

Supplementary data

Title- Structural switches: intracellular G-quadruplexes modulate DNA repair and genome maintenance in *Deinococcus radiodurans*

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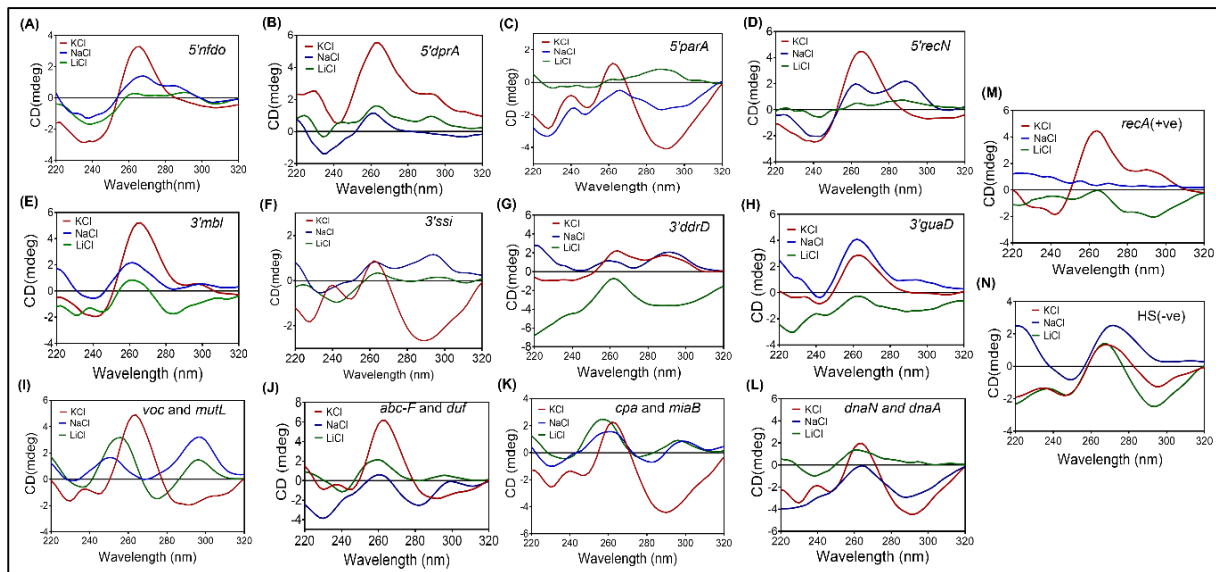


Fig S1

Figure S1: Circular dichroism analysis of PQS present at various positions (5' or 3' or intergenic) in the presence of monovalent cations- 100 mM KCl, 50 mM NaCl, and 50 mM LiCl. PQS present at 5' end of the gene (**A-D**), 3' end of the gene (**E-H**), and intergenic region (**I-L**) were checked by CD. *recA* (+) indicates positive control (**M**) and HS indicates negative control (**N**).

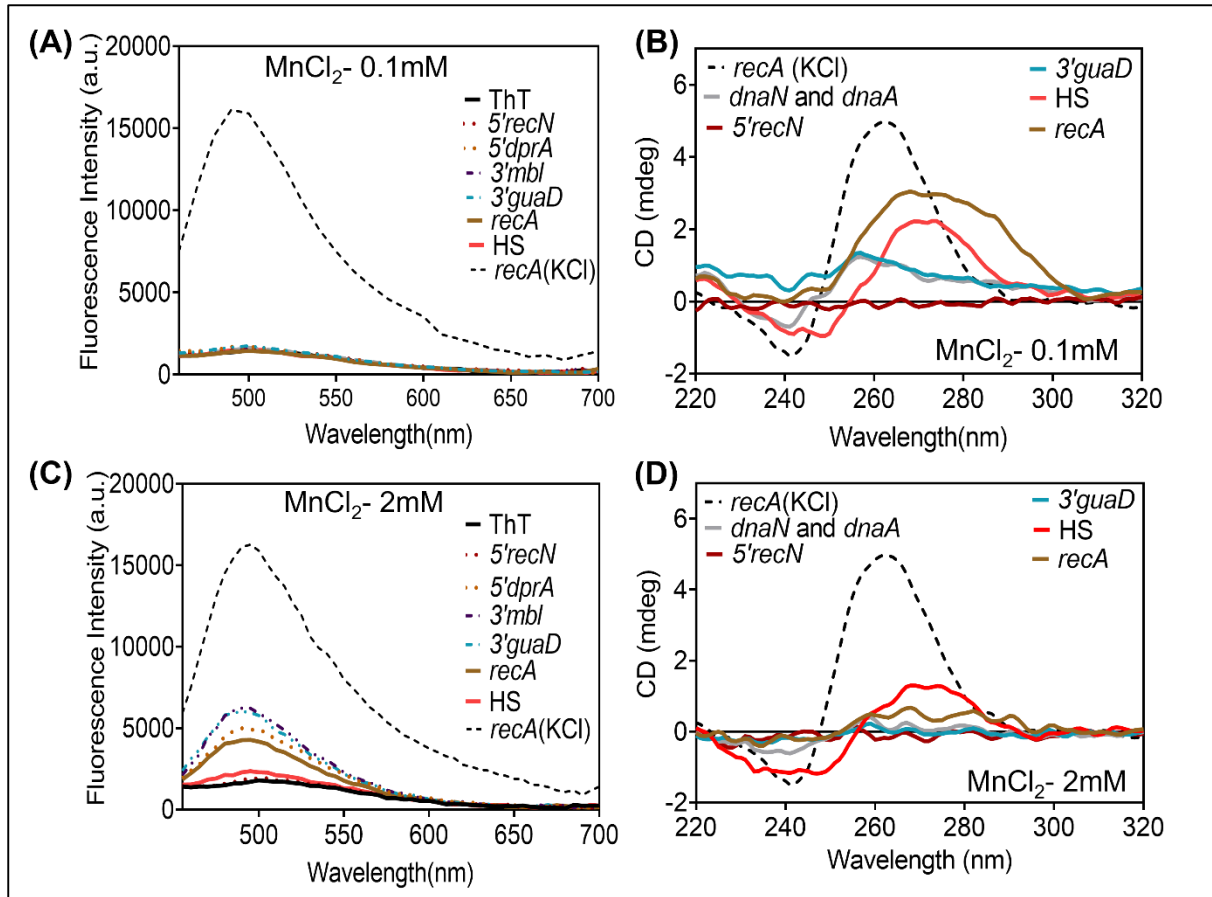


Fig S2

Figure S2: In vitro validation of PQS using ThioflavinT fluorescence assay and circular dichroism in the presence of divalent cation (MnCl₂). Fluorescence emission spectra of Thioflavin T in the presence of divalent cation MnCl₂ -0.1 mM **(A)** and 2 mM **(C)** alone and in presence of synthesized PQS. The fluorescence spectra were collected between 440 and 700 nm after excitation at 425 nm. Circular dichroism analysis in presence of 0.1 mM MnCl₂ **(B)** and 2 mM MnCl₂ **(D)**. The *recA* (KCl) represents the ThT fluorescence and CD spectra in the presence of KCl (100 mM).

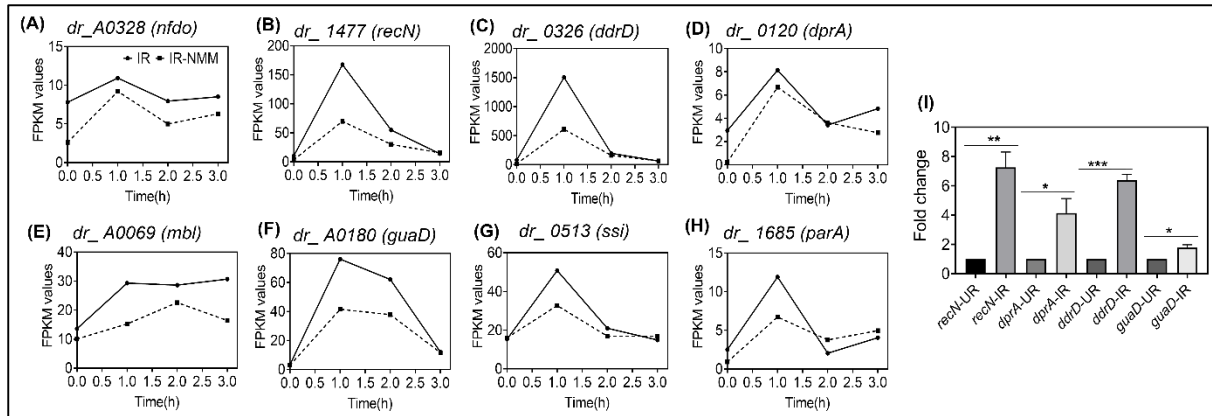


Fig S3

Figure S3: Effect of irradiation on genes containing PQS located at different genomic positions. The FPKM values of genes having G4 motifs present at 5' end (A-D), and at 3' end (E-H) obtained after transcriptome sequencing of irradiated (IR) and irradiated NMM (IR-NMM) cells were plotted using GraphPad to get an estimate of the levels of expression of these genes. (I) Real-time PCR analysis of DNA repair genes (*recN*, *dprA*, and *ddrD*) containing PQS at 5' or 3' end in unirradiated (UR) and 6 kGy irradiated (IR) conditions. The data obtained was analyzed using Graphpad prism8 and represented a change in fold change of genes with 16S rRNA as a control. After irradiation, there was an increase in the transcript levels of DNA repair genes. Data represented in the graph are the mean $\pm$ SE (n=3) and the statistical significance was assessed with a student's t-test. The p-values attained at 95% confidence intervals are depicted as (*) for <0.05, (**) for <0.01, (***) for <0.001.

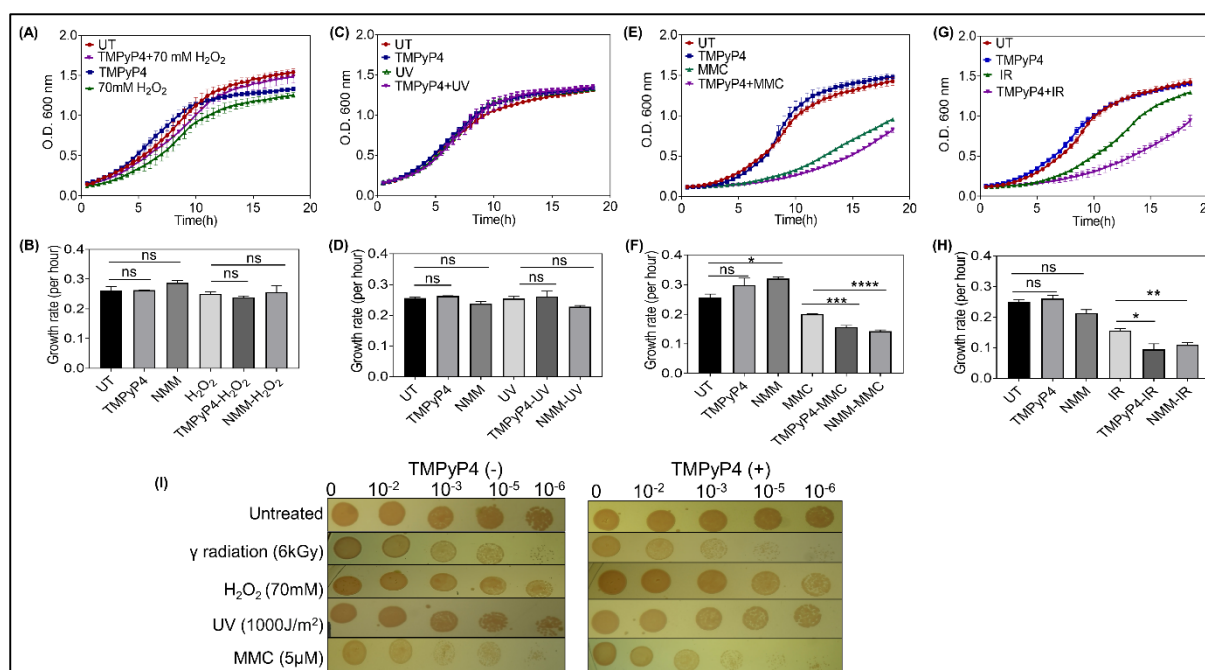


Fig S4

Figure S4: Effect of various DNA damaging agents on growth kinetics in the presence of G4 binding ligand TMPyP4. **(A)** Effect of H_2O_2 (70 mM) **(B)** Growth rate for H_2O_2 (70 mM) **(C)** Effect of UV (1000 J/m²). **(D)** Growth rate for UV (1000 J/m²). **(E)** Effect of MMC (5 μ M) **(F)** Growth rate for MMC (5 μ M). **(G)** Effect of γ - radiation (6 kGy). **(H)** Growth rate for γ - radiation (6 kGy). The growth rate of untreated (UT) and treated (NMM and TMPyP4) cells was calculated using the growth rate formula as described in the methodology. The difference in the growth rates (per hour) of cells is calculated by estimating slopes. Data shown here are the mean $\pm$ SE (n=3) and the statistical significance of the difference in growth rate was found using the student's t-test. The P-values attained at 95% confidence intervals are depicted as (ns) >0.05, (*) for <0.05, and (**) for 0.05-0.001, (***) for <0.001 and (****) for <0.0001. **(I)** Spot plate assay of wild-type cells grown in the presence (TMPyP4+) and absence (TMPyP4-) of ligand were exposed to different stresses. Different dilutions were spotted on TGY and TGY containing TMPyP4 agar plate.

