Heterogeneous Contribution of Microdeletions in the Development of Common Generalized and Focal epilepsies.

SUPPLEMENTARY METHODS

Epilepsy subtype extended description.

Genetic Gereralized Epilepsy (GGE): Features unprovoked tonic and/or clonic seizures, originated inconsistently at some focal point within the brain that rapidly generalizes engaging bilateral distributed spikes and waves discharges on the electroencephalogram. This generalization can include cortical and sub cortical structures but not necessarily the entire cortex[1]. GGE is the most common group of epilepsies accounting for 20% of all cases[2]. It is characterized by an age-related onset and a strong familial aggregation and heritability which allows the assumption of a genetic cause. Although genetic associations have been identified, a broad spectrum of causes is acknowledged and remains largely unsolved [3].

Rolandic Epilepsy (RE): Commonly known also as Benign Epilepsy with Centrotemporal Spikes (BECTS), hallmarks early onset diagnosis (mean onset = 7 years old) with brief, focal hemifacial or oropharyngeal sensorimotor seizures alongside speech arrest and secondarily generalized tonic–clonic seizures, which mainly occur during sleep[4]. Rolandic epilepsy features a broad spectrum of less benign related syndromes called atypical Rolandic epilepsy (ARE), including benign partial epilepsy (ABPE), Landau–Kleffner syndrome(LKS) and epileptic encephalopathy with continuous spike-and-waves during sleep (CSWSS)[5]. Together they are the most common childhood epilepsy with a prevalence of 0.2–0.73/1000 (i.e. _1/2500)[6].

Adult Focal Epilepsy (AFE). Focal epilepsy is characterized by sporadic events of seizures originated within a specific brain region and restricted to one hemisphere. Although they can exhibit more than

one network of wave discharges on the electroencephalogram, and different degrees of spreading, they feature a consistent site of origin. While patients diagnosed with AFE can exhibit juvenile to adult onset influenced by a structural aetiology (e.g., malformations, tumors, hippocampal sclerosis or ischemia) for most of the cases a nonlesional unknown etiology is attributed[1].

Extended cohort description.

A total of 1,366 unrelated GGE patients of European descent were ascertained through the primary diagnosis of a common GGE syndrome according to the classification of the International League Against Epilepsy[7] collected from Austria (n = 142), Belgium (n = 39), Denmark (n = 97), Germany (n = 801) and the Netherlands (n = 287) (for details see [3]). Patients with a history of severe major psychiatric disorders (e.g. ASD, SZ, ID) were excluded (for details see [3]). RE samples come from a multi-center effort which recruited 281 unrelated patients of Caucasian ancestry from Austria (n = 160), Germany (n = 134), Australia (n = 78) and Canada (n = 21) with RE and atypical RE (for details see [4]). AFE samples constitute a total of 807 unrelated and sporadic patients of self-reported European ancestry collected in Germany. Of these, 434 had non-lesional focal epilepsy of unknown etiology, 253 had structural focal epilepsy (e.g., malformations, tumors, or ischemia), and 120 patients had mesial temporal lobe epilepsy with hippocampal sclerosis (for details see [8]). For the GGE cohort all microdeletion calls have been published previously [3]. GGE samples were genotyped with the Genome-Wide Human SNP Array 6.0 platform (Affymetrix, Santa Clara, CA, USA). RE and AFE cohorts were genotyped with the Human OmniExpress BeadChip platform (Illumina Inc., San Diego, CA, U.S.A.). Diagnosis of GGE, AFE and RE was performed according to the International Classification of Seizures[1] and Epilepsies and irrespective of whether they had a family history of seizures. All study participants provided written informed consent. The study was approved by the local institutional review boards of the contributing clinical centers. Population

controls were taken from the individual GGE (n = 5,234) and RE (N = 1,512) studies [3 4] and were unscreened for epilepsy or major neuropsychiatric disorders. In the individual studies, EIGENSTRAT principal component analysis was applied to remove ancestry outliers and to match for European ancestry of the case-control cohorts.

Extended CNV calling description.

CNV calling and quality control investigations have been described in the individual epilepsy type-specific studies [Main Text References 16, 17, 19]. In sum, for the three datasets (GGE, RE and AFE) the software PennCNV was used to call CNVs following array specific author recommendations [9]. The genome-wide microdeletion calls reported in this study have not been reported previously for RE and AFE. All gene annotations refer to the genome build GRCh37/hg19, and were performed with ANNOVAR software using the gene-based annotation tool [10]. The present genome-wide burden analysis focused on rare (<1% in cases & controls for each array type) and large (>400kb) autosomal microdeletions to ensure a high reliability of the microdeletion calls (adjusted for the overall amount of probe, >200 probes for the Affymetrix arrays, >100 probes for the Illumina arrays) and to enrich for pathogenic microdeletions [11-14]. Hotspot loci were in addition manually inspected to rule out false negative calls from borderline size/marker microdeletions (e.g. 15q.11.2). Likewise, Microdeletions with less than 1 Mb apart were combined in to 1 call. We did not include microduplications in the present burden analysis because the accuracy of CNV detection is lower for microduplications compared to microdeletions [15]. In particular, genomic DNA samples with substantial degradation are prone to spurious microduplication calls. Moreover, microduplications seem to exert pathogenic effects less frequently compared to microdeletions [11].

Extended GTEx enrichment analysis

RNA-seq expression data was obtained from the GTEx project (www.gtexportal.org). In the dataset, postmortem samples from a wide variety of tissues and donors have been used for bulk RNA sequencing according to a unified protocol. All samples were sequenced using Illumina 76 base-pair paired-end reads. The pilot phase of the GTEx project was completed in December of 2014, and includes data from 42 human tissues and three cell line preparations. Collapsed reads per kilobase per million mapped reads (RPKM) values for each of the 52,577 included transcripts, filtered for unique HGNC IDs (n = 20,932) were organized by tissue and individual ($n_{tissues}$ = 45, $n_{samples}$ = 1,641). All transcripts were ranked by mean RPKM across samples, and 100,000 permutations of each credible set gene list were generated by selecting a random transcript for each entry in the credible set within +/-100 ranks of the transcript for that gene. For all samples, the RPKM values were converted into ranks for that transcript, and the sums of ranks for each within each tissue were computed for their corresponding gene. P-values for each tissue were calculated by taking the total number of patients where the gene list of interest had a lower sum of ranks than the permuted sum of ranks, and dividing by the total number of permutations. To assess the significance of the enrichment after testing multiple tissues, we used a Bonferroni correction adjusted for the number of independent tissues, estimated via the matSpD tool to arrive at 27 independent tests and a significance threshold of P = 1.90 x 10^{-3}.

SUPPLEMENTARY ACKNOWLEDGMENTS

References

1. Berg AT, Berkovic SF, Brodie MJ, et al. Revised terminology and concepts for organization of seizures and epilepsies: report of the ILAE Commission on Classification and Terminology, 2005-2009. Epilepsia 2010;**51**(4):676-85 doi: 10.1111/j.1528-1167.2010.02522.x[published Online First: Epub Date]|.
2. Jallon P, Loiseau P, Loiseau J. Newly diagnosed unprovoked epileptic seizures: presentation at diagnosis in CAROLE study. Coordination Active du Reseau Observatoire Longitudinal de l' Epilepsie. Epilepsia 2001;**42**(4):464-75
3. Lal D, Ruppert AK, Trucks H, et al. Burden analysis of rare microdeletions suggests a strong impact of neurodevelopmental genes in genetic generalised epilepsies. PLoS genetics 2015;**11**(5):e1005226 doi: 10.1371/journal.pgen.1005226[published Online First: Epub Date]|.
4. Reinthaler EM, Lal D, Lebon S, et al. 16p11.2 600 kb Duplications confer risk for typical and atypical Rolandic epilepsy. Human molecular genetics 2014;**23**(22):6069-80 doi: 10.1093/hmg/ddu306[published Online First: Epub Date]|.
5. Fejerman N. Atypical rolandic epilepsy. Epilepsia 2009;**50 Suppl 7**:9-12 doi: 10.1111/j.1528-1167.2009.02210.x[published Online First: Epub Date]|.
6. Waaler PE, Blom BH, Skeidsvoll H, et al. Prevalence, classification, and severity of epilepsy in children in western Norway. Epilepsia 2000;**41**(7):802-10
7. de Kovel CG, Trucks H, Helbig I, et al. Recurrent microdeletions at 15q11.2 and 16p13.11 predispose to idiopathic generalized epilepsies. Brain : a journal of neurology 2010;**133**(Pt 1):23-32 doi: 10.1093/brain/awp262[published Online First: Epub Date]|.
8. Lal D, Pernhorst K, Klein KM, et al. Extending the phenotypic spectrum of RBFOX1 deletions: Sporadic focal epilepsy. Epilepsia 2015;**56**(9):e129-e33 doi: 10.1111/epi.13076[published Online First: Epub Date]|.
9. Wang K, Li M, Hadley D, et al. PennCNV: an integrated hidden Markov model designed for high-resolution copy number variation detection in whole-genome SNP genotyping data. Genome research 2007;**17**(11):1665-74 doi: 10.1101/gr.6861907[published Online First: Epub Date]|.
10. Wang K, Li M, Hakonarson H. ANNOVAR: functional annotation of genetic variants from high-throughput sequencing data. Nucleic acids research 2010;**38**(16):e164 doi: 10.1093/nar/gkq603[published Online First: Epub Date]|.
11. Watson CT, Marques-Bonet T, Sharp AJ, et al. The genetics of microdeletion and microduplication syndromes: an update. Annual review of genomics and human genetics 2014;**15**:215-44 doi: 10.1146/annurev-genom-091212-153408[published Online First: Epub Date]|.
12. Cooper GM, Coe BP, Girirajan S, et al. A copy number variation morbidity map of developmental delay. Nature genetics 2011;**43**(9):838-46 doi: 10.1038/ng.909[published Online First: Epub Date]|.
13. Cooper NJ, Shtir CJ, Smyth DJ, et al. Detection and correction of artefacts in estimation of rare copy number variants and analysis of rare deletions in type 1 diabetes. Human molecular genetics 2015;**24**(6):1774-90 doi: 10.1093/hmg/ddu581[published Online First: Epub Date]|.
14. Pinto D, Darvishi K, Shi X, et al. Comprehensive assessment of array-based platforms and calling algorithms for detection of copy number variants. Nature biotechnology 2011;**29**(6):512-20 doi: 10.1038/nbt.1852[published Online First: Epub Date]|.
15. Zhang D, Qian Y, Akula N, et al. Accuracy of CNV Detection from GWAS Data. PloS one 2011;**6**(1):e14511 doi: 10.1371/journal.pone.0014511[published Online First: Epub Date]|.

Supplementary Table S1. Genomic context of microdeletions found in all epilepsy samples.

