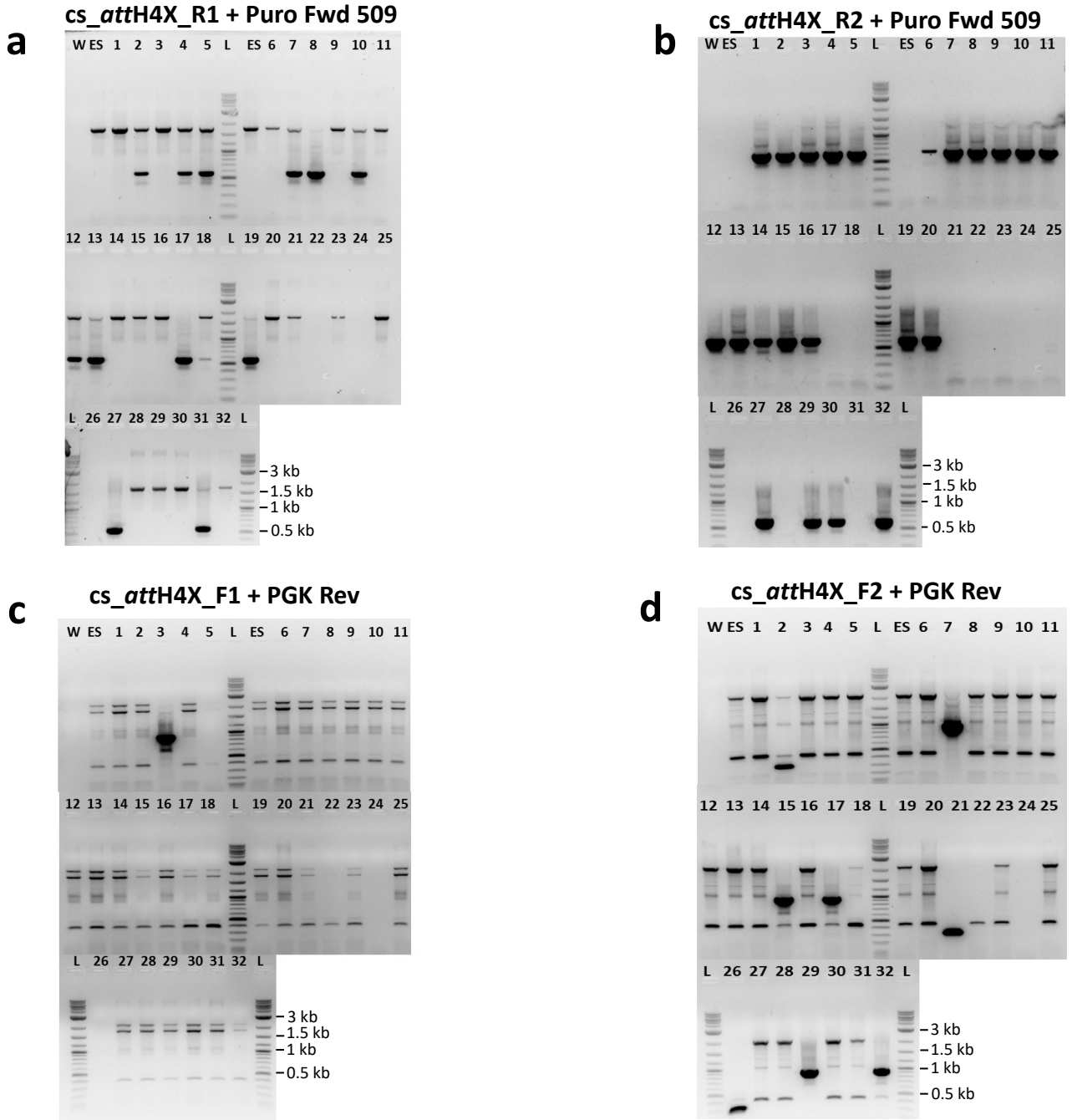
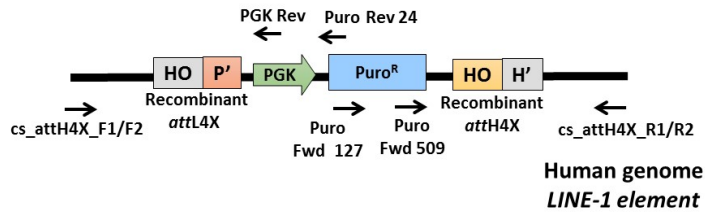


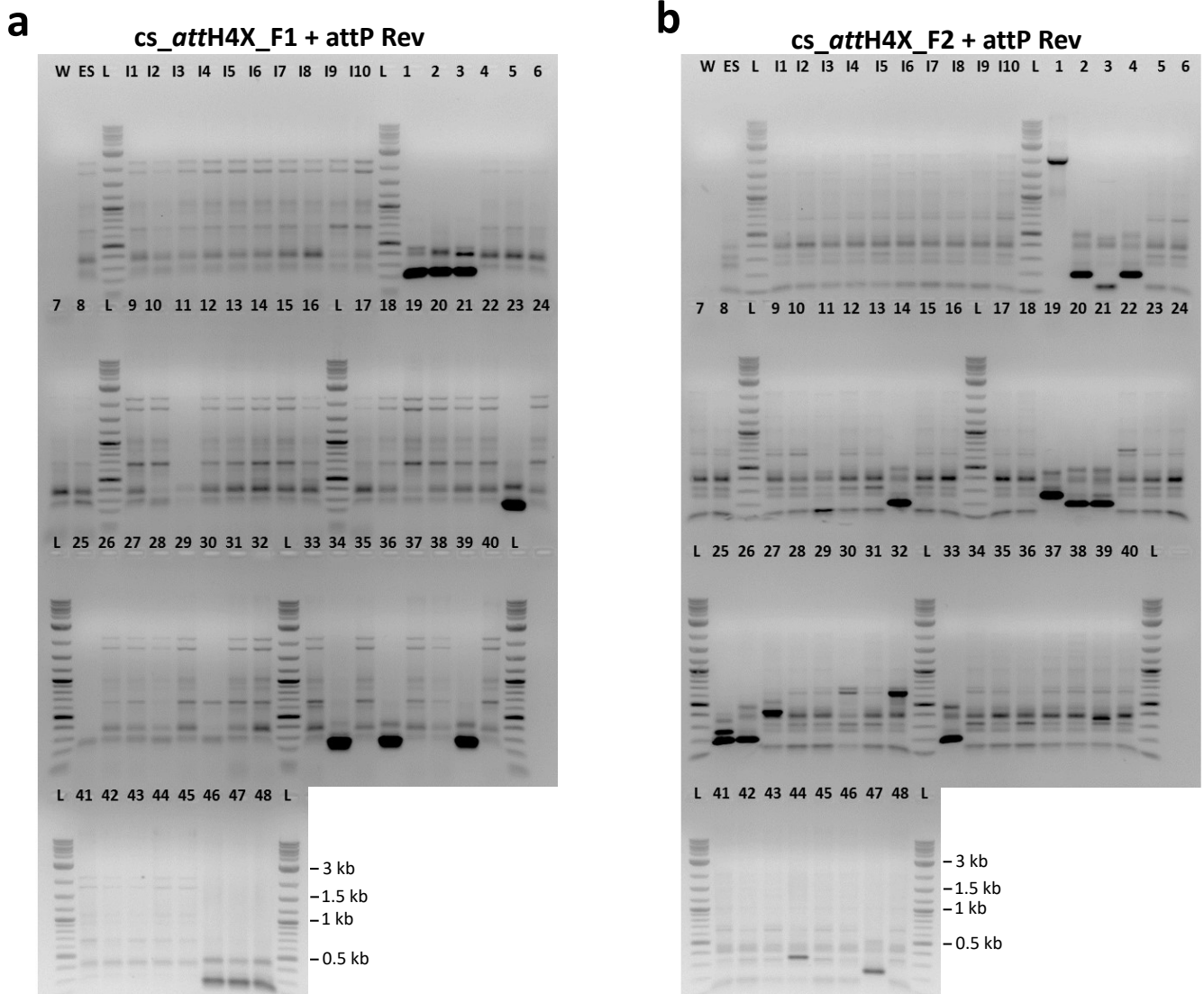
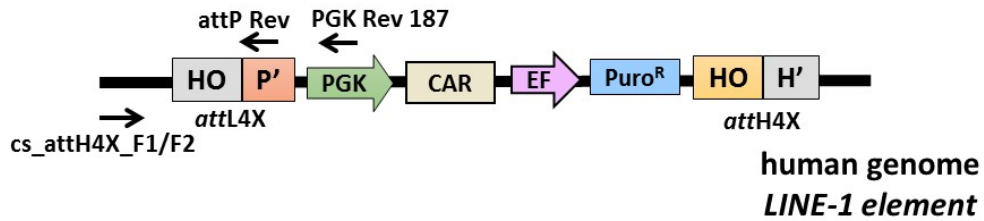
### Figure S1: Screening for *attH4X/attL4X* recombination events in HT1080 clones

PCR analysis of *attH4X* x *attL4X* recombination events using the genomic DNA from puromycin resistant clones obtained from targeting of seamless vector *attL4X-PGKssPuro* in HT1080 cells. Position of primers *cs\_attH4X\_R1*, *cs\_attH4X\_R2*, *cs\_attH4X\_F1*, Puro Fwd 127 and Puro Rev 24 to identify recombinant junctions after successful integration at *attH4X* in *LINE-1* elements are indicated. **a)** PCR screening with *cs\_attH4X\_R1* and Puro Fwd 127 (~950 bp) resulted in 32 positive clones. **b)** PCR-amplifications with *cs\_attH4X\_R2* and Puro Fwd 127 (~1000 bp) resulted in 33 positive clones. **c)** PCR with *cs\_attH4X\_F1* and Puro Rev 24 (~1100 bp) detected for 13 clones. W, no DNA template control; HT, genomic DNA from HT1080 parental cells; IN, genomic DNA from two puromycin resistant colonies obtained through co-transfection of 50ng of *attL4X-PGKssPuro* and 500ng of *pCMVssIna*; 1-92, genomic DNA from puromycin resistant clones obtained through co-transfection of 50ng of *attL4X-PGKssPuro* and 500ng of *pCMVssInt-C3CNLS*; M1, 1 kb DNA ladder.