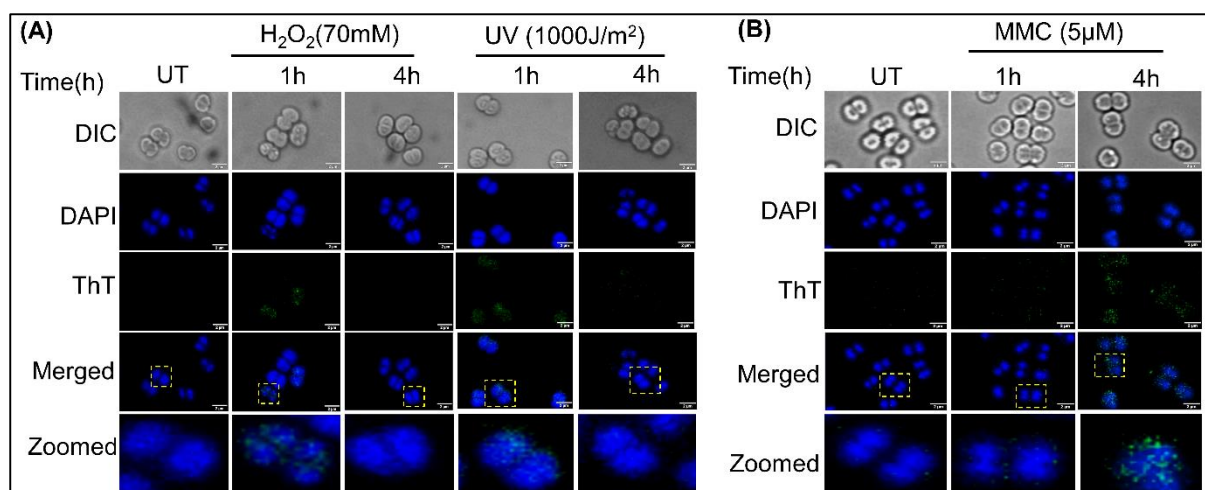


Fig S5

Figure S5: Microscopic images showing the in vivo formation of G4 structure in response to different DNA damaging agents in *D. radiodurans*. **(A)** Wild-type cells (R1) were treated with H_2O_2 (70 mM), UV (1000 J/m²), and **(B)** MMC (5 µM), UT represents the untreated samples. Images were taken in differential inference contrast (DIC), DAPI (for nucleoid), FITC (for ThT), and merged (DAPI+FITC) channels and are presented in planar view. The scale bar for all the panels is 2 µm.

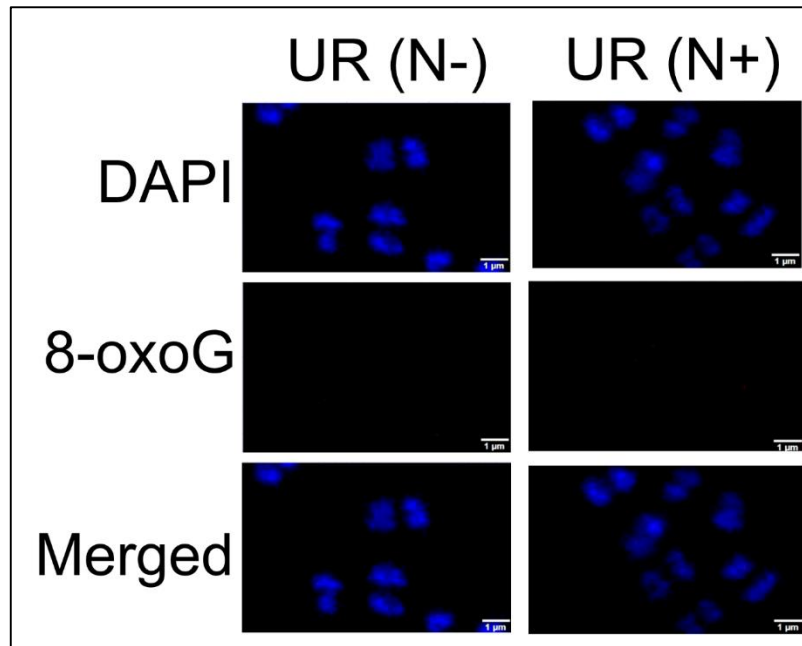


Fig S6

Figure S6: Immunofluorescence assay using anti 8-oxoG antibody. The level of 8-oxoG was tested under unirradiated conditions in presence and absence of NMM. UR (N-) represents the unirradiated cells grown in the absence of NMM, while UR (N+) represents the unirradiated cells grown in the presence of NMM. The microscopic images show the DAPI (for nucleoid), TRITC (for 8-oxoG), and the merged (DAPI+TRITC) channels. The scale bar is 1 µm.

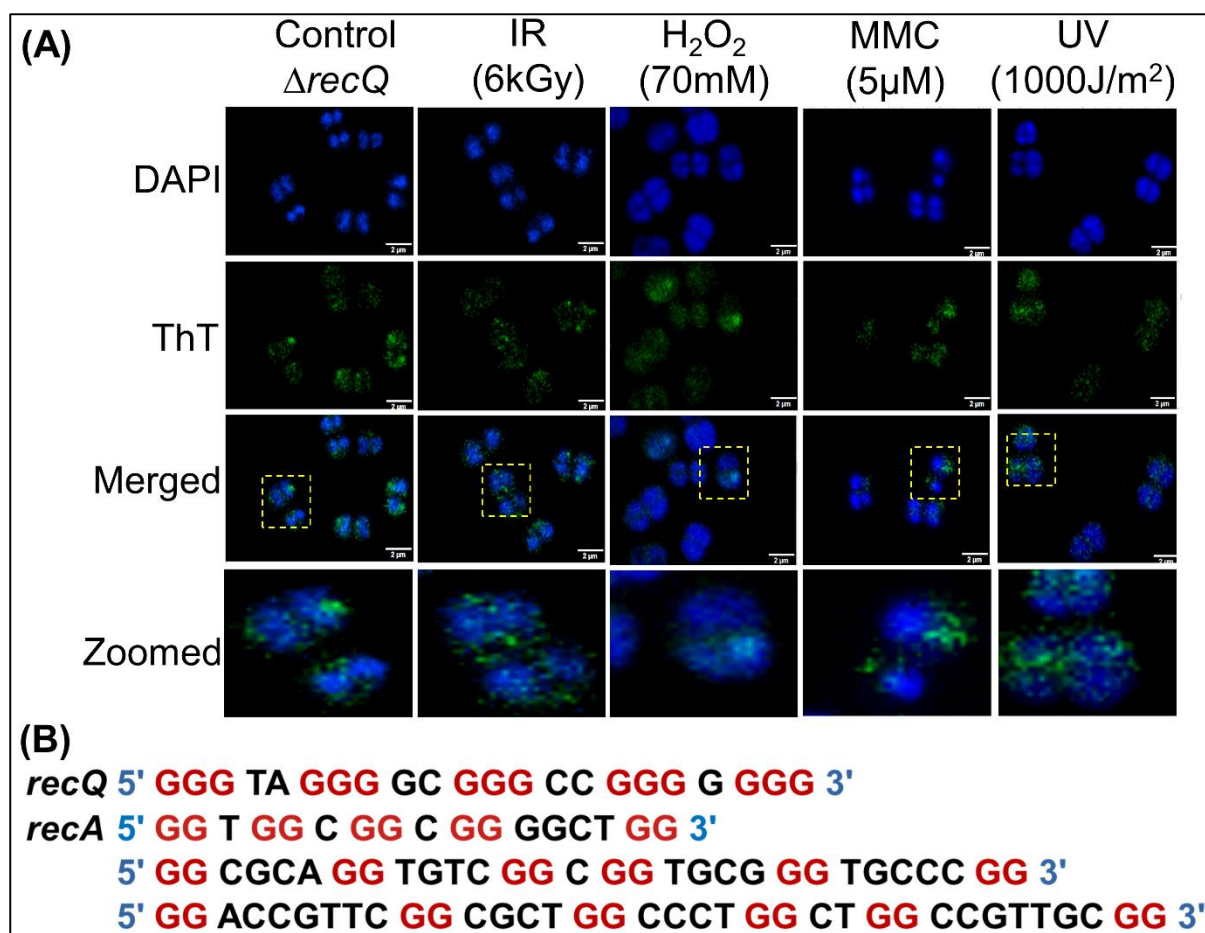


Fig S7

Figure S7: Microscopic images showing the in vivo formation of G4 structure in response to different DNA damaging agents in *recQ* mutant and analysis for extra G track that can act as spare tyre in promoter regions. **(A)** $\Delta recQ$ cells were treated with γ -radiation (IR, 6 kGy), H₂O₂ (70 mM), MMC (5 μ M) and UV (1000 J/m²). Untreated $\Delta recQ$ was taken as control. Images were taken in DAPI (for nucleoid), FITC (for ThT), and merged (DAPI+FITC) channels. For better visualization, the cells were zoomed. The scale bar is 2 μ m. **(B).** The *recA* and *recQ* promoter sequences were checked for the presence of extra G-tracks that can function as spare tires for alternate G4 formation in case of oxidative damage to the core G4 track.

Tables:

Table S1: Bacterial strains used in this study

S.No.	Strain	Genotype	Source
1	<i>D. radiodurans</i> R1	Wild type	Lab stock
2	<i>E. coli</i> DH5 α	<i>F</i> - / <i>endA1 hsdR17 glnV44 thi-1 recA1 gyrArelA</i> Δ (<i>lacIZYA-argF</i>) U169 <i>deoR</i> (Φ 80 <i>dlac</i> Δ (<i>lacZ</i>)M15)	Lab stock
3	Δ <i>recQ</i>	DrRecQ knock-out mutant of <i>D. radiodurans</i> , <i>recQ::nptII</i> (Kan ^R , 8 μ g/ml)	Khairnar et al. 2019
4	Δ <i>topoIB</i>	DrTopoIB mutant of <i>D. radiodurans</i> , <i>topo::nptII</i> (Kan ^R , 8 μ g/ml)	Kota et al. 2021
5	Δ <i>sbcCD</i>	DrSbcCD knock-out mutant of <i>D. radiodurans</i> , <i>sbcCD::nptII</i> (Kan ^R , 8 μ g/ml)	Kamble and Misra 2010

Table S2: List of primers used in this study

S. No	Primer Name	Oligonucleotide Sequences	Purpose
1	RecN Fw	CAGCCGTTTGGAGCGC	Real time PCR
2	RecN Rw	CTGTCTCGTCGTACTTGGC	
3	NFDO Fw	CGTTCATCCTGGCGCTGC	
4	NFDO Rw	CGCCCATCAGGTAGGGG	
5	DprA Fw	GCTCGGGAAGTGGTGC	
6	DprA Rw	CCTCATCGTCAGCGG	
7	ParA Fw	CAAGAAGCTGGCCGC	
8	ParA Rw	CGAACGCAGCGCCGTG	
9	GuaD Fw	CGAGCGCTGGCACGG	

10	GuaD Rw	GCCGAGTTCGCGCTCG	
11	SSI Fw	AGGGTCAGGAGCACGCCC	
12	SSI Rw	GCCAAATTGCAACACTTGTACCTT	
13	MBL Fw	CGGTGCTGCTCGACTCGG	
14	MBL Rw	CCGAGGTCGCCCCGACATC	
15	DdrD Fw	GATGCGGGCCAGCGTG	
16	DdrD Rw	GCGGCGTACATGAAGGAG	

Table S3: QGRS predicted putative G-quadruplexes in Chromosome I

Position	Length	QGRS	G-Score	Genomic location				
				Genic				Intergenic
				5'	Middle	3'	Strand	
1638	29	<u>GGGGGGTTATCCACAG</u> <u>GGCATTTTTAGGG</u>	33					✓
3015	24	<u>GGGCGCGGGTGGGGG</u> <u>GTCGTTGGG</u>	40		✓		Non-coding	
7220	21	<u>GGGCCGGGCGGGCAC</u> <u>GGTGGG</u>	37	✓			Coding	
15206	30	<u>GGGTGCGGGCGTCGCC</u> <u>CGAAACGGGCAGGG</u>	31			✓	Non-coding	
17006	30	<u>GGGCAGCCTTCAGGGC</u> <u>GGCGCGGGCTTGGG</u>	36	✓			Non-coding	
17491	30	<u>GGGCGCATGGGGGGA</u> <u>TGGTAGAGGGTCGGG</u>	36	✓			Non-coding	
22444	30	<u>GGGGCGGGGGGGGCC</u> <u>GCGCACCTGCCAGGG</u>	30	✓			Coding	
40044	27	<u>GGGCCAGCGGGTCGC</u> <u>GGGTGGTGCGGG</u>	40		✓		Non-coding	
46803	30	<u>GGGTGAGGGTCTGA</u> <u>GCGAGGGGCGGCGGG</u>	37		✓		Coding	
52598	20	<u>GGGTGAGGGTGGGGA</u> <u>GGGGG</u>	41	✓			Non-coding	
59199	22	<u>GGGTTCCGGGGGTGG</u> <u>GCCGGGG</u>	41					✓
61662	26	<u>GGGCGGGCGGGCCGC</u> <u>GTGGCGCCGGG</u>	31		✓		Coding	
64102	21	<u>GGGAGGTAGGGTCAG</u> <u>GGCGGG</u>	38	✓			Non-coding	