Chr	Start	End	Size	Probes	N°Genes	Genes	Sample ID	Case=1/ Control=0	Epilepsy Sub-Type	Overlaps HOTSPOT?
2	111392259	113094793	1702535	340	15	ACOXL,ANAPC1,BCL2L11,BUB1,FBLN7,MERTK,TMEM87B,ZC3H6,ZC3H8,LOC400997,MIR4435-1,MIR4435-1HG,MIR4435-2,MIR4771-1,MIR4771-2	25SLHE1AB00534297	0	RE	NO
5	154689635	155583137	893503	213	0		25SLHE1AB00578488	0	RE	NO
3	1149544	1661120	511577	295	1	CNTN6	5913280008_R02C01	0	RE	NO
9	30138908	31102874	963967	184	1	LINC01242	5913280020_R04C01	0	RE	NO
4	189260808	189958110	697303	248	1	LINC01060	5913280027_R03C01	0	RE	NO
7	144971709	147725495	2753787	608	5	CNTNAP2,LOC101928700,MIR548F4,MIR548I4,MIR548T	5913280048_R03C02	0	RE	NO
6	162459571	162995679	536109	198	1	PARK2	5970153030_R02C02	0	RE	NO
12	59647541	61907022	2259482	389	1	SLC16A7	5970153030_R06C01	0	RE	NO
12	42072698	42483435	410738	121	1	GXYLT1	5970196033_R06C02	0	RE	NO
16	14968859	16303388	1334530	424	40	ABCC1,ABCC6,C16orf45,FOPNL,KIAA0430,MPV17L,MYH11,NDE1,NOMO1,NPIPA1,NPIPA5,NTAN1,PDXDC1,RRN3,LOC100288162,LOC100505915,MIR3179-1,MIR3179-2,MIR3179-3,MIR3179-4,MIR3180-1,MIR3180-2,MIR3180-3,MIR3180-4,MIR3670-1,MIR3670-2,MIR3670-3,MIR3670-4,MIR484,MIR6506,MIR6511A1,MIR6511A2,MIR6511A3,MIR6511A4,MIR6511B1,MIR6511B2,MIR6770-1,MIR6770-2,MIR6770-3,PKD1P6	6015596057_R04C02	0	RE	YES
3	162012615	162698133	685519	126	0		6015596166_R06C02	0	RE	NO
5	23371163	24624103	1252941	238	2	CDH10,PRDM9	6015617071_R06C01	0	RE	NO
9	28400550	28895878	495329	154	3	MIR873,MIR876,LINGO2	6015617074_R03C02	0	RE	NO
13	49154165	51173240	2019076	311	14	CYSLTR2,LINC00462,FNDC3A,KCNRG,SPRYD7,TRIM13,CTAGE10P,DLEU1,DLEU1-AS1,DLEU2,MIR15A,MIR16-1,MIR3613,ST13P4	6015617086_R02C02	0	RE	NO
10	55355543	57237203	1881661	592	1	PCDH15	6015617090_R02C01	0	RE	NO
13	103914406	104434701	520296	204	2	LINC01309,MIR548AS	6015617101_R03C01	0	RE	NO
2	52721889	53561575	839687	273	1	MIR4431	6015617107_R06C02	0	RE	NO
20	32294584	33551100	1256517	181	22	ACSS2,AHCY,ASIP,CHMP4B,DYNLRB1,EIF2S2,GGT7,GSS,ITCH,MAP1LC3A,NCOA6,PIGU,PXMP4,RALY,TP53INP2,ZNF341,HMGB3P1,MIR4755,MIR644A,RALY-AS1,ZNF341-AS1,MYH7B	6015617112_R06C01	0	RE	NO
20	36070440	45740274	9669835	2393	79	BLCAP,BPI,CTNNBL1,KIAA1755,LBP,NNAT,RPRD1B,TGM2,TTI1,VSTM2L,LINC00489,LOC100287792,LOC149684,ACTR5,ADIG,ARHGAP40,DHX35,FAM83D,MAFB,PLCG1,PPP1R16B,RALGAPB,SLC32A1,TOP1,ZHX3,LINC01370,LOC339568,MIR6871,PLCG1-AS1,CHD6,PTPRT,LOC101927159,ADA,C20orf62,FITM2,GDAP1L1,GTSF1L,HNF4A,JPH2,KCNK15,KCNS1,MATN4,OSER1,PABPC1L,PI3,PKIG,R3HDML,RBPJL,RIMS4,SDC4,SEMG1,SEMG2,SERINC3,SLPI,STK4,TOMM34,TOX2,TTPAL,WFDC12,WFDC5,WISP2,YWHAB,HNF4A-AS1,LINC01260,LINC01430,MIR3646,OSER1-AS1,STK4-AS1,ELMO2,EYA2,OCSTAMP,SLC13A3,SLC2A10,SLC35C2,TP53RK,ZNF334,MKRN7P,ZNF663P,CDH22	6015617112_R06C01	0	RE	NO
11	92792884	93216751	423867	113	3	CCDC67,SLC36A4,SMCO4	6015617125_R02C02	0	RE	NO
3	2050777	3158485	1107709	556	4	CNTN4,IL5RA,CNTN4-AS1,CNTN4-AS2	6015617137_R01C01	0	RE	NO
7	124977736	125816381	838646	162	1	LOC101928283	6015617151_R06C01	0	RE	NO
1	105739503	106540583	801081	157	1	LOC101928476	6015617154_R01C01	0	RE	NO
1	247828797	248578622	749826	192	27	OR11L1,OR13G1,OR14A16,OR14C36,OR1C1,OR2AK2,OR2L13,OR2L2,OR2L3,OR2L5,OR2L8,OR2M2,OR2M3,OR2M4,OR2M5,OR2M7,OR2T1,OR2T12,OR2T33,OR2T4,OR2T6,OR2T8,OR2W3,OR6F1,TRIM58,OR2L1P,OR2M1P	6015617155_R04C01	0	RE	NO
16	15493046	18164698	2671653	751	11	ABCC1,ABCC6,C16orf45,FOPNL,KIAA0430,MPV17L,MYH11,NDE1,MIR484,MIR6506,XYLT1	6023713060_R02C02	0	RE	NO
10	56547551	57191812	644262	180	1	PCDH15	6159645003_R02C01	0	RE	NO

10	48300421	51797239	3496819	748	34	GDF10,GDF2,PTPN20,RBP3,ZNF488,AGAP6,ARHGAP22,C10orf128,C10orf53,C10orf71,CHAT,DRGX,ERCC6,ERCC6-PGBD3,FAM170B,FRMPD2,LRRC18,MAPK8,MSMB,NCOA4,OGDHL,PARG,PGBD3,SLC18A3,TIMM23,TIMM23B,VSTM4,WDFY4,AGAP7P,C10orf71-AS1,FAM170B-AS1,FAM21EP,MIR4294,PARGP1	6182351063_R05C01	0	RE	NO
2	50895613	51358886	463274	141	2	NRXN1,MIR8485	88_4	1	RE	NO
1	18361468	18853490	492023	419	3	IGSF21,KLHDC7A,LOC101927876	CTR-0001	0	GGE	NO
1	50002235	50676365	674131	289	2	AGBL4,ELAVL4	CTR-0002	0	GGE	NO
1	76631270	77036326	405057	294	1	ST6GALNAC3	CTR-0003	0	GGE	NO
1	80073991	81847639	1773649	1198	1	LOC101927412	CTR-0004	0	GGE	NO
1	81563249	82131272	568024	497	1	LOC101927434	CTR-0005	0	GGE	NO
1	100661874	101502850	840977	488	12	CDC14A,DBT,DPH5,EXTL2,GPR88,RTCA,SLC30A7,VCAM1,LINC01349,LOC102606465,MIR553,RTCA-AS1	CTR-0006	0	GGE	NO
1	104452958	106299533	1846576	1037	2	LOC100129138,LOC101928476	CTR-0007	0	GGE	NO
1	145932456	147831171	1898716	682	22	ACP6,BCL9,CHD1L,FMO5,GJA5,GJA8,GPR89B,NBPF10,NBPF11,NBPF12,NBPF20,NBPF8,PRKAB2,LINC00624,LOC101927468,LOC728989,MIR5087,NBPF13P,NBPF25P,PDIA3P1,PDZK1P2,RNVU1-8	CTR-0008	0	GGE	YES
1	187074307	187997025	922719	622	1	LINC01036	CTR-0009	0	GGE	NO
1	191141835	191607427	465593	276	0		CTR-0010	0	GGE	NO
2	35144127	35957851	813725	567	0		CTR-0011	0	GGE	NO
2	39459208	39933966	474759	296	4	MAP4K3,TMEM178A,LOC728730,TMEM178A	CTR-0012	0	GGE	NO
2	82382056	83395285	1013230	532	1	LOC1720	CTR-0013	0	GGE	NO
2	116858262	118862350	2004089	1236	3	CCDC93,DDX18,INSIG2	CTR-0014	0	GGE	NO
2	132063736	132503337	439602	228	12	CCDC74A,MZT2A,TUBA3D,WTH3DI,LINC01087,LINC01120,LOC150776,LOC401010,MIR4784,POTEKP,RNU6-81P,C2orf27A	CTR-0015	0	GGE	NO
2	137102171	137720610	618440	536	0		CTR-0016	0	GGE	NO
7	64487892	65326821	838930	283	6	ZNF92,CCT6P1,CCT6P3,INTS4P2,LOC441242,SNORA22	CTR-0016	0	GGE	NO
2	143121048	143968270	847223	495	2	ARHGAP15,KYNU	CTR-0017	0	GGE	NO
2	171695070	172163971	468902	252	3	GAD1,GORASP2,TLK1	CTR-0018	0	GGE	NO
2	193143380	194087210	943831	470	1	PCGEM1	CTR-0019	0	GGE	NO
2	213133916	213639760	505845	388	2	ERBB4,MIR548F2	CTR-0020	0	GGE	NO
3	60333	2823064	2762732	2416	7	CHL1,CNTN4,CNTN6,CHL1-AS1,CNTN4-AS2,LINC01266,LOC102723448	CTR-0021	0	GGE	NO
3	168688	2657435	2488748	2171	6	CHL1,CNTN4,CNTN6,CHL1-AS1,CNTN4-AS2,LINC01266	CTR-0022	0	GGE	NO
3	2212224	2879612	667389	566	1	CNTN4	CTR-0023	0	GGE	NO
3	12123180	12581830	458651	291	5	MKRN2OS,PPARG,SYN2,TIMP4,TSEN2	CTR-0024	0	GGE	NO
3	83768965	84545597	776633	375	0		CTR-0025	0	GGE	NO
3	89453045	89952815	499771	205	1	EPHA3	CTR-0026	0	GGE	NO
3	109246073	109747572	501500	518	1	MIR4445	CTR-0027	0	GGE	NO
3	163122547	164071784	949238	517	1	MIR1263	CTR-0028	0	GGE	NO
3	175081214	175746934	665721	414	4	NAALADL2,MIR4789,MIR548AY,NAALADL2-AS1	CTR-0029;CTR-0030	0,0	GGE,GGE	NO
4	92610923	93200528	589606	268	1	LOC101929194	CTR-0031	0	GGE	NO
4	105742158	106158458	416301	244	2	TET2,TET2-AS1	CTR-0032	0	GGE	NO
4	116428545	116930084	501540	282	0		CTR-0033	0	GGE	NO
4	117074400	118178149	1103750	683	2	TRAM1L1,MIR1973	CTR-0034	0	GGE	NO
4	160388454	160836212	447759	271	0		CTR-0035	0	GGE	NO
4	172607979	173399996	792018	483	1	GALNTL6	CTR-0036	0	GGE	NO
4	182230250	182962405	732156	648	0		CTR-0037	0	GGE	NO
4	187512056	188078484	566429	435	1	FAT1	CTR-0038	0	GGE	NO