**Figure S2: Screening for *attH4X/attL4X* recombination events in hES clones**

PCR screening of *attH4X* x *attL4X* recombination events using the genomic DNA from puromycin resistant clones obtained from targeting of seamless vector *attL4X-PGKssPuro* in hESCs. Recombinant junctions at *LINE-1* elements were identified in a screen involving semi-nested PCR with primers *cs\_attH4X\_R1/R2*, *cs\_attH4X\_F1/F2*, Puro Fwd 509, PGK Rev using the genomic DNA template from primary PCR (with primers Puro Fwd 127 and Puro Rev 24) as indicated. **a**) PCR amplification with *cs\_attH4X\_R1* and Puro Fwd 509 (~600 bp) resulted in 13 positive clones. **b**) PCR-amplifications with *cs\_attH4X\_R2* and Puro Fwd 509 (~700 bp) were detected for 22 clones. **c**) PCR screening with *cs\_attH4X\_F1* and PGK Rev (~800 bp) resulted in a single positive clone. **d**) PCR screening with *cs\_attH4X\_F2* and PGK Rev (~900 bp) resulted in 6 positive clones. W, no DNA template control; ES, genomic DNA from parental hESCs; 1-32, puromycin resistant clones obtained through co-transfection of 100ng of *attL4X-PGKssPuro* and 1 $\mu$ g of *pEFssInt-C3CNLS*; 1 kb DNA ladder.



**Figure S3: Screening of *attL4X-PGKssCAR-EF-Puro* targeting at *attH4X* in hESC clones**

PCR screening of *attH4X* x *attL4X* recombination events using the genomic DNA from puromycin resistant clones obtained from targeting of seamless vector *attL4X-PGKssCAR-EF-Puro* in hESCs. Recombinant *attL4X* junction at *LINE-1* elements were identified in a screen involving semi-nested PCR with primers *cs\_attH4X\_F1*, *cs\_attH4X\_F2*, *attP Rev* using the genomic DNA template from primary PCR (with primers *PGK Rev 187*) as indicated. **a)** PCR with *cs\_attH4X\_F1* and *attP Rev* (~220bp) resulted in 10 positive clones. **b)** PCR screening with *cs\_attH4X\_F2* and *attP Rev* (~280bp) resulted in 2 positive clones. W, no DNA template control; ES, genomic DNA from parental hESCs; I1-I10, puromycin resistant clones obtained through co-transfection of 100ng of *attL4X-PGKssCAR-EF-Puro* and 500ng of *pEFssInt-INA*; 1-48, puromycin resistant clones obtained through co-transfection of 100ng of *attL4X-PGKssCAR-EF-Puro* and 500ng of *pEFssInt-C3CNLS*; L, 1 kb DNA ladder.

**Table S1: List of Primers (5'-3')**

PstI_EGFP	GTACCTGCAGCCACCATGGTGAGCAAGGGCGAGGAGC
NotI_attH4X_NheI_bpa	CAGTGC GGCCG CCAACTTAATGAAATAAAGCAGGCTAGCCGACTCACTATAGGGCGA ATTGGAGC
Puro_fwd_PstI	CCAACTGCAGATGACCGAGTACAAG
Puro_rev_XbaI	GACTTCTAGATCAGGCACCGGGCTTGCGG
CAR_fwd_NcoI	CCACCATGGCCTTACCAGTGACCGC
CAR_rev_XbaI	GATATCTAGATTAGCGAGGGGGCAGGGCCTGCATG
HR_NheI_EF fwd	CGCCCTATAGTGAGTCGGCTAGCGGCTCCGGTGCCCGTCAGTG
HR_NheI_Bgh rev	CTTAATGAAATAAAGCAGGCTAGCGCCGCTACAGGGCGCGTGGGGAT
Puro fwd_BamHI_HR	GTAAGCTTGGTACCGAGCTCGGATCCCCACCATGACCGAGTACAAGCCCACGG
Puro rev_EcoRI_HR	GGCTGATCAGCGAGCTAGTGAATTCTCAGGCACCGGGCTTGCGGGTC
cs_attH4X_F1	GAGTGTTTTCCA ACTTGGTTCCATT
cs_attH4X_R1	AAAACACAGCACGAGA ACTTCGTGA
cs_attH4X_F2	CCTGTCTTGCTAGGTTGGGAAGT
cs_attH4X_R2	TAGAGGAATTGCTAACTAGAATAACCA
Puro Fwd 127	GAGCTGCAAGA ACTCTTCCTCAC
Biotinylated Puro Fwd 127	Biotin-GAGCTGCAAGA ACTCTTCCTCAC
Puro Rev 24	CACCGTGGGCTTGTACTCGGTC
PETF2-PH	PHOSPO-CATCGGTGATGTCGGCGATAT
Puro Fwd 128	CAACAGATGGAAGGCTCCTGG
petF2RC	ATATCGCCGACATCACCGATG
bpa1	GGACAGCAAGGGGGAGGATTG
PGK_rev	CAGGTGAATATCAAATCCTCCTCG
Puro Fwd 509	CTACGAGCGGCTCGGCTTCACC
PGK Rev 187	CTGACTAGGGGAGGAGTAGAAGTGG
attP_Rev	GACTGATAGTGACCTGTTGTTGTC

**Table S2: List of genomic coordinates and locations of targeted *attH4X* in corresponding *LINE-1* in HT1080 bulk cultures identified using different primer pairs**

<b>Samples</b>	<b>Genomic coordinates</b>	<b>Genomic locations</b>	<b><i>LINE-1</i> elements</b>
<b>Primers: cs_attH4X_R1 + Puro Fwd 127</b>			
C3_50	chr20:14027192-14027288	Intron of MACROD2 gene	L1PA10
C3_100	chr18:3698874-3698964	Intron of DLGAP1 gene	L1PA7
C3_200	chr20:14027192-14027288	Intron of MACROD2 gene	L1PA10
<b>Primers: cs_attH4X_R2 + Puro Fwd 127</b>			
C3_50	chr3:115752168-115752305	Intergenic	L1PA7
C3_100	chr3:115752168-115752305	Intergenic	L1PA7
C3_200	chr14:25137990-25138154	Intergenic	L1P3
<b>Primers: cs_attH4X_F1 + Puro Rev 24</b>			
C3_50	chr7:36257488-36257573	Intron of EEPD1 gene	L1PA7
C3_100	chr10:44267991-44268090	Intergenic	L1P2
C3_200	chr7:36257468-36257573	Intron of EEPD1 gene	L1PA7
<b>Primers: cs_attH4X_F2 + Puro Rev 24</b>			
C3_50	Insufficient sequencing data		
C3_100	chr3:17450647-17450731	Intron of TBC1D5 gene	L1P3
C3_200	chr15:38572194-38572340	Intergenic	L1PA7

**Table S3: List of genomic coordinates and locations of targeted *attH4X* in corresponding *LINE-1* in HT1080 clones identified using different primer pairs**

Clone #	Genomic coordinates	Genomic locations	<i>LINE-1</i> elements
<b>Primers: cs_attH4X_R1 + Puro Fwd 127</b>			
10	Insufficient sequencing data		
12	chr7:94821074-94821150	Intergenic	L1PA7
15	chr17:35525040-35525120	Intron of SLFN12L gene	L1PA7
17	chr7:54854768-54854843	Intergenic	L1PA7
18	Insufficient sequencing data		
19	Insufficient sequencing data		
21	chr3:66311241-66311321	Intron of SLC25A26 gene	L1PA8
22	chr7:143585724-143585804	Intergenic	L1P3
24	Insufficient sequencing data		
26	chr4:60158615-60158695	Intergenic	L1PA7
27	chr1:230475395-230475453	Intergenic	L1PA7
28	chr4:60158619-60158695	Intergenic	L1PA7
35	chr2:58169727-58169815	Intron of FANCL gene	L1P2
39	chr17:35525032-35525120	Intron of SLFN12L gene	L1PA7
41	chr1:113574938-113575026	Intron of MAGI3	L1PA8
42	chr17:35525040-35525120	Intron of SLFN12L gene	L1PA7
43	chr2:224486485-224486529	Intron of CUL3 gene	L1P3
44	chr3:66311241-66311285	Intron of SLC25A26 gene	L1PA8
45	chr3:156067904-156067987	Intergenic	L1PA7
46	chr17:35302490-35302566	Intergenic	L1PA7
47	chr2:224486454-224486529	Intron of CUL3 gene	L1P3
48	chr17:35302490-35302566	Intergenic	L1PA7
50	chr10:47432585-47432662	Intergenic	L1PA6
59	chr1:183683917-183683997	Intron of RGL1 gene	L1PA7
71	chr14:54406591-54406666	Intron of CDKN3 gene	L1P2
74	chr17:66156714-66156794	Intron of CEP112 gene	L1PA7
77	chr2:232036264-232036346	Intron of DIS3L2 gene	L1PA7
78	chr7:82491494-82491569	Intergenic	L1P2
79	chr11:10424843-10424917	Intergenic	L1PA7
80	chr3:169414717-169414803	Intron of MECOM gene	L1P3
82	chr3:169414720-169414795	Intron of MECOM gene	L1P3
89	chr2:58169739-58169815	Intron of FANCL gene	L1P2
<b>Primers: cs_attH4X_R2 + Puro Fwd 127</b>			
14	chr3:157803268- 157803384	Intergenic	L1PA7

15	Insufficient sequencing data		
17	chr7:54854762-54854913	Intergenic	L1PA7
25	chr3:817798-817909	Intron of LINC01266 gene	L1PA7
26	chr7:116744329-116744459	Intron of MET gene	L1PA7
27	chr1:230475373-230475514	Intergenic	L1PA7
39	chrX:44254389-44254542	Intron of EFHC2 gene	L1PA7
40	chr3:25361222-25361370	Intron of RARB gene	L1PA7
41	chr1:113574929-113575086	Intron of MAGI3 gene	L1PA8
42	chr2:6903558-6903715	Intergenic	L1PA7
44	chr3:125997822-125997973	Intergenic	L1P2
45	chr3:156067904-156068021	Intergenic	L1PA7
46	chr17:35302459-35302575	Intergenic	L1PA7
47	chr17:35302465-35302575	Intergenic	L1PA7
48	chr17:35302459-35302580	Intergenic	L1PA7
50	chr2:150193440-150193595	Intron of AC016682.1	L1PA7
52	chr6:23431503-23431654	Intergenic	L1PA8
54	chr12:101061624-101061772	Intron of ANO4 gene	L1PA7
59	chr1:183683908-183684064	Intron of RGL1 gene	L1PA7
65	Insufficient sequencing data		
66	Insufficient sequencing data		
67	chr2:210446661-210446782	Intron of LANCL1-AS1 gene	L1PA7
68	chrX:73893782-73893936	Intergenic	L1PA7
71	chr1:183683908-183684062	Intron of RGL1 gene	L1PA7
74	chr10:31567543-31567656	Intergenic	L1PA7
75	chr10:56762675-56762703	Intergenic	L1M4
76	chr3:157803265-157803418	Intergenic	L1PA7
77	chr2:232036264-232036422	Intron of DIS3L2 gene	L1PA7
78	chr7:82491485-82491620	Intergenic	L1P2
80	chr3:169414652-169414804	Intron of MECOM gene	L1P3
82	chr3:169414655-169414804	Intron of MECOM gene	L1P3
83	chr3:157803265-157803416	Intergenic	L1PA7
87	chr12:88438242-88438391	Intergenic	L1PA7
<b>Primers: cs_attH4X_F1 + Puro Rev 24</b>			
27	chr1:230475281-230475380	Intergenic	L1PA7
39	chrX:44254535-44254610	Intron of EFHC2 gene	L1PA7
40	chr2:39812312-39812427	Intergenic	L1PA7
41	chr1:113574820-113574937	Intron of MAGI3 gene	L1PA8
42	chr2:6903466-6903566	Intergenic	L1PA7
44	chr3:125997966-125998072	Intergenic	L1P2