71815	30	<u>GGGACTCCTTGGGAAC</u> <u>GGGGGGAGACAGGG</u>	40					✓
91606	29	<u>GGGCCGGGCGGTTC</u> <u>AGGGCGCCCTCGGG</u>	36		✓		Non-coding	
94077	28	<u>GGGTCCGAGGGTGGG</u> <u>GGGCCGCTCTGGG</u>	39		✓		Non-coding	
94712	15	<u>GGGGGGGAGGGTGGG</u>	42					✓
97310	25	<u>GGGCAAAGGTGC</u> <u>GGG</u> <u>CGGGCGAGGG</u>	34	✓			Non-coding	
102202	25	<u>GGGTGCGTTGGGCCAC</u> <u>CAGGGCGGG</u>	37			✓	Non-coding	
106132	26	<u>GGGTGGGCACCGAGG</u> <u>CGGGGGCCGGG</u>	34		✓		Coding	
111801	29	<u>GGGGTGGGGGCGGAC</u> <u>GACAGGGCCAGGGG</u>	37	✓			Non-coding	
119317	24	<u>GGGCGGCAGCAGGGG</u> <u>AGGGAAGGG</u>	36	✓			Non-coding	
119978	30	<u>GGGCTTCGGGGAAGTT</u> <u>GGGGGCCGAGCGGG</u>	40		✓		Non-coding	
130322	29	<u>GGGGTGGGAGCGGGC</u> <u>GTGGCCTGTTCTGGG</u>	32		✓		Non-coding	
130568	23	<u>GGGCTGCTGGGCTGGG</u> <u>GTTCTGGG</u>	40		✓		Non-coding	
130691	27	<u>GGGGTCGGGACCGCC</u> <u>GGGATTTCGGG</u>	39		✓		Non-coding	
130760	23	<u>GGGCCGGGGCTCACG</u> <u>GGCACGGG</u>	40		✓		Non-coding	
134668	27	<u>GGGCTTGGGCAGGGC</u> <u>GCAGGCGGAGGG</u>	34			✓	Coding	
136527	28	<u>GGGCCGGAATGCTGG</u> <u>GCGGGCTGGCGGG</u>	33			✓	Coding	
138114	30	<u>GGGGCGGCGGGGGCA</u> <u>GCGCCGGGGGCGGGG</u>	58		✓		Coding	
158261	22	<u>GGGCGGGCCAGGCCG</u> <u>GGCCGGG</u>	36		✓		Non-coding	
159034	26	<u>GGGCGGGGGTTTTAG</u> <u>GGGAGACGGG</u>	39					✓
164602	26	<u>GGGGGGTGCTGCTGG</u> <u>AACGGGCCGGG</u>	30		✓		Coding	
169212	27	<u>GGGCCAGCAGGGAAT</u> <u>CTGGGCCGGGGG</u>	40	✓			Non-coding	
169913	24	<u>GGGGTAAGGGGCGGG</u> <u>GGGATGGGG</u>	62	✓			Coding	
175331	29	<u>GGGCTTTGTGGGGAGC</u> <u>GGGGCGGCCCGGG</u>	41					✓
178845	29	<u>GGGCTGGGTCAAGAC</u> <u>CAGGGGCCAGCGGG</u>	35		✓		Coding	
188331	26	<u>GGGCCGGGGCTTTTCG</u> <u>TCGGGCGGGG</u>	35	✓			Coding	

189742	23	<u>GGGCGAGGGCGGCGC</u> <u>GGGCGGGG</u>	38	✓			Coding	
190704	22	<u>GGGCGGCGGGGGCAC</u> <u>GGGCGGG</u>	38			✓	Coding	
192011	26	<u>GGGCGGGTCGTCTGGG</u> <u>CCAGAAAAGGG</u>	35		✓		Non-coding	
192778	21	<u>GGGGCGGGCAGGGGA</u> <u>GGCGGG</u>	40	✓			Non-coding	
194466	28	<u>GGGCCGGGGACTGGG</u> <u>CCTGCTGACCGGG</u>	35		✓		Coding	
196351	27	<u>GGGCACGTCTGGGAA</u> <u>GCGGGCATCGGG</u>	39			✓	Coding	
201124	26	<u>GGGGAAAAGGGTAAA</u> <u>GGGTGGGAGGG</u>	41					✓
206030	26	<u>GGGTGCTGCTGGGGCT</u> <u>GGGCTGCGGG</u>	38		✓		Coding	
213059	23	<u>GGGGGGAGTTTAGGG</u> <u>GCTTTGGG</u>	36					✓
213129	30	<u>GGGGACAGGGGGGCT</u> <u>CACGTTGGCACTGGG</u>	28					✓
215622	20	<u>GGGTACAAGGGCAAG</u> <u>GGGGG</u>	37			✓	Coding	
216792	24	<u>GGGCAGCGGGGGTCA</u> <u>GGGGATGGG</u>	40	✓			Non-coding	
216939	30	<u>GGGGGAGAGGGGAGC</u> <u>CCCAAAGGGGCGGGG</u>	55					✓
222090	28	<u>GGGAAAATCCTTGTGT</u> <u>GGGGCGGGCGGG</u>	30					✓
232521	20	<u>GGGCGGGCGACGGCG</u> <u>GGGGG</u>	35		✓		Coding	
232594	30	<u>GGGCCGGGTGCCCTGT</u> <u>GGCGACGGGGTGGG</u>	30		✓		Coding	
235715	29	<u>GGGGGGCTGGGCCTC</u> <u>GCCCGCGACGAGGG</u>	27	✓			Coding	
241014	30	<u>GGGCATGATAGGACA</u> <u>CGCGGGCCGGGAGGG</u>	28					✓
242082	23	<u>GGGGCGGGGCACCA</u> <u>GGCGCGGG</u>	40		✓		Non-coding	
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258254	24	<u>GGGGGGCGCGGTGGG</u> <u>GGTTGTGGG</u>	36	✓			Non-coding	
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268644	24	<u>GGGGGGGCGGGGGCA</u> <u>AAGGAAGGG</u>	35					✓

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279601	29	<u>GGGTGCCGGGGCAGG</u> <u>GGGTCACTGCCGGG</u>	38					✓
291489	23	<u>GGGCAACCTGCTGGG</u> <u>GGGCCGGG</u>	33		✓		Coding	
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322785	25	<u>GGGTCGGGCTGGCGC</u> <u>GGGGGCTGGG</u>	37		✓		Non-coding	
329236	30	<u>GGGTGATTTGCGGGGT</u> <u>CGGGGCGGTCTGGG</u>	38	✓			Non-coding	
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392958	17	<u>GGGTCGGGGGGTGAG</u> <u>GG</u>	39		✓		Coding	
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444837	24	<u>GGGGATAGGGGTTTG</u> <u>GGGTTGGGG</u>	62					✓
446667	30	<u>GGGCCTGCTGCAACCC</u> <u>GGCGGGGGGGTGGG</u>	27	✓			Non-coding	
447256	25	<u>GGGTCTTGGGGCATGG</u> <u>TGGGGAGGG</u>	38					✓
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474898	21	<u>GGGCCGGGCGGTAGC</u> <u>GGGGGG</u>	35		✓		Non-coding	
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480143	30	<u>GGGCGCGGTGACGGC</u> <u>GGGGGGCGTTGCGGG</u>	30		✓		Non-coding	
482277	21	<u>GGGTTCGGGGCGGGG</u> <u>ACAGGG</u>	42					✓
483876	27	<u>GGGTTTCAGCAGGGGCT</u> <u>ACCGGGTCGGG</u>	37		✓		Non-coding	
483911	27	<u>GGGAAGCCGCCGGGC</u> <u>CGGGGAGCGGGG</u>	37	✓			Non-coding	
485455	26	<u>GGGGGGATGGTAGTG</u> <u>GGGAGACCGGG</u>	34					✓
491618	24	<u>GGGCGCTCGGGTTGTC</u> <u>GGGGTGGG</u>	39	✓			Non-coding	
493916	21	<u>GGGAGCCGGGCTGGG</u> <u>TCCGGG</u>	40	✓			Coding	
497575	28	<u>GGGTCGGGGAGCGCG</u> <u>GGGTACAGTAGGG</u>	38					✓
498313	26	<u>GGGGGGTCACCCGGC</u> <u>GCTGGGGCGGG</u>	30		✓		Coding	
498710	25	<u>GGGTCGGGCATTCTCG</u> <u>CCGGGTGGG</u>	33		✓		Coding	
501738	29	<u>GGGGTGGGAAAGGCC</u> <u>GCCCCGGGACAGGG</u>	32		✓		Non-coding	
502555	25	<u>GGGACGTAGGGTAGC</u> <u>AGGGGTGGGG</u>	40					✓
504837	27	<u>GGGTAAGGGCGGGAA</u> <u>GCTGGGCCAGGG</u>	38	✓			Non-coding	

513952	21	<u>GGGCGTGGGCTGGGT</u> <u>GCTGGG</u>	40		✓		Non-coding	
517598	30	<u>GGGGCCGGGGCCGCC</u> <u>GCTGGGGTCAGCGGG</u>	38			✓	Non-coding	
518867	24	<u>GGGAGTAGGGGTAGG</u> <u>GTTCTAGGG</u>	40					✓
520108	27	<u>GGGCGAGGGGCTGGG</u> <u>CGTGTAGCTGGG</u>	36					✓
526524	29	<u>GGGCAGGGCACGGGC</u> <u>CGCGCTCGCCCGGG</u>	32			✓	Non-coding	
529271	29	<u>GGGCGTCGAGCTGGG</u> <u>CCGCGCTGGGGGGG</u>	34			✓	Non-coding	
529996	22	<u>GGGCGAGCTGGGCAC</u> <u>CGGGGGG</u>	36					✓
530027	28	<u>GGGCGGGGGGGCAGC</u> <u>GAGGGCACCGGGG</u>	41					✓
531726	29	<u>GGGCAGGTCAGCGGC</u> <u>GGCGGGGCGGGGGG</u>	27		✓		Non-coding	
533783	26	<u>GGGGGCTAGGGGTAG</u> <u>AGCTGGGCGGG</u>	36					✓
533901	29	<u>GGGCAGGGGGCGCGA</u> <u>GGGGTGCGGCTGGG</u>	39					✓
534695	20	<u>GGGGTGGGCAGGGTC</u> <u>ACGGG</u>	40					✓
538715	30	<u>GGGCTTCTGGTGGGCT</u> <u>GCTCGGGTTGCGGG</u>	38		✓		Non-coding	
538952	30	<u>GGGCTTCTCGGGGAAG</u> <u>GGCCGGATTGCGGG</u>	36		✓		Non-coding	
548226	24	<u>GGGGCATGGGCTCAG</u> <u>GGTAGCGGG</u>	42	✓			Non-coding	
549145	29	<u>GGGGTGCTGGGCGCG</u> <u>ATTCTGGGTCTGGG</u>	36	✓			Coding	
574927	21	<u>GGGCAAGGGAGCGGG</u> <u>GGCGGG</u>	42	✓			Non-coding	
577482	24	<u>GGGCGGAGGTGGGGT</u> <u>CCTGGGGGG</u>	35	✓			Non-coding	
578587	28	<u>GGGCGCGGGGGTCCA</u> <u>CCCGGGCGACGGG</u>	39		✓		Non-coding	
579035	22	<u>GGGAGTCGGGTCGGG</u> <u>CGGCGGG</u>	40	✓			Non-coding	
579253	30	<u>GGGGCCCTGGCGGGA</u> <u>TGGGCGCTGACCGGG</u>	36	✓			Coding	
594435	24	<u>GGGCGTGGGCGCGGG</u> <u>CGTACTGGG</u>	39			✓	Non-coding	
598438	26	<u>GGGCCGCGTCTGGGGC</u> <u>TGGGGGCGGG</u>	37			✓	Coding	
611169	19	<u>GGGCCGGGTGGGGAG</u> <u>AGGG</u>	41					✓

612360	28	<u>GGGCATCAGGGAAGC</u> <u>GCTCGCCGGGGGG</u>	31		✓		Coding	
625399	25	<u>GGGCCGACACCGGGC</u> <u>CCCGGGTGGG</u>	35	✓			Non-coding	
632560	23	<u>GGGCAGCTTGGGCGG</u> <u>GTTGAGGG</u>	37		✓		Non-coding	
638756	26	<u>GGGTGGCGGGCATGG</u> <u>CGGCGGGCGGG</u>	34		✓		Coding	
641394	29	<u>GGGCCGGGCCCGCGCT</u> <u>GGGAAATCAAGGG</u>	36		✓		Coding	
648182	23	<u>GGGCGGGTGGGCGCT</u> <u>CTCGCGGG</u>	34			✓	Coding	
648280	24	<u>GGGAACAGCGGGCGG</u> <u>GAGTGCGGG</u>	37			✓	Coding	
654646	30	<u>GGGATGCTCGGGCAG</u> <u>CGTCACCTGGGTGGG</u>	32			✓	Non-coding	
657341	29	<u>GGGTGGTCTGGGGCCG</u> <u>GGGGCTGGTTGGG</u>	41	✓			Non-coding	
664009	29	<u>GGGCGGGTGCTGGCCC</u> <u>TCGGGCGTGCGGG</u>	32		✓		Non-coding	
668321	30	<u>GGGGTGGTGGGGGGT</u> <u>GACGGGGGGTAGGGG</u>	62			✓	Coding	
670233	25	<u>GGGATTGAGCGGGCG</u> <u>GGCCGACGGG</u>	36	✓			Non-coding	
679359	28	<u>GGGCGGGGGTCTGAG</u> <u>CTTGCGGGGGGG</u>	31		✓		Coding	
687427	26	<u>GGGGGGCACCCAGC</u> <u>GGGCTGGCGGG</u>	33	✓			Coding	
719040	30	<u>GGGCGGGCCAGCCGC</u> <u>CGGGCCGTGAGAGGG</u>	34			✓	Non-coding	
721744	26	<u>GGGCCTCGGGCGAGG</u> <u>GCGCTTGCGGG</u>	38	✓			Non-coding	
725994	26	<u>GGGCACGAGGGGCTT</u> <u>GGGAACGCGGG</u>	41	✓			Non-coding	
727741	27	<u>GGGGCGCAGGGTGAC</u> <u>AAACCGGGCGGG</u>	34		✓		Non-coding	
729581	29	<u>GGGGGGCACGGCGGT</u> <u>CAGGGGCCGCAGGG</u>	31		✓		Non-coding	
730129	29	<u>GGGTCGCCGCGCGGG</u> <u>CGGGGAGCGCCGGG</u>	35	✓			Non-coding	
732477	27	<u>GGGATGAAGCGGGGG</u> <u>CAGGGGAGAGGG</u>	39					✓
738592	26	<u>GGGCGGGCGCTGTGG</u> <u>CGGCTGGGGGG</u>	29		✓		Coding	
739210	26	<u>GGGCGAGGAGGGCCG</u> <u>GGCTGAGCGGG</u>	38			✓	Non-coding	
743511	30	<u>GGGTGACGGTGGGCA</u> <u>ATGCGGGCGTTGGGG</u>	40		✓		Non-coding	