4	188948961	189890184	941224	727	3	TRIML1,TRIML2,LINC01060	CTR-0039	0	GGE	NO
4	189132112	190161009	1028898	825	1	LINC01060	CTR-0040	0	GGE	NO
4	189244879	190439764	1194886	901	1	LINC01060	CTR-0041	0	GGE	NO
5	23200492	23967573	767082	454	1	PRDM9	CTR-0042	0	GGE	NO
5	25185177	25829555	644379	376	0		CTR-0043	0	GGE	NO
5	101481484	102005038	523555	285	4	SLCO4C1,SLCO6A1,LINC00491,LINC00492	CTR-0044	0	GGE	NO
5	101518451	103697029	2178579	1186	10	C5orf30,GIN1,NUDT12,PAM,PPIP5K2,SLCO4C1,SLCO6A1,LINC00491,LINC00492,LOC102467212	CTR-0045	0	GGE	NO
5	103362555	103771854	409300	254	0		CTR-0046	0	GGE	NO
6	47946823	49749615	1802793	982	8	C6orf141,CENPQ,CRISP2,CRISP3,GLYATL3,MUT,PTCHD4,RHAG	CTR-0047	0	GGE	NO
6	67058129	67497830	439702	329	0		CTR-0048	0	GGE	NO
6	94553885	95265811	711927	475	0		CTR-0049	0	GGE	NO
7	10116564	10845291	728728	491	0		CTR-0050	0	GGE	NO
7	13466980	14269443	802464	786	2	DGKB,ETV1	CTR-0051	0	GGE	NO
7	23088341	24183209	1094869	732	12	CCDC126,FAM221A,GPNMB,IGF2BP3,KLHL7,MALSU1,NUPL2,STK31,TRA2A,CLK2P1,KLHL7-AS1,RPS2P32	CTR-0052	0	GGE	NO
7	63431014	64019749	588736	345	7	ZNF679,ZNF680,ZNF727,ZNF735,ZNF736,LINC01005,YWHAEP1	CTR-0053	0	GGE	NO
7	64527406	65162170	634765	223	4	ZNF92,CCT6P3,INTS4P2,LOC441242	CTR-0055	0	GGE	NO
7	64542840	65162170	619331	222	3	ZNF92,INTS4P2,LOC441242	CTR-0056	0	GGE	NO
7	64565573	65162170	596598	218	3	ZNF92,INTS4P2,LOC441242	CTR-0057	0	GGE	NO
18	4046539	4556103	509565	424	2	DLGAP1-AS5,DLGAP1	CTR-0057	0	GGE	NO
7	64594329	65161364	567036	215	3	ZNF92,INTS4P2,LOC441242	CTR-0058;CTR-0059	0,0	GGE, GGE	NO
7	64594329	65080276	485948	206	1	ZNF92	CTR-0061	0	GGE	NO
7	64594329	65091612	497284	212	1	ZNF92	CTR-0065	0	GGE	NO
7	64594329	65082747	488419	207	1	ZNF92	CTR-0066;CTR-0068	0,0	GGE, GGE	NO
7	64594329	65076447	482119	205	1	ZNF92	CTR-0067	0	GGE	NO
7	64637116	65162170	525055	215	3	ZNF92,INTS4P2,LOC441242	CTR-0070	0	GGE	NO
7	64637116	65082747	445632	206	1	ZNF92	CTR-0071	0	GGE	NO
7	64651298	65162170	510873	214	3	ZNF92,INTS4P2,LOC441242	CTR-0072	0	GGE	NO
7	64651298	65091612	440315	210	1	ZNF92	CTR-0073	0	GGE	NO
7	64651628	65106792	455165	210	1	ZNF92	CTR-0074	0	GGE	NO
7	64663212	65161364	498153	210	3	ZNF92,INTS4P2,LOC441242	CTR-0075	0	GGE	NO
7	64663212	65106792	443581	209	1	ZNF92	CTR-0076	0	GGE	NO
7	64663212	65082747	419536	202	1	ZNF92	CTR-0077	0	GGE	NO
7	64673048	65162170	489123	209	3	ZNF92,INTS4P2,LOC441242	CTR-0078;CTR-0079	0,0	GGE, GGE	NO
7	64680323	65162170	481848	208	3	ZNF92,INTS4P2,LOC441242	CTR-0080	0	GGE	NO
7	64680323	65087974	407652	202	1	ZNF92	CTR-0081	0	GGE	NO
7	76072579	76601573	528995	238	5	DTX2,POMZP3,UPK3B,FDPSP2,LOC100133091	CTR-0082	0	GGE	NO
7	76074968	76607295	532328	238	5	DTX2,POMZP3,UPK3B,FDPSP2,LOC100133091	CTR-0083	0	GGE	NO
7	76074968	76596892	521925	236	5	DTX2,POMZP3,UPK3B,FDPSP2,LOC100133091	CTR-0084;CTR-0086	0,0	GGE, GGE	NO
7	76074968	76565750	490783	214	5	DTX2,POMZP3,UPK3B,FDPSP2,LOC100133091	CTR-0087	0	GGE	NO
14	40232226	40906944	674719	405	0		CTR-0088	0	GGE	NO
7	76108749	76601573	492825	236	4	DTX2,POMZP3,UPK3B,LOC100133091	CTR-0088;CTR-0091;CTR-0093	0,0,0	GGE, GGE, GGE	NO

7	76108749	76596892	488144	235	4	DTX2,POMZP3,UPK3B,LOC100133091	CTR-0089;CTR-0090	0,0	GGE, GGE	NO
7	76108749	76607295	498547	237	4	DTX2,POMZP3,UPK3B,LOC100133091	CTR-0092	0	GGE	NO
7	76135718	76601573	465856	235	4	POMZP3,UPK3B,LOC100133091,DTX2	CTR-0094	0	GGE	NO
7	76135718	76596892	461175	234	4	POMZP3,UPK3B,LOC100133091,DTX2	CTR-0095	0	GGE	NO
7	76143625	76607295	463671	231	3	POMZP3,UPK3B,LOC100133091	CTR-0096	0	GGE	NO
7	76143625	76601573	457949	230	3	POMZP3,UPK3B,LOC100133091	CTR-0097	0	GGE	NO
7	76153336	76601573	448238	225	3	POMZP3,LOC100133091,UPK3B	CTR-0098;CTR-0099	0,0	GGE, GGE	NO
7	76156529	76601573	445045	223	3	POMZP3,LOC100133091,UPK3B	CTR-0100	0	GGE	NO
7	76197418	76601573	404156	221	2	POMZP3,LOC100133091	CTR-0101	0	GGE	NO
7	102288510	102763204	474695	205	8	ARMC10,FAM185A,FBXL13,LRRC17,NAPEPLD,POLR2J2,SPDYE2,SPDYE2B	CTR-0102	0	GGE	NO
7	110687160	111181317	494158	321	2	IMMP2L,LRRN3	CTR-0103;CTR-0104	0,0	GGE, GGE	NO
7	110932158	111336737	404580	232	1	IMMP2L	CTR-0105	0	GGE	NO
7	118237641	122401983	4164343	2365	13	AASS,CADPS2,CPED1,FAM3C,FEZF1,ING3,KCND2,PTPRZ1,RNF133,RNF148,TSPAN12,WNT16,FEZF1-AS1	CTR-0106	0	GGE	NO
7	124963783	125809910	846128	572	1	LOC101928283	CTR-0107	0	GGE	NO
7	125336194	125853905	517712	370	0		CTR-0108	0	GGE	NO
8	2996150	4041820	1045671	1447	1	CSMD1	CTR-0109	0	GGE	NO
8	3848750	4555177	706428	1136	1	CSMD1	CTR-0110	0	GGE	NO
8	5110018	6176137	1066120	1459	0		CTR-0111	0	GGE	NO
8	7170477	8055248	884772	201	28	DEFB103A,DEFB103B,DEFB104A,DEFB104B,DEFB105A,DEFB105B,DEFB106A,DEFB106B,DEFB107A,DEFB107B,DEFB4A,DEFB4B,PRR23D1,PRR23D2,SPAG11A,SPAG11B,USP17L1,USP17L3,USP17L4,USP17L8,ZNF705B,ZNF705G,DEFB109P1B,FAM66B,FAM66E,FAM90A10P,FAM90A7P,MIR548I3	CTR-0112	0	GGE	NO
8	63287851	63937632	649782	455	3	GGH,NKAIN3,UG0898H09	CTR-0113	0	GGE	NO
8	140894951	141367540	472590	348	1	TRAPPC9	CTR-0114	0	GGE	NO
9	11201888	11958106	756219	564	0		CTR-0115	0	GGE	NO
9	11967856	12379463	411608	348	0		CTR-0116	0	GGE	NO
9	31156012	31562541	406530	254	0		CTR-0117	0	GGE	NO
9	31172350	32240391	1068042	779	0		CTR-0118	0	GGE	NO
9	87715350	88196203	480854	383	1	AGTPBP1	CTR-0119	0	GGE	NO
10	19415575	19827284	411710	354	1	MALRD1	CTR-0120	0	GGE	NO
10	19415575	19832047	416473	357	1	MALRD1	CTR-0121	0	GGE	NO
10	19422562	19837622	415061	356	1	MALRD1	CTR-0122	0	GGE	NO
10	46247355	51989169	5741815	2103	60	AGAP4,AGAP6,AGAP9,ANTXRL,ANXA8,ANXA8L1,ARHGAP22,ASAH2,C10orf128,C10orf53,C10orf71,CHAT,DRGX,ERCC6,ERCC6-PGBD3,FAM170B,FAM21A,FAM21C,FAM25C,FAM25G,FRMPD2,GDF10,GDF2,GPRIN2,LOC100996758,LRRC18,MAPK8,MSMB,NCOA4,NPY4R,OGDHL,PARG,PGBD3,PTPN20,RBP3,SLC18A3,SYT15,TIMM23,TIMM23B,VSTM4,WDFY4,ZNF488,AGAP7P,ANTXRLP1,BMS1P5,BMS1P6,C10orf71-AS1,CTGLF12P,CTSLP2,FAM170B-AS1,FAM21EP,FAM25BP,FAM35BP,FAM35DP,FRMPD2B,GLUD1P7,HNRNPA1P33,LINC00842,MIR4294,PARGP1	CTR-0123	0	GGE	NO
10	46674168	48117191	1443024	361	18	AGAP9,ANTXRL,ANXA8,ANXA8L1,FAM25C,FAM25G,GPRIN2,LOC100996758,NPY4R,SYT15,ANTXRLP1,BMS1P5,BMS1P6,FAM25BP,FAM35BP,FAM35DP,HNRNPA1P33,LINC00842	CTR-0124	0	GGE	NO
10	46674168	47739252	1065085	353	16	AGAP9,ANTXRL,ANXA8,FAM25C,FAM25G,GPRIN2,LOC100996758,NPY4R,SYT15,ANTXRLP1,BMS1P5,BMS1P6,FAM35BP,FAM35DP,HNRNPA1P33,LINC00842	CTR-0125	0	GGE	NO
10	46674168	47650951	976784	252	15	AGAP9,ANXA8,FAM25C,FAM25G,GPRIN2,LOC100996758,NPY4R,SYT15,ANTXRLP1,BMS1P5,BMS1P6,FAM35BP,FAM35DP,HNRNPA1P33,LINC00842	CTR-0126	0	GGE	NO