45	chr3:156067809-156067893	Intergenic	L1PA7
46	chr17:35302567-35302667	Intergenic	L1PA7
48	chr17:35302567-35302679	Intergenic	L1PA7
65	chr3:1033771-1033879	Intergenic	L1PA8
71	chr6:80613523-80613618	Intergenic	L1PA6
77	chr7:36257468-36257573	Intron of EEPD1 gene	L1PA7
80	chr3:169414796-169414904	Intron of MECOM gene	L1P3



**Table S4: List of genomic coordinates of the targeted *attH4X* in HT1080 bulk culture along with their frequency of occurrence obtained using deep paired-end sequencing**

<b>Chromosome</b>	<b>Start</b>	<b>End</b>	<b>Counts</b>
10	47432566	47432842	14116
5	37655668	37655966	3562
11	86542419	86542586	3223
1	210886727	210886826	312
X	104143467	104143534	234
2	224486415	224486548	125
3	137376024	137376055	115
1	107845629	107845731	94
1	205900757	205900858	88
X	132864468	132864513	80
9	15050823	15050879	66
12	33493949	33494006	65
3	67541275	67541444	62
3	156067893	156067992	57
12	102493125	102493166	56
3	96092506	96092604	52
2	58169733	58169815	50
3	169414716	169414795	50
7	17353179	17353266	50
18	7712701	7712801	45
3	151886483	151886577	42
Y	19661244	19661283	41
10	109547670	109547704	40
11	3269140	3269321	40
GL000213.1	22304	22340	39
7	133969091	133969162	36
14	22687362	22687421	33
11	63394044	63394123	32
5	157722276	157722356	32
12	97866922	97866956	31
7	94821074	94821154	31
1	157346999	157347052	29
1	104058375	104058472	27

5	6648494	6648592	26
1	65742930	65742968	23
5	90032846	90032926	23
3	87652598	87652653	20
5	72981677	72981777	20
7	94968892	94968972	20
1	74015741	74015800	19
13	97594574	97594642	19
13	48395563	48395662	18
12	80082999	80083088	17
15	49006499	49006529	17
1	169409192	169409301	15
13	19653740	19653819	15
3	66894359	66894441	15
3	164162167	164162247	15
7	7392706	7392806	15
X	56195456	56195495	15
X	57272103	57272162	15
1	104587615	104587780	14
4	120510442	120510519	14
X	131657562	131657608	14
X	139064922	139065002	14
6	101063329	101063409	13
7	18011687	18011843	13
7	97052219	97052319	13
13	112815802	112815927	12
2	159823285	159823360	12
21	46631673	46631755	12
X	67831307	67831343	12
12	63338237	63338266	11
2	112613731	112613770	11
1	230475381	230475453	10
12	88438302	88438404	10
13	28782949	28783027	10
13	42451916	42451996	10
4	55168854	55168933	10

6	70805252	70805286	10
1	210963630	210963703	9
11	49964843	49964882	9
14	54406590	54406670	9
17	35525040	35525120	9
18	8150379	8150477	9
2	48301703	48301783	9
5	162328591	162328667	9
7	121292246	121292348	9
15	76097854	76097898	8
4	124013145	124013175	8
4	160341227	160341303	8
8	110255556	110255618	8
8	119378032	119378094	8
1	100821321	100821351	7
12	101061615	101061695	7
4	129054501	129054551	7
7	21928644	21928715	7
KI270728.1	1154641	1154677	7
X	76381100	76381131	7
X	117466937	117466996	7
1	174710046	174710098	6
10	91645492	91645572	6
3	133735635	133735717	6
4	127076083	127076145	6
6	106406212	106406289	6
8	65381296	65381361	6
X	21546258	21546334	6
X	43726512	43726618	6
X	57745517	57745556	6
X	112182436	112182578	6
Y	14270975	14271004	6
Y	18957360	18957395	6
11	110849041	110849087	5
11	110849113	110849266	5
18	44365737	44365816	5

2	175913051	175913206	5
2	212056109	212056189	5
21	14622503	14622533	5
4	20721077	20721108	5
4	174619360	174619541	5
5	126087347	126087376	5
8	69281522	69281599	5
8	106562303	106562382	5
9	78055601	78055630	5
10	75577221	75577300	4
12	90754213	90754277	4
12	94065653	94065705	4
12	112157957	112157999	4
14	37489209	37489378	4
18	70238091	70238130	4
2	101458962	101458992	4
3	3890347	3890418	4
3	66311241	66311295	4
3	121263557	121263723	4
4	100867544	100867574	4
6	122987530	122987610	4
7	11390351	11390423	4
8	48168112	48168142	4
9	104704788	104704871	4
X	39543352	39543502	4
X	54846100	54846213	4
X	65893404	65893434	4
X	93662021	93662101	4
1	92254099	92254179	3
1	173030869	173030919	3
10	64809195	64809267	3
10	108695078	108695158	3
10	109338348	109338377	3
11	48452541	48452580	3
12	20335360	20335429	3
13	42775696	42775751	3

13	49881048	49881124	3
13	112815595	112815726	3
19	32786675	32786705	3
2	62621158	62621289	3
2	72299236	72299271	3
2	189891984	189892064	3
20	18940603	18940682	3
3	14193528	14193567	3
3	29984162	29984238	3
3	132745905	132745935	3
3	132958085	132958155	3
3	151738746	151738785	3
3	161708398	161708480	3
3	189257757	189257833	3
4	2921883	2921961	3
4	52091040	52091227	3
4	129946708	129946748	3
4	138784371	138784406	3
5	55097912	55097941	3
5	72807787	72807867	3
5	130608117	130608199	3
6	64569326	64569404	3
6	129836807	129836836	3
7	42370174	42370204	3
7	126278796	126278826	3
8	70464804	70464834	3
9	77266893	77266924	3
9	86089508	86089570	3
9	106203067	106203115	3
9	135842204	135842260	3
X	25883671	25883751	3
X	66859096	66859158	3
X	72890882	72890961	3
X	76266404	76266576	3
X	77822728	77822791	3
X	114184815	114184894	3

X	123284616	123284662	3
Y	17244190	17244225	3
1	100201264	100201315	2
1	113574938	113575015	2
1	221048769	221048848	2
10	27588649	27588725	2
10	74607983	74608053	2
10	85279118	85279180	2
11	10964600	10964629	2
11	13991414	13991525	2
11	23485409	23485442	2
12	298882	298961	2
12	77287529	77287608	2
12	100303003	100303060	2
14	37189162	37189192	2
14	37631864	37631943	2
14	38600553	38600628	2
14	60528004	60528034	2
15	97584199	97584253	2
2	55836250	55836302	2
2	108430772	108430852	2
2	135517023	135517103	2
2	185687111	185687141	2
2	209242803	209242841	2
2	210985966	210986002	2
2	215989728	215989806	2
3	1062530	1062583	2
3	37430107	37430137	2
3	37659431	37659483	2
3	66293038	66293091	2
3	83107843	83107878	2
3	118321439	118321542	2
3	137318338	137318505	2
3	181003254	181003292	2
4	141164135	141164215	2
4	151596775	151596822	2

5	10179015	10179090	2
5	23187510	23187541	2
5	58607294	58607324	2
5	62036387	62036469	2
5	63091672	63091711	2
5	89801765	89801794	2
5	131897639	131897669	2
5	157425693	157425722	2
6	44880299	44880339	2
6	74034428	74034458	2
6	80684596	80684626	2
6	85203246	85203406	2
6	103523273	103523307	2
6	118839175	118839250	2
6	145674670	145674700	2
7	82491495	82491547	2
7	83628538	83628668	2
7	90550302	90550332	2
7	103404937	103405067	2
8	24163281	24163355	2
8	50991236	50991272	2
8	126458501	126458603	2
9	4468020	4468049	2
9	13793024	13793059	2
X	22233561	22233601	2
X	37529185	37529262	2
X	39279450	39279485	2
X	65065894	65065929	2
X	68777046	68777075	2
X	72829874	72829954	2
X	73893754	73893927	2
X	78231808	78231854	2
X	132450416	132450455	2
Y	19797122	19797152	2
Y	25135576	25135605	2
1	49653699	49653732	1

1	95798603	95798636	1
1	104058227	104058328	1
1	121585910	121585971	1
1	183683918	183683974	1
1	217381027	217381057	1
10	25620855	25620916	1
10	32501130	32501208	1
10	38188104	38188231	1
10	43835326	43835400	1
10	95933132	95933212	1
11	2497417	2497464	1
11	10340974	10341023	1
11	10951117	10951204	1
11	18993428	18993458	1
11	21696140	21696178	1
11	35023350	35023379	1
11	40849880	40849915	1
11	60010348	60010383	1
11	102818644	102818711	1
11	103911692	103911792	1
11	106757099	106757146	1
12	67554440	67554498	1
12	83682922	83682956	1
12	87419901	87419977	1
12	88668816	88668865	1
13	28692799	28692837	1
13	48138356	48138391	1
13	48417665	48417789	1
13	48674351	48674392	1
13	65108638	65108684	1
13	82954030	82954059	1
13	110078372	110078512	1
13	112815740	112815792	1
14	23943808	23943842	1
14	52595569	52595599	1
14	57099859	57100019	1