747626	30	<u>GGGCGCGAGGGCAAA</u> <u>AGCGGGCTGAAGGGG</u>	40			✓	Coding	
747873	26	<u>GGGAGCGGGTCGGTG</u> <u>GGGGTCATGGG</u>	39	✓			Non-coding	
758128	30	<u>GGGGCGGGCAGCGCT</u> <u>GGGCCGTCACGCGGG</u>	35					✓
766373	29	<u>GGGCATCGGTCGGGG</u> <u>CAGCGGGCATGGGG</u>	38			✓	Non-coding	
766420	28	<u>GGGAAGCGGGAGAAA</u> <u>CGGGCGCGTCGGG</u>	40					✓
769806	29	<u>GGGCGGGTTTCTTTTG</u> <u>GCTGTGGGGTGGG</u>	29					✓
772578	28	<u>GGGGGAGAGGGTAGC</u> <u>GGGTGGGCGTGGG</u>	39	✓			Coding	
774527	22	<u>GGGCGCGGGGGGCCT</u> <u>GTTCGGG</u>	35		✓		Coding	
776967	23	<u>GGGTGGGGGGCGTAC</u> <u>AATCCGGG</u>	32					✓
779998	29	<u>GGGACGGGCCTTGTCC</u> <u>TGCCGGGAGCGGG</u>	32		✓		Coding	
782273	27	<u>GGGTGGCGTGGGTCA</u> <u>GTGGGGGCCGGG</u>	40	✓			Coding	
784321	27	<u>GGGACTGGCGCTGCG</u> <u>GGGGGTGATGGG</u>	31			✓	Coding	
785575	21	<u>GGGCGGGGGCGGGAC</u> <u>GCTGGG</u>	39			✓	Coding	
798533	27	<u>GGGAGACGGCGGGGG</u> <u>CGGGCGCCTGGG</u>	38	✓			Coding	
802022	23	<u>GGGTTTCAGGGGATGG</u> <u>GGCCGGG</u>	40		✓		Coding	
809954	21	<u>GGGAGTATAGGGGGG</u> <u>TTTGGG</u>	36					✓
814587	28	<u>GGGGCGGGTACGGGC</u> <u>AGGCGCCGCTGGG</u>	33		✓		Non-coding	
815156	22	<u>GGGTTCTGCGGGCGGG</u> <u>GCGGGG</u>	38		✓		Non-coding	
815715	20	<u>GGGGGGGCGTGGGAG</u> <u>AAGGG</u>	39	✓			Non-coding	
819858	27	<u>GGGCGCCGAGGGCCG</u> <u>CAGGGTTCCGGG</u>	40					✓
824499	30	<u>GGGCGAGGGTGGTGG</u> <u>CGAGCAGGGTGCGGG</u>	33	✓			Non-coding	
830077	25	<u>GGGTAAAGCCCCAGG</u> <u>GTGGGCGGGG</u>	33	✓			Non-coding	
834707	24	<u>GGGCGGGGCGCAGTC</u> <u>GCCGGGGGGG</u>	32	✓			Coding	
837151	23	<u>GGGGCCAGGGTGGGC</u> <u>CAGCAGGG</u>	37	✓			Non-coding	

840140	25	<u>GGGACGGACGAGGGG</u> <u>ATTCGGGGGG</u>	34		✓		Coding	
841669	24	<u>GGGCGGTGGTCGGGG</u> <u>TGCGGGGGG</u>	34	✓			Non-coding	
842860	29	<u>GGGCTGTACGGGCCG</u> <u>GGCCGCCCGCCGGG</u>	35		✓		Coding	
847188	19	<u>GGGTGGGGACCGGG</u> <u>GGGG</u>	40		✓		Coding	
848143	26	<u>GGGCGCCAGAGCGGG</u> <u>ACGGCGGGGGG</u>	33		✓		Coding	
852875	30	<u>GGGCGGCTGCGGGCC</u> <u>AATGCGGGGCAAGGG</u>	39		✓		Coding	
858466	22	<u>GGGTGGGAAGGGGAC</u> <u>GCATGGG</u>	37	✓			Non-coding	
867855	29	<u>GGGCTGATGTGGGGG</u> <u>CTGGGTTTACTGGG</u>	39		✓		Coding	
879515	26	<u>GGGCAGGTCCTTGGGG</u> <u>TCGGGCGGGG</u>	35		✓		Non-coding	
886782	30	<u>GGGTAAGGGGAGAAA</u> <u>GCAATAGGGAAGGG</u>	34			✓	Coding	
890385	21	<u>GGGGGGCGGGTTCATC</u> <u>GCGGG</u>	34	✓			Coding	
895956	30	<u>GGGCTGCCCCGTGGGCG</u> <u>AGGGCGTCTTCGGG</u>	37			✓	Coding	
896896	23	<u>GGGTTGGGCGTTGAAG</u> <u>GGCTGGG</u>	37	✓			Coding	
897298	29	<u>GGGGAGGGGCAGCTC</u> <u>GGTCAGGGCGCGGG</u>	34		✓		Non-coding	
897783	27	<u>GGGGGGCTGCGGGCG</u> <u>GAGTCATGCGGG</u>	31	✓			Non-coding	
898728	21	<u>GGGAACGGGTGTGGG</u> <u>TGGGGG</u>	42					✓
901352	22	<u>GGGTGGGCGGGCTGT</u> <u>GGCTGGG</u>	35			✓	Coding	
907734	30	<u>GGGCCGACCACGTTGG</u> <u>GGTCGGGGGCCGGG</u>	34		✓		Non-coding	
908492	23	<u>GGGCAGCGGGCCGGG</u> <u>AGGCAGGG</u>	39		✓		Non-coding	
913079	30	<u>GGGACTGGGCAGCGG</u> <u>CGTAGATGGGGAGGG</u>	31					✓
915296	30	<u>GGGAGGGCGGCACCG</u> <u>GGCTGCTCGGACGGG</u>	33		✓		Coding	
925159	27	<u>GGGGCGTGGGCGGCG</u> <u>AGCCGGGGCGGG</u>	35		✓		Coding	
935274	26	<u>GGGAGGACGGGCAGC</u> <u>CGGGAGACGGG</u>	41					✓
942617	27	<u>GGGCCTGTGCGGGATC</u> <u>GGGAAAAAGGG</u>	38	✓			Non-coding	

956822	18	<u>GGGCGGGGAAGGGCA</u> <u>GGG</u>	42			✓	Non-coding	
956864	28	<u>GGGCCACCGCCGGGA</u> <u>AGTCGGGGTGGGG</u>	37		✓		Non-coding	
958716	21	<u>GGGCGGGCCGTCAGG</u> <u>GGCGGG</u>	37					✓
971086	17	<u>GGGATGGGACGGGGG</u> <u>GG</u>	41			✓	Coding	
973183	24	<u>GGGGTAAGGGGCTGG</u> <u>GGGATGGGG</u>	62					✓
974303	27	<u>GGGCTGGGACGAACG</u> <u>CGCCGGGCTGGG</u>	33			✓	Coding	
984364	23	<u>GGGCTCAGCGGGTTGG</u> <u>CGGGGGG</u>	36		✓		Non-coding	
988127	29	<u>GGGAGCGGGAACGAC</u> <u>GACGCTGGGACGGG</u>	32	✓			Coding	
992541	29	<u>GGGCTGGGATACGGG</u> <u>GTTGACCCTGCGGG</u>	34	✓			Coding	
993506	17	<u>GGGCGGTGGGCGGGG</u> <u>GG</u>	38			✓	Coding	
1008415	21	<u>GGGCGGGGGTCTGGG</u> <u>CGTGGG</u>	42	✓			Non-coding	
1009227	28	<u>GGGTGCGTGACCGGGT</u> <u>GCGGGCGGCGGG</u>	36			✓	Coding	
1009312	24	<u>GGGTGGGCGGGTTTTG</u> <u>TTGTTGGG</u>	33					✓
1010856	22	<u>GGGCAGGTGGGCGGG</u> <u>CAGCGGG</u>	38	✓			Coding	
1012137	24	<u>GGGACCGGGCGGCTG</u> <u>CTGGGCGGG</u>	35			✓	Coding	
1015007	19	<u>GGGACGGGGCGCGGG</u> <u>TGGG</u>	40		✓		Coding	
1021282	21	<u>GGGCGAAGGGCGGGA</u> <u>GCAGGG</u>	39	✓			Coding	
1023360	22	<u>GGGCCGGTGGGGGGC</u> <u>GCCGGGG</u>	37		✓		Coding	
1024574	22	<u>GGGCGCGGCGGGCGG</u> <u>GGTCGGG</u>	38	✓			Non-coding	
1024707	16	<u>GGGCGGGCGGGCAGG</u> <u>G</u>	41	✓			Non-coding	
1025172	22	<u>GGGCGCTGGGCCGGG</u> <u>GCGTGGG</u>	41		✓		Coding	
1027961	26	<u>GGGTAGCTGGGAAAG</u> <u>GGCGGCGTGGG</u>	39			✓	Non-coding	
1028718	23	<u>GGGCGCGGGCGGCGG</u> <u>GCGGCGGG</u>	41		✓		Non-coding	
1029276	27	<u>GGGGTGGGCATCGTGC</u> <u>GGGTGAGCGGG</u>	36	✓			Coding	

1032980	28	<u>GGGCGCTCAAGCTCAG</u> <u>CCGGGTGGGGGG</u>	27			✓	Coding	
1036522	26	<u>GGGCCAGGGTGGCGG</u> <u>CGTCGGGCGGG</u>	33		✓		Non-coding	
1037745	30	<u>GGGCGAACGGGTTTG</u> <u>ATTTCGGGACCTGGG</u>	37	✓			Coding	
1041413	29	<u>GGGTTTGCAGGGCGGC</u> <u>GAGGGCGGCGGGG</u>	41	✓			Non-coding	
1054316	27	<u>GGGTGGGCGACGGCG</u> <u>GGCTGATTCTGGG</u>	36		✓		Coding	
1065004	28	<u>GGGTGGAGGTGCGGG</u> <u>TCGGGGACGTGGG</u>	36		✓		Coding	
1065265	19	<u>GGGAAAGGGTGGGGA</u> <u>AGGG</u>	41			✓	Coding	
1065301	23	<u>GGGTGGGGGAGAAGG</u> <u>GGTGAGGG</u>	41			✓	Coding	
1068276	29	<u>GGGTCAAAGGGGGCG</u> <u>GCTAGGCAGGGGGG</u>	32					✓
1069556	24	<u>GGGGGCTGGGCAACG</u> <u>GGGAATGGG</u>	42	✓			Coding	
1076200	24	<u>GGGGGGGATTGTAGC</u> <u>AGGGGCGGG</u>	34					✓
1084787	23	<u>GGGGGGCATCGGCCT</u> <u>GGGACGGG</u>	33		✓		Coding	
1088094	29	<u>GGGCCTGCCGAAGGC</u> <u>AGGGGTGAGGGGGG</u>	29					✓
1090041	25	<u>GGGCGGCAGGGCAGG</u> <u>GGCGTTAGGG</u>	40			✓	Non-coding	
1095246	20	<u>GGGCGGGTAGTCCGG</u> <u>GCGGG</u>	37			✓	Non-coding	
1096383	29	<u>GGGGCTGGGGAGCCG</u> <u>GGTGGAGCGGCGGG</u>	37			✓	Coding	
1098113	30	<u>GGGCAGCGGGGCGGC</u> <u>GCGGGGCGCGTCGGG</u>	40		✓		Non-coding	
1099585	18	<u>GGGGTGGGGTGGGCC</u> <u>GGG</u>	42					✓
1102048	30	<u>GGGGTGGTGGGGCGG</u> <u>TGAGGGGCTGGCGGG</u>	42			✓	Coding	
1106642	25	<u>GGGCGGGCGCTTGGG</u> <u>GAGAAAGTGGG</u>	37	✓			Non-coding	
1108140	24	<u>GGGGTAAGGGGCTGG</u> <u>GGGATGGGG</u>	62					✓
1109653	29	<u>GGGGCGCGGGGTGAG</u> <u>GCTCGGGCACGGGG</u>	38	✓			Non-coding	
1112270	29	<u>GGGCTACAGCCGGGC</u> <u>GCGGGCGCAGCGGG</u>	37		✓		Coding	
1113631	30	<u>GGGTGGGGCTGGTGC</u> <u>GGGACTGAGAGTGGG</u>	35			✓	Coding	