10	46961233	47704625	743393	334	14	AGAP9,ANTXRL,ANXA8,FAM25C,FAM25G,GPRIN2,LOC100996758,NPY4R,SYT15,ANTXRLP1,BMS1P6,FAM35DP,HNRNPA1P33,LINC00842	CTR-0127;CTR-0128	0,0	GGE, GGE	NO
10	47058780	47743504	684725	281	13	AGAP9,ANTXRL,ANXA8,FAM25C,FAM25G,LOC100996758,NPY4R,ANTXRLP1,BMS1P6,FAM25BP,FAM35DP,HNRNPA1P33,LINC00842	CTR-0129	0	GGE	NO
10	54731281	57273977	2542697	1869	1	PCDH15	CTR-0130	0	GGE	NO
10	68080799	68510589	429791	319	1	CTNNA3	CTR-0131	0	GGE	NO
10	91568555	92036154	467600	323	2	LINC00865,LINC01375	CTR-0132	0	GGE	NO
11	24589391	25945339	1355949	1044	1	LUZP2	CTR-0133	0	GGE	NO
16	86721765	87697382	975618	780	9	C16orf95,FBXO31,JPH3,MAP1LC3B,ZCCHC14,LOC101928682,LOC101928708,LOC101928737,LOC440390	CTR-0133	0	GGE	NO
11	54976192	55382738	406547	217	7	OR4A15,OR4A16,OR4C11,OR4C15,OR4C16,TRIM48,TRIM51HP	CTR-0134	0	GGE	NO
11	92941753	98361581	5419829	3763	44	AMOTL1,ANKRD49,C11orf54,C11orf97,CCDC67,CCDC82,CEP295,CEP57,CWC15,ENDOD1,FAM76B,FUT4,GPR83,HEPHL1,IZUMO1R,JRKL,KDM4D,KDM4E,MAML2,MED17,MRE11A,MTMR2,PANX1,PIWIL4,SESN3,SMCO4,SRSF8,TAF1D,VSTM5,JRKL-AS1,LOC100129203,LOC101929295,MIR1260B,MIR1304,MIR548L,SCARNA9,SNORA1,SNORA18,SNORA25,SNORA32,SNORA40,SNORA8,SNORD5,SNORD6	CTR-0135	0	GGE	NO
12	21007732	21415635	407904	261	3	SLCO1B1,SLCO1B3,SLCO1B7	CTR-0136	0	GGE	NO
12	59624435	61911057	2286623	1343	1	SLC16A7	CTR-0138	0	GGE	NO
13	23519918	24928441	1408524	1172	13	C1QTNF9,C1QTNF9B,C1QTNF9B-AS1,MIPEP,SACS,SGCG,SPATA13,TNFRSF19,ANKRD20A19P,LINC00327,MIR2276,SACS-AS1,SPATA13-AS1	CTR-0139	0	GGE	NO
13	23545597	24963661	1418065	1184	13	C1QTNF9,C1QTNF9B,C1QTNF9B-AS1,MIPEP,SACS,SGCG,SPATA13,TNFRSF19,ANKRD20A19P,LINC00327,MIR2276,SACS-AS1,SPATA13-AS1	CTR-0140	0	GGE	NO
13	23604147	24968813	1364667	1136	13	C1QTNF9,C1QTNF9B,C1QTNF9B-AS1,MIPEP,SACS,SGCG,SPATA13,TNFRSF19,ANKRD20A19P,LINC00327,MIR2276,SACS-AS1,SPATA13-AS1	CTR-0141	0	GGE	NO
13	23629198	24969682	1340485	1103	13	C1QTNF9,C1QTNF9B,C1QTNF9B-AS1,MIPEP,SACS,SGCG,SPATA13,TNFRSF19,ANKRD20A19P,LINC00327,MIR2276,SACS-AS1,SPATA13-AS1	CTR-0142	0	GGE	NO
13	40677763	41218756	540994	447	4	FOXO1,LINC00332,LINC00548,LINC00598	CTR-0143	0	GGE	NO
13	48646280	51676662	3030383	1680	36	ARL11,CAB39L,CDADC1,CYSLTR2,DLEU7,EBPL,FNDC3A,ITM2B,KCNRG,KPNA3,LPAR6,MED4,MLNR,PHF11,RB1,RCBTB1,RCBTB2,RNASEH2B,SETDB2,SPRYD7,TRIM13,CTAGE10P,DLEU1,DLEU1-AS1,DLEU2,DLEU7-AS1,GUCY1B2,LINC00371,LINC00441,LINC00462,MED4-AS1,MIR15A,MIR16-1,MIR3613,RNASEH2B-AS1,ST13P4	CTR-0143	0	GGE	NO
13	44678576	47194685	2516110	1559	33	COG3,CPB2,ERICH6B,GPALPP1,GTF2F2,KCTD4,KIAA0226L,LCP1,LRCH1,LRRC63,NUFIP1,SERP2,SIAH3,SLC25A30,SMIM2,SPERT,TPT1,TSC22D1,ZC3H13,CPB2-AS1,LINC00330,LINC00563,LINC01055,LINC01198,LOC101929259,MIR8079,SLC25A30-AS1,SMIM2-AS1,SMIM2-IT1,SNORA31,TPT1-AS1,TSC22D1-AS1,TUSC8	CTR-0144	0	GGE	NO
13	50594729	51287814	693086	391	8	DLEU7,DLEU1,DLEU1-AS1,DLEU2,MIR15A,MIR16-1,ST13P4,KCNRG	CTR-0146	0	GGE	NO
13	56803353	57828080	1024728	495	5	PRR20A,PRR20B,PRR20C,PRR20D,PRR20E	CTR-0147	0	GGE	NO
13	63959044	64467882	508839	305	3	LINC00395,LOC102723968,OR7E156P	CTR-0148	0	GGE	NO
14	19844095	21165479	1321385	689	41	ANG,APEX1,CCNB1IP1,KLHL33,OR11G2,OR11H2,OR11H4,OR11H6,OR4K1,OR4K13,OR4K14,OR4K15,OR4K17,OR4K2,OR4K5,OR4L1,OR4M1,OR4N2,OR4N5,OR4Q3,OR6S1,OSGEP,PARP2,PNP,POTEM,RNASE10,RNASE11,RNASE12,RNASE9,TEP1,TMEM55B,TTC5,BMS1P17,BMS1P18,DUXAP10,LINC01296,LOC100508046,LOC254028,RPPH1,SNORD126,RNASE4	CTR-0149	0	GGE	NO
14	84861047	85706663	845617	528	0		CTR-0152	0	GGE	NO
14	87964498	88400253	435756	261	1	GALC	CTR-0153	0	GGE	NO

14	87964498	88398407	433910	260	1	GALC	CTR-0154	0	GGE	NO
15	20216943	23487534	3270592	646	41	CYFIP1,GOLGA6L1,GOLGA6L22,GOLGA6L6,NIPA1,NIPA2,OR4M2,OR4N4,POTEB,POTEB2,POTEB3,TUBGCP5,CHEK2P2,CXADRP2,GOLGA8CP,GOLGA8DP,GOLGA8EP,GOLGA8IP,HERC2P2,HERC2P3,HERC2P7,LINC01193,LOC101927079,LOC283683,LOC646214,LOC727924,MIR1268A,MIR3118-2,MIR3118-3,MIR3118-4,MIR4509-1,MIR4509-2,MIR4509-3,MIR5701-1,MIR5701-2,MIR5701-3,NBEAP1,NF1P2,OR4N3P,REREP3,WHAMMP3	CTR-0155	0	GGE	YES
15	20284054	23487534	3203481	643	41	CYFIP1,GOLGA6L1,GOLGA6L22,GOLGA6L6,NIPA1,NIPA2,OR4M2,OR4N4,POTEB,POTEB2,POTEB3,TUBGCP5,CHEK2P2,CXADRP2,GOLGA8CP,GOLGA8DP,GOLGA8EP,GOLGA8IP,HERC2P2,HERC2P3,HERC2P7,LINC01193,LOC101927079,LOC283683,LOC646214,LOC727924,MIR1268A,MIR3118-2,MIR3118-3,MIR3118-4,MIR4509-1,MIR4509-2,MIR4509-3,MIR5701-1,MIR5701-2,MIR5701-3,NBEAP1,NF1P2,OR4N3P,REREP3,WHAMMP3	CTR-0156	0	GGE	YES
15	21271038	23487534	2216497	442	35	CYFIP1,GOLGA6L1,GOLGA6L22,NIPA1,NIPA2,OR4M2,OR4N4,POTEB,POTEB2,POTEB3,TUBGCP5,CXADRP2,GOLGA8DP,GOLGA8EP,GOLGA8IP,HERC2P2,HERC2P7,LOC101927079,LOC283683,LOC646214,LOC727924,MIR1268A,MIR3118-2,MIR3118-3,MIR3118-4,MIR4509-1,MIR4509-2,MIR4509-3,MIR5701-1,MIR5701-2,MIR5701-3,NF1P2,OR4N3P,REREP3,WHAMMP3	CTR-0157	0	GGE	YES
15	22280465	23459190	1178726	409	23	CYFIP1,GOLGA6L1,GOLGA6L22,NIPA1,NIPA2,OR4M2,OR4N4,TUBGCP5,GOLGA8DP,GOLGA8EP,GOLGA8IP,HERC2P2,HERC2P7,LOC101927079,LOC283683,LOC727924,MIR1268A,MIR4509-1,MIR4509-2,MIR4509-3,OR4N3P,REREP3,WHAMMP3	CTR-0158	0	GGE	YES
15	22586948	23226468	639521	287	12	CYFIP1,GOLGA6L1,GOLGA6L22,NIPA1,NIPA2,TUBGCP5,GOLGA8DP,LOC283683,MIR4509-1,MIR4509-2,MIR4509-3,WHAMMP3	CTR-0159	0	GGE	YES
15	22673387	23248421	575035	288	12	CYFIP1,GOLGA6L1,GOLGA6L22,NIPA1,NIPA2,TUBGCP5,GOLGA8DP,LOC283683,MIR4509-1,MIR4509-2,MIR4509-3,WHAMMP3	CTR-0160	0	GGE	YES
15	22673387	23094223	420837	259	10	CYFIP1,GOLGA6L1,GOLGA6L22,NIPA1,NIPA2,TUBGCP5,GOLGA8DP,MIR4509-1,MIR4509-2,MIR4509-3	CTR-0166	0	GGE	YES
15	22681064	23389101	708038	291	11	CYFIP1,GOLGA6L1,GOLGA6L22,NIPA1,NIPA2,TUBGCP5,GOLGA8DP,GOLGA8IP,HERC2P2,LOC283683,WHAMMP3	CTR-0168	0	GGE	YES
15	28953484	30501879	1548396	821	13	APBA2,FAM189A1,GOLGA8J,GOLGA8M,NDNL2,TJP1,DKFZP434L187,GOLGA6L7P,GOLGA8T,LOC100289656,PDCD6IPP2,ULK4P3,WHAMMP2	CTR-0169	0	GGE	NO
15	28962131	30606491	1644361	856	12	APBA2,FAM189A1,GOLGA8J,NDNL2,TJP1,DKFZP434L187,GOLGA6L7P,GOLGA8T,LOC100289656,PDCD6IPP2,ULK4P3,WHAMMP2	CTR-0170	0	GGE	NO
15	28962131	30370019	1407889	807	8	APBA2,FAM189A1,NDNL2,TJP1,GOLGA6L7P,LOC100289656,PDCD6IPP2,WHAMMP2	CTR-0171	0	GGE	NO
16	15053713	16377650	1323938	619	20	ABCC1,ABCC6,C16orf45,FOPNL,KIAA0430,MPV17L,MYH11,NDE1,NOMO3,NPIPA5,NTAN1,PDXDC1,RRN3,LOC100505915,MIR3180-4,MIR484,MIR6506,MIR6511B1,MIR6511B2,PKD1P6	CTR-0172	0	GGE	YES
14	82231575	82845119	613545	384	0		CTR-0173	0	GGE	NO
16	15491127	18361376	2870250	1512	34	ABCC1,ABCC6,C16orf45,FOPNL,KIAA0430,MPV17L,MYH11,NDE1,NOMO3,NPIPA7,NPIPA8,XYLT1,LOC100288162,MIR3179-1,MIR3179-2,MIR3179-3,MIR3179-4,MIR3180-1,MIR3180-2,MIR3180-3,MIR3670-1,MIR3670-2,MIR3670-3,MIR3670-4,MIR484,MIR6506,MIR6511A1,MIR6511A2,MIR6511A3,MIR6511A4,MIR6770-1,MIR6770-2,MIR6770-3,PKD1P1	CTR-0173	0	GGE	YES
16	21807855	22588038	780184	259	12	C16orf52,CDR2,EEF2K,NPIPB5,PDZD9,POLR3E,UQCRC2,VWA3A,LOC653786,RRN3P1,RRN3P3,SMG1P1	CTR-0174	0	GGE	YES
16	21949122	22558299	609178	245	11	C16orf52,CDR2,EEF2K,NPIPB5,PDZD9,POLR3E,UQCRC2,VWA3A,LOC653786,RRN3P3,SMG1P1	CTR-0175	0	GGE	YES
16	29517699	30191895	674197	201	31	ALDOA,ASPHD1,C16orf54,C16orf92,CDIPT,DOC2A,FAM57B,GDPD3,HIRIP3,INO80E,KCTD13,KIF22,MAPK3,MAZ,MVP,PAGR1,PPP4C,PRRT2,QPRT,SEZ6L2,SPN,TAOK2,TBX6,TMEM219,YPEL3,ZG16,CDIPT-AS1,MIR3680-1,MIR3680-2,SLC7A5P1,SMG1P2	CTR-0176	0	GGE	YES
16	61431493	62110146	678654	419	1	CDH8	CTR-0177	0	GGE	NO

