Supplementary figures 1-15 for the manuscript *Multi-trait Genetic Association Analysis identifies 50 new risk loci for gastroesophageal reflux, seven new loci for Barrett's esophagus and provides insights into clinical heterogeneity in reflux diagnosis*

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Supplementary Figure 2. Regional LocusZoom plot for all genome-wide GERD loci (n=88) identified in the GERD MTAG analysis

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Supplementary Figure 9. PheWAS plot illustrating the association between each of the seven novel BE loci identified in the BE MTAG analysis against a range of complex traits from the OpenTarget platform. Each point represent the -log10 p-value of the association between the putative trait of interest and the BE-associated variant.

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Supplementary Figure 12. Gene expression heatmap showing the average expression per label (log2 transformed) across 53 human tissues for obesity-driven GERD genes. Tissue expression data extracted from the GTEx v8 database.

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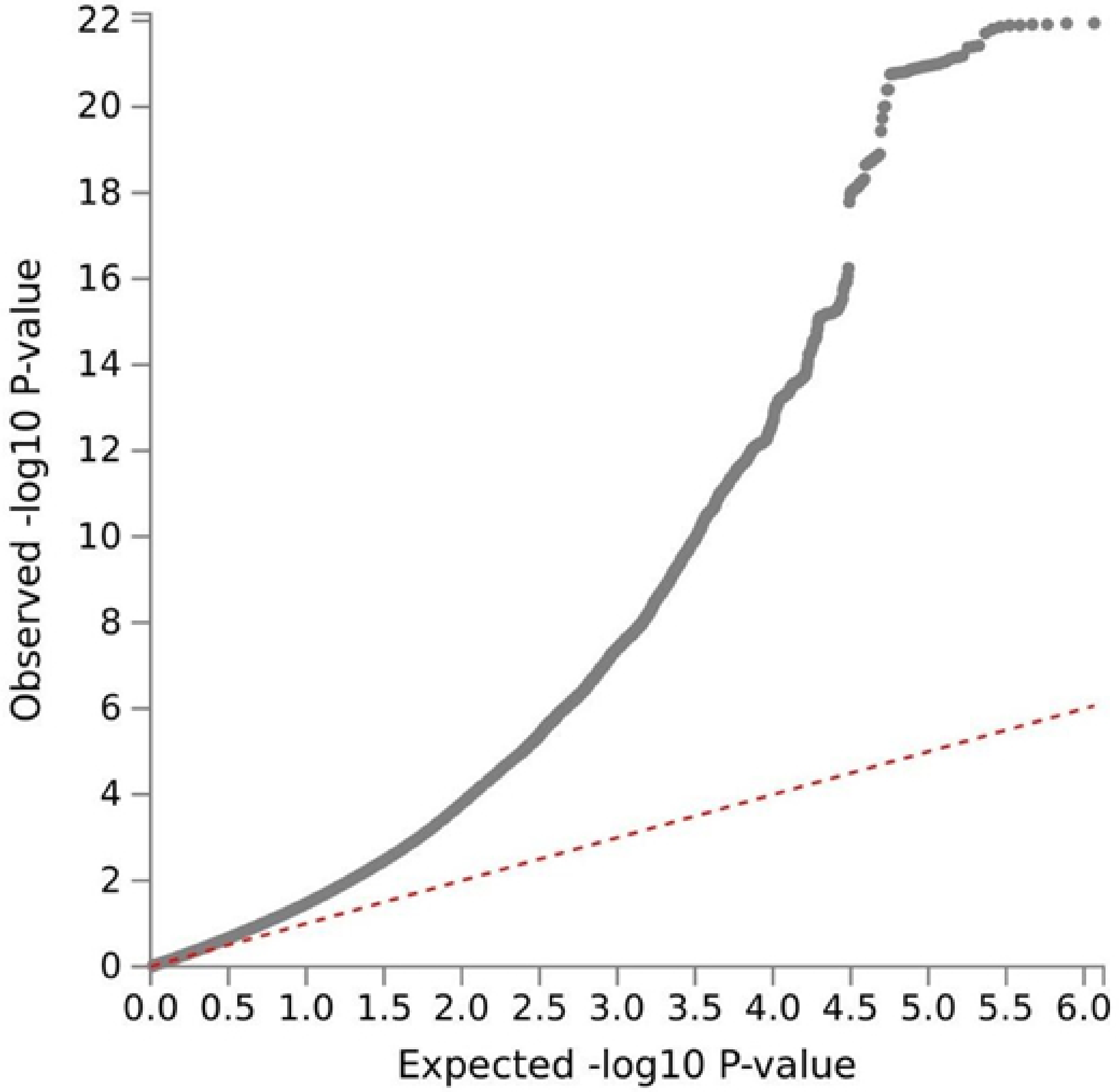
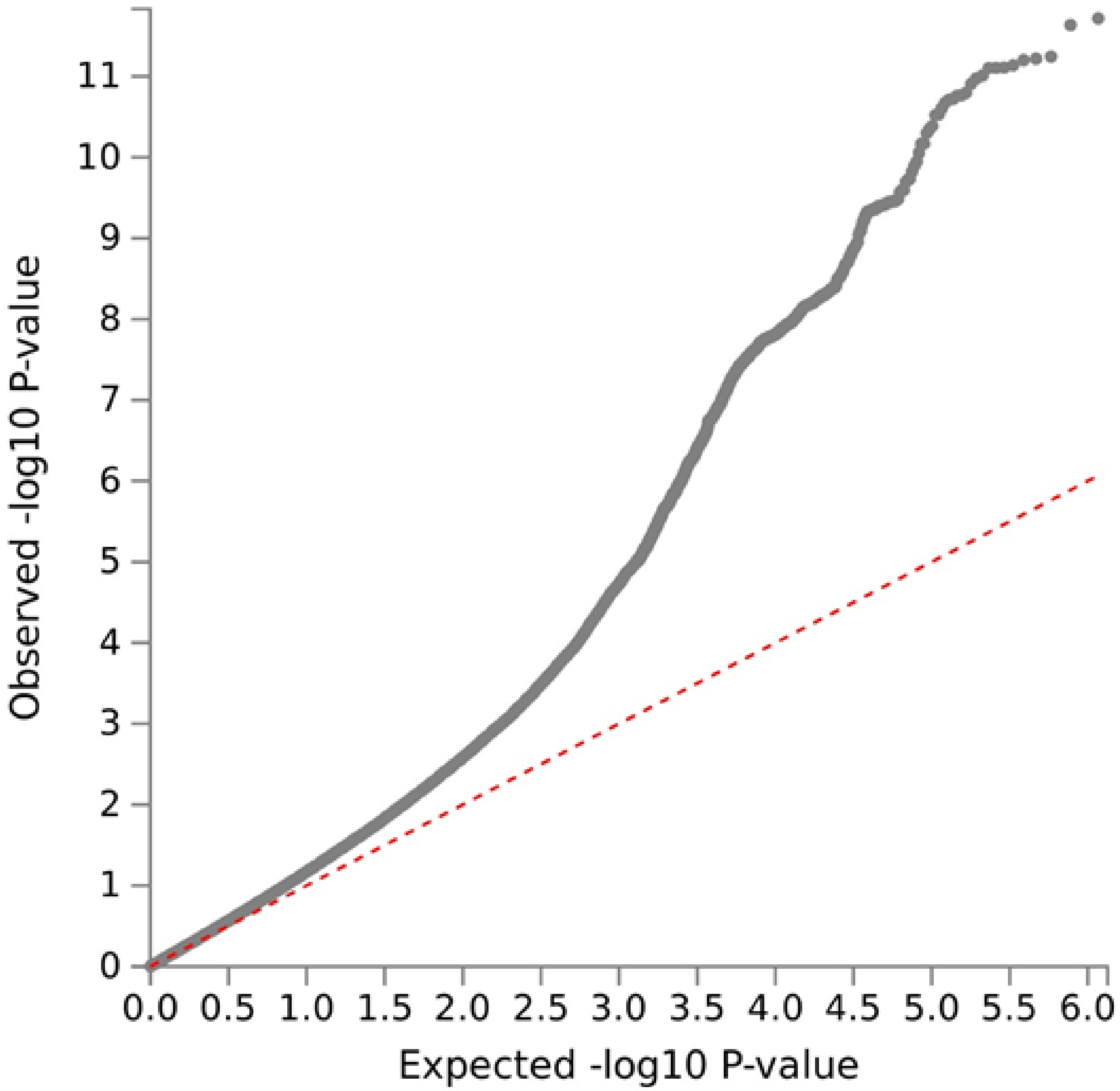
Supplementary Figure 14. Estimation of the genetic association between GERD and risk of Barrett's Esophagus only, stratified by genetic GERD subtypes. Each of the slopes represent the estimated magnitude of association between per unit increase in log(OR) of GERD on log(OR) of BE, for all GERD loci (in blue; with the 95% confidence interval bound shaded), all functional GERD loci (in green), all non-functional GERD loci (in orange) using an inverse variance weighted regression model. Points labelled unclear are those in the indeterminate subset.

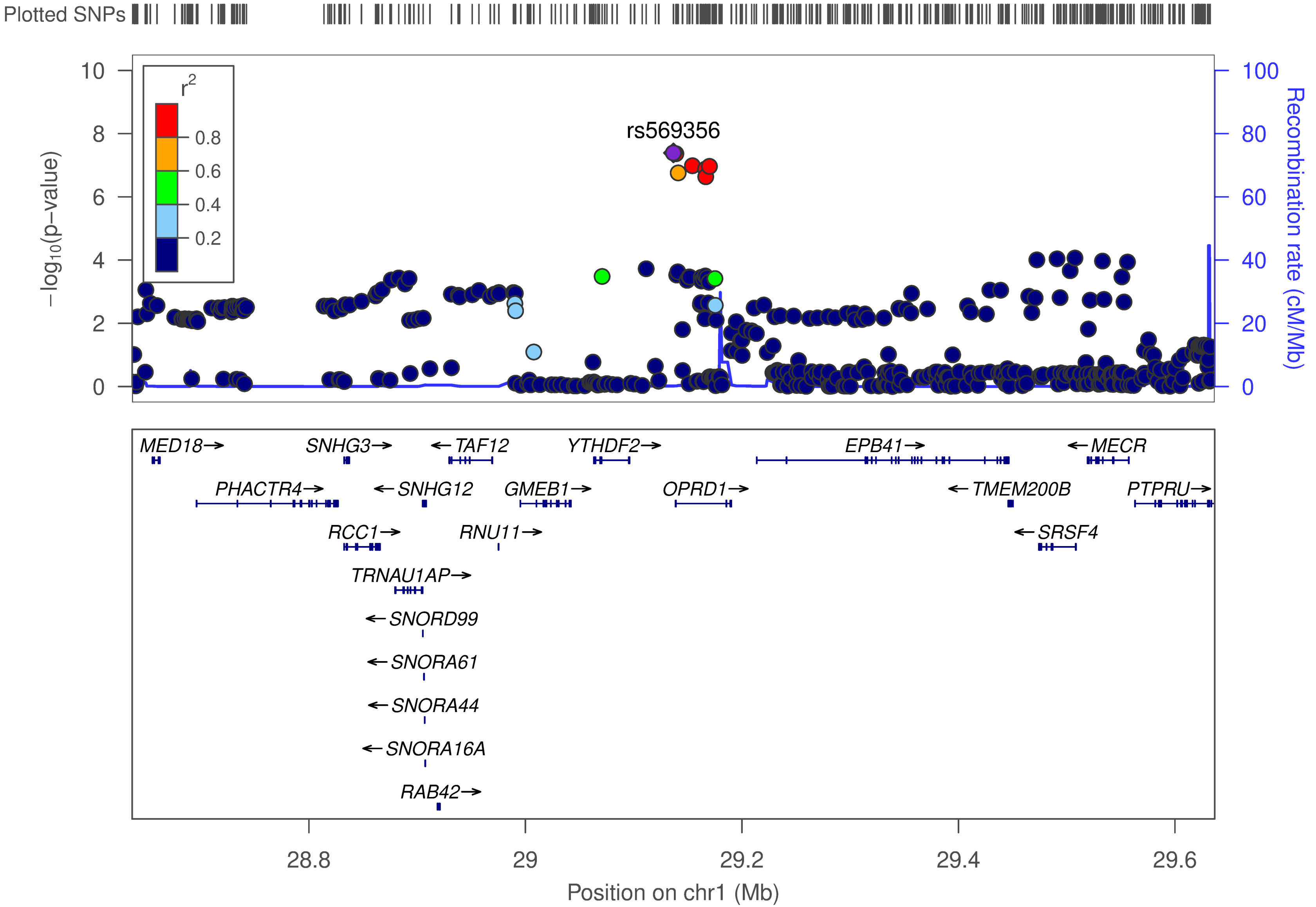
Supplementary Figure 15. Estimation of the genetic association between GERD and risk of Esophageal Adenocarcinoma only, stratified by genetic GERD subtypes. Each of the slopes represent the estimated magnitude of association between per unit increase in log(OR) of GERD on log(OR) of EA, for all GERD loci (in blue; with the 95% confidence interval bound shaded), all functional GERD loci (in green), all non-functional GERD loci (in orange) using an inverse variance weighted regression model. Points labelled unclear are those in the indeterminate subset.

(A) QQ plot for MTAG GERD output



(B) QQ plot for BE GERD output

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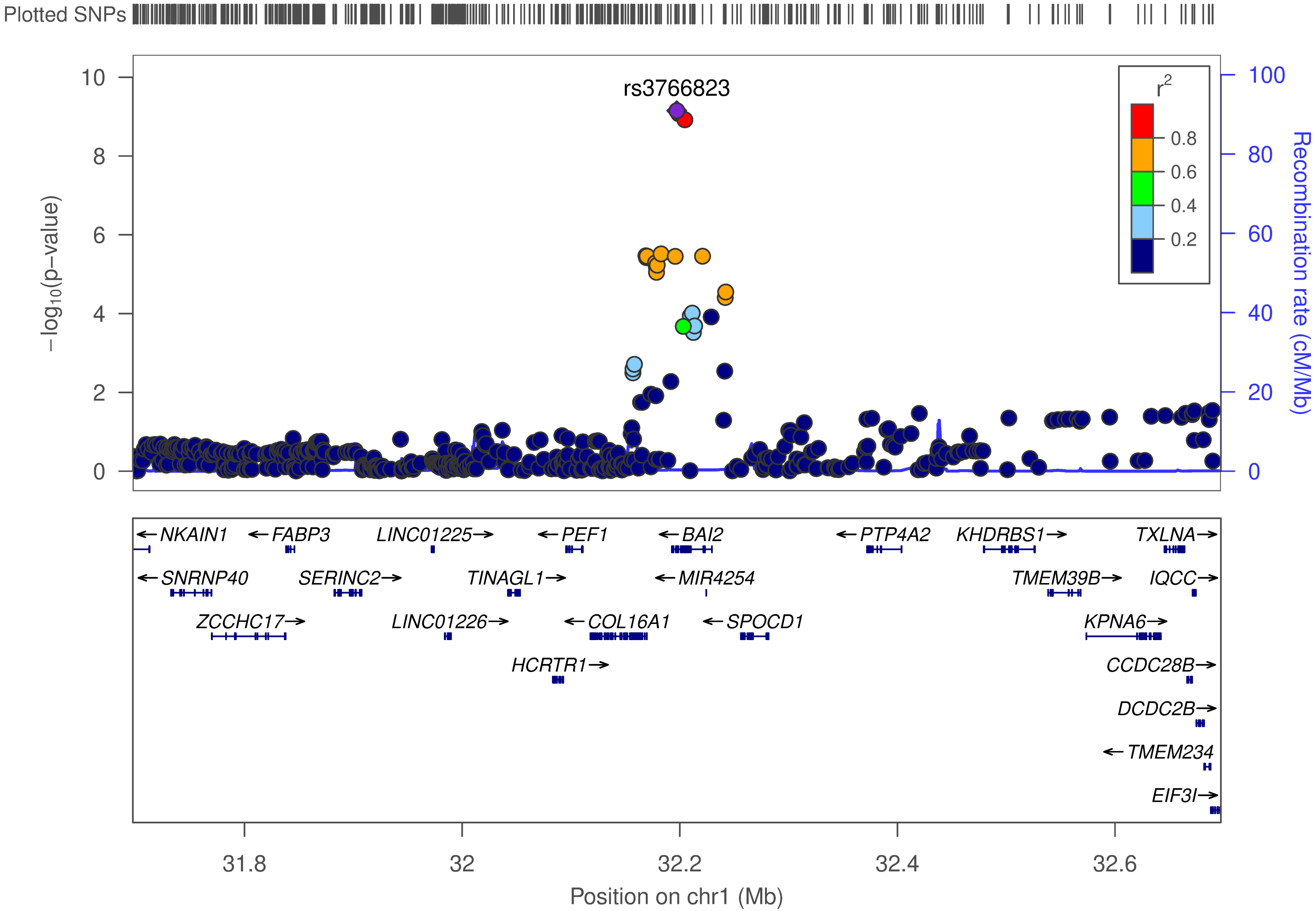
0.8
0.6
0.4
0.2
−log10(p−value)
0
2
4
6
8
10
Recombination rate (cM/Mb)
0
20
40
60
80
100
MED18→
PHACTR4→
SNHG3→
RCC1→
TRNAU1AP→
←SNORD99
←SNORA61
←SNORA44
←SNORA16A
RAB42→
←SNHG12
←TAF12
RNU11→
GMEB1→
YTHDF2→
OPRD1→
EPB41→
←TMEM200B
←SRSF4
←MECR
PTPRU→
28.8
29
29.2
29.4
29.6
Position on chr1 (Mb)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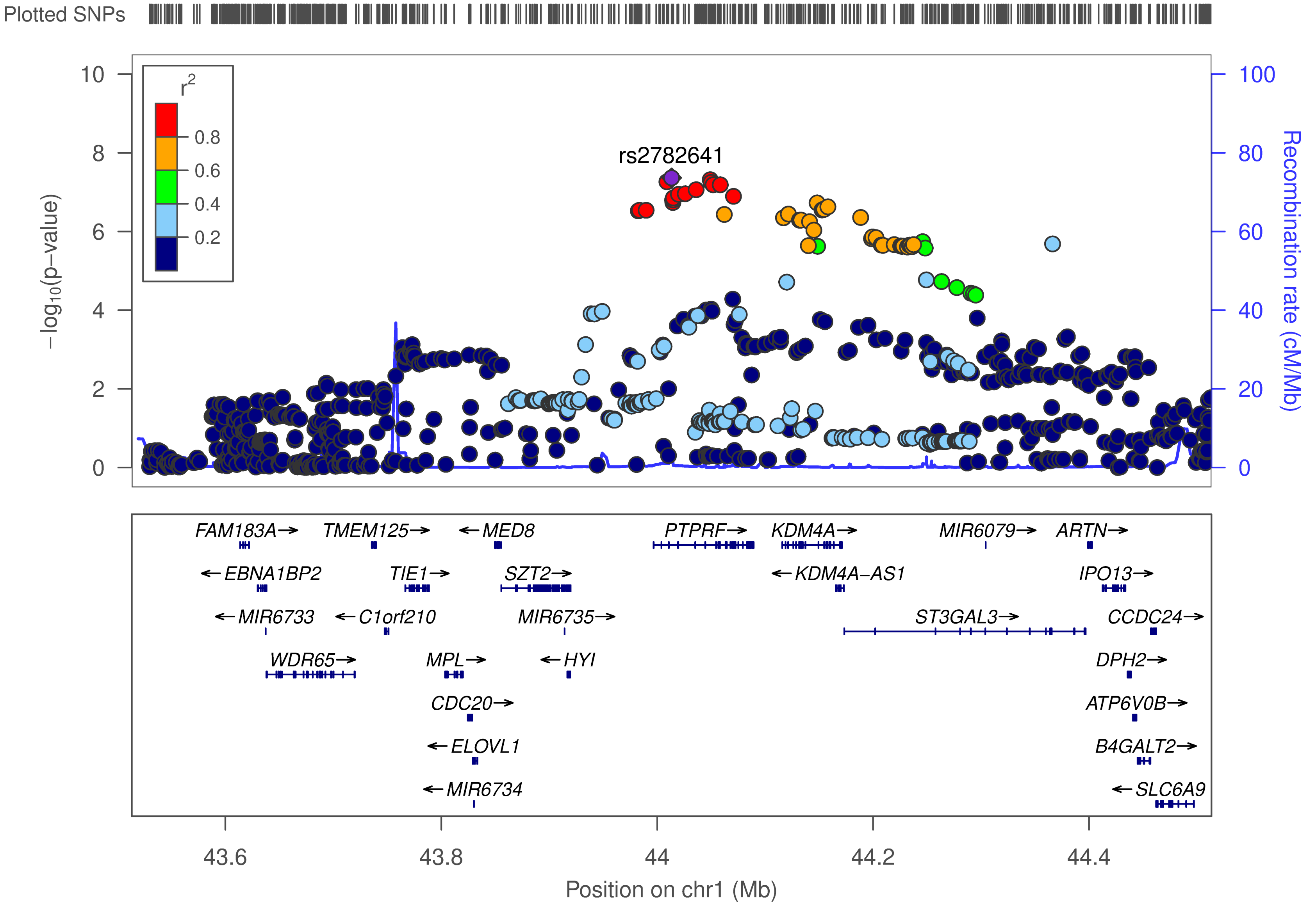
8
6
4
2
0
−log10(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
r2
0.8
0.6
0.4
0.2
← NKAIN1
← FABP3
LINC01225 →
← PEF1
← BAI2
← PTP4A2
KHDRBS1 →
TXLNA →
← SNRNP40
SERINC2 →
TINAGL1 →
← MIR4254
TMEM39B →
IQCC →
ZCCHC17 →
LINC01226 →
← COL16A1
← SPOCD1
KPNA6 →
HCRTR1 →
CCDC28B →
DCDC2B →
← TMEM234
EIF3I →
31.8
32
32.2
32.4
32.6
Position on chr1 (Mb)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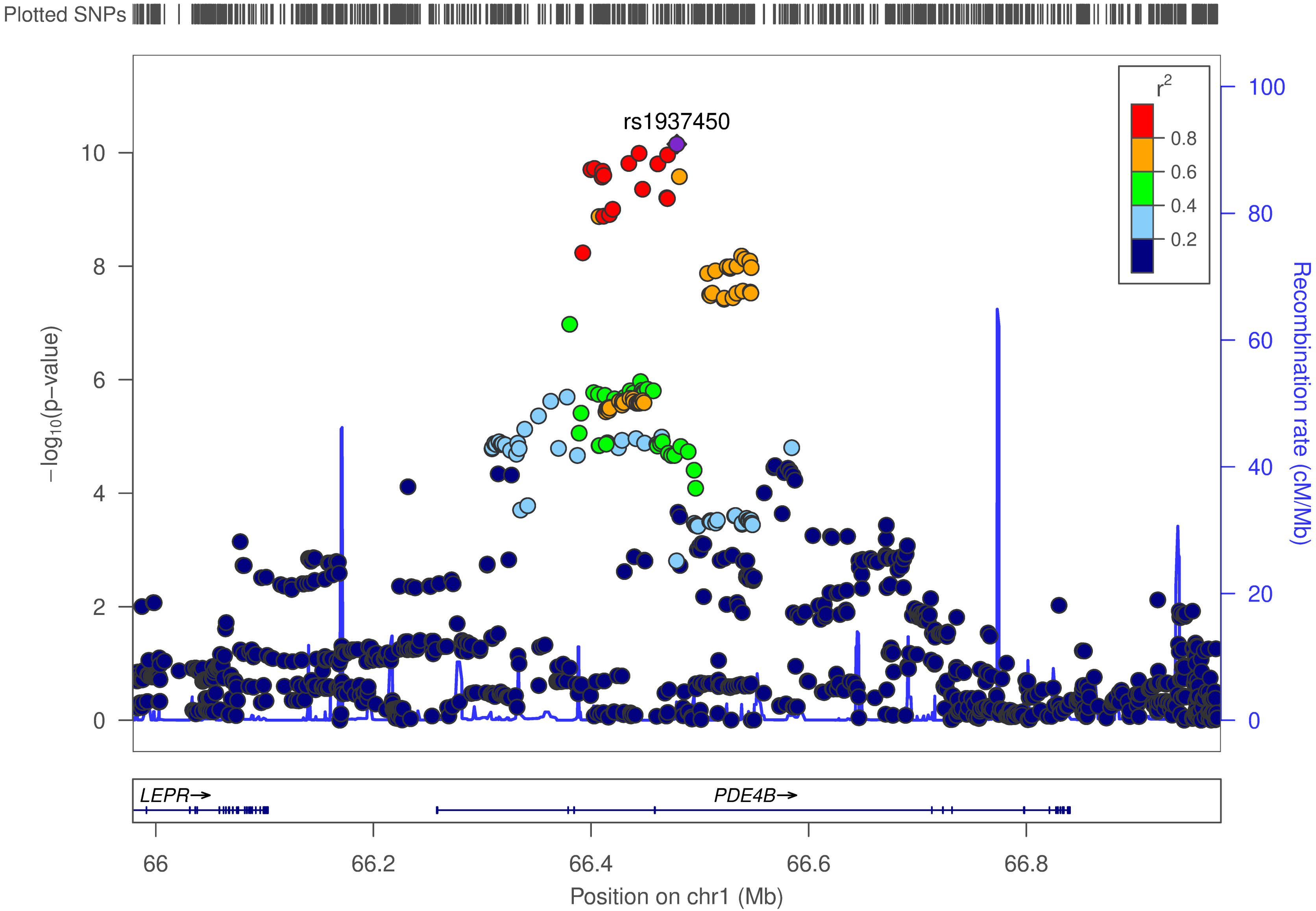
0.6
0.4
0.2
rs2782641
10
8
6
4
2
0
−log10(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
FAM183A→
TMEM125→
←MED8
PTPRF→
KDM4A→
MIR6079→
ARTN→
←EBNA1BP2
TIE1→
SZT2→
←KDM4A−AS1
IPO13→
←MIR6733
←C1orf210
MIR6735→
ST3GAL3→
CCDC24→
WDR65→
MPL→
←HYI
DPH2→
CDC20→
ATP6V0B→
←ELOVL1
B4GALT2→
←MIR6734
←SLC6A9
43.6
43.8
44
44.2
44.4
Position on chr1 (Mb)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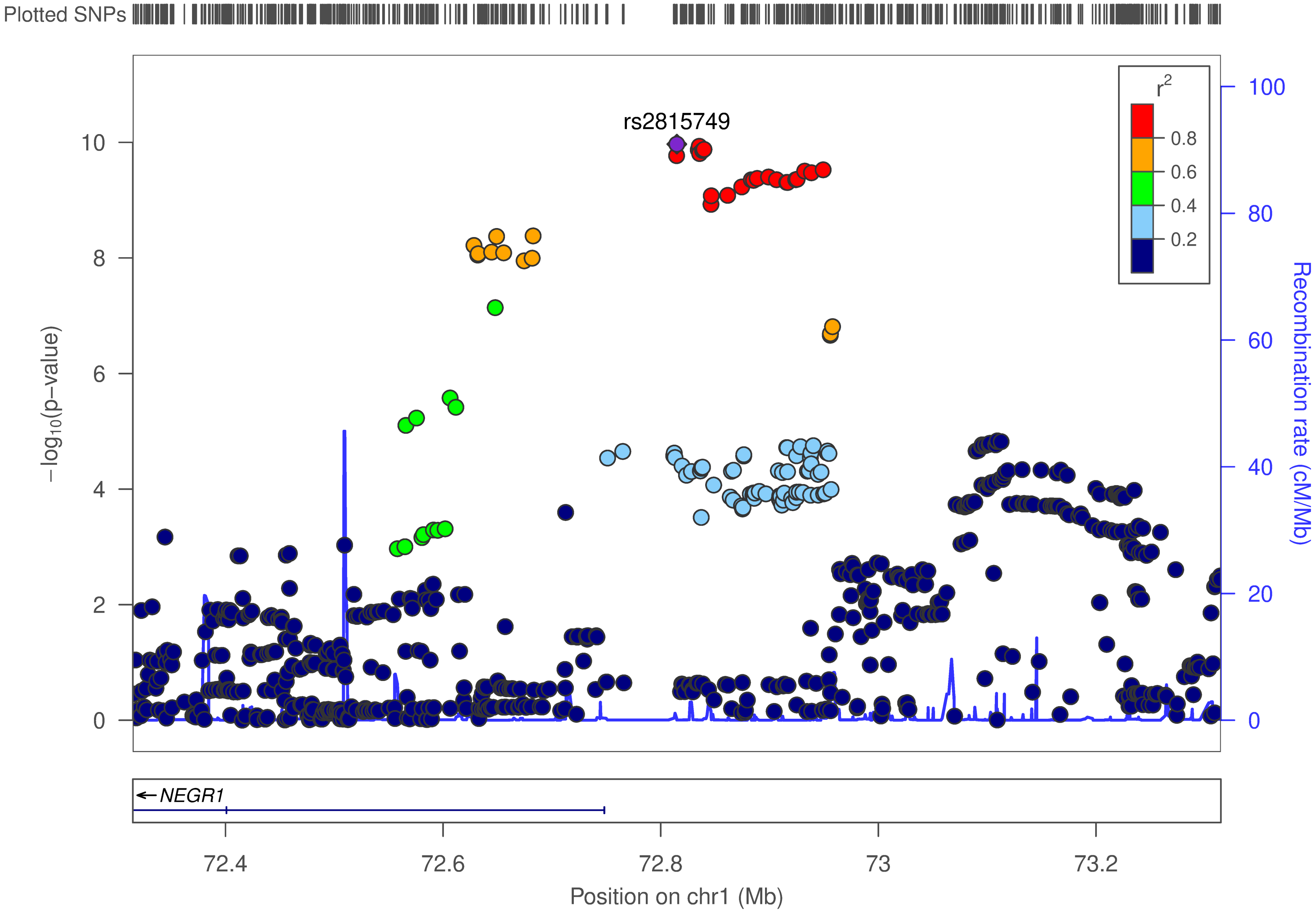
0.6
0.4
0.2
−log₁₀(p−value)
0
2
4
6
8
10
Recombination rate (cM/Mb)
0
20
40
60
80
100
LEPR→
PDE4B→
66
66.2
66.4
66.6
66.8
Position on chr1 (Mb)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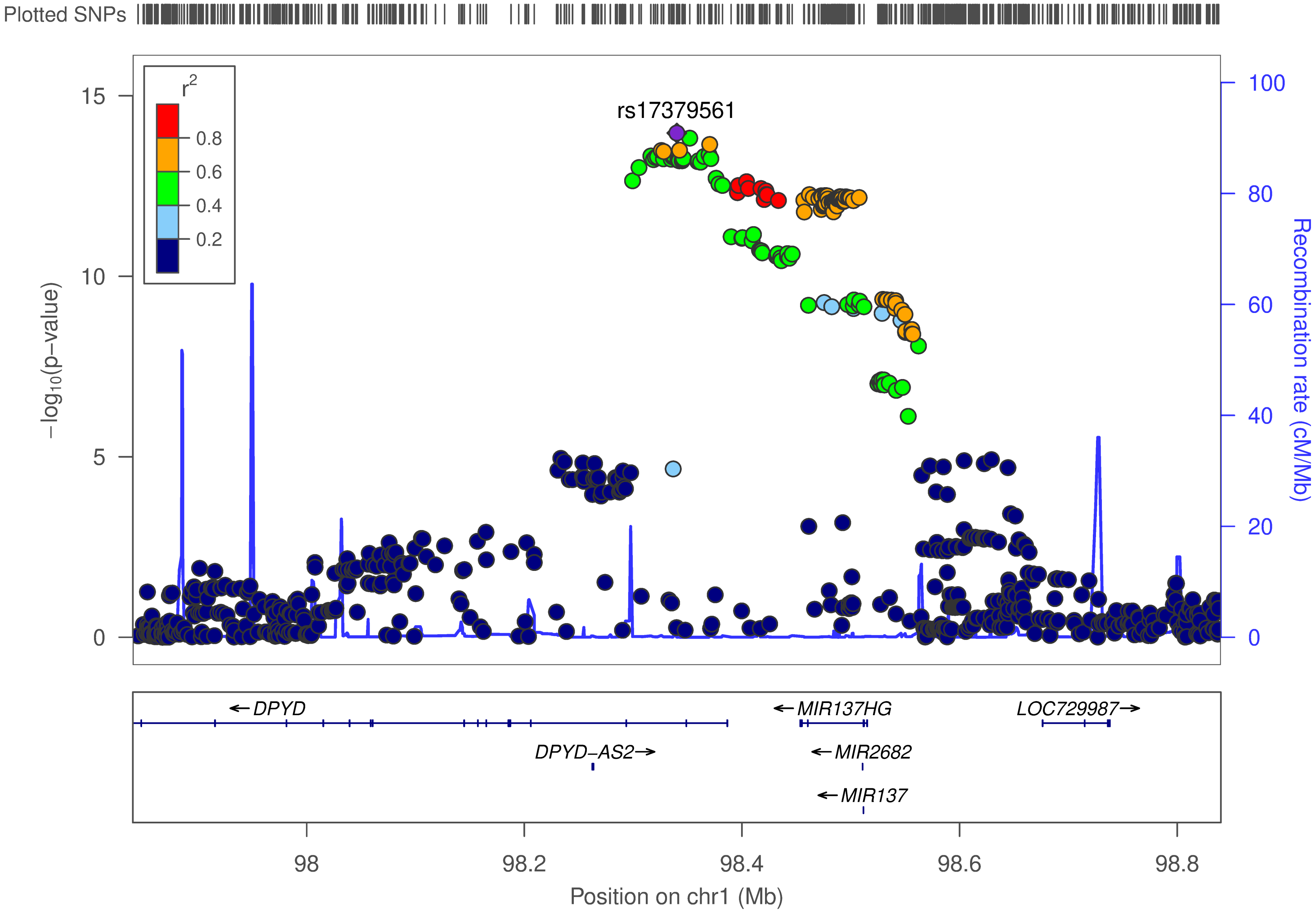
0.6
0.4
0.2
−log10(p−value)
0
2
4
6
8
10
Recombination rate (cM/Mb)
0
20
40
60
80
100
← NEGR1
72.4
72.6
72.8
73
73.2
Position on chr1 (Mb)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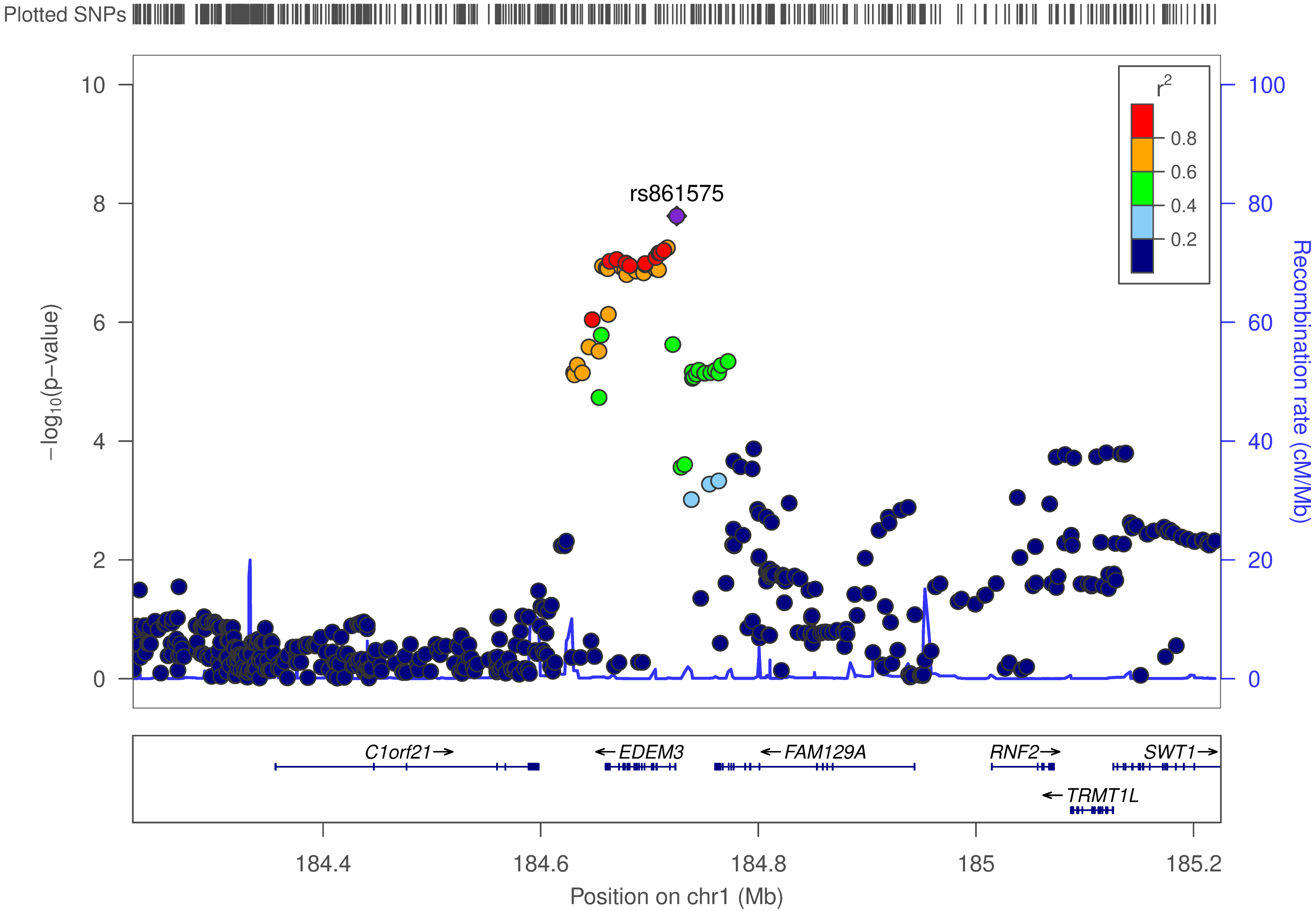
0.6
0.4
0.2
rs17379561
15
10
5
0
−log10(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
← DPYD
DPYD−AS2 →
← MIR137HG
← MIR2682
← MIR137
LOC729987 →
98
98.2
98.4
98.6
98.8
Position on chr1 (Mb)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−log10(p−value)
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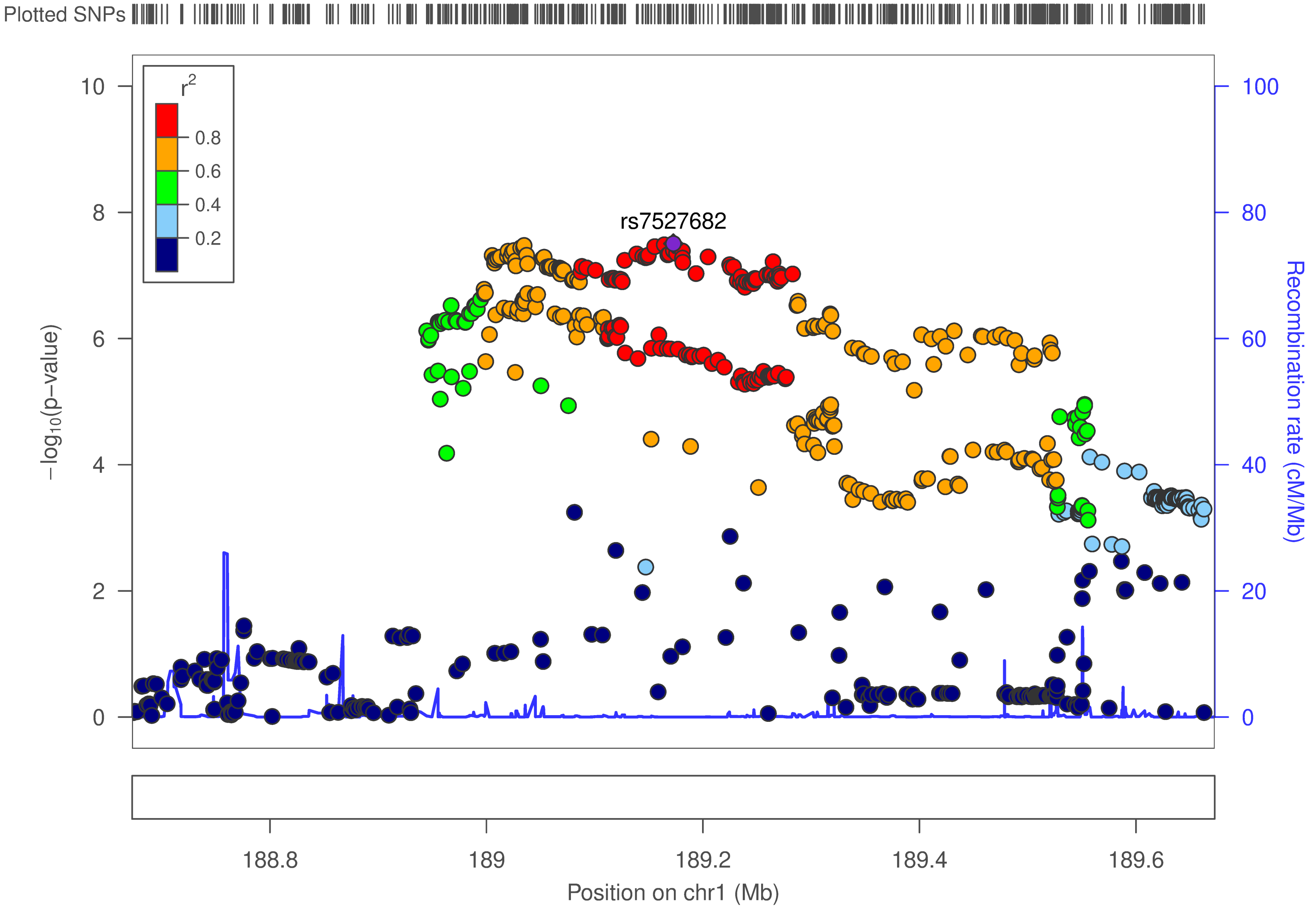
8
6
4
2
0
Recombination rate (cM/Mb)
100
80
60
40
20
0
r²
0.8
0.6
0.4
0.2
C1orf21→
←EDEM3
←FAM129A
RNF2→
SWT1→
←TRMT1L
184.4
184.6
184.8
185
185.2
Position on chr1 (Mb)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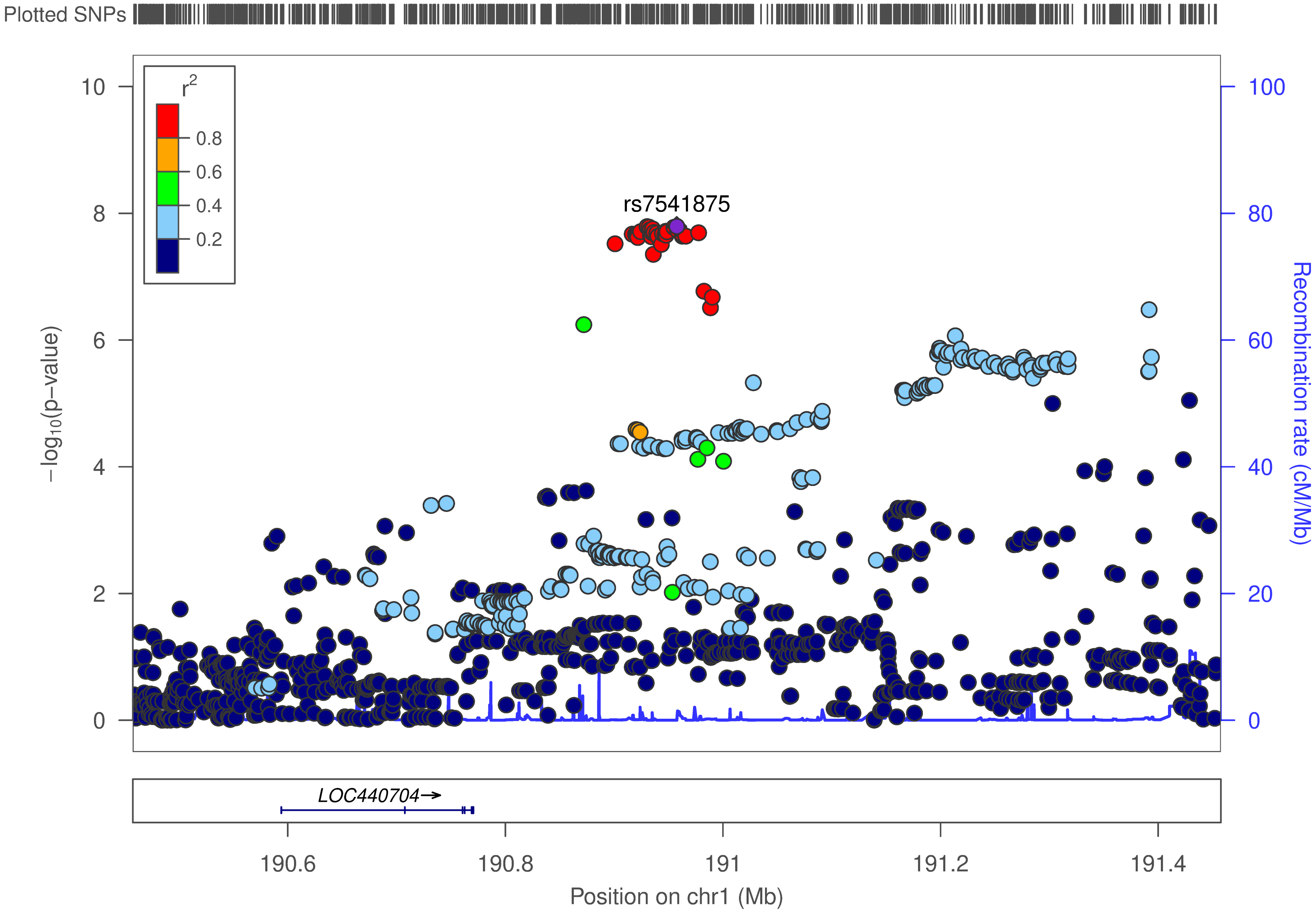
0.2
rs7527682
10
8
6
4
2
0
−log10(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
188.8
189
189.2
189.4
189.6
Position on chr1 (Mb)


Plotted SNPs
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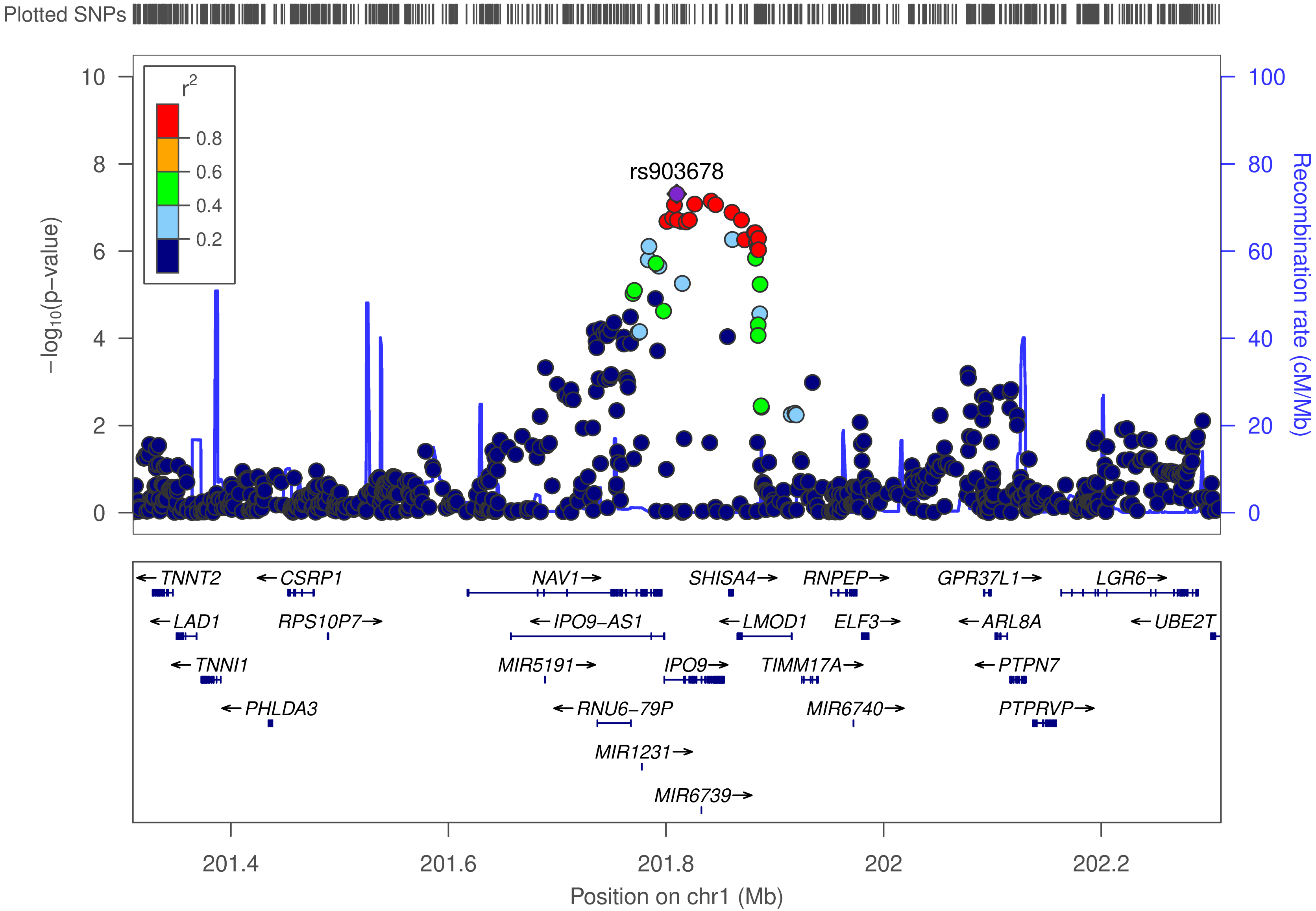
0.4
0.2
rs7541875
−log10(p−value)
10
8
6
4
2
0
100
80
60
40
20
0
Recombination rate (cM/Mb)
LOC440704→
190.6
190.8
191
191.2
191.4
Position on chr1 (Mb)



Plotted SNPs
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rs903678
10
8
6
4
2
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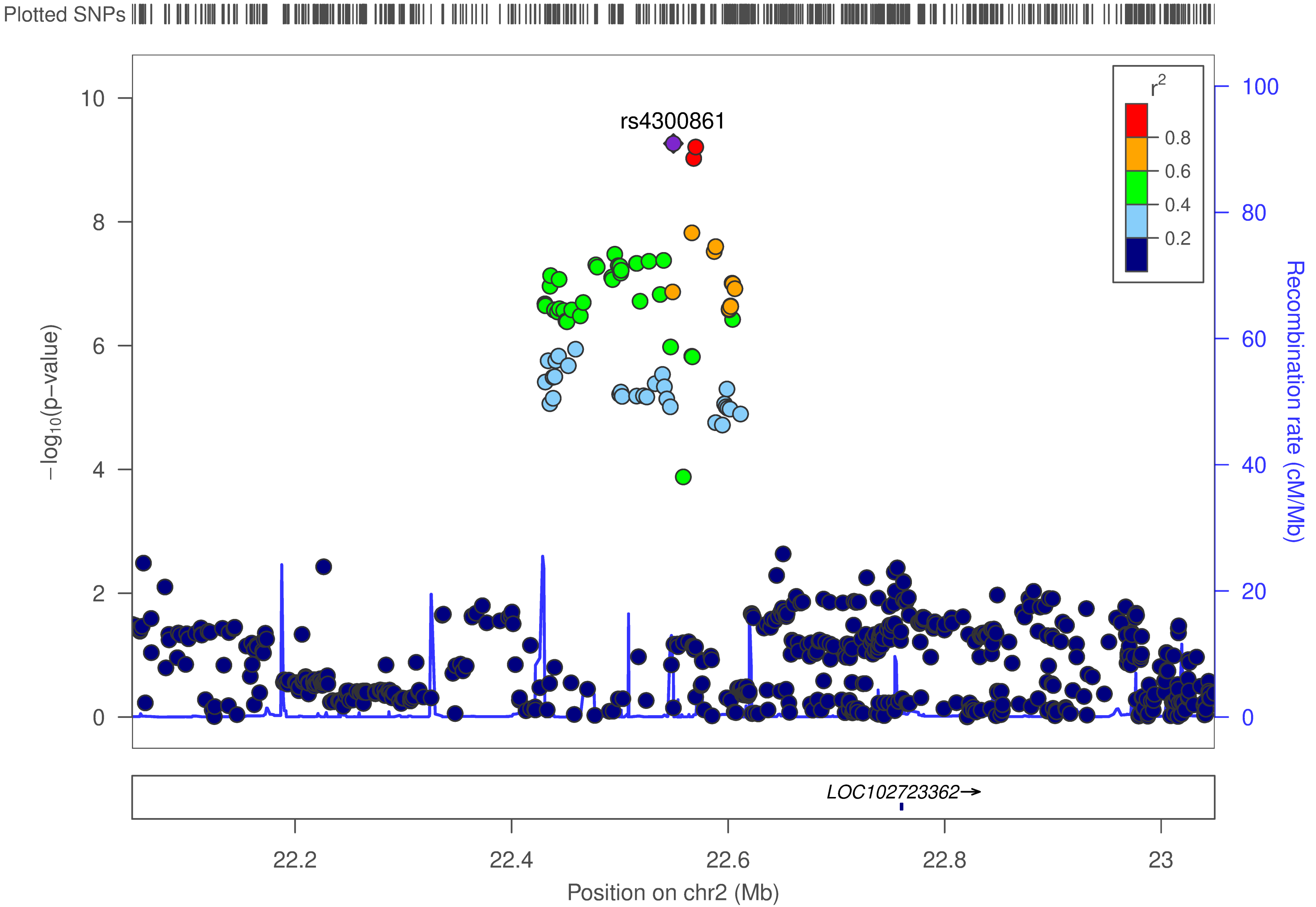
−log10(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
TNNT2
CSRP1
NAV1
SHISA4
RNPEP
GPR37L1
LGR6
LAD1
RPS10P7
IPO9−AS1
LMOD1
ELF3
ARL8A
UBE2T
TNNI1
MIR5191
IPO9
TIMM17A
PTPN7
PHLDA3
RNU6−79P
MIR6740
PTPRVP
MIR1231
MIR6739
201.4
201.6
201.8
202
202.2
Position on chr1 (Mb)


