binding of 1~3 base of TP annealing 3' end	7.80E-02	1.35E-01	9
dG_cTP_turnback_3end_1_3	-ΔG of binding of 1~3 base of cTP turn-back 3' end to its complementary sequence	6.32E-02	2.13E-01	27
Probability_non-paired_template_anneal_3end_7_9	The probability of non-paired state of the region in the template where 7~9 bases of TP annealing 3' end binds	-8.01E-02	2.41E-01	69
Probability_non-paired_template_turnback_5end_1_3	The probability of non-paired state of the region in the template where 1~3 bases of cTP turn-back 5' end binds	-4.49E-02	2.57E-01	77
Probability_non-paired_cTP-loop_anneal_3end_1_3	The probability of non-paired state of the region in the cTP loop where 1~3 bases of TP annealing 3' end binds	4.69E-02	2.73E-01	59
Length_IM	Length of the intermediate product (forward TP + reverse TP + region sandwiched between those two TPs)	-7.45E-04	3.04E-01	7
Probability_non-paired_template_anneal_5end_7_9	The probability of non-paired state of the region in the template where 7~9 bases of TP annealing 5' end binds	3.73E-02	3.27E-01	73
| W - 1.5 |	| W - 1.5 | W : length of the overlapped bases between the annealing and turn-back region	-1.38E-02	3.44E-01	6

Probability_non-paired_cTP-loop_anneal_3end_4_6	The probability of non-paired state of the region in the cTP loop where 4~6 bases of TP annealing 3' end binds	3.36E-02	3.61E-01	60
Probability_non-paired_TP_all_ave	The avarage probability for non-paired state in all the bases of TP	3.13E-01	4.01E-01	58
Probability_non-paired_template_turnback_3end_1_3	The probability of non-paired state of the region in the template where 1~3 bases of cTP turn-back 3' end binds	-1.13E-02	4.12E-01	75
dG_TP_template	-ΔG of binding of TP to the template	2.28E-03	4.65E-01	8
dG_TP_anneal_5end_10_12	-ΔG of binding of 10~12 base of TP annealing 5' end to its complementary sequence	5.98E-03	4.65E-01	22
Probability_non-paired_template_turnback_3end_4_6	The probability of non-paired state of the region in the template where 4~6 bases of cTP turn-back 3' end binds	-2.04E-03	4.83E-01	76
Length_TP	Length of the whole TP	0	5.00E-01	1
Length_anneal	Length of the annealing region	0	5.00E-01	2
Length_turnback	Length of the turn-back region	0	5.00E-01	3
| Z / L - 0.45 |	| Z / L - 0.45 | Z : length of the turn-back region L : length of the whole TP	0	5.00E-01	5
dG_TP_anneal_3end_1_6	-ΔG of binding of 1~6 base of TP annealing 3' end	0	5.00E-01	10
dG_TP_anneal_3end_4_6	-ΔG of binding of 4~6 base of TP annealing 3' end	0	5.00E-01	11
dG_TP_anneal_3end_4_9	-ΔG of binding of 4~9 base of TP annealing 3' end to its complementary sequence	0	5.00E-01	12
dG_TP_anneal_3end_7_9	-ΔG of binding of 7~9 base of TP annealing 3' end to its complementary sequence	0	5.00E-01	13
dG_TP_anneal_3end_7_12	-ΔG of binding of 7~12 base of TP annealing 3' end to its complementary sequence	0	5.00E-01	14
dG_TP_anneal_3end_10_12	-ΔG of binding of 10~12 base of TP annealing 3' end	0	5.00E-01	15
dG_TP_anneal_5end_1_3	-ΔG of binding of 1~3 base of TP annealing 5' end to its complementary sequence	0	5.00E-01	16
dG_TP_anneal_5end_1_6	-ΔG of binding of 1~6 base of TP annealing 5' end to its complementary sequence	0	5.00E-01	17
dG_TP_anneal_5end_4_6	-ΔG of binding of 4~6 base of TP annealing 5' end to its complementary sequence	0	5.00E-01	18
dG_TP_anneal_5end_4_9	-ΔG of binding of 4~9 base of TP annealing 5' end to its complementary sequence	0	5.00E-01	19