14	86047199	86047299	1
15	38802218	38802296	1
16	47773943	47773979	1
17	60765937	60765967	1
18	7867947	7868076	1
18	70922054	70922084	1
18	79082158	79082309	1
19	20989556	20989595	1
19	34566964	34567007	1
2	24536202	24536232	1
2	37940636	37940717	1
2	114303065	114303136	1
2	115893829	115893883	1
2	115964762	115964810	1
2	138797304	138797352	1
2	157705827	157705877	1
2	160627322	160627351	1
2	175710458	175710523	1
2	179630901	179630930	1
2	181749287	181749327	1
2	195952731	195952831	1
2	197749565	197749643	1
2	198686171	198686206	1
20	5240493	5240528	1
20	7319855	7319984	1
20	13053739	13053800	1
20	17412412	17412441	1
21	32220857	32220891	1
3	1654266	1654320	1
3	4244989	4245018	1
3	19681438	19681508	1
3	25932828	25932925	1
3	26322798	26322827	1
3	58677350	58677405	1
3	61262568	61262723	1
3	79049279	79049308	1

3	101923796	101923853	1
3	110496407	110496461	1
3	119131435	119131463	1
3	131043495	131043524	1
3	132607456	132607536	1
3	162248018	162248047	1
3	173383511	173383568	1
4	36438850	36438880	1
4	52152806	52152868	1
4	54826081	54826116	1
4	62570692	62570725	1
4	63590979	63591014	1
4	88540328	88540357	1
4	89089117	89089159	1
4	93931541	93931585	1
4	105298432	105298463	1
4	105410291	105410324	1
4	106470321	106470368	1
4	127462897	127462977	1
4	134441891	134441921	1
4	149340304	149340484	1
4	158901718	158901771	1
4	161116977	161117008	1
4	180469748	180469818	1
4	188673825	188673905	1
5	11671624	11671722	1
5	12154880	12154930	1
5	12673020	12673064	1
5	34446538	34446577	1
5	36466573	36466648	1
5	43964701	43964750	1
5	64475460	64475491	1
5	111715962	111716031	1
5	156784195	156784224	1
5	171021523	171021680	1
6	4406975	4407041	1

6	6071466	6071497	1
6	6669546	6669575	1
6	23259034	23259078	1
6	29361162	29361192	1
6	54328854	54328905	1
6	56205318	56205396	1
6	57289186	57289215	1
6	61184838	61184882	1
6	62087944	62087999	1
6	64897837	64897887	1
6	76098911	76098978	1
6	80241002	80241031	1
6	80432412	80432451	1
6	84822318	84822357	1
6	85877646	85877676	1
6	85891427	85891480	1
6	93835946	93836020	1
6	115479811	115479840	1
6	117646938	117646991	1
6	118422412	118422441	1
6	120815032	120815057	1
6	127412009	127412038	1
6	130172958	130173105	1
6	143034121	143034146	1
6	143856165	143856214	1
6	144507015	144507087	1
6	147252460	147252491	1
6	161177395	161177424	1
7	9168104	9168133	1
7	24353484	24353539	1
7	31928150	31928200	1
7	40933685	40933715	1
7	76993700	76993783	1
7	81479819	81479849	1
7	111704966	111705023	1
7	123855950	123856021	1

8	9817216	9817350	1
8	59382190	59382229	1
8	60449422	60449474	1
8	62977446	62977510	1
8	94126185	94126228	1
8	112875671	112875814	1
9	1394768	1394814	1
9	19766048	19766097	1
9	21650599	21650633	1
9	27784005	27784102	1
9	75326431	75326480	1
9	100618372	100618401	1
9	114871042	114871112	1
X	3983375	3983414	1
X	6974962	6975007	1
X	8936147	8936182	1
X	17573430	17573465	1
X	55094658	55094689	1
X	55605269	55605348	1
X	55673094	55673123	1
X	56675050	56675084	1
X	56810500	56810557	1
X	57480993	57481029	1
X	64476702	64476737	1
X	64660959	64660990	1
X	78373062	78373133	1
X	81065026	81065055	1
X	96428324	96428357	1
X	108943152	108943212	1
X	110658261	110658296	1
X	110972904	110972974	1
X	113734752	113734813	1
X	115984351	115984421	1
X	122062343	122062461	1
X	148180774	148180871	1
X	155320936	155320974	1

Y	3594102	3594143	1
Y	15618152	15618191	1
Y	15853088	15853128	1
Y	20675850	20675879	1
Y	22498980	22499009	1

**Table S5: Location of targeted *attH4X* sequences in corresponding *LINE-1* in hESC clones identified using different primer pairs**

Clone #	Genomic coordinates	Genomic locations	<i>LINE-1</i> elements
<b>Primers: cs_attH4X_R1 + Puro Fwd 509</b>			
2	chr1:183683917-183684005	intron of RGL1 gene	L1PA7
4	chr8:99415140-99415208	intron of VPS13B gene	L1PA7
5	chr12:101061623-101061687	intron of ANO4 gene	L1PA7
7	chr2:6903549-6903642	Intergenic	L1PA7
8	chr7:54854750-54854843	Intergenic	L1PA7
10	chr7:54854750-54854857	Intergenic	L1PA7
12	chr6:23431494-23431600	Intergenic	L1PA8
13	chr2:6903549-6903622	Intergenic	L1PA7
17	chr2:58169734-58169833	intron of FANCL gene	L1P2
19	chrX:44254483-44254552	intron of EFHC2 gene	L1PA7
27	chr20:13053749-13053819	intron of SPTLC3	L1P3
31	chr7:54854750-54854843	Intergenic	L1PA7
<b>Primers: cs_attH4X_R2 + Puro Fwd 509</b>			
1	chr12:72781550-72781631	Intergenic	L1P3
2	chr12:101061615-101061782	intron of ANO4 gene	L1PA7
3	chr12:101061615-101061765	intron of ANO4 gene	L1PA7
4	chr10:31567534-31567630	Intergenic	L1PA7
5	chr12:101061615-101061782	intron of ANO4 gene	L1PA7
7	chr3:157803256-157803426	Intergenic	L1PA7
8	chr11:96488217-96488387	Intron of JRKL-AS1 gene	L1PA6
9	chr12:101061615-101061782	intron of ANO4 gene	L1PA7
10	chr12:101061615-101061782	intron of ANO4 gene	L1PA7
11	chr3:157803256-157803426	Intergenic	L1PA7
12	chr3:157803256-157803426	Intergenic	L1PA7
13	chr2:73509950-73510120	Intron of ALMS1 gene	L1PA7
14	chr17:35302478-35302584	intergenic	L1PA7
15	chr3:157803256-157803426	Intergenic	L1PA7
16	chr3:157803256-157803426	Intergenic	L1PA7
19	chr7:54854750-54854920	Intergenic	L1PA7
20	chr3:157803256-157803426	Intergenic	L1PA7
27	chr3:157803256-157803413	Intergenic	L1PA7

29	chr12:101061615-101061782	intron of ANO4 gene	L1PA7
30	chr3:157803256-157803426	Intergenic	L1PA7
32	chr12:44898931-44899037	intron of NELL2	L1PA7
<b>Primers: cs_attH4X_F1 + PGK Rev</b>			
3	chr3:156067764-156067893	Intergenic	L1PA7
<b>Primers: cs_attH4X_F2 + PGK Rev</b>			
7	chr2:159357384-159357465	Intron of BAZ2B gene	L1PA7
15	chr2:159357384-159357515	Intron of BAZ2B gene	L1PA7
17	chr2:159357384-159357490	Intron of BAZ2B gene	L1PA7
29	chr2:159357384-159357485	Intron of BAZ2B gene	L1PA7
32	chr2:159357384-159357505	Intron of BAZ2B gene	L1PA7

**Table S6: Location of *attH4X* sequences in corresponding *LINE-1* in hESC clones targeted with anti-CD19-CAR seamless vector identified using different primer pairs**

Clone #	Genomic coordinates	Genomic locations	<i>LINE-1</i> elements
<b>Primers: cs_attH4X_F1 + attP Rev</b>			
1	chr12:88438383-88438489	Intergenic	L1PA7
2	chr12:88438383-88438495	Intergenic	L1PA7
3	chr12:88438383-88438496	Intergenic	L1PA7
23	chr3:156067805-156067912	Intergenic	L1PA7
34	chr2:153327436-153327543	Intergenic	L1PA7
36	chr3:156067805-156067911	Intergenic	L1PA7
39	chr12:88438384-88438497	Intergenic	L1PA7
46	chr12:88438384-88438489	Intergenic	L1PA7
47	chr12:88438383-88438491	Intergenic	L1PA7
48	chr12:88438384-88438498	Intergenic	L1PA7
<b>Primers: cs_attH4X_F2 + attP Rev</b>			
19	chr2:159357384-159357546	Intron of BAZ2B gene	L1PA7
25	chr2:159357384-159357549	Intron of BAZ2B gene	L1PA7



**Table S7: Genomic coordinates and annotations of 933 *attH4X*-containing *LINE-1***

Serial #	Genomic coordinates	Genomic annotations	<i>LINE-1</i> elements
1	chr1:104052453-104058471	Intergenic	L1P3
2	chr1:106848665-106854683	Intergenic	L1PA7
3	chr1:108513472-108519490	Intergenic	L1PA8
4	chr1:115632200-115638218	Intergenic	L1PA7
5	chr1:157341002-157347020	Intergenic	L1PA7
6	chr1:157657044-157663062	Intergenic	L1P2
7	chr1:158425760-158431778	Intergenic	L1PA7
8	chr1:163985551-163991569	Intergenic	L1PA7
9	chr1:164190913-164196931	Intergenic	L1PA7
10	chr1:164495894-164501912	Intergenic	L1P3
11	chr1:166545171-166551189	Intergenic	L1PA7
12	chr1:170450774-170456792	Intergenic	L1PA7
13	chr1:171354951-171360969	Intergenic	L1PA7
14	chr1:179689756-179695774	Intergenic	L1PA7
15	chr1:181264613-181270631	Intergenic	L1PA7
16	chr1:181954606-181960624	Intergenic	L1PA7
17	chr1:186505142-186511160	Intergenic	L1PA7
18	chr1:194654292-194660310	Intergenic	L1PA7
19	chr1:199594876-199600894	Intergenic	L1MA4
20	chr1:199628259-199634277	Intergenic	L1PA7
21	chr1:213705241-213711259	Intergenic	L1PA7
22	chr1:218646503-218652521	Intergenic	L1PA7
23	chr1:221042849-221048867	Intergenic	L1PA7
24	chr1:227545122-227551140	Intergenic	L1PA4
25	chr1:48166046-48172064	Intergenic	L1PA7
26	chr1:51000638-51006656	Intergenic	L1P3
27	chr1:55425980-55431998	Intergenic	L1PA7
28	chr1:60322090-60328108	Intergenic	L1PA7
29	chr1:65704276-65710294	Intergenic	L1P3
30	chr1:65736931-65742949	Intergenic	L1PA7
31	chr1:74009780-74015798	Intergenic	L1P2
32	chr1:78198809-78204827	Intergenic	L1PA7
33	chr1:84438484-84444502	Intergenic	L1PA7
34	chr1:91181409-91187427	Intergenic	L1PA7
35	chr1:91421164-91427182	Intergenic	L1PA8
36	chr1:95792637-95798655	Intergenic	L1PA7
37	chr1:99154973-99160991	Intergenic	L1PA7
38	chr10:108943943-108949961	Intergenic	L1P4
39	chr10:126759772-126765790	Intergenic	L1PA7