Plotted SNPs
rs4300861
r²
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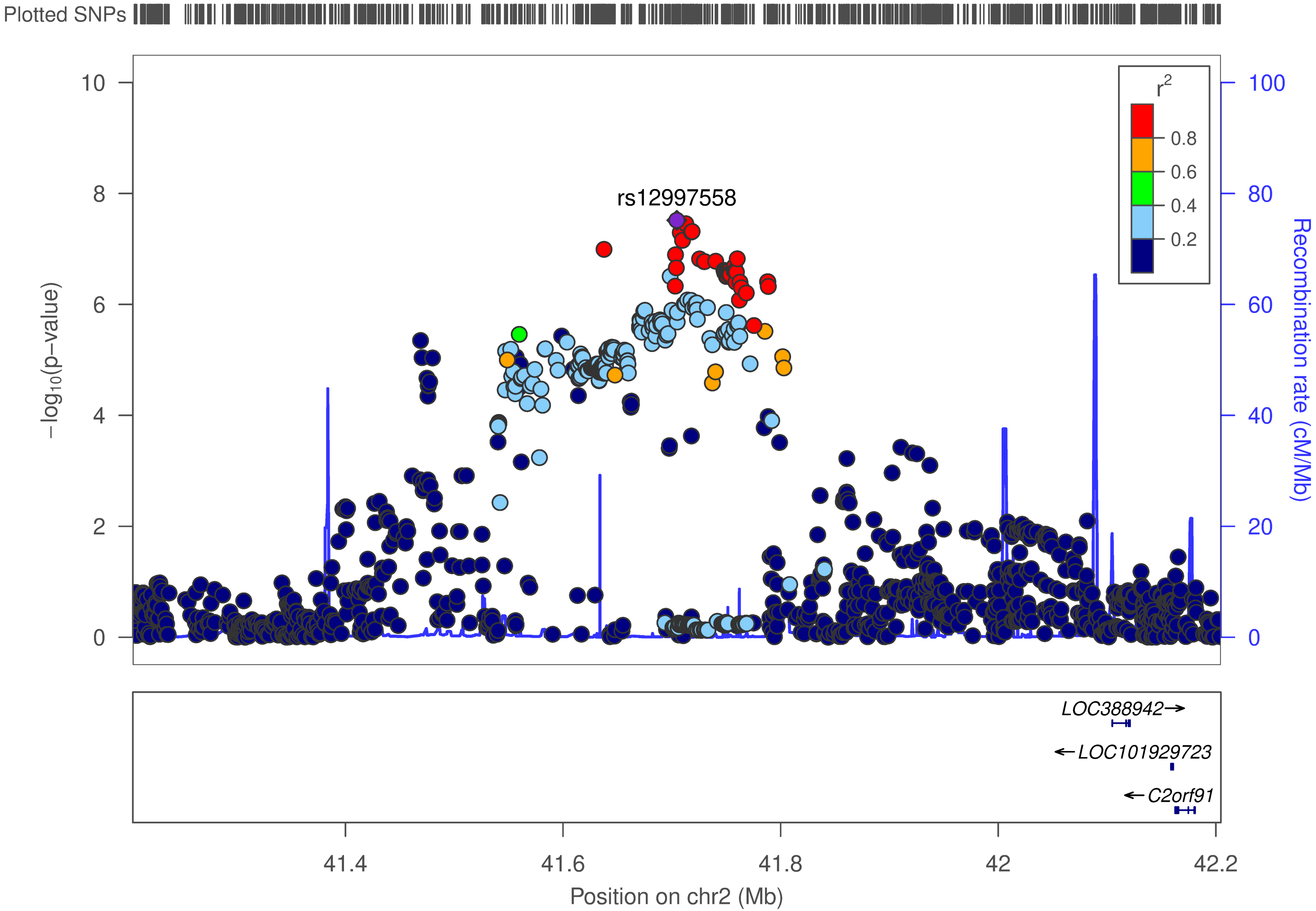
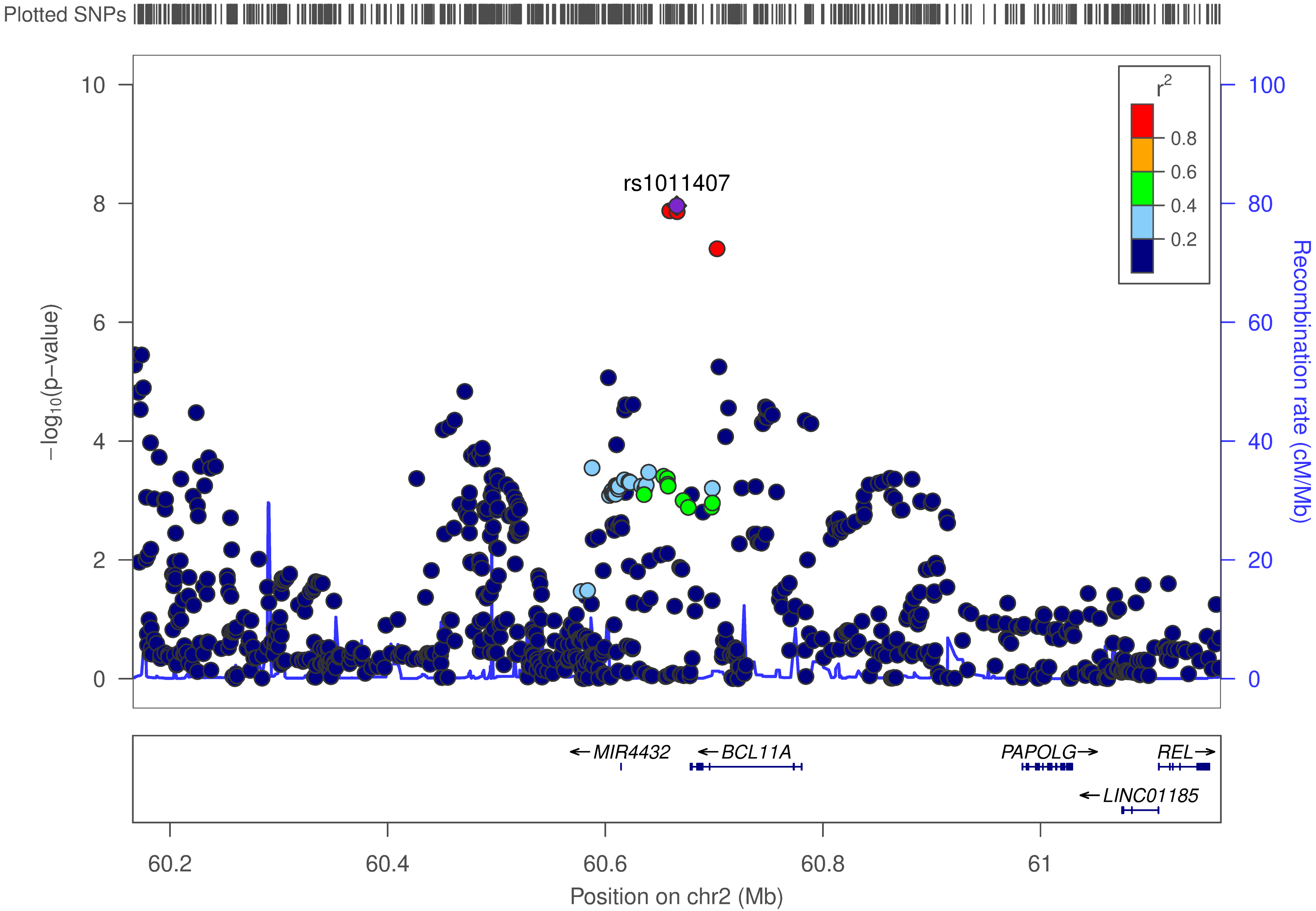
0.6
0.4
0.2
10
8
6
4
2
0
−log₁₀(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
LOC102723362→
22.2
22.4
22.6
22.8
23
Position on chr2 (Mb)


Plotted SNPs
rs12997558
−log10(p−value)
10
8
6
4
2
0
Recombination rate (cM/Mb)
100
80
60
40
20
0
r²
0.8
0.6
0.4
0.2
LOC388942→
←LOC101929723
←C2orf91
41.4
41.6
41.8
42
42.2
Position on chr2 (Mb)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rs1011407
r²
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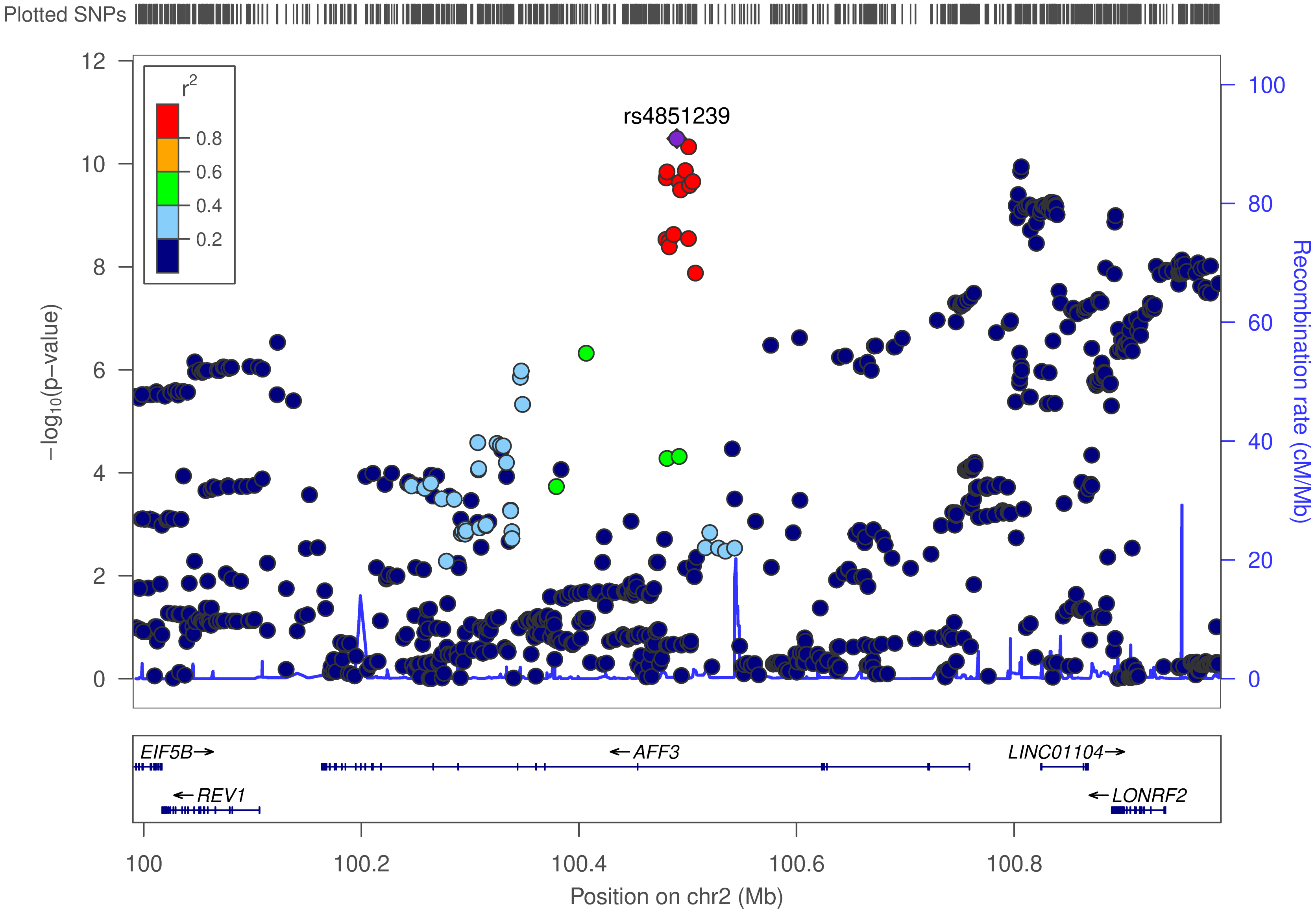
0.6
0.4
0.2
10
8
6
4
2
0
−log10(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
MIR4432
BCL11A
PAPOLG
REL
LINC01185
60.2
60.4
60.6
60.8
61
Position on chr2 (Mb)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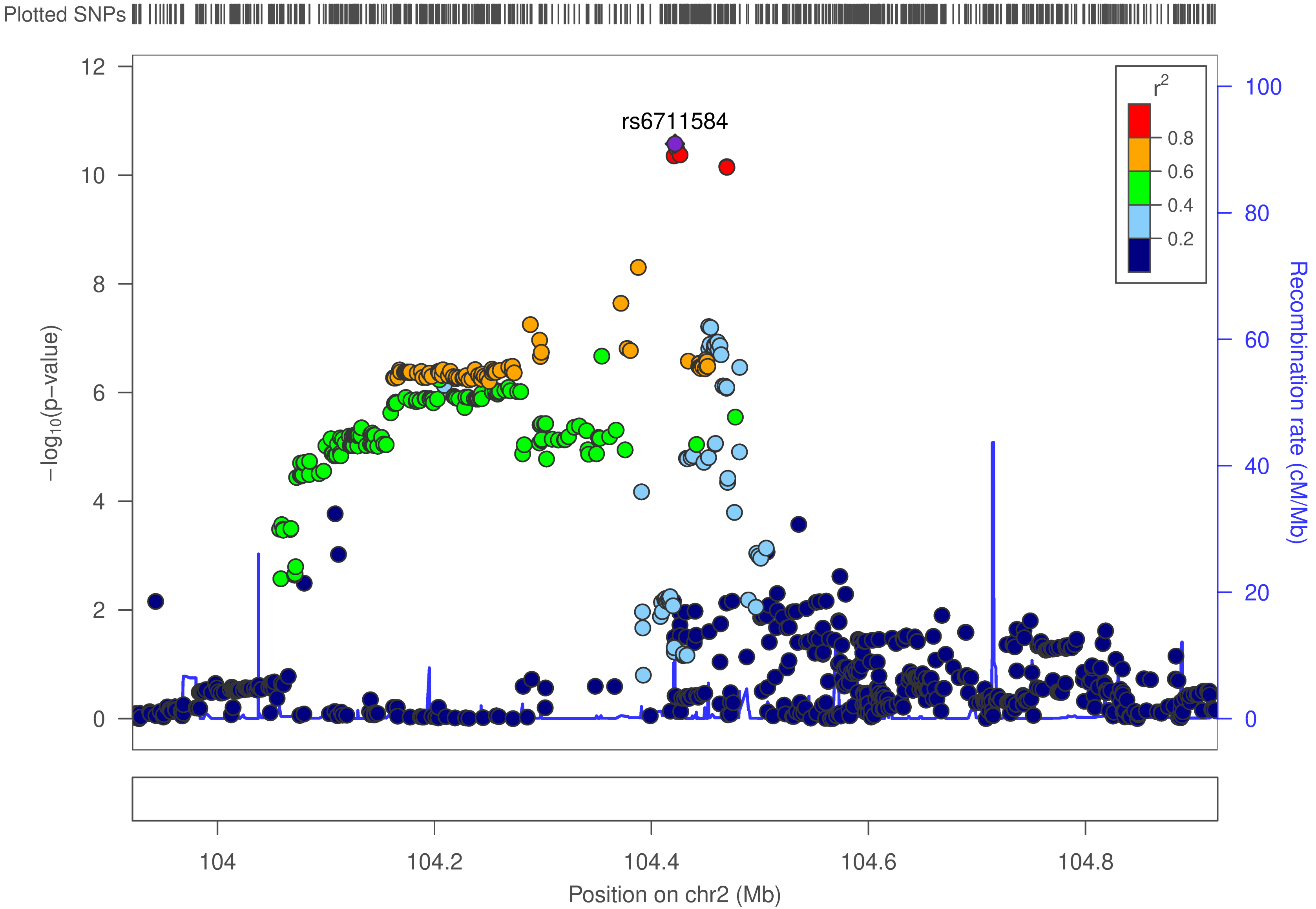
0.4
0.2
rs4851239
12
10
8
6
4
2
0
−log10(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
EIF5B→
←REV1
←AFF3
LINC01104→
←LONRF2
100
100.2
100.4
100.6
100.8
Position on chr2 (Mb)


Plotted SNPs
rs6711584
r2
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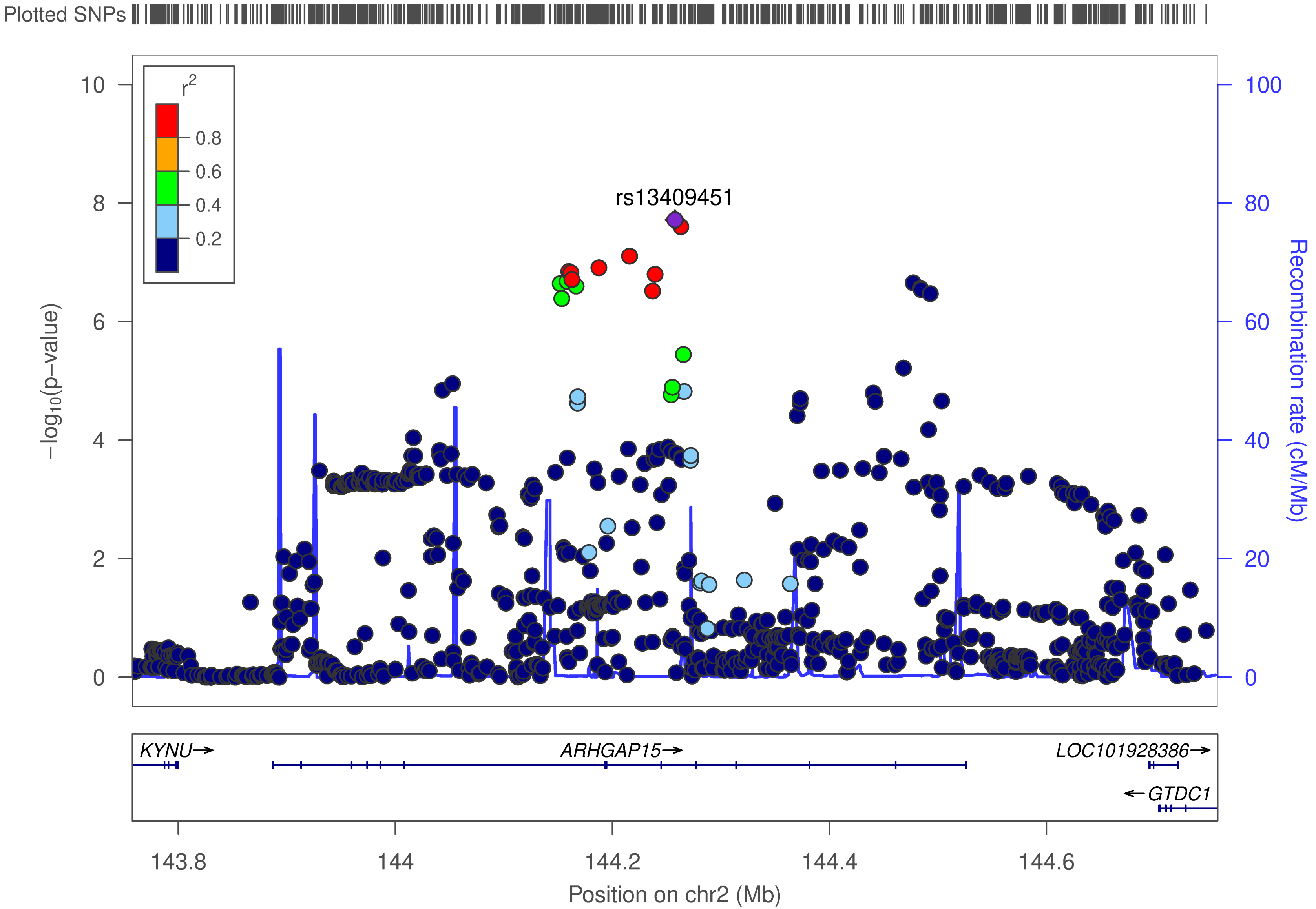
0.6
0.4
0.2
−log10(p−value)
0
2
4
6
8
10
12
Recombination rate (cM/Mb)
0
20
40
60
80
100
104
104.2
104.4
104.6
104.8
Position on chr2 (Mb)


Plotted SNPs
r²
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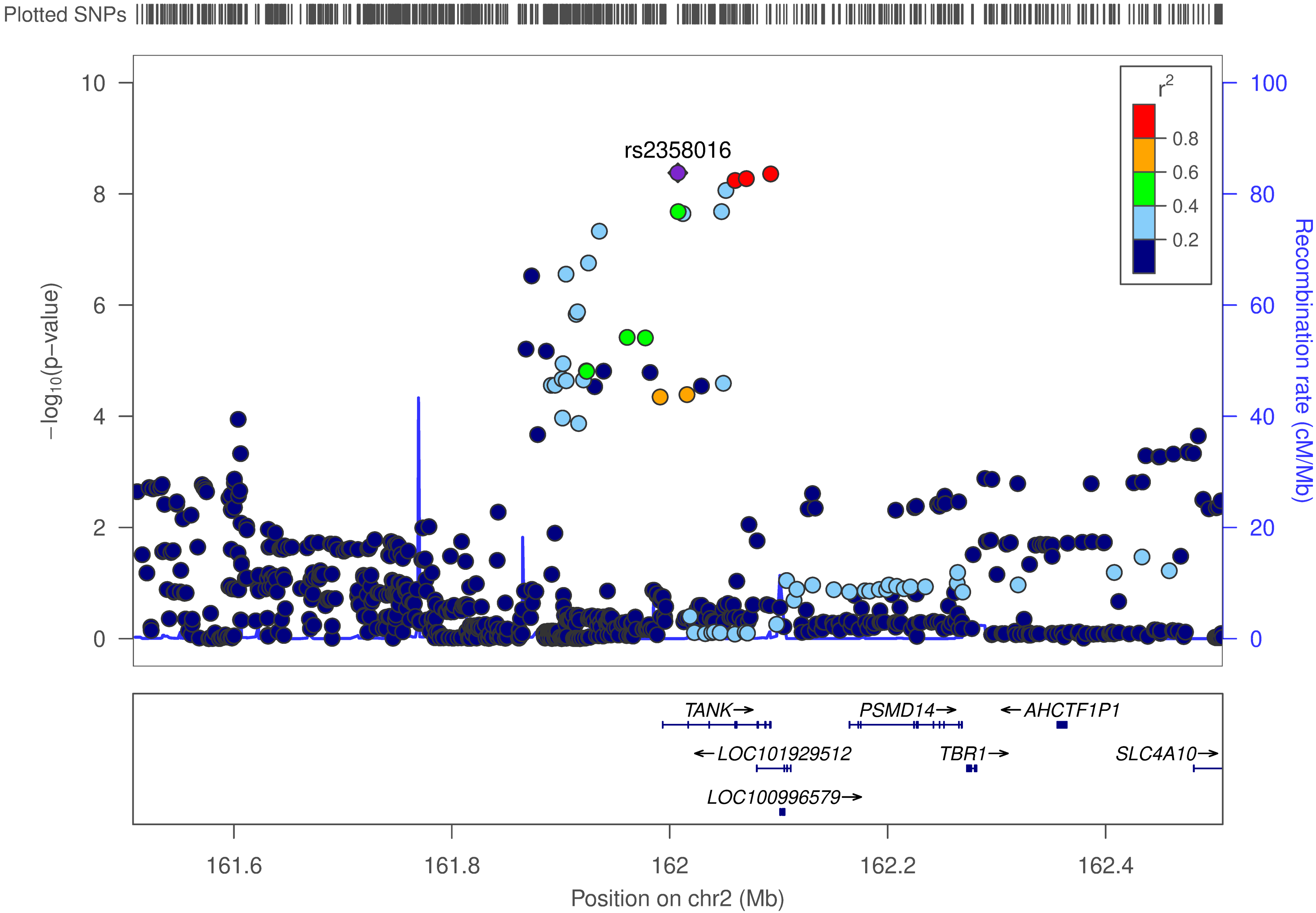
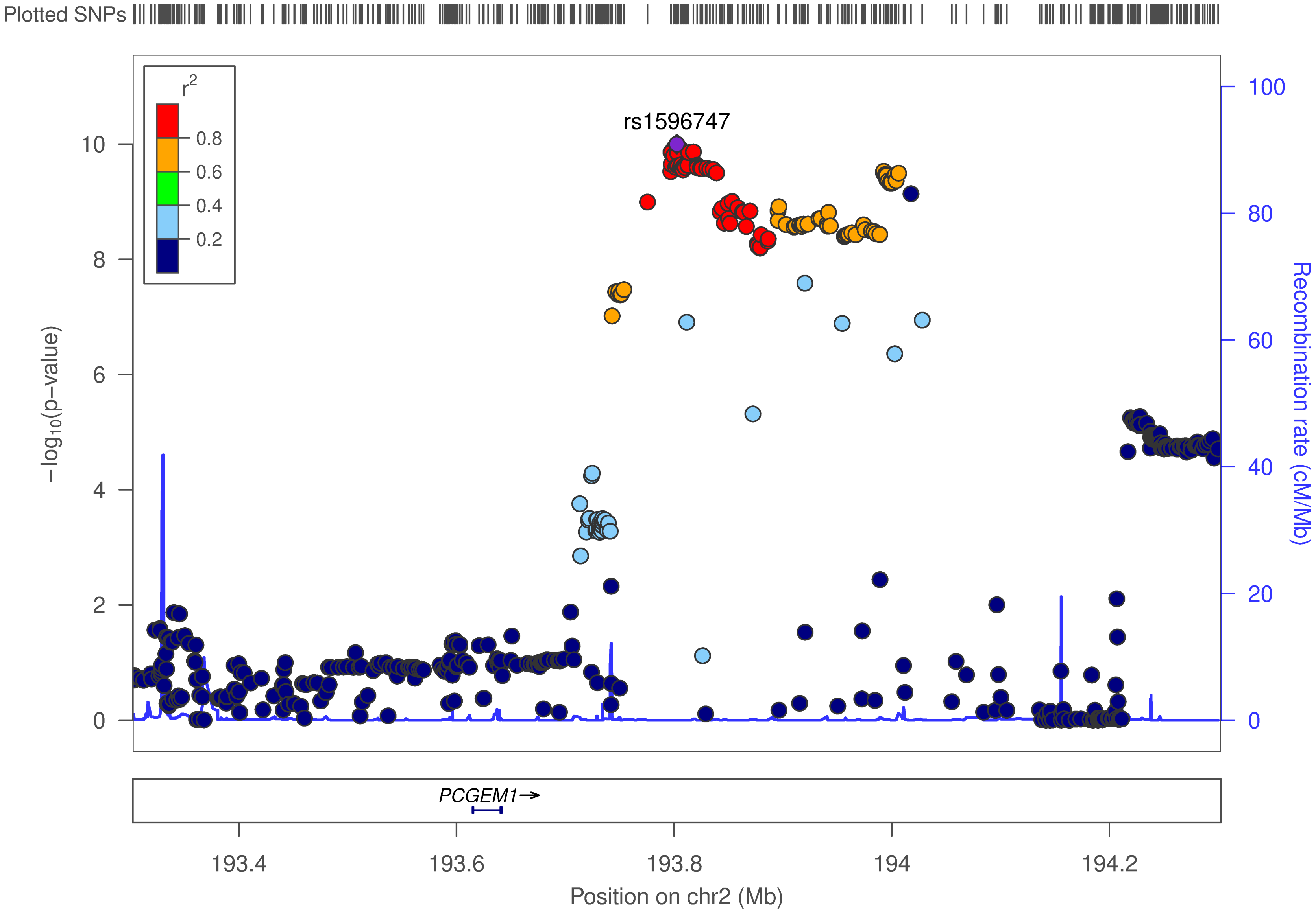
0.6
0.4
0.2
rs13409451
10
8
6
4
2
0
−log10(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
KYNU→
ARHGAP15→
LOC101928386→
←GTDC1
143.8
144
144.2
144.4
144.6
Position on chr2 (Mb)


Plotted SNPs
rs2358016
r²
0.8
0.6
0.4
0.2
−log10(p−value)
10
8
6
4
2
0
Recombination rate (cM/Mb)
100
80
60
40
20
0
TANK→
PSMD14→
←AHCTF1P1
←LOC101929512
TBR1→
SLC4A10→
LOC100996579→
161.6
161.8
162
162.2
162.4
Position on chr2 (Mb)


Plotted SNPs
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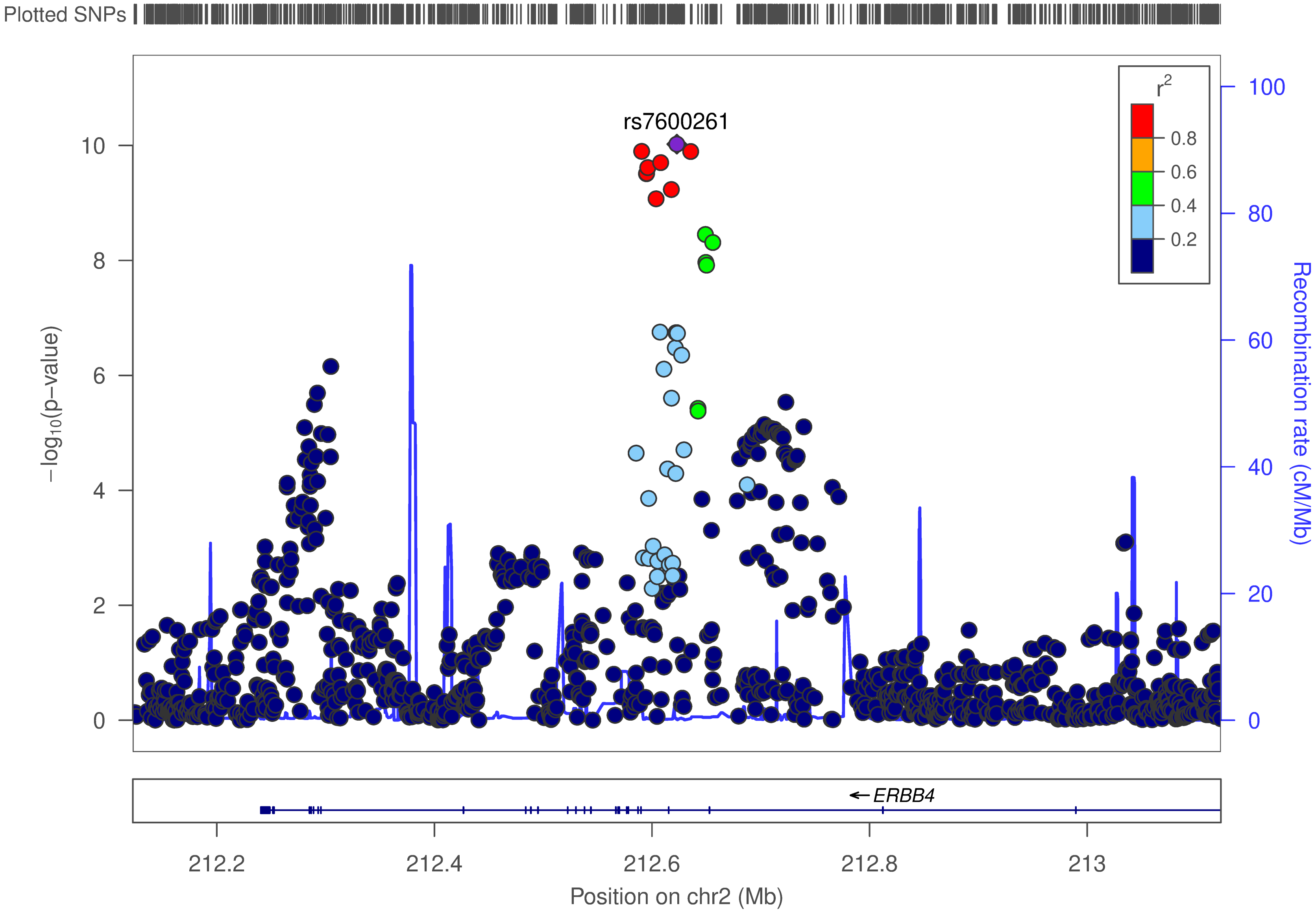
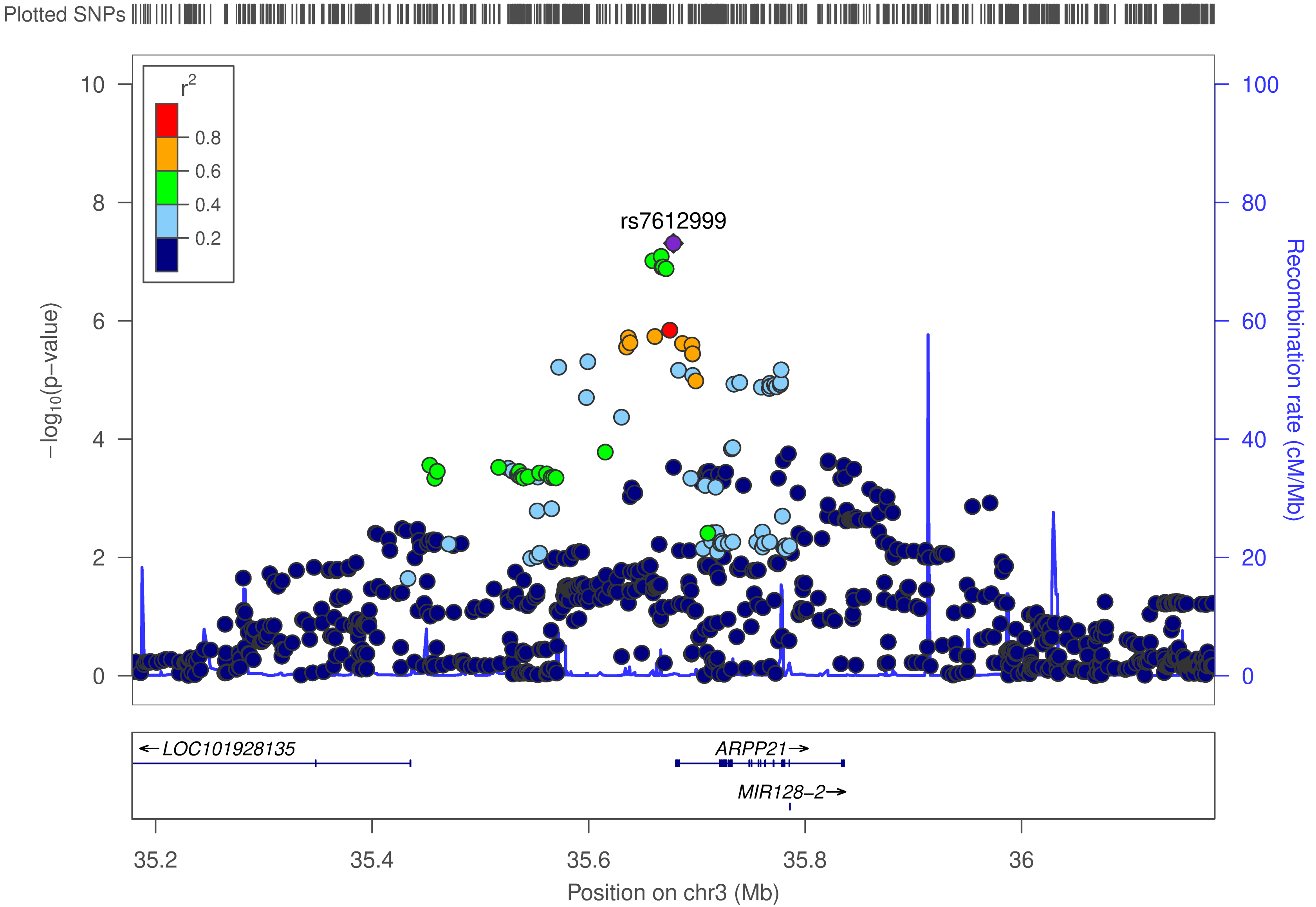
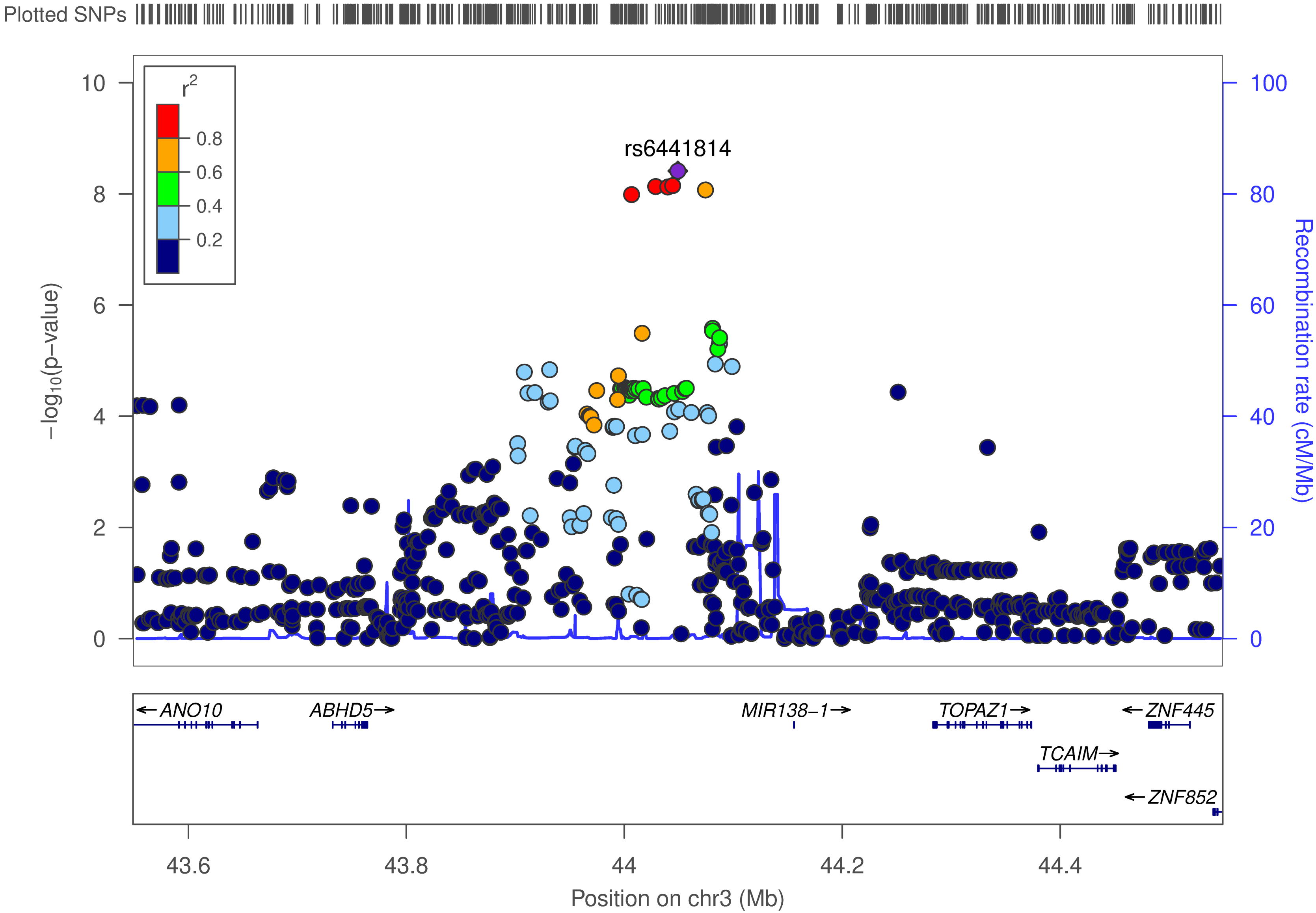
0.2
rs1596747
10
8
6
4
2
0
−log10(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
PCGEM1→
193.4
193.6
193.8
194
194.2
Position on chr2 (Mb)


Plotted SNPs
rs7600261
r²
0.8
0.6
0.4
0.2
10
8
6
4
2
0
−log10(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
← ERBB4
212.2
212.4
212.6
212.8
213
Position on chr2 (Mb)


Plotted SNPs
r²
0.8
0.6
0.4
0.2
rs7612999
−log₁₀(p−value)
0
2
4
6
8
10
Recombination rate (cM/Mb)
0
20
40
60
80
100
←LOC101928135
ARPP21→
MIR128−2→
35.2
35.4
35.6
35.8
36
Position on chr3 (Mb)


Plotted SNPs
r²
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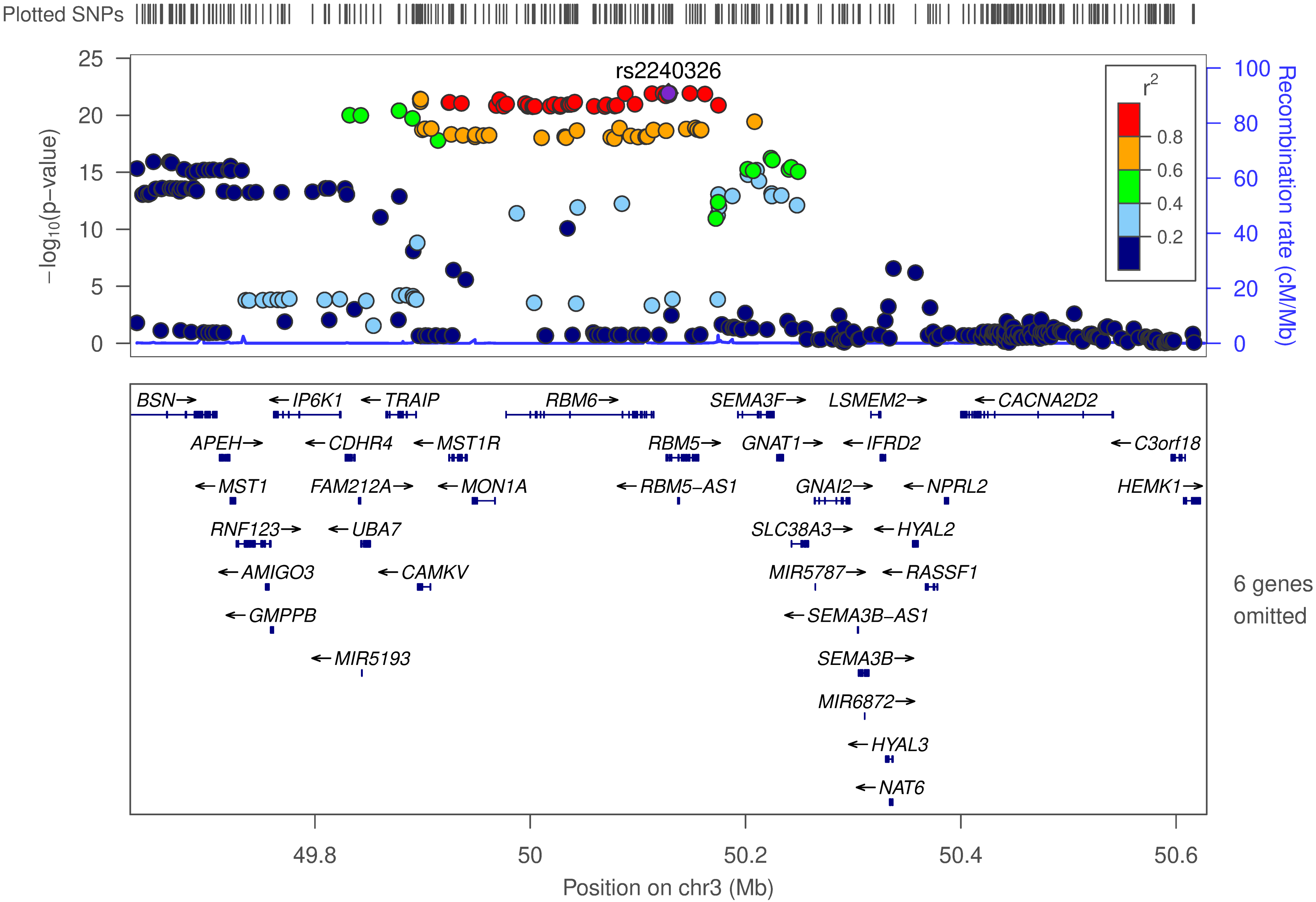
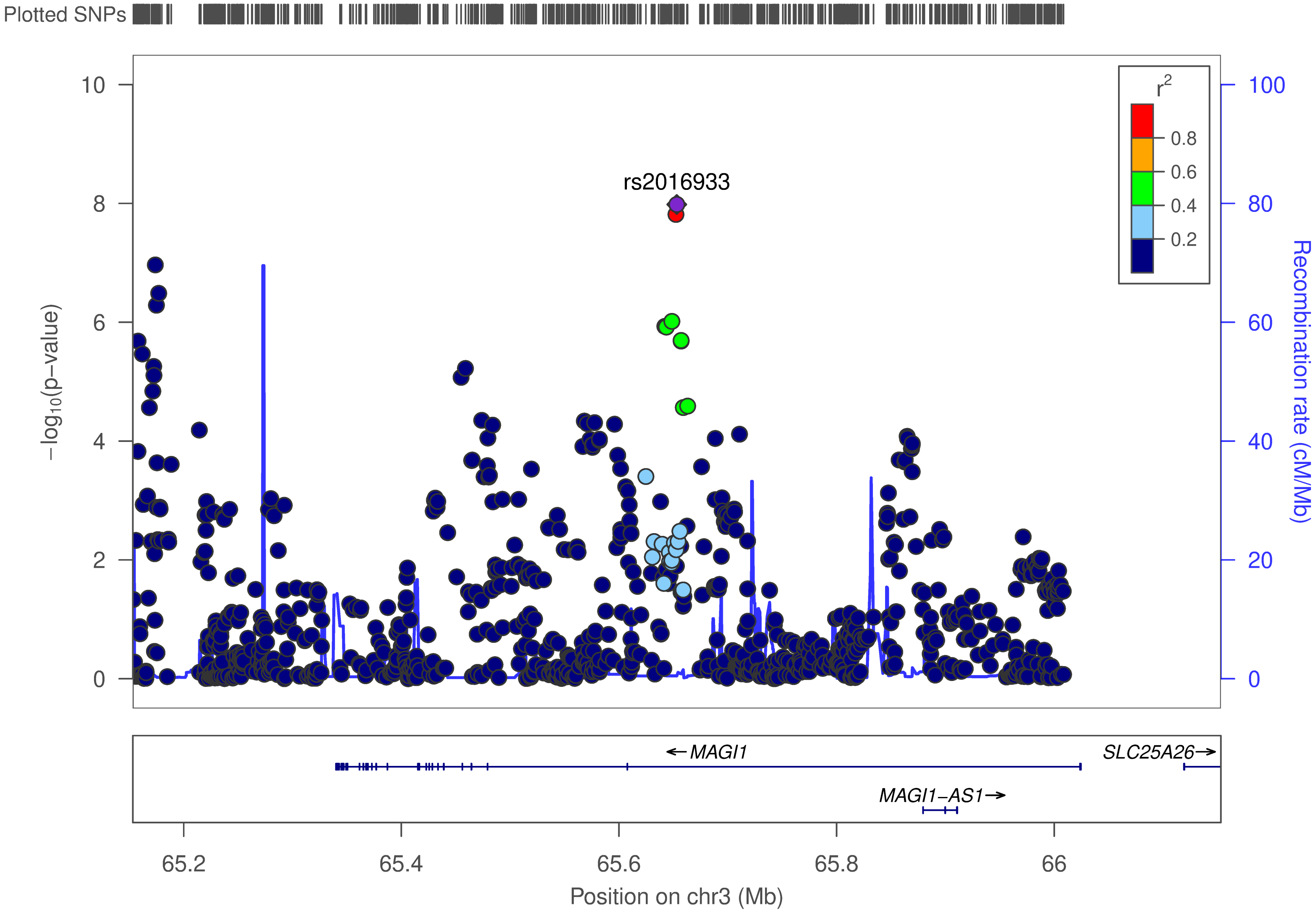
0.6
0.4
0.2
rs6441814
10
8
6
4
2
0
−log10(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
ANO10
ABHD5
MIR138−1
TOPAZ1
ZNF445
TCAIM
ZNF852
43.6
43.8
44
44.2
44.4
Position on chr3 (Mb)


Plotted SNPs
rs2240326
25
20
15
10
5
0
−log10(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
r2
0.8
0.6
0.4
0.2
BSN→
←IP6K1
←TRAIP
RBM6→
SEMA3F→
LSMEM2→
←CACNA2D2
APEH→
←CDHR4
←MST1R
RBM5→
GNAT1→
←IFRD2
←C3orf18
←MST1
FAM212A→
←MON1A
←RBM5-AS1
GNAI2→
←NPRL2
HEMK1→
RNF123→
←UBA7
SLC38A3→
←HYAL2
←AMIGO3
←CAMKV
MIR5787→
←RASSF1
←GMPPB
←SEMA3B-AS1
←MIR5193
SEMA3B→
MIR6872→
←HYAL3
←NAT6
6 genes omitted
49.8
50
50.2
50.4
50.6
Position on chr3 (Mb)


Plotted SNPs
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r²
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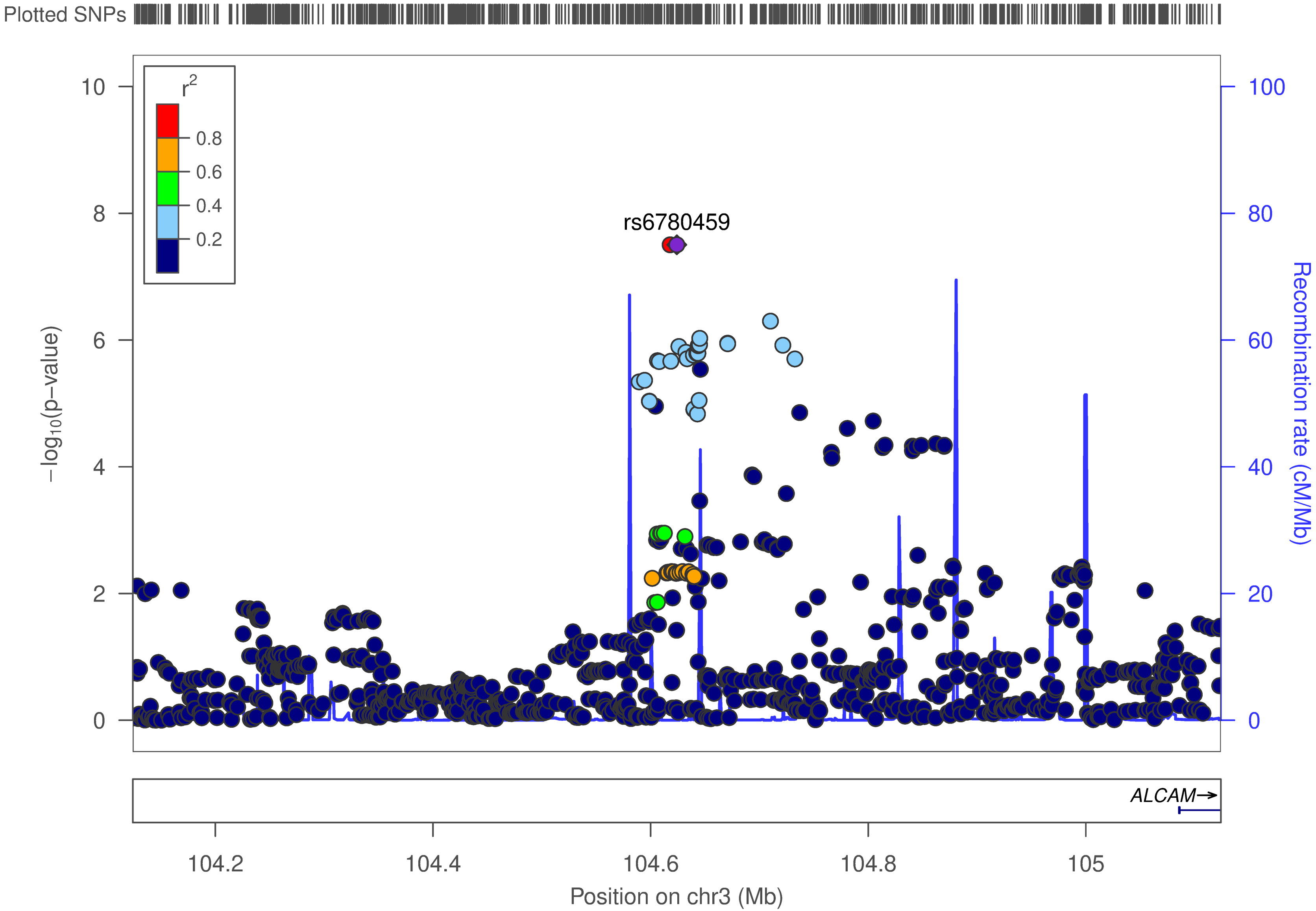
0.6
0.4
0.2
10
8
6
4
2
0
−log10(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
← MAGI1
SLC25A26 →
MAGI1−AS1 →
65.2
65.4
65.6
65.8
66
Position on chr3 (Mb)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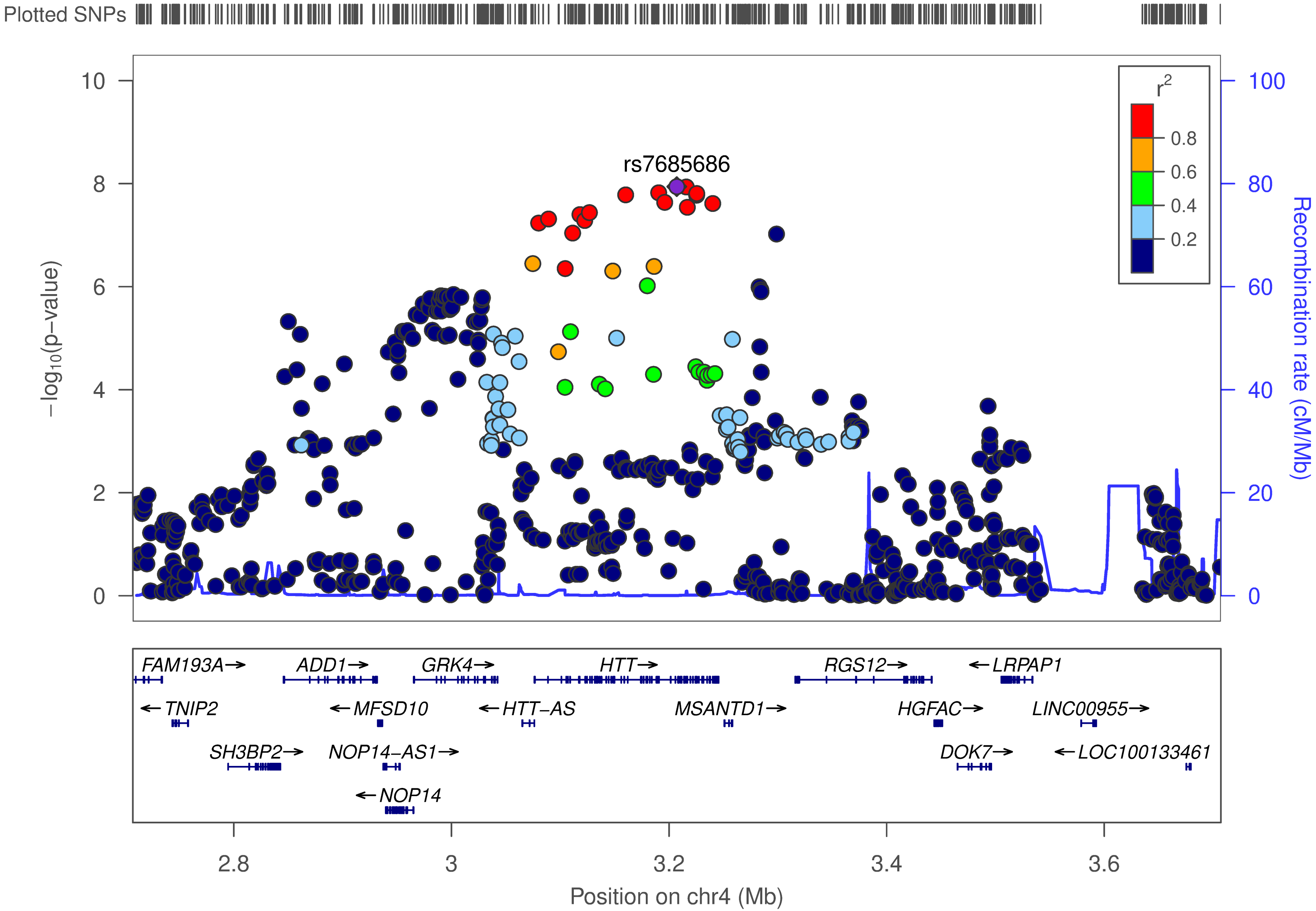
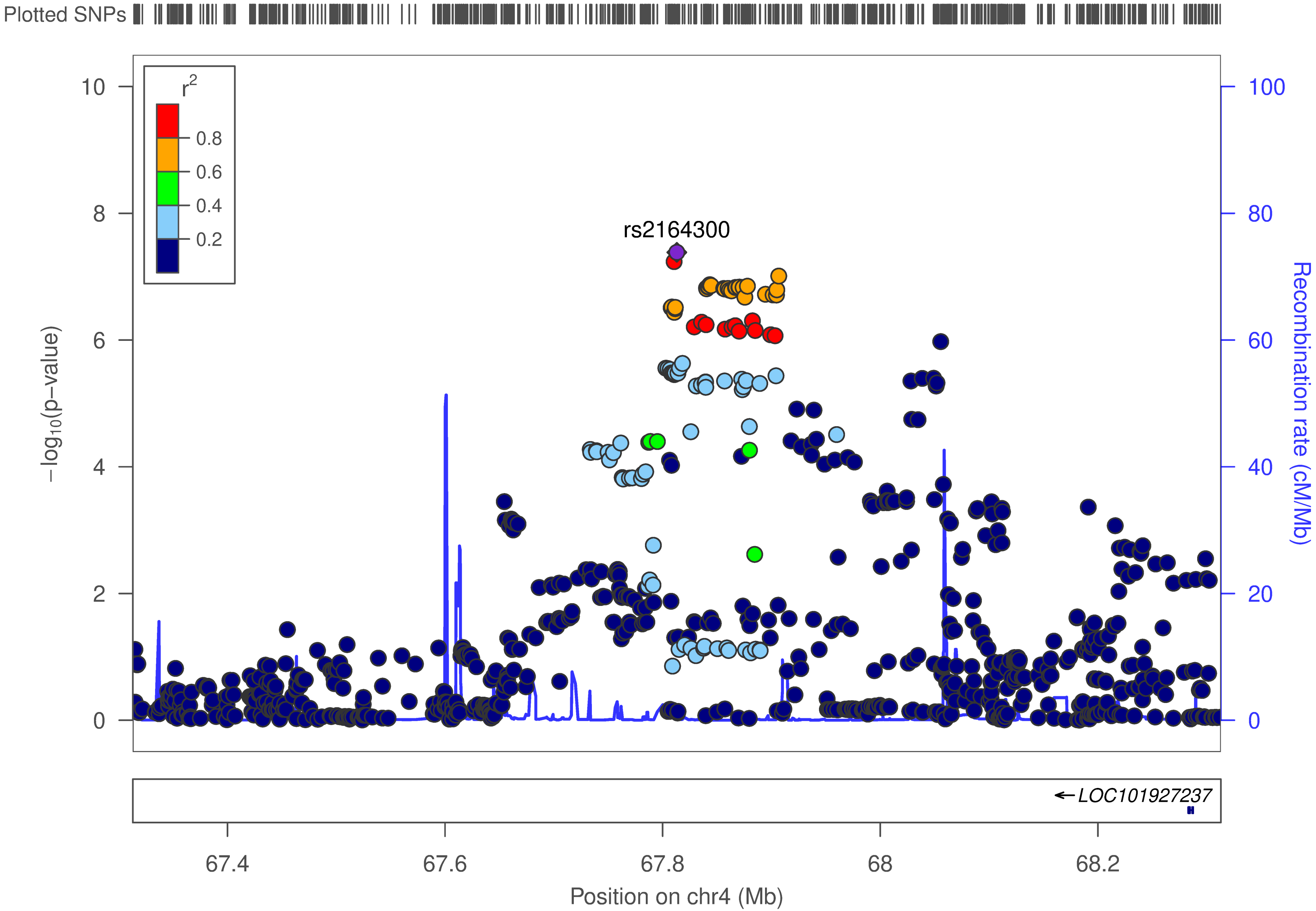
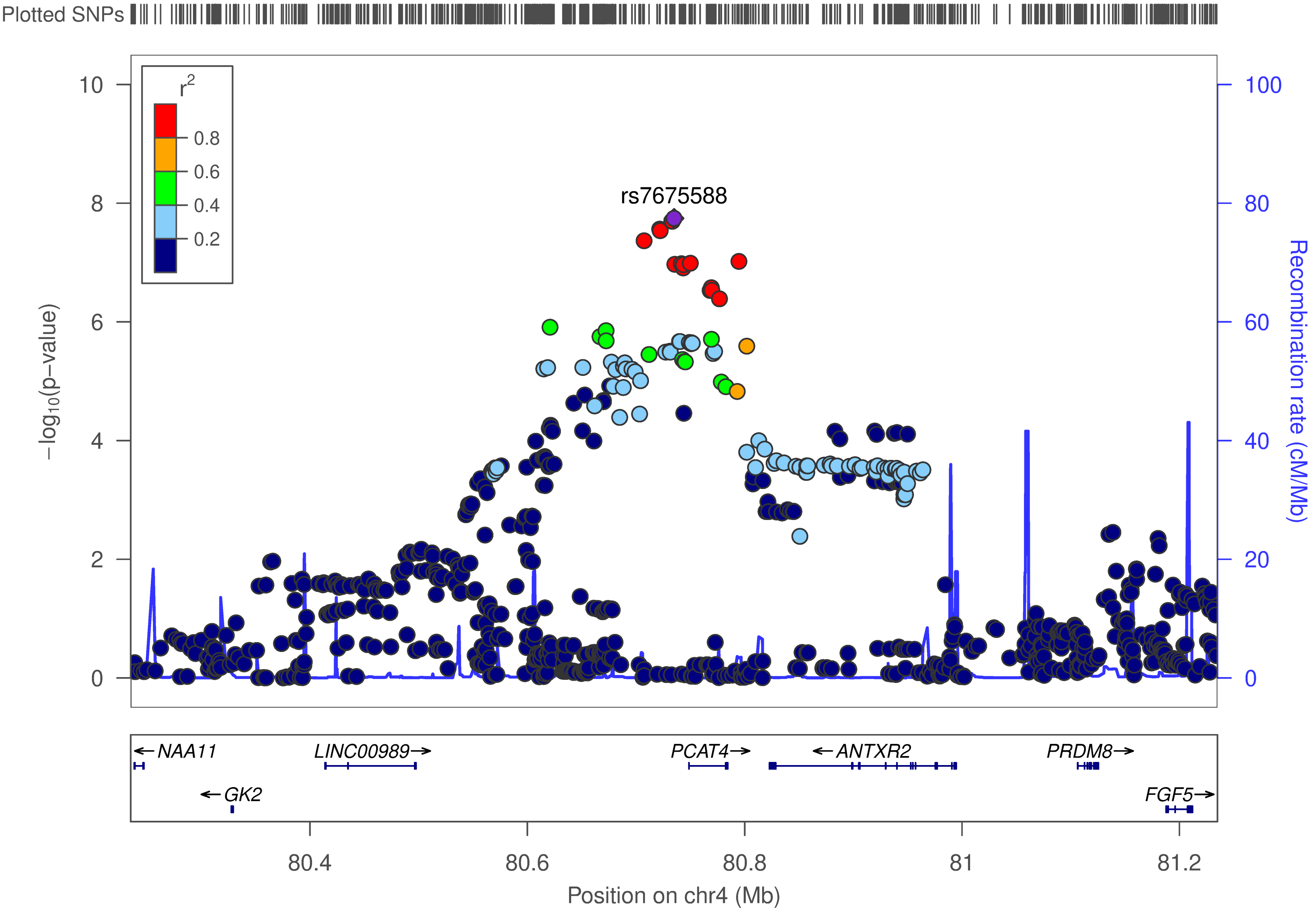
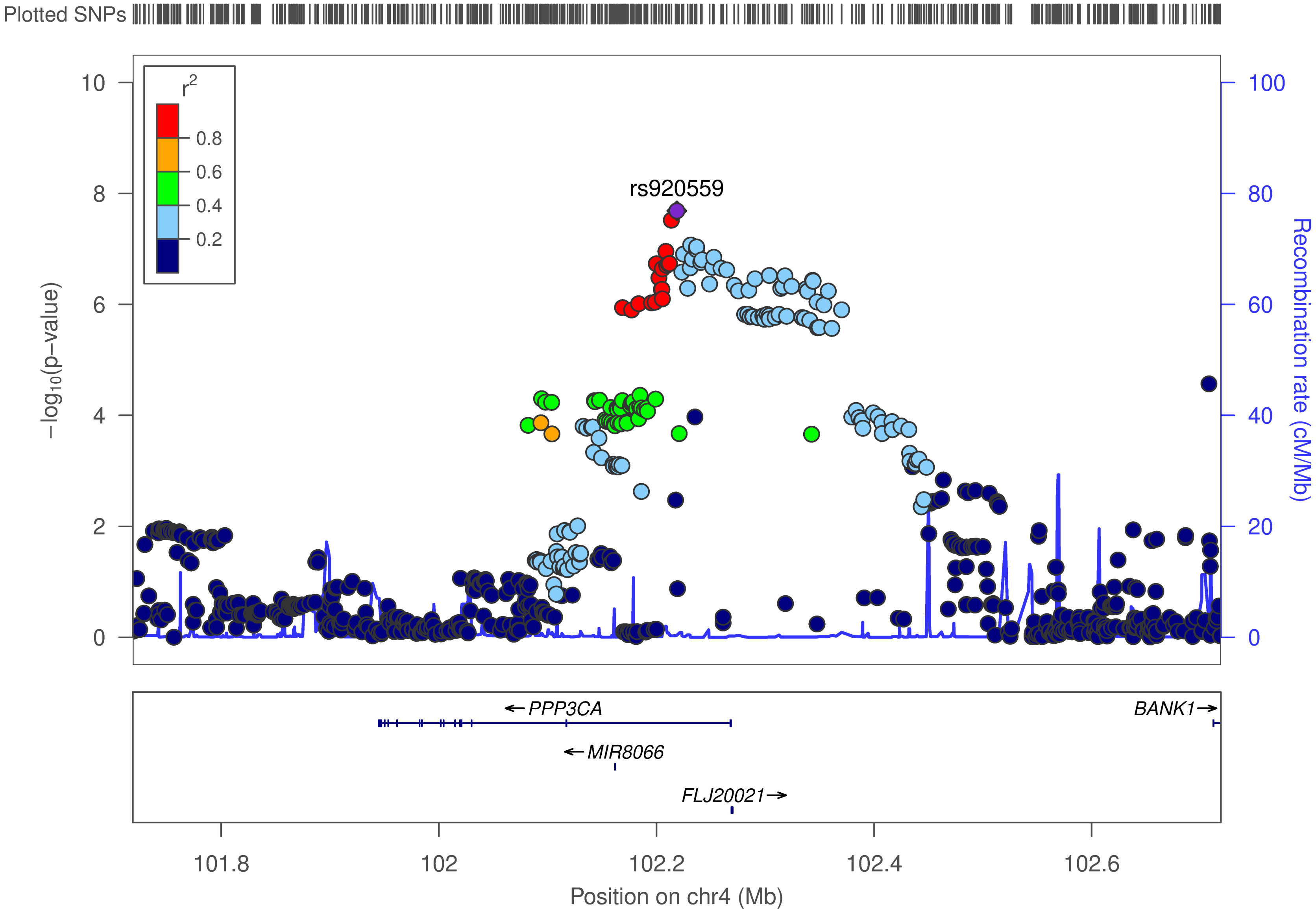
0.8
0.6
0.4
0.2
rs6780459
−log10(p−value)
0
2
4
6
8
10
Recombination rate (cM/Mb)
0
20
40
60
80
100
ALCAM→
104.2
104.4
104.6
104.8
105
Position on chr3 (Mb)