1113954	24	<u>GGGGTAAGGGGCTGG</u> <u>GGGATGGGG</u>	62					✓
1117046	29	<u>GGGTCGTCGATGACCG</u> <u>GGCGGGTGTGGG</u>	31		✓		Non-coding	
1118771	21	<u>GGGGGGCAGCAGGGT</u> <u>GGCGGG</u>	37		✓		Coding	
1120889	29	<u>GGGCCTGGGACGGGC</u> <u>CACCCCGGACTGGG</u>	32	✓			Coding	
1121206	27	<u>GGGGGCGGGGCTGGG</u> <u>CCTGTCGGCGGG</u>	36	✓			Coding	
1124747	30	<u>GGGCTTCTCGGGGACG</u> <u>ACGGGGGGAACGGG</u>	42	✓			Non-coding	
1128536	25	<u>GGGTGTCAGGGCCGG</u> <u>GGTGTGTCAGGG</u>	40			✓	Non-coding	
1139366	27	<u>GGGCCTGAAGCAGGG</u> <u>CGTCGGGCGGGG</u>	35	✓			Non-coding	
1142144	22	<u>GGGTAGGGTATGGGC</u> <u>GTTAGGG</u>	39	✓			Non-coding	
1146228	30	<u>GGGGTCGAGGGCGGT</u> <u>GGGCTGGTCGGCGGG</u>	37	✓			Non-coding	
1160726	26	<u>GGGTGCTGGGGGGGT</u> <u>AGGAAAAAGGG</u>	34			✓	Coding	
1161171	24	<u>GGGGTAAGGGGCTGG</u> <u>GGGATGGGG</u>	62					✓
1168256	24	<u>GGGCGCGGGTGCGGG</u> <u>CGAGCAGGG</u>	39		✓		Non-coding	
1168568	22	<u>GGGCCAGGGCCAGGG</u> <u>CGGCGGG</u>	41	✓			Non-coding	
1168646	28	<u>GGGAAGGGAGTGAAA</u> <u>ATGGGGAGGCGGG</u>	35					✓
1181269	27	<u>GGGCTGGGCCAGGCG</u> <u>GGCTGCTGCGGG</u>	37	✓			Non-coding	
1195319	21	<u>GGGCGCCGGGGTGGG</u> <u>CACGGG</u>	40		✓		Non-coding	
1205714	26	<u>GGGCACGCGGGGCTG</u> <u>GGTCAGGAGGG</u>	39		✓		Non-coding	
1211028	18	<u>GGGTCAGGGCCAGGG</u> <u>GGG</u>	39	✓			Non-coding	
1211434	20	<u>GGGCAGTGGGGCGGG</u> <u>TGGGG</u>	40	✓			Coding	
1216236	25	<u>GGGCGCCGTCTGGGGC</u> <u>CGGGGCGGG</u>	36	✓			Coding	
1218502	30	<u>GGGTGCGCCGGGTCCA</u> <u>GTCGGGGGGCAGGG</u>	40		✓		Coding	
1219908	20	<u>GGGCTGGTGGGCGGG</u> <u>GCGGG</u>	38			✓	Coding	
1229448	23	<u>GGGCGGTGAGGGGGG</u> <u>CTTCAGGG</u>	36	✓			Non-coding	

1230778	30	<u>GGGCATGGGGGCAGC</u> <u>ATAGCGGGCGCAGGG</u>	37	✓			Non-coding	
1233913	28	<u>GGGCCGCCGGATTCTG</u> <u>GGTCGGGGCGGG</u>	32		✓		Non-coding	
1240554	21	<u>GGGCCAGAGCGGGGG</u> <u>GCAGGG</u>	35	✓			Non-coding	
1247054	20	<u>GGGCTGGCGGGGGGC</u> <u>GTGGG</u>	37			✓	Coding	
1250708	24	<u>GGGCAGGAATCAGGG</u> <u>GGGGCGGGG</u>	34	✓			Non-coding	
1251318	26	<u>GGGTTTGGGGCAAAG</u> <u>AGGGTTTAGGG</u>	40					✓
1255642	29	<u>GGGCCGGGCCAGGGA</u> <u>GTCTCAAGGCTGGG</u>	32					✓
1256531	23	<u>GGGGGGGCGGGCTAT</u> <u>GTACTGGG</u>	34	✓			Non-coding	
1259898	25	<u>GGGAAAAAGAATCGG</u> <u>GCCTGGGGGGG</u>	32			✓	Non-coding	
1265051	24	<u>GGGCGAGCGGCAGGG</u> <u>GAGGGCGGG</u>	34	✓			Non-coding	
1265104	27	<u>GGGTCAGGGTAGAGC</u> <u>AGCCGGGCCCGGG</u>	34					✓
1271133	24	<u>GGGGATAGGGGTTTG</u> <u>GGGTTGGGG</u>	62					✓
1274856	30	<u>GGGAAGCAAAAAGGG</u> <u>GTGGGGACAGGC</u> <u>GGG</u>	36					✓
1275767	19	<u>GGGAAGGGCTGGGCA</u> <u>AGGG</u>	41					✓
1280619	28	<u>GGGCCACGCGGGGGT</u> <u>CTTCGGGGTCGGG</u>	38		✓		Non-coding	
1285139	25	<u>GGGAAGTCTAGGGTA</u> <u>CGGGCGGGGGG</u>	38				Coding	✓
1287965	23	<u>GGGTGGGTCAGGGGA</u> <u>AGCAAGGG</u>	37				Coding	✓
1293506	28	<u>GGGCGTGGGGGCGGG</u> <u>CCGGCGAGCCGGG</u>	35		✓		Coding	
1303108	27	<u>GGGTCTGGGCGGCGGT</u> <u>CTGGGCCGGGG</u>	36	✓			Non-coding	
1303620	27	<u>GGGCGCTCGGCGGATT</u> <u>GGGCCGGGGGG</u>	29		✓		Coding	
1305943	27	<u>GGGGCGGCGGGTGCC</u> <u>GGGCACGACGGG</u>	40		✓		Coding	
1311375	24	<u>GGGAATCCGCAGGGC</u> <u>GAGGGCGGG</u>	35	✓			Non-coding	
1331449	27	<u>GGGAAAGGTCGTCAG</u> <u>GGGCAAGGGGGG</u>	31					✓
1336401	28	<u>GGGGCGCGGGCGCTG</u> <u>CAAGGGCTGGGGG</u>	38		✓		Coding	

1345039	27	<u>GGGGGGCGTCCGGGC</u> <u>AGGTCTAGTGGG</u>	32					✓
1345201	30	<u>GGGCATGTTAAGGCG</u> <u>GGGCGGGGCCAGGGG</u>	34					✓
1367115	25	<u>GGGCCATCGGTGGCG</u> <u>GGGGGCTGGG</u>	31			✓		
1373057	20	<u>GGGACGGGGGGAGCG</u> <u>GTGGG</u>	36					✓
1379494	30	<u>GGGCGAGGAACAGGG</u> <u>GGATGAGGGGGCGGG</u>	36	✓			Non-coding	
1392597	27	<u>GGGCGCCTCGCAGGG</u> <u>CGAAGGGCTGGG</u>	35		✓		Coding	
1395855	30	<u>GGGGCGCGGGACGTG</u> <u>GCCGGGCCGCTGGGG</u>	38	✓			Coding	
1397055	27	<u>GGGCCGCTGTGGGGG</u> <u>GCGTGATACGGG</u>	34					✓
1402131	27	<u>GGGCTTCGCGGGCCGG</u> <u>GGGCGTCAGGG</u>	40		✓		Non-coding	
1408357	21	<u>GGGAGCGGGTGCGGG</u> <u>CGCGGG</u>	42			✓	Non-coding	
1408397	30	<u>GGGGTGGGAAC TGGG</u> <u>GGCGTGTTGGCTGGG</u>	34			✓	Non-coding	
1410501	23	<u>GGGAGCGCGGCGGGG</u> <u>GGCGCGGG</u>	34		✓		Coding	
1415770	24	<u>GGGCGGGACGTGGGG</u> <u>CGGAGCGGG</u>	37		✓		Non-coding	
1416264	26	<u>GGGTCGGTGCGGGCC</u> <u>GGGGCGCCGGG</u>	38		✓		Non-coding	
1416396	27	<u>GGGACGGAGGGGTCA</u> <u>GCGGCGGGGGGG</u>	35		✓		Non-coding	
1416854	28	<u>GGGTCTGGTCCGGGGG</u> <u>CCGGGATGGGGG</u>	38					✓
1434101	28	<u>GGGAGGGTGAAAAGG</u> <u>CGCGGGGAGTGGG</u>	32					✓
1438444	23	<u>GGGCGCGGGGAGGGG</u> <u>CTGGAGGG</u>	40		✓		Coding	
1441037	26	<u>GGGCGCGGTCTGGGGC</u> <u>GGGCGGCTGGG</u>	37	✓			Non-coding	
1441159	29	<u>GGGCCGGGGTGGGCG</u> <u>CTCAGGGGAGCGGG</u>	39					✓
1441261	23	<u>GGGTCTTGAGGGCGG</u> <u>GGCCAGGG</u>	38			✓	Non-coding	
1449095	21	<u>GGGGGGCCTGCCGGG</u> <u>CGCGGG</u>	36		✓		Coding	
1449701	29	<u>GGGGCCAGCGGGCCG</u> <u>ATTGCCCGGGTGGG</u>	33		✓		Coding	
1453212	27	<u>GGGCCTGACGGGACC</u> <u>GGGCCTGATGGG</u>	39	✓			Non-coding	

1456033	20	<u>GGGTGGCGGGCCTGG</u> <u>GCGGG</u>	39		✓		Coding	
1462305	18	<u>GGGAGCGGGGGGCGT</u> <u>GGG</u>	39		✓		Non-coding	
1464934	25	<u>GGGCGCAGCGGGCAG</u> <u>GGTCGTGGGG</u>	38		✓		Non-coding	
1467822	21	<u>GGGTGAGGGGGTCGG</u> <u>GAAGGG</u>	40		✓		Non-coding	
1472895	29	<u>GGGTGCTCTGGCCGGG</u> <u>CAGGGTCAGCGGG</u>	34		✓		Non-coding	
1481666	17	<u>GGGCTGGGGCCGGGG</u> <u>GG</u>	39		✓		Coding	
1489442	27	<u>GGGCGAGTGGGAACG</u> <u>GCTGAAGGGGGG</u>	32		✓		Coding	
1490943	22	<u>GGGCTGCTGTTGGGCG</u> <u>GGCGGG</u>	35	✓			Coding	
1491074	27	<u>GGGCCGGGGGGCGGC</u> <u>GCGGCTCTCGGG</u>	29		✓		Coding	
1493354	27	<u>GGGCGCGTCGCCGGG</u> <u>CTTGGGCGCGGG</u>	36			✓	Non-coding	
1493480	30	<u>GGGAGCAGCGGGTGC</u> <u>GGGGGTCGCCTTGGG</u>	40		✓		Non-coding	
1500273	25	<u>GGGTGGTACAGGCCG</u> <u>GCGGGCAGGG</u>	33	✓			Non-coding	
1500539	25	<u>GGGTTCAACTCACGGG</u> <u>TGGGCGGGG</u>	33					✓
1502326	25	<u>GGGCGGGCGTCGGCG</u> <u>TGGGCGCGGG</u>	34		✓		Non-coding	
1504003	27	<u>GGGCTGGGCGGGATA</u> <u>AGGCCAGACGGG</u>	31	✓			Non-coding	
1504119	27	<u>GGGCCGGGAACGCGG</u> <u>GCGAGAGCAGGG</u>	36	✓			Non-coding	
1522031	21	<u>GGGGCGGGGCGGGCA</u> <u>GCCGGG</u>	39		✓		Non-coding	
1522457	25	<u>GGGCATGGGGGGGCC</u> <u>TCCCTTTGGG</u>	34	✓			Non-coding	
1527062	24	<u>GGGAAAGGGTGGGGA</u> <u>AACGAAGGG</u>	37					✓
1529756	25	<u>GGGTCACGGGGGGCA</u> <u>CCCAAACGGG</u>	33					✓
1540511	27	<u>GGGCGCCAGGGCGTT</u> <u>GGGGTGGGCGGG</u>	42		✓		Coding	
1541161	18	<u>GGGCGCCGGGCCGGG</u> <u>GGG</u>	38		✓		Non-coding	
1541699	27	<u>GGGATACTCCGGGTTG</u> <u>TGGGTCATGGG</u>	39	✓			Non-coding	
1543722	30	<u>GGGCGCGCACGCGGG</u> <u>CCGGGGAATAGAGGG</u>	36	✓			Non-coding	