40	chr10:22506958-22512976	Intergenic	LIPA7
41	chr10:27582725-27588743	Intergenic	LIPA7
42	chr10:28745949-28751967	Intergenic	LIPA7
43	chr10:31561533-31567551	Intergenic	LIPA7
44	chr10:43829307-43835325	Intergenic	LIP3
45	chr10:44261990-44268008	Intergenic	LIP2
46	chr10:47432567-47438585	Intergenic	LIPA6
47	chr10:52367959-52373977	Intergenic	LIP3
48	chr10:59202838-59208856	Intergenic	LIPA7
49	chr10:59465749-59471767	Intergenic	LIPA7
50	chr10:62777722-62783740	Intergenic	LIPA7
51	chr10:64803176-64809194	Intergenic	LIPA7
52	chr10:67715389-67721407	Intergenic	LIPA7
53	chr10:84644377-84650395	Intergenic	LIP2
54	chr10:85273119-85279137	Intergenic	LIPA7
55	chr10:91639572-91645590	Intergenic	LIPA7
56	chr11:10418823-10424841	Intergenic	LIPA7
57	chr11:110843042-110849060	Intergenic	LIP2
58	chr11:121780555-121786573	Intergenic	LIPA7
59	chr11:129462454-129468472	Intergenic	LIPA7
60	chr11:130969817-130975835	Intergenic	LIPA7
61	chr11:133877991-133884009	Intergenic	LIPA3
62	chr11:16722992-16729010	Intergenic	LIPA7
63	chr11:21690179-21696197	Intergenic	LIPA7
64	chr11:27266631-27272649	Intergenic	LIPA7
65	chr11:3263141-3269159	Intergenic	LIPA7
66	chr11:3308961-3314979	Intergenic	LIPA7
67	chr11:34733207-34739225	Intergenic	LIP3
68	chr11:37203837-37209855	Intergenic	LIPA7
69	chr11:37351977-37357995	Intergenic	LIPA7
70	chr11:38724840-38730858	Intergenic	LIPA7
71	chr11:38914066-38920084	Intergenic	LIPA7
72	chr11:44432731-44438749	Intergenic	LIPA7
73	chr11:48446542-48452560	Intergenic	LIPA7
74	chr11:49958880-49964900	Intergenic	LIP2
75	chr11:54623473-54629491	Intergenic	LIPA7
76	chr11:55404942-55410960	Intergenic	LIPA8
77	chr11:56028523-56034541	Intergenic	LIP3
78	chr11:58276040-58282058	Intergenic	LIPA7
79	chr11:62299366-62305384	Intergenic	LIP3
80	chr11:63254561-63260579	Intergenic	LIPA4

81	chr11:87793914-87799932	Intergenic	L1PA7
82	chr12:102487128-102493146	Intergenic	L1PA7
83	chr12:105006218-105012236	Intergenic	L1PA7
84	chr12:112151938-112157956	Intergenic	L1P3
85	chr12:1935239-1941257	Intergenic	L1P2
86	chr12:20329340-20335358	Intergenic	L1P3
87	chr12:22361350-22367368	Intergenic	L1PA7
88	chr12:27164602-27170620	Intergenic	L1PA7
89	chr12:33487984-33494002	Intergenic	L1PA7
90	chr12:38041858-38047876	Intergenic	L1P2
91	chr12:39724884-39730902	Intergenic	L1PA7
92	chr12:46032266-46038284	Intergenic	L1PA7
93	chr12:54805683-54811701	Intergenic	L1PA7
94	chr12:55350643-55356661	Intergenic	L1PA7
95	chr12:58421277-58427295	Intergenic	L1PA7
96	chr12:60615156-60621174	Intergenic	L1PA7
97	chr12:72775613-72781631	Intergenic	L1P3
98	chr12:73666797-73672815	Intergenic	L1P3
99	chr12:7278968-7284986	Intergenic	L1PA7
100	chr12:74671806-74677824	Intergenic	L1PA7
101	chr12:7589610-7595628	Intergenic	L1PA7
102	chr12:80077000-80083018	Intergenic	L1PA7
103	chr12:80108847-80114865	Intergenic	L1PA7
104	chr12:84036488-84042506	Intergenic	L1PA7
105	chr12:88432382-88438400	Intergenic	L1PA7
106	chr12:88662866-88668884	Intergenic	L1PA7
107	chr12:90748214-90754232	Intergenic	L1PA7
108	chr12:91237967-91243985	Intergenic	L1P3
109	chr12:91552198-91558216	Intergenic	L1P3
110	chr12:91552198-91558216	Intergenic	L1P3
111	chr12:97891024-97897042	Intergenic	L1PA7
112	chr13:110072544-110078562	Intergenic	L1PA7
113	chr13:22309174-22315192	Intergenic	L1P3
114	chr13:22629807-22635825	Intergenic	L1PA7
115	chr13:26098935-26104953	Intergenic	L1P3
116	chr13:28686799-28692817	Intergenic	L1PA7
117	chr13:28776930-28782948	Intergenic	L1PB1
118	chr13:29629386-29635404	Intergenic	L1PA7
119	chr13:29660988-29667006	Intergenic	L1PA3
120	chr13:39233757-39239775	Intergenic	L1P2
121	chr13:40705599-40711617	Intergenic	L1PA7

122	chr13:45615097-45621115	Intergenic	LIPA7
123	chr13:45633908-45639926	Intergenic	LIPA7
124	chr13:49875124-49881142	Intergenic	LIPA8
125	chr13:56758549-56764567	Intergenic	LIPA7
126	chr13:59287109-59293127	Intergenic	LIPA7
127	chr13:59372539-59378557	Intergenic	LIPA7
128	chr13:60895742-60901760	Intergenic	LIPA7
129	chr13:62604224-62610242	Intergenic	LIP3
130	chr13:63775141-63781159	Intergenic	LIPA7
131	chr13:64823434-64829452	Intergenic	LIPA7
132	chr13:68788613-68794631	Intergenic	LIPA7
133	chr13:70452713-70458731	Intergenic	LIPA7
134	chr13:79953503-79959521	Intergenic	LIPA7
135	chr13:81357938-81363956	Intergenic	LIPA7
136	chr13:81625069-81631087	Intergenic	LIPA7
137	chr13:97588620-97594638	Intergenic	LIP3
138	chr14:19813418-19819436	Intergenic	LIPA7
139	chr14:25132135-25138153	Intergenic	LIP3
140	chr14:26304328-26310346	Intergenic	LIPA7
141	chr14:30403200-30409218	Intergenic	LIPA7
142	chr14:31489935-31495953	Intergenic	LIP3
143	chr14:38261674-38267692	Intergenic	LIP3
144	chr14:38594534-38600552	Intergenic	LIPA7
145	chr14:40083917-40089935	Intergenic	LIPA7
146	chr14:44688314-44694332	Intergenic	LIPA7
147	chr14:45749348-45755366	Intergenic	LIPA7
148	chr14:52377561-52383579	Intergenic	LIP3
149	chr14:56358306-56364324	Intergenic	LIPA7
150	chr14:57946699-57952717	Intergenic	LIPA7
151	chr14:81536068-81542086	Intergenic	LIPA5
152	chr14:84648254-84654272	Intergenic	LIPA7
153	chr14:89097549-89103567	Intergenic	LIPA7
154	chr14:94145413-94151431	Intergenic	LIPA7
155	chr15:24704224-24710242	Intergenic	LIP2
156	chr15:26526769-26532787	Intergenic	LIPA7
157	chr15:37312508-37318526	Intergenic	LIP2
158	chr15:38115141-38121159	Intergenic	LIPA7
159	chr15:38566322-38572340	Intergenic	LIPA7
160	chr15:53886605-53892623	Intergenic	LIPA7
161	chr15:54846448-54852466	Intergenic	LIPA7
162	chr15:55130616-55136634	Intergenic	LIPA7

163	chr15:57807861-57813879	Intergenic	L1PA7
164	chr15:58358316-58364334	Intergenic	L1PA7
165	chr15:76012058-76018076	Intergenic	L1PA7
166	chr16:25551557-25557575	Intergenic	L1PA7
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523	chrX:69241324-69247342	Intergenic	LIPA7
524	chrX:6968943-6974961	Intergenic	LIP3
525	chrX:71825358-71831376	Intergenic	LIPA7
526	chrX:73047785-73053803	Intergenic	LIPA7
527	chrX:73490769-73496787	Intergenic	LIPA7
528	chrX:73887927-73893945	Intergenic	LIPA7
529	chrX:75253521-75259539	Intergenic	LIPA5
530	chrX:75809593-75815611	Intergenic	LIPA7
531	chrX:75874376-75880394	Intergenic	LIPA7