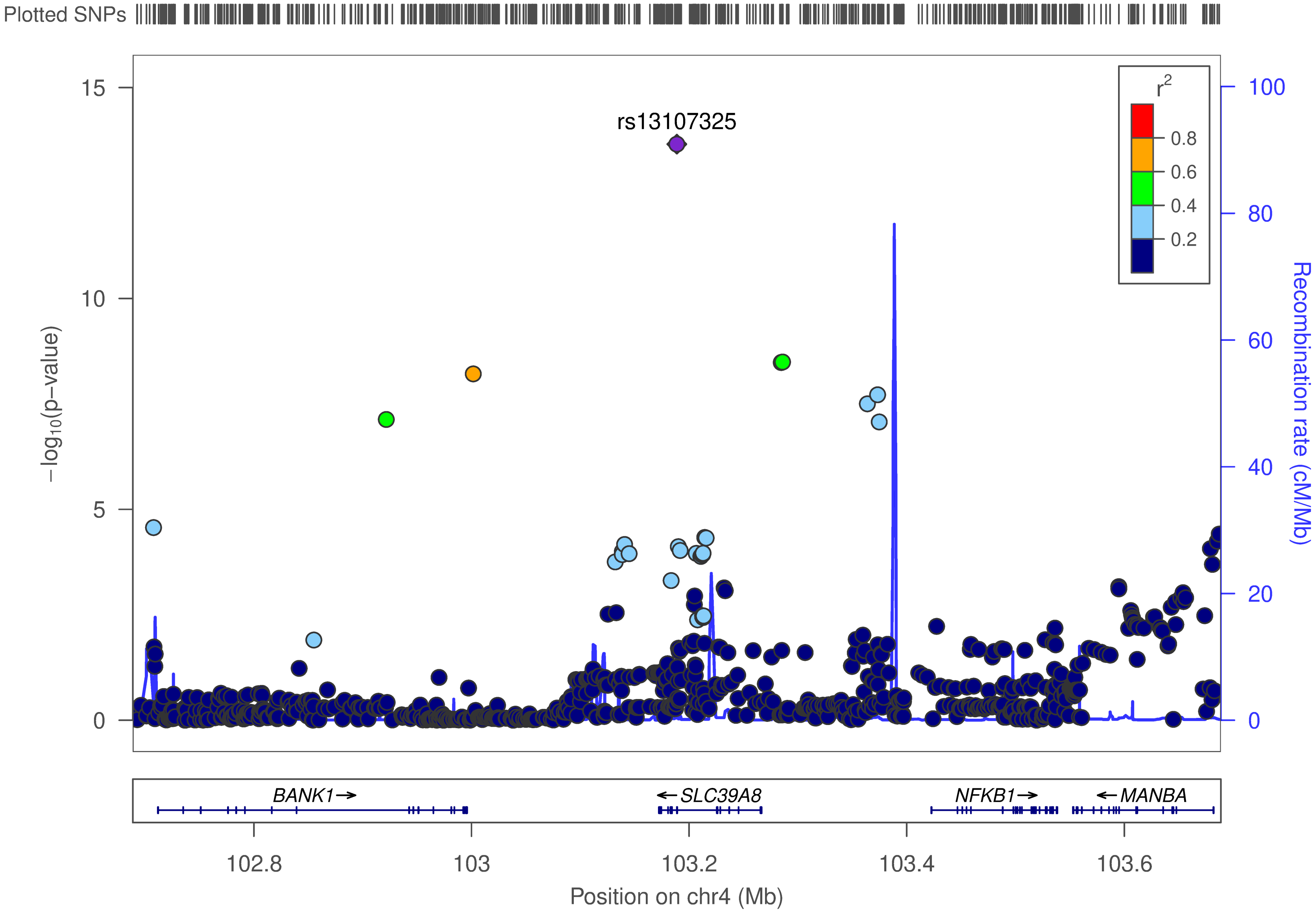


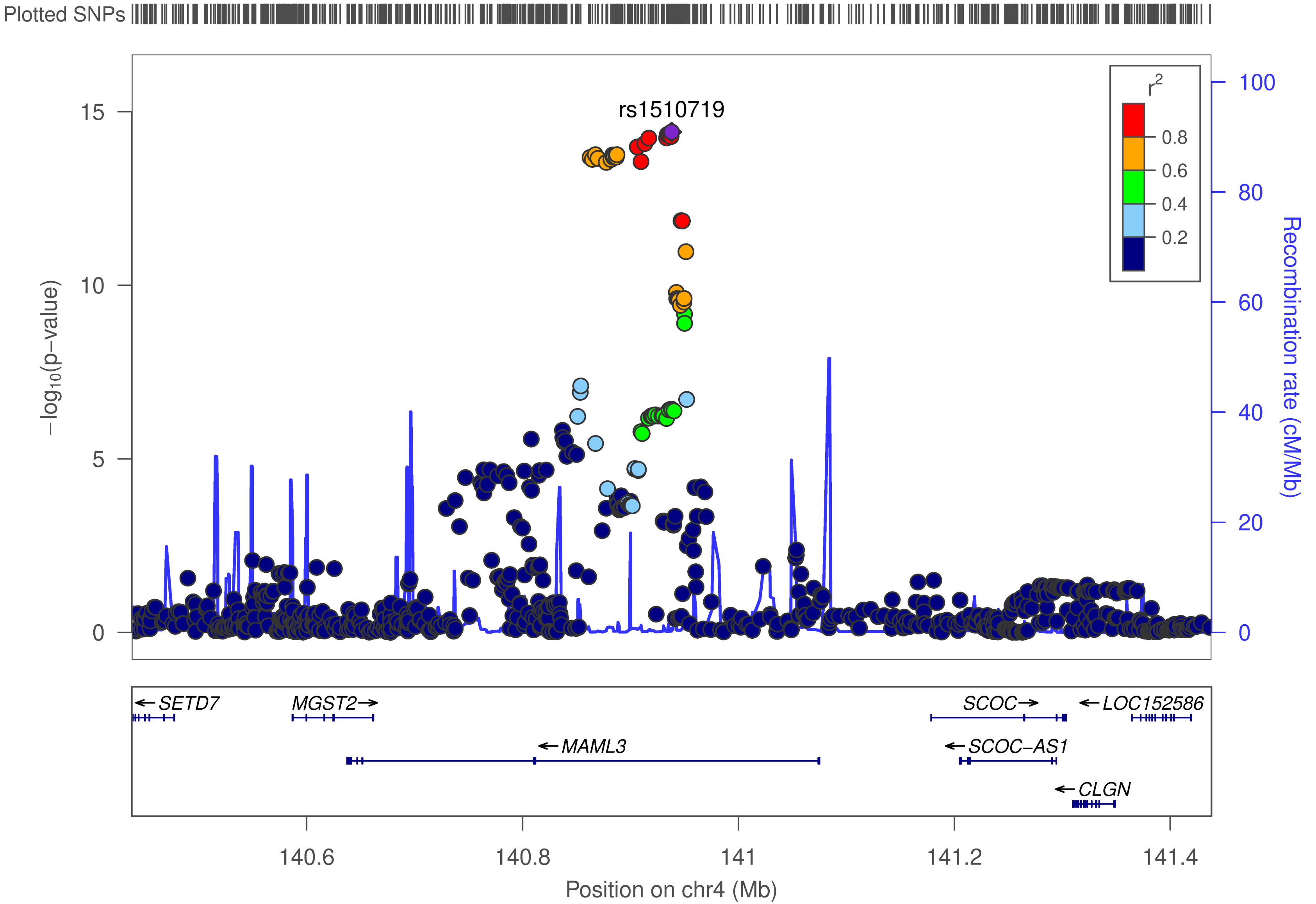
Plotted SNPs
rs7685686
−log10(p−value)
0
2
4
6
8
10
Recombination rate (cM/Mb)
0
20
40
60
80
100
r²
0.8
0.6
0.4
0.2
FAM193A→
ADD1→
GRK4→
HTT→
RGS12→
←LRPAP1
←TNIP2
←MFSD10
←HTT−AS
MSANTD1→
HGFAC→
LINC00955→
SH3BP2→
NOP14−AS1→
DOK7→
←LOC100133461
←NOP14
2.8
3
3.2
3.4
3.6
Position on chr4 (Mb)

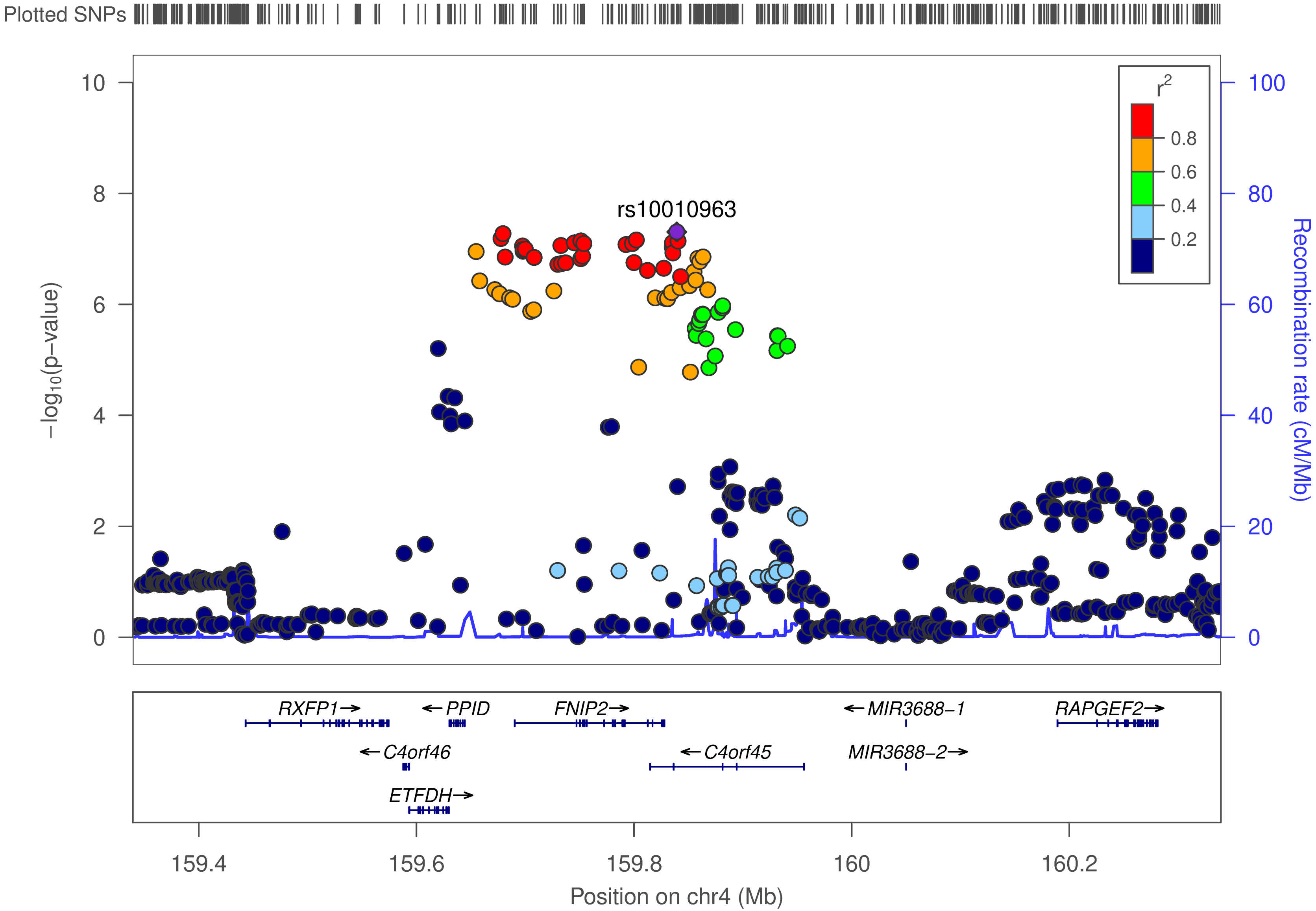

Plotted SNPs
r2
0.8
0.6
0.4
0.2
rs2164300
10
8
6
4
2
0
−log10(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
← LOC101927237
67.4
67.6
67.8
68
68.2
Position on chr4 (Mb)

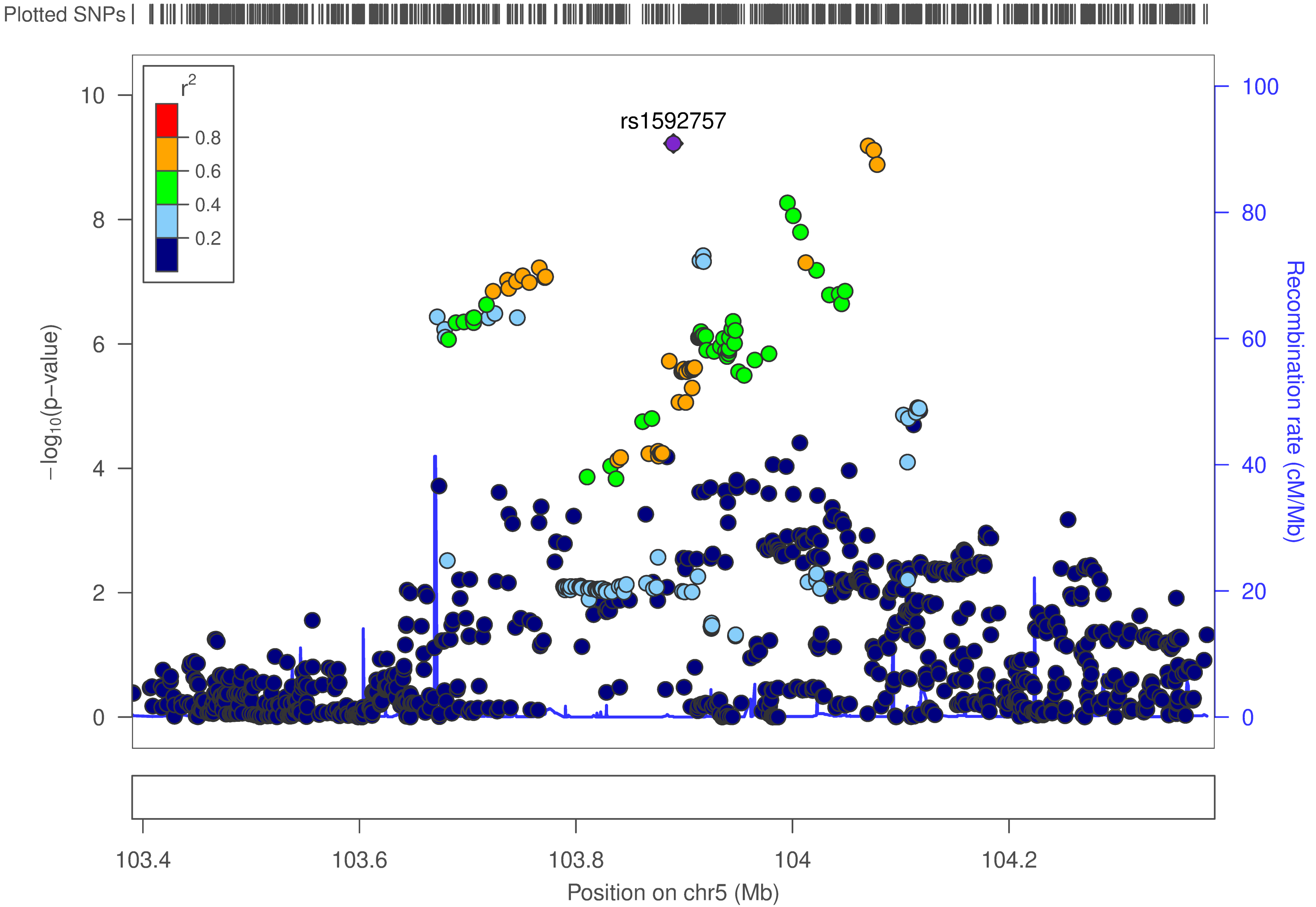

Plotted SNPs
r²
0.8
0.6
0.4
0.2
rs7675588
−log10(p−value)
0
2
4
6
8
10
Recombination rate (cM/Mb)
0
20
40
60
80
100
NAA11
GK2
LINC00989
PCAT4
ANTXR2
PRDM8
FGF5
80.4
80.6
80.8
81
81.2
Position on chr4 (Mb)

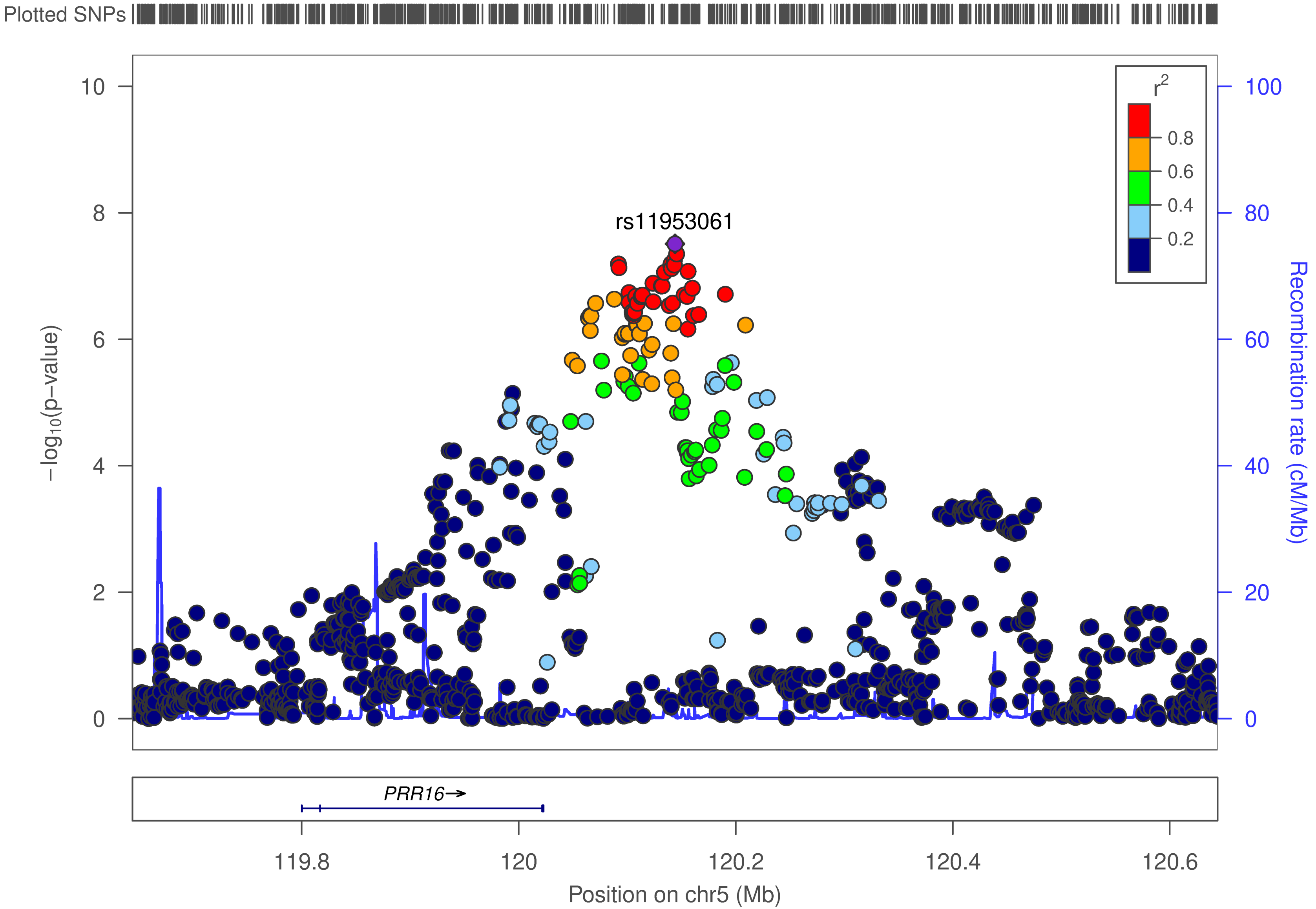

Plotted SNPs
r²
0.8
0.6
0.4
0.2
rs920559
10
8
6
4
2
0
−log10(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
← PPP3CA
← MIR8066
FLJ20021 →
BANK1 →
101.8
102
102.2
102.4
102.6
Position on chr4 (Mb)

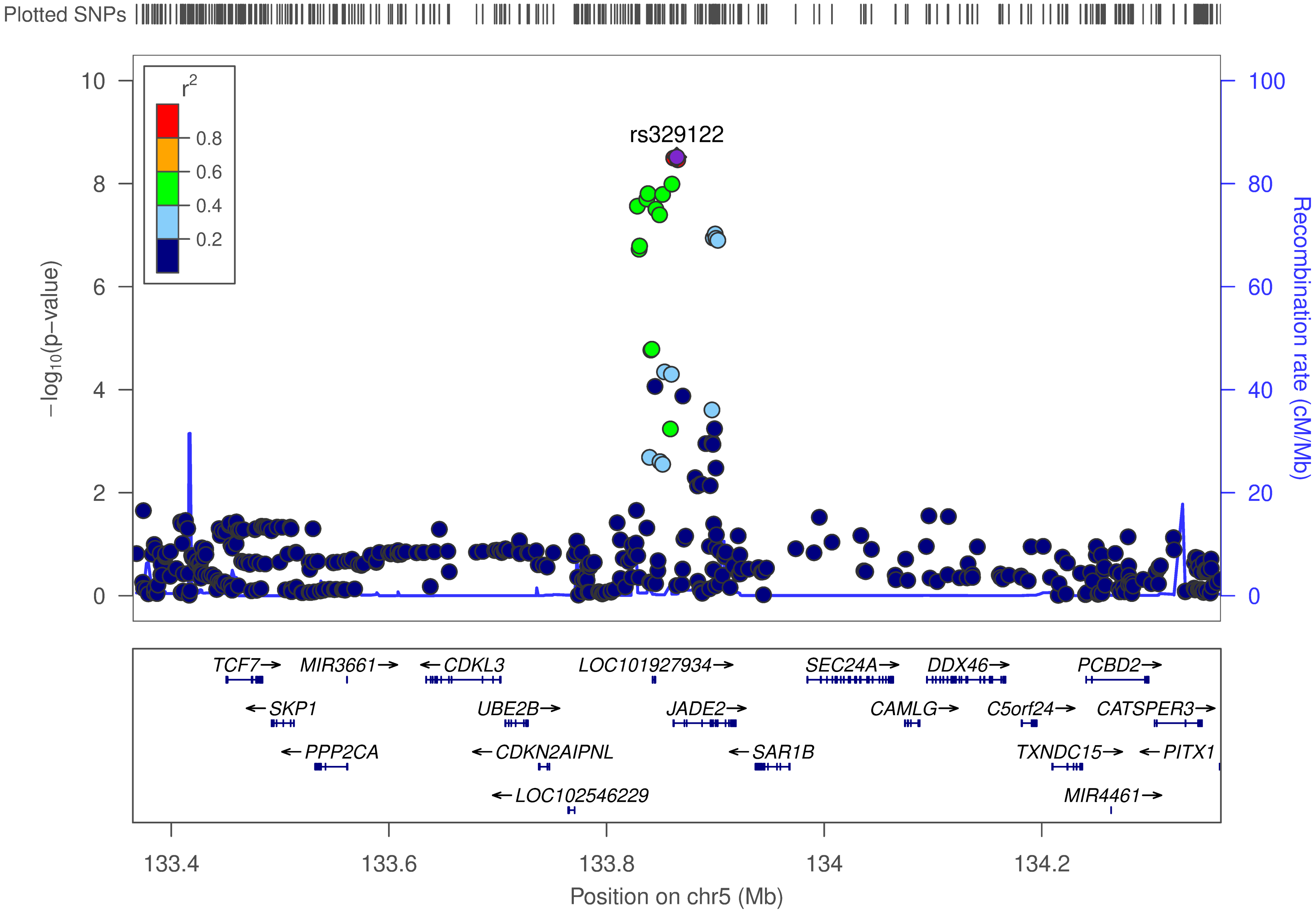

Plotted SNPs
rs13107325
15
10
5
0
−log10(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
r2
0.8
0.6
0.4
0.2
BANK1→
←SLC39A8
NFKB1→
←MANBA
102.8
103
103.2
103.4
103.6
Position on chr4 (Mb)

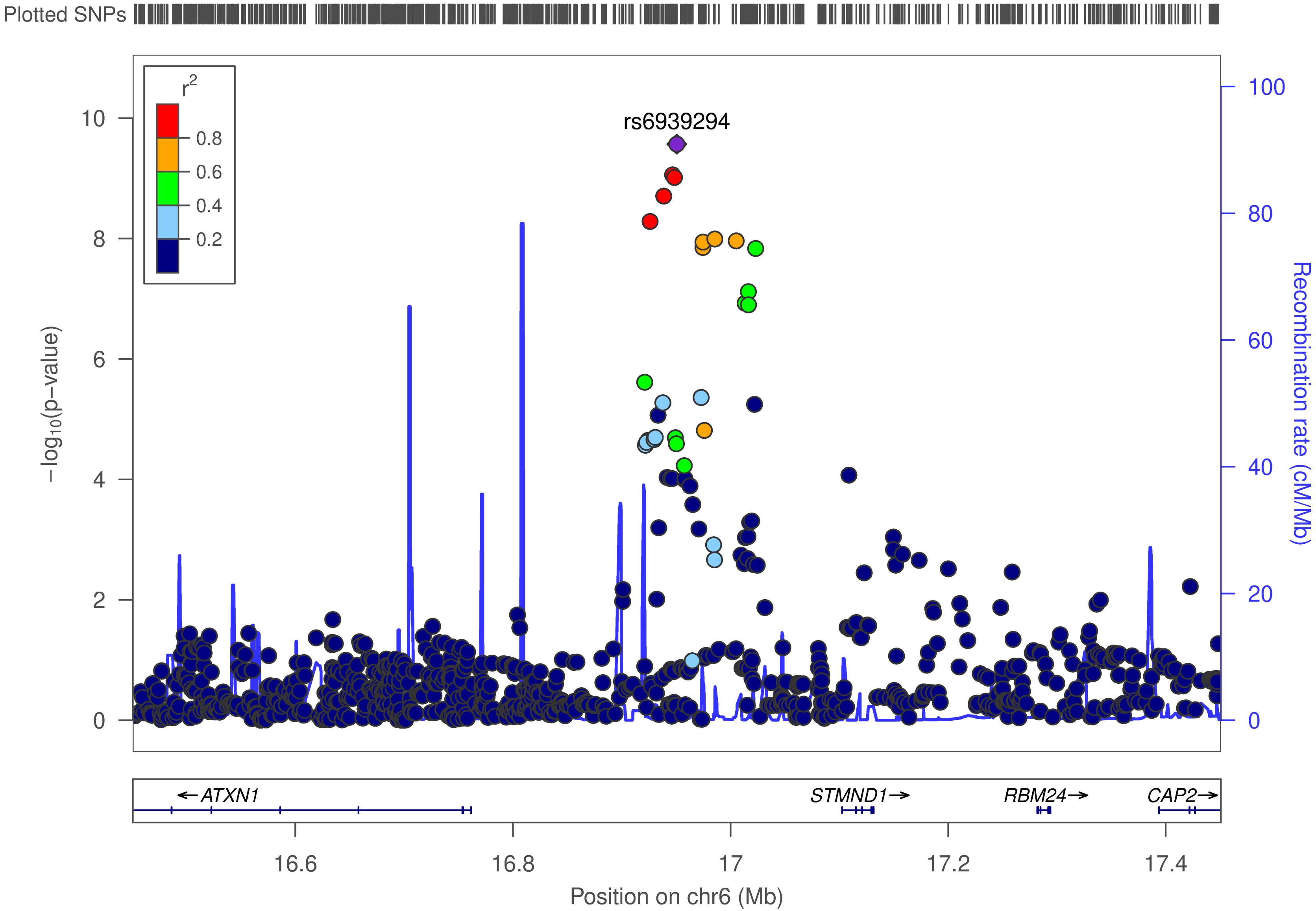

Plotted SNPs
rs1510719
r²
0.8
0.6
0.4
0.2
−log10(p−value)
0
5
10
15
Recombination rate (cM/Mb)
0
20
40
60
80
100
SETD7
MGST2
MAML3
SCOC
SCOC−AS1
LOC152586
CLGN
140.6
140.8
141
141.2
141.4
Position on chr4 (Mb)

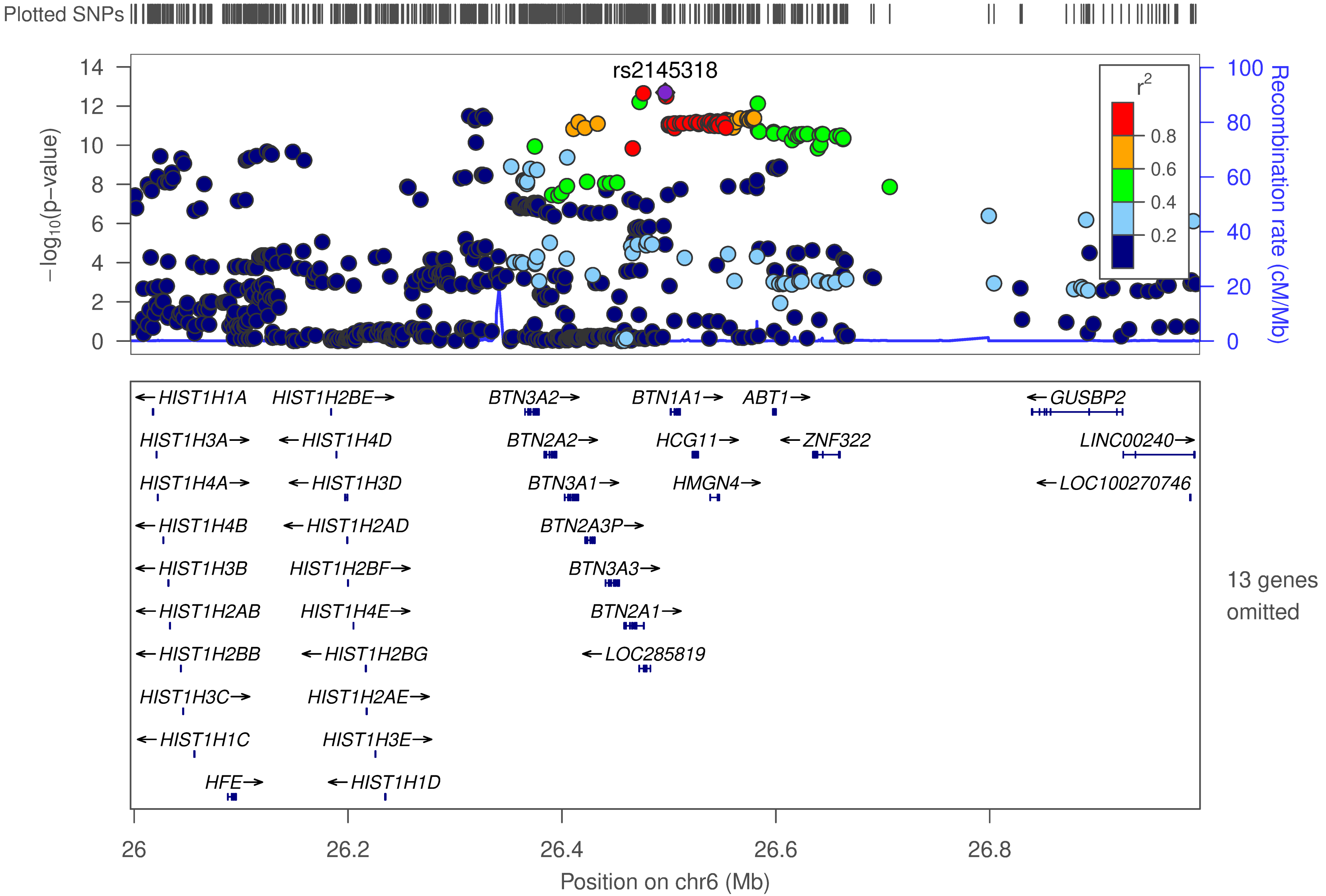

Plotted SNPs
rs10010963
r²
0.8
0.6
0.4
0.2
−log10(p−value)
0
2
4
6
8
10
Recombination rate (cM/Mb)
0
20
40
60
80
100
RXFP1→
←PPID
FNIP2→
←MIR3688−1
RAPGEF2→
←C4orf46
←C4orf45
MIR3688−2→
ETFDH→
159.4
159.6
159.8
160
160.2
Position on chr4 (Mb)

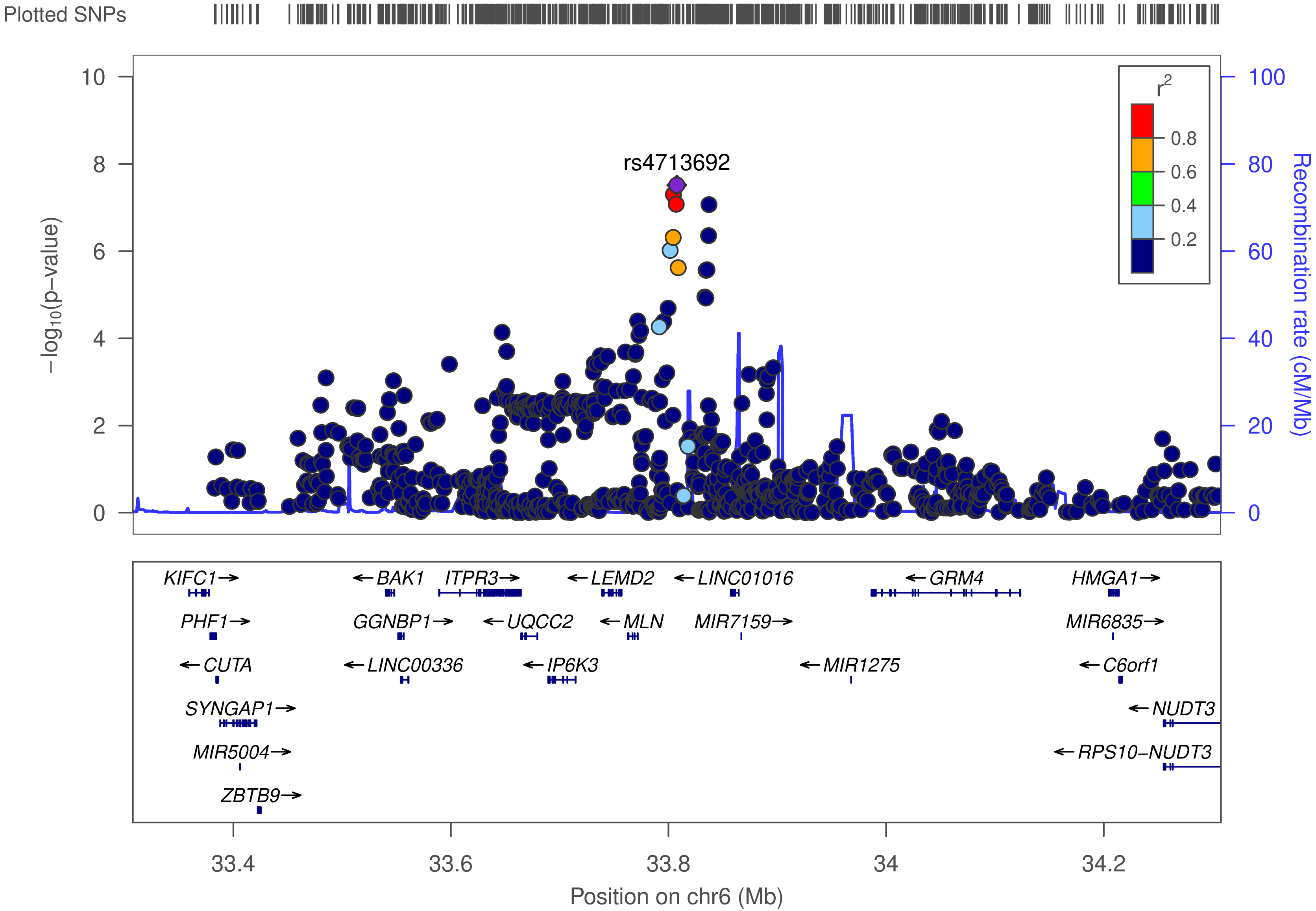

Plotted SNPs
r2
0.8
0.6
0.4
0.2
rs1592757
−log10(p−value)
0
2
4
6
8
10
Recombination rate (cM/Mb)
0
20
40
60
80
100
103.4
103.6
103.8
104
104.2
Position on chr5 (Mb)

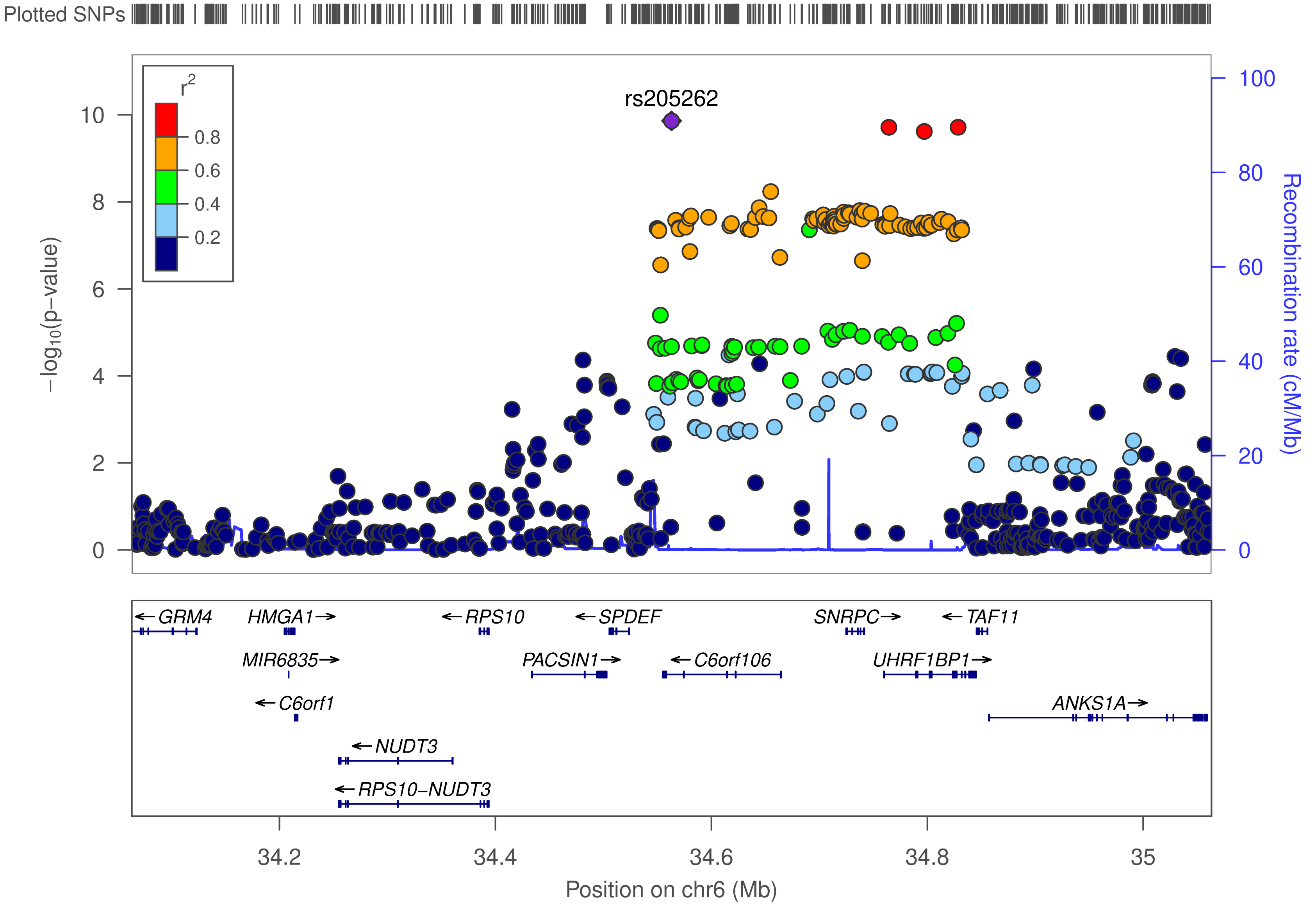

Plotted SNPs
10
8
6
4
2
0
−log10(p−value)
rs11953061
r2
0.8
0.6
0.4
0.2
100
80
60
40
20
0
Recombination rate (cM/Mb)
PRR16→
119.8
120
120.2
120.4
120.6
Position on chr5 (Mb)

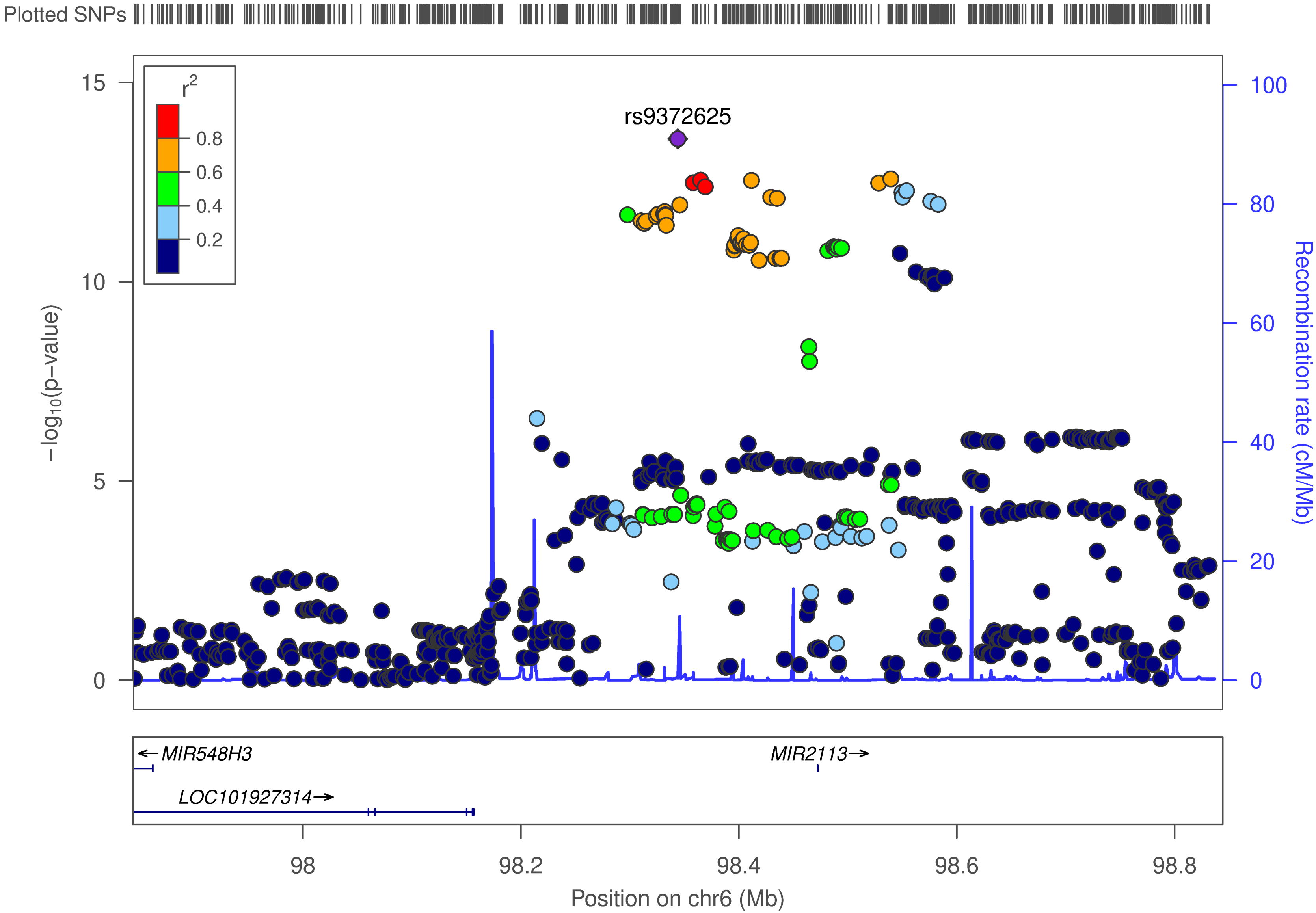

Plotted SNPs
r²
0.8
0.6
0.4
0.2
rs329122
10
8
6
4
2
0
−log10(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
TCF7→
MIR3661→
←CDKL3
LOC101927934→
SEC24A→
DDX46→
PCBD2→
←SKP1
UBE2B→
JADE2→
CAMLG→
C5orf24→
CATSPER3→
←PPP2CA
←CDKN2AIPNL
←SAR1B
TXNDC15→
←PITX1
←LOC102546229
MIR4461→
133.4
133.6
133.8
134
134.2
Position on chr5 (Mb)

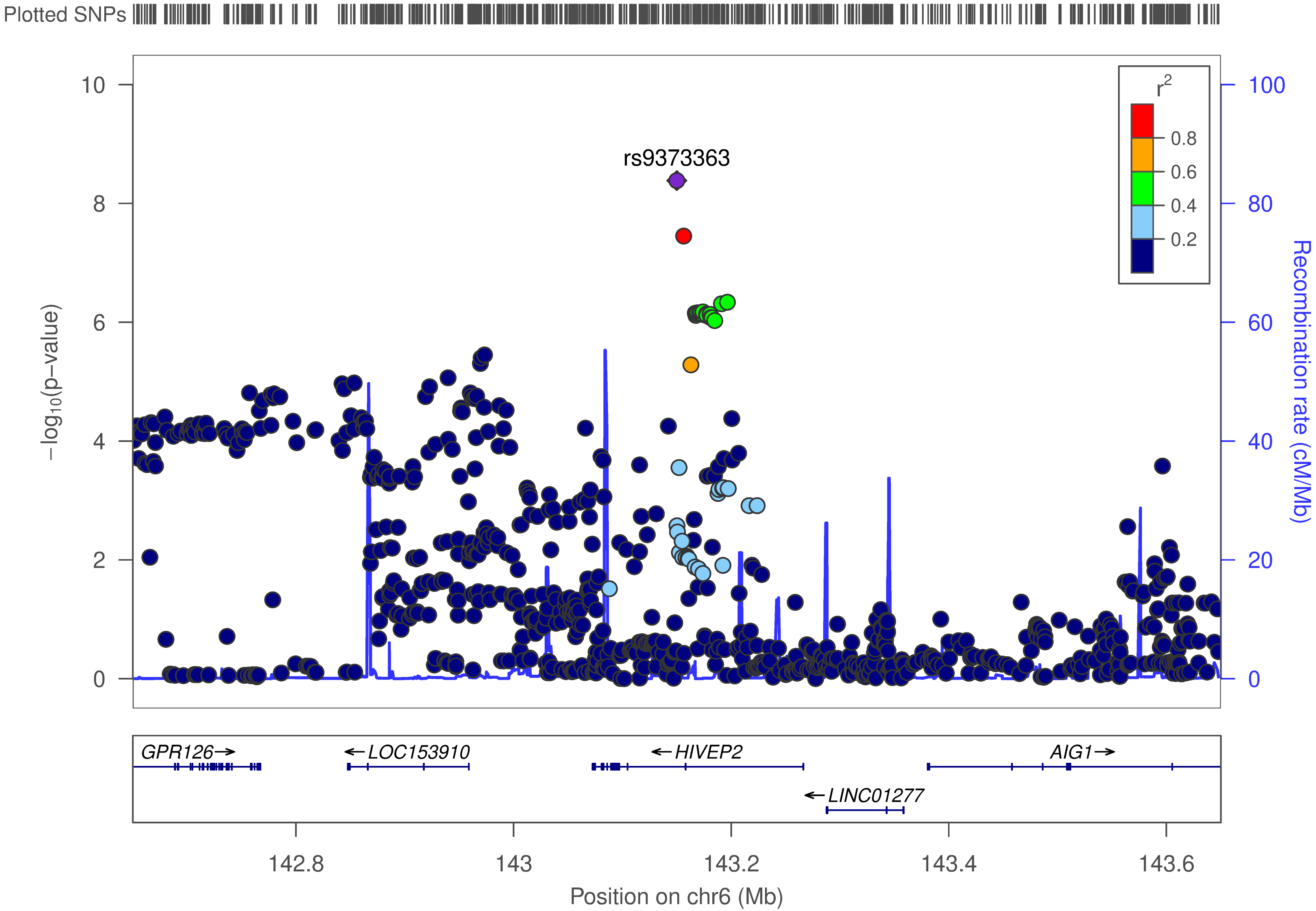

Plotted SNPs
r²
0.8
0.6
0.4
0.2
rs6939294
−log10(p−value)
0
2
4
6
8
10
Recombination rate (cM/Mb)
0
20
40
60
80
100
←ATXN1
STMND1→
RBM24→
CAP2→
16.6
16.8
17
17.2
17.4
Position on chr6 (Mb)