dG_TP_anneal_5end_7_9	-ΔG of binding of 7~9 base of TP annealing 5' end to its complementary sequence	0	5.00E-01	20
dG_TP_anneal_5end_7_12	-ΔG of binding of 7~12 base of TP annealing 5' end to its complementary sequence	0	5.00E-01	21
dG_cTP_template	-ΔG of binding of cTP to the template	0	5.00E-01	23
dG_cTP_turnback_5end_1_3	-ΔG of binding of 1~3 base of cTP turn-back 5' end to its complementary sequence	0	5.00E-01	24
dG_cTP_turnback_5end_4_6	-ΔG of binding of 4~6 base of cTP turn-back 5' end to its complementary sequence	0	5.00E-01	26
dG_cTP_turnback_3end_1_6	-ΔG of binding of 1~6 base of cTP turn-back 3' end to its complementary sequence	0	5.00E-01	28
dG_cTP_turnback_3end_4_6	-ΔG of binding of 4~6 base of cTP turn-back 3' end to its complementary sequence	0	5.00E-01	29
dG_TP_whole	-ΔG of binding of the whole TP sequence to its complementary sequence	0	5.00E-01	30
dG_TP_homodimer	-ΔG of dimer formation within the same TP type	0	5.00E-01	39
dG_TP_heterodimer	-ΔG of dimer formation between forward and reverse TP	0	5.00E-01	40
dG_TP_self-folding	-ΔG of self-folding of TP	0	5.00E-01	41
dG_TP-loop_self-folding	-ΔG of self-folding of TP loop	0	5.00E-01	42
Log_N_3end_binding_TP_template_15	The logarithmic number of 3'-anchored binding sites on the template (genomic DNA or plasmid), whose ΔG are less than -15 kcal/mol	0	5.00E-01	43
dG_3end_binding_cTP_homo_TP	-ΔG of 3'-anchored binding of cTP to TP within the same TP type	0	5.00E-01	45
dG_3end_binding_TP_hetero_TP	-ΔG of 3'-anchored binding of two TPs between forward and reverse TP	0	5.00E-01	46
dG_3end_binding_cTP_hetero_TP	-ΔG of 3'-anchored binding of cTP to TP between forward and reverse TP	0	5.00E-01	47
Probability_non-paired_TP_3end_4_6	The probability for non-paired state in 4-6 bases of TP 3' end	0	5.00E-01	49
Probability_non-paired_TP_3end_7_9	The probability for non-paired state in 7-9 bases of TP 3' end	0	5.00E-01	50
Probability_non-paired_TP_3end_10_12	The probability for non-paired state in 10-12 bases of TP 3' end	0	5.00E-01	51
Probability_non-paired_TP_5end_4_6	The probability for non-paired state in 4-6 bases of TP 5' end	0	5.00E-01	54
Probability_non-paired_TP_5end_7_9	The probability for non-paired state in 7-9 bases of TP 5' end	0	5.00E-01	55

parameter_name	description			
Probability_non-paired_TP_5end_10_12	The probability for non-paired state in 10-12 bases of TP 5' end	0	5.00E-01	56
Probability_non-paired_cTP-loop_anneal_3end_7_9	The probability of non-paired state of the region in the cTP loop where 7~9 bases of TP annealing 3' end binds	0	5.00E-01	61
Probability_non-paired_cTP-loop_anneal_3end_10_12	The probability of non-paired state of the region in the cTP loop where 10~12 bases of TP annealing 3' end binds	0	5.00E-01	62
Probability_non-paired_cTP-loop_anneal_5end_1_3	The probability of non-paired state of the region in the cTP loop where 1~3 bases of TP annealing 5' end binds	0	5.00E-01	63
Probability_non-paired_cTP-loop_anneal_5end_4_6	The probability of non-paired state of the region in the cTP loop where 4~6 bases of TP annealing 5' end binds	0	5.00E-01	64
Probability_non-paired_cTP-loop_anneal_5end_7_9	The probability of non-paired state of the region in the cTP loop where 7~9 bases of TP annealing 5' end binds	0	5.00E-01	65
Probability_non-paired_cTP-loop_anneal_5end_10_12	The probability of non-paired state of the region in the cTP loop where 10~12 bases of TP annealing 5' end binds	0	5.00E-01	66
Probability_non-paired_template_anneal_3end_1_3	The probability of non-paired state of the region in the template where 1~3 bases of TP annealing 3' end binds	0	5.00E-01	67
Probability_non-paired_template_anneal_3end_4_6	The probability of non-paired state of the region in the template where 4~6 bases of TP annealing 3' end binds	0	5.00E-01	68
Probability_non-paired_template_anneal_3end_10_12	The probability of non-paired state of the region in the template where 10~12 bases of TP annealing 3' end binds	0	5.00E-01	70
Probability_non-paired_template_anneal_5end_1_3	The probability of non-paired state of the region in the template where 1~3 bases of TP annealing 5' end binds	0	5.00E-01	71
Probability_non-paired_template_anneal_5end_4_6	The probability of non-paired state of the region in the template where 4~6 bases of TP annealing 5' end binds	0	5.00E-01	72
Probability_non-paired_template_anneal_5end_10_12	The probability of non-paired state of the region in the template where 10~12 bases of TP annealing 5' end binds	0	5.00E-01	74
Probability_non-paired_template_turnback_5end_4_6	The probability of non-paired state of the region in the template where 4~6 bases of cTP turn-back 5' end binds	0	5.00E-01	78