532	chrX:76260385-76266403	Intergenic	L1PA7
533	chrX:76375109-76381127	Intergenic	L1PA7
534	chrX:76541343-76547365	Intergenic	L1PA7
535	chrX:76584360-76590375	Intergenic	L1PA7
536	chrX:77024771-77030789	Intergenic	L1P2
537	chrX:77190192-77196210	Intergenic	L1PA7
538	chrX:77278249-77284267	Intergenic	L1P8A
539	chrX:77404765-77410783	Intergenic	L1PA7
540	chrX:78225809-78231827	Intergenic	L1PA7
541	chrX:78367063-78373081	Intergenic	L1PA7
542	chrX:79006133-79012151	Intergenic	L1PA7
543	chrX:79213284-79219302	Intergenic	L1P2
544	chrX:79690013-79696031	Intergenic	L1PA7
545	chrX:80467888-80473906	Intergenic	L1P3
546	chrX:80961226-80967244	Intergenic	L1P2
547	chrX:81444670-81450688	Intergenic	L1PA7
548	chrX:83428732-83434750	Intergenic	L1P2
549	chrX:85399553-85405571	Intergenic	L1PA7
550	chrX:86891270-86897288	Intergenic	L1PA15
551	chrX:87248962-87254980	Intergenic	L1PA7
552	chrX:87773827-87779845	Intergenic	L1P3
553	chrX:8930128-8936146	Intergenic	L1PA7
554	chrX:89930549-89936567	Intergenic	L1PA7
555	chrX:90191372-90197390	Intergenic	L1P2
556	chrX:90971858-90977876	Intergenic	L1P2
557	chrX:91465205-91471223	Intergenic	L1P3
558	chrX:93656101-93662119	Intergenic	L1PA7
559	chrX:94837919-94843937	Intergenic	L1PA7
560	chrX:96209941-96215959	Intergenic	L1PA7
561	chrX:96422304-96428322	Intergenic	L1PA7
562	chrX:98042084-98048102	Intergenic	L1PA7
563	chrX:100207505-100213523	Intergenic	L1PA7
564	chrY:14764966-14770984	Intergenic	L1PA7
565	chrY:15336601-15342619	Intergenic	L1PA7
566	chrY:15811541-15817559	Intergenic	L1PA8
567	chrY:16784252-16790270	Intergenic	L1P3
568	chrY:16923384-16929402	Intergenic	L1PA7
569	chrY:17645801-17651819	Intergenic	L1P2
570	chrY:18248191-18254209	Intergenic	L1P2
571	chrY:18791992-18798010	Intergenic	L1PA8
572	chrY:19655263-19661281	Intergenic	L1PA7

573	chrY:2824682-2830700	Intergenic	LIP2
574	chrY:3760340-3766358	Intergenic	LIP2
575	chrY:4547284-4553302	Intergenic	LIP2
576	chrY:6751398-6757416	Intergenic	L1PA7
577	chrY:6839567-6845585	Intergenic	L1PA7
578	chr1:107839711-107845729	Intron of VAV3 gene	L1PA7
579	chr1:113568919-113574937	Intron of MAGI3 gene	L1PA8
580	chr1:114962410-114968428	Intron of SYCP1 gene	L1PA7
581	chr1:153181432-153187450	Intron of RP1-140J1.1 gene	L1PA8
582	chr1:166402659-166408677	Intron of RP11-479J7 gene	L1PA7
583	chr1:166422190-166428208	Intron of RP11-479J7.1 gene	L1PA7
584	chr1:168991330-168997348	Intron of LINC00970 gene	L1PA7
585	chr1:173024919-173030937	Intron of RP1-15D23.2 gene	L1PA7
586	chr1:182214186-182220204	Intron of LINC01344 gene	L1PA7
587	chr1:183677898-183683916	Intron of RGL1 gene	L1PA7
588	chr1:183744292-183750310	Intron of RGL1 gene	L1PA7
589	chr1:207583879-207589897	Intron of CR1 and RP11-78B10.2 gene	L1PA7
590	chr1:210880808-210886826	Intron of KCNH1 gene	L1PA6
591	chr1:210957703-210963721	Intron of KCNH1 gene	L1PA6
592	chr1:225006693-225012711	Intron of DNAH4 gene	L1PA7
593	chr1:242151086-242157104	Intron of PLD5 and RP11-561I11.4 gene	L1PA7
594	chr1:242164818-242170836	Intron of PLD5 and RP11-561I11.4 gene	L1PA5
595	chr1:247565934-247571952	Intron of GCSAML and RP11-978I15.10 gene	L1PA8
596	chr1:47148716-47154734	Intron of CYP4A22-AS1 gene	L1PA8
597	chr1:49595362-49601380	Intron of AGBL4 gene	LIP2
598	chr1:49747801-49753819	Intron of AGBL4 gene	LIP2
599	chr1:59201904-59207922	Intron of LINC01358 gene	L1PA7
600	chr1:65547447-65553465	Intron of LEPR gene	L1PA3
601	chr1:89863370-89869388	Intron of LRRC8D and RP11-302M6.4 gene	LIP2
602	chr1:92248179-92254197	Intron of GLMN gene	L1PA7
603	chr10:99170534-99176552	Intron of HPSE2 gene	L1PA7
604	chr10:130085828-130091846	Intron of LINC00959 gene	L1PA7
605	chr10:32709813-32715831	Intron of CCDC7 gene	L1PA7
606	chr10:5230184-5236202	Intron of RP11-445P17.3 gene	L1PA7
607	chr10:66431419-66437437	Intron of CTNNA3 gene	L1PA7
608	chr10:67495696-67501714	Intron of CTNNA3 gene	LIP3
609	chr10:74601963-74607981	Intron of ADK gene	L1PA7
610	chr10:78661740-78667758	Intron of RP11-90J7.3 gene	L1PA7
611	chr10:94696466-94702484	Intron of RP11-400G3.5 and CYP2C18 gene	LIP3
612	chr10:95927113-95933131	Intron of ENTPD1-AS1 and C10orf131 gene	L1PA7
613	chr11:100252199-100258217	Intron of CNTN5 gene	L1PA7

614	chr11:103256112-103262130	Intron of DYNC2H1 gene	L1PA8
615	chr11:108270091-108276109	Intron of ATM gene	L1P3
616	chr11:108418317-108424335	Intron of C11orf65 gene	L1PA7
617	chr11:120759189-120765207	Intron of GRIK4 gene	L1PA7
618	chr11:131266484-131272502	Intron of AP002856.5 gene	L1PA7
619	chr11:132755539-132761557	Intron of OPCML gene	L1PA7
620	chr11:13985307-13991325	Intron of SPON1 gene	L1PA7
621	chr11:19407336-19413354	Intron of NAV2 gene	L1PA7
622	chr11:21198342-21204360	Intron of NELL1 gene	L1PA7
623	chr11:31176003-31182021	Intron of DCDC1 gene	L1PA7
624	chr11:40187868-40193886	Intron of LRRC4C gene	L1P3
625	chr11:40464796-40470814	Intron of LRRC4C gene	L1PA7
626	chr11:42200744-42206762	Intron of CTD-2572N17.1 gene	L1PA7
627	chr11:4392272-4398290	Intron of TRIM21 gene	L1P2
628	chr11:58525469-58531487	Intron of LPXN gene	L1PA7
629	chr11:63388025-63394043	Intron of SLC22A9 gene	L1P2
630	chr11:85413663-85419681	Intron of DLG2 gene	L1PA7
631	chr11:86536566-86542584	Intron of ME3 and RP11-317J19.1 gene	L1PA7
632	chr11:88720300-88726318	Intron of GRM5 gene	L1PA7
633	chr11:92424109-92430127	Intron of FAT3 gene	L1PA7
634	chr11:96482369-96488387	Intron of KRKL-AS1 gene	L1PA6
635	chr12:101055614-101061632	Intron of ANO4 gene	L1PA7
636	chr12:107854775-107860793	Intron of RP11-554D14.6 gene	L1P2
637	chr12:23817847-23823865	Intron of SOX5 gene	L1PA7
638	chr12:32422759-32428777	Intron of FGD4 gene	L1PA7
639	chr12:43380718-43386736	Intron of ADAMTS20 gene	L1PA7
640	chr12:44893019-44899037	Intron of NELL2 gene	L1PA7
641	chr12:46594315-46600333	Intron of RP11-96H19.1 gene	L1PA7
642	chr12:48269167-48275185	Intron of RP11-370I10.2 gene	L1MC2
643	chr12:62106715-62112733	Intron of FAM19A2 gene	L1PA7
644	chr12:65396344-65402362	Intron of MSRB3 gene	L1PA7
645	chr13:19647819-19653837	Intron of MPHOSPH8 gene	L1P3
646	chr13:23589521-23595539	Intron of TNFRSF19 gene	L1P3
647	chr13:29031744-29037762	Intron of MTUS2 gene	L1P2
648	chr13:35314827-35320845	Intron of NBEA gene	L1PA7
649	chr13:38832693-38838711	Intron of FREM2 gene	L1P3
650	chr13:46213334-46219352	Intron of LRRC63 gene	L1PA8A
651	chr13:46401796-46407814	Intron of KIAA0226L gene	L1P3
652	chr13:49113751-49119769	Intron of FNDC3A gene	L1PA7
653	chr13:51978327-51984345	Intron of ATP7B gene	L1PA7
654	chr13:60499793-60505811	Intron of TDRD3 gene	L1P2



655	chr13:71123727-71129745	Intron of LINC00348 gene	L1PA7
656	chr14:31661282-31667300	Intron of NUBPL gene	L1PA7
657	chr14:31811092-31817110	Intron of NUBPL gene	L1PA7
658	chr14:36154956-36160974	Intron of LINC00609 and PTCSC3 gene	L1PA7
659	chr14:37625845-37631863	Intron of TTC6 gene	L1PA7
660	chr14:42640336-42646354	Intron of CTD-2307P3.1 gene	L1P2
661	chr14:44017231-44023249	Intron of RP11-305B6.3 gene	L1PA7
662	chr14:49057177-49063195	Intron of RP11-816J8.1 gene	L1PA7
663	chr14:52563703-52569721	Intron of GPR137 gene	L1PA7
664	chr14:53793583-53799601	Intron of AL162759.1 gene	L1PA7
665	chr14:54400571-54406589	Intron of CDKN3 gene	L1P2
666	chr14:66582648-66588666	Intron of GPHN gene	L1PA7
667	chr14:71077582-71083600	Intron of PCNX gene	L1PA7
668	chr14:85365665-85371683	Intron of CTD-2128A3.2 gene	L1PA7
669	chr14:97669978-97675996	Intron of RP11-76E12.1 gene	L1PA7
670	chr15:22111695-22117713	Intron of RP11-69H14.6 gene	L1PA7
671	chr15:37403560-37409578	Intron of RP11-720L8.1 gene	L1PA7
672	chr15:46736425-46742443	Intron of RP11-627D16.1 gene	L1PA7
673	chr15:49961535-49967553	Intron of ATP8B4 gene	L1PA7
674	chr15:56144976-56150994	Intron of RFX7 gene	L1PA7
675	chr15:76091835-76097853	Intron of TMEM266 gene	L1PA7
676	chr15:86414871-86420889	Intron of AGBL1 gene	L1PA7
677	chr15:86460224-86466242	Intron of AGBL1 gene	L1PA7
678	chr16:10445552-10451570	Intron of ATF7IP2 gene	L1P2
679	chr16:58913402-58919420	Intron of RP11-410D17.2 gene	L1PA7
680	chr17:55101168-55107186	Intron of STXB4 gene	L1PA7
681	chr18:34682875-34688893	Intron of DTNA gene	L1PA7
682	chr18:36872747-36878765	Intron of KIAA1328 gene	L1PA7
683	chr18:36955227-36961245	Intron of KIAA1328 gene	L1P2
684	chr18:3692874-3698892	Intron of DLGAP1 gene	L1PA7
685	chr18:44359718-44365736	Intron of LINC01478 gene	L1PA7
686	chr18:44411634-44417652	Intron of LINC01478 gene	L1PA7
687	chr18:45470713-45476731	Intron of SLC14A2 and SLC14A2-AS1 gene	L1PA7
688	chr18:53489844-53495862	Intron of DCC gene	L1PA7
689	chr18:70090029-70096047	Intron of RTTN gene	L1P2
690	chr18:7706781-7712799	Intron of PTPRM gene	L1P3
691	chr18:7861928-7867946	Intron of PTPRM gene	L1PA7
692	chr18:8144378-8150396	Intron of PTPRM gene	L1PA7
693	chr19:22973275-22979293	Intron of ZNF278 gene	L1PA7
694	chr19:53203049-53209067	Intron of CTD-2245F17.3 gene	L1PA7
695	chr2:102639714-102645732	Intron of SLC9A2 gene	L1PA8