17	14076657	15484859	1408203	1120	13	CDRT1,CDRT15,CDRT4,COX10,HS3ST3B1,PMP22,TEKT3,TVP23C,TVP23C-CDRT4,CDRT7,CDRT8,MGC12916,MIR4731	CTR-0179	0	GGE	NO
17	14085625	15473298	1387674	1114	13	CDRT1,CDRT15,CDRT4,COX10,HS3ST3B1,PMP22,TEKT3,TVP23C,TVP23C-CDRT4,CDRT7,CDRT8,MGC12916,MIR4731	CTR-0180	0	GGE	NO
17	14087919	15484859	1396941	1117	13	CDRT1,CDRT15,CDRT4,COX10,HS3ST3B1,PMP22,TEKT3,TVP23C,TVP23C-CDRT4,CDRT7,CDRT8,MGC12916,MIR4731	CTR-0181	0	GGE	NO
17	14094687	15484859	1390173	1115	13	CDRT1,CDRT15,CDRT4,COX10,HS3ST3B1,PMP22,TEKT3,TVP23C,TVP23C-CDRT4,CDRT7,CDRT8,MGC12916,MIR4731	CTR-0182	0	GGE	NO
17	21527046	22235650	708605	241	3	MTRNR2L1,FAM27L,FLJ36000	CTR-0183	0	GGE	NO
18	30906697	31433575	526879	327	3	ASXL3,CCDC178,NOL4	CTR-0185	0	GGE	NO
18	37912402	38709991	797590	603	0		CTR-0186	0	GGE	NO
18	39030815	39470402	439588	341	1	KC6	CTR-0187	0	GGE	NO
18	65074573	66007597	933025	718	2	DSEL,LOC643542	CTR-0188	0	GGE	NO
18	69286241	71759517	2473277	1982	6	CBLN2,FBXO15,NETO1,LOC100505817,LOC102724913,LOC400655	CTR-0189	0	GGE	NO
19	23621430	24082569	461140	306	3	ZNF675,ZNF681,RPSAP58	CTR-0192	0	GGE	NO
19	37755719	38438505	682787	322	19	HKR1,WDR87,ZFP30,ZNF527,ZNF540,ZNF569,ZNF570,ZNF571,ZNF573,ZNF607,ZNF781,ZNF793,LINC01535,LOC100631378,LOC284412,LOC644554,ZNF571-AS1,ZNF793-AS1,SIPA1L3	CTR-0193	0	GGE	NO
19	43300194	43740953	440760	200	10	PSG1,PSG11,PSG2,PSG4,PSG5,PSG6,PSG7,LOC100289650,LOC284344,PSG10P	CTR-0194	0	GGE	NO
19	43321125	43776500	455376	208	11	PSG1,PSG11,PSG2,PSG4,PSG5,PSG6,PSG7,PSG9,LOC100289650,LOC284344,PSG10P	CTR-0195	0	GGE	NO
19	43321125	43767249	446125	200	11	PSG1,PSG11,PSG2,PSG4,PSG5,PSG6,PSG7,PSG9,LOC100289650,LOC284344,PSG10P	CTR-0196	0	GGE	NO
19	43321125	43785898	464774	212	11	PSG1,PSG11,PSG2,PSG4,PSG5,PSG6,PSG7,PSG9,LOC100289650,LOC284344,PSG10P	CTR-0197	0	GGE	NO
19	43323314	43768182	444869	200	11	PSG1,PSG11,PSG2,PSG4,PSG5,PSG6,PSG7,PSG9,LOC100289650,LOC284344,PSG10P	CTR-0198	0	GGE	NO
21	14414125	15142378	728254	229	7	POTED,ANKRD30BP2,LOC102724188,MIR3118-1,MIR3156-3,MIR8069-1,MIR8069-2	CTR-0199	0	GGE	NO
21	14566190	15168743	602554	214	6	POTED,LOC102724188,MIR3118-1,MIR3156-3,MIR8069-1,MIR8069-2	CTR-0200	0	GGE	NO
21	14570272	15142378	572107	209	6	POTED,LOC102724188,MIR3118-1,MIR3156-3,MIR8069-1,MIR8069-2	CTR-0201;CTR-0202;CTR-0204	0,0,0	GGE, GGE, GGE	NO
21	14570272	15255416	685145	231	7	POTED,CYP4F29P,LOC102724188,MIR3118-1,MIR3156-3,MIR8069-1,MIR8069-2	CTR-0203	0	GGE	NO
21	14594223	15142378	548156	205	6	POTED,LOC102724188,MIR3118-1,MIR3156-3,MIR8069-1,MIR8069-2	CTR-0205;CTR-0207	0,0	GGE, GGE	NO
21	14594223	15133680	539458	204	6	POTED,LOC102724188,MIR3118-1,MIR3156-3,MIR8069-1,MIR8069-2	CTR-0206;CTR-0208	0,0	GGE, GGE	NO
21	14600070	15155536	555467	201	6	POTED,LOC102724188,MIR3118-1,MIR3156-3,MIR8069-1,MIR8069-2	CTR-0209	0	GGE	NO
21	14600070	15136617	536548	200	6	POTED,LOC102724188,MIR3118-1,MIR3156-3,MIR8069-1,MIR8069-2	CTR-0210	0	GGE	NO
21	14603577	15142378	538802	200	6	POTED,LOC102724188,MIR3118-1,MIR3156-3,MIR8069-1,MIR8069-2	CTR-0211	0	GGE	NO
21	19422940	22377007	2954068	2221	5	CHODL,NCAM2,TMPRSS15,LINC00320,LOC101927797	CTR-0212	0	GGE	NO
21	24625703	25246848	621146	488	1	D21S2088E	CTR-0213	0	GGE	NO
21	36054547	37377890	1323344	1017	9	CLIC6,RUNX1,LINC00160,LINC01426,LINC01436,LOC100506403,LOC101928269,MIR802,RUNX1-IT1	CTR-0214	0	GGE	NO
2	21683285	23585786	1902502	397	2	LOC102723362,LOC645949	E102	1	RE	NO
8	70931383	71738054	806672	134	7	LACTB2,NCOA2,PRDM14,TRAM1,XKR9,LACTB2-AS1,LOC101926892	E318	1	RE	NO
1	4529544	5043734	514191	266	1	AJAP1	E472	1	RE	NO

						Genes	ID		Type	
7	64663212	65162170	498959	211	3	ZNF92,INTS4P2,LOC441242	EC-CAE009;EC-JME454	1,1	GGE, GGE	NO
16	14780642	16628050	1847409	649	48	ABCC1,ABCC6,C16orf45,FOPNL,KIAA0430,MPV17L,MYH11,NDE1,NOMO1,NOMO3,NPIPA1,NPIPA2, NPIPA3,NPIPA5,NPIPA7,NPIPA8,NTAN1,PDXDC1,PLA2G10,RRN3,ABCC6P2,LOC100288162,LOC1005 05915,MIR3179-1,MIR3179-2,MIR3179-3,MIR3179-4,MIR3180-1,MIR3180-2,MIR3180-3,MIR3180- 4,MIR3670-1,MIR3670-2,MIR3670-3,MIR3670- 4,MIR484,MIR6506,MIR6511A1,MIR6511A2,MIR6511A3,MIR6511A4,MIR6511B1,MIR6511B2,MIR6 770-1,MIR6770-2,MIR6770-3,PKD1P1,PKD1P6	EC-CAE026	1	GGE	YES
3	165317672	166886252	1568581	861	1	BCHE	EC-CAE040	1	GGE	NO
15	30730691	32566499	1835809	1060	14	ARHGAP11B,CHRNA7,FAN1,GOLGA8H,KLF13,LOC283710,MTMR10,OTUD7A,TRPM1,HERC2P10,LOC 100288637,MIR211,ULK4P1,ULK4P2	EC-CAE047	1	GGE	YES
15	28942693	32799815	3857123	1959	31	APBA2,ARHGAP11B,CHRFAM7A,CHRNA7,FAM189A1,FAN1,GOLGA8H,GOLGA8J,GOLGA8K,GOLGA8 M,GOLGA8O,GOLGA8R,KLF13,LOC283710,MTMR10,NDNL2,OTUD7A,TJP1,TRPM1,DKFZP434L187,G OLGA6L7P,GOLGA8T,HERC2P10,LOC100288637,LOC100289656,MIR211,PDCD6IPP2,ULK4P1,ULK4P 2,ULK4P3,WHAMMP2	EC-CAE061	1	GGE	YES
6	140891477	141310653	419177	211	1	MIR4465	EC-CAE077	1	GGE	NO
13	65781201	66223237	442037	239	0		EC-CAE079	1	GGE	NO
15	21098527	23417273	2318747	478	35	CYFIP1,GOLGA6L1,GOLGA6L22,NIPA1,NIPA2,OR4M2,OR4N4,POTEB,POTEB2,POTEB3,TUBGCP5,CXA DRP2,GOLGA8DP,GOLGA8IP,HERC2P2,HERC2P7,LINC01193,LOC101927079,LOC283683,LOC646214 ,LOC727924,MIR1268A,MIR3118-2,MIR3118-3,MIR3118-4,MIR4509-1,MIR4509-2,MIR4509- 3,MIR5701-1,MIR5701-2,MIR5701-3,NF1P2,OR4N3P,REREP3,WHAMMP3	EC-CAE084	1	GGE	YES
5	275875	1257621	981747	391	22	AHRR,BRD9,CEP72,EXOC3,NKD2,PDCD6,SLC12A7,SLC6A18,SLC6A19,SLC9A3,TERT,TPPP,TRIP13,ZDH HC11,CTD-3080P12.3,EXOC3- AS1,LOC100288152,LOC100506688,LOC100996325,MIR4456,MIR4635,PP7080	EC-CAE099	1	GGE	NO
7	76074968	76601573	526606	237	5	DTX2,POMZP3,UPK3B,FDPSP2,LOC100133091	EC-CAE104;CTR-0085	1,0	GGE, GGE	NO
21	25270936	25781558	510623	444	1	LOC101927869	EC-CAE123	1	GGE	NO
7	143223069	143873940	650872	353	14	CTAGE15,CTAGE6,OR2A12,OR2A14,OR2A2,OR2A25,OR2A5,OR2F1,OR2F2,OR6B1,TCAF1,TCAF2,LO C154761,TCAF2P1	EC-CAE158	1	GGE	NO
20	8099277	8572225	472949	382	1	PLCB1	EC-CAE161	1	GGE	NO
16	21817448	22588038	770591	258	12	C16orf52,CDR2,EEF2K,NPIPB5,PDZD9,POLR3E,UQCRC2,VWA3A,LOC653786,RRN3P1,RRN3P3,SMG1 P1	EC-CAE162	1	GGE	YES
6	162801345	163287279	485935	337	2	PACRG,PARK2	EC-CAE204	1	GGE	NO
15	30920612	32796323	1875712	1059	16	ARHGAP11B,CHRNA7,FAN1,GOLGA8K,GOLGA8O,KLF13,LOC283710,MTMR10,OTUD7A,TRPM1,HER C2P10,LOC100288637,MIR211,ULK4P1,ULK4P2,ULK4P3	EC-CAE205	1	GGE	YES
18	13982898	14969710	986813	335	9	ANKRD30B,POTEC,ZNF519,ANKRD20A5P,CXADRP3,CYP4F35P,LINC01443,LINC01444,MIR3156-2	EC-CAE226	1	GGE	NO
7	111048579	111927237	878659	564	4	DOCK4,IMMP2L,ZNF277,DOCK4-AS1	EC-CAE273	1	GGE	NO
16	5615773	6512138	896366	1056	3	LINC01570,MIR8065,RBFOX1	EC-CAE286	1	GGE	NO
16	14971403	16377650	1406248	638	41	ABCC1,ABCC6,C16orf45,FOPNL,KIAA0430,MPV17L,MYH11,NDE1,NOMO1,NOMO3,NPIPA1,NPIPA5, NTAN1,PDXDC1,RRN3,LOC100288162,LOC100505915,MIR3179-1,MIR3179-2,MIR3179-3,MIR3179- 4,MIR3180-1,MIR3180-2,MIR3180-3,MIR3180-4,MIR3670-1,MIR3670-2,MIR3670-3,MIR3670- 4,MIR484,MIR6506,MIR6511A1,MIR6511A2,MIR6511A3,MIR6511A4,MIR6511B1,MIR6511B2,MIR6 770-1,MIR6770-2,MIR6770-3,PKD1P6	EC-CAE298	1	GGE	YES
9	76601085	77182821	581737	349	4	RORB,LOC101927358,MIR6130,RORB-AS1	EC-CAE300	1	GGE	NO
12	73111962	73586933	474972	298	1	LOC101928137	EC-CAE320	1	GGE	NO
15	22681064	23300761	619698	290	11	CYFIP1,GOLGA6L1,GOLGA6L22,NIPA1,NIPA2,TUBGCP5,GOLGA8DP,GOLGA8IP,HERC2P2,LOC283683 ,WHAMMP3	EC-CAE325;CTR-0167	1,0	GGE, GGE, GGE	YES