B. Parameters for background amplification

parameter_name	description	coefficient	p-value	no.
dG_3end_binding_TP_hetero_TP	-ΔG of 3'-anchored binding of two TPs between forward and reverse TP	2.40E-02	2.69E-10	46

dG_3end_complementarity_TP	-ΔG of 3'-anchored binding of two TPs within the same TP type	-3.01E-02	2.78E-07	44
dG_TP_3end_1_6	-ΔG of binding of 1~6 base of TP 3' end to its complementary sequence	9.58E-02	2.61E-05	31
dG_TP_5end_4_9	-ΔG of binding of 4~9 base of TP 5' end to its complementary sequence	-7.44E-02	1.20E-04	36
dG_TP_3end_7_12	-ΔG of binding of 7~12 base of TP 3' end to its complementary sequence	5.67E-02	3.49E-03	33
dG_TP_heterodimer	-ΔG of dimer formation between forward and reverse TP	2.03E-02	8.90E-03	40
dG_TP_homodimer	-ΔG of dimer formation within the same TP type	1.87E-02	9.41E-03	39
dG_TP_5end_1_6	-ΔG of binding of 1~6 base of TP 5' end to its complementary sequence	4.05E-02	1.29E-02	35
Probability_non-paired_TP_3end_1_3	The probability for non-paired state in 1-3 bases of TP 3' end	1.33E-01	1.92E-02	48
dG_TP_self-folding	-ΔG of self-folding of TP	-3.52E-02	5.07E-02	41
dG_TP_5end_7_12	-ΔG of binding of 7~12 base of TP 5' end to its complementary sequence	-4.08E-02	5.43E-02	37
Probability_non-paired_TP_5end_1_3	The probability for non-paired state in 1-3 bases of TP 5' end	5.73E-02	1.34E-01	53
dG_TP_3end_4_9	-ΔG of binding of 4~9 base of TP 3' end to its complementary sequence	2.03E-02	1.35E-01	32
Probability_non-paired_TP_3end_7_9	The probability for non-paired state in 7-9 bases of TP 3' end	4.04E-04	4.97E-01	50
Length_TP	Length of the whole TP	0	5.00E-01	1
dG_TP_whole	-ΔG of binding of the whole TP sequence to its complementary sequence	0	5.00E-01	30
dG_TP_3end_10_15	-ΔG of binding of 10~15 base of TP 3' end to its complementary sequence	0	5.00E-01	34
dG_TP_5end_10_15	-ΔG of binding of 10~15 base of TP 5' end to its complementary sequence	0	5.00E-01	38
dG_3end_binding_cTP_homo_TP	-ΔG of 3'-anchored binding of cTP to TP within the same TP type	0	5.00E-01	45
dG_3end_binding_cTP_hetero_TP	-ΔG of 3'-anchored binding of cTP to TP between forward and reverse TP	0	5.00E-01	47
Probability_non-paired_TP_3end_4_6	The probability for non-paired state in 4-6 bases of TP 3' end	0	5.00E-01	49
Probability_non-paired_TP_3end_10_12	The probability for non-paired state in 10-12 bases of TP 3' end	0	5.00E-01	51

Probability_non-paired_TP_3end_13_15	The probability for non-paired state in 13-15 bases of TP 3' end	0	5.00E-01	52
Probability_non-paired_TP_5end_4_6	The probability for non-paired state in 4-6 bases of TP 5' end	0	5.00E-01	54
Probability_non-paired_TP_5end_7_9	The probability for non-paired state in 7-9 bases of TP 5' end	0	5.00E-01	55
Probability_non-paired_TP_5end_10_12	The probability for non-paired state in 10-12 bases of TP 5' end	0	5.00E-01	56
Probability_non-paired_TP_5end_13_15	The probability for non-paired state in 13-15 bases of TP 5' end	0	5.00E-01	57
Probability_non-paired_TP_all_ave	The avarage probability for non-paired state in all the bases of TP	0	5.00E-01	58