696	chr2:135511004-135517022	Intron of ZRANB3 gene	LIP3
697	chr2:137096799-137102817	Intron of THSD7B gene	L1PA7
698	chr2:141336634-141342652	Intron of LPR1B gene	LIP2
699	chr2:141441144-141447162	Intron of LPR1B gene	L1PA7
700	chr2:144780684-144786702	Intron of TEX41 gene	LIP3
701	chr2:148306382-148312400	Intron of MBD5 gene	L1PA7
702	chr2:148357757-148363775	Intron of MBD5 gene	L1PA7
703	chr2:150187586-150193604	Intron of AC016682 gene	L1PA7
704	chr2:159351383-159357401	Intron of BAZ2B gene	L1PA7
705	chr2:159817360-159823378	Intron of LY75and LY75-CD302 gene	L1PA7
706	chr2:160176405-160182423	Intron of ITGB6 gene	L1PA7
707	chr2:167092279-167098297	Intron of XIRP2 gene	L1PA7
708	chr2:177366930-177372948	Intron of NFE2L2 and AC074286.1 gene	L1PA8
709	chr2:178961014-178967032	Intron of CCDC141 gene	L1PA7
710	chr2:181084633-181090651	Intron of AC068196.1 gene	L1PA7
711	chr2:190549583-190555601	Intron of AC093388.3 gene	L1PA7
712	chr2:19013273-19019306	Intron of LINC01376 gene	L1PA7
713	chr2:19013273-19019306	Intron of LINC01376 gene	L1PA7
714	chr2:195946663-195952681	Intron of DNAH7 gene	L1PA7
715	chr2:198013648-198019666	Intron of PLCL1 gene	L1PA7
716	chr2:198680206-198686224	Intron of ACAC019330.1 gene	L1PA7
717	chr2:210176725-210182743	Intron of AC006994.2 gene	L1PA7
718	chr2:212748184-212754202	Intron of AC079610.1 gene	LIP2
719	chr2:215814741-215820759	Intron of LINC00607 gene	L1PA7
720	chr2:215983807-215989825	Intron of MREG gene	L1PA7
721	chr2:216975438-216981456	Intron of AC007563.5 gene	L1PA7
722	chr2:224480529-224486547	Intron of CUL3 gene	LIP3
723	chr2:229376679-229382697	Intron of DNER3 gene	L1PA7
724	chr2:34461922-34467940	Intron of AC073218.1 gene	L1PA7
725	chr2:51886728-51892746	Intron of AC007682.1 gene	LIP2
726	chr2:58163815-58169833	Intron of FANCL gene	LIP2
727	chr2:58683906-58689924	Intron of LINC01122 gene	L1PA7
728	chr2:62615138-62621156	Intron of AC092155.4 gene	L1PA7
729	chr2:62628684-62634702	Intron of AC092155.4 gene	L1PA7
730	chr2:63501846-63507864	Intron of WDPCP gene	L1PA7
731	chr2:72430632-72436650	Intron of EXOC6B gene	L1PA7
732	chr2:97868135-97874153	Intron of TMEM131 gene	L1PA7
733	chr2:99128313-99134331	Intron of TSGA10 gene	L1PA7
734	chr20:13047801-13053819	Intron of SPTLC3 gene	LIP3
735	chr20:14021191-14027209	Intron of MACROD2 gene	L1PA10
736	chr20:14463659-14469677	Intron of MACROD2 gene	LIP3

737	chr20:14801854-14807872	Intron of MACROD2 gene	L1PA7
738	chr20:1539347-1545365	Intron of SIRPD gene	L1PA7
739	chr20:16515431-16521449	Intron of KIF16B gene	L1PA7
740	chr20:3517327-3523345	Intron of ATRN gene	L1PA7
741	chr21:17768479-17774497	Intron of C21orf91-OT1 gene	L1PA7
742	chr22:16970431-16976449	Intron of GAB4 gene	L1PA7
743	chr22:28604984-28611002	Intron of TTC28 gene	L1PA6
744	chr22:33635793-33641811	Intron of LARGE gene	L1PA8
745	chr3:101232132-101238150	Intron of IMPG2 gene	L1PA7
746	chr3:114527402-114533420	Intron of ZBTB20 gene	L1PA7
747	chr3:121209935-121215953	Intron of STXBP5L gene	L1PA7
748	chr3:121257724-121263742	Intron of STXBP5L gene	L1PA7
749	chr3:121806682-121812700	Intron of IQCB1 gene	L1PA8
750	chr3:132601536-132607554	Intron of ACAD11 gene	L1PA7
751	chr3:13729132-13735150	Intron of LINC00620 gene	L1PA7
752	chr3:138556116-138562134	Intron of CEP70 gene	L1PA7
753	chr3:14187509-14193527	Intron of LSM3 gene	L1PA7
754	chr3:151880557-151886575	Intron of AADACL2-AS1 gene	L1P3
755	chr3:152366033-152372051	Intron of MBNL1 gene	L1PA7
756	chr3:158059808-158065826	Intron of RP11-290K4.2 gene	L1P2
757	chr3:159686456-159692474	Intron of IQCJ-SCHIP1 gene	L1PA7
758	chr3:163292174-163298192	Intron of LINC01192 gene	L1PA7
759	chr3:170614366-170620404	Intron of CLDN11 gene	L1PA7
760	chr3:170614386-170620404	Intron of CLDN11 gene	L1PA7
761	chr3:17444646-17450664	Intron of TBC1D5 gene	L1PA7
762	chr3:178356524-178362542	Intron of RP11-33A14.1 gene	L1PA7
763	chr3:189251738-189257756	Intron of TPRG1 gene	L1PA7
764	chr3:29978143-29984161	Intron of RBMS3 gene	L1PA7
765	chr3:36503634-36509652	Intron of STAC gene	L1PA7
766	chr3:37653411-37659429	Intron of ITGA9 gene	L1PA7
767	chr3:41366056-41372074	Intron of ULK4 gene	L1PA7
768	chr3:41920761-41926779	Intron of ULK4 gene	L1PA7
769	chr3:42852937-42858955	Intron of ACKR2, KRBOX1 and CYP8B1 gene	L1PA7
770	chr3:46785358-46791376	Intron of PRSS50 gene	L1PA7
771	chr3:50894208-50900226	Intron of DOCK3 gene	L1PA7
772	chr3:51090373-51096391	Intron of DOCK3 gene	L1P3
773	chr3:54716143-54722161	Intron of CACNA2D3 gene	L1P3
774	chr3:58937985-58944003	Intron of C3orf67 and C3orf67-AS1 gene	L1P3
775	chr3:61115006-61121024	Intron of FHIT gene	L1PA7
776	chr3:66305222-66311240	Intron of SLC25A26 gene	L1PA8
777	chr3:67774323-67780341	Intron of SUCLG2-AS1 gene	L1PA7

778	chr3:68385273-68391291	Intron of FAM19A1 gene	L1PA7
779	chr3:8367296-8373314	Intron of LMCD1-AS1 gene	L1PA7
780	chr3:84756423-84762441	Intron of LINC00971 gene	L1PA7
781	chr3:811901-817919	Intron of LINC01266 gene	L1PA7
782	chr4:99240937-99246955	Intron of RP11-696N14.1 gene	L1PA7
783	chr4:99256530-99262548	Intron of RP11-696N14.1 gene	L1PA6
784	chr4:104247356-104253374	Intron of RP11-729M20.1 gene	L1P2
785	chr4:127070064-127076082	Intron of RP11-810P8.1 gene	L1P3
786	chr4:131396312-131402330	Intron of RP11-314N14.1 gene	L1PA7
787	chr4:134779898-134785916	Intron of CTD-2012I17.1 gene	L1PA7
788	chr4:138778352-138784370	Intron of RP11-9802.1 gene	L1PA7
789	chr4:141106957-141112975	Intron of RNF150 gene	L1PA7
790	chr4:146799649-146805667	Intron of TTC29 gene	L1PA7
791	chr4:150266726-150272744	Intron of LRBA gene	L1PA7
792	chr4:151590756-151596774	Intron of FAM160A1 gene	L1PA7
793	chr4:158895718-158901736	Intron of FNIP2 and C4orf45 gene	L1PA7
794	chr4:165894969-165900987	Intron of TLL1 gene	L1PA7
795	chr4:2915864-2921882	Intron of ADD1 gene	L1PA7
796	chr4:33859347-33865365	Intron of RP11-79E3.2 gene	L1PA7
797	chr4:37347576-37353594	Intron of NWD2 gene	L1PA7
798	chr4:37403421-37409439	Intron of NWD2 gene	L1PA7
799	chr4:57465197-57471215	Intron of RP11-319E12.1 gene	L1PA7
800	chr4:59553229-59559247	Intron of RP11-725D20.1 gene	L1PA7
801	chr4:59576992-59583010	Intron of RP11-725D20.1 gene	L1P3
802	chr4:59775518-59781536	Intron of RP11-525J21.1 gene	L1PA7
803	chr4:70459659-70465677	Intron of MUC7 gene	L1PA7
804	chr4:72115162-72121180	Intron of NPFFR2 gene	L1P3
805	chr4:75413655-75419673	Intron of RP11-567N4.2 gene	L1PA7
806	chr4:81178903-81184921	Intron of RP11-100N20.1 and PRKG2 gene	L1P3
807	chr4:81469050-81475068	Intron of RASGEF1B gene	L1PA7
808	chr4:81710643-81716661	Intron of RP11-689K5.3 gene	L1PA7
809	chr4:84281342-84287360	Intron of RP11-8L2.1 gene	L1PA7
810	chr4:86186504-86192522	Intron of MAPK10 and RP11-778J15.1 gene	L1PA7
811	chr4:87481826-87487844	Intron of SPARCL1 gene	L1PA7
812	chr4:87631543-87637561	Intron of RP11-742B18.1 gene	L1PA8
813	chr4:89561315-89567333	Intron of RP11-115D19.1 gene	L1P2
814	chr4:98529765-98535783	Intron of TSPAN5 gene	L1PA7
815	chr5:106834140-106840158	Intron of CTC-254B4.1 gene	L1PA7
816	chr5:115875932-115881950	Intron of AP3S1 gene	L1PA7
817	chr5:147603917-147609935	Intron of JAKMIP2 and JAKMIP2-AS1 gene	L1PA7
818	chr5:148274015-148280033	Intron of SPINK13 and RP11-373N22.3 gene	L1PA7