1545477	23	<u>GGGCACGGCGGGCCG</u> <u>GGTGTGGG</u>	38		✓		Coding	
1545978	28	<u>GGGCGGCGTCTGGGTC</u> <u>AGCCGGGGCGGG</u>	36		✓		Coding	
1546191	27	<u>GGGGAGGGCATGGCT</u> <u>GGGGCTGGTGGG</u>	37			✓	Coding	
1552367	29	<u>GGGCCGGGCCGGGGC</u> <u>AAAAGCGCTCAGGG</u>	32		✓		Non-coding	
1552901	27	<u>GGGCGGCGCTGC</u> <u>GGG</u> <u>CTCGGGCGGGGG</u>	36		✓		Non-coding	
1558638	22	<u>GGGCGAAGGGGCCGG</u> <u>GGCCGGG</u>	41					✓
1559186	25	<u>GGGCCGGGTGAGCCG</u> <u>GGAACGGGGG</u>	38		✓		Coding	
1565855	30	<u>GGGCGGCGCGGGCCT</u> <u>GGGCTTCGGCGCGGG</u>	36		✓		Non-coding	
1568583	22	<u>GGGCCAGGGTGTGGG</u> <u>TCGCGGG</u>	41	✓			Non-coding	
1575686	25	<u>GGGCGGCGGGCCGGG</u> <u>TGGCGCTGGG</u>	37		✓		Coding	
1575795	28	<u>GGGGGGCGCGGTGCG</u> <u>GGAGAGCAACGGG</u>	34		✓		Coding	
1586233	21	<u>GGGCGGGTTGATGGG</u> <u>GCTGGG</u>	38			✓	Non-coding	
1587327	24	<u>GGGGGGCAGGTTGAG</u> <u>CGGGTTGGG</u>	32			✓	Non-coding	
1598351	30	<u>GGGTGCGCGGGCGTC</u> <u>AGGTCGGGCTGAGGG</u>	37	✓			Non-coding	
1601135	24	<u>GGGCGCGGGCCTGGG</u> <u>CTTCGTGGG</u>	39		✓		Coding	
1602587	27	<u>GGGCTTTCTGGGGCCG</u> <u>AACGGGGCGGG</u>	37	✓			Coding	
1605336	22	<u>GGGCGGCGGGGCAGG</u> <u>GGCCGGG</u>	41			✓	Coding	
1606442	16	<u>GGGCGGGGGGTAAGG</u> <u>G</u>	39	✓			Non-coding	
1607310	24	<u>GGGGAGGGCGGAGCG</u> <u>GGGCGCGGG</u>	38	✓			Non-coding	
1607377	28	<u>GGGCCGGTGGGTTTT</u> <u>GAGGGGCTTGGG</u>	39					✓
1612532	25	<u>GGGTCTGCGGGAGGC</u> <u>GTGGGCGGGG</u>	38		✓		Non-coding	
1613028	27	<u>GGGGCTGGGCGTCCA</u> <u>AGCGGGCGCGGG</u>	36	✓			Non-coding	
1613218	30	<u>GGGAGGGAACCGGGC</u> <u>GGCGGACGACCAGGG</u>	30					✓
1629236	29	<u>GGGCCGGGCCGAAGG</u> <u>CGGAGGGGCGCGGG</u>	33			✓	Coding	
1640542	15	<u>GGGTGGGCGGGCGGG</u>	42		✓		Coding	

1642704	28	<u>GGGCGACTTCGCTGGG</u> <u>GGTGGGCAAGGG</u>	35		✓		Non-coding	
1654814	27	<u>GGGGGGCCGCGCCAG</u> <u>TTTCCGGGTGGG</u>	28		✓		Coding	
1655522	30	<u>GGGCTGGGGTTTTCAC</u> <u>GCGGGGTACGAGGG</u>	36		✓		Non-coding	
1657985	29	<u>GGGGAGGGCGGGCAG</u> <u>TGAGACGGGCAGGG</u>	35		✓		Non-coding	
1658126	21	<u>GGGCCGGGCGGGGGC</u> <u>GCCGGG</u>	40		✓		Non-coding	
1660498	27	<u>GGGGCCGGGTGCTGA</u> <u>CCGGGGCGCGGG</u>	37		✓		Coding	
1665014	27	<u>GGGCGTGGCCGCCGG</u> <u>CGGGGGGCGGGG</u>	29			✓	Coding	
1666017	30	<u>GGGCCGGGCACTGGG</u> <u>ACACAGTGAGCGGG</u>	32		✓		Coding	
1667186	30	<u>GGGGGGCCTGCGCGG</u> <u>AGCACGGGGCTTGGG</u>	28					✓
1667290	30	<u>GGGCGCAGCGGGCGC</u> <u>TGGGCGCGCGGCGGG</u>	38	✓			Coding	
1686027	27	<u>GGGCCC GCATCCGGGC</u> <u>AGGGGTGGGGG</u>	36	✓			Non-coding	
1687644	29	<u>GGGGCAGGGA AAAAG</u> <u>GCATGGGCGCAGGG</u>	35	✓			Non-coding	
1689536	29	<u>GGGCGCTCAGGCGGG</u> <u>CCAGGGTGCTGGGG</u>	36		✓		Non-coding	
1691775	30	<u>GGGCAGGGCCAGGAC</u> <u>GGGTCATAGAACGGG</u>	35	✓			Non-coding	
1694603	27	<u>GGGTGATGTTGGGGTT</u> <u>GGGCTGGCGGG</u>	38	✓			Non-coding	
1696571	23	<u>GGGGGGCTGGGTGGA</u> <u>CGGACGGG</u>	33		✓		Coding	
1697951	27	<u>GGGCGGGCTGGGCAT</u> <u>CGCCGCCTCGGG</u>	31		✓		Coding	
1700616	18	<u>GGGCGTCGGGGGGTT</u> <u>GGG</u>	38	✓			Non-coding	
1701507	27	<u>GGGGCGGGCGTCTGGG</u> <u>TCGTCTGAAGGG</u>	35					✓
1701586	24	<u>GGGTAGGAGGAAGGG</u> <u>GGGCGTGGG</u>	33					✓
1702604	26	<u>GGGTAGAGGCCGGGCA</u> <u>GGGTCGTCGGG</u>	37	✓			Non-coding	
1703381	29	<u>GGGGCGAGGAAGGGC</u> <u>CAAAAATGGGAGGG</u>	35	✓			Non-coding	
1703458	20	<u>GGGAAAGGGGCGAGG</u> <u>GGGGG</u>	39					✓
1705631	28	<u>GGGCGGGTGGGCAGT</u> <u>TCGCTGCGCTGGG</u>	29	✓			Coding	

1708994	20	<u>GGGATGGTGGGCGGG</u> <u>TCGGG</u>	38		✓		Non-coding	
1715897	30	<u>GGGATGAGGTTTCGCT</u> <u>GGGCCGGGCGCTGGG</u>	31					✓
1716191	24	<u>GGGGATAGGGGTTTG</u> <u>GGGTTGGGG</u>	62					✓
1723087	25	<u>GGGGGGGAGATGTCA</u> <u>AGGGGGCGGG</u>	34					✓
1725908	26	<u>GGGGGACAGGGCTGG</u> <u>CGGGGTCCGGG</u>	41					✓
1726299	28	<u>GGGCGAGGGCGAGCA</u> <u>CCTCGGGCCGGGG</u>	35		✓		Non-coding	
1728759	26	<u>GGGCTCGGAGACGGG</u> <u>CGCGGGGCGGG</u>	35		✓		Non-coding	
1730508	27	<u>GGGCAAGGGCGGTCA</u> <u>GGGTCAGATGGG</u>	39	✓			Non-coding	
1734703	29	<u>GGGCAGCGGCGCGAA</u> <u>GGGACGGGTGAGGG</u>	32		✓		Non-coding	
1736781	29	<u>GGGCGGCGTTTCCCCG</u> <u>TTGGGCGGGCGGG</u>	28					✓
1738958	25	<u>GGGCCGGGCACGTTG</u> <u>GGCGCGAGGG</u>	38		✓		Non-coding	
1742531	24	<u>GGGCATCGTGGGCTGG</u> <u>GGCGTGGG</u>	39		✓		Coding	
1749010	25	<u>GGGCTGCGGGAAGTGG</u> <u>GGTGTGAGGG</u>	41		✓		Coding	
1750173	25	<u>GGGTAGGGCATGGAG</u> <u>CGGCGGGGGG</u>	31					✓
1757664	30	<u>GGGGAGGGCGCTGCA</u> <u>AAGCAGCGGGAGGGG</u>	30					✓
1769219	16	<u>GGGACTGGGTGGGGG</u> <u>G</u>	39		✓		Coding	
1770055	19	<u>GGGTGAGGGGTGGGA</u> <u>GGGG</u>	41			✓	Coding	
1770340	24	<u>GGGGTAAGGGGCTGG</u> <u>GGGATGGGG</u>	62					✓
1779127	27	<u>GGGCATCGGCGGGCT</u> <u>GCTGGGCGTGGG</u>	38		✓		Coding	
1791615	16	<u>GGGCTAGGGCGGGGG</u> <u>G</u>	39			✓	Coding	
1813874	23	<u>GGGCGCGCCGGGCGC</u> <u>TGGGCGGG</u>	37		✓		Coding	
1819651	26	<u>GGGTGGGCAGAGGTC</u> <u>TGGGACATGGG</u>	34	✓			Non-coding	
1821014	24	<u>GGGGAAGGGCGGCGG</u> <u>CGGGCGGGG</u>	37					✓
1821642	30	<u>GGGCCTTAGCGTTGGG</u> <u>GCGGCGGGCCGGGG</u>	35	✓			Non-coding	

1822897	22	<u>GGGCGAGGGCTGCCG</u> <u>GGTCGGG</u>	39		✓		Non-coding	
1823688	28	<u>GGGCGGGACGGAATG</u> <u>GGCGAAAGGAGGG</u>	35		✓		Non-coding	
1824098	22	<u>GGGCTTCTCGGGGTTT</u> <u>GGGGGG</u>	36	✓			Non-coding	
1845255	27	<u>GGGCGCGGCGGGGAT</u> <u>TCTGGGCCAGGG</u>	39	✓			Coding	
1849203	27	<u>GGGATAGGGTGCGTG</u> <u>GGCGGTGGTGGG</u>	38			✓	Non-coding	
1855011	30	<u>GGGCCGGGTGCCGAG</u> <u>GTCACCGGGGTCGGG</u>	31		✓		Non-coding	
1857281	30	<u>GGGCGGGCAGGGGTC</u> <u>AAACAGGGGCGCGGG</u>	39					✓
1858646	25	<u>GGGCAGCGTCAGGGC</u> <u>GAGGGCCGGG</u>	36					✓
1858854	26	<u>GGGGCTGTGGGGGGTT</u> <u>AAATTTCGGG</u>	33					✓
1860590	30	<u>GGGGCGGGCCGTGCC</u> <u>CCACAGCGGGTCGGG</u>	30		✓		Non-coding	
1866552	25	<u>GGGATCGGGTGAAGG</u> <u>GGCGACGGGG</u>	40	✓			Non-coding	
1868843	28	<u>GGGCGCGGGAGCTGA</u> <u>CGGGGGATGAGGG</u>	38					✓
1869057	27	<u>GGGCGCGGGCCAGCG</u> <u>GGTGGTGTAGGG</u>	38		✓		Non-coding	
1869917	23	<u>GGGCACGAGGGCGAG</u> <u>GGCCTGGG</u>	40			✓	Coding	
1874647	25	<u>GGGGCGCGGGCTCGC</u> <u>CGGGTTCGGG</u>	39			✓	Non-coding	
1876287	24	<u>GGGGGCCGGGTTCGG</u> <u>GGCGCTGGG</u>	42	✓			Non-coding	
1876379	25	<u>GGGGTGCGGGGCGGG</u> <u>GGGTTTGGGG</u>	63					✓
1876996	23	<u>GGGGTAGGGGGTTGG</u> <u>GGGTGGGG</u>	62					✓
1877289	29	<u>GGGCCAATCAGGGCCT</u> <u>CGGCGGGGTCGGG</u>	38			✓	Non-coding	
1883202	24	<u>GGGGAAGGGCAACTC</u> <u>GGGCGCGGG</u>	39		✓		Non-coding	
1896089	30	<u>GGGCGTGCGGGCACA</u> <u>GGTGGGCGACACGGG</u>	40		✓		Coding	
1899264	24	<u>GGGAATGCCGGGGCG</u> <u>GGCCAGGGG</u>	38					✓
1902251	20	<u>GGGGGGGCTGGGCAC</u> <u>CTGGG</u>	38			✓	Coding	
1904260	24	<u>GGGGTAAGGGGCTGG</u> <u>GGGATGGGG</u>	62					✓