Chr	Start	End	Size	Col5	Col6	Genes	ID	CN	Type	Flag
2	50979977	51453231	473255	333	1	NRXN1	EC-CAE333	1	GGE	NO
6	144444363	146880409	2436047	1475	8	EPM2A,FBXO30,GRM1,RAB32,SHPRH,STX11,UTRN,LOC100507557	EC-CAE347	1	GGE	NO
15	30920612	32512208	1591597	1034	11	ARHGAP11B,CHRNA7,FAN1,KLF13,LOC283710,MTMR10,OTUD7A,TRPM1,HERC2P10,LOC100288637,MIR211	EC-CAE368	1	GGE	YES
1	146496383	147831171	1334789	675	18	ACP6,BCL9,CHD1L,FMO5,GJA5,GJA8,GPR89B,NBPF11,NBPF8,PRKAB2,LINC00624,LOC101927468,LOC728989,MIR5087,NBPF13P,PDIA3P1,PDZK1P2,RNVU1-8	EC-CAE381	1	GGE	YES
15	22522798	23226468	703671	310	13	CYFIP1,GOLGA6L1,GOLGA6L22,NIPA1,NIPA2,TUBGCP5,GOLGA8DP,LOC283683,MIR4509-1,MIR4509-2,MIR4509-3,REREP3,WHAMMP3	EC-CAE382	1	GGE	YES
6	22739208	23372483	633276	413	0		EC-CAE393	1	GGE	NO
1	97005643	97712686	707044	389	3	DPYD,PTBP2,DPYD-AS1	EC-CAE428	1	GGE	NO
21	14570272	15136617	566346	208	6	POTED,LOC102724188,MIR3118-1,MIR3156-3,MIR8069-1,MIR8069-2	EC-CAE430	1	GGE	NO
16	14835055	16340428	1505374	643	44	ABCC1,ABCC6,C16orf45,FOPNL,KIAA0430,MPV17L,MYH11,NDE1,NOMO1,NOMO3,NPIPA1,NPIPA2,NPIPA3,NPIPA5,NTAN1,PDXDC1,RRN3,ABCC6P2,LOC100288162,LOC100505915,MIR3179-1,MIR3179-2,MIR3179-3,MIR3179-4,MIR3180-1,MIR3180-2,MIR3180-3,MIR3180-4,MIR3670-1,MIR3670-2,MIR3670-3,MIR3670-4,MIR484,MIR6506,MIR6511A1,MIR6511A2,MIR6511A3,MIR6511A4,MIR6511B1,MIR6511B2,MIR6770-1,MIR6770-2,MIR6770-3,PKD1P6	EC-CAE433	1	GGE	YES
18	62649936	63179300	529365	319	0		EC-EGMA012	1	GGE	NO
1	187320741	188743888	1423148	961	1	LINC01036	EC-EGMA026	1	GGE	NO
7	64673048	65161364	488317	208	3	ZNF92,INTS4P2,LOC441242	EC-EGMA070	1	GGE	NO
9	11975273	12379463	404191	346	0		EC-EGMA080	1	GGE	NO
4	136159924	136592446	432523	219	0		EC-EGMA083	1	GGE	NO
7	125334614	125856601	521988	372	0		EC-EGMA091	1	GGE	NO
22	18876416	21465835	2589420	1574	70	AIFM3,ARVCF,C22orf29,C22orf39,CDC45,CLDN5,CLTCL1,COMT,CRKL,DGCR14,DGCR2,DGCR6,DGCR6L,DGCR8,GNB1L,GP1BB,GSC2,HIRA,KLHL22,LOC388849,LRRC74B,LZTR1,MED15,MRPL40,P2RX6,PI4KA,PRODH,RANBP1,RIMBP3,RTN4R,SCARF2,SEPT5,SERPIND1,SLC25A1,SLC7A4,SNAP29,TANGO2,TBX1,THAP7,TMEM191B,TRMT2A,TSSK2,TXNRD2,UFD1L,ZDHHC8,ZNF74,BCRP2,DGCR10,DGCR11,DGCR5,DGCR9,LINC00895,LINC00896,LINC01311,LOC101928891,LOC284865,MIR1286,MIR1306,MIR185,MIR3618,MIR4761,MIR649,MIR6816,P2RX6P,PI4KAP1,POM121L4P,SEPT5-GP1BB,THAP7-AS1,TMEM191A,TUBA3FP	EC-EGMA094	1	GGE	YES
15	22673387	23459190	785804	294	16	CYFIP1,GOLGA6L1,GOLGA6L22,NIPA1,NIPA2,TUBGCP5,GOLGA8DP,GOLGA8EP,GOLGA8IP,HERC2P2,HERC2P7,LOC283683,MIR4509-1,MIR4509-2,MIR4509-3,WHAMMP3	EC-EGTCS006;CTR-0162;CTR-0165	1,0,0	GGE, GGE, GGE	YES
1	110606081	111393713	787633	653	17	ALX3,KCNA10,KCNA2,KCNA3,KCNC4,LAMTOR5,PROK1,RBM15,SLC16A4,SLC6A17,UBL4B,CYMP,KCNC4-AS1,LAMTOR5-AS1,LINC01397,LOC440600,LOC440602	EC-EGTCS014	1	GGE	NO
5	100534242	102566438	2032197	1199	7	GIN1,PAM,PPIP5K2,SLCO4C1,SLCO6A1,LINC00491,LINC00492	EC-EGTCS014	1	GGE	NO
19	43321125	43786678	465554	213	11	PSG1,PSG11,PSG2,PSG4,PSG5,PSG6,PSG7,PSG9,LOC100289650,LOC284344,PSG10P	EC-EGTCS018	1	GGE	NO
22	18748428	21721708	2973281	1585	73	AIFM3,ARVCF,C22orf29,C22orf39,CDC45,CLDN5,CLTCL1,COMT,CRKL,DGCR14,DGCR2,DGCR6,DGCR6L,DGCR8,GNB1L,GP1BB,GSC2,HIRA,KLHL22,LOC388849,LRRC74B,LZTR1,MED15,MRPL40,P2RX6,PI4KA,PRODH,RANBP1,RIMBP3,RTN4R,SCARF2,SEPT5,SERPIND1,SLC25A1,SLC7A4,SNAP29,TANGO2,TBX1,THAP7,TMEM191B,TRMT2A,TSSK2,TXNRD2,UFD1L,ZDHHC8,ZNF74,BCRP2,DGCR10,DGCR11,DGCR5,DGCR9,FAM230B,GGT3P,LINC00895,LINC00896,LINC01311,LOC101928891,LOC284865,MIR1286,MIR1306,MIR185,MIR3618,MIR4761,MIR649,MIR6816,P2RX6P,PI4KAP1,POM121L4P,POM121L8P,SEPT5-GP1BB,THAP7-AS1,TMEM191A,TUBA3FP	EC-EGTCS044	1	GGE	YES

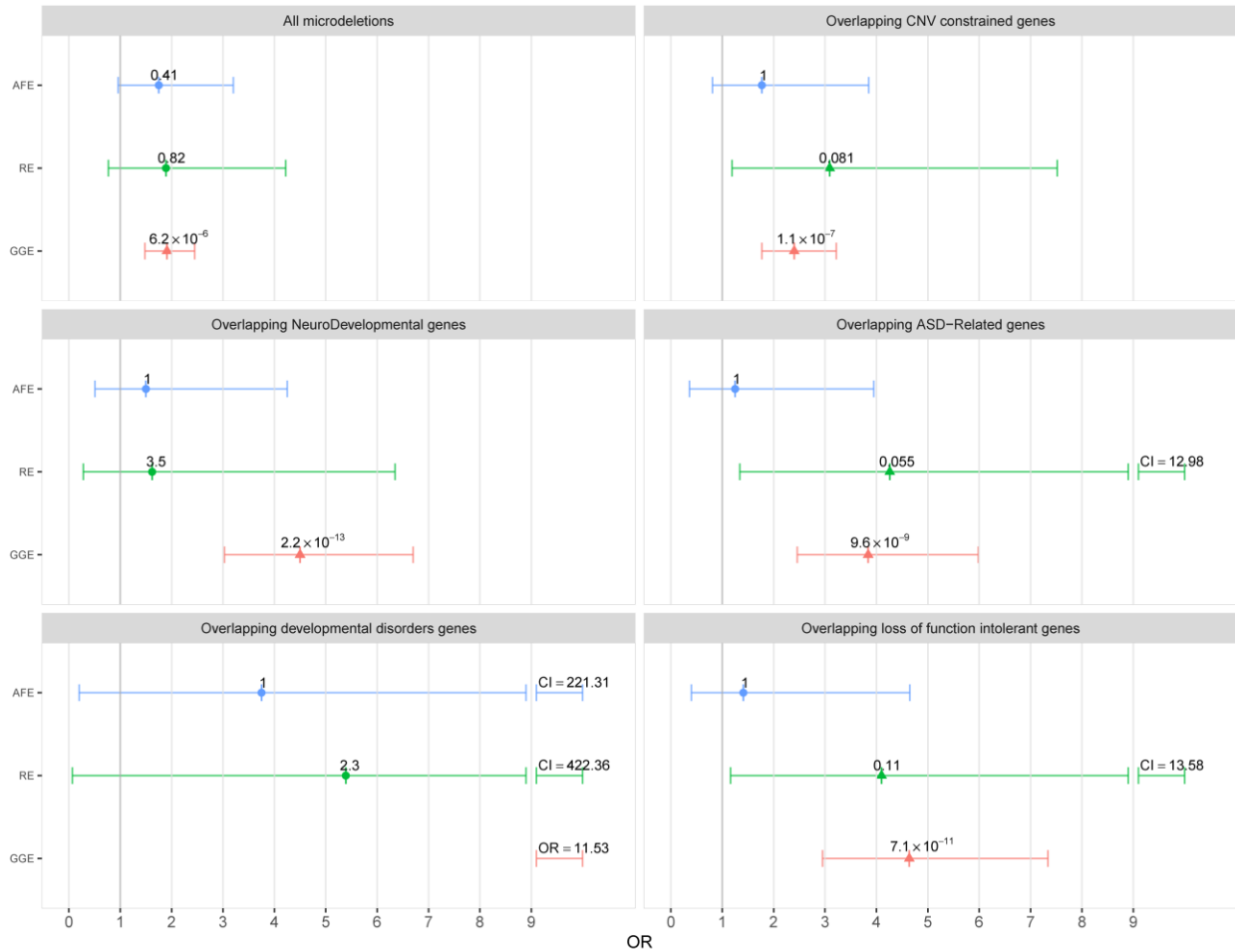|						Genes				
16	14939328	16377650	1438323	640	41	ABCC1,ABCC6,C16orf45,FOPNL,KIAA0430,MPV17L,MYH11,NDE1,NOMO1,NOMO3,NPIPA1,NPIPA5,NTAN1,PDXDC1,RRN3,LOC100288162,LOC100505915,MIR3179-1,MIR3179-2,MIR3179-3,MIR3179-4,MIR3180-1,MIR3180-2,MIR3180-3,MIR3180-4,MIR3670-1,MIR3670-2,MIR3670-3,MIR3670-4,MIR484,MIR6506,MIR6511A1,MIR6511A2,MIR6511A3,MIR6511A4,MIR6511B1,MIR6511B2,MIR6770-1,MIR6770-2,MIR6770-3,PKD1P6	EC-EGTCS053	1	GGE	YES
16	29580611	30306956	726346	203	45	ALDOA,ASPHD1,BOLA2,BOLA2B,C16orf54,C16orf92,CDIPT,CORO1A,DOC2A,FAM57B,GDPD3,HIRIP3,INO80E,KCTD13,KIF22,MAPK3,MAZ,MVP,PAGR1,PPP4C,PRRT2,QPRT,SEZ6L2,SLX1A,SLX1B,SPN,SULT1A3,SULT1A4,TAOK2,TBX6,TMEM219,YPEL3,ZG16,CDIPT-AS1,LOC388242,LOC606724,LOC613037,LOC613038,MIR3680-1,MIR3680-2,SLC7A5P1,SLX1A-SULT1A3,SLX1B-SULT1A4,SMG1P2,SMG1P5	EC-EGTCS063	1	GGE	YES
2	22138930	23445743	1306814	852	1	LOC102723362	EC-EGTCS105	1	GGE	NO
16	14971403	16294706	1323304	632	40	ABCC1,ABCC6,C16orf45,FOPNL,KIAA0430,MPV17L,MYH11,NDE1,NOMO1,NPIPA1,NPIPA5,NTAN1,PDXDC1,RRN3,LOC100288162,LOC100505915,MIR3179-1,MIR3179-2,MIR3179-3,MIR3179-4,MIR3180-1,MIR3180-2,MIR3180-3,MIR3180-4,MIR3670-1,MIR3670-2,MIR3670-3,MIR3670-4,MIR484,MIR6506,MIR6511A1,MIR6511A2,MIR6511A3,MIR6511A4,MIR6511B1,MIR6511B2,MIR6770-1,MIR6770-2,MIR6770-3,PKD1P6	EC-EGTCS114	1	GGE	YES
20	14902412	15312347	409936	342	3	MACROD2,MACROD2-AS1	EC-EGTCS119	1	GGE	NO
8	99979097	100538070	558974	266	1	VPS13B	EC-EGTCS130	1	GGE	NO
22	18876416	21611337	2734922	1579	71	AIFM3,ARVCF,C22orf29,C22orf39,CDC45,CLDN5,CLTCL1,COMT,CRKL,DGCR14,DGCR2,DGCR6,DGCR6L,DGCR8,GNB1L,GP1BB,GSC2,HIRA,KLHL22,LOC388849,LRRC74B,LZTR1,MED15,MRPL40,P2RX6,PI4KA,PRODH,RANBP1,RIMBP3,RTN4R,SCARF2,SEPT5,SERPIND1,SLC25A1,SLC7A4,SNAP29,TANGO2,TBX1,THAP7,TMEM191B,TRMT2A,TSSK2,TXNRD2,UFD1L,ZDHHC8,ZNF74,BCRP2,DGCR10,DGCR11,DGCR5,DGCR9,FAM230B,LINC00895,LINC00896,LINC01311,LOC101928891,LOC284865,MIR1286,MIR1306,MIR185,MIR3618,MIR4761,MIR649,MIR6816,P2RX6P,PI4KAP1,POM121L4P,SEPT5-GP1BB,THAP7-AS1,TMEM191A,TUBA3FP	EC-EGTCS145	1	GGE	YES
16	21807855	22442008	634154	254	9	C16orf52,CDR2,EEF2K,PDZD9,POLR3E,UQCRC2,VWA3A,RRN3P1,RRN3P3	EC-EGTCS156	1	GGE	YES
16	15054292	16635036	1580745	614	42	ABCC1,ABCC6,C16orf45,FOPNL,KIAA0430,MPV17L,MYH11,NDE1,NOMO3,NPIPA5,NPIPA7,NPIPA8,NTAN1,PDXDC1,RRN3,LOC100288162,LOC100505915,MIR3179-1,MIR3179-2,MIR3179-3,MIR3179-4,MIR3180-1,MIR3180-2,MIR3180-3,MIR3180-4,MIR3670-1,MIR3670-2,MIR3670-3,MIR3670-4,MIR484,MIR6506,MIR6511A1,MIR6511A2,MIR6511A3,MIR6511A4,MIR6511B1,MIR6511B2,MIR6770-1,MIR6770-2,MIR6770-3,PKD1P1,PKD1P6	EC-IAE002	1	GGE	YES
15	22777605	23300761	523157	267	8	CYFIP1,NIPA1,NIPA2,TUBGCP5,GOLGA8IP,HERC2P2,LOC283683,WHAMMP3	EC-JAE003	1	GGE	YES
21	14594223	15136617	542395	205	6	POTED,LOC102724188,MIR3118-1,MIR3156-3,MIR8069-1,MIR8069-2	EC-JAE006	1	GGE	NO
21	14570272	15133680	563409	207	6	POTED,LOC102724188,MIR3118-1,MIR3156-3,MIR8069-1,MIR8069-2	EC-JAE014	1	GGE	NO
12	21007732	21410089	402358	260	3	SLCO1B1,SLCO1B3,SLCO1B7	EC-JAE022;CTR-0137	1,0	GGE, GGE	NO
11	24986207	25496342	510136	404	1	LUZP2	EC-JAE034	1	GGE	NO
15	30444264	32827524	2383261	1151	21	ARHGAP11B,CHRFAM7A,CHRNA7,FAN1,GOLGA8H,GOLGA8K,GOLGA8O,GOLGA8R,KLF13,LOC283710,MTMR10,OTUD7A,TRPM1,DKFZP434L187,HERC2P10,LOC100288637,MIR211,ULK4P1,ULK4P2,ULK4P3,WHAMMP1	EC-JAE037	1	GGE	YES
15	30730691	32843110	2112420	1086	19	ARHGAP11B,CHRNA7,FAN1,GOLGA8H,GOLGA8K,GOLGA8O,KLF13,LOC283710,MTMR10,OTUD7A,TRPM1,HERC2P10,LOC100288637,LOC100996255,MIR211,ULK4P1,ULK4P2,ULK4P3,WHAMMP1	EC-JAE069	1	GGE	YES
2	51080429	51682854	602426	444	1	NRXN1	EC-JAE085	1	GGE	NO
6	48013276	48653561	640286	335	1	PTCHD4	EC-JAE106	1	GGE	NO
8	142850077	143549806	699730	384	6	ADGRB1,TSNARE1,LINC00051,MIR1302-7,MIR4472-1,MIR4539	EC-JAE119	1	GGE	NO
15	30807930	32539525	1731596	1039	14	ARHGAP11B,CHRNA7,FAN1,GOLGA8H,KLF13,LOC283710,MTMR10,OTUD7A,TRPM1,HERC2P10,LOC100288637,MIR211,ULK4P1,ULK4P2	EC-JAE134	1	GGE	YES