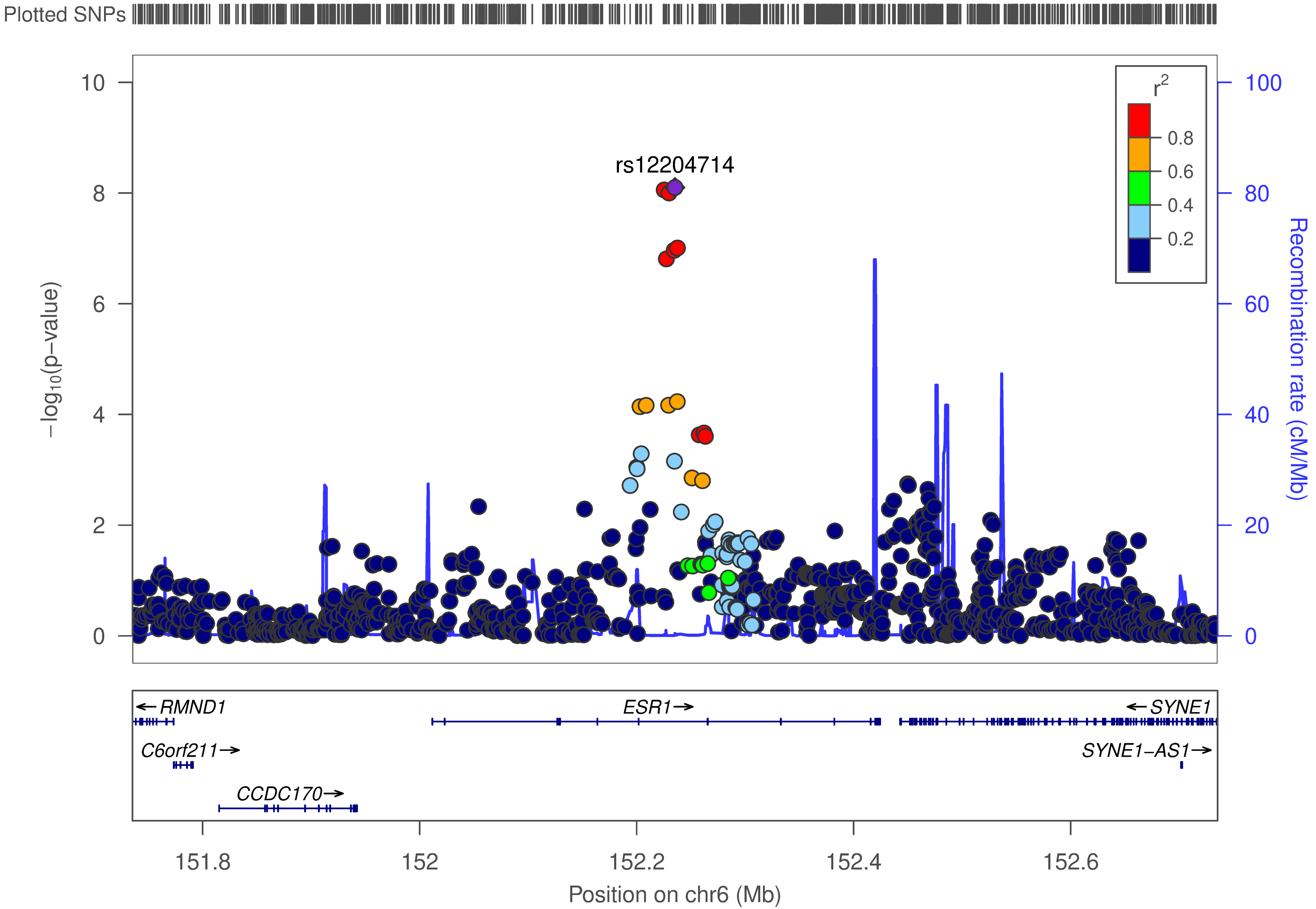

Plotted SNPs
rs2145318
−log10(p−value)
0
2
4
6
8
10
12
14
Recombination rate (cM/Mb)
0
20
40
60
80
100
r2
0.2
0.4
0.6
0.8
←HIST1H1A
HIST1H2BE→
BTN3A2→
BTN1A1→
ABT1→
←GUSBP2
HIST1H3A→
←HIST1H4D
BTN2A2→
HCG11→
←ZNF322
LINC00240→
HIST1H4A→
←HIST1H3D
BTN3A1→
HMGN4→
←LOC100270746
←HIST1H4B
←HIST1H2AD
BTN2A3P→
←HIST1H3B
HIST1H2BF→
BTN3A3→
←HIST1H2AB
HIST1H4E→
BTN2A1→
←HIST1H2BB
←HIST1H2BG
←LOC285819
HIST1H3C→
HIST1H2AE→
←HIST1H1C
HIST1H3E→
HFE→
←HIST1H1D
13 genes omitted
26
26.2
26.4
26.6
26.8
Position on chr6 (Mb)

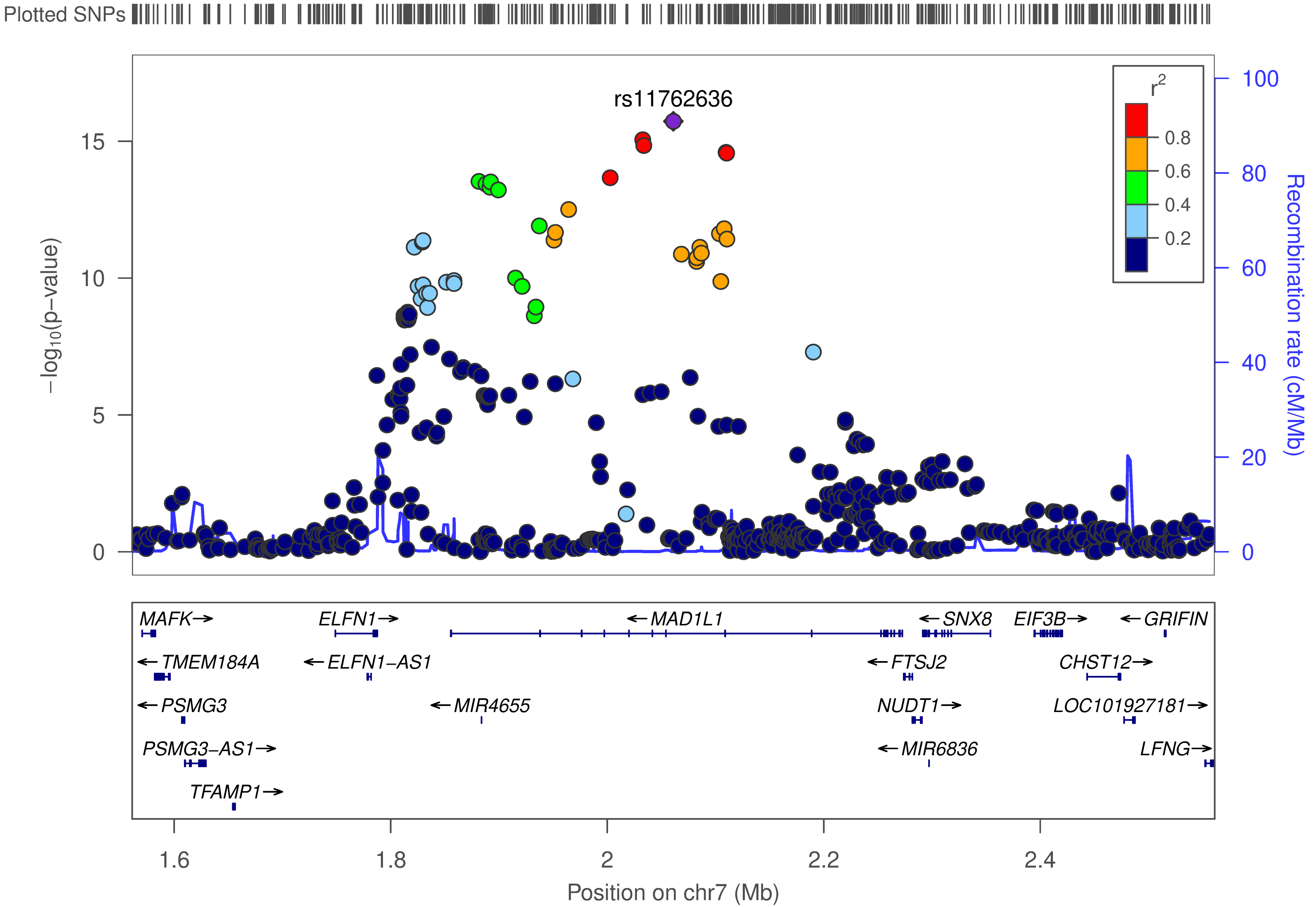

Plotted SNPs
rs4713692
10
8
6
4
2
0
−log10(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
r2
0.8
0.6
0.4
0.2
KIFC1→
PHF1→
←CUTA
SYNGAP1→
MIR5004→
ZBTB9→
←BAK1
GGNBP1→
←LINC00336
ITPR3→
←UQCC2
←IP6K3
←LEMD2
←MLN
←LINC01016
MIR7159→
←MIR1275
←GRM4
HMGA1→
MIR6835→
←C6orf1
←NUDT3
←RPS10−NUDT3
33.4
33.6
33.8
34
34.2
Position on chr6 (Mb)

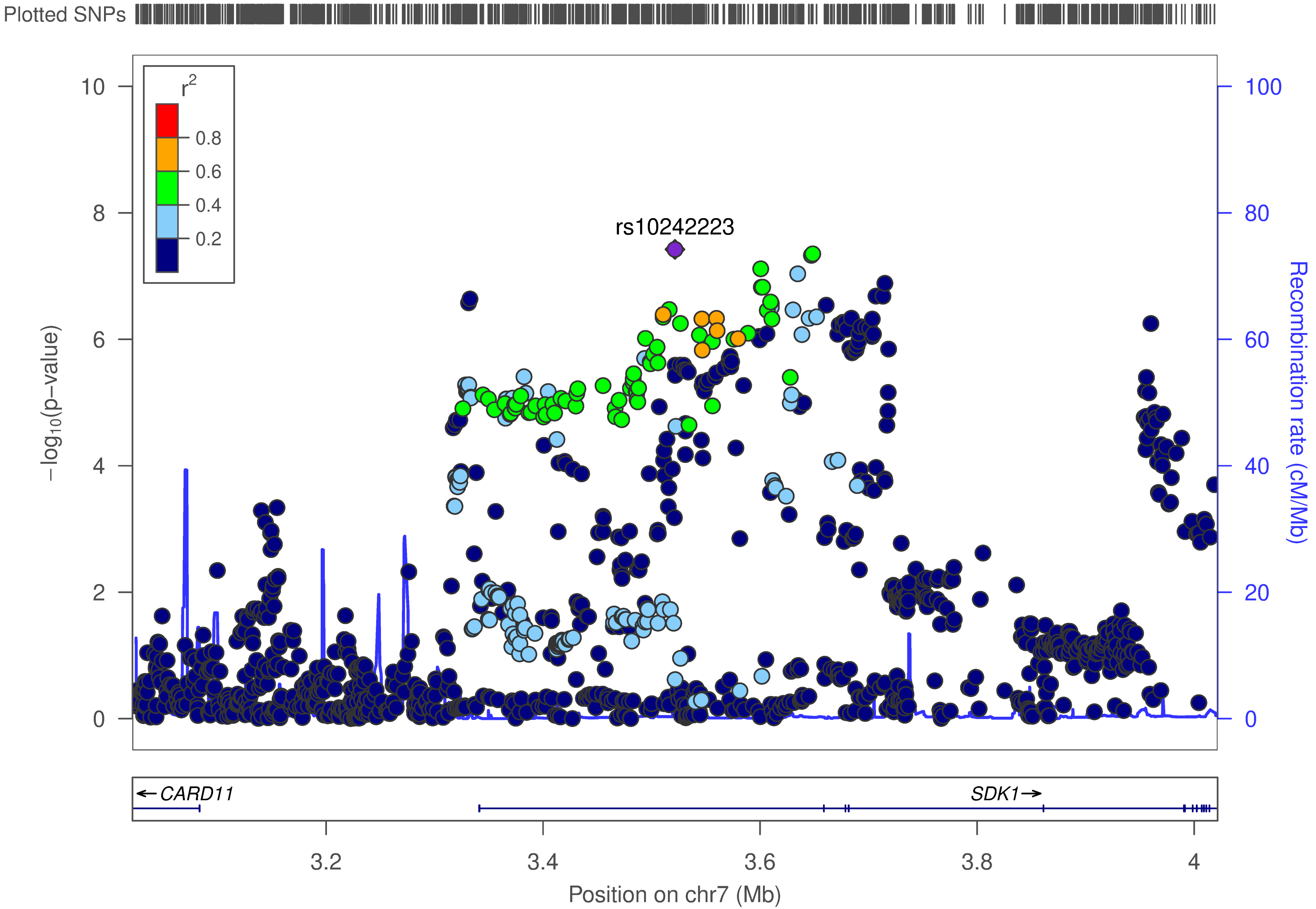

Plotted SNPs
r2
0.8
0.6
0.4
0.2
rs205262
10
8
6
4
2
0
−log10(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
← GRM4
HMGA1 →
← RPS10
← SPDEF
SNRPC →
← TAF11
MIR6835 →
PACSIN1 →
← C6orf106
UHRF1BP1 →
← C6orf1
ANKS1A →
← NUDT3
← RPS10−NUDT3
34.2
34.4
34.6
34.8
35
Position on chr6 (Mb)

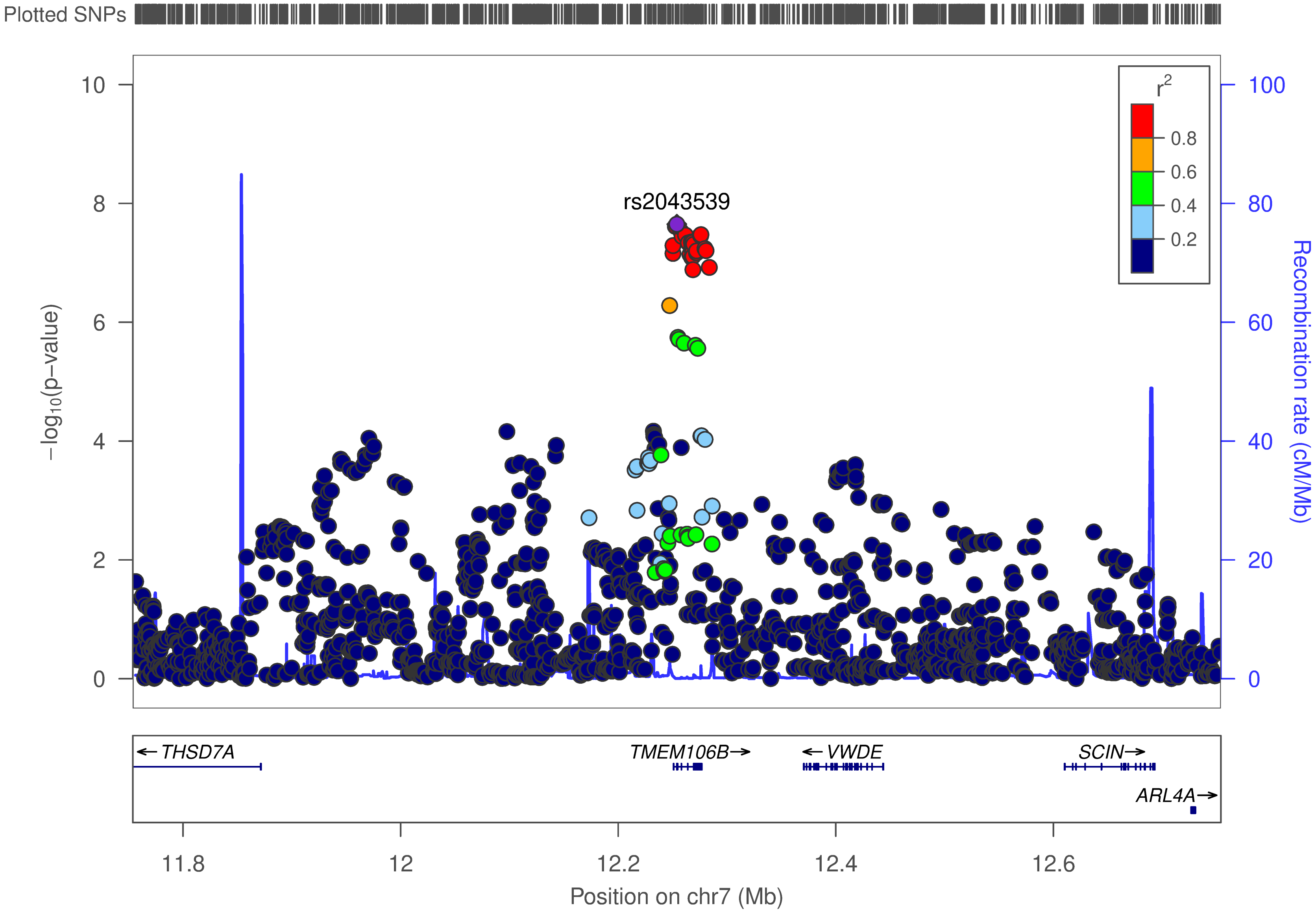

Plotted SNPs
r²
0.8
0.6
0.4
0.2
rs9372625
15
10
5
0
−log₁₀(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
← MIR548H3
MIR2113 →
LOC101927314 →
98
98.2
98.4
98.6
98.8
Position on chr6 (Mb)

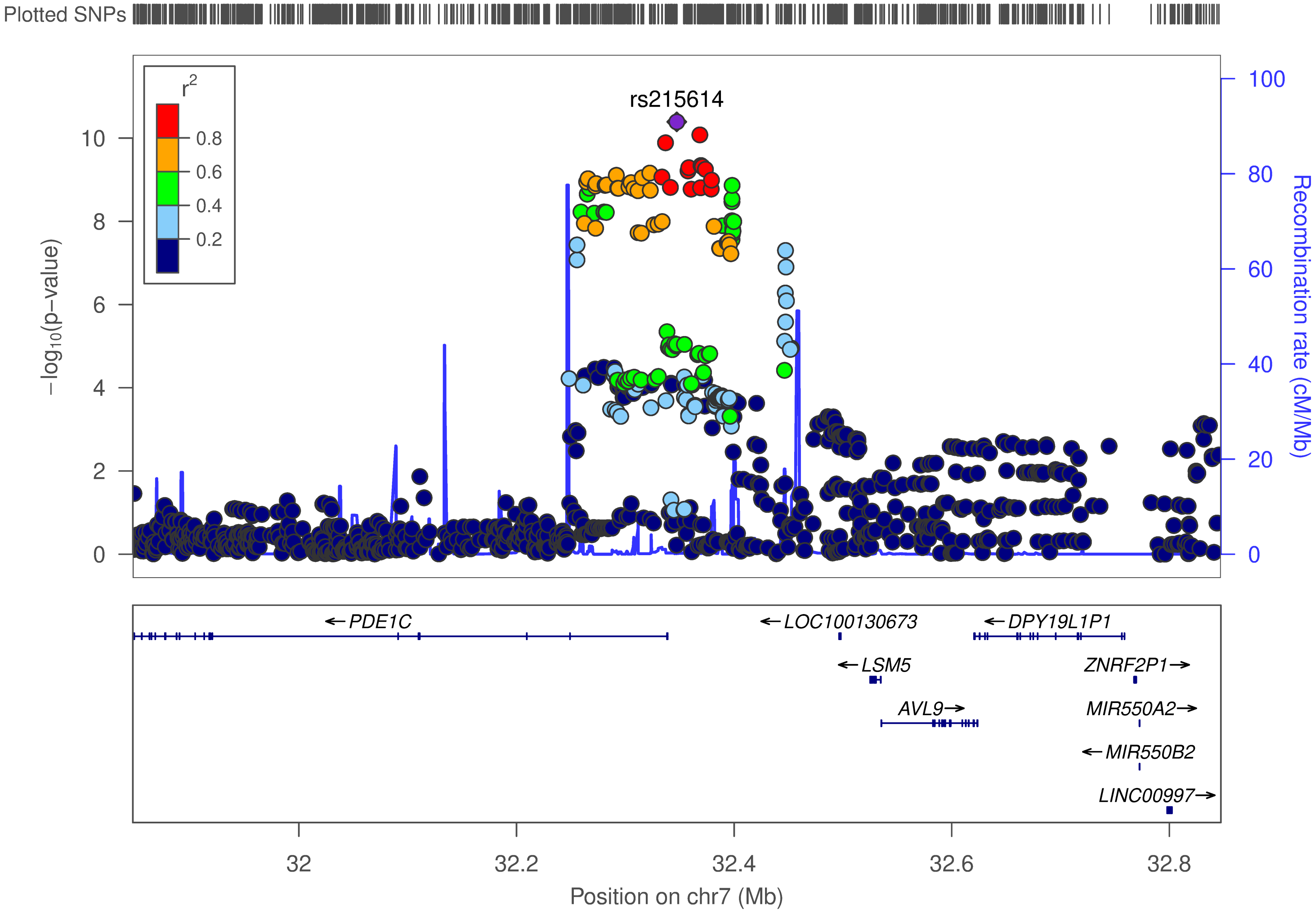

Plotted SNPs
rs9373363
r²
0.8
0.6
0.4
0.2
−log10(p−value)
10
8
6
4
2
0
Recombination rate (cM/Mb)
100
80
60
40
20
0
GPR126→
←LOC153910
←HIVEP2
←LINC01277
AIG1→
142.8
143
143.2
143.4
143.6
Position on chr6 (Mb)

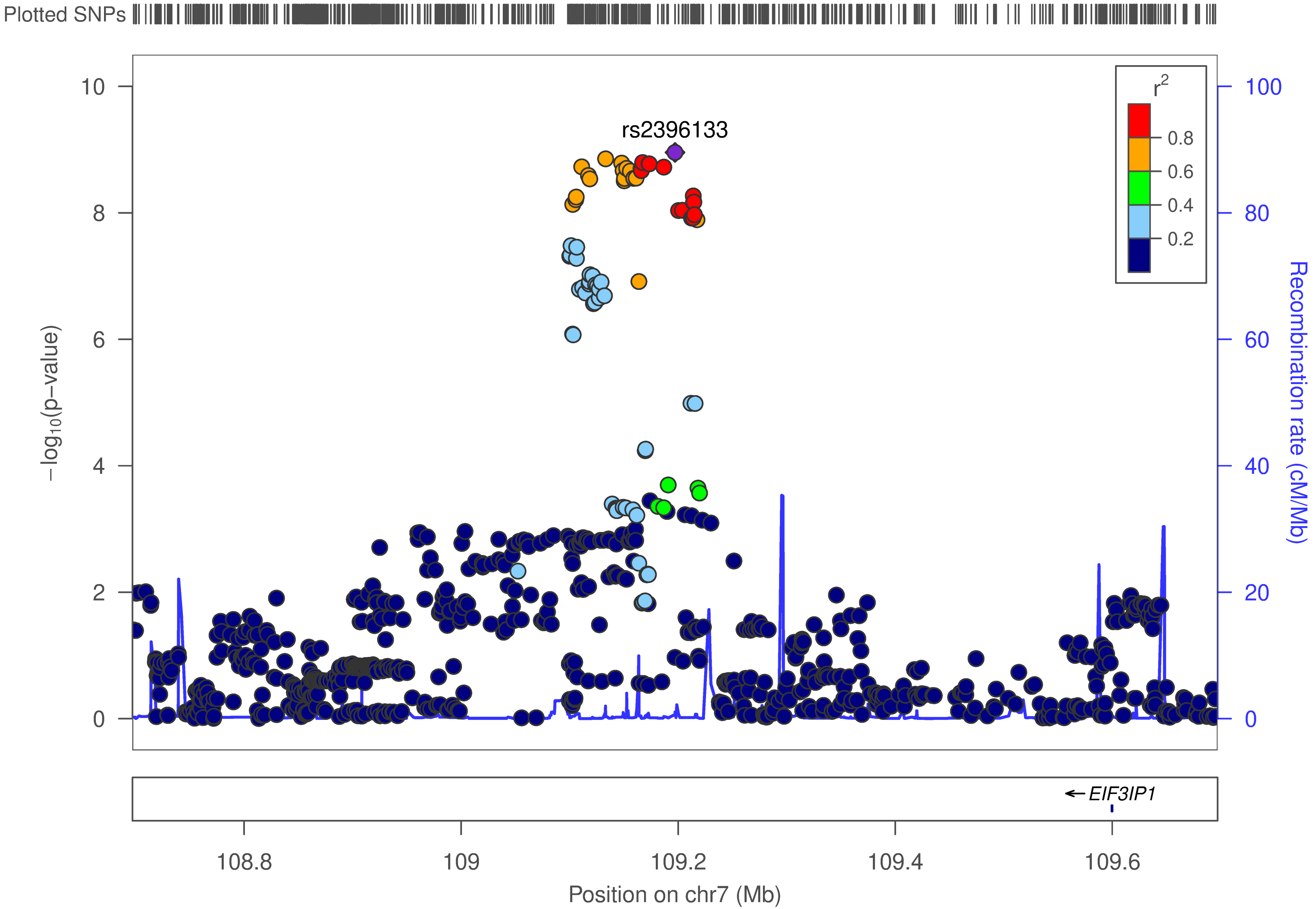

Plotted SNPs
rs12204714
r2
0.8
0.6
0.4
0.2
10
8
6
4
2
0
−log10(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
← RMND1
ESR1 →
← SYNE1
C6orf211 →
SYNE1−AS1 →
CCDC170 →
151.8
152
152.2
152.4
152.6
Position on chr6 (Mb)

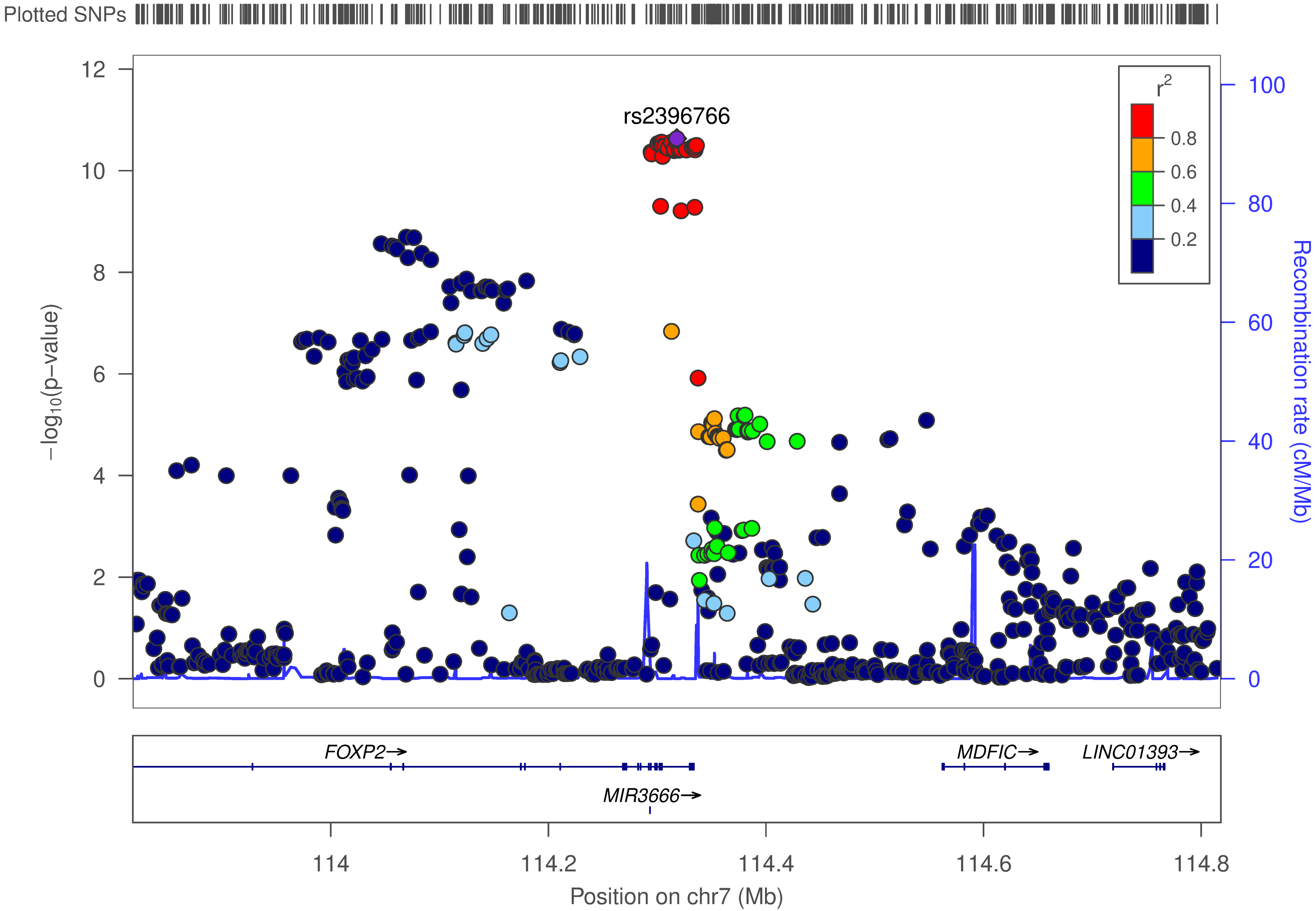

Plotted SNPs
rs11762636
r²
0.8
0.6
0.4
0.2
−log₁₀(p−value)
0
5
10
15
Recombination rate (cM/Mb)
0
20
40
60
80
100
MAFK→
ELFN1→
←MAD1L1
←SNX8
EIF3B→
←GRIFIN
←TMEM184A
←ELFN1−AS1
←FTSJ2
CHST12→
←PSMG3
←MIR4655
NUDT1→
LOC101927181→
PSMG3−AS1→
←MIR6836
LFNG→
TFAMP1→
1.6
1.8
2
2.2
2.4
Position on chr7 (Mb)

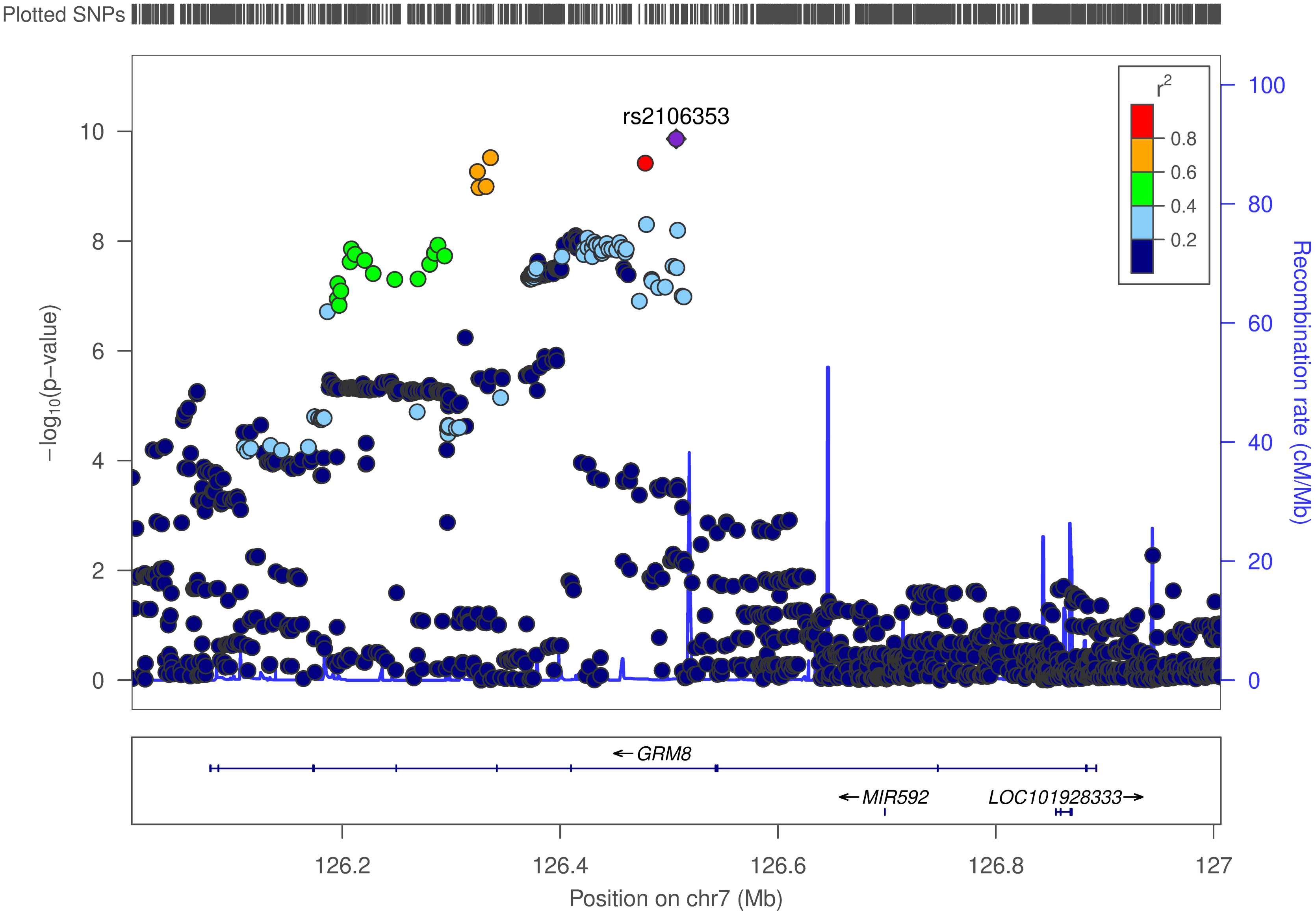

Plotted SNPs
r²
0.8
0.6
0.4
0.2
rs10242223
−log10(p−value)
0
2
4
6
8
10
Recombination rate (cM/Mb)
0
20
40
60
80
100
← CARD11
SDK1 →
3.2
3.4
3.6
3.8
4
Position on chr7 (Mb)

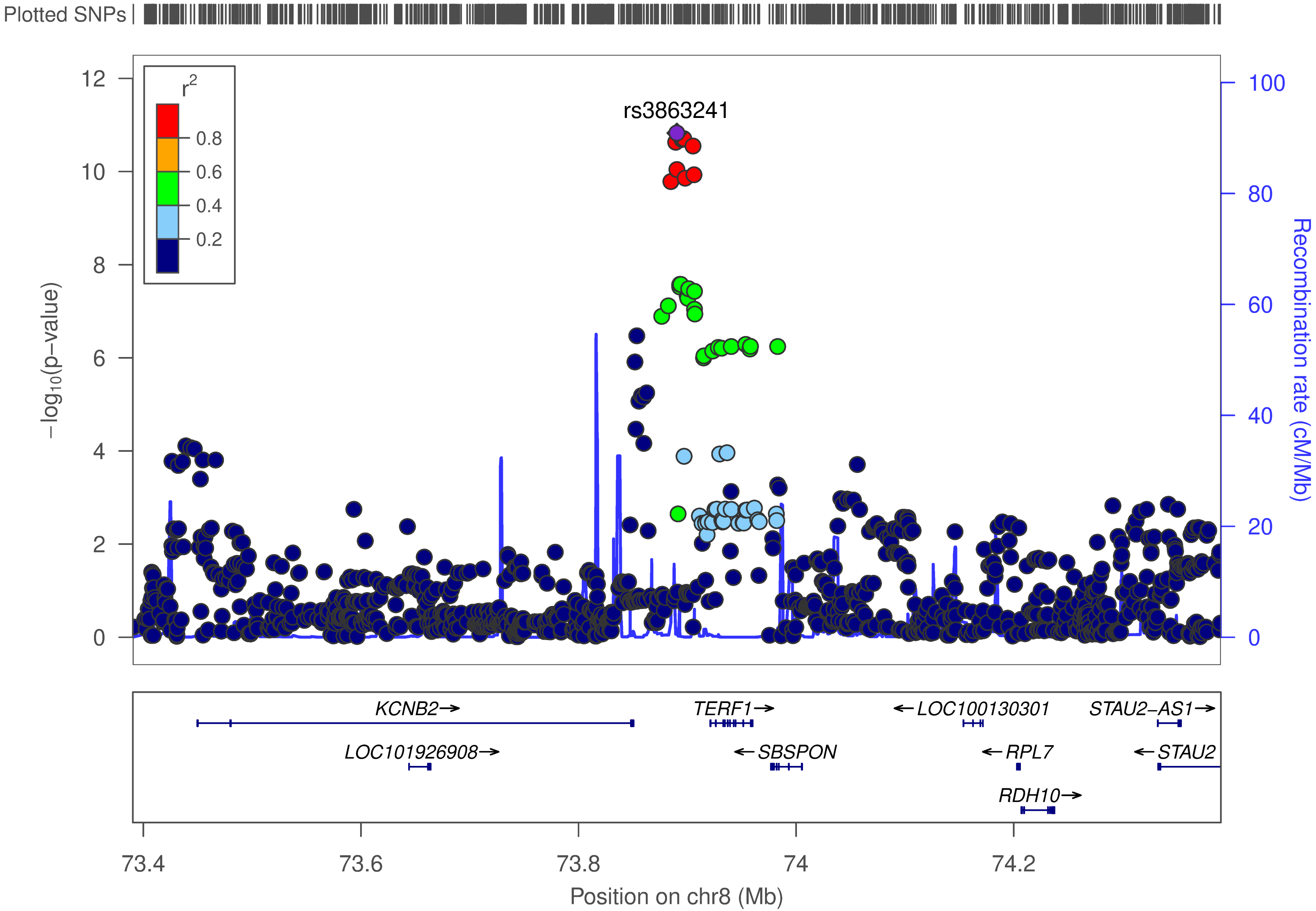

Plotted SNPs
rs2043539
r^2
0.8
0.6
0.4
0.2
−log10(p−value)
0
2
4
6
8
10
Recombination rate (cM/Mb)
0
20
40
60
80
100
← THSD7A
TMEM106B →
← VWDE
SCIN →
ARL4A →
11.8
12
12.2
12.4
12.6
Position on chr7 (Mb)

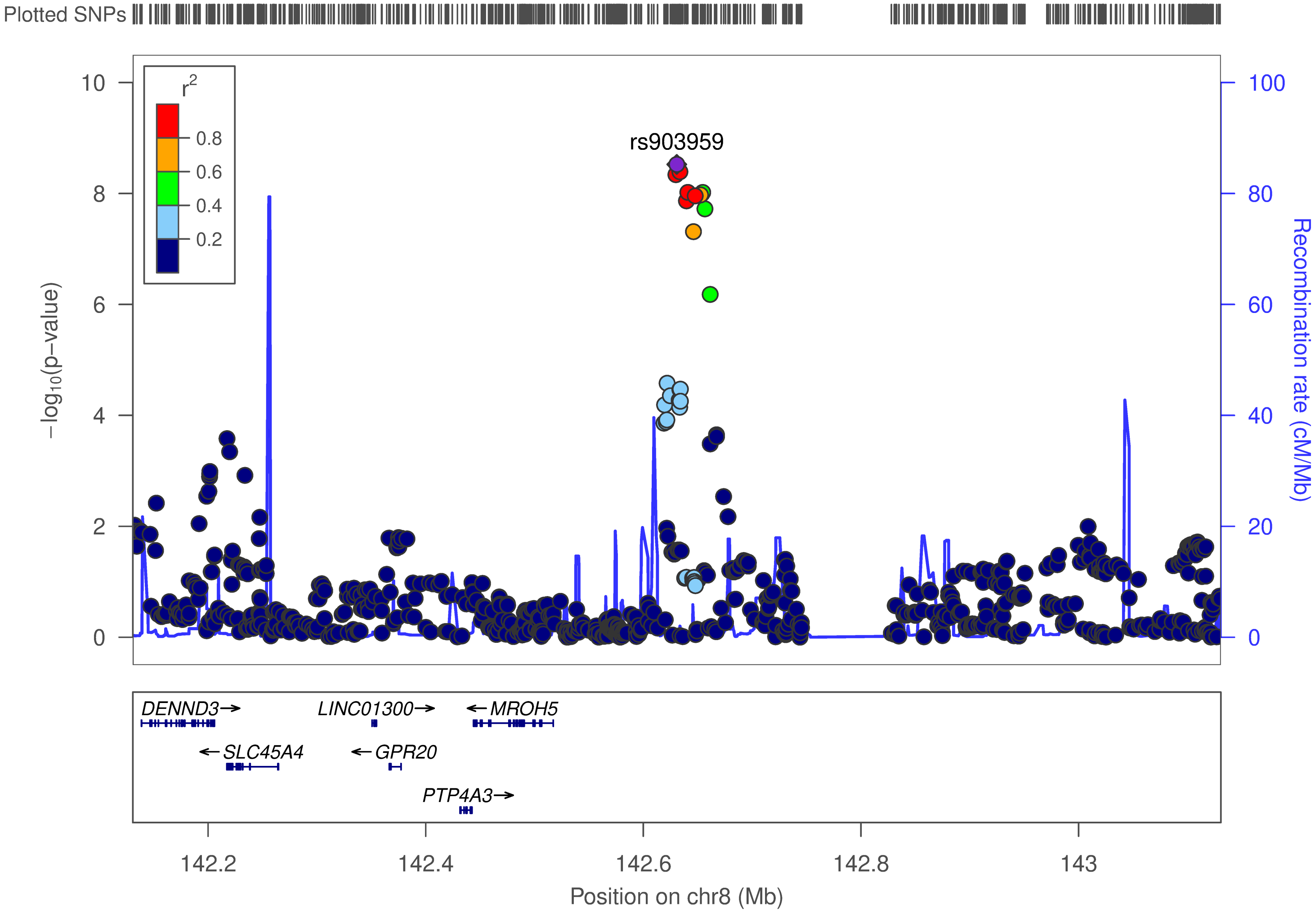

Plotted SNPs
rs215614
r²
0.8
0.6
0.4
0.2
−log10(p−value)
0
2
4
6
8
10
Recombination rate (cM/Mb)
0
20
40
60
80
100
← PDE1C
← LOC100130673
← DPY19L1P1
← LSM5
ZNRF2P1 →
AVL9 →
MIR550A2 →
← MIR550B2
LINC00997 →
32
32.2
32.4
32.6
32.8
Position on chr7 (Mb)

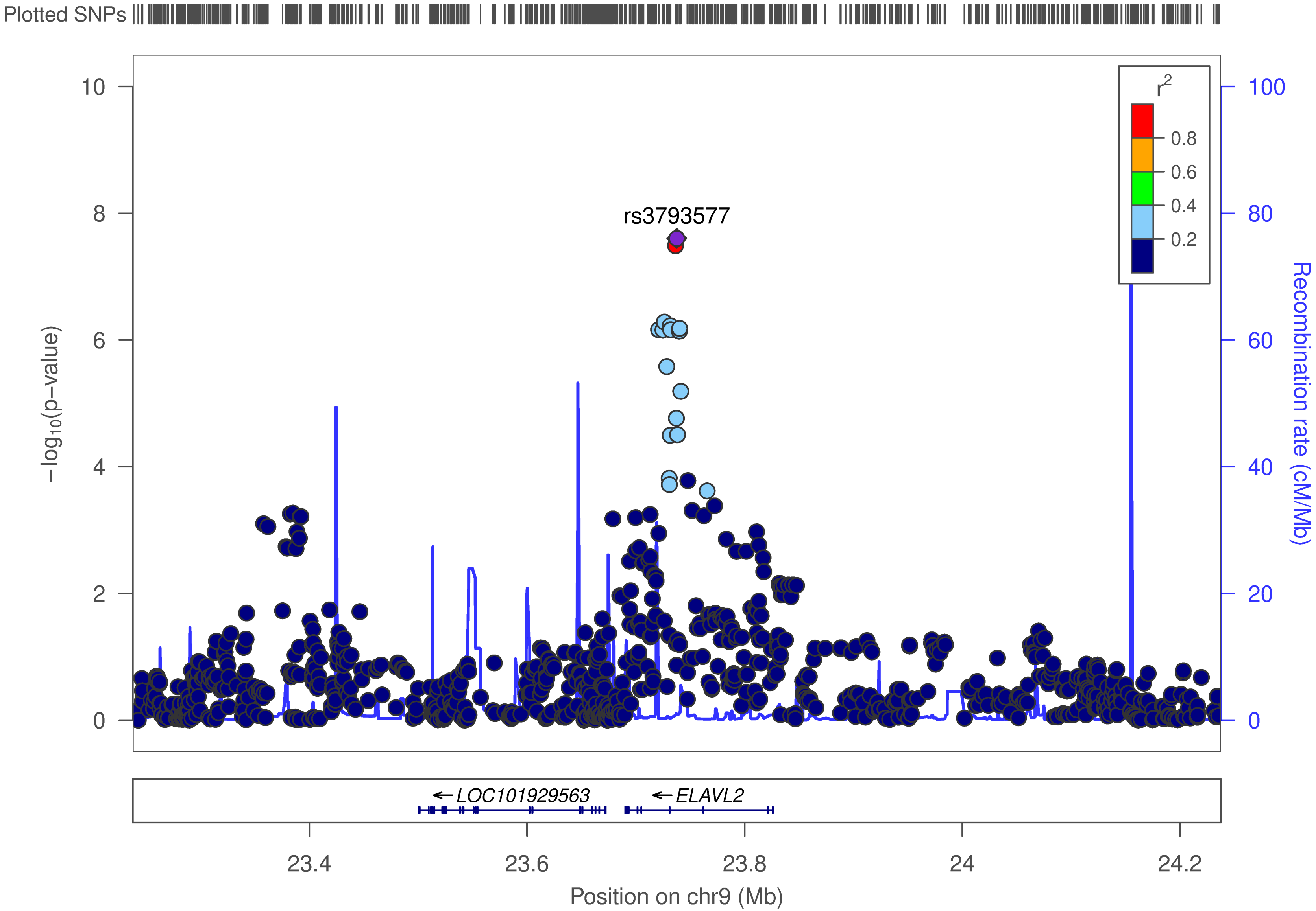

Plotted SNPs
rs2396133
r²
0.8
0.6
0.4
0.2
10
8
6
4
2
0
−log₁₀(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
← EIF3IP1
108.8
109
109.2
109.4
109.6
Position on chr7 (Mb)

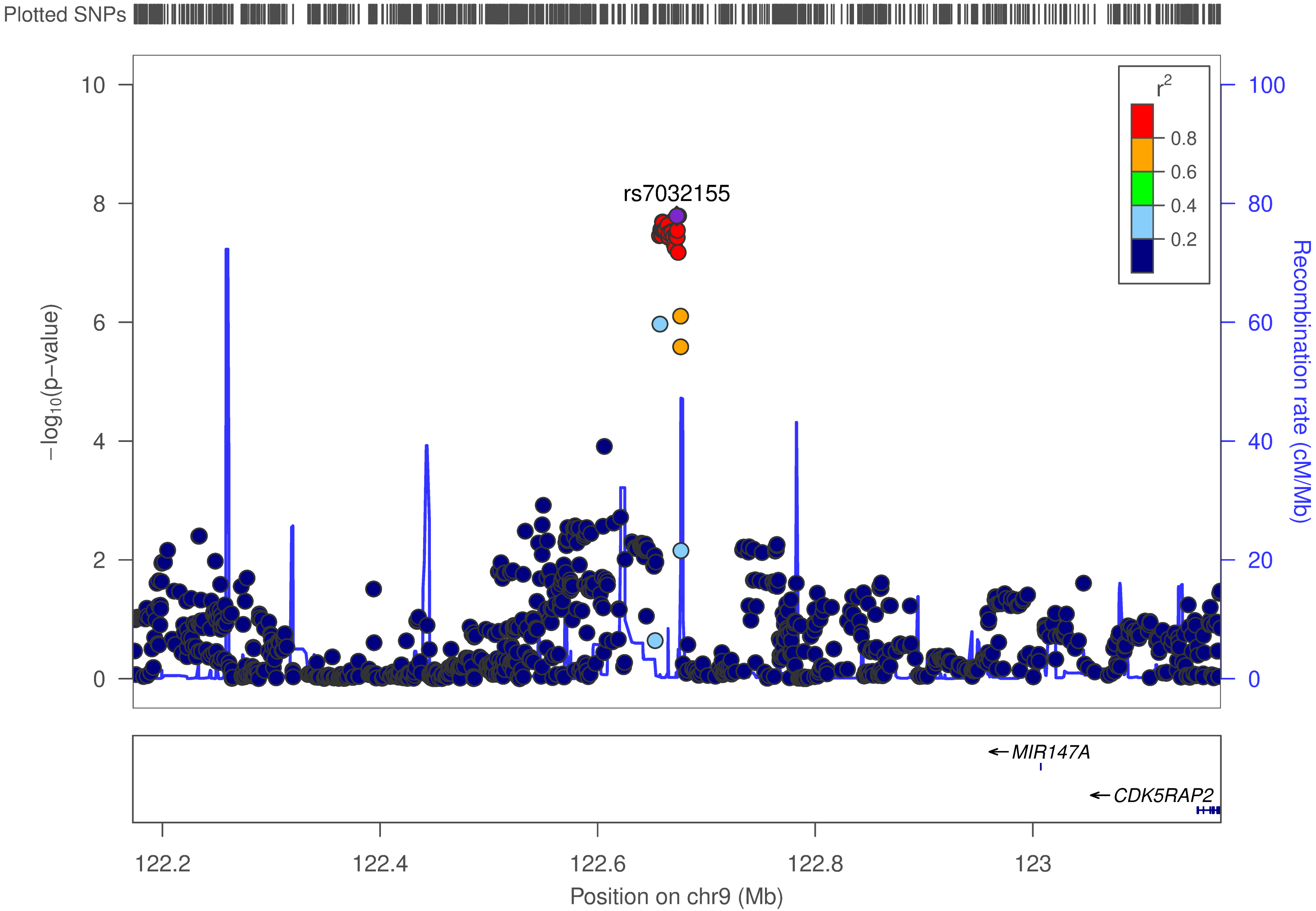

Plotted SNPs
rs2396766
r²
0.8
0.6
0.4
0.2
12
10
8
6
4
2
0
−log10(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
FOXP2→
MIR3666→
MDFIC→
LINC01393→
114
114.2
114.4
114.6
114.8
Position on chr7 (Mb)

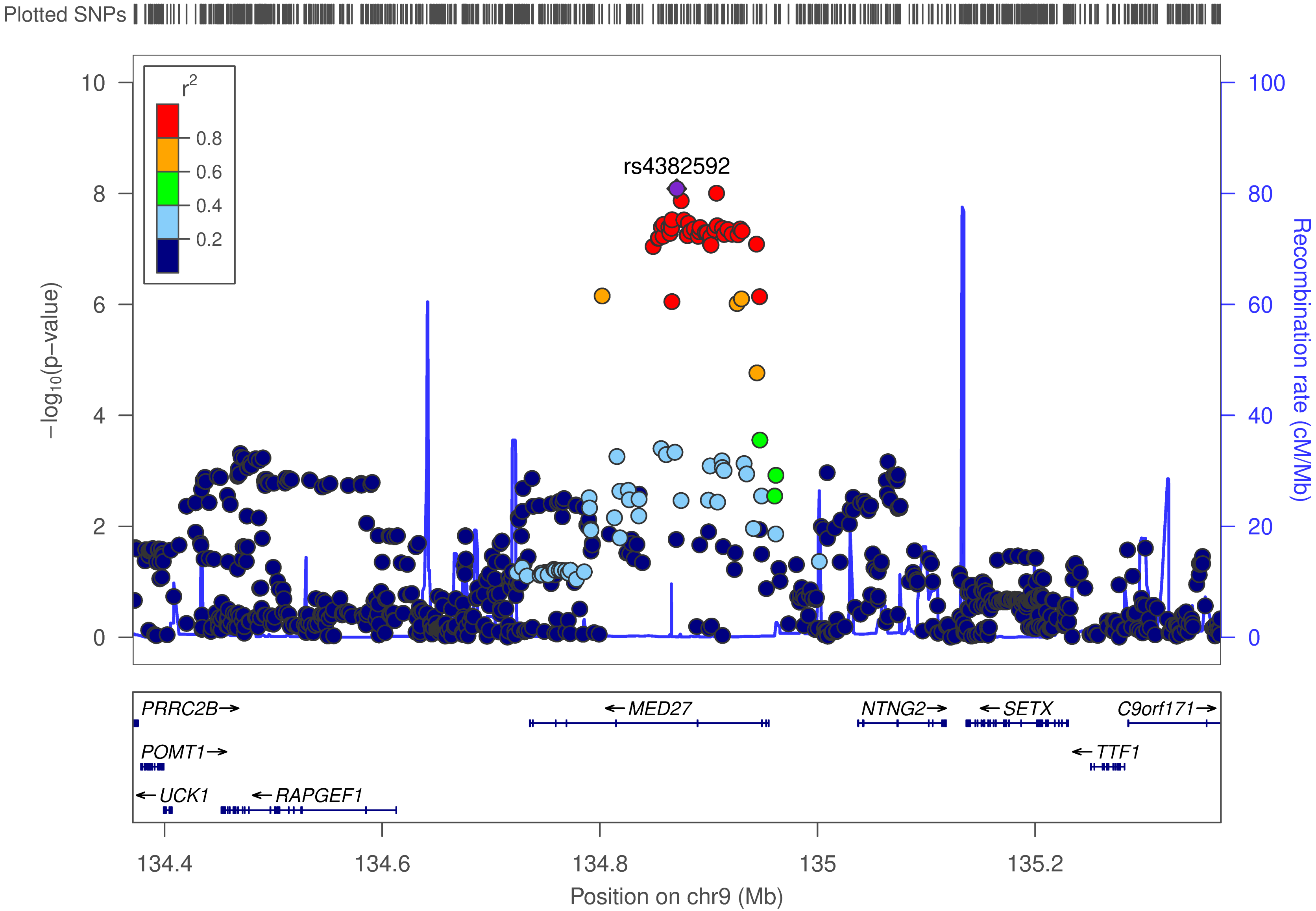

Plotted SNPs
rs2106353
r²
0.8
0.6
0.4
0.2
10
8
6
4
2
0
−log₁₀(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
← GRM8
← MIR592
LOC101928333 →
126.2
126.4
126.6
126.8
127
Position on chr7 (Mb)

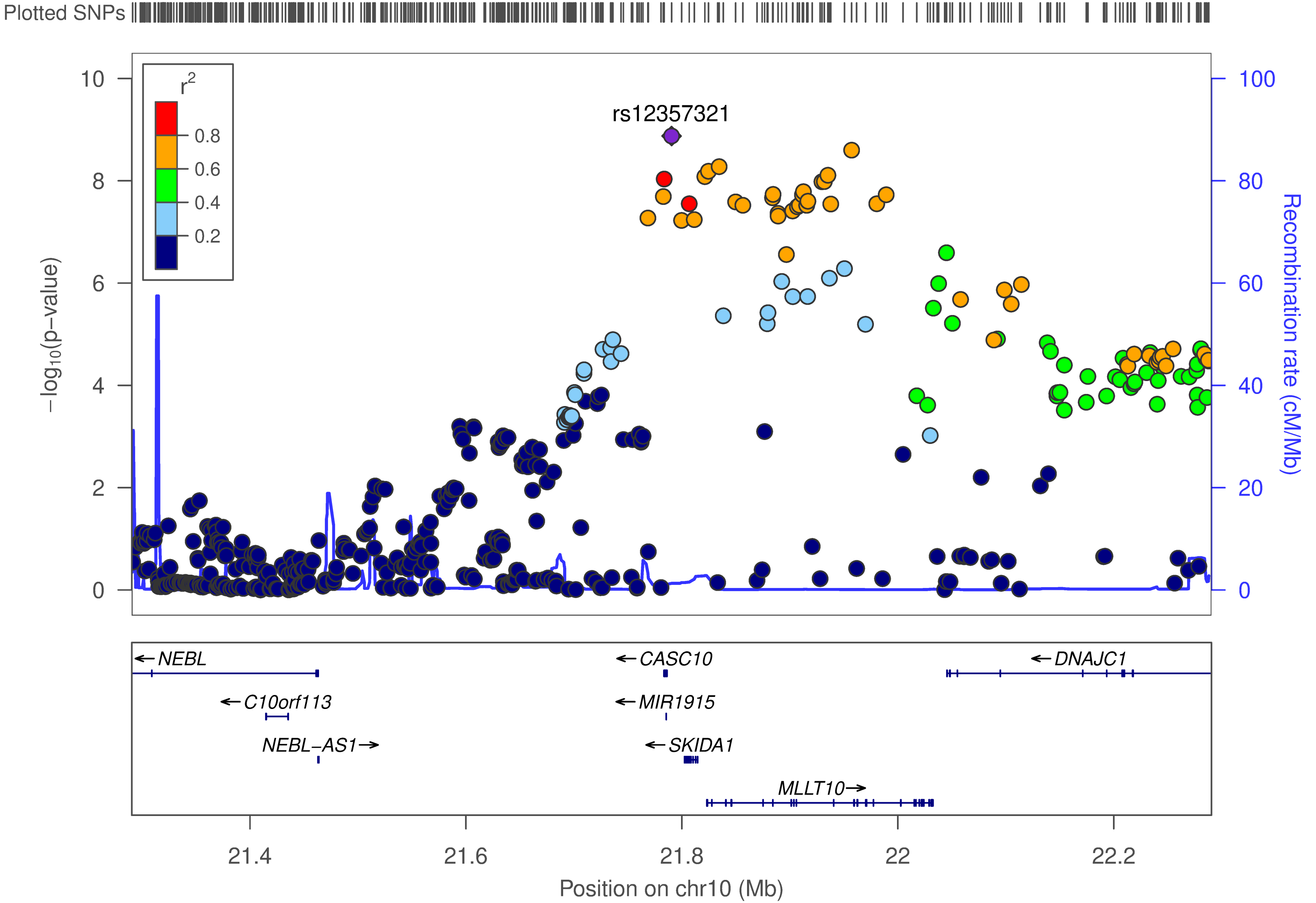

Plotted SNPs
r2
0.8
0.6
0.4
0.2
rs3863241
−log10(p−value)
0
2
4
6
8
10
12
Recombination rate (cM/Mb)
0
20
40
60
80
100
KCNB2→
LOC101926908→
TERF1→
←SBSPON
←LOC100130301
←RPL7
RDH10→
STAU2−AS1→
←STAU2
73.4
73.6
73.8
74
74.2
Position on chr8 (Mb)

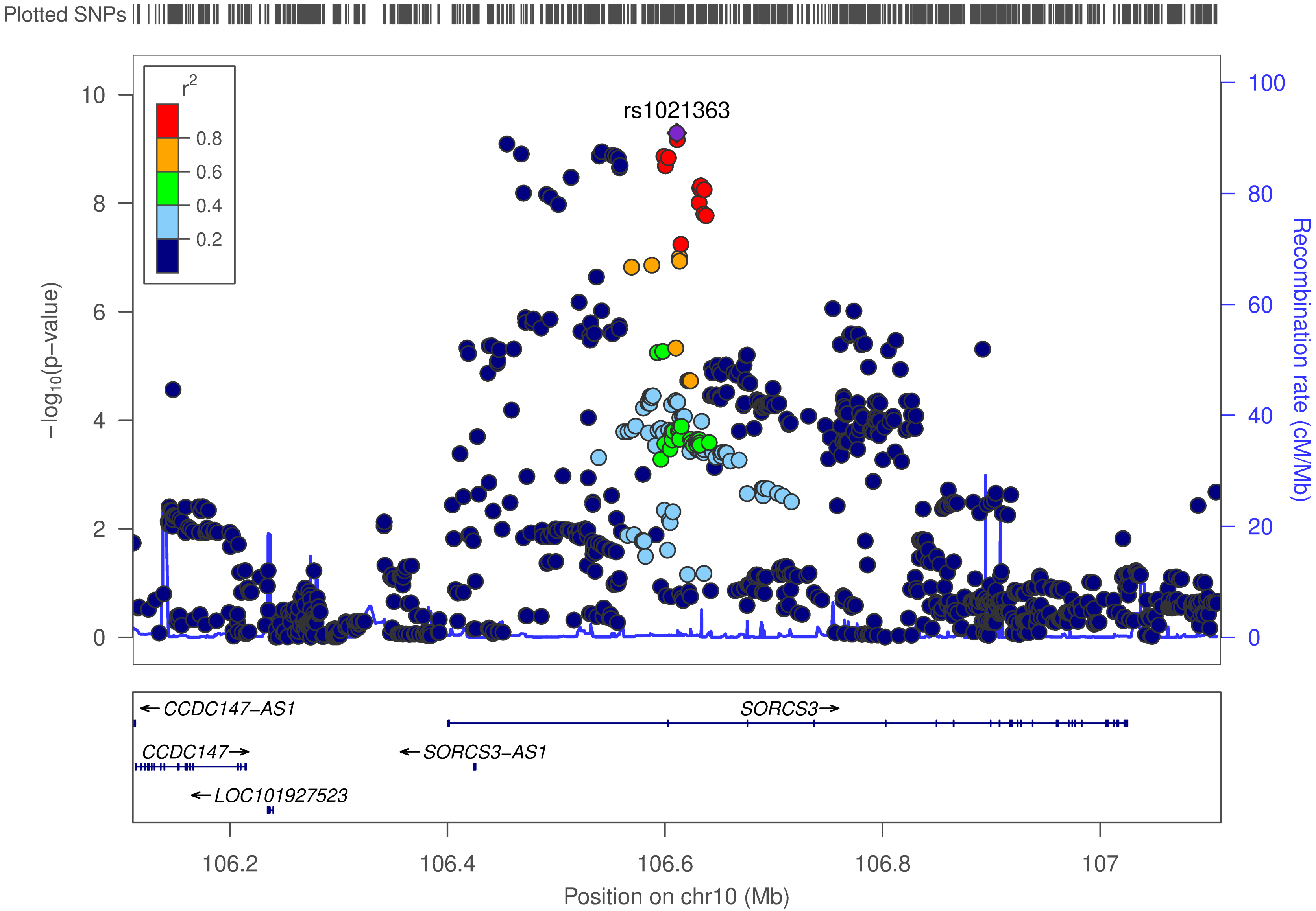

Plotted SNPs
r2
0.8
0.6
0.4
0.2
rs903959
−log10(p−value)
0
2
4
6
8
10
Recombination rate (cM/Mb)
0
20
40
60
80
100
DENND3→
LINC01300→
←MROH5
←SLC45A4
←GPR20
PTP4A3→
142.2
142.4
142.6
142.8
143
Position on chr8 (Mb)

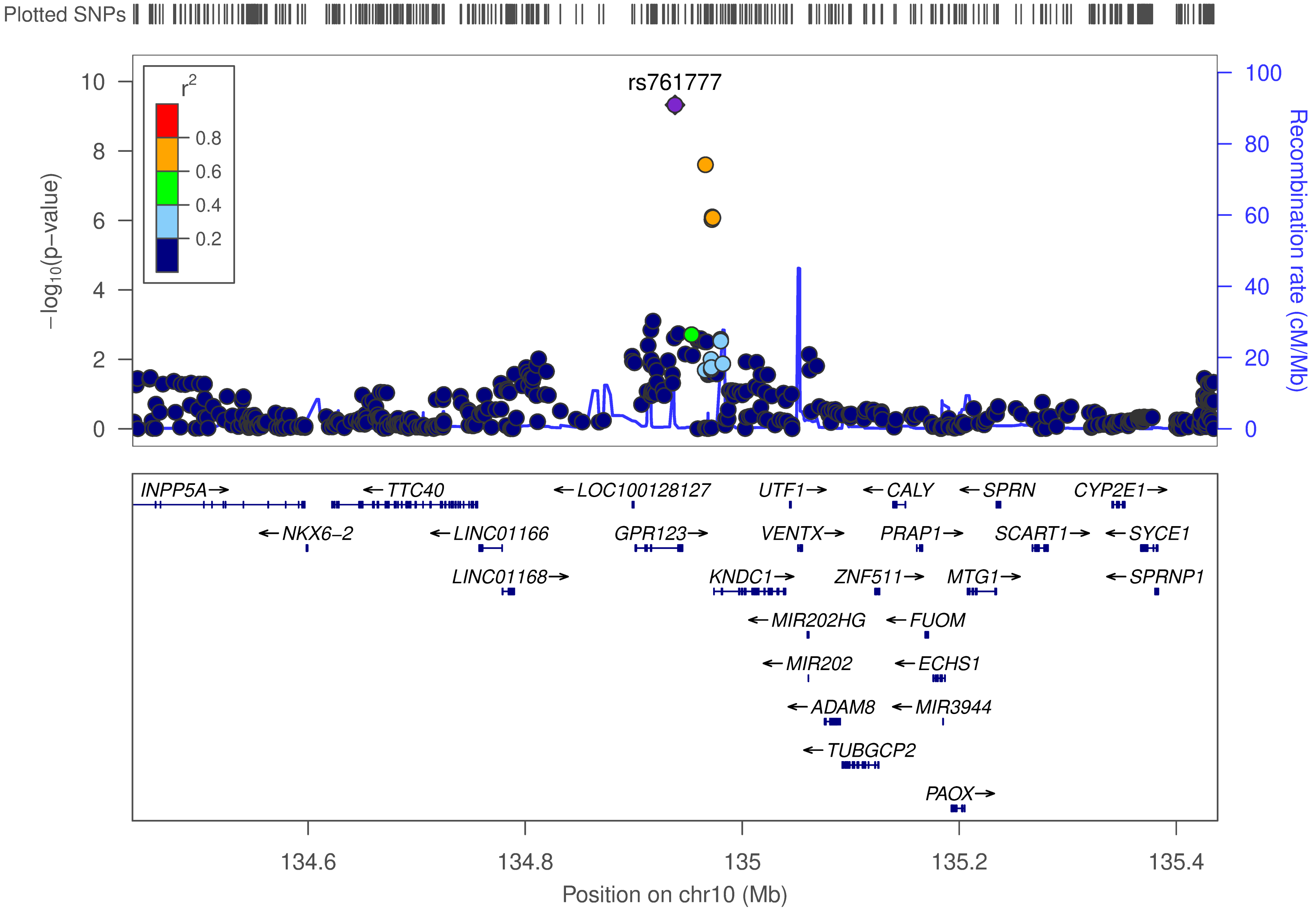

Plotted SNPs
10
8
6
4
2
0
−log10(p−value)
rs3793577
r²
0.8
0.6
0.4
0.2
100
80
60
40
20
0
Recombination rate (cM/Mb)
← LOC101929563
← ELAVL2
23.4
23.6
23.8
24
24.2
Position on chr9 (Mb)

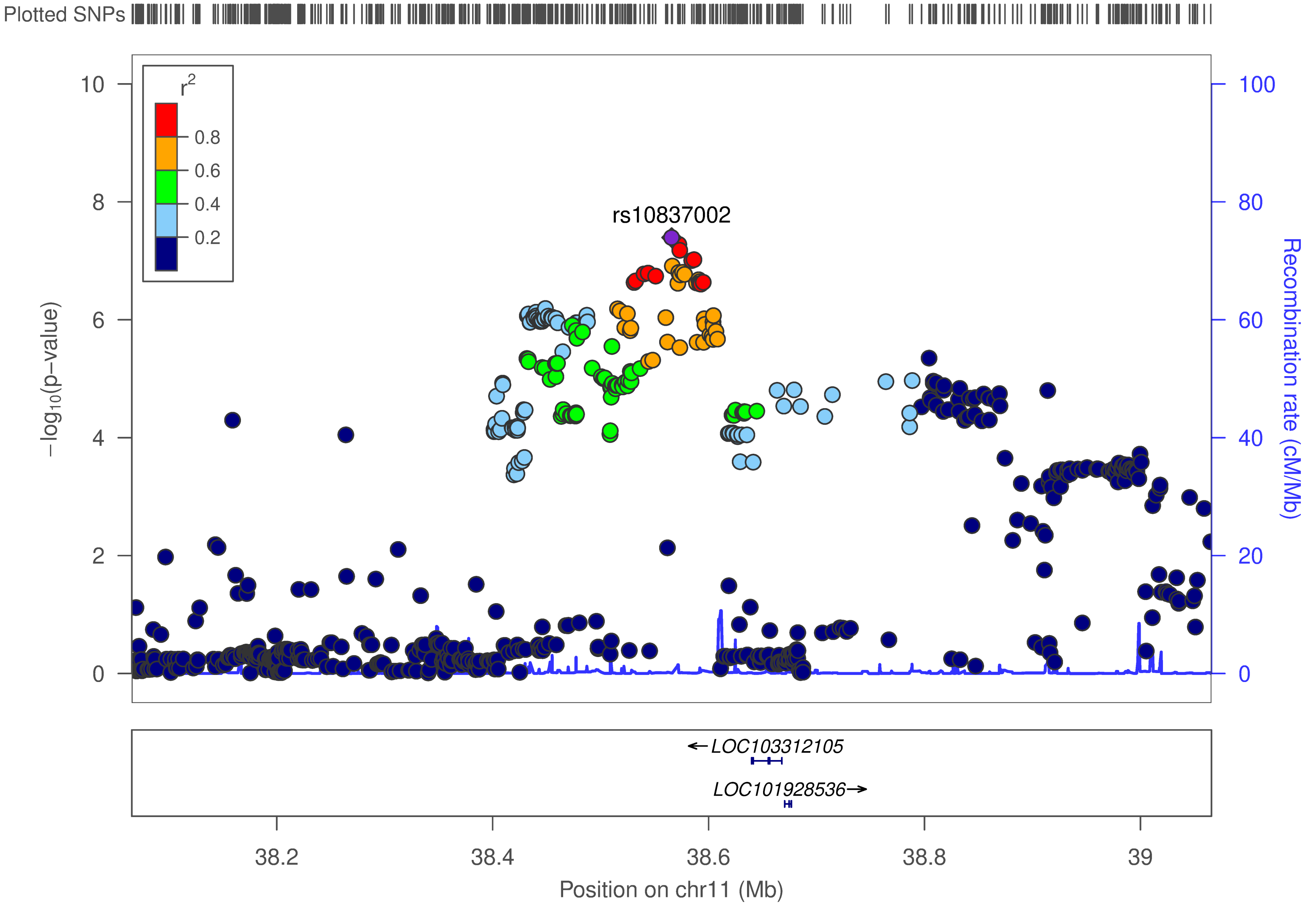

Plotted SNPs
rs7032155
r²
0.8
0.6
0.4
0.2
10
8
6
4
2
0
−log₁₀(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
← MIR147A
← CDK5RAP2
122.2
122.4
122.6
122.8
123
Position on chr9 (Mb)

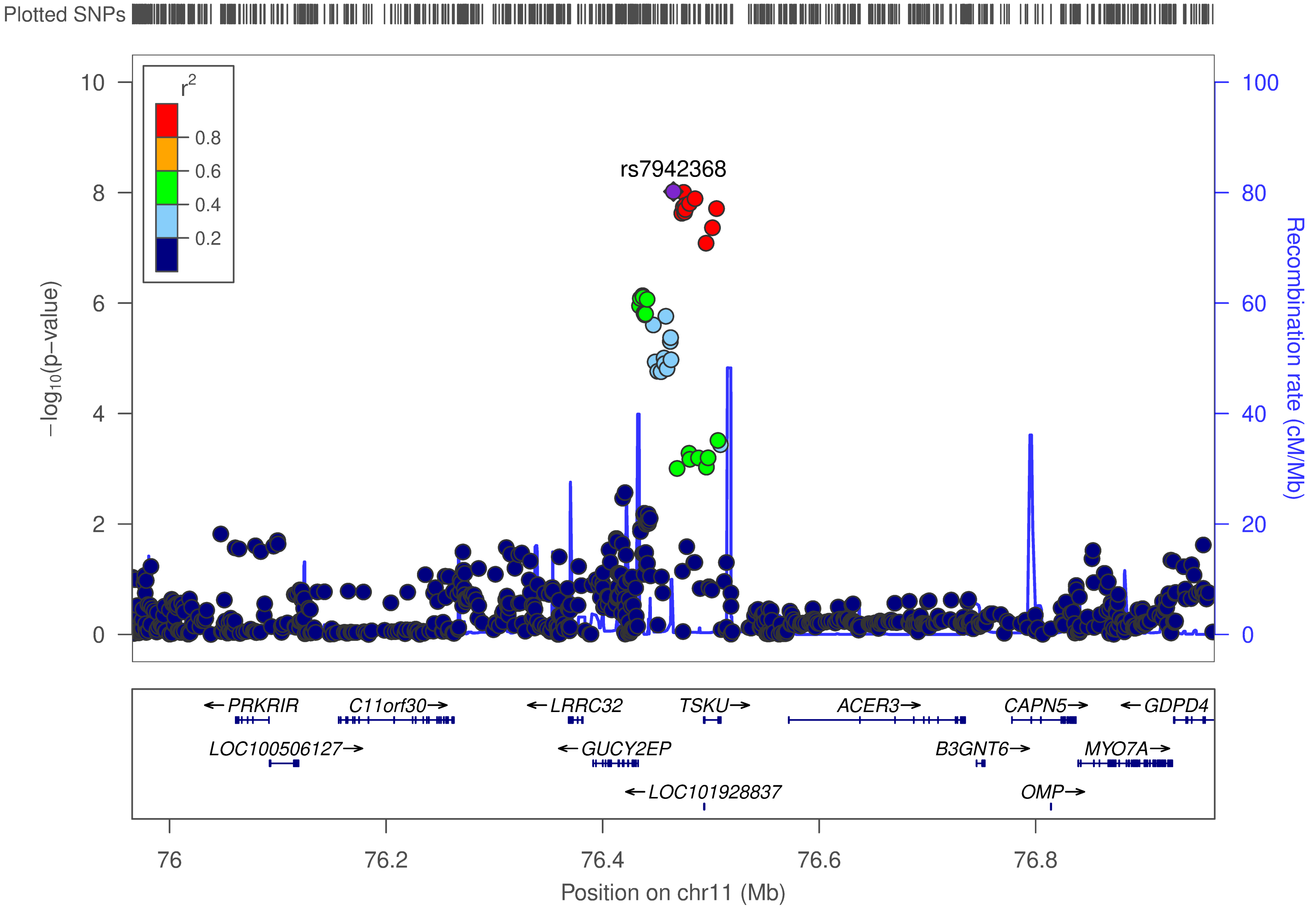

Plotted SNPs
r²
0.8
0.6
0.4
0.2
rs4382592
10
8
6
4
2
0
−log₁₀(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
PRRC2B→
POMT1→
←UCK1
←RAPGEF1
←MED27
NTNG2→
←SETX
C9orf171→
←TTF1
134.4
134.6
134.8
135
135.2
Position on chr9 (Mb)

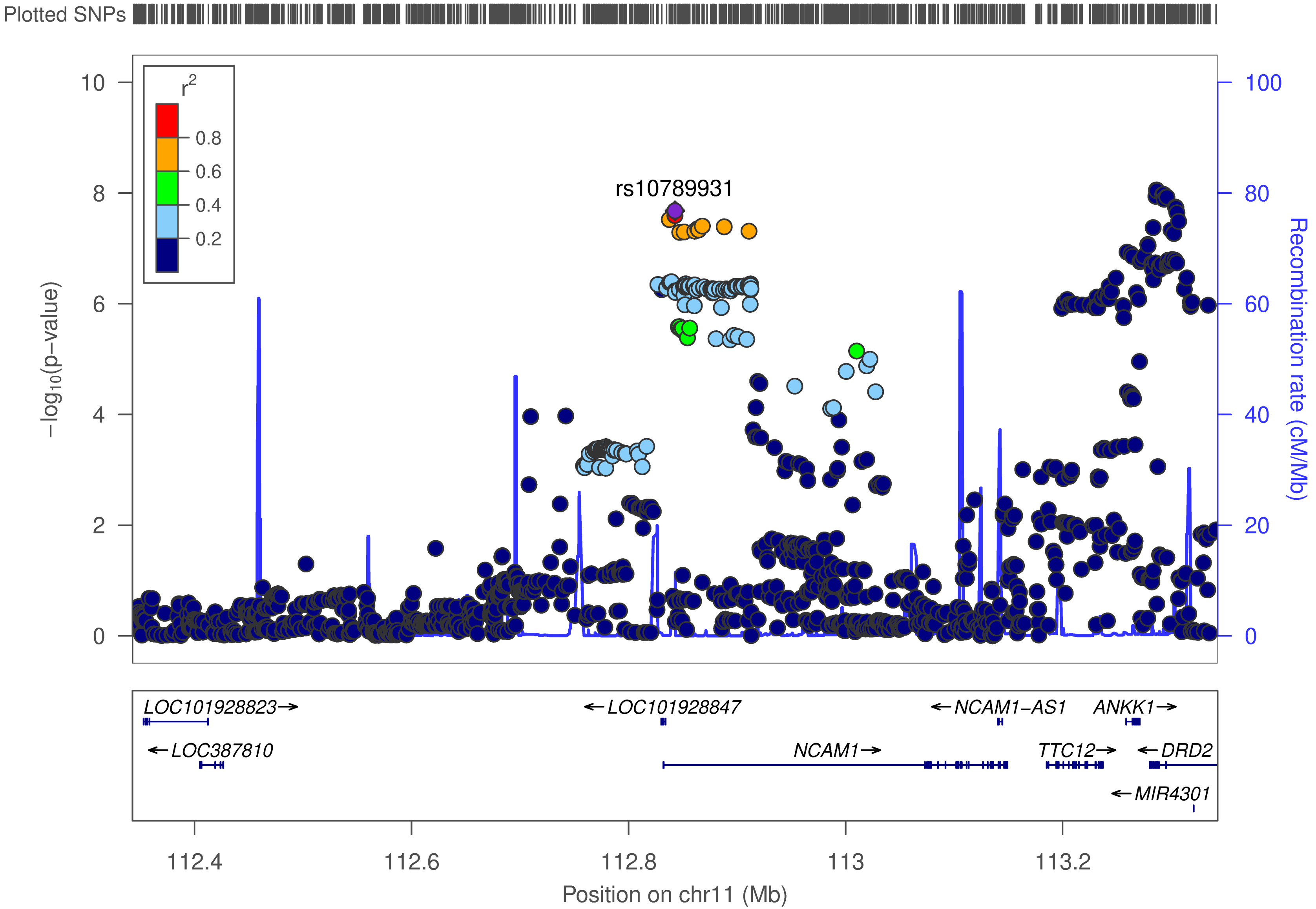

Plotted SNPs
rs12357321
r²
0.8
0.6
0.4
0.2
−log₁₀(p−value)
Recombination rate (cM/Mb)
10
8
6
4
2
0
100
80
60
40
20
0
NEBL
C10orf113
NEBL−AS1
CASC10
MIR1915
SKIDA1
MLLT10
DNAJC1
21.4
21.6
21.8
22
22.2
Position on chr10 (Mb)

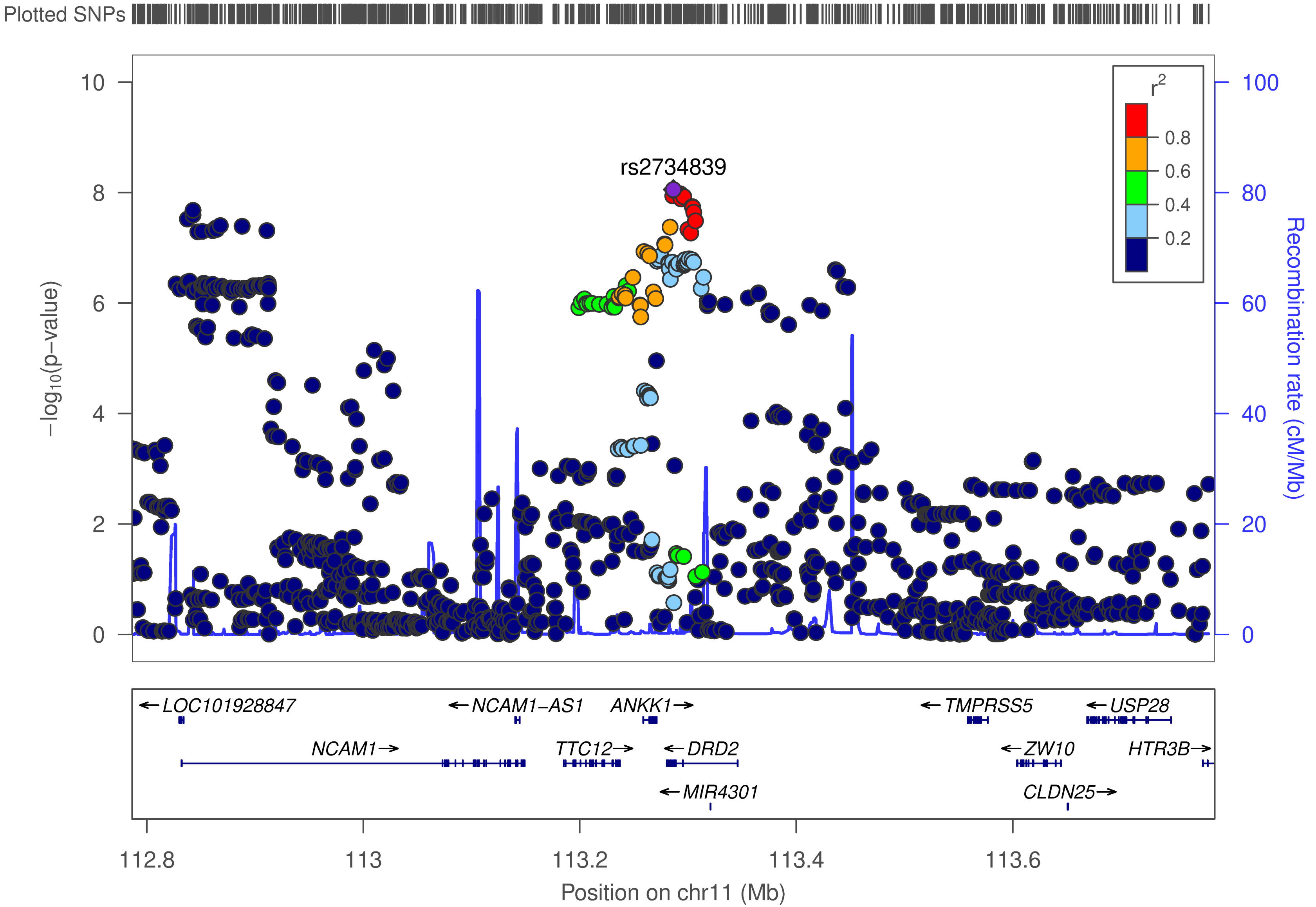

Plotted SNPs
rs1021363
r2
0.8
0.6
0.4
0.2
−log10(p−value)
0
2
4
6
8
10
Recombination rate (cM/Mb)
0
20
40
60
80
100
← CCDC147−AS1
SORCS3 →
CCDC147 →
← SORCS3−AS1
← LOC101927523
106.2
106.4
106.6
106.8
107
Position on chr10 (Mb)

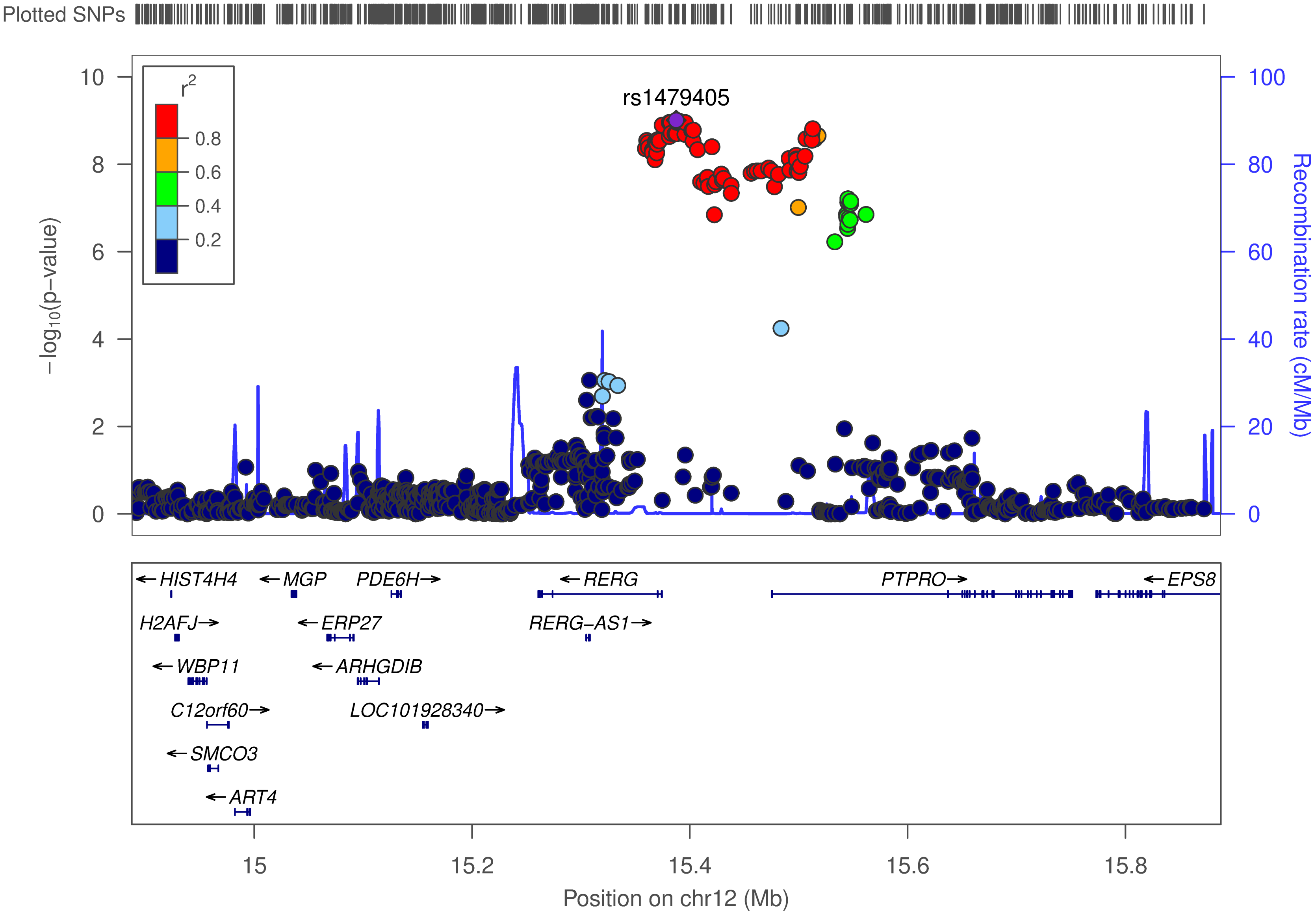

Plotted SNPs
rs761777
r²
0.8
0.6
0.4
0.2
−log10(p−value)
10
8
6
4
2
0
Recombination rate (cM/Mb)
100
80
60
40
20
0
INPP5A→
←TTC40
←LOC100128127
UTF1→
←CALY
←SPRN
CYP2E1→
←NKX6−2
←LINC01166
GPR123→
VENTX→
PRAP1→
SCART1→
←SYCE1
LINC01168→
KNDC1→
ZNF511→
MTG1→
←SPRNP1
←MIR202HG
←FUOM
←MIR202
←ECHS1
←ADAM8
←MIR3944
←TUBGCP2
PAOX→
134.6
134.8
135
135.2
135.4
Position on chr10 (Mb)

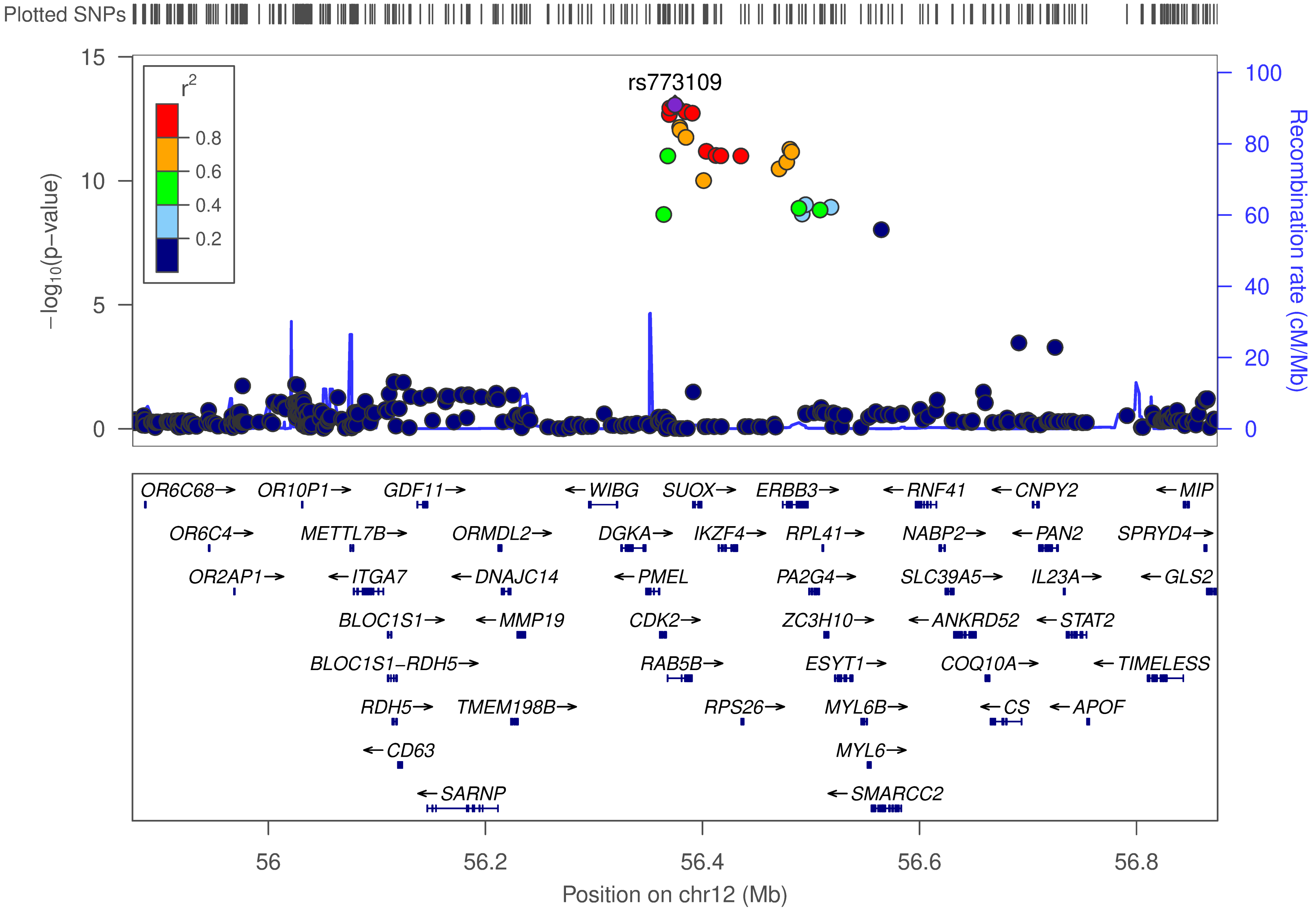

Plotted SNPs
r²
0.8
0.6
0.4
0.2
rs10837002
10
8
6
4
2
0
−log10(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
← LOC103312105
LOC101928536 →
38.2
38.4
38.6
38.8
39
Position on chr11 (Mb)

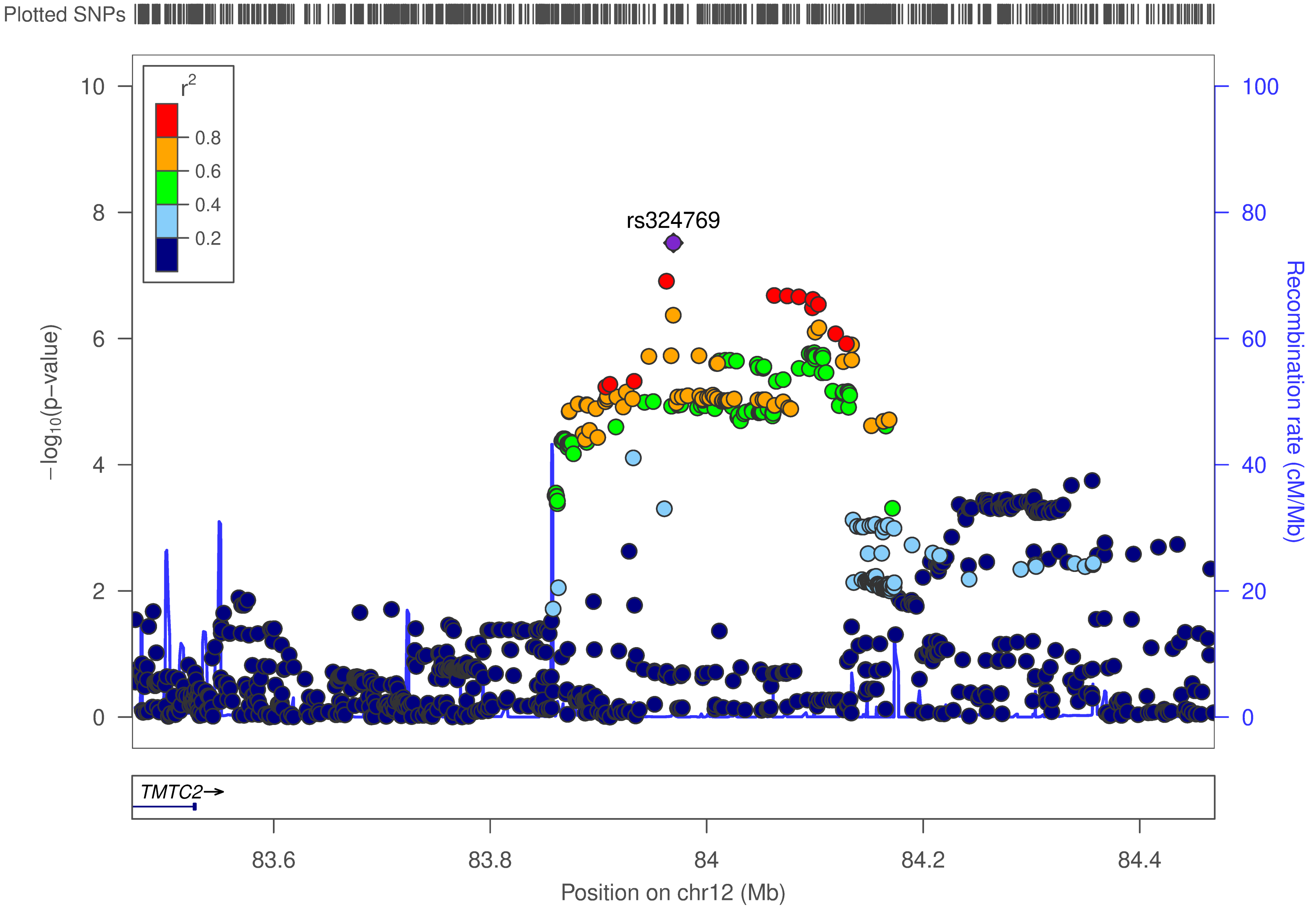

Plotted SNPs
r²
0.8
0.6
0.4
0.2
rs7942368
10
8
6
4
2
0
−log10(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
← PRKRIR
C11orf30 →
← LRRC32
TSKU →
ACER3 →
CAPN5 →
← GDPD4
LOC100506127 →
← GUCY2EP
B3GNT6 →
MYO7A →
← LOC101928837
OMP →
76
76.2
76.4
76.6
76.8
Position on chr11 (Mb)

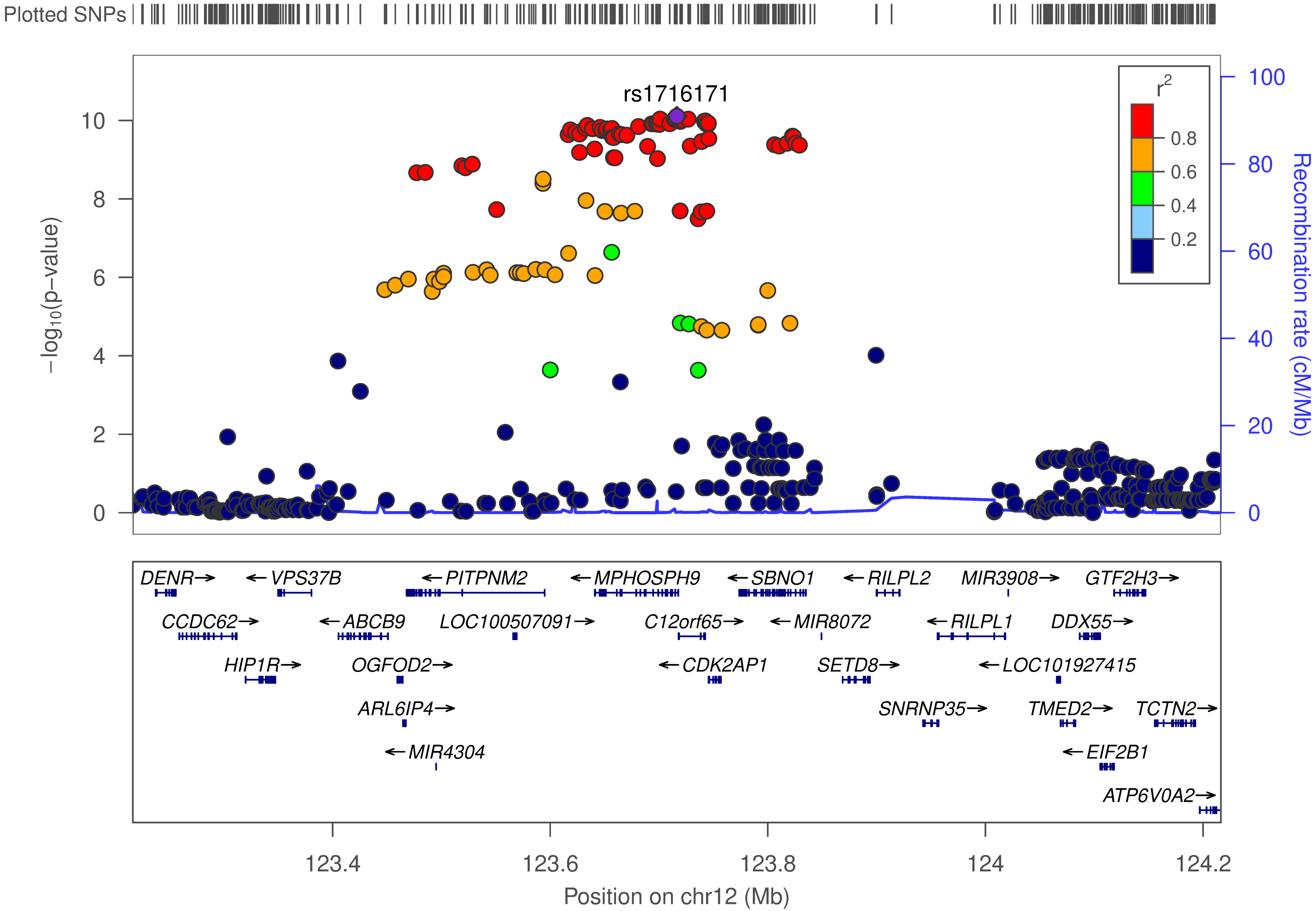

Plotted SNPs
r²
0.8
0.6
0.4
0.2
rs10789931
−log10(p−value)
10
8
6
4
2
0
Recombination rate (cM/Mb)
100
80
60
40
20
0
LOC101928823→
←LOC387810
←LOC101928847
NCAM1→
←NCAM1−AS1
ANKK1→
TTC12→
←DRD2
←MIR4301
112.4
112.6
112.8
113
113.2
Position on chr11 (Mb)

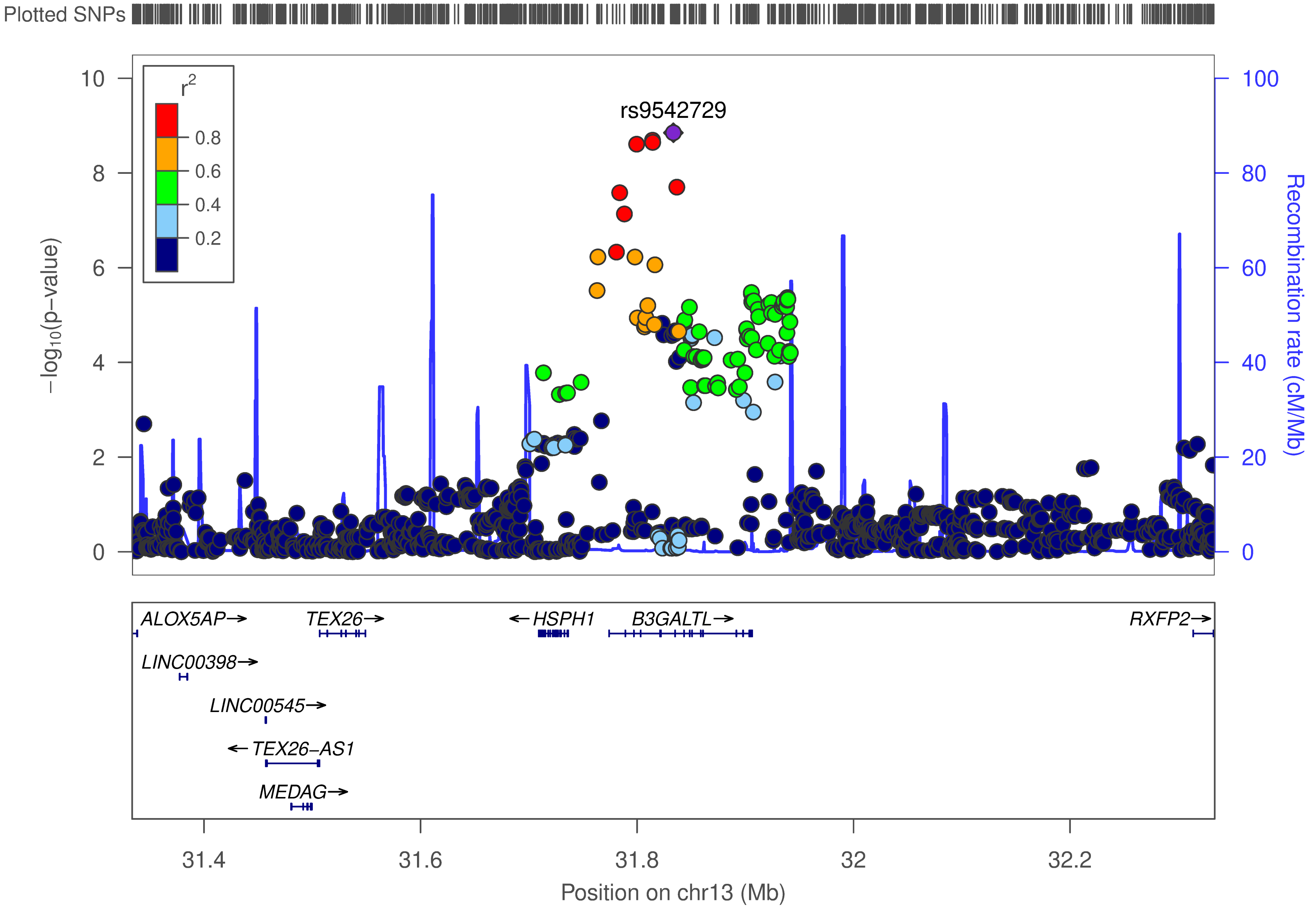

Plotted SNPs
rs2734839
−log10(p−value)
0
2
4
6
8
10
Recombination rate (cM/Mb)
0
20
40
60
80
100
r2
0.8
0.6
0.4
0.2
← LOC101928847
NCAM1 →
← NCAM1−AS1
ANKK1 →
TTC12 →
← DRD2
← MIR4301
← TMPRSS5
← USP28
← ZW10
HTR3B →
CLDN25 →
112.8
113
113.2
113.4
113.6
Position on chr11 (Mb)

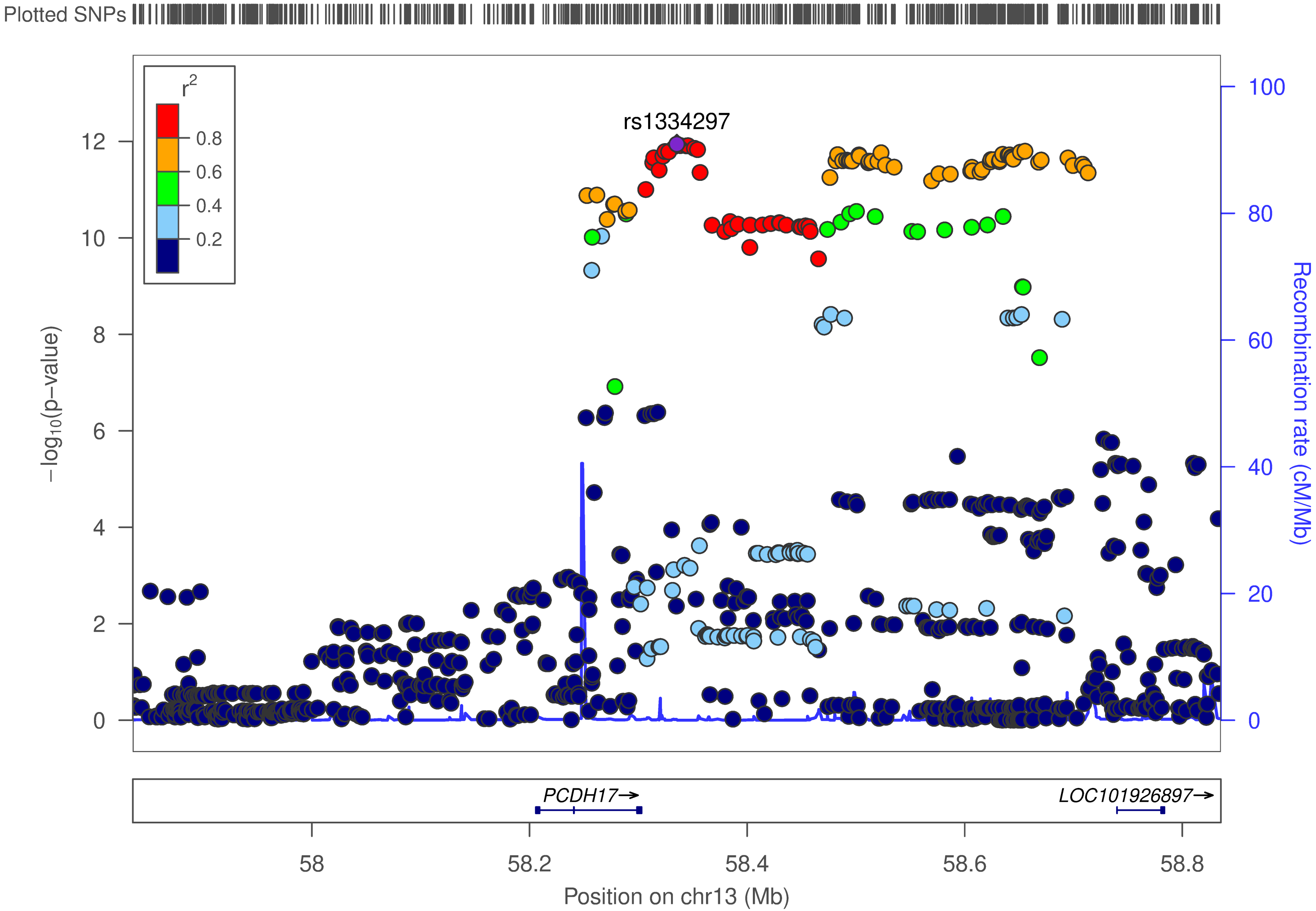

Plotted SNPs
rs1479405
r^2
0.8
0.6
0.4
0.2
$-\log_{10}$(p−value)
0
2
4
6
8
10
Recombination rate (cM/Mb)
0
20
40
60
80
100
←HIST4H4
←MGP
PDE6H→
←RERG
PTPRO→
←EPS8
H2AFJ→
←ERP27
RERG−AS1→
←WBP11
←ARHGDIB
C12orf60→
LOC101928340→
←SMCO3
←ART4
15
15.2
15.4
15.6
15.8
Position on chr12 (Mb)

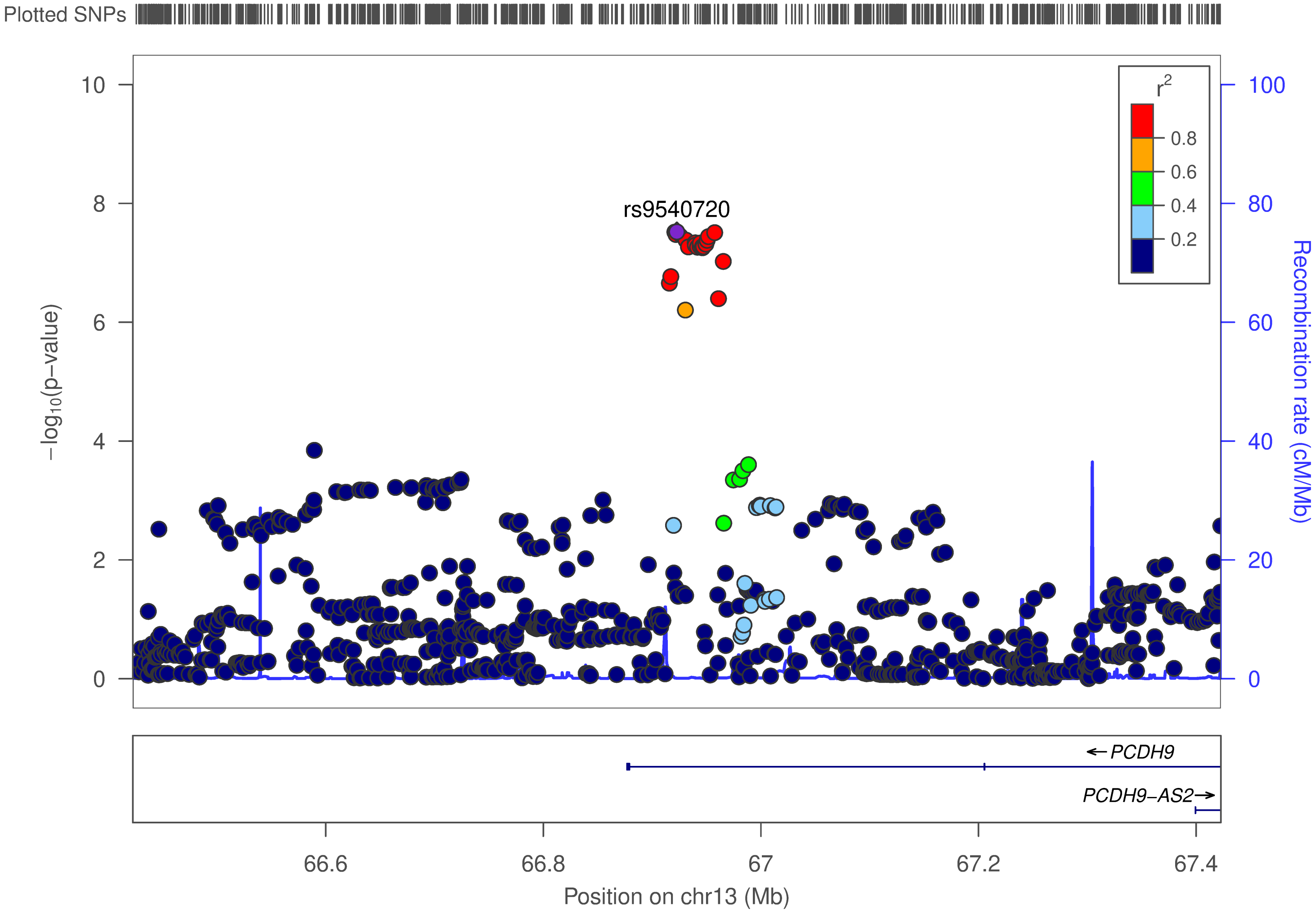

Plotted SNPs
15
10
5
0
−log10(p−value)
r2
0.8
0.6
0.4
0.2
rs773109
100
80
60
40
20
0
Recombination rate (cM/Mb)
OR6C68→
OR10P1→
GDF11→
←WIBG
SUOX→
ERBB3→
←RNF41
←CNPY2
←MIP
OR6C4→
METTL7B→
ORMDL2→
DGKA→
IKZF4→
RPL41→
NABP2→
←PAN2
SPRYD4→
OR2AP1→
←ITGA7
←DNAJC14
←PMEL
PA2G4→
SLC39A5→
IL23A→
←GLS2
BLOC1S1→
←MMP19
CDK2→
ZC3H10→
←ANKRD52
←STAT2
BLOC1S1−RDH5→
RAB5B→
ESYT1→
COQ10A→
←TIMELESS
RDH5→
TMEM198B→
RPS26→
MYL6B→
←CS
←APOF
←CD63
MYL6→
←SARNP
←SMARCC2
56
56.2
56.4
56.6
56.8
Position on chr12 (Mb)

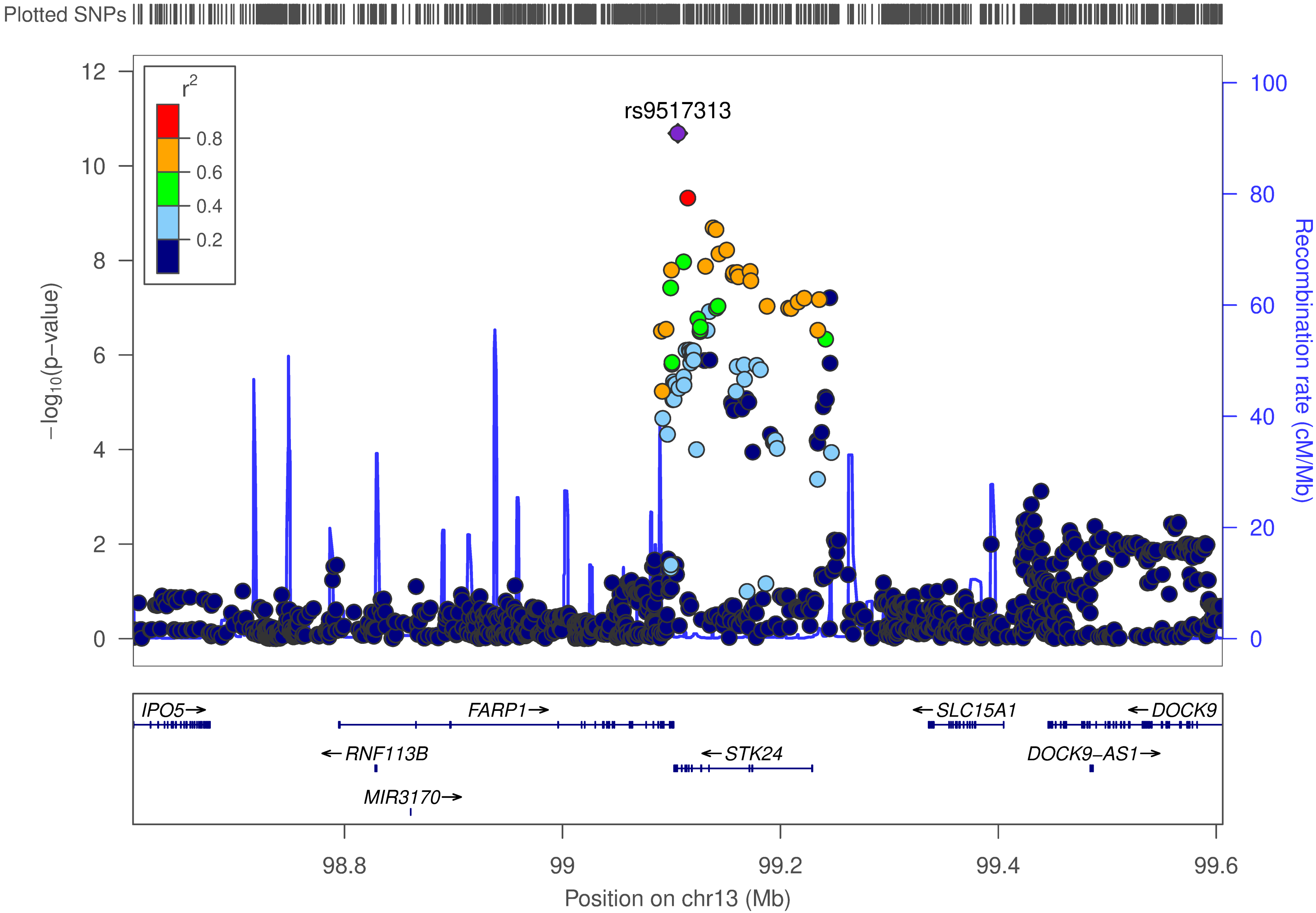

Plotted SNPs
r2
0.8
0.6
0.4
0.2
rs324769
10
8
6
4
2
0
−log10(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
TMTC2→
83.6
83.8
84
84.2
84.4
Position on chr12 (Mb)

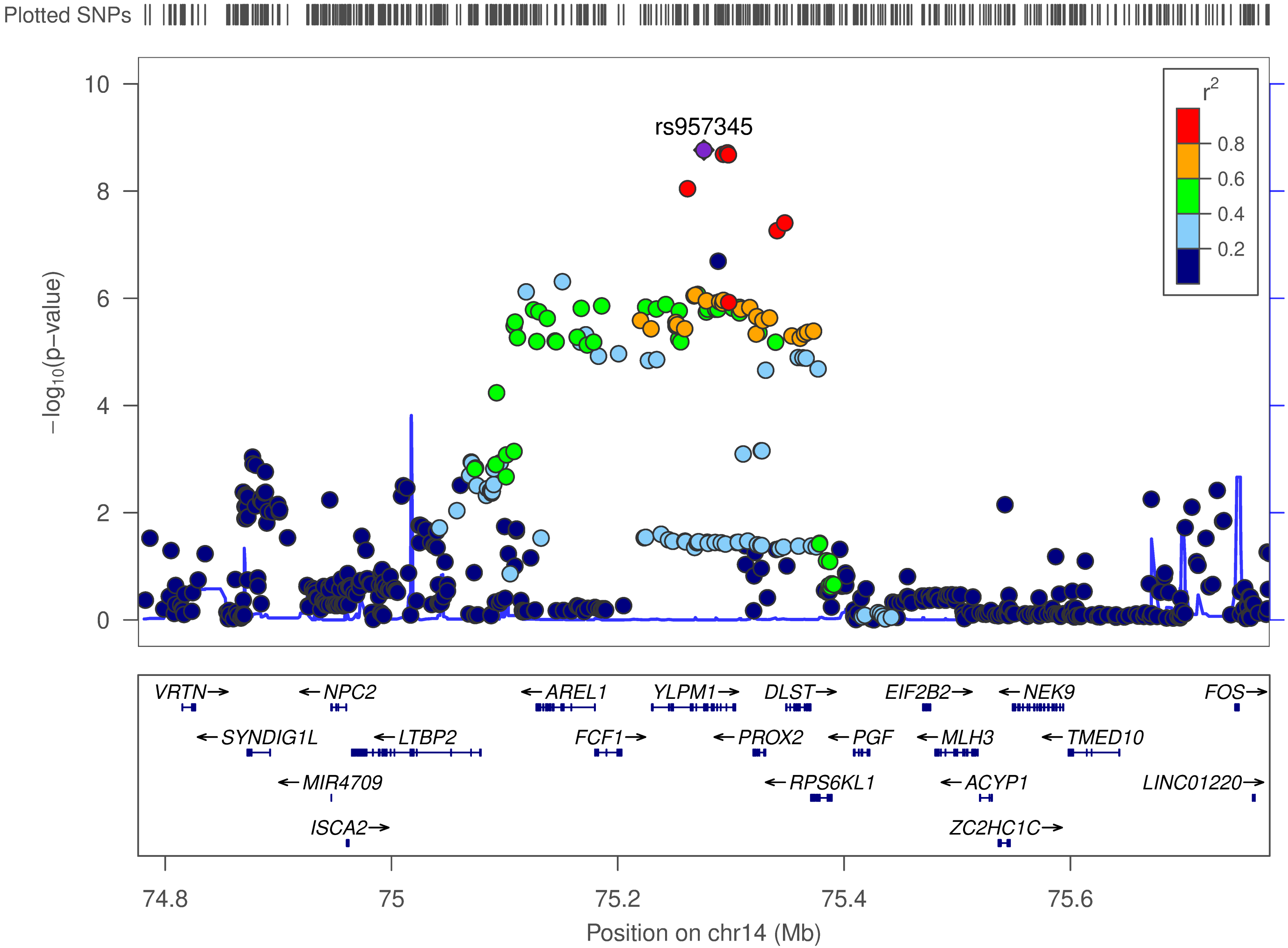

Plotted SNPs
rs1716171
r²
0.8
0.6
0.4
0.2
−log₁₀(p−value)
0
2
4
6
8
10
Recombination rate (cM/Mb)
0
20
40
60
80
100
DENR→
←VPS37B
←PITPNM2
←MPHOSPH9
←SBNO1
←RILPL2
MIR3908→
GTF2H3→
CCDC62→
←ABCB9
LOC100507091→
C12orf65→
←MIR8072
←RILPL1
DDX55→
HIP1R→
OGFOD2→
←CDK2AP1
SETD8→
←LOC101927415
ARL6IP4→
SNRNP35→
TMED2→
TCTN2→
←MIR4304
←EIF2B1
ATP6V0A2→
123.4
123.6
123.8
124
124.2
Position on chr12 (Mb)

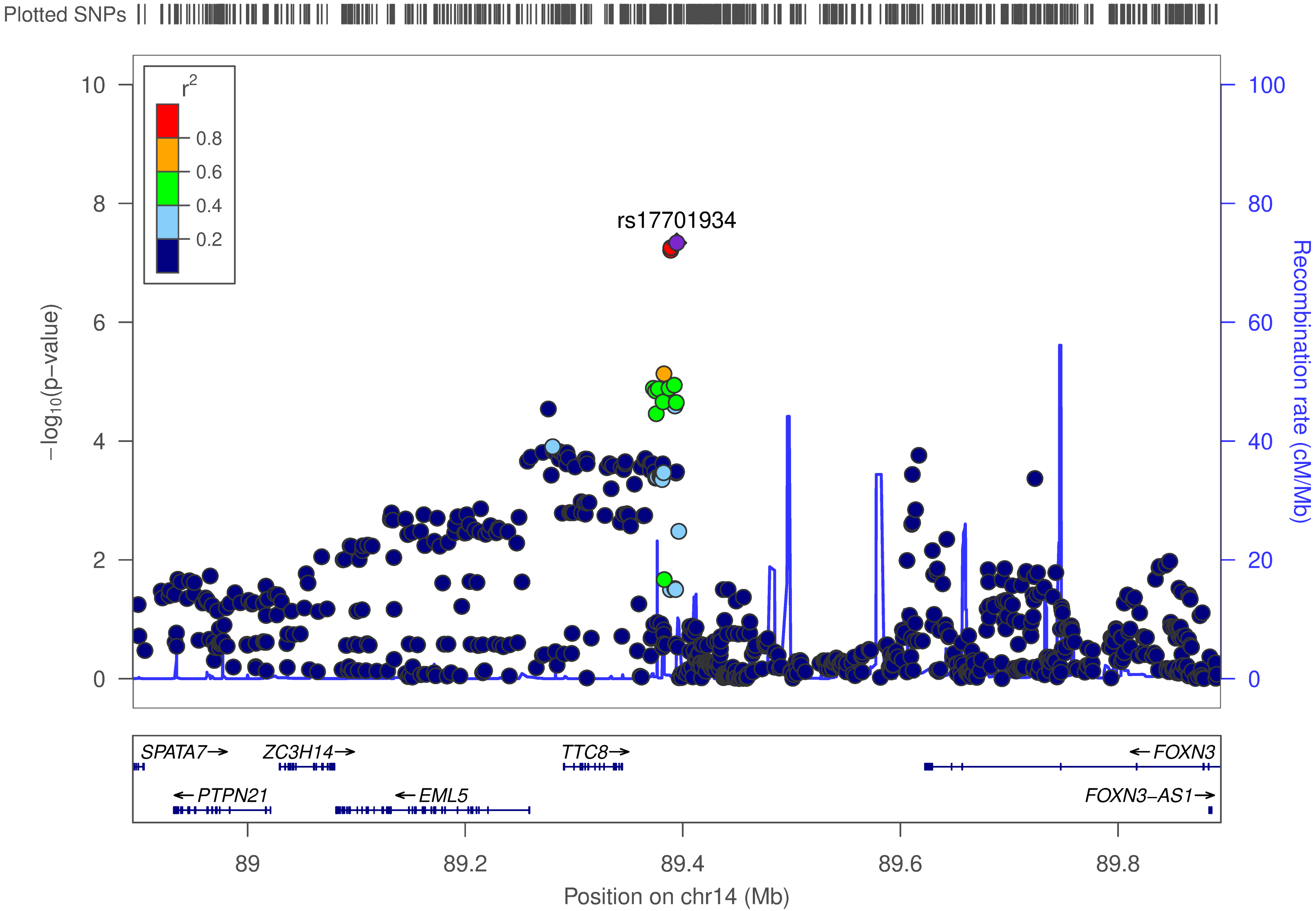

Plotted SNPs
r²
0.8
0.6
0.4
0.2
rs9542729
10
8
6
4
2
0
−log10(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
ALOX5AP→
TEX26→
← HSPH1
B3GALTL→
RXFP2→
LINC00398→
LINC00545→
← TEX26−AS1
MEDAG→
31.4
31.6
31.8
32
32.2
Position on chr13 (Mb)

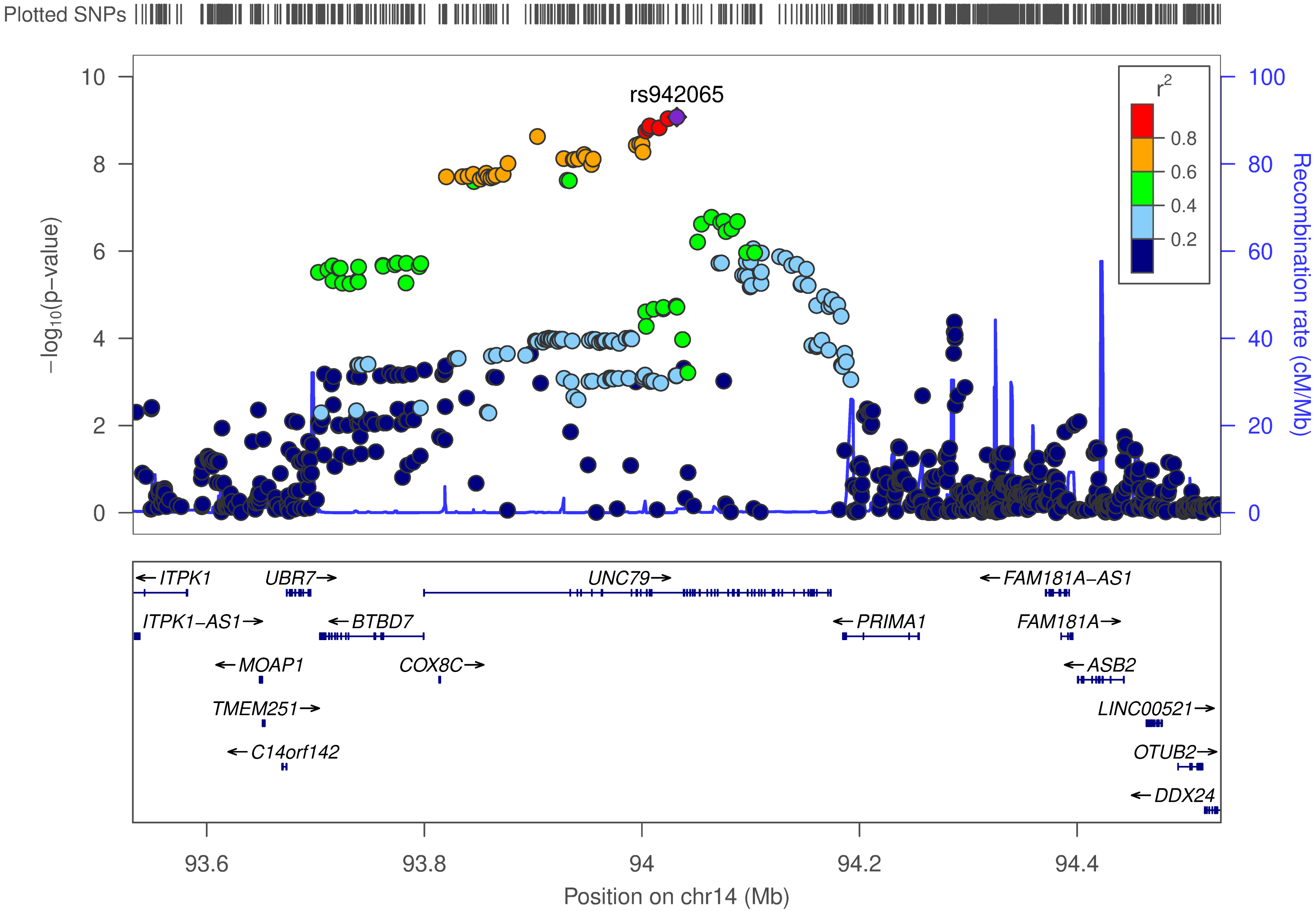

Plotted SNPs
r²
0.8
0.6
0.4
0.2
rs1334297
12
10
8
6
4
2
0
−log₁₀(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
PCDH17→
LOC101926897→
58
58.2
58.4
58.6
58.8
Position on chr13 (Mb)

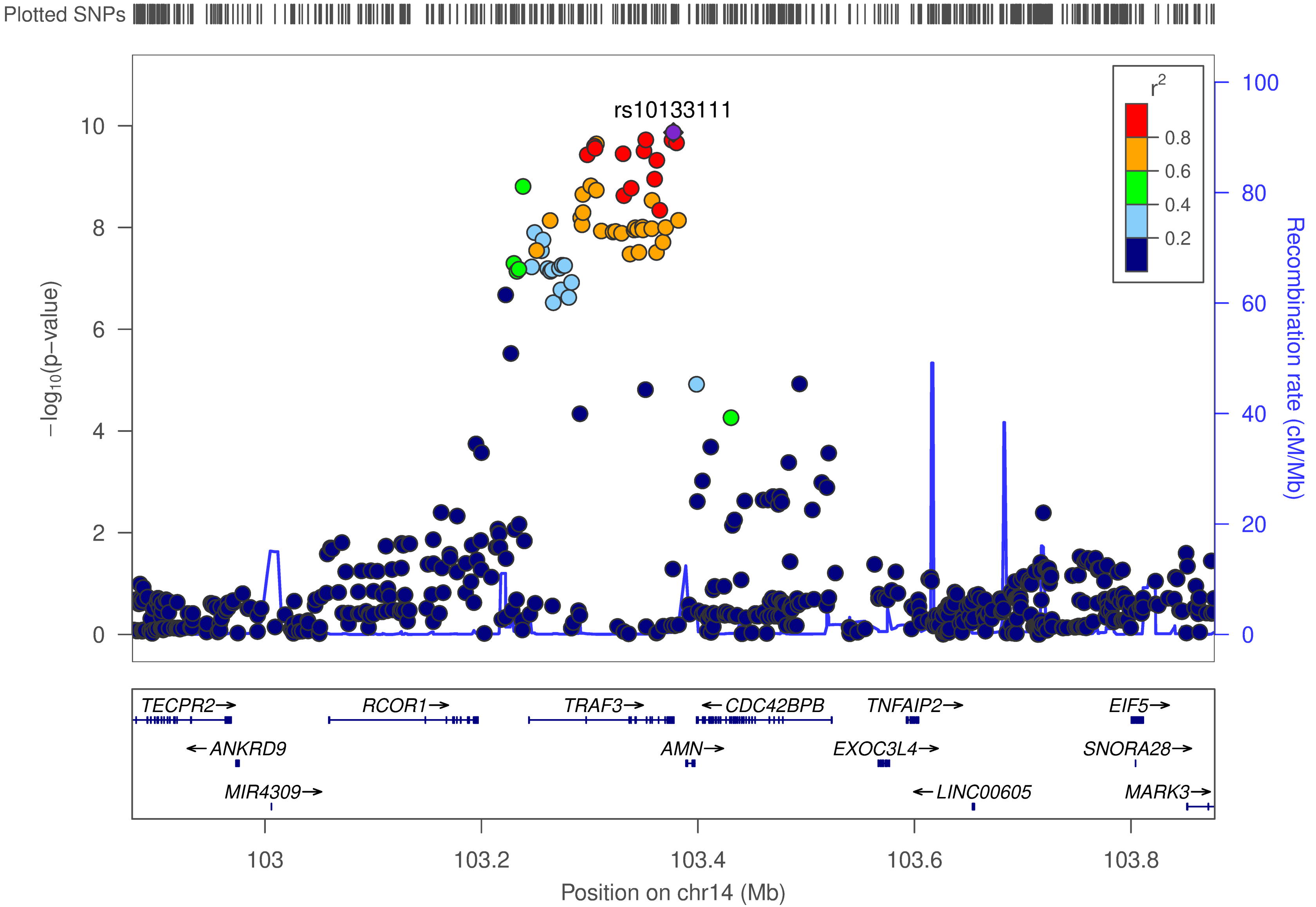

Plotted SNPs
rs9540720
r²
0.8
0.6
0.4
0.2
10
8
6
4
2
0
−log10(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
← PCDH9
PCDH9−AS2→
66.6
66.8
67
67.2
67.4
Position on chr13 (Mb)

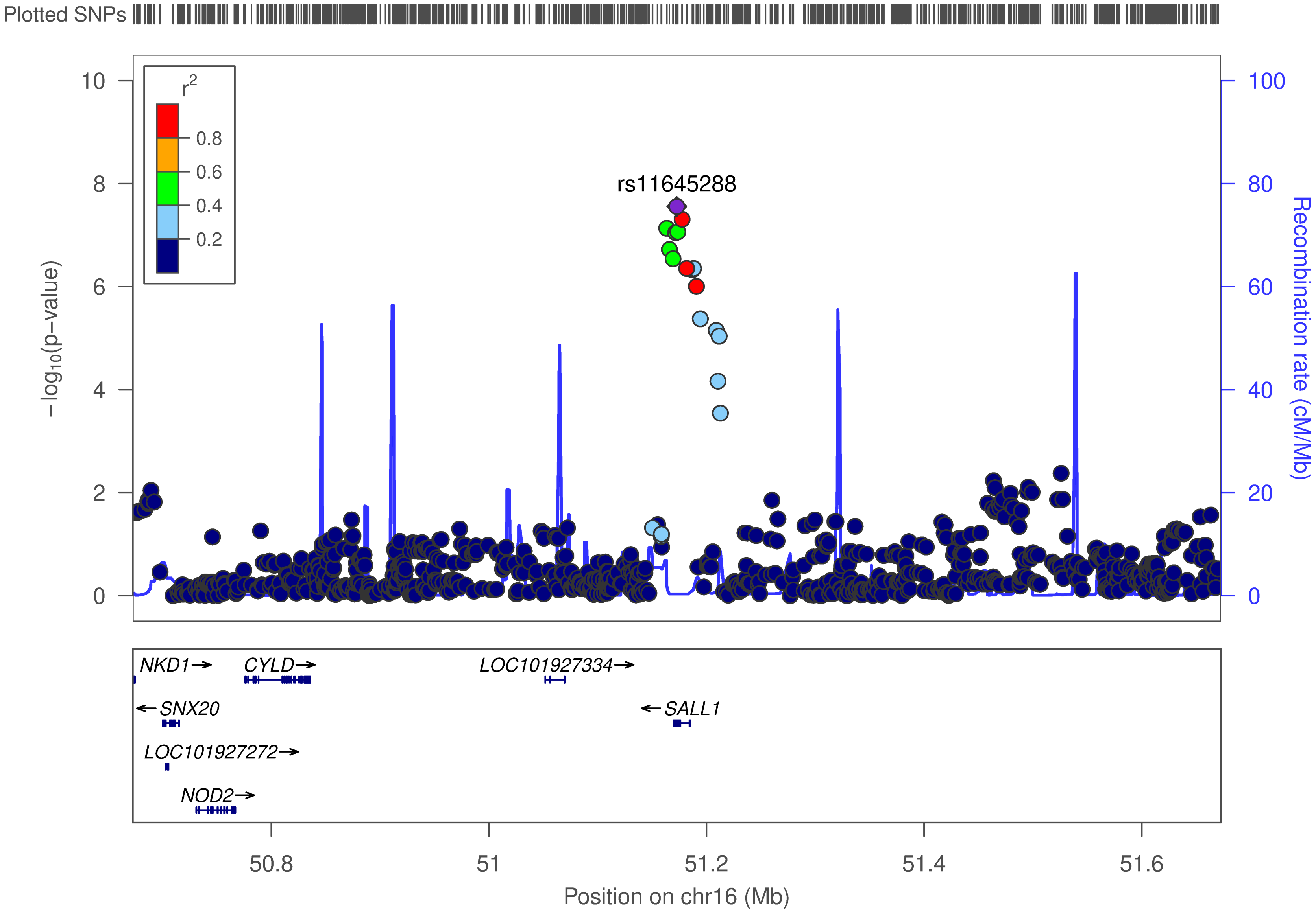

Plotted SNPs
12
10
8
6
4
2
0
−log10(p−value)
r²
0.8
0.6
0.4
0.2
rs9517313
100
80
60
40
20
0
Recombination rate (cM/Mb)
IPO5→
FARP1→
←SLC15A1
←DOCK9
←RNF113B
←STK24
DOCK9−AS1→
MIR3170→
98.8
99
99.2
99.4
99.6
Position on chr13 (Mb)

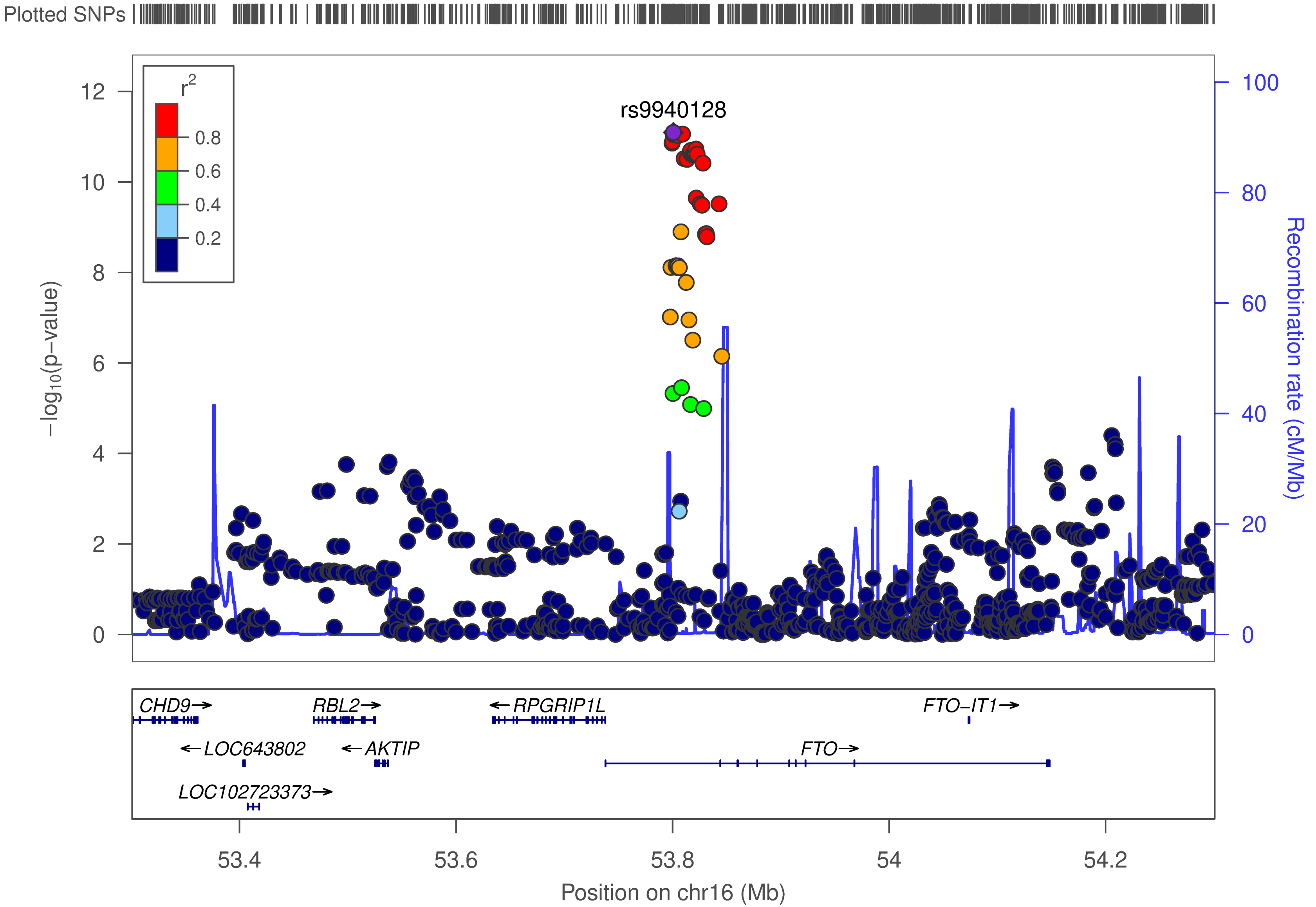

Plotted SNPs
rs957345
r²
0.8
0.6
0.4
0.2
10
8
6
4
2
0
−log10(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
VRTN→
←NPC2
←AREL1
YLPM1→
DLST→
EIF2B2→
←NEK9
FOS→
←SYNDIG1L
←LTBP2
FCF1→
←PROX2
←PGF
←MLH3
←TMED10
←MIR4709
←RPS6KL1
←ACYP1
LINC01220→
ISCA2→
ZC2HC1C→
74.8
75
75.2
75.4
75.6
Position on chr14 (Mb)

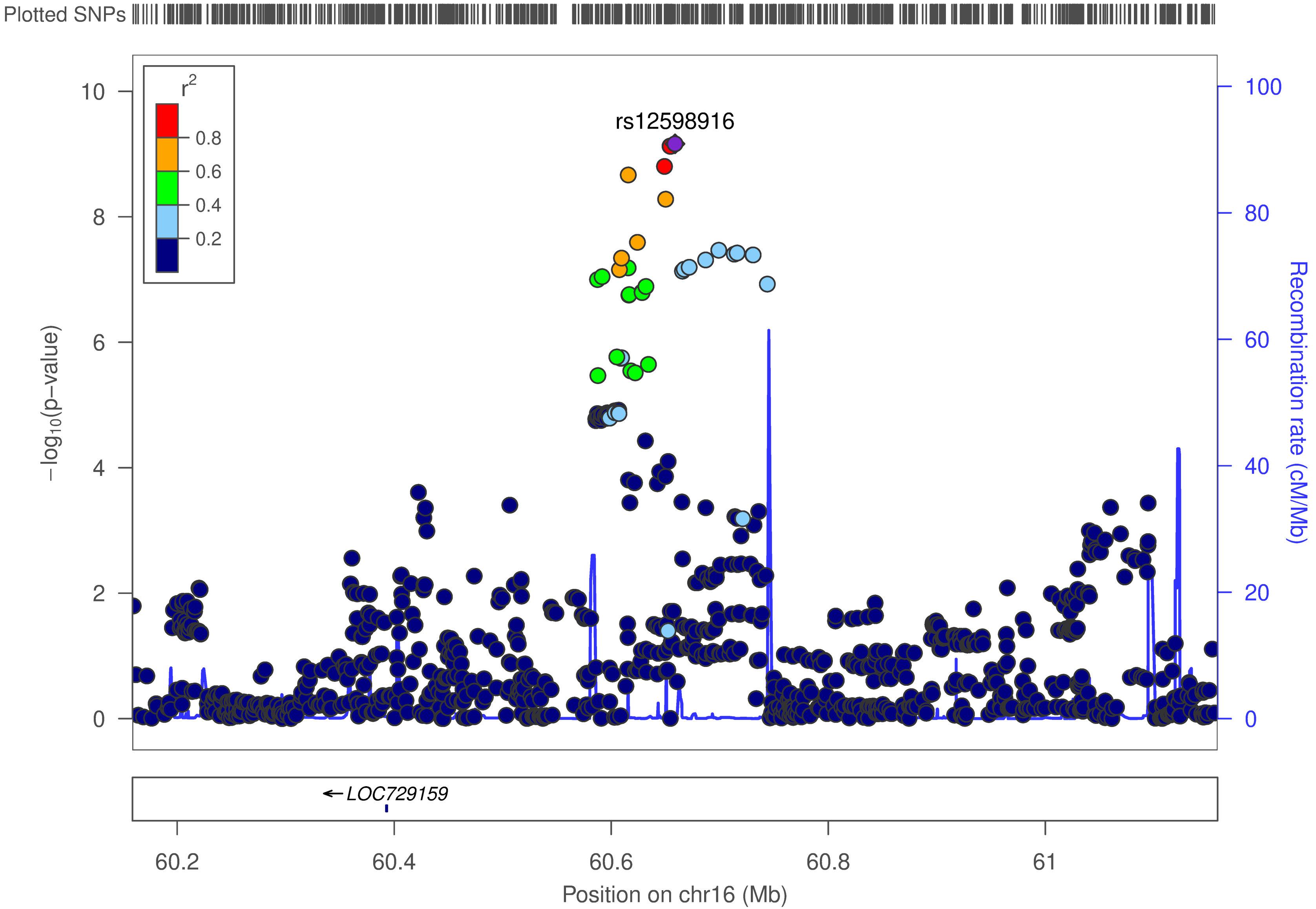

Plotted SNPs
r²
0.8
0.6
0.4
0.2
rs17701934
10
8
6
4
2
0
−log₁₀(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
SPATA7→
ZC3H14→
TTC8→
←FOXN3
←PTPN21
←EML5
FOXN3−AS1→
89
89.2
89.4
89.6
89.8
Position on chr14 (Mb)

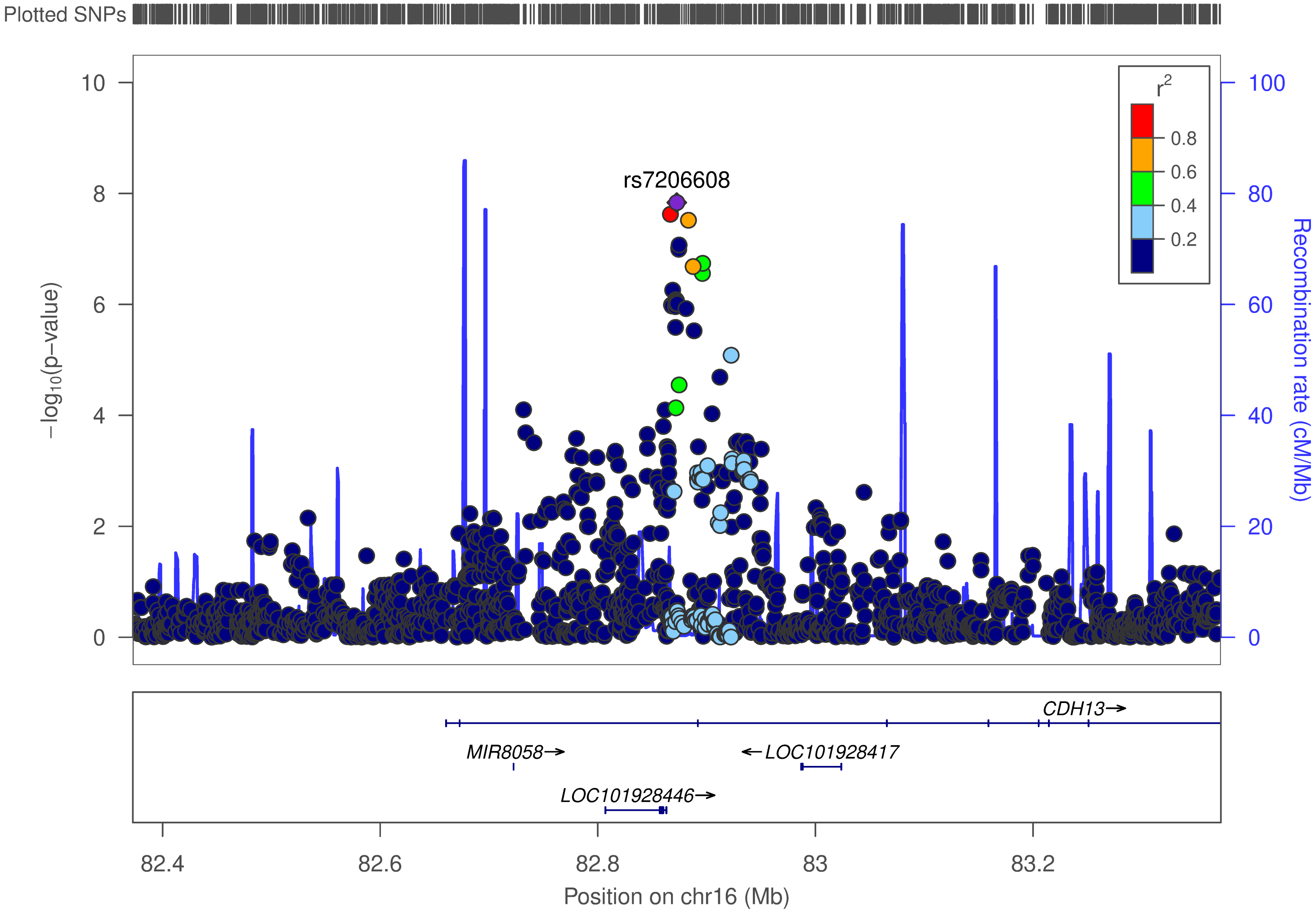

Plotted SNPs
rs942065
−log10(p−value)
10
8
6
4
2
0
Recombination rate (cM/Mb)
100
80
60
40
20
0
r2
0.8
0.6
0.4
0.2
ITPK1
UBR7
UNC79
FAM181A−AS1
ITPK1−AS1
BTBD7
PRIMA1
FAM181A
MOAP1
COX8C
ASB2
TMEM251
LINC00521
C14orf142
OTUB2
DDX24
93.6
93.8
94
94.2
94.4
Position on chr14 (Mb)

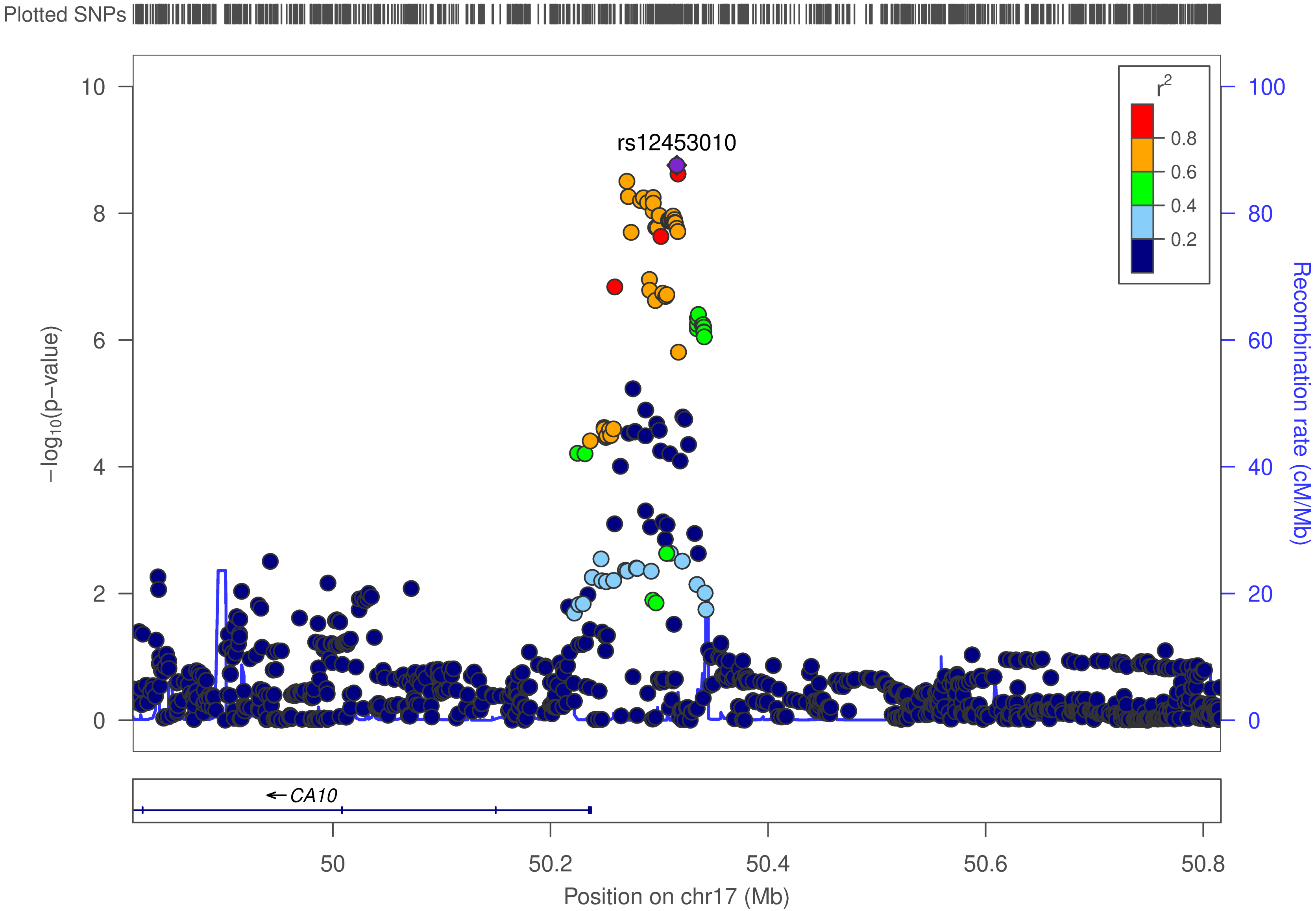

Plotted SNPs
rs10133111
r2
0.8
0.6
0.4
0.2
−log10(p−value)
0
2
4
6
8
10
Recombination rate (cM/Mb)
0
20
40
60
80
100
TECPR2→
RCOR1→
TRAF3→
←CDC42BPB
TNFAIP2→
EIF5→
←ANKRD9
AMN→
EXOC3L4→
SNORA28→
MIR4309→
←LINC00605
MARK3→
103
103.2
103.4
103.6
103.8
Position on chr14 (Mb)

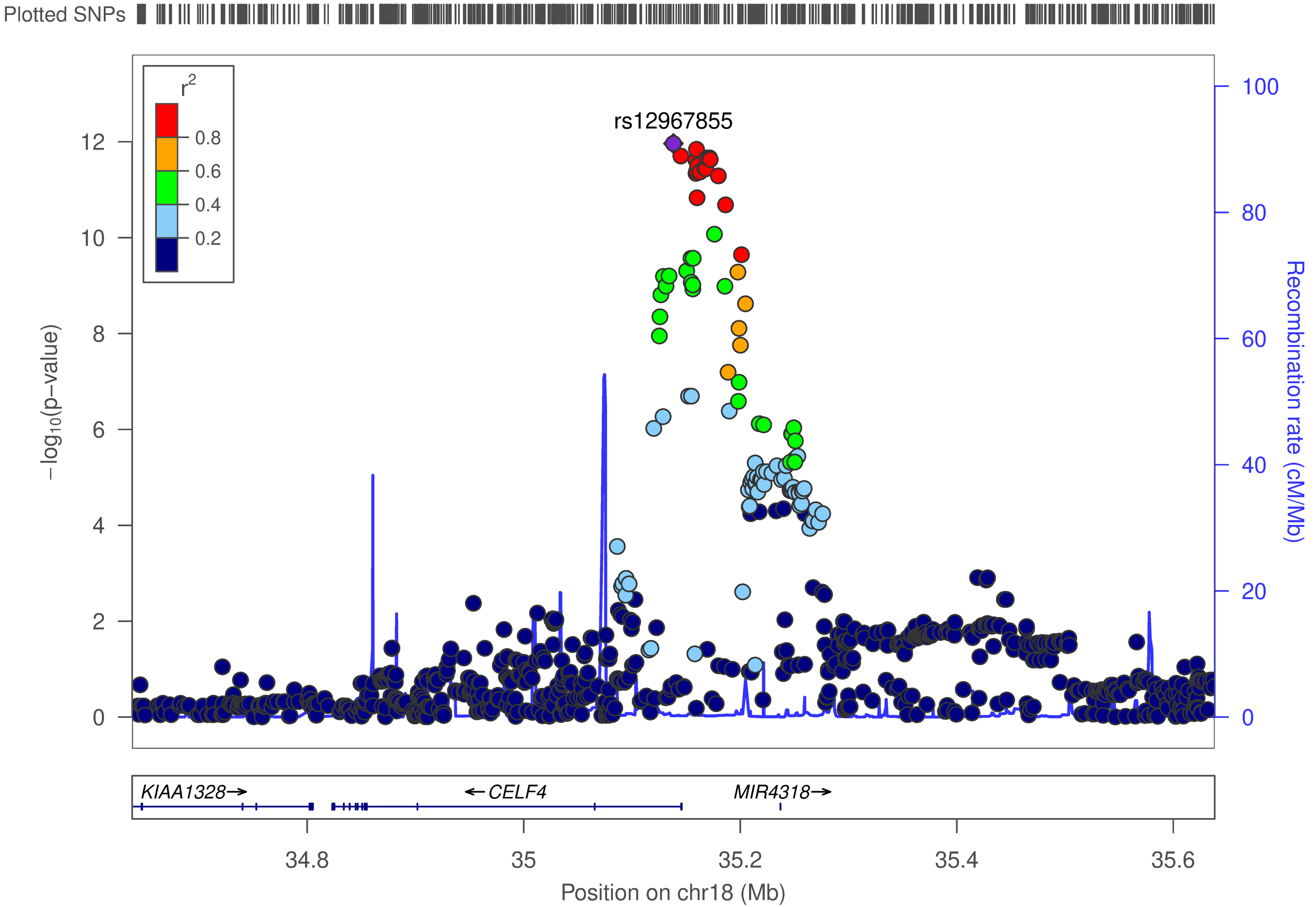

Plotted SNPs
rs11645288
r²
0.8
0.6
0.4
0.2
−log10(p−value)
10
8
6
4
2
0
Recombination rate (cM/Mb)
100
80
60
40
20
0
NKD1→
CYLD→
LOC101927334→
←SNX20
←SALL1
LOC101927272→
NOD2→
50.8
51
51.2
51.4
51.6
Position on chr16 (Mb)

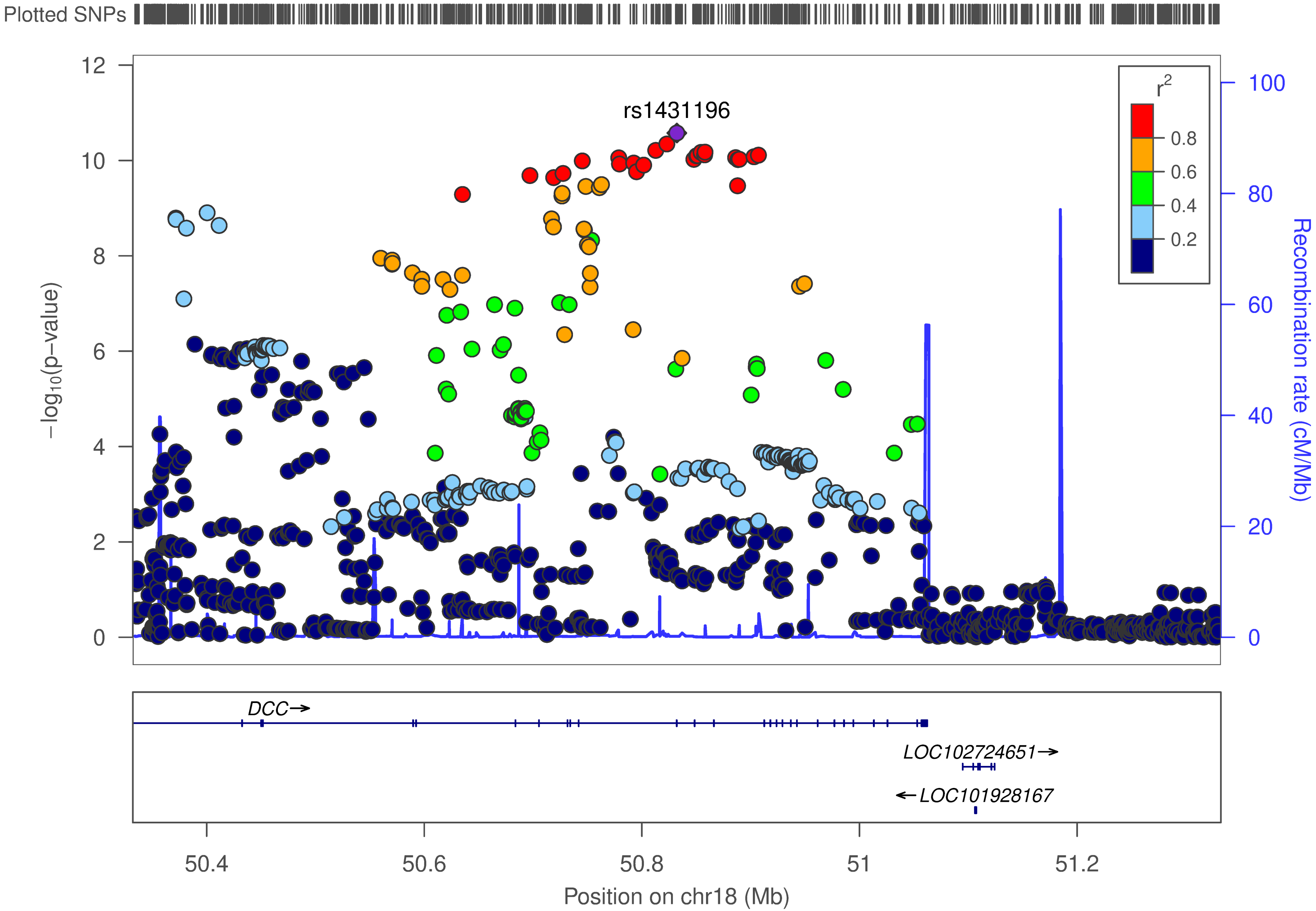

Plotted SNPs
r2
0.8
0.6
0.4
0.2
rs9940128
−log10(p−value)
12
10
8
6
4
2
0
100
80
60
40
20
0
Recombination rate (cM/Mb)
CHD9→
RBL2→
←RPGRIP1L
FTO−IT1→
←LOC643802
←AKTIP
FTO→
LOC102723373→
53.4
53.6
53.8
54
54.2
Position on chr16 (Mb)

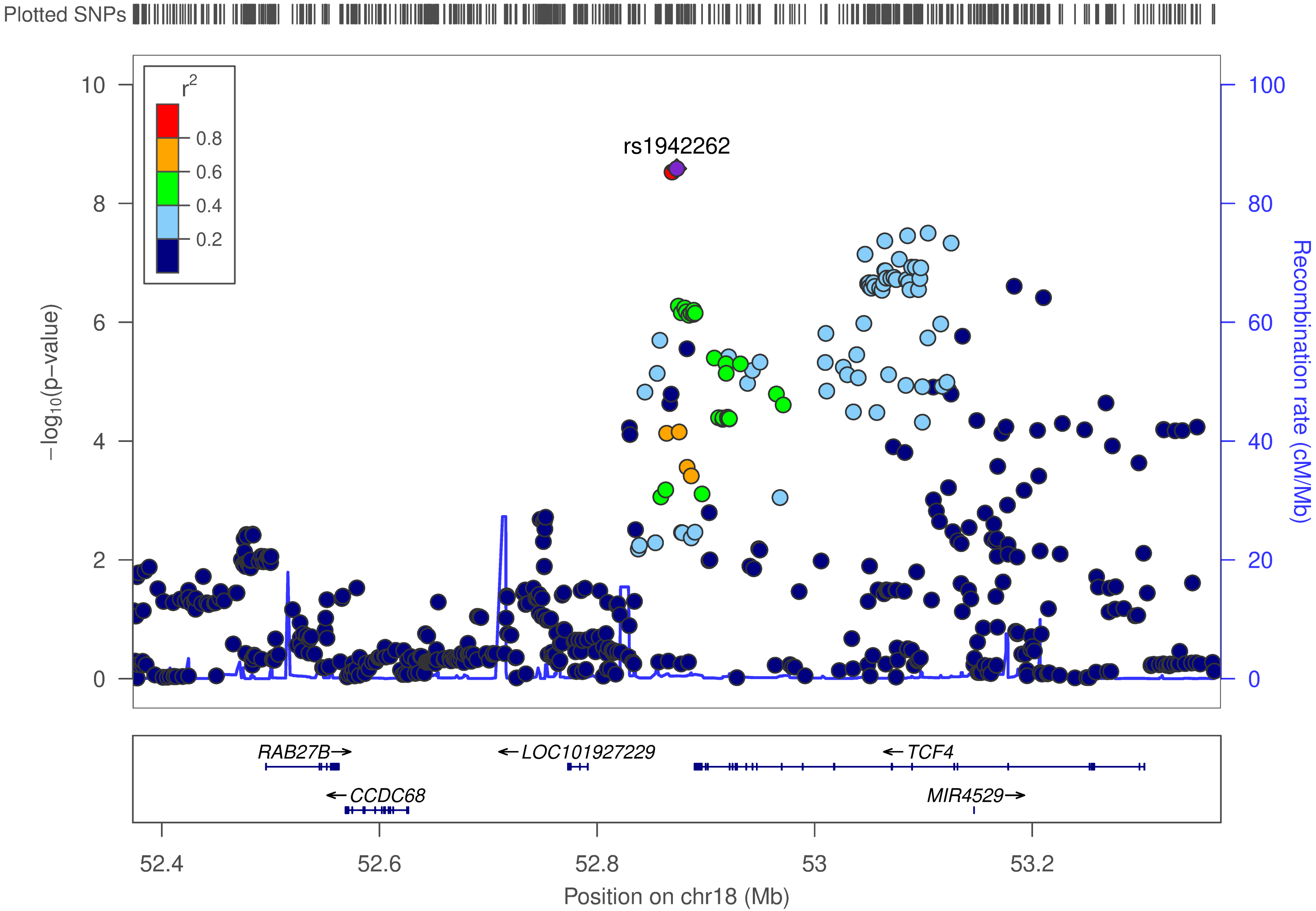

Plotted SNPs
r2
0.8
0.6
0.4
0.2
rs12598916
10
8
6
4
2
0
−log10(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
← LOC729159
60.2
60.4
60.6
60.8
61
Position on chr16 (Mb)

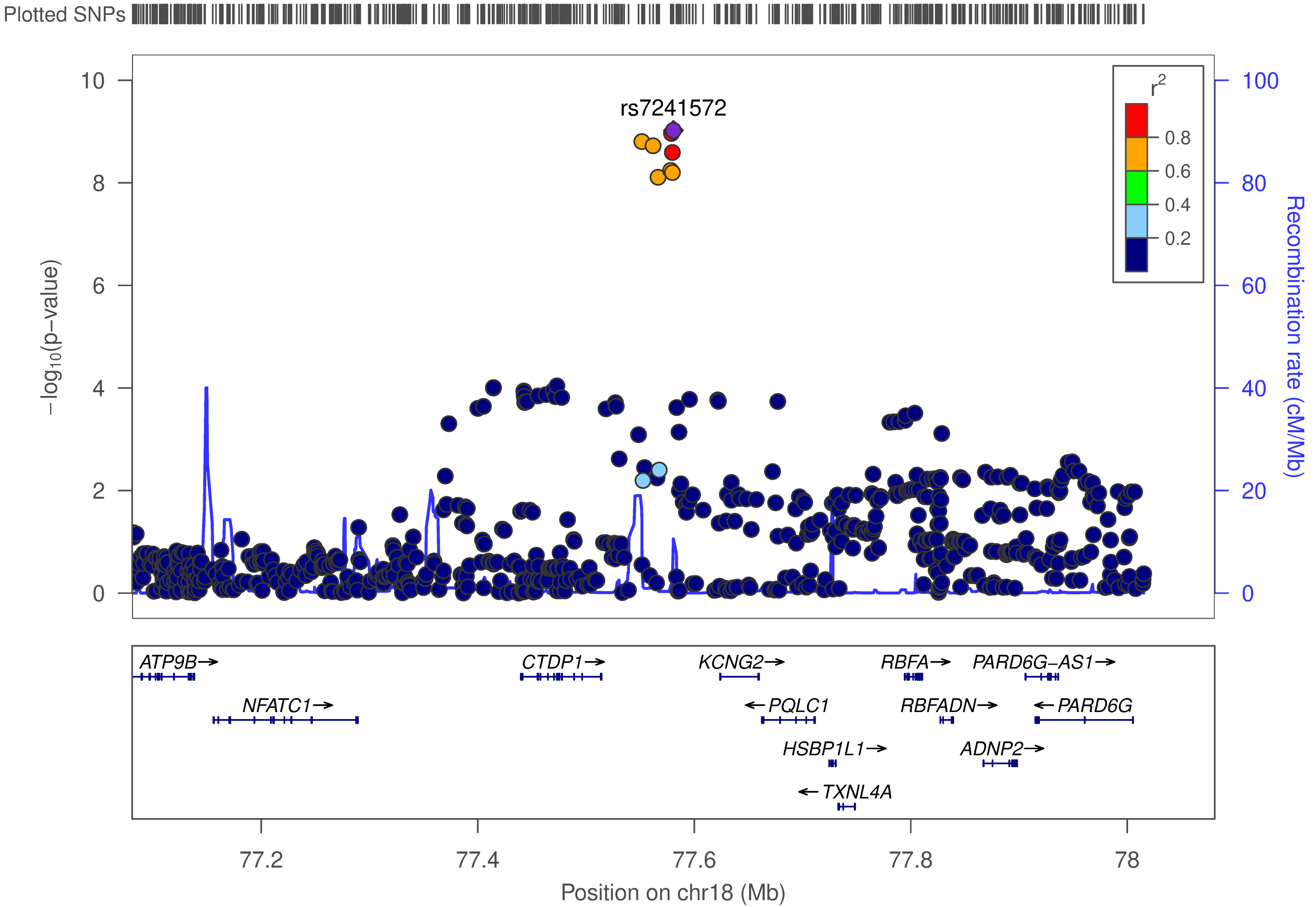

Plotted SNPs
rs7206608
−log10(p−value)
10
8
6
4
2
0
Recombination rate (cM/Mb)
100
80
60
40
20
0
r2
0.8
0.6
0.4
0.2
CDH13→
MIR8058→
←LOC101928417
LOC101928446→
82.4
82.6
82.8
83
83.2
Position on chr16 (Mb)

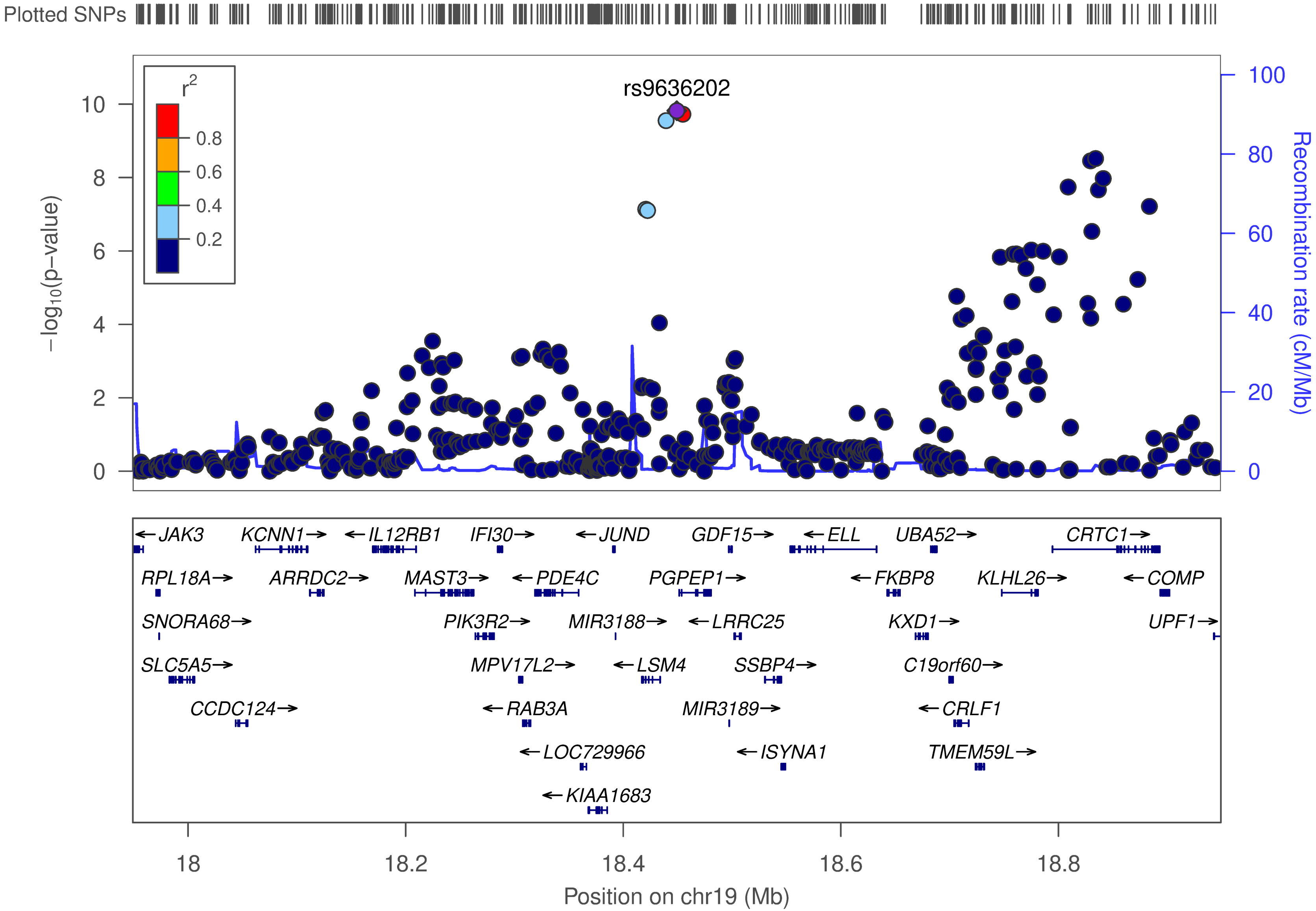

Plotted SNPs
rs12453010
r2
0.8
0.6
0.4
0.2
10
8
6
4
2
0
−log10(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
← CA10
50
50.2
50.4
50.6
50.8
Position on chr17 (Mb)

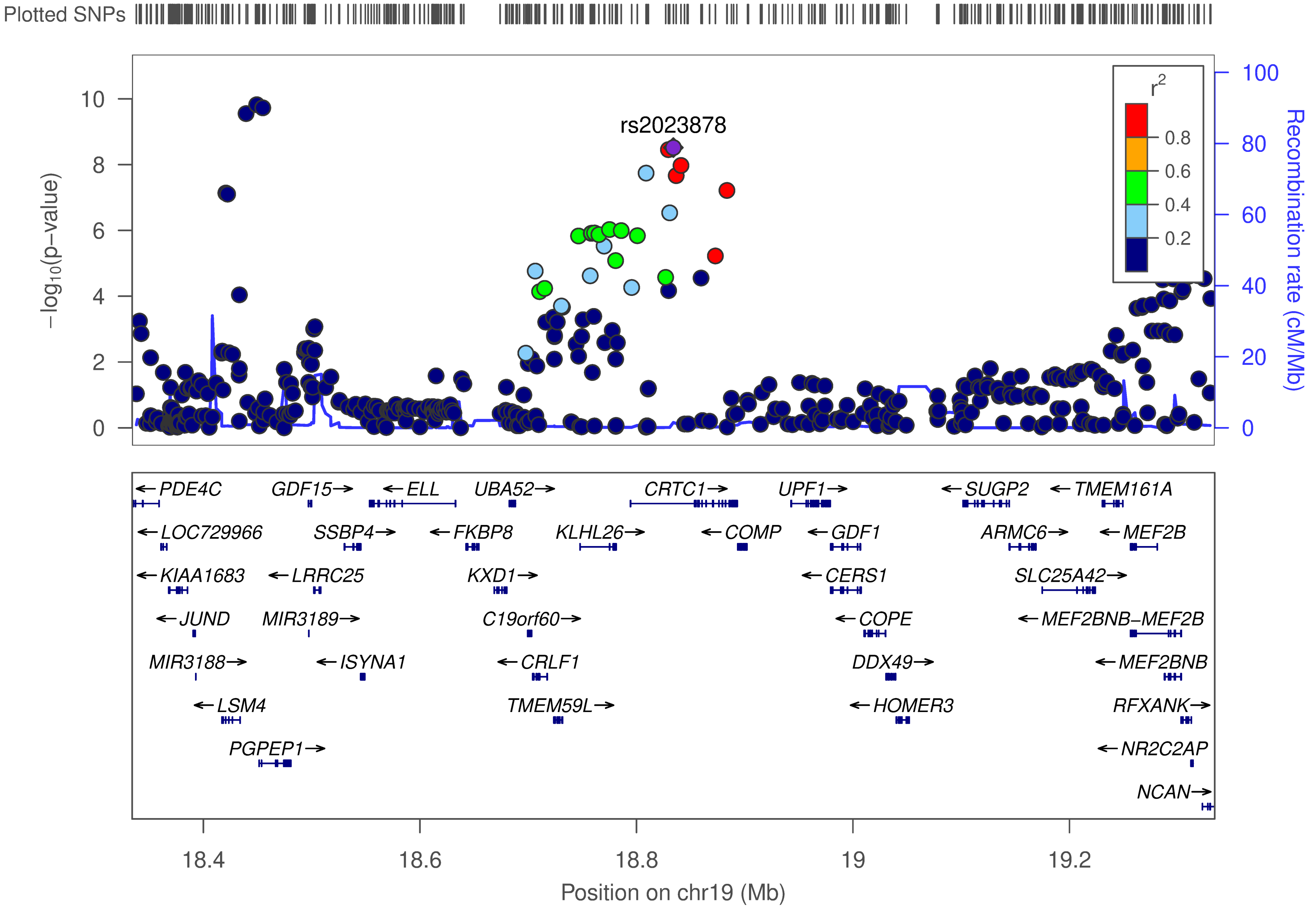

Plotted SNPs
r²
0.8
0.6
0.4
0.2
rs12967855
12
10
8
6
4
2
0
−log10(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
KIAA1328→
← CELF4
MIR4318→
34.8
35
35.2
35.4
35.6
Position on chr18 (Mb)

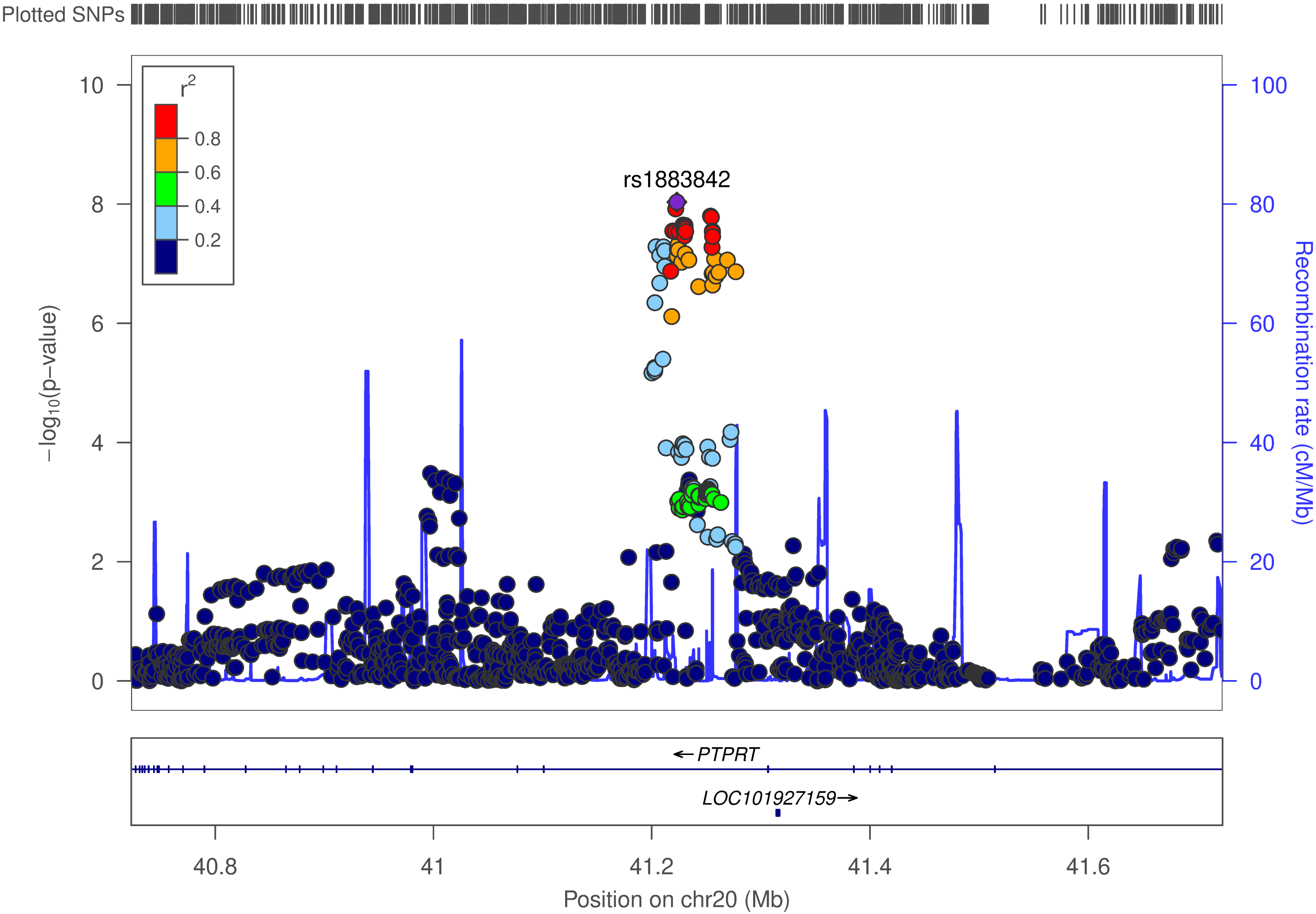

Plotted SNPs
rs1431196
r²
0.8
0.6
0.4
0.2
−log10(p−value)
12
10
8
6
4
2
0
Recombination rate (cM/Mb)
100
80
60
40
20
0
DCC→
LOC102724651→
←LOC101928167
50.4
50.6
50.8
51
51.2
Position on chr18 (Mb)

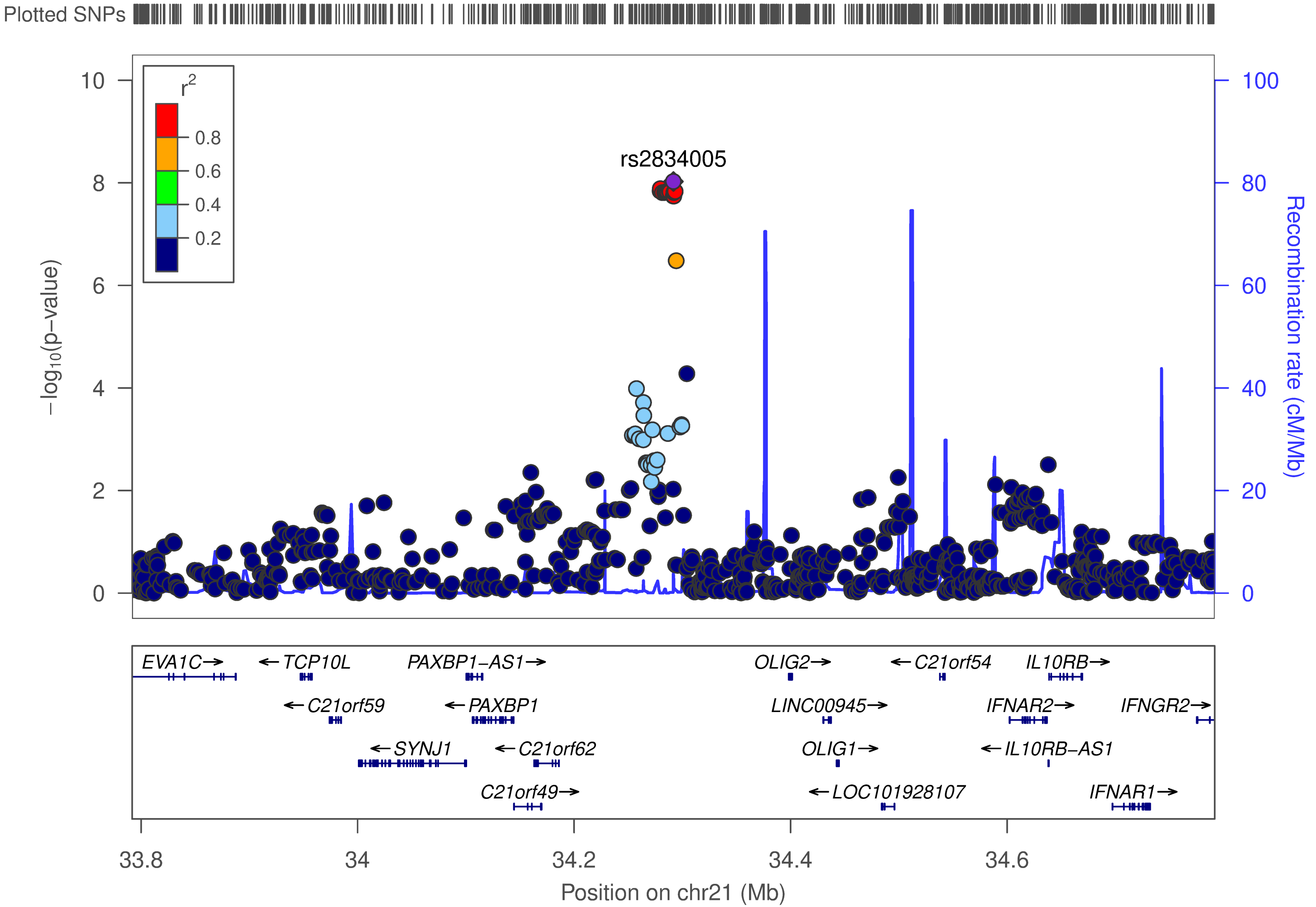

Plotted SNPs
rs1942262
r²
0.8
0.6
0.4
0.2
−log₁₀(p−value)
0
2
4
6
8
10
Recombination rate (cM/Mb)
0
20
40
60
80
100
RAB27B→
←CCDC68
←LOC101927229
←TCF4
MIR4529→
52.4
52.6
52.8
53
53.2
Position on chr18 (Mb)

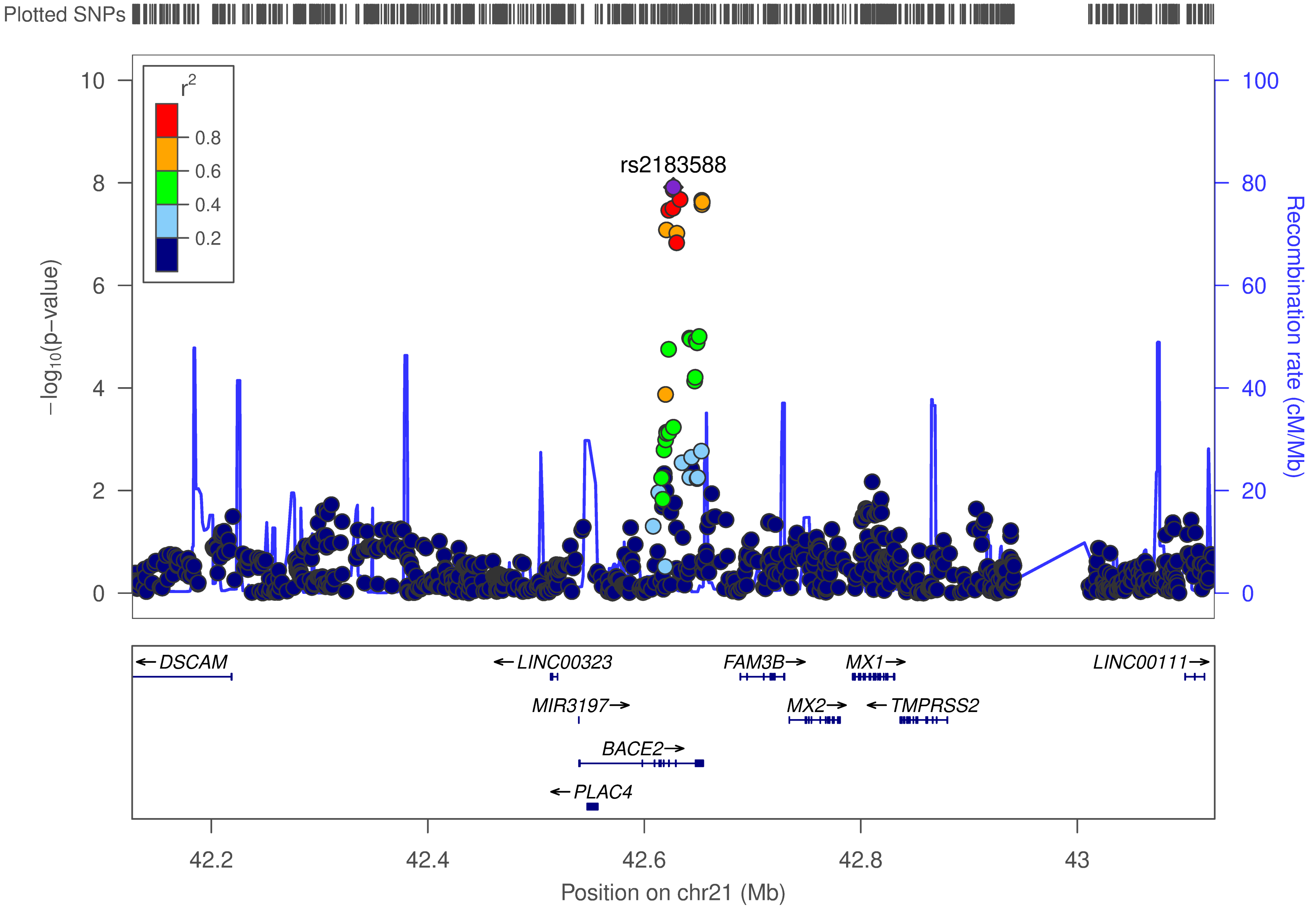

Plotted SNPs
rs7241572
r²
0.8
0.6
0.4
0.2
10
8
6
4
2
0
−log10(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
ATP9B→
NFATC1→
CTDP1→
KCNG2→
←PQLC1
HSBP1L1→
←TXNL4A
RBFA→
RBFADN→
PARD6G−AS1→
←PARD6G
ADNP2→
77.2
77.4
77.6
77.8
78
Position on chr18 (Mb)

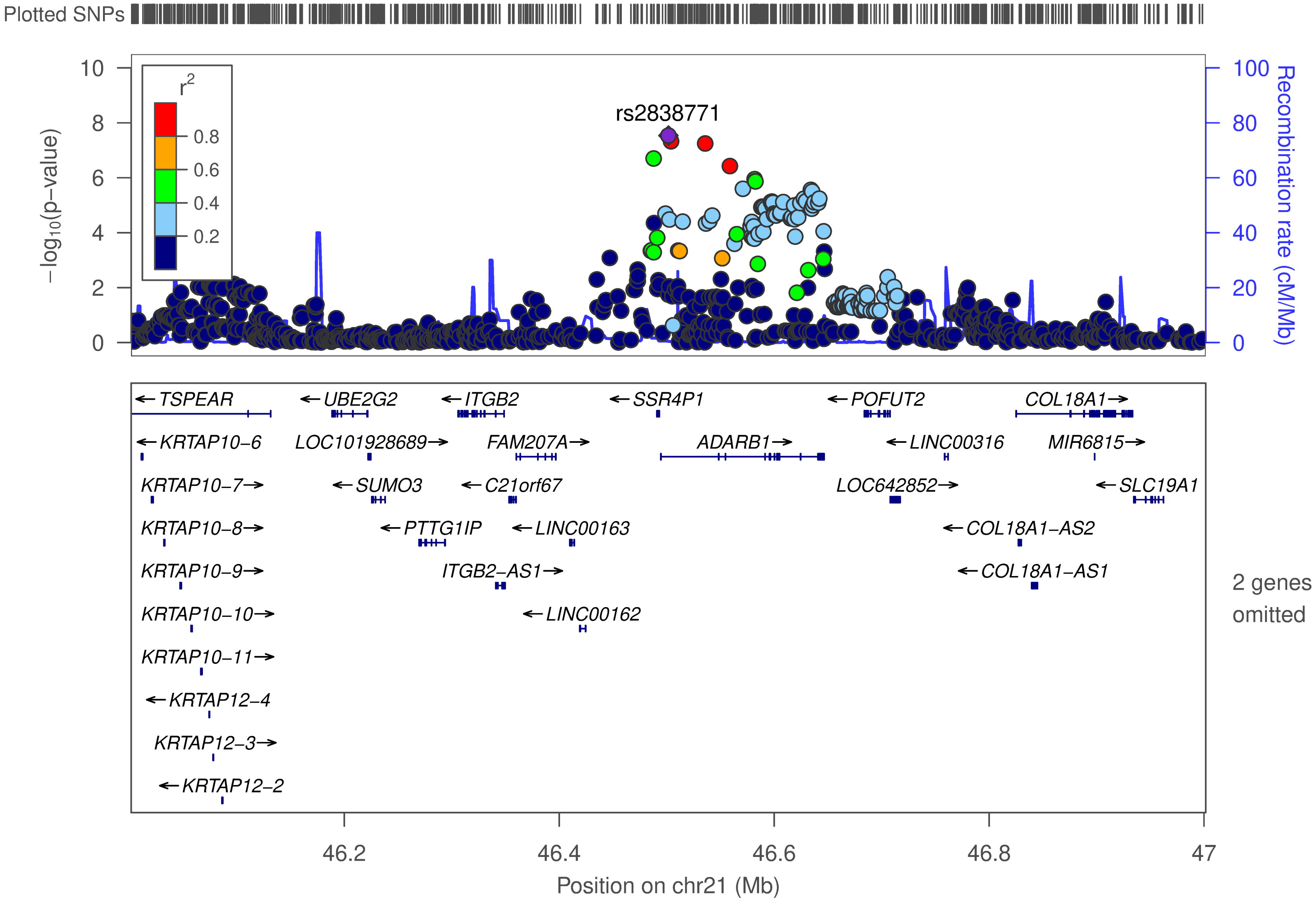

Plotted SNPs
r²
0.8
0.6
0.4
0.2
rs9636202
−log₁₀(p−value)
0
2
4
6
8
10
Recombination rate (cM/Mb)
0
20
40
60
80
100
← JAK3
KCNN1 →
← IL12RB1
IFI30 →
← JUND
GDF15 →
← ELL
UBA52 →
CRTC1 →
RPL18A →
ARRDC2 →
MAST3 →
← PDE4C
PGPEP1 →
← FKBP8
KLHL26 →
← COMP
SNORA68 →
PIK3R2 →
MIR3188 →
← LRRC25
KXD1 →
UPF1 →
SLC5A5 →
MPV17L2 →
← LSM4
SSBP4 →
C19orf60 →
CCDC124 →
← RAB3A
MIR3189 →
← CRLF1
← LOC729966
← ISYNA1
TMEM59L →
← KIAA1683
18
18.2
18.4
18.6
18.8
Position on chr19 (Mb)

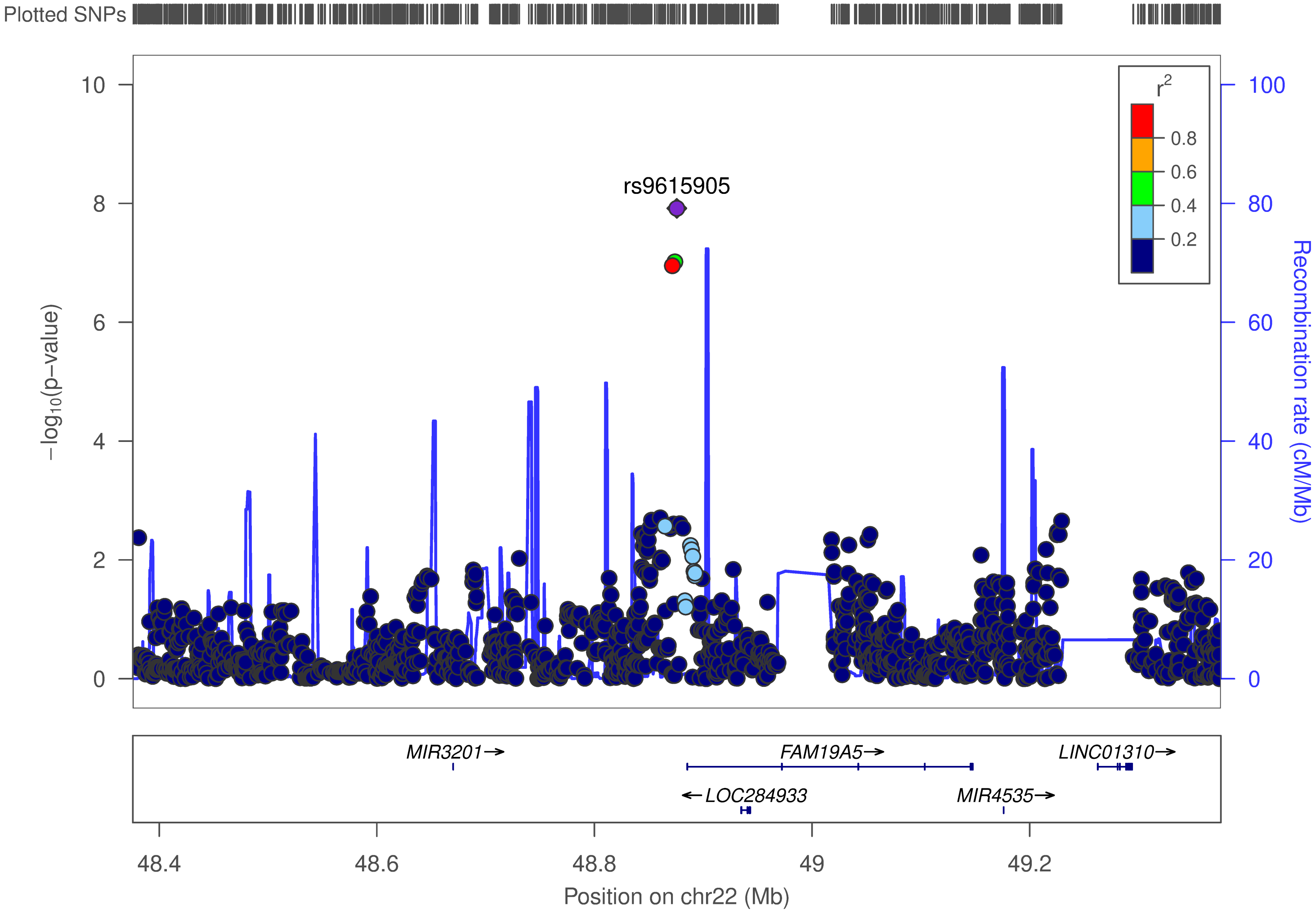

Plotted SNPs
rs2023878
−log10(p−value)
0
2
4
6
8
10
Recombination rate (cM/Mb)
0
20
40
60
80
100
r2
0.8
0.6
0.4
0.2
←PDE4C
GDF15→
←ELL
UBA52→
CRTC1→
UPF1→
←SUGP2
←TMEM161A
←LOC729966
SSBP4→
←FKBP8
KLHL26→
←COMP
←GDF1
ARMC6→
←MEF2B
←KIAA1683
←LRRC25
KXD1→
←CERS1
SLC25A42→
←JUND
MIR3189→
C19orf60→
←COPE
←MEF2BNB−MEF2B
MIR3188→
←ISYNA1
←CRLF1
DDX49→
←MEF2BNB
←LSM4
TMEM59L→
←HOMER3
RFXANK→
PGPEP1→
←NR2C2AP
NCAN→
18.4
18.6
18.8
19
19.2
Position on chr19 (Mb)

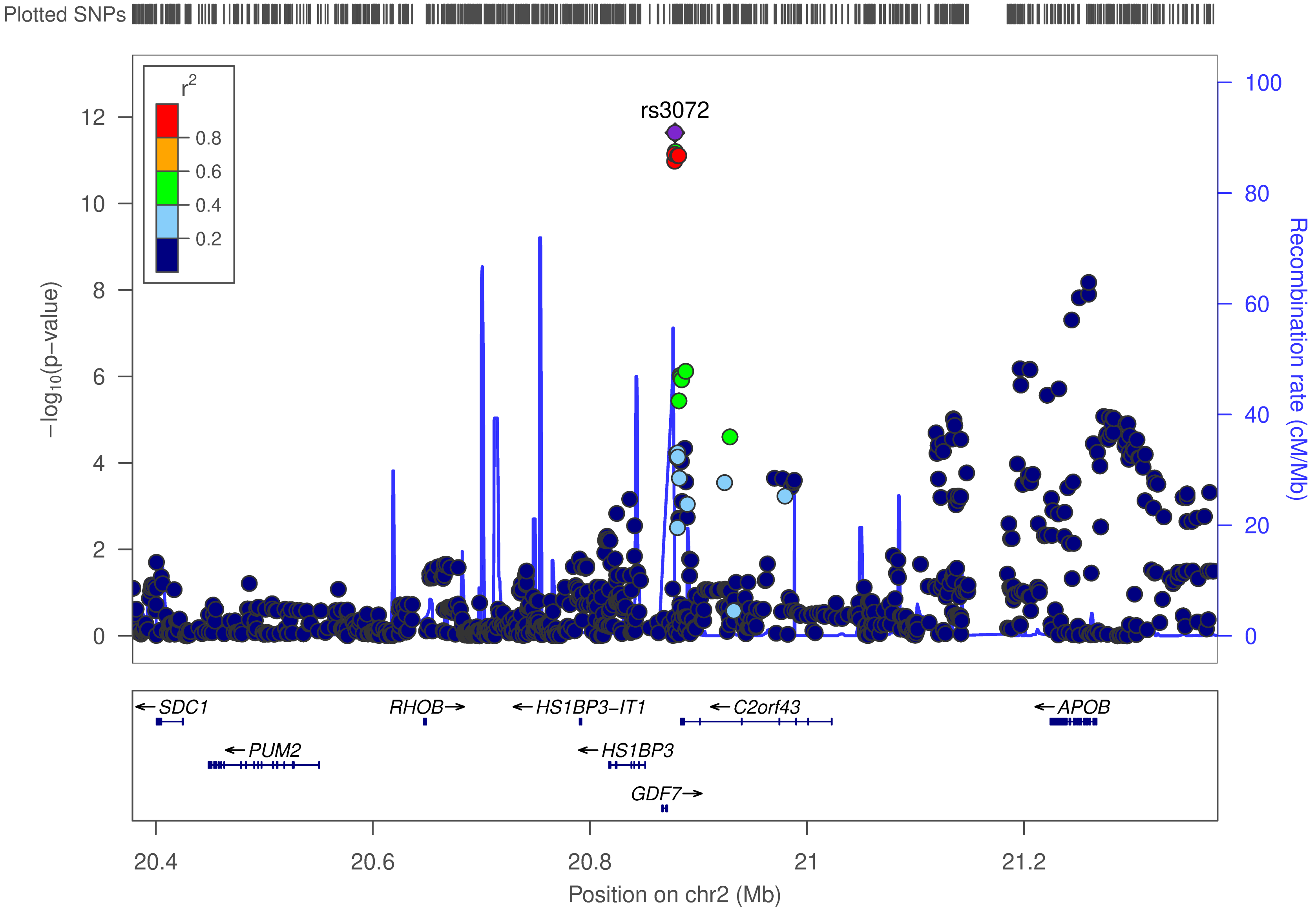

Plotted SNPs
rs1883842
r^2
0.8
0.6
0.4
0.2
10
8
6
4
2
0
−log10(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
← PTPRT
LOC101927159 →
40.8
41
41.2
41.4
41.6
Position on chr20 (Mb)

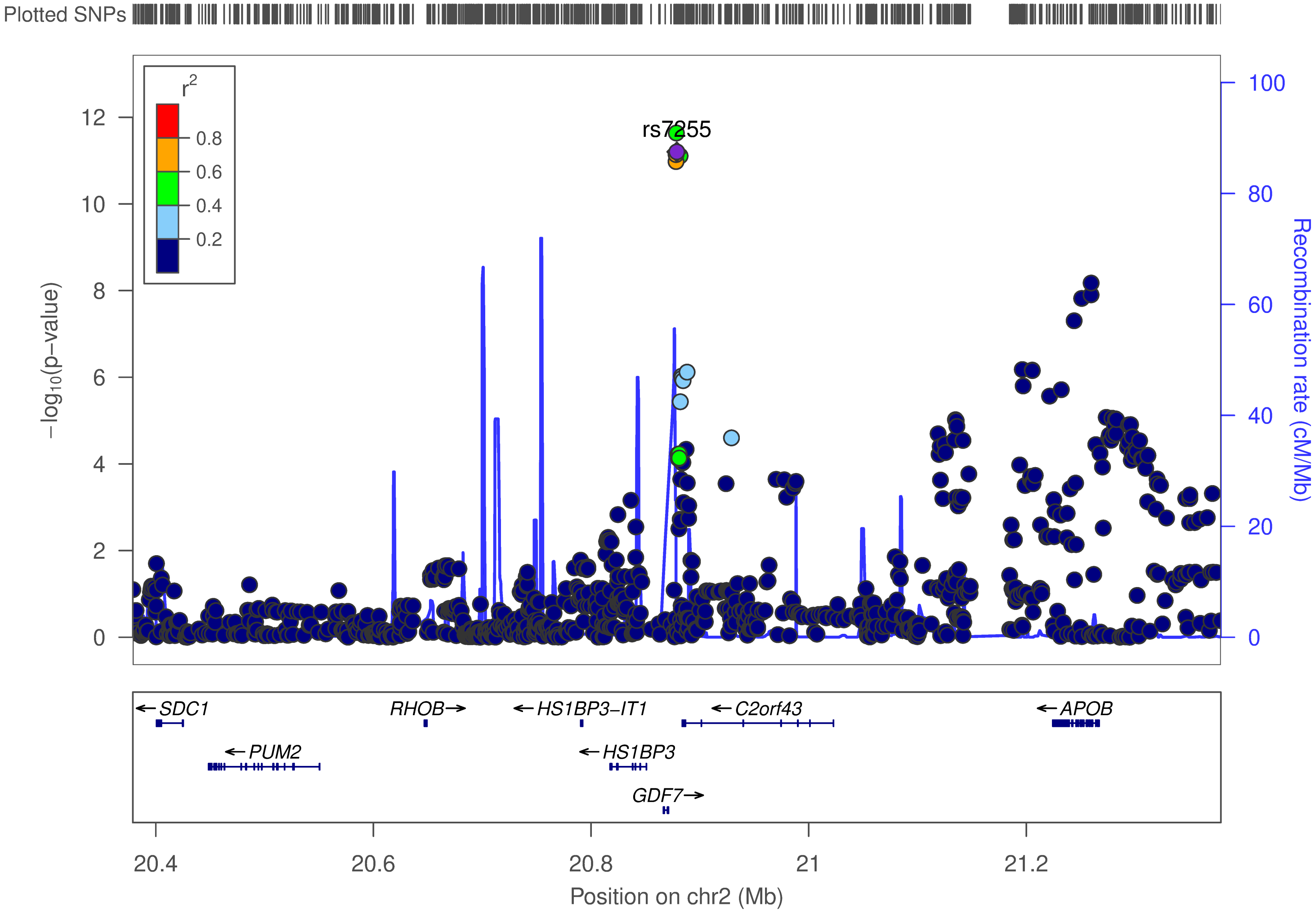

Plotted SNPs
r²
0.8
0.6
0.4
0.2
rs2834005
−log₁₀(p−value)
10
8
6
4
2
0
Recombination rate (cM/Mb)
100
80
60
40
20
0
EVA1C→
←TCP10L
PAXBP1−AS1→
OLIG2→
←C21orf54
IL10RB→
←C21orf59
←PAXBP1
LINC00945→
IFNAR2→
IFNGR2→
←SYNJ1
←C21orf62
OLIG1→
←IL10RB−AS1
C21orf49→
←LOC101928107
IFNAR1→
33.8
34
34.2
34.4
34.6
Position on chr21 (Mb)

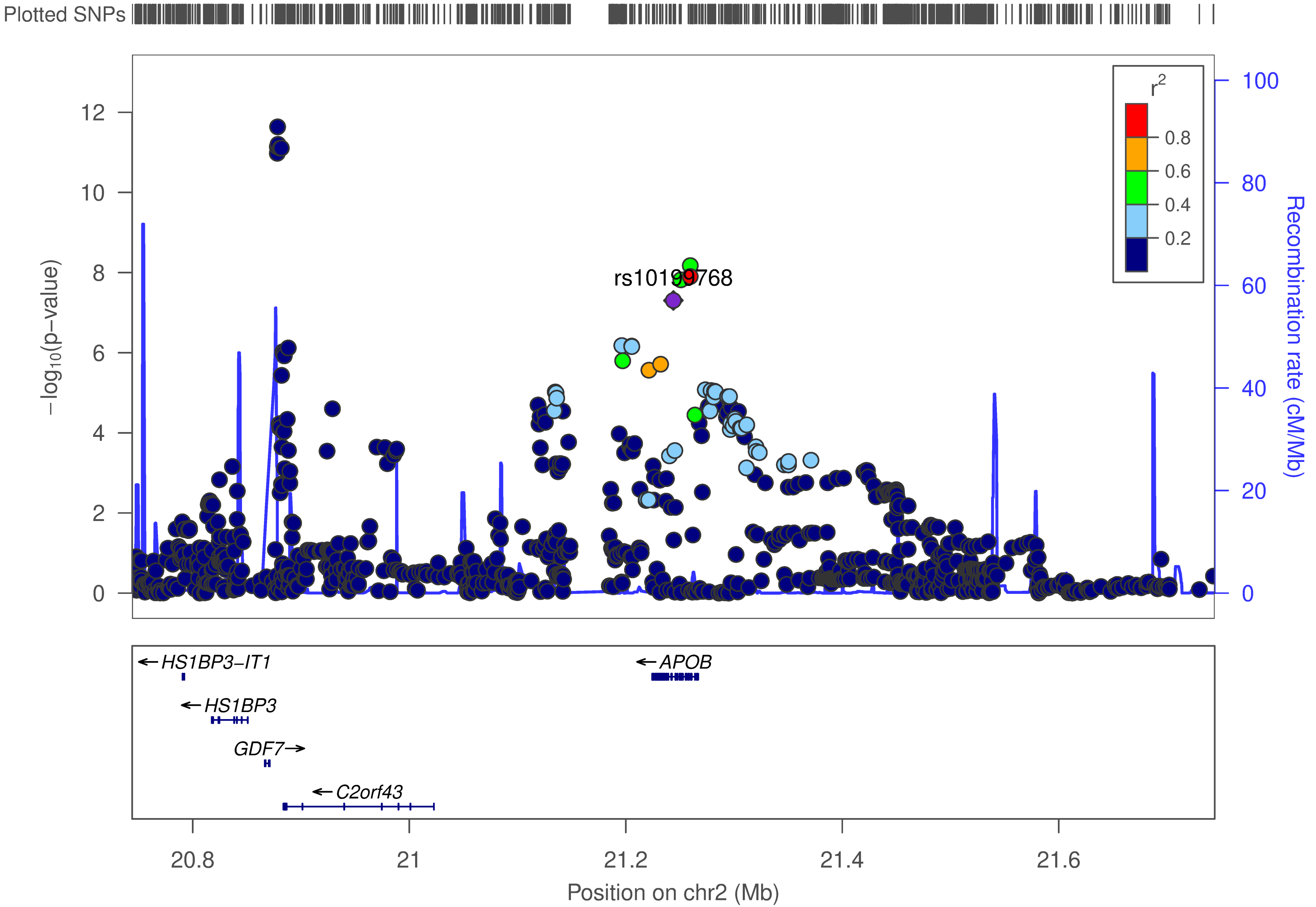

Plotted SNPs
r²
0.8
0.6
0.4
0.2
rs2183588
10
8
6
4
2
0
−log10(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
← DSCAM
← LINC00323
MIR3197→
BACE2→
← PLAC4
FAM3B→
MX2→
MX1→
← TMPRSS2
LINC00111→
42.2
42.4
42.6
42.8
43
Position on chr21 (Mb)

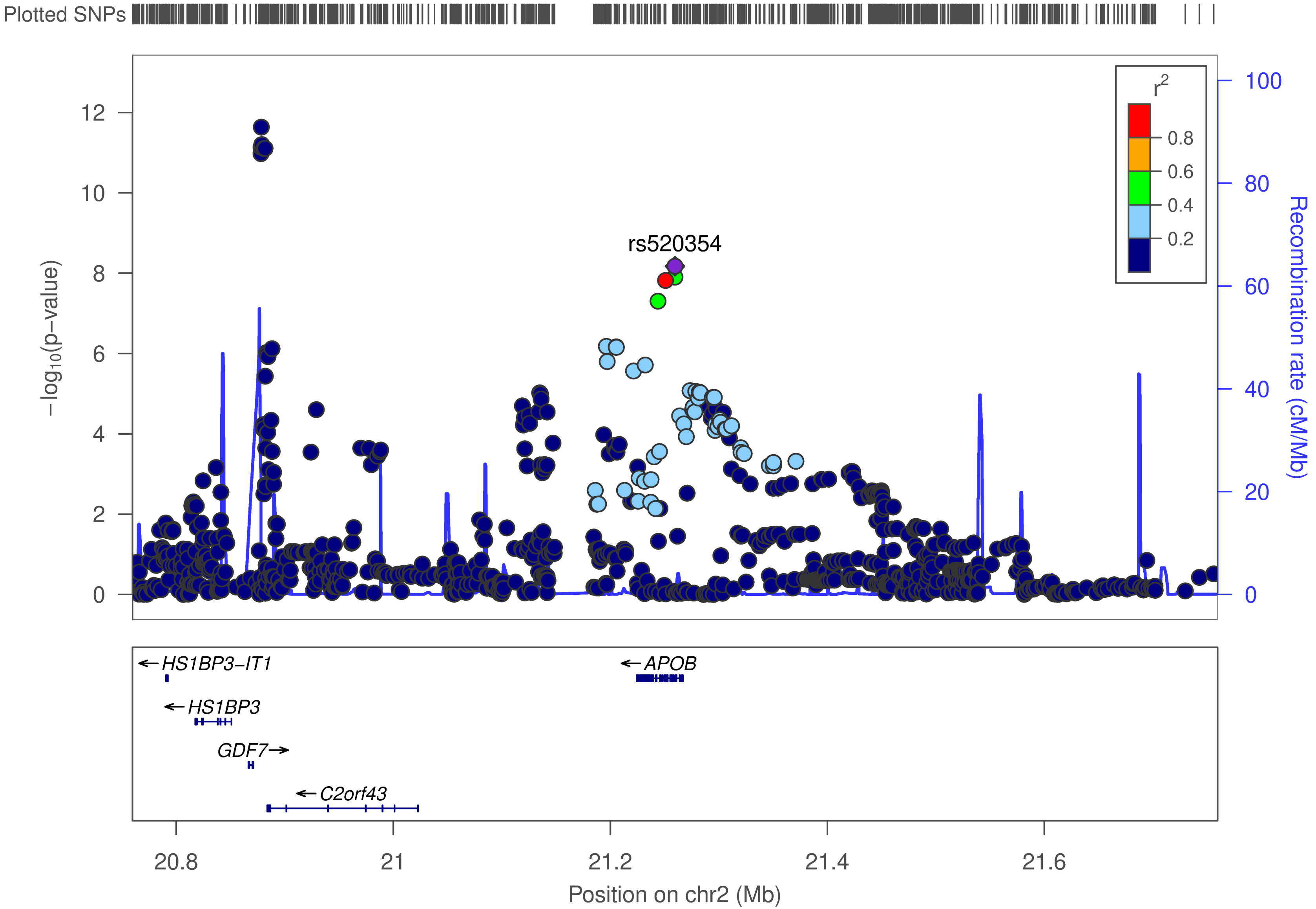

Plotted SNPs
rs2838771
r^2
0.8
0.6
0.4
0.2
−log10(p−value)
0
2
4
6
8
10
Recombination rate (cM/Mb)
0
20
40
60
80
100
TSPEAR
KRTAP10−6
KRTAP10−7
KRTAP10−8
KRTAP10−9
KRTAP10−10
KRTAP10−11
KRTAP12−4
KRTAP12−3
KRTAP12−2
UBE2G2
LOC101928689
SUMO3
PTTG1IP
ITGB2
FAM207A
C21orf67
ITGB2−AS1
LINC00163
LINC00162
SSR4P1
ADARB1
POFUT2
LINC00316
LOC642852
COL18A1−AS2
COL18A1−AS1
COL18A1
MIR6815
SLC19A1
2 genes omitted
46.2
46.4
46.6
46.8
47
Position on chr21 (Mb)

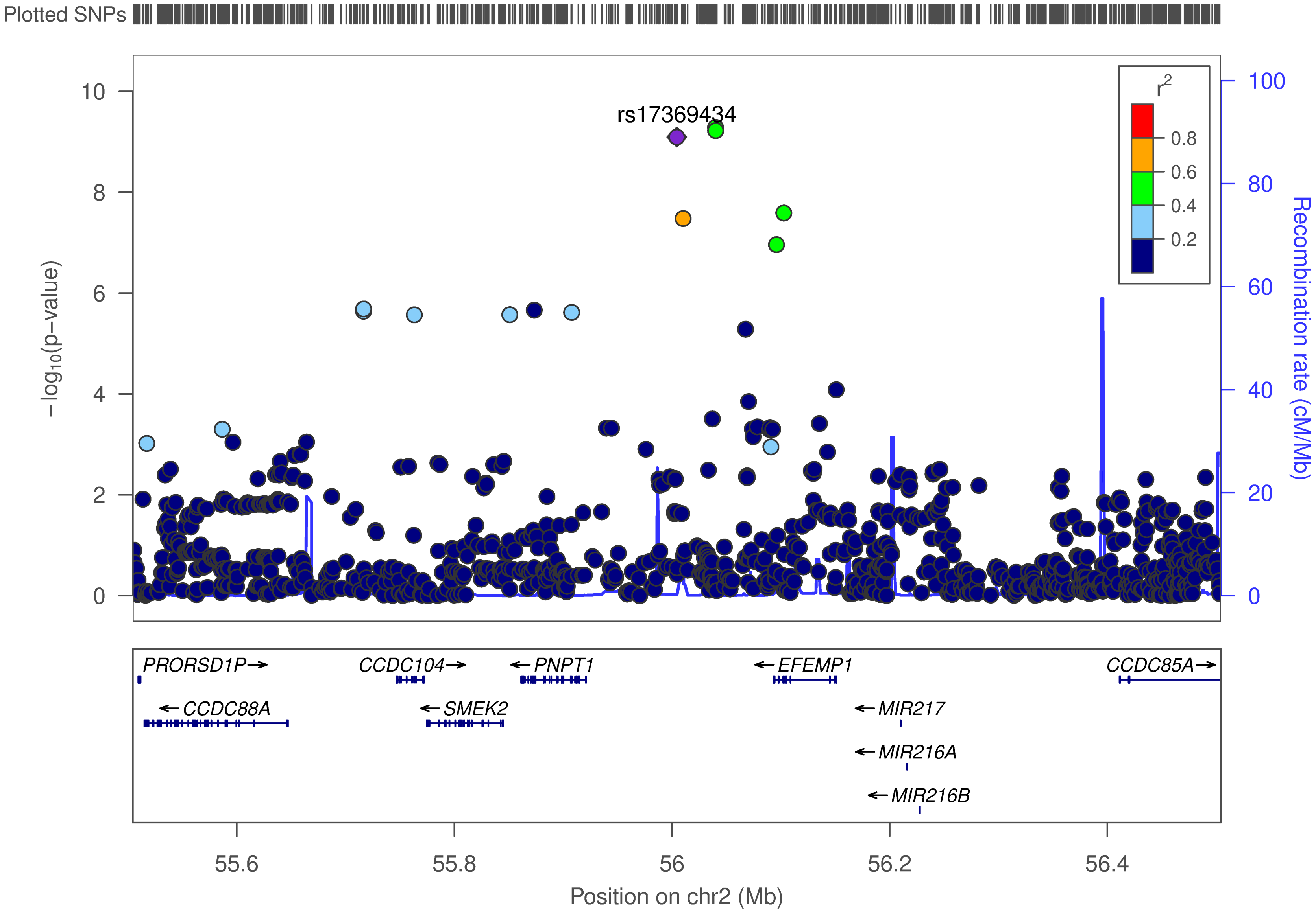

Plotted SNPs
rs9615905
r²
0.8
0.6
0.4
0.2
−log10(p−value)
0
2
4
6
8
10
Recombination rate (cM/Mb)
0
20
40
60
80
100
MIR3201→
FAM19A5→
LINC01310→
←LOC284933
MIR4535→
48.4
48.6
48.8
49
49.2
Position on chr22 (Mb)


Plotted SNPs
rs3072
r²
0.8
0.6
0.4
0.2
−log₁₀(p−value)
0
2
4
6
8
10
12
Recombination rate (cM/Mb)
0
20
40
60
80
100
← SDC1
RHOB →
← HS1BP3−IT1
← C2orf43
← APOB
← PUM2
← HS1BP3
GDF7 →
20.4
20.6
20.8
21
21.2
Position on chr2 (Mb)

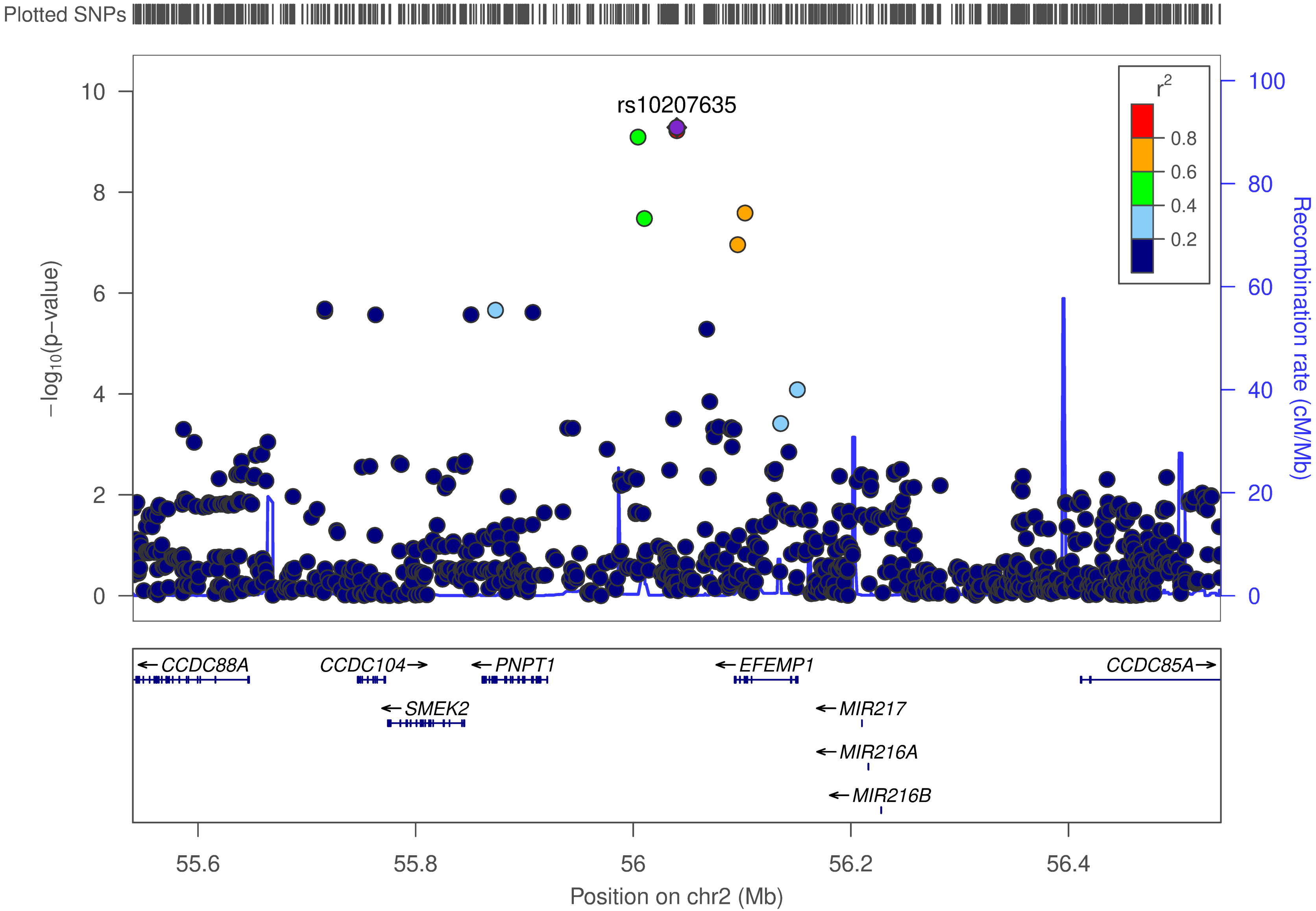

Plotted SNPs
r2
0.8
0.6
0.4
0.2
rs7255
12
10
8
6
4
2
0
−log10(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
SDC1
RHOB
HS1BP3−IT1
C2orf43
APOB
PUM2
HS1BP3
GDF7
20.4
20.6
20.8
21
21.2
Position on chr2 (Mb)