1908221	20	<u>GGGTGGGCGGGCTGCT</u> <u>CGGG</u>	37		✓		Coding	
1911562	26	<u>GGGGGCGGGCCGCGC</u> <u>CGGGCAGTGGG</u>	38					✓
1915358	23	<u>GGGCCGAGCAGGGCG</u> <u>GCGTGGG</u>	36		✓		Non-coding	
1922376	27	<u>GGGTGGCGGGGCAGT</u> <u>TCGGGGTGCGGG</u>	40		✓		Coding	
1922988	21	<u>GGGAAATGGGATGGG</u> <u>GACGGG</u>	40					✓
1925081	27	<u>GGGCGGGGCCAAAGC</u> <u>GGGCATGAAGGG</u>	37		✓		Coding	
1963551	22	<u>GGGCGACGCGGGCGG</u> <u>GAGCGGG</u>	37	✓			Non-coding	
1971291	25	<u>GGGATAGGGACCGAG</u> <u>TTGGGCGGGG</u>	36			✓	Non-coding	
1972298	14	<u>GGGCGGGGGGCGGG</u>	41	✓			Non-coding	
1975971	30	<u>GGGCGACGGGCTACC</u> <u>GGGCGTTCTCGCGGG</u>	37	✓			Coding	
1987259	24	<u>GGGTGGCGGCGGGGG</u> <u>GCGTCTGGG</u>	35	✓			Non-coding	
1988747	25	<u>GGGCGTGGGGCGGGT</u> <u>GGTCGGCGGG</u>	36		✓		Coding	
1989179	29	<u>GGGCGTCGAAGTCGG</u> <u>GTCGGGCGCCTGGG</u>	34		✓		Coding	
1989551	26	<u>GGGCTTCACCGGGGCG</u> <u>GGAAGCTGGG</u>	37			✓	Coding	
1997397	26	<u>GGGAGGGGCGGGCGG</u> <u>AAAATCGTGGG</u>	32					✓
2000149	29	<u>GGGAGAGGGCCGGCA</u> <u>CGGGACAATGCGGG</u>	38					✓
2000302	21	<u>GGGCAAGGGCGTGGG</u> <u>CCGGGG</u>	42	✓			Coding	
2005986	26	<u>GGGGGCTGGGCAGTTC</u> <u>AGGGGCAGGG</u>	38					✓
2006071	28	<u>GGGTGTGGGTGGGCA</u> <u>GCGGGATGGCGGG</u>	39			✓	Non-coding	
2010168	20	<u>GGGGCCGGGGAGGGA</u> <u>AAGGG</u>	41	✓			Non-coding	
2010660	21	<u>GGGAGCAGGGCCGGG</u> <u>AACGGG</u>	40	✓			Non-coding	
2015906	30	<u>GGGATAGAAAAGCGA</u> <u>GAGGGCCGGGAAGGG</u>	30					✓
2019720	21	<u>GGGGGTGGGCGTTGG</u> <u>GCCGGG</u>	40	✓			Coding	
2030476	27	<u>GGGCGCGGCGGGGCG</u> <u>GGGGCTACCGGG</u>	40	✓			Non-coding	

2037621 *	22	<u>GGGCAGCGGGCCGGG</u> <u>TGGTGGG</u>	40				Coding	
2048609	29	<u>GGGCGAGGGAGAAGC</u> <u>GTGCTGGGAGCGGG</u>	34	✓			Coding	
2058291	22	<u>GGGACCGACAGGGGG</u> <u>GGCCGGG</u>	36	✓			Non-coding	
2058767	23	<u>GGGCGACAGGGGCAC</u> <u>CGGGCGGG</u>	38		✓		Non-coding	
2080065	25	<u>GGGCGCGCGGGCGCC</u> <u>GGGCGCCGGG</u>	41	✓			Non-coding	
2081062	23	<u>GGGCGGGGCAGGCGG</u> <u>GGTTGGGG</u>	39		✓		Non-coding	
2082331	28	<u>GGGCCAGGTAGCGGG</u> <u>CGCGGGGGTTCGGG</u>	36	✓			Non-coding	
2087521	27	<u>GGGGCGGGTGGTCCA</u> <u>CTCGGGGGCGGG</u>	34			✓	Non-coding	
2098560	26	<u>GGGGGGCAGGTCCTG</u> <u>GGGAGGCAGGG</u>	34	✓			Non-coding	
2099110	29	<u>GGGCCGGGGCGCGGT</u> <u>GCTGGGCGCCGGGG</u>	36			✓	Coding	
2101496	24	<u>GGGGTCTGGGCTGCGC</u> <u>GGGCGGGG</u>	38		✓		Coding	
2107781	17	<u>GGGGCGGGTGGGACG</u> <u>GG</u>	41	✓			Non-coding	
2132792	22	<u>GGGGGGCAAAGGGCA</u> <u>TAACGGG</u>	36	✓			Non-coding	
2135057	30	<u>GGGCCTGGGCGGCGTT</u> <u>GGCGCGGGTCTGGG</u>	33		✓		Non-coding	
2136461	17	<u>GGGCGGGCGGGCGTG</u> <u>GG</u>	40	✓			Non-coding	
2136483	27	<u>GGGCAGCGGCGGGCT</u> <u>GGGCGGCAAGGG</u>	37	✓			Non-coding	
2140256	27	<u>GGGGCGGGTGGGCGT</u> <u>GTACGTGCCGGG</u>	31		✓		Coding	
2149706	27	<u>GGGAGCCCTGGGGGC</u> <u>GCGGGTGACGGG</u>	40			✓	Non-coding	
2152949	24	<u>GGGCCGGGTGGACGC</u> <u>CTGGGTGGG</u>	34		✓		Coding	
2154964 *	30	<u>GGGGCCGGGACGCCG</u> <u>CCGGGCGGAAGCGGG</u>	37				Coding	
2155411	25	<u>GGGCAGGGCCGGGTC</u> <u>TACAAGTGGG</u>	35		✓		Coding	
2162851	26	<u>GGGCGGGGCGAGCCG</u> <u>GGCGTCGCGGG</u>	38		✓		Non-coding	
2163168	21	<u>GGGCGGGGTGAAGG</u> <u>GCTGGG</u>	39	✓			Non-coding	
2163217	29	<u>GGGCAGGATAGCGGG</u> <u>GGAAGGGGAATGGG</u>	37					✓

2163777	28	<u>GGGGTGGGGGGCAGT</u> <u>TTCTTGCTCAGGG</u>	28		✓		Non-coding	
2165611	20	<u>GGGCAGCGGGGCCGG</u> <u>GAGGG</u>	39		✓		Non-coding	
2180729	28	<u>GGGCGGGCGGGCACG</u> <u>GCAGCGTCATGGG</u>	29		✓		Coding	
2182178	25	<u>GGGTCCGGGTGGCGG</u> <u>GGCTGGAGGG</u>	40		✓		Coding	
2193310	21	<u>GGGTGCGGGGTGGGG</u> <u>TGGGGG</u>	42	✓			Non-coding	
2193355	19	<u>GGGCCGGGAATGGGA</u> <u>TGGG</u>	41					✓
2196974	23	<u>GGGAGAAGGGGCGGG</u> <u>GCGGCGGG</u>	41			✓	Coding	
2197285	24	<u>GGGGAGAGGGGTTTG</u> <u>GGGTTGGGG</u>	62					✓
2198189	29	<u>GGGACAAACGGGAAG</u> <u>GGGTGCTGAGCGGG</u>	37					✓
2203459	24	<u>GGGGCTGGGTCCGCA</u> <u>GGGCGCGGG</u>	39		✓		Non-coding	
2211655	20	<u>GGGCGCTCTCGGGGG</u> <u>GCGGG</u>	35		✓		Coding	
2213618	29	<u>GGGCATCGACCGGGC</u> <u>CGCGCTCGGGCGGG</u>	35		✓		Coding	
2218498	17	<u>GGGAGCGGGGCGGGG</u> <u>GG</u>	39		✓		Coding	
2219156	25	<u>GGGCTTTTTCGGGTTC</u> <u>GGGGGCGGG</u>	38	✓			Coding	
2220187	26	<u>GGGCAGGGCTACACC</u> <u>GGGGGCCTGGG</u>	37			✓	Coding	
2222843	27	<u>GGGTCAGCTTGGGGG</u> <u>GGCAAGCTGGGG</u>	36					✓
2224270	18	<u>GGGGGGCCGGGTCGT</u> <u>GGG</u>	38	✓			Non-coding	
2225693	23	<u>GGGGGGCGGCGGGGG</u> <u>CCTGAGGG</u>	36			✓	Coding	
2241116	30	<u>GGGTCCTGGGGGCTCA</u> <u>CACCAGCCGGGGGG</u>	30		✓		Coding	
2241550	28	<u>GGGCTGGGGGGTGCG</u> <u>CTGTATGGCCGGG</u>	28		✓		Coding	
2251964	30	<u>GGGCGAGCGCCTGGG</u> <u>CCTGGGCGCGGTGGG</u>	36		✓		Non-coding	
2253041	24	<u>GGGCGGGCGTCAGCA</u> <u>GGGCGAGGG</u>	35	✓			Non-coding	
2253099	24	<u>GGGTGGGCCTCCGGG</u> <u>GAATGAGGG</u>	37					✓
2256063	22	<u>GGGTGGGAAGGGTGG</u> <u>TCATGGG</u>	36			✓	Non-coding	

2257710	22	<u>GGGTCGCCGTGGGCG</u> <u>GGCAGGG</u>	36		✓		Non-coding	
2260748	27	<u>GGGCGGGCACCCGGG</u> <u>AGCTTCCCTGGG</u>	34					✓
2264419	28	<u>GGGTGGGCTTCGCGGC</u> <u>GGGGGACGCGGG</u>	34		✓		Coding	
2270075	28	<u>GGGCGTGGGACACCT</u> <u>GGGATTCGGCGGG</u>	38		✓		Coding	
2272545	27	<u>GGGCGGCGCTGAGCA</u> <u>TGGGGCGGGGGG</u>	29			✓	Coding	
2276969	20	<u>GGGAGATCGGGAAGG</u> <u>GGGGG</u>	38	✓			Non-coding	
2277258	24	<u>GGGGTAGGGGTTTG</u> <u>GGGGCGGGG</u>	62					✓
2282094	22	<u>GGGCACGGGGGGTGC</u> <u>TGTAGGG</u>	35		✓		Non-coding	
2286996	28	<u>GGGGGGCGGCGCATA</u> <u>CAGGCGGGGCGGG</u>	28	✓			Non-coding	
2287263	29	<u>GGGGGGTGCGGGGGC</u> <u>GGAAAGCTACCGGG</u>	30	✓			Coding	
2299141	29	<u>GGGGCCGGGCCTTTGG</u> <u>GGAAGAAGGCGGG</u>	37		✓		Non-coding	
2305622	26	<u>GGGTTGTCCATTTGG</u> <u>GTTGGGAGGG</u>	32	✓			Non-coding	
2308006	26	<u>GGGCTGGGGCTTGGGC</u> <u>TGCGGTTGGG</u>	37	✓			Non-coding	
2317365	29	<u>GGGCGGGCGCGTGAG</u> <u>CAAGGCGGGCCGGG</u>	29		✓		Coding	
2322075	25	<u>GGGCGGCGCAGGGCG</u> <u>GTGGGCCGGG</u>	37		✓		Coding	
2322410	24	<u>GGGCTGGGTTGGTGGG</u> <u>TGGCGGGG</u>	39		✓		Coding	
2323919	30	<u>GGGTGCGGGCGCTGCC</u> <u>GGGCGGCGAGCGGG</u>	37		✓		Coding	
2327670	24	<u>GGGCCGGGCGCGGGC</u> <u>GGCGGCGGG</u>	37		✓		Coding	
2343137	27	<u>GGGCGGCGGGGTGCG</u> <u>GGCACTGCTGGG</u>	39		✓		Coding	
2349561	23	<u>GGGCAGTTCCGGGGG</u> <u>GAACTGGG</u>	35			✓	Coding	
2351563	24	<u>GGGCATCGCGGGCATC</u> <u>ATGGGGGG</u>	36		✓		Coding	
2361618	27	<u>GGGCCTCGGGGTTGGG</u> <u>CTCGGCCCGGG</u>	37		✓		Non-coding	
2366837	25	<u>GGGTCACGGCCAGCG</u> <u>GGGGGGCGGG</u>	32			✓	Non-coding	
2373263	30	<u>GGGCCGGGCGCTGCTG</u> <u>GGGCGCCGCGCGGG</u>	36			✓	Coding	

2377390	29	<u>GGGGGGCTTTGACTTC</u> <u>GGGGTCAGCAGGG</u>	32					✓
2383989	27	<u>GGGTCGGGTCTGCTCT</u> <u>TGGGTCATGGG</u>	35	✓			Non-coding	
2388008	25	<u>GGGCGTTGGGGTTCGG</u> <u>GGTCCCAGGG</u>	41	✓			Non-coding	
2392581	24	<u>GGGCCGGCAACGTGG</u> <u>GCGGGCGGG</u>	33		✓		Coding	
2396782	23	<u>GGGACGCGGCGGGCC</u> <u>GGGCAGGG</u>	37	✓			Non-coding	
2401313	22	<u>GGGCGCGGGTTCGGGG</u> <u>GCCAGGG</u>	41		✓		Non-coding	
2403389	23	<u>GGGATTGCGGGCATGT</u> <u>GGGTGGG</u>	38			✓	Coding	
2406266	28	<u>GGGTACATCCGGGGCT</u> <u>GAGGGGGCCGGG</u>	39			✓	Coding	
2410603	21	<u>GGGTGGGGGGCCAGC</u> <u>GCTGGG</u>	34		✓		Coding	

*Indicates gene size <400bp.