819	chr5:152019426-152025444	Intron of CTB-1202.1 gene	L1PA7
820	chr5:152153016-152159034	Intron of CTB-1202.1 gene	L1PA8
821	chr5:158939914-158945932	Intron of EBF1 gene	L1PA7
822	chr5:163041369-163047387	Intron of RP11-541P9.3 gene	L1PA7
823	chr5:167953431-167959449	Intron of TENM2 gene	L1PA7
824	chr5:170896254-170902272	Intron of RANBP17 gene	L1PA7
825	chr5:171213623-171219641	Intron of RANBP17 gene	L1PA8
826	chr5:20810021-20816039	Intron of RP11-774D14.1 gene	L1P3
827	chr5:37649669-37655687	Intron of WDR70 gene	L1PA7
828	chr5:59627149-59633167	Intron of PDE4D gene	L1PA7
829	chr5:64932838-64938856	Intron of CWC27 gene	L1PA7
830	chr5:7155546-7161564	Intron of RP11-122F24.1 gene	L1P3
831	chr5:72801768-72807786	Intron of CTD-2631K10.1 gene	L1PA7
832	chr5:72975678-72981696	Intron of FCHO2 gene	L1PA7
833	chr5:81368753-81374771	Intron of ACOT12 gene	L1PA7
834	chr5:94289152-94295170	Intron of KIAA0825 gene	L1PA7
835	chr5:94950679-94956697	Intron of MCTP1 gene	L1PA7
836	chr6:109674366-109680384	Intron of AK9 gene	L1PA7
837	chr6:118833156-118839174	Intron of MCM9 gene	L1AP7
838	chr6:143850166-143856184	Intron of LTV1 gene	L1PA7
839	chr6:149888508-149894526	Intron of RAET1E and RAET1E-AS1 gene	L1PA6
840	chr6:1746297-1752315	Intron of GMDS gene	L1P3
841	chr6:32256120-32262138	Intron of XXbac-BPG154L12.5 gene	L1PA7
842	chr6:54322885-54328903	Intron of TINAG gene	L1PA7
843	chr6:55119847-55125865	Intron of HCRTR2 gene	L1PA7
844	chr6:55153749-55159767	Intron of HCRTR2 gene	L1PA7
845	chr6:56183380-56189398	Intron of COL21A1 gene	L1PA7
846	chr6:56199396-56205414	Intron of COL21A1 gene	L1PA7
847	chr6:64563405-64569423	Intron of EYS gene	L1PA7
848	chr6:65369790-65375808	Intron of EYS gene	L1PA8
849	chr6:83316567-83322585	Intron of ME1 gene	L1PA7
850	chr7:103455477-103461495	Intron of CTB-107G13.1 gene	L1P3
851	chr7:106488301-106494319	Intron of CTB-111H14.1 gene	L1PA7
852	chr7:107527577-107533595	Intron of COG5 gene	L1PA7
853	chr7:10737330-10743348	Intron of CTD-2060L22.1 gene	L1P3
854	chr7:108210645-108216663	Intron of NRCAM gene	L1P3
855	chr7:11384335-11393795	Intron of AC004538.3 and THSD7A gene	L1PA7
856	chr7:11387777-11393795	Intron of AC004538.3 and THSD7A gene	L1PA7
857	chr7:116738451-116744469	Intron of MET gene	L1PA7
858	chr7:121286247-121292265	Intron of CPED1 gene	L1PA7
859	chr7:133963072-133969090	Intron of EXOC4 gene	L1PA7

860	chr7:136426623-136432641	Intron of AC009784.3 gene	L1PA7
861	chr7:137098745-137104763	Intron of AC009264.1 gene	L1PA7
862	chr7:13666750-13672768	Intron of AC011288.2 gene	L1PA7
863	chr7:142205603-142211621	Intron of MGAM2 gene	L1PA7
864	chr7:153976276-153982294	Intron of DPP6 gene	L1PA7
865	chr7:16158241-16164259	Intron of ISPD gene	L1PA7
866	chr7:17802366-17808384	Intron of SNX13 gene	L1PA7
867	chr7:21922715-21928733	Intron of CDCA7L gene	L1PA7
868	chr7:23772564-23778582	Intron of STK31 gene	L1PA6
869	chr7:27849094-27855112	Intron of JAZF1 gene	L1PA7
870	chr7:36251555-36257573	Intron of EEPD1 gene	L1PA7
871	chr7:50036085-50042103	Intron of ZBPB gene	L1PA7
872	chr7:7386707-7392725	Intron of COL28A1 gene	L1PA7
873	chr7:7655046-7661064	Intron of RPA3 and UMAD1 gene	L1PA7
874	chr7:79064338-79070356	Intron of MAGI2 gene	L1PA7
875	chr7:8731865-8737883	Intron of NXP1 gene	L1PA7
876	chr7:94962873-94968891	Intron of PPP1R9A gene	L1PA7
877	chr7:95019805-95025823	Intron of PPP1R9A gene	L1PA7
878	chr8:99409139-99415157	Intron of VPS13B gene	L1PA7
879	chr8:99823327-99829345	Intron of VPS13B gene	L1PA7
880	chr8:105892442-105898460	Intron of ZFPM2-AS1 gene	L1P3
881	chr8:106556382-106562400	Intron of OXR1 and RP11-649G15.2 gene	L1PA7
882	chr8:108979295-108985313	Intron of RP11-1084E5.1 gene	L1PA7
883	chr8:109667942-109673960	Intron of SYBU gene	L1P3
884	chr8:112869652-112875670	Intron of CSMD3 gene	L1PA7
885	chr8:32249941-32255959	Intron of NRG1 gene	L1P2
886	chr8:4566849-4572867	Intron of CSMD1 gene	L1PA7
887	chr8:50729534-50735552	Intron of SNTG1 gene	L1P2
888	chr8:53195461-53201479	Intron of RP11-162D9.3 gene	L1P2
889	chr8:53927521-53933539	Intron of RGS20 gene	L1PA7
890	chr8:60443475-60449493	Intron of LINC01301 gene	L1PA7
891	chr8:67533730-67539748	Intron of CPA6 gene	L1PA7
892	chr8:81161076-81167094	Intron of RP11-1149M10.2 gene	L1PA7
893	chr8:82529084-82535102	Intron of RP11-653B10.1 gene	L1PA7
894	chr8:88520605-88526623	Intron of RP11-586K2.1 gene	L1PA13
895	chr9:10295682-10301700	Intron of PTRD gene	L1PA7
896	chr9:100230089-100236107	Intron of INVS gene	L1PA7
897	chr9:105511087-105517105	Intron of FSD1L gene	L1P2
898	chr9:119497591-119503609	Intron of RP11-295D22.1 gene	L1PA7
899	chr9:135836261-135842279	Intron of CAMSAP1 gene	L1PA7
900	chr9:18960472-18966490	Intron of SAX01 gene	L1PA7

901	chr9:19760028-19766046	Intron of SLC24A2 gene	L1PA7
902	chr9:4246339-4252357	Intron of GLIS3 gene	L1PA7
903	chr9:68585920-68591938	Intron of RP11-274B18.4 gene	L1PA7
904	chr9:86083489-86089507	Intron of GOLM1 gene	L1PA7
905	chrX:102862912-102868930	Intron of LINC00630 gene	L1P2
906	chrX:104137514-104143532	Intron of SLC25A53 gene	L1PA3
907	chrX:104603582-104609600	Intron of IL1RAPL2 gene	L1P2
908	chrX:104821858-104827876	Intron of IL1RAPL2 gene	L1P3
909	chrX:11017526-11023544	Intron of RP11-120D5 gene	L1PA5
910	chrX:113818277-113824294	Intron of XACT gene	L1PA7
911	chrX:117937559-117943577	Intron of KLHL13 gene	L1PA7
912	chrX:130809160-130815178	Intron of ENOX2 gene	L1PA7
913	chrX:132444396-132450414	Intron of MBNL3 gene	L1PA8
914	chrX:132858513-132864531	Intron of HS6ST2 gene	L1P2
915	chrX:139058903-139064921	Intron of FGF13 gene	L1P2
916	chrX:139152738-139158756	Intron of FGF13 gene	L1PA7
917	chrX:148774480-148780498	Intron of AFF2 gene	L1PA7
918	chrX:21540334-21546352	Intron of CNKSR2 gene	L1PA7
919	chrX:31463902-31469920	Intron of DMD gene	L1PA7
920	chrX:32799375-32805393	Intron of DMD gene	L1P2
921	chrX:42336098-42342116	Intron of RP1-154K9.2 gene	L1PA7
922	chrX:42502427-42508445	Intron of RP1-154K9.2 gene	L1PA7
923	chrX:43720405-43726423	Intron of MAOA gene	L1PA7
924	chrX:44248534-44254552	Intron of EFHC2 gene	L1PA7
925	chrX:51120633-51126651	Intron of LINC01284 gene	L1P3
926	chrX:68523210-68529228	Intron of YIPF6 gene	L1PA7
927	chrX:74039303-74045321	Intron of JPX and FTX gene	L1PA7
928	chrX:86330988-86337006	Intron of DACH2 gene	L1PA7
929	chrX:98691843-98697861	Intron of RPI1-485F13.1 gene	L1P3
930	chrY:18516395-18522413	Intron of AC022486.1 gene	L1PA8
931	chrY:18951395-18957413	Intron of TTTY14 gene	L1PA7
932	chrY:57097609-57103627	Intron of VAMP7 gene	L1PA7
933	chr6:115930738-115936756	Exon of FRK gene	L1PA7