15	22673387	23300761	627375	291	14	CYFIP1,GOLGA6L1,GOLGA6L22,NIPA1,NIPA2,TUBGCP5,GOLGA8DP,GOLGA8IP,HERC2P2,LOC283683,MIR4509-1,MIR4509-2,MIR4509-3,WHAMMP3	EC-JAE135;CTR-0161;CTR-0163;CTR-0164	1,0,0,0	GGE, GGE, GGE, GGE	YES
16	21807855	22587453	779599	258	12	C16orf52,CDR2,EEF2K,NPIPB5,PDZD9,POLR3E,UQCRC2,VWA3A,LOC653786,RRN3P1,RRN3P3,SMG1P1	EC-JAE151	1	GGE	YES
15	30900866	32512208	1611343	1035	12	ARHGAP11B,CHRNA7,FAN1,GOLGA8H,KLF13,LOC283710,MTMR10,OTUD7A,TRPM1,HERC2P10,LOC100288637,MIR211	EC-JAE168	1	GGE	YES
13	103747360	104149067	401708	355	2	LINC01309,MIR548AS	EC-JAE178	1	GGE	NO
7	64594329	65094953	500625	213	1	ZNF92	EC-JAE192;CTR-0063;CTR-0064;CTR-0069	1,0,0,0	GGE, GGE, GGE, GGE	NO
10	27836576	28429513	592938	403	4	ARMC4,MKX,MPP7,MKX-AS1	EC-JME005	1	GGE	NO
11	4167416	5262622	1095207	1007	32	C11orf40,HBB,HBD,MMP26,OR51A2,OR51A4,OR51A7,OR51D1,OR51E1,OR51E2,OR51F1,OR51F2,OR51G1,OR51G2,OR51L1,OR51S1,OR51T1,OR51V1,OR52A1,OR52A5,OR52B4,OR52E2,OR52I1,OR52I2,OR52J3,OR52K1,OR52K2,OR52M1,OR52R1,TRIM21,TRIM68,LOC100506082	EC-JME054	1	GGE	NO
4	187972195	188471064	498870	330	2	LOC100506272,LOC339975	EC-JME055	1	GGE	NO
21	45866974	48096945	2229972	1315	58	ADARB1,C21orf58,COL18A1,COL6A1,COL6A2,DIP2A,FAM207A,FTCD,ITGB2,KRTAP10-1,KRTAP10-10,KRTAP10-11,KRTAP10-12,KRTAP10-2,KRTAP10-3,KRTAP10-4,KRTAP10-5,KRTAP10-6,KRTAP10-7,KRTAP10-8,KRTAP10-9,KRTAP12-1,KRTAP12-2,KRTAP12-3,KRTAP12-4,LRRC3,LSS,MCM3AP,PCBP3,PCNT,POFUT2,PRMT2,PTTG1IP,S100B,SLC19A1,SPATC1L,SUMO3,TSPEAR,UBE2G2,YBEY,COL18A1-AS1,COL18A1-AS2,DIP2A-IT1,ITGB2-AS1,LINC00162,LINC00163,LINC00316,LINC01424,LINC01547,LOC100129027,LOC101928796,LOC642852,LRRC3-AS1,MCM3AP-AS1,MIR6815,SSR4P1,TSPEAR-AS1,TSPEAR-AS2	EC-JME101	1	GGE	NO
3	85017098	85603757	586660	309	3	MIR5688,CADM2	EC-JME104	1	GGE	NO
15	30730691	32799815	2069125	1081	17	ARHGAP11B,CHRNA7,FAN1,GOLGA8H,GOLGA8K,GOLGA8O,KLF13,LOC283710,MTMR10,OTUD7A,TRPM1,HERC2P10,LOC100288637,MIR211,ULK4P1,ULK4P2,ULK4P3	EC-JME106	1	GGE	YES
11	24970298	25501327	531030	415	1	LUZP2	EC-JME120	1	GGE	NO
15	22673387	23389101	715715	292	14	CYFIP1,GOLGA6L1,GOLGA6L22,NIPA1,NIPA2,TUBGCP5,GOLGA8DP,GOLGA8IP,HERC2P2,LOC283683,MIR4509-1,MIR4509-2,MIR4509-3,WHAMMP3	EC-JME145	1	GGE	YES
3	175080735	175746934	666200	417	4	NAALADL2,MIR4789,MIR548AY,NAALADL2-AS1	EC-JME194	1	GGE	NO
7	110647683	111169227	521545	339	2	IMMP2L,LRRN3	EC-JME209	1	GGE	NO
19	23620873	24071154	450282	312	3	ZNF675,ZNF681,RPSAP58	EC-JME246;CTR-0190;CTR-0191	1,0,0	GGE, GGE, GGE	NO
15	22587462	23300761	713300	293	14	CYFIP1,GOLGA6L1,GOLGA6L22,NIPA1,NIPA2,TUBGCP5,GOLGA8DP,GOLGA8IP,HERC2P2,LOC283683,MIR4509-1,MIR4509-2,MIR4509-3,WHAMMP3	EC-JME265	1	GGE	YES
7	64594329	65162170	567842	216	3	ZNF92,INTS4P2,LOC441242	EC-JME310;CTR-0060;CTR-0062	1,0,0	GGE, GGE, GGE	NO
15	22280465	23226468	946004	399	19	CYFIP1,GOLGA6L1,GOLGA6L22,NIPA1,NIPA2,OR4M2,OR4N4,TUBGCP5,GOLGA8DP,LOC101927079,LOC283683,LOC727924,MIR1268A,MIR4509-1,MIR4509-2,MIR4509-3,OR4N3P,REREP3,WHAMMP3	EC-JME338	1	GGE	YES
15	22673387	23226468	553082	284	12	CYFIP1,GOLGA6L1,GOLGA6L22,NIPA1,NIPA2,TUBGCP5,GOLGA8DP,LOC283683,MIR4509-1,MIR4509-2,MIR4509-3,WHAMMP3	EC-JME384	1	GGE	YES
2	130275170	130762880	487711	333	4	RAB6C,LOC101927924,LOC389033,RAB6C-AS1	EC-JME399	1	GGE	NO
5	104011380	104423684	412305	290	0		EC-JME399	1	GGE	NO