Table S4: QGRS predicted putative G-quadruplexes in Chromosome II

Position	Length	QGRS	G-Score	Genomic location				
				Genic				Intergenic
				5'	Middle	3'	Strand	
7335	30	<u>GGGAAGCGGTGACCGG</u> <u>GTTGCGGGCGCGGG</u>	34		✓		Coding	
10198	21	<u>GGGTTCACGCGGGTGG</u> <u>GCGGG</u>	36			✓	Coding	
12062	22	<u>GGGGCAGGGGAGGGCT</u> <u>TGCGGG</u>	39			✓	Non-coding	
20352	22	<u>GGGCCGGGGCCCGGGC</u> <u>GCTGGG</u>	41	✓			Coding	
37131	25	<u>GGGTGCAGCTTACGGG</u> <u>TGAGGGGGG</u>	32		✓		Coding	
38023	21	<u>GGGGCGGGCAGTACGG</u> <u>GCGGG</u>	37		✓		Coding	
55890	27	<u>GGGCGTCGGGGCAGCC</u> <u>GGGGGGCAGGG</u>	42		✓		Non-coding	
57838	30	<u>GGGCGTCGAGGCGCGG</u> <u>GTGATGGGCCTGGG</u>	34		✓		Coding	
62164	30	<u>GGGCGGGCTGACCGAA</u> <u>AAGGGTGGTGAGGG</u>	32			✓	Non-coding	
68327	26	<u>GGGGGTGGGGTGCTCG</u> <u>GGGAGCGGGG</u>	60			✓	Non-coding	

75538	24	<u>GGGAAGGGGCAGGGG</u> <u>GAAGGCGGG</u>	40			✓	Coding	
77671	30	<u>GGGAGGGCGCGGGCTT</u> <u>CGCTGGCCGCCGGG</u>	29		✓		Non-coding	
80399*	23	<u>GGGAGGCGCGGGGGGC</u> <u>GACTGGG</u>	36				Coding	
80532*	19	<u>GGGAAGGGAGGGAAA</u> <u>CGGG</u>	39				Coding	
92165	29	<u>GGGCACGCTGAACTGG</u> <u>GAATGGGACGGGG</u>	34		✓		Coding	
103544	26	<u>GGGCAACTGGGTCAAG</u> <u>GGCCTGCGGG</u>	41		✓		Coding	
105720	28	<u>GGGCGGGCTGGGGGAG</u> <u>AGCCTCGCCGGG</u>	32		✓		Coding	
111641	25	<u>GGGCCTGGGCTGGGGT</u> <u>TGCCGTGGG</u>	38			✓	Coding	
124056	22	<u>GGGCGGCGGGGTGGGC</u> <u>GCAGGG</u>	40	✓			Non-coding	
126015	21	<u>GGGCCTCGGGGGGCAA</u> <u>TTGGG</u>	37	✓			Non-coding	
126709	25	<u>GGGCAAGCGGGCGCGC</u> <u>AGGGCCGGG</u>	38		✓		Non-coding	
127654	23	<u>GGGCGAGTGGGCGGGC</u> <u>CACCGGG</u>	38		✓		Non-coding	
128774	29	<u>GGGCCGGGGCAACGCA</u> <u>GCGAGGGTGCGGG</u>	34	✓			Non-coding	
137344	17	<u>GGGGCGGGCGGGCTGG</u> <u>G</u>	41			✓	Coding	
137747	22	<u>GGGCGACATCCGGGTG</u> <u>GGCGGG</u>	35	✓			Coding	
137897	26	<u>GGGTCGGGAAACGCGG</u> <u>GCGGCGCGGG</u>	38		✓		Coding	
149473	30	<u>GGGGGCCGGGCCGGGG</u> <u>CGTGCGAGCTGGG</u>	34	✓			Non-coding	
151650	25	<u>GGGCCGGGCTGGGCGG</u> <u>CTTGCTGGG</u>	35	✓			Non-coding	
157581	26	<u>GGGCCCAGGGGGGGAG</u> <u>CGGCGGTGGG</u>	34	✓			Non-coding	
157767	24	<u>GGGCAGGGAGCGGGGA</u> <u>AGGAAGGG</u>	38					✓
175261	28	<u>GGGTGAGGCCGGGTAC</u> <u>GCAGGGGCGGGG</u>	38	✓			Non-coding	

176445	27	<u>GGGCGCGGGCCTTTTC</u> <u>GGGTTCGAGGG</u>	38			✓	Non-coding	
177898	29	<u>GGGCACGAGCAGCGGC</u> <u>GGTTGGGCAGGG</u>	31	✓			Non-coding	
183681	28	<u>GGGACGAGTCGCAGGG</u> <u>GCCGGGCCGGGG</u>	35		✓		Coding	
186131	21	<u>GGGTGTGGGTCGGTGG</u> <u>GGGGG</u>	38			✓	Coding	
186653	24	<u>GGGCTGGGGCTGGGGG</u> <u>CTGGTGGG</u>	40		✓		Coding	
190001	21	<u>GGGGGGCAGCGGGTTG</u> <u>CTGGG</u>	37					✓
205598	29	<u>GGGGGGAAACAGAAAC</u> <u>TGGGTCAGGGGG</u>	31			✓	Non-coding	
211414	25	<u>GGGCGGCTCGGGCGCG</u> <u>GGCAGCGGG</u>	39	✓			Non-coding	
211453	29	<u>GGGCGGGGGCGTCTGG</u> <u>GCAGCGCAAGGG</u>	36	✓			Non-coding	
223741	27	<u>GGGCGCGGGAACGAGC</u> <u>GGGCGGCTGGG</u>	38	✓			Coding	
228672	21	<u>GGGTGGGGGCGGGCTG</u> <u>GTGGG</u>	39		✓		Coding	
229349	25	<u>GGGCAGGTCGGAGGGA</u> <u>GGGAGCGGG</u>	34					✓
237333	27	<u>GGGCTGGGACACCTTC</u> <u>GGGCCGCTGGG</u>	36		✓		Coding	
250829	24	<u>GGGAAAGTGGGGCGAC</u> <u>TGGGGGGG</u>	37					✓
255364	26	<u>GGGCAGAGGGGACCTG</u> <u>GGTAGAAGGG</u>	41					✓
260472	30	<u>GGGTGGGGGTGGGGTC</u> <u>GGAAACGCACAGGG</u>	31			✓	Non-coding	
281268	27	<u>GGGCGTGC GCAAGGGC</u> <u>GACCGGGTGGG</u>	34	✓			Coding	
284086	19	<u>GGGCTGCCGGGGGGGC</u> <u>GGG</u>	38		✓		Coding	
287301	30	<u>GGGCGCCAGTGTGGCG</u> <u>GACGGGCGGGCGGG</u>	27					✓
287949	27	<u>GGGCAGGGGGGGCGTC</u> <u>TCGCCGCCGGG</u>	31		✓		Non-coding	
289075	28	<u>GGGGAGGGGGTCATGC</u> <u>TGCCGGGGAGGG</u>	34					✓

291314	29	<u>GGGCGCGGCGGGCGCA</u> <u>GGGGCCGAACGGG</u>	41		✓		Coding	
291756	30	<u>GGGGGGCCGGGTGGAC</u> <u>GTGTACGGCGTGGG</u>	26		✓		Coding	
292937	26	<u>GGGCTTGTGGGAATTG</u> <u>CCGGGGCGGG</u>	37		✓		Coding	
294147	30	<u>GGGCGTGCCGGGTTCG</u> <u>AGGCGGGCACCGGG</u>	38		✓		Non-coding	
307809	28	<u>GGGCCGCACCGGGCAG</u> <u>GGCCGCTTCGGG</u>	37		✓		Coding	
309998	24	<u>GGGGATAGGGGTTTGG</u> <u>GGTTAGGG</u>	42					✓
325677	25	<u>GGGCAGAGGGTGTGCG</u> <u>GGACCGGGG</u>	41					✓
327735	28	<u>GGGACAGGGGCCGGGG</u> <u>CCTCCAGGCGGG</u>	36			✓	Non-coding	
329455	18	<u>GGGCGGGCAGCGGGTG</u> <u>GG</u>	39		✓		Non-coding	
331316	20	<u>GGGTCTGGGTCGGGCA</u> <u>GGGG</u>	41	✓			Non-coding	
332094	30	<u>GGGTGAGGGGGCAGGG</u> <u>TCGGTCATGTCGGG</u>	34	✓			Non-coding	
334513	26	<u>GGGCGGTGGCGGGCGC</u> <u>GGGATGCGGG</u>	38		✓		Coding	
345968	27	<u>GGGCATTGCGGGGGTG</u> <u>GCGGGCGTGGG</u>	39		✓		Coding	
346441	30	<u>GGGCCAGGGCCTGTTT</u> <u>TTCGGGCTGGGGGG</u>	35	✓			Coding	
347108	29	<u>GGGCGGGCCAGCCTGT</u> <u>GGGGCGCGGCGGG</u>	34		✓		Coding	
353121	30	<u>GGGCGGCGGGCCGGTG</u> <u>GGGACATTTCTGGG</u>	38	✓			Coding	
354704	28	<u>GGGCTGGGCCTCGCGC</u> <u>CGCTGGGGGGGG</u>	32		✓		Coding	
355862	25	<u>GGGACGAGGGCCAGGG</u> <u>CGCACCGGG</u>	39		✓		Coding	
377886	28	<u>GGGTCGAAGGGTCGGC</u> <u>GGGGTCGCCGGG</u>	41		✓		Non-coding	
378778	29	<u>GGGACGCTCGGGACGG</u> <u>GCGGACGCTTGGG</u>	35			✓	Non-coding	
382720	30	<u>GGGCTGGATGCTGCCG</u> <u>GGCAGCGGGCTGGG</u>	32		✓		Coding	

384784	30	<u>GGGTAAAAACCGCGAG</u> <u>GGAGGGGGCCAGGG</u>	33					✓
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*Indicates gene size <400bp.

Table S5: QGRS predicted putative G-quadruplexes in Mega Plasmid

Position	Length	QGRS	G-Score	Genomic location				
				Genic				Intergenic
				5'	Middle	3'	Strand	
13811	30	<u>GGGGTGGAGGGCGGGA</u> <u>GCGCTGCGTCTGGG</u>	31		✓		Coding	
14173	26	<u>GGGCCTGAGCTGGGAC</u> <u>CGGGTGCGGG</u>	37			✓	Coding	
26805	22	<u>GGGCGGCGGGCTCGGG</u> <u>CTCGGG</u>	41			✓	Coding	
28353	23	<u>GGGATGGGCGTGGGGC</u> <u>TGACGGG</u>	39		✓		Coding	
57618	30	<u>GGGGGGCAACGTTCTG</u> <u>GGTCAACGTCTGGG</u>	33			✓	Coding	
77035	29	<u>GGGGCAGGGCACACAG</u> <u>GGCGAGCTTCGGG</u>	37	✓			Non-coding	
94060	30	<u>GGGGCGGGCGTGCAGC</u> <u>CCCTGTGGGTGGG</u>	30	✓			Non-coding	
98481	22	<u>GGGGAGGGGAGAGGG</u> <u>GGCGGGG</u>	61					✓
99658	21	<u>GGGGGGTCAGGGGCGA</u> <u>GTGGG</u>	37			✓	Non-coding	
100101	29	<u>GGGTCAGGCATGGGGC</u> <u>GCCTCGGGCAGGG</u>	36	✓			Non-coding	
119788	25	<u>GGGTCGGGGTCCAGGG</u> <u>CCTGAAGGG</u>	39			✓	Non-coding	
162311	26	<u>GGGCGTGTACGCCGGG</u> <u>GAGGGTGGGG</u>	34	✓			Coding	
164899	28	<u>GGGTGCGTGGGGCCGC</u> <u>GCGCGGGCAGGG</u>	36			✓	Coding	

Table S6: QGRS predicted putative G-quadruplexes in Small Plasmid

Position	Length	QGRS	G-Score	Genomic location				
				Genic				Intergenic
				5'	Middle	3'	Strand	
8208	21	<u>GGGCAGGGGTGGGTCA</u> <u>CCGGG</u>	39	✓			Non-coding	
15294	29	<u>GGGATCTGGGGGGTAA</u> <u>ACGCACGGACGGG</u>	29		✓		Coding	
19044	29	<u>GGGTGGCCGCCGGGCA</u> <u>GGACGGGGTCTCGG</u>	37		✓		Coding	
22825	30	<u>GGGACTGGGCTACGGT</u> <u>CTGAGGGGAAAGGG</u>	34			✓	Coding	

Table S7: Functions of genes used in this study which have G4 motifs at different positions (3', 5' or intergenic) in the genome.

Protein(s) or [ORF(s)]	G4 motif location	Functions	References
RecN (DR_1477)	Towards 5' end	DNA double strand break repair	Reyes et al. 2010
ParA (DR_1685)	Towards 5' end	Regulate the number of copies during stress conditions.	Maurya et al. 2021
DprA (DR_0120)	Towards 5' end	Natural transformation and facilitate loading of RecA onto incoming ssDNA	Sharma et al. 2022
NAD(P)/FAD-dependent oxidoreductase (DR_A0328) (NFDO)	Towards 5' end	Redox homeostasis	Groot et al. 2022
DdrD (DR_0326)	Towards 3' end	DNA damage response	Tour et al. 2021
Tyrosine-type recombinase/integrase (DR_0513) (SSI)	Towards 3' end	DNA repair and recombination	Grainge I and Jayaram M. 1999

MBL fold metallo-hydrolase (DR_A0069)	Towards 3' end	Stress response	Wang et al. 2024
GuaD (DR_A0180)	Towards 3' end	Metabolic process (not explicitly identified in D. radiodurans)	Iwadate and Kato 2019
VOC family protein (DR_1695) MutL (DR_1696)	Intergenic	Stress response	Liang et al. 2017
		DNA mismatch repair pathway	Mennecier et al. 2004
DnaN (DR_001) DnaA (DR_002)	Intergenic	DNA replication and repair	Slade and Radman 2011
		DNA replication initiation	Maurya et al. 2021
Cation:Proton Antiporter (DR_1571) (CPA) MiaB (DR_1571)	Intergenic	Osmotic stress	Tsujii et al. 2020
		Thiolation and Methylation of tRNA	Hernández et al. 2027
ABC-F family ATP-binding cassette (DR_1103) (ABC-F)	Intergenic	mRNA translation	Ousalem et al. 2019
DUF2087 domain-containing protein (DR_1103)		Cell division	Goodacre et al. 2013