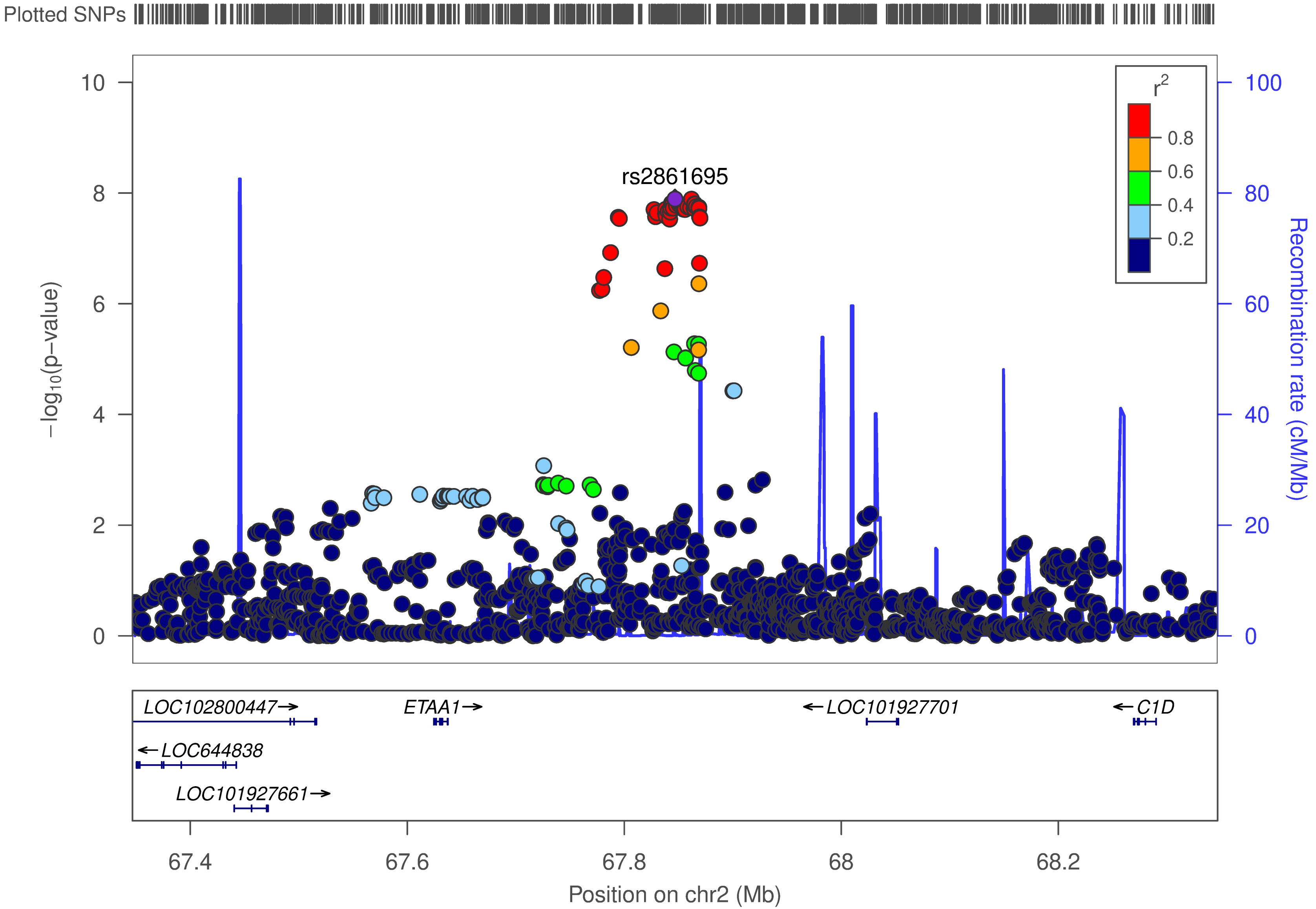

Plotted SNPs
−log10(p−value)
0
2
4
6
8
10
12
Recombination rate (cM/Mb)
0
20
40
60
80
100
r²
0.8
0.6
0.4
0.2
rs1019768
HS1BP3−IT1
HS1BP3
GDF7
C2orf43
APOB
20.8
21
21.2
21.4
21.6
Position on chr2 (Mb)

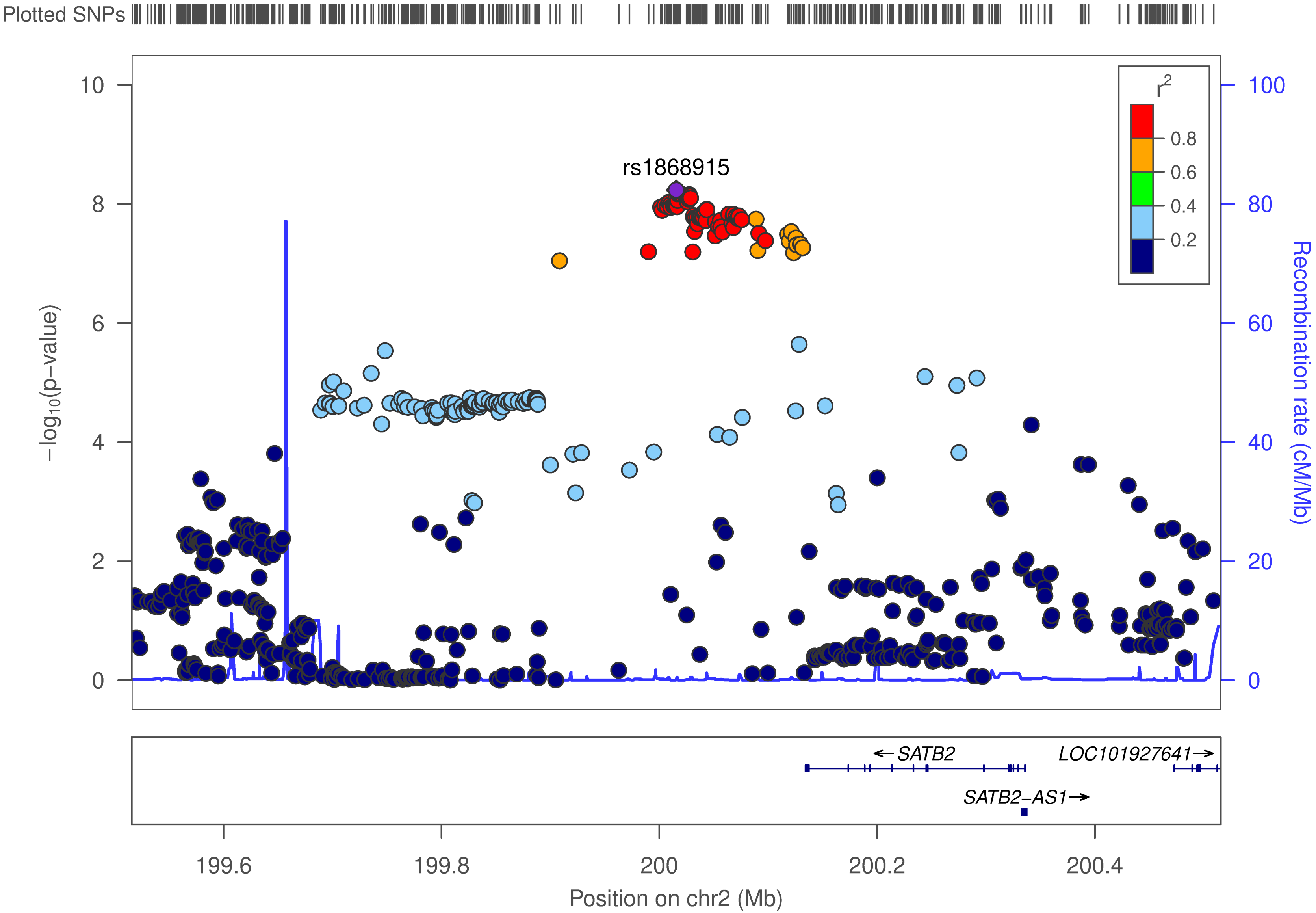

Plotted SNPs
12
10
8
6
4
2
0
−log10(p−value)
rs520354
r2
0.8
0.6
0.4
0.2
100
80
60
40
20
0
Recombination rate (cM/Mb)
HS1BP3−IT1
APOB
HS1BP3
GDF7
C2orf43
20.8
21
21.2
21.4
21.6
Position on chr2 (Mb)

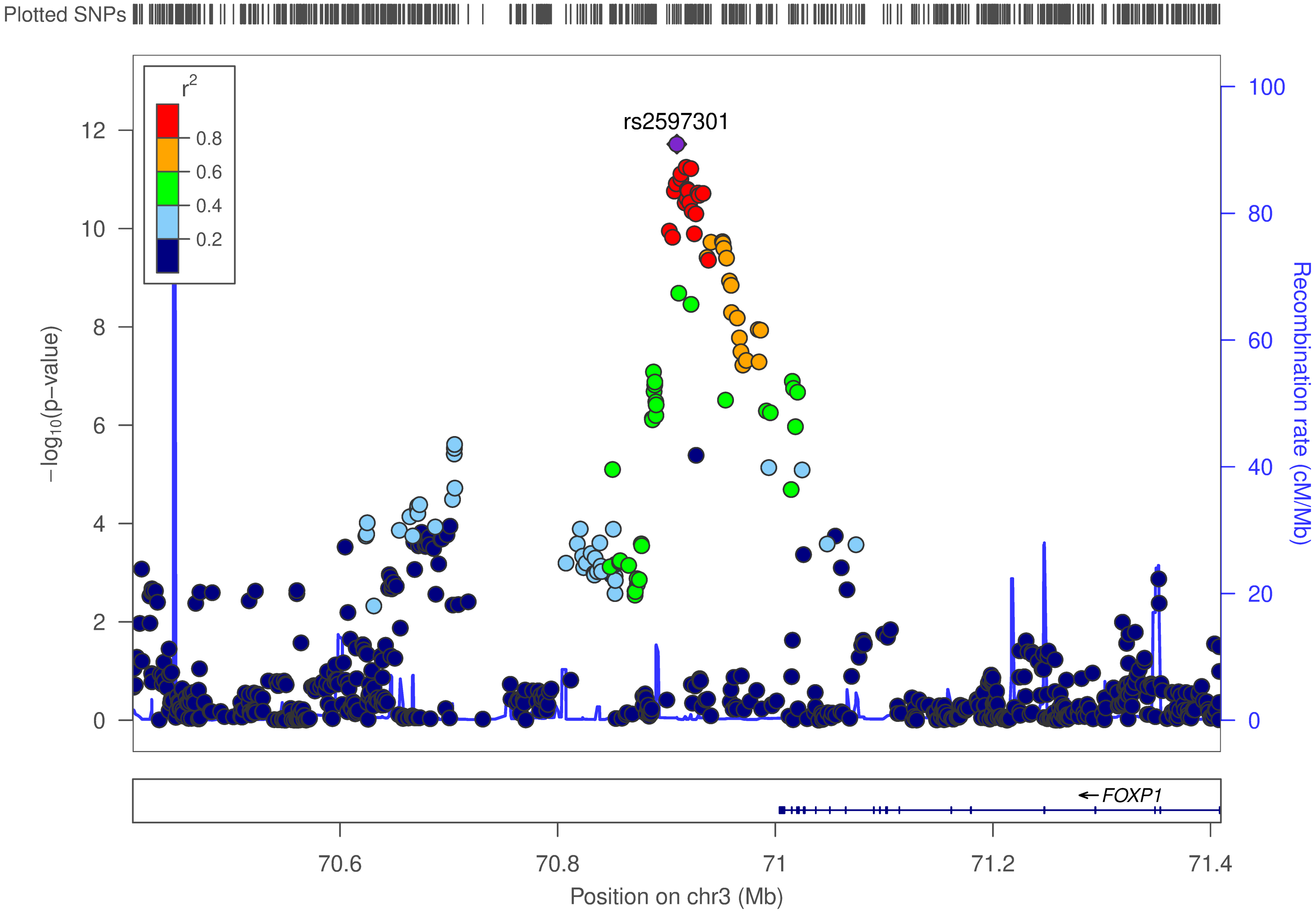


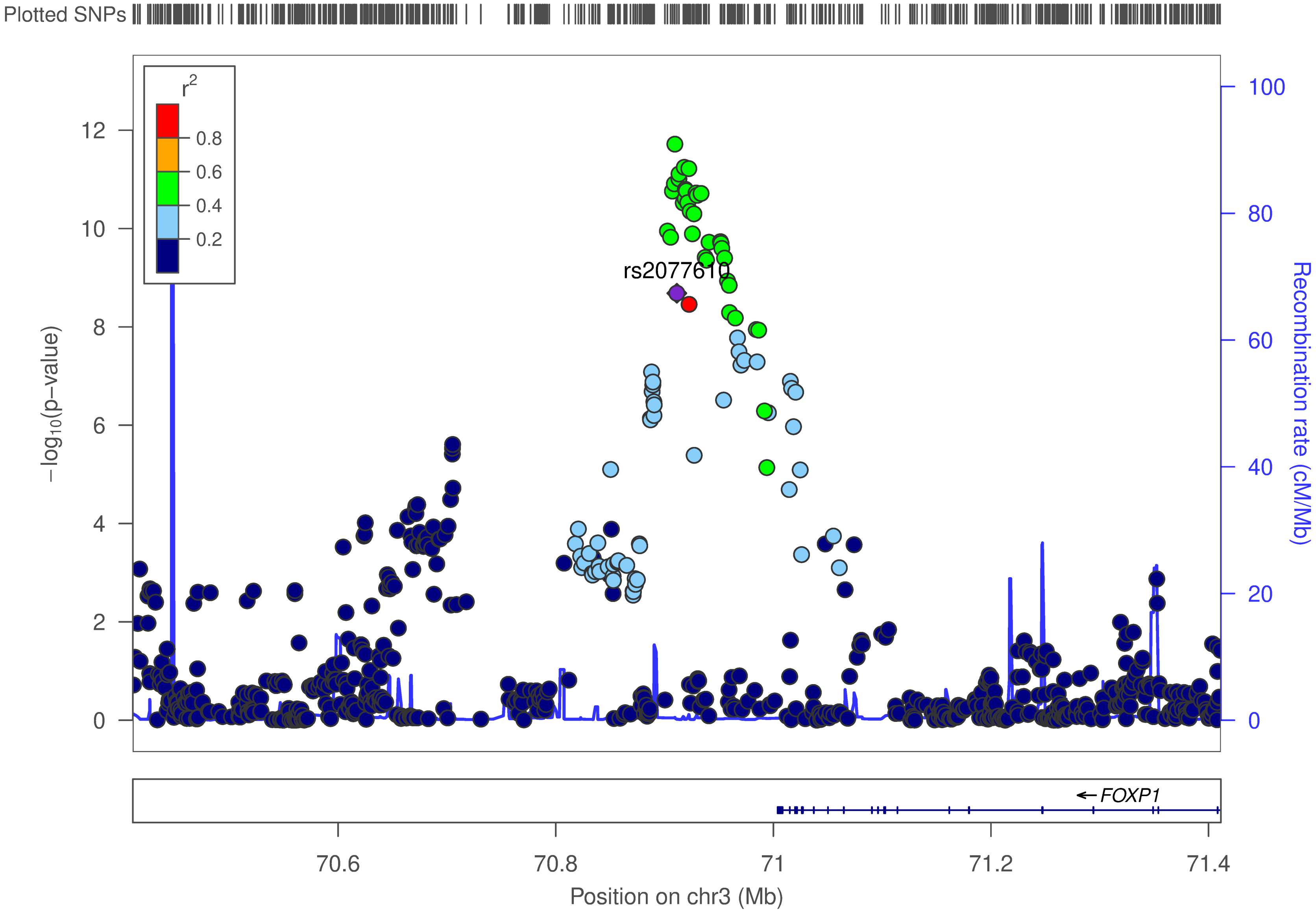
Plotted SNPs
rs17369434
−log10(p−value)
10
8
6
4
2
0
Recombination rate (cM/Mb)
100
80
60
40
20
0
r2
0.8
0.6
0.4
0.2
PRORSD1P→
CCDC104→
←PNPT1
←EFEMP1
CCDC85A→
←CCDC88A
←SMEK2
←MIR217
←MIR216A
←MIR216B
55.6
55.8
56
56.2
56.4
Position on chr2 (Mb)


Plotted SNPs
rs10207635
r^2
0.8
0.6
0.4
0.2
−log$_{10}$(p−value)
0
2
4
6
8
10
Recombination rate (cM/Mb)
0
20
40
60
80
100
← CCDC88A
CCDC104→
← PNPT1
← EFEMP1
CCDC85A→
← SMEK2
← MIR217
← MIR216A
← MIR216B
55.6
55.8
56
56.2
56.4
Position on chr2 (Mb)

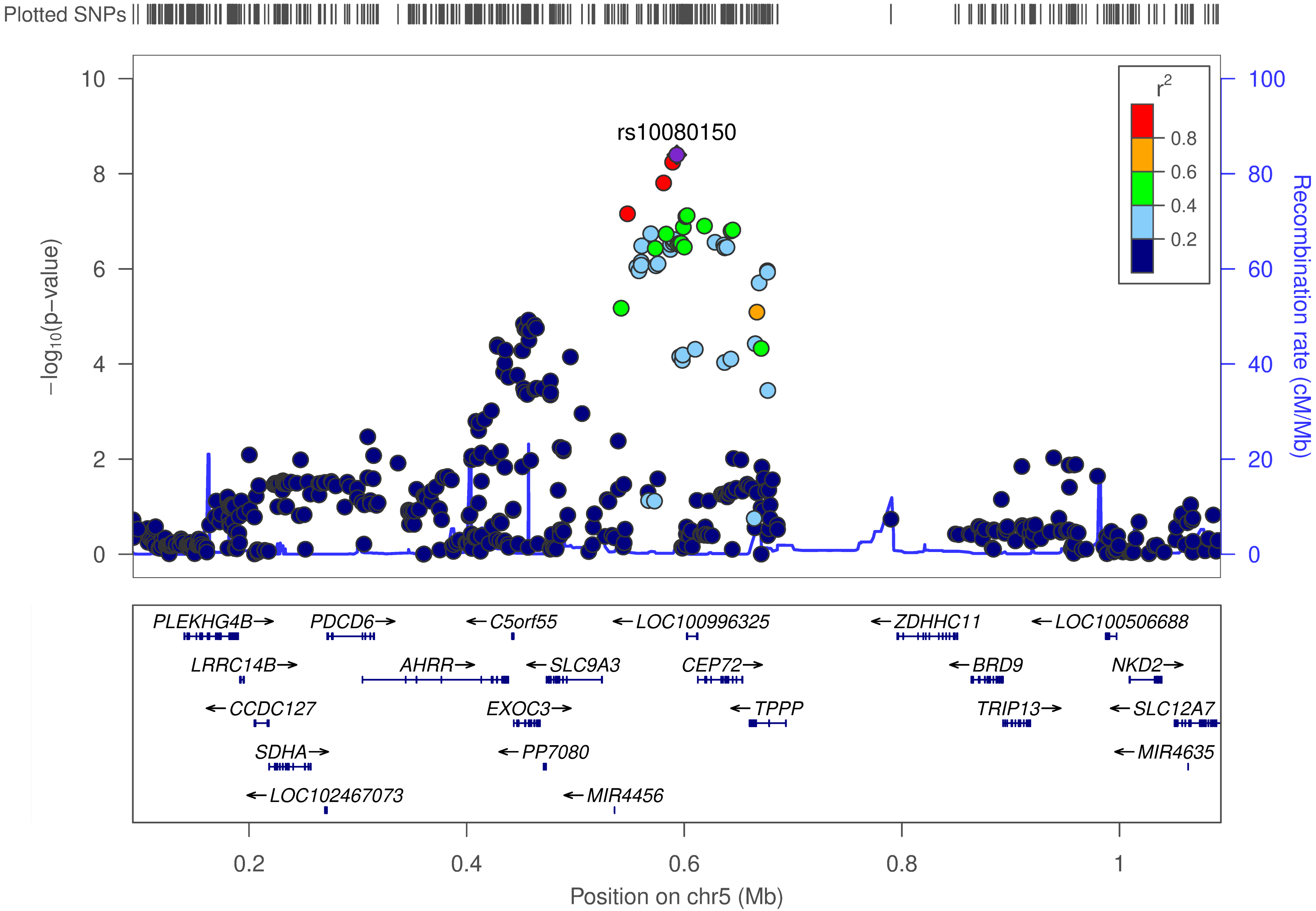

Plotted SNPs
rs2861695
r2
0.8
0.6
0.4
0.2
−log10(p−value)
0
2
4
6
8
10
Recombination rate (cM/Mb)
0
20
40
60
80
100
LOC102800447→
ETAA1→
←LOC101927701
←C1D
←LOC644838
LOC101927661→
67.4
67.6
67.8
68
68.2
Position on chr2 (Mb)

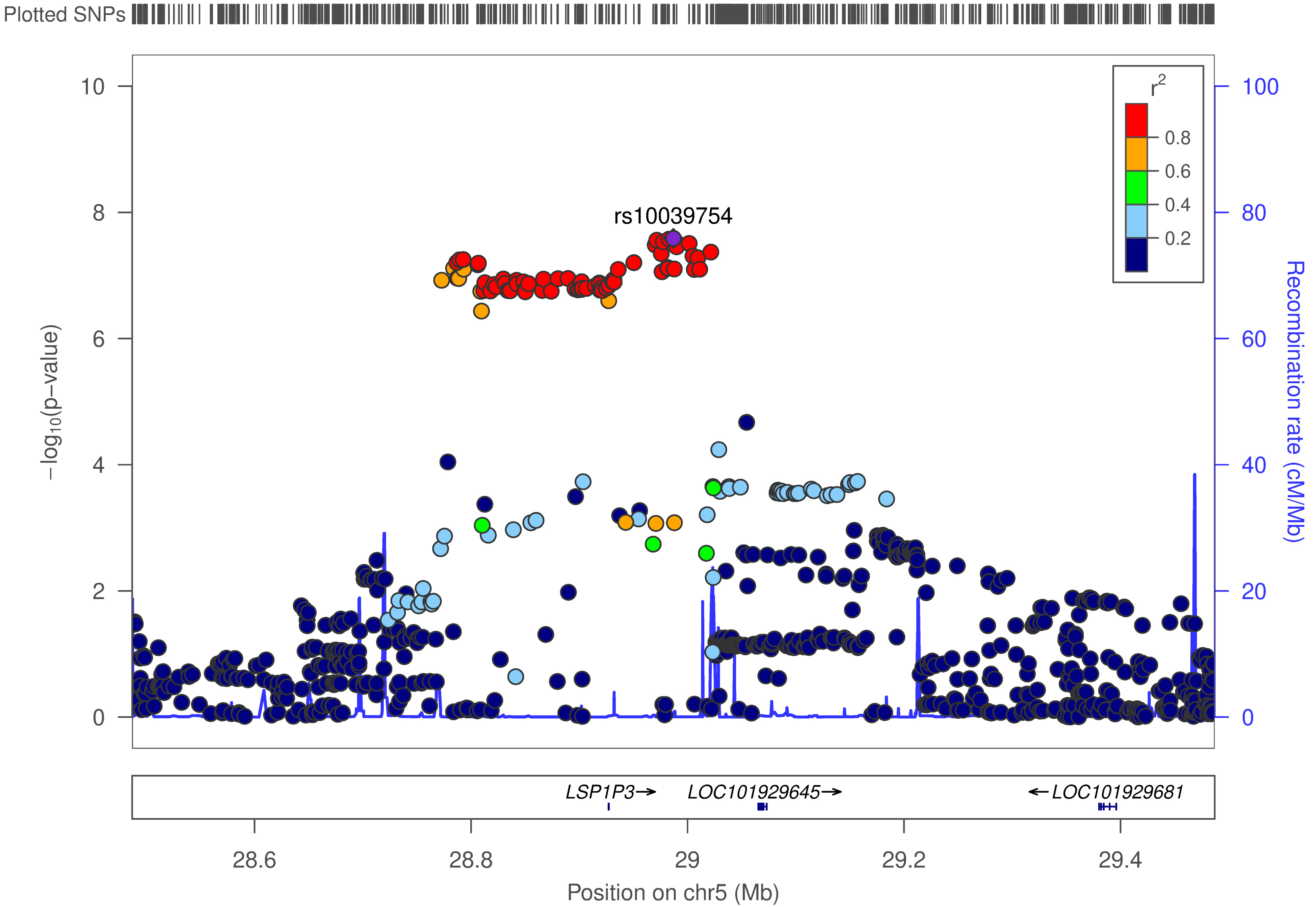

Plotted SNPs
rs1868915
r2
0.8
0.6
0.4
0.2
10
8
6
4
2
0
−log10(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
← SATB2
LOC101927641 →
SATB2−AS1 →
199.6
199.8
200
200.2
200.4
Position on chr2 (Mb)

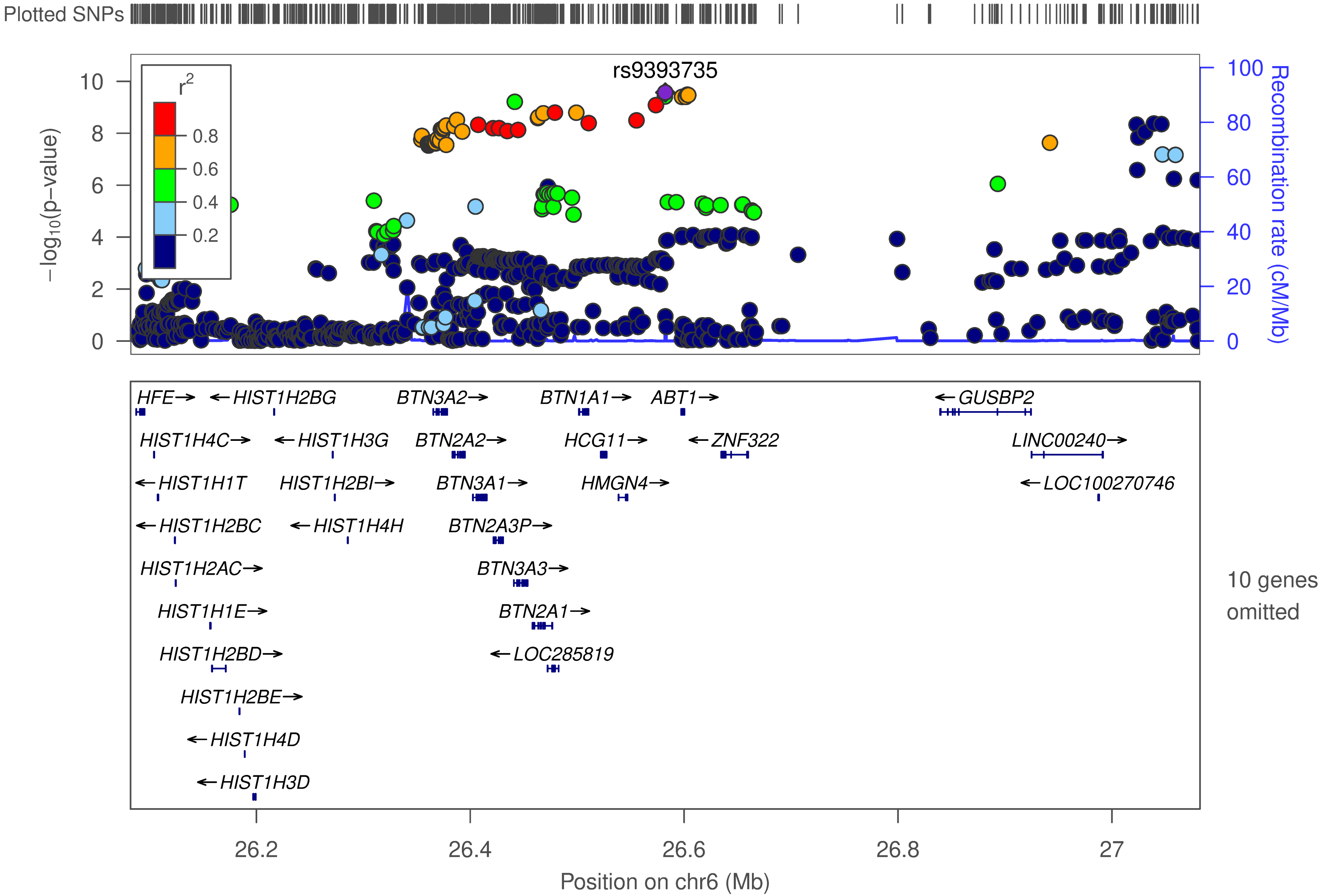

Plotted SNPs
r2
0.8
0.6
0.4
0.2
rs2597301
−log10(p−value)
0
2
4
6
8
10
12
Recombination rate (cM/Mb)
0
20
40
60
80
100
FOXP1
70.6
70.8
71
71.2
71.4
Position on chr3 (Mb)



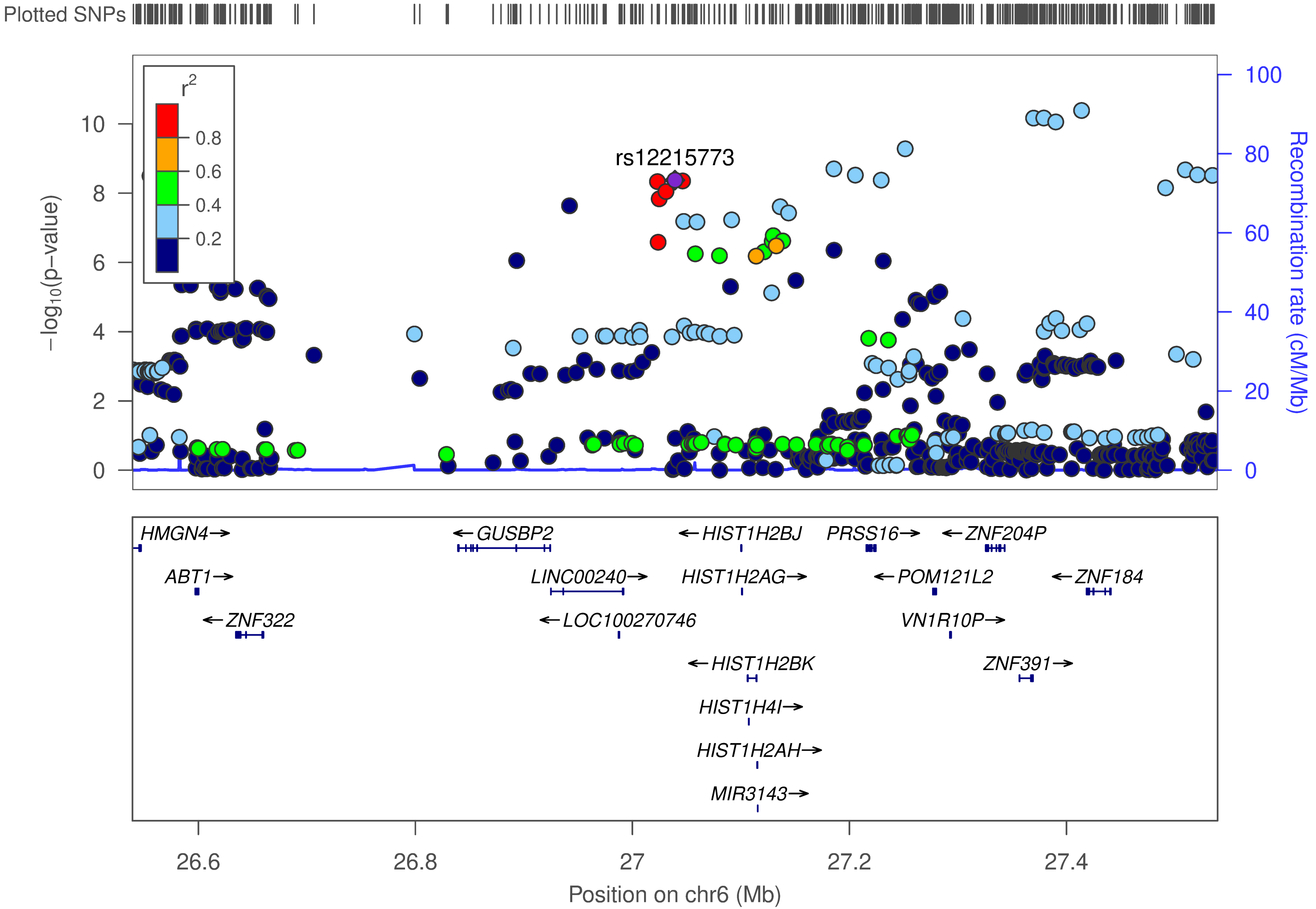
Plotted SNPs
r²
0.8
0.6
0.4
0.2
rs2077610
12
10
8
6
4
2
0
−log10(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
← FOXP1
70.6
70.8
71
71.2
71.4
Position on chr3 (Mb)

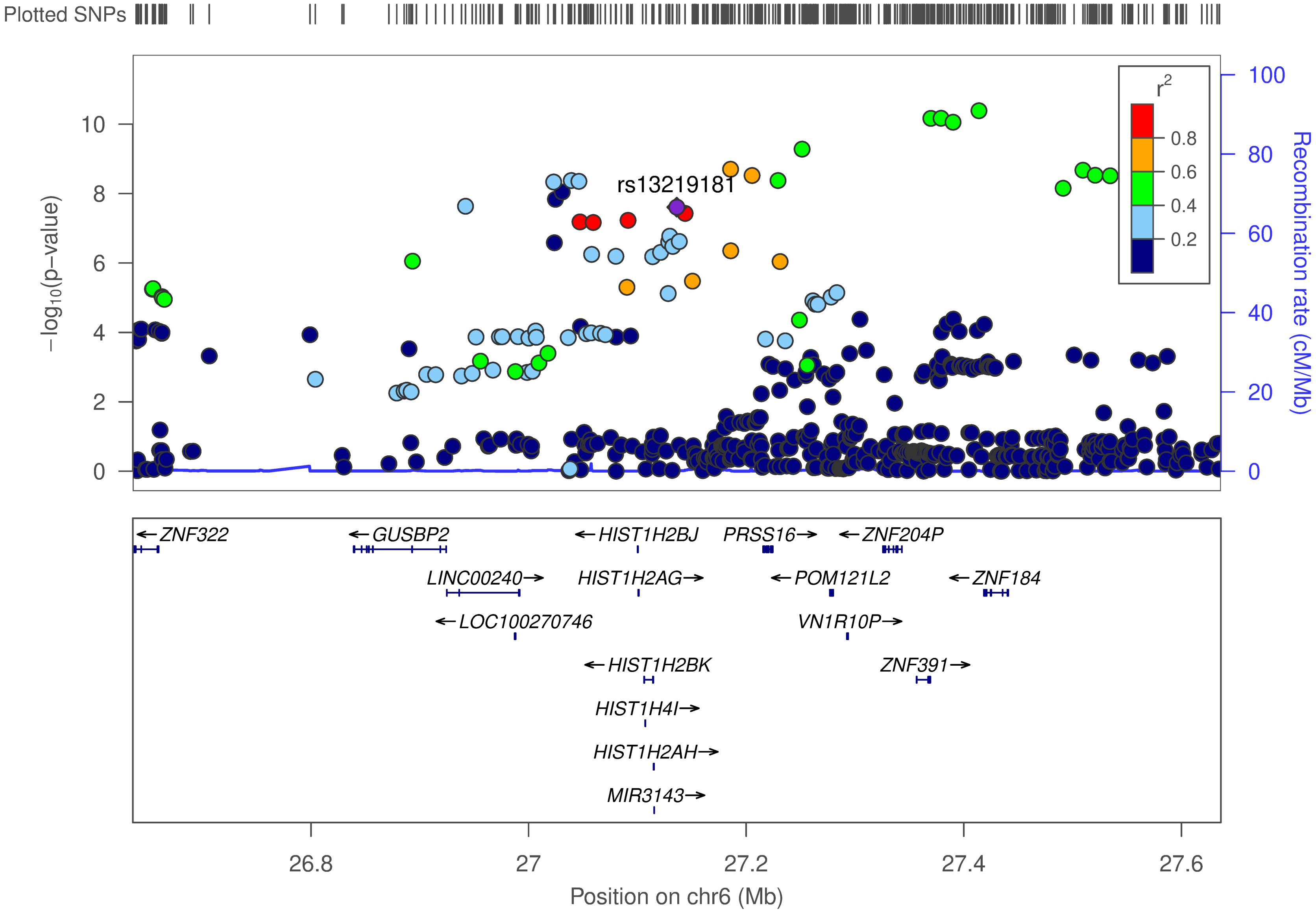

Plotted SNPs
rs10080150
−log10(p−value)
0
2
4
6
8
10
Recombination rate (cM/Mb)
0
20
40
60
80
100
r²
0.8
0.6
0.4
0.2
PLEKHG4B→
PDCD6→
←C5orf55
←LOC100996325
←ZDHHC11
←LOC100506688
LRRC14B→
AHRR→
←SLC9A3
CEP72→
←BRD9
NKD2→
←CCDC127
EXOC3→
←TPPP
TRIP13→
←SLC12A7
SDHA→
←PP7080
←MIR4635
←LOC102467073
←MIR4456
0.2
0.4
0.6
0.8
1
Position on chr5 (Mb)

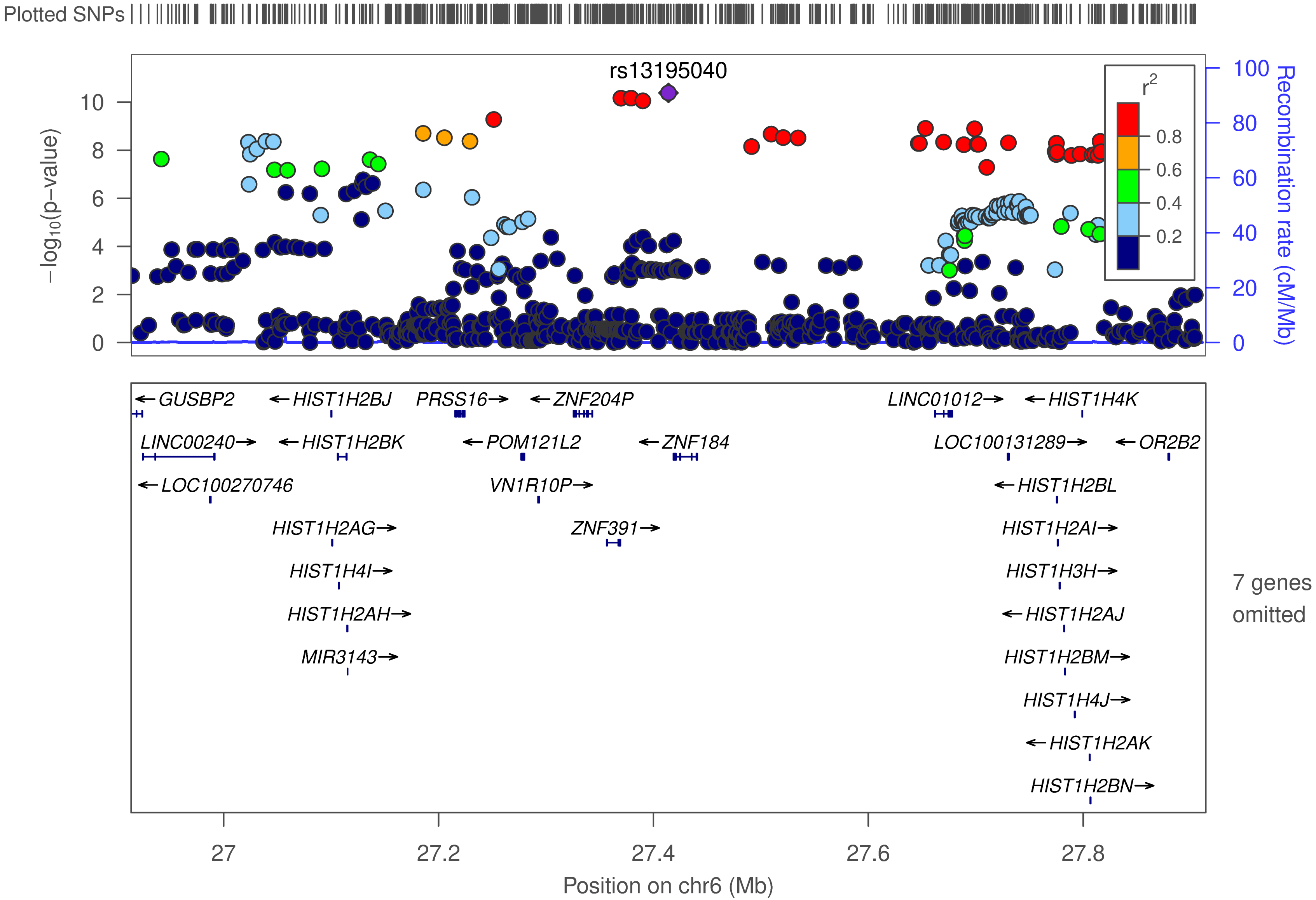

Plotted SNPs
rs10039754
r2
0.8
0.6
0.4
0.2
10
8
6
4
2
0
−log10(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
LSP1P3→
LOC101929645→
←LOC101929681
28.6
28.8
29
29.2
29.4
Position on chr5 (Mb)



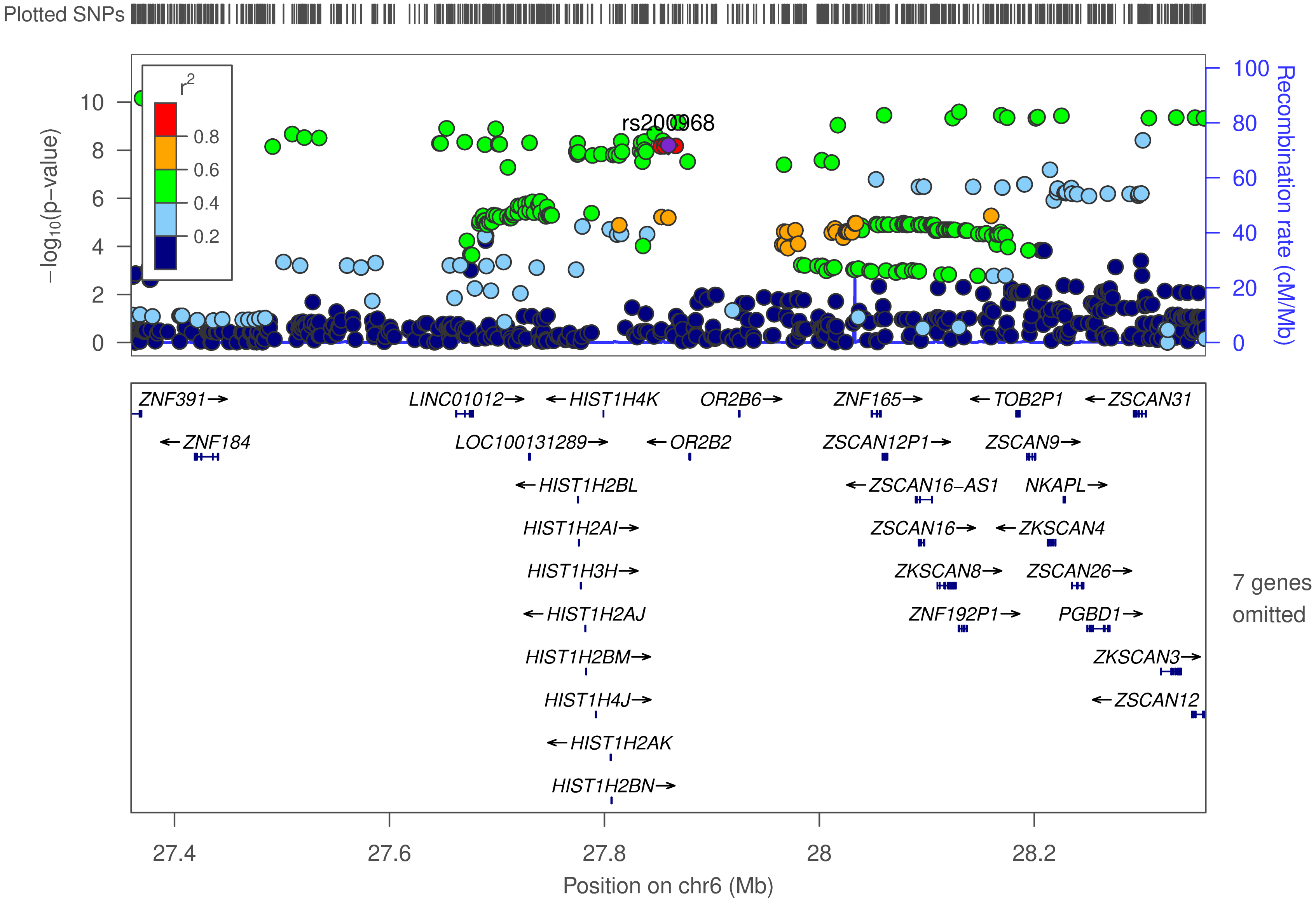
Plotted SNPs
rs9393735
r²
0.8
0.6
0.4
0.2
−log₁₀(p−value)
0
2
4
6
8
10
Recombination rate (cM/Mb)
0
20
40
60
80
100
HFE→
←HIST1H2BG
BTN3A2→
BTN1A1→
ABT1→
←GUSBP2
HIST1H4C→
←HIST1H3G
BTN2A2→
HCG11→
←ZNF322
LINC00240→
←HIST1H1T
HIST1H2BI→
BTN3A1→
HMGN4→
←LOC100270746
←HIST1H2BC
←HIST1H4H
BTN2A3P→
HIST1H2AC→
BTN3A3→
HIST1H1E→
BTN2A1→
HIST1H2BD→
←LOC285819
HIST1H2BE→
←HIST1H4D
←HIST1H3D
10 genes omitted
26.2
26.4
26.6
26.8
27
Position on chr6 (Mb)

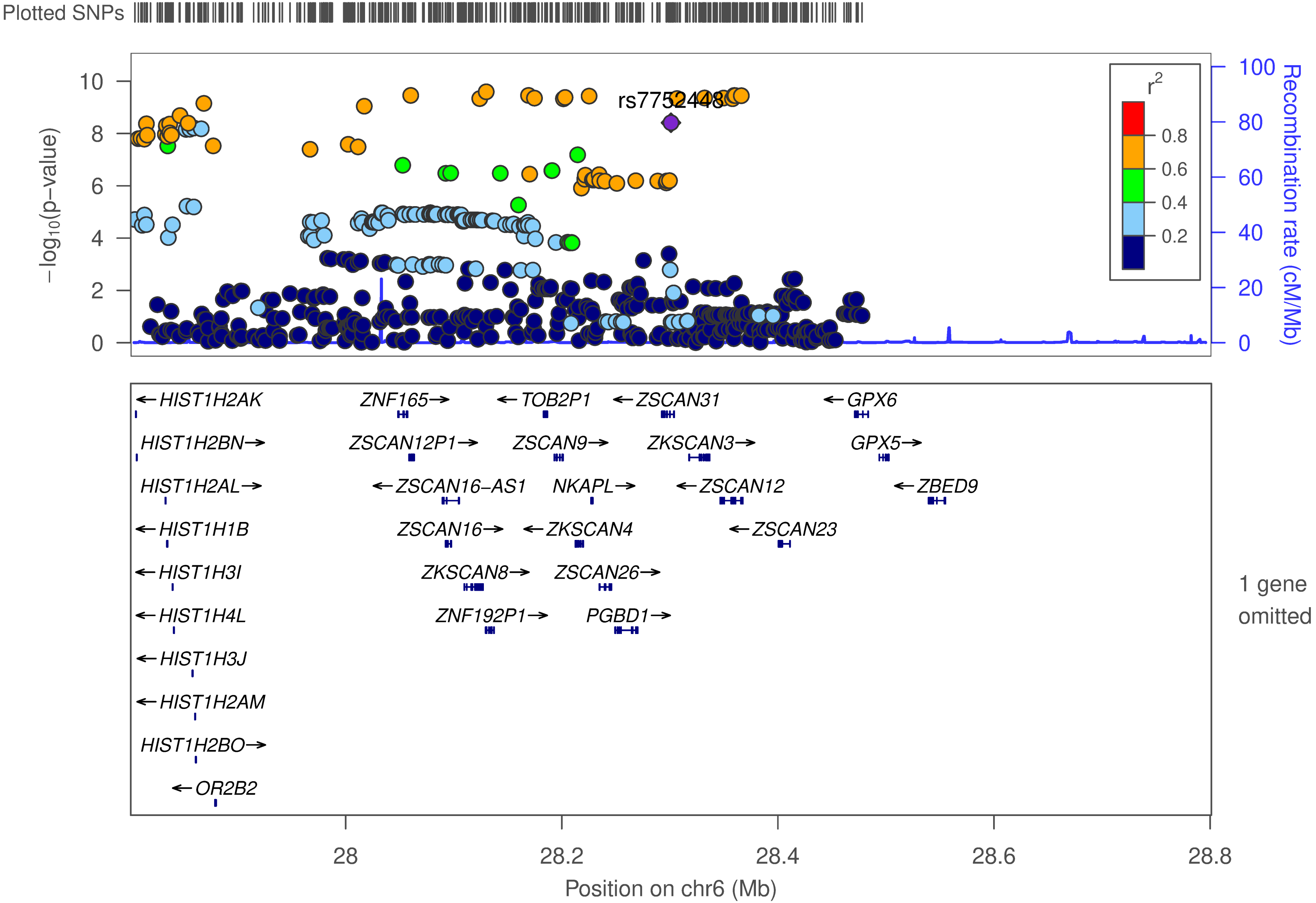

Plotted SNPs
r²
0.8
0.6
0.4
0.2
rs12215773
−log10(p−value)
0
2
4
6
8
10
Recombination rate (cM/Mb)
0
20
40
60
80
100
HMGN4→
ABT1→
←ZNF322
←GUSBP2
LINC00240→
←LOC100270746
←HIST1H2BJ
HIST1H2AG→
←HIST1H2BK
HIST1H4I→
HIST1H2AH→
MIR3143→
PRSS16→
←POM121L2
VN1R10P→
←ZNF204P
ZNF391→
←ZNF184
26.6
26.8
27
27.2
27.4
Position on chr6 (Mb)

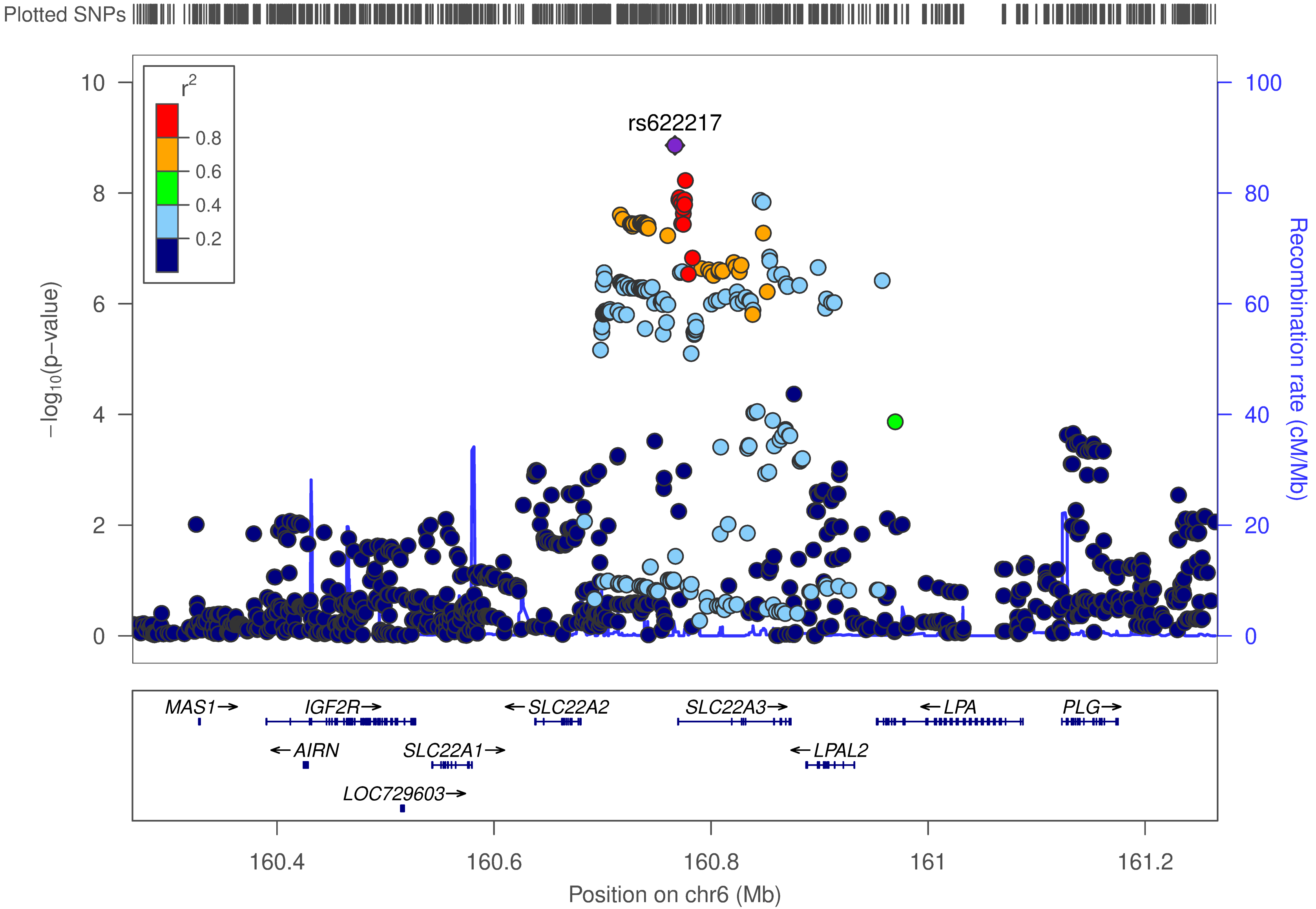

Plotted SNPs
−log10(p−value)
0
2
4
6
8
10
Recombination rate (cM/Mb)
0
20
40
60
80
100
r2
0.8
0.6
0.4
0.2
rs13219181
←ZNF322
←GUSBP2
LINC00240→
←LOC100270746
←HIST1H2BJ
HIST1H2AG→
←HIST1H2BK
HIST1H4I→
HIST1H2AH→
MIR3143→
PRSS16→
←POM121L2
VN1R10P→
←ZNF204P
ZNF391→
←ZNF184
26.8
27
27.2
27.4
27.6
Position on chr6 (Mb)

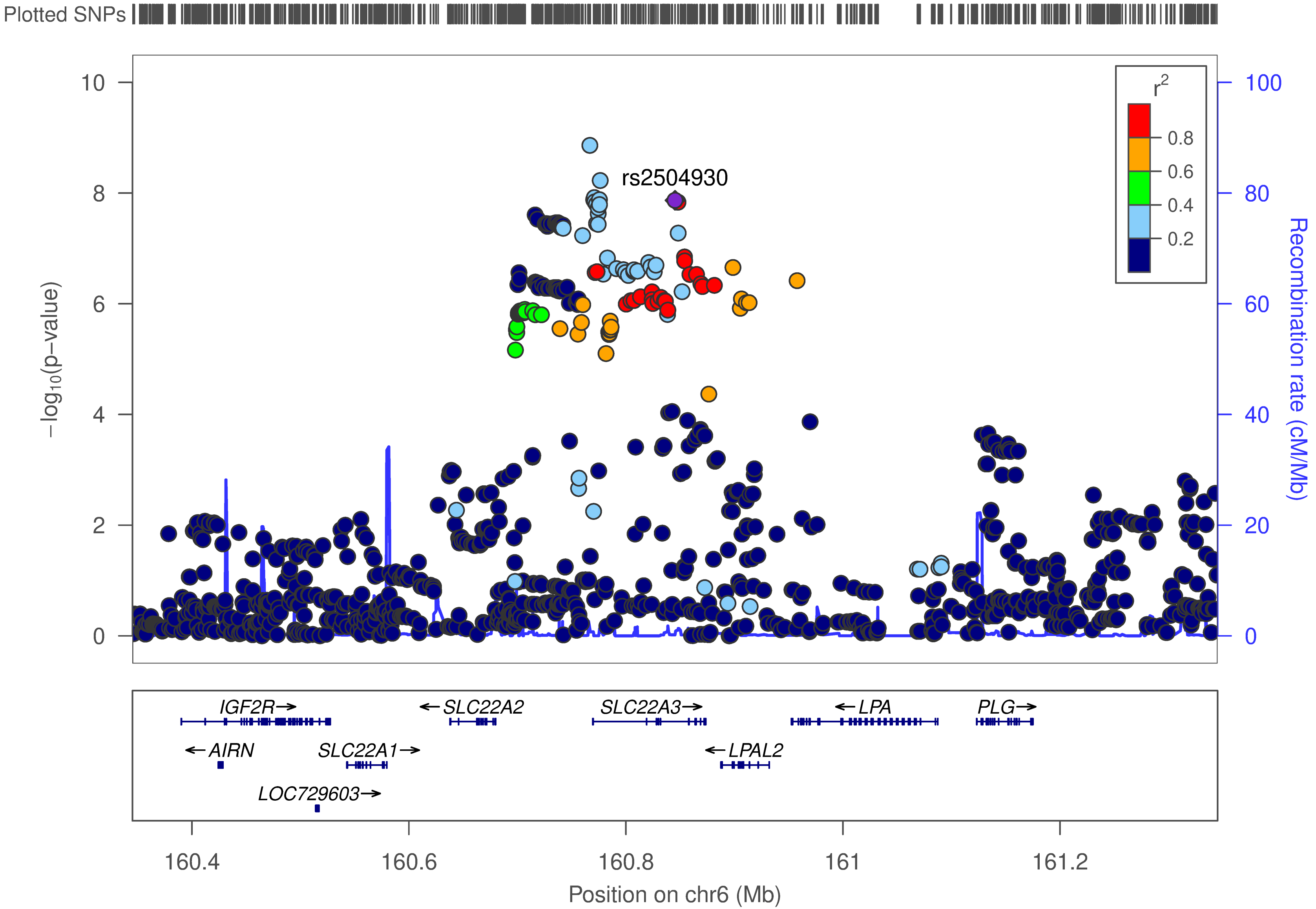