15	22317500	23237164	919665	395	19	CYFIP1,GOLGA6L1,GOLGA6L22,NIPA1,NIPA2,OR4M2,OR4N4,TUBGCP5,GOLGA8DP,LOC101927079,LOC283683,LOC727924,MIR1268A,MIR4509-1,MIR4509-2,MIR4509-3,OR4N3P,REREP3,WHAMMP3	EC-JME404	1	GGE	YES
2	35708834	36456580	747747	604	0		EC-JME413	1	GGE	NO
8	142563566	143798641	1235076	625	11	ADGRB1,ARC,JRK,LY6K,PSCA,TSNARE1,LINC00051,LOC100288181,MIR1302-7,MIR4472-1,MIR4539	EC-JME417	1	GGE	NO
12	72135173	73995884	1860712	1101	7	RAB21,TBC1D15,TPH2,TRHDE,LOC101928137,MRS2P2,TRHDE-AS1	EC-JME425	1	GGE	NO
15	22673387	23487534	814148	297	16	CYFIP1,GOLGA6L1,GOLGA6L22,NIPA1,NIPA2,TUBGCP5,GOLGA8DP,GOLGA8EP,GOLGA8IP,HERC2P2,HERC2P7,LOC283683,MIR4509-1,MIR4509-2,MIR4509-3,WHAMMP3	EC-JME426	1	GGE	YES
15	30920612	32539525	1618914	1035	11	ARHGAP11B,CHRNA7,FAN1,KLF13,LOC283710,MTMR10,OTUD7A,TRPM1,HERC2P10,LOC100288637,MIR211	EC-JME431	1	GGE	YES
4	27778687	31233363	3454677	2209	3	PCDH7,LOC102723778,MIR4275	EC-JME445	1	GGE	NO
7	124586130	126665734	2079605	1364	4	GRM8,LOC101928254,LOC101928283,POT1-AS1	EC-JME461	1	GGE	NO
15	22280465	23300761	1020297	406	21	CYFIP1,GOLGA6L1,GOLGA6L22,NIPA1,NIPA2,OR4M2,OR4N4,TUBGCP5,GOLGA8DP,GOLGA8IP,HERC2P2,LOC101927079,LOC283683,LOC727924,MIR1268A,MIR4509-1,MIR4509-2,MIR4509-3,OR4N3P,REREP3,WHAMMP3	EC-JME461	1	GGE	YES
13	65806192	66219510	413319	225	0		EC-JME472	1	GGE	NO
5	28059042	31736582	3677541	2427	7	C5orf22,CDH6,DROSHA,LOC101929645,LOC101929660,LOC101929681,LSP1P3	EC-JME481	1	GGE	NO
15	30386399	32857400	2471002	1154	24	ARHGAP11B,CHRFAM7A,CHRNA7,FAN1,GOLGA8H,GOLGA8K,GOLGA8O,GOLGA8R,KLF13,LOC283710,MTMR10,OTUD7A,TRPM1,DKFZP434L187,GOLGA8T,HERC2P10,LOC100288637,LOC100996255,MIR211,ULK4P1,ULK4P2,ULK4P3,WHAMMP1,GOLGA8J	EC-JME537	1	GGE	YES
3	60333	1853710	1793378	1582	5	CHL1,CNTN6,CHL1-AS1,LINC01266,LOC102723448	EC-JME554	1	GGE	NO
19	43321125	43785717	464593	211	11	PSG1,PSG11,PSG2,PSG4,PSG5,PSG6,PSG7,PSG9,LOC100289650,LOC284344,PSG10P	EC-JME575	1	GGE	NO
15	84915113	85726714	811602	407	16	ALPK3,NMB,PDE8A,SEC11A,SLC28A1,WDR73,ZNF592,ZSCAN2,DNM1P41,GOLGA6L5P,LINC00933,LOC102724034,LOC103171574,SCAND2P,UBE2Q2P1,GOLGA6L4	EC-JME642	1	GGE	NO
7	110317244	110966237	648994	421	2	IMMP2L,LRRN3	EC-JME658	1	GGE	NO
2	220690131	221835641	1145511	317	1	MIR4268	EP565	1	AFE	NO
10	19073973	19605298	531326	168	1	MALRD1	EP610	1	AFE	NO
12	21007718	21411854	404137	278	3	SLCO1B1,SLCO1B3,SLCO1B7	EP780;ROL_016_1	1,1	AFE;RE	NO
4	29869342	31032608	1163267	246	1	PCDH7	EPI0301	1	AFE	NO
8	82517136	85021548	2504413	449	6	CHMP4C,IMPA1,SLC10A5,SNX16,ZFAND1,LINC01419	EPW_1018_1	1	RE	NO
13	23079905	23657518	577614	232	1	BASP1P1	IT-AR-28	1	AFE	NO
13	94445415	94904461	459047	127	3	GPC6,GPC6-AS1,GPC6-AS2	IT-AR-33	1	AFE	NO
16	78356662	78761364	404703	193	1	WWOX	IT-BA-50	1	AFE	NO
4	189390949	189926941	535993	180	1	LINC01060	IT-BA-57	1	AFE	NO
10	57143622	57647581	503960	107	1	MTRNR2L5	IT-FI-20	1	AFE	NO
16	6053808	6792188	738381	463	1	RBFOX1	IT-FI-3	1	AFE	NO
6	67382664	68653644	1270981	283	0		IT-FI-33	1	AFE	NO

16	29595483	30198151	602669	116	31	ALDOA,ASPHD1,C16orf54,C16orf92,CDIPT,CORO1A,DOC2A,FAM57B,GDPD3,HIRIP3,INO80E,KCTD13,KIF22,MAPK3,MAZ,MVP,PAGR1,PPP4C,PRRT2,QPRT,SEZ6L2,SPN,TAOK2,TBX6,TMEM219,YPEL3,ZG16,CDIPT-AS1,MIR3680-1,MIR3680-2,SLC7A5P1	IT-MI-59	1	AFE	YES
4	160857395	161878326	1020932	263	0		IT-MN-32	1	AFE	NO
6	163661513	170904973	7243461	2439	59	C6orf118,CCR6,FGFR1OP,GPR31,MPC1,PACRG,PDE10A,PRR18,QKI,RNASET2,RPS6KA2,SFT2D1,T,CAHM,DKFZp451B082,LINC00473,LINC00602,LOC100289495,LOC101929297,MIR1913,MIR3939,MIR7641-2,PACRG-AS1,RPS6KA2-AS1,RPS6KA2-IT1,C6orf120,DACT2,DLL1,ERMARD,FAM120B,FRMD1,HGC6.3,KIF25,MLLT4,PDCD2,PHF10,PSMB1,SMOC2,TBP,TCP10,TCTE3,THBS2,TTLL2,UNC93A,WDR27,FLJ38122,KIF25-AS1,LINC00242,LINC00574,LINC01558,LOC101929420,LOC101929504,LOC102724511,LOC154449,LOC285804,LOC401286,LOC441178,MIR4644,MLLT4-AS1	IT-NA-89	1	AFE	NO
1	846808	4679951	3833144	1112	94	ACAP3,AGRN,ANKRD65,ATAD3A,ATAD3B,ATAD3C,AURKAIP1,B3GALT6,C1orf159,C1orf233,CCNL2,CDK11B,CPSF3L,CPTP,DVL1,FAM132A,HES4,ISG15,KLHL17,MIB2,MMP23B,MRPL20,MXRA8,NOC2L,PERM1,PLEKHN1,PUSL1,RNF223,SAMD11,SCNN1D,SDF4,SLC35E2B,SSU72,TAS1R3,TMEM240,TMEM88B,TNFRSF18,TTLL10,UBE2J2,VWA1,LINC01342,LOC100130417,LOC102724312,LOC148413,MIR200A,MIR200B,MIR429,MIR6726,MIR6727,MIR6808,MMP23A,ACTRT2,C1orf86,CALML6,CFAP74,FAM213B,GABRD,GNB1,HES5,MMEL1,MORN1,NADK,PANK4,PEX10,PLCH2,PRDM16,PRKCZ,RER1,SKI,TMEM52,TNFRSF14,TTC34,LINC00982,LOC100129534,LOC100996583,LOC115110,MIR4251,ARHGEF16,C1orf174,CCDC27,CEP104,DFFB,LRRC47,MEGF6,SMIM1,TP73,TPRG1L,WRAP73,LINC01134,MIR551A,TP73-AS1,LINC01346,LOC284661	IT-PR-2	1	AFE	NO
5	8074665	8697444	622780	199	3	LOC729506,MIR4458,MIR4458HG	IT-PR-39	1	AFE	NO
16	6766068	7270582	504515	293	1	RBFOX1	IT-PR-6	1	AFE	NO
13	85830257	86469014	638758	159	2	SLITRK6,LINC00351	IT-VI-59	1	AFE	NO
4	117478490	118740650	1262161	320	2	TRAM1L1,LINC01378	L1904	1	AFE	NO
15	22750305	23226254	475950	113	6	CYFIP1,NIPA1,NIPA2,TUBGCP5,LOC283683,WHAMMP3	L1921;88_4	1,1	AFE;RE	YES
4	189133207	190552585	1419379	425	1	LINC01060	L2804	1	AFE	NO
22	23250736	23651318	400583	125	5	BCR,GNAZ,RAB36,RSPH14,FBXW4P1	ROL_003_1	1	RE	YES
15	28962131	32514341	3552211	734	28	APBA2,ARHGAP11B,CHRFAM7A,CHRNA7,FAM189A1,FAN1,GOLGA8H,GOLGA8J,GOLGA8R,KLF13,LOC283710,MTMR10,NDNL2,OTUD7A,TJP1,TRPM1,DKFZP434L187,GOLGA6L7P,GOLGA8T,HERC2P10,LOC100288637,LOC100289656,MIR211,PDCD6IPP2,ULK4P1,ULK4P2,ULK4P3,WHAMMP2	ROL_046_1	1	RE	YES
14	54629941	56027815	1397875	371	15	ATG14,CDKN3,CGRRF1,CNIH1,DLGAP5,FBXO34,GCH1,GMFB,LGALS3,MAPK1IP1L,SAMD4A,SOCS4,TBPL2,WDHD1,MIR4308	ROL_048_1	1	RE	NO
1	237834700	239439084	1604385	537	4	RYR2,ZP4,LINC01139,LOC100130331	tle-273	1	AFE	NO
17	14101028	15471179	1370152	655	13	CDRT15,CDRT4,COX10,HS3ST3B1,PMP22,TEKT3,TVP23C,TVP23C-CDRT4,CDRT7,CDRT8,MGC12916,MIR4731,CDRT1	tle-432	1	AFE	NO
9	107856028	108535272	679245	133	5	FKTN,FSD1L,SLC44A1,TAL2,TMEM38B	tle-463	1	AFE	NO

Supplementary Figure S2. Burden analysis of microdeletions including hotspots. For adult focal epilepsies (AFE, Purple), rolandic epilepsies (RE, Blue), genetic generalized epilepsies (GGE, Green) datasets the burden analysis with genomic rearrangement hotspots loci consideration [16] is shown using the following microdeletion sets: All microdeletions; Overlapping at least one: CNV constrained gene, Neuro-Developmental gene[17], ASD-Related gene [18], developmental disorders gene[19] and loss-of-function intolerant gene[20]. The effect size observed (OR), confidence interval (C.I., horizontal lines) and multiple testing corrected p value obtained is shown for each dataset. Triangles denote if the signal is nominally significant. C.I. above 9 are shown in numbers.

Supplementary Table S3. Microdeletion burden analisys sample count.

Microdeletions Sets	N° Genes	Affymetrix GenomeWide 6.0		Illumina Omni Express Array		
		GGE Cases (N=1.366)	Ctrl (N=5.234)	RE Cases (N=281)	AFE Cases (N=807)	Ctrl (N=1.512)
All microdeletions		100	208	9	24	26
Overlapping CNV constrained genes	20,206	78	129	9	15	16
Overlapping NeuroDevelopmental genes	1,559	59	52	3	8	10
Overlapping ASD-Related genes	1,683	44	45	7	6	9
Overlappingdevelopmental disorders genes	294	6	2	1	2	1
Overlapping loss of function intolerant genes	2,506	46	39	6	6	8
Overlapping hotspots loci genes	330	38	20	3	2	2
Microdeletions Sets outside hotspots						
All microdeletions outside hotspots		63	189	7	22	25
Overlapping CNV constrained genes outside hotspots		40	110	7	13	14
Overlapping NeuroDevelopmental genes outside hotspots		25	34	2	6	8
Overlapping ASD-Related genes outside hotspots		10	28	4	4	8
Overlapping developmental disorders genes outside hotspots		1	0	1	1	1
Overlapping loss of function intolerant genes outside hotspots		12	22	4	4	7
Control						
Overlappin Random genes	4,696	19	71	3	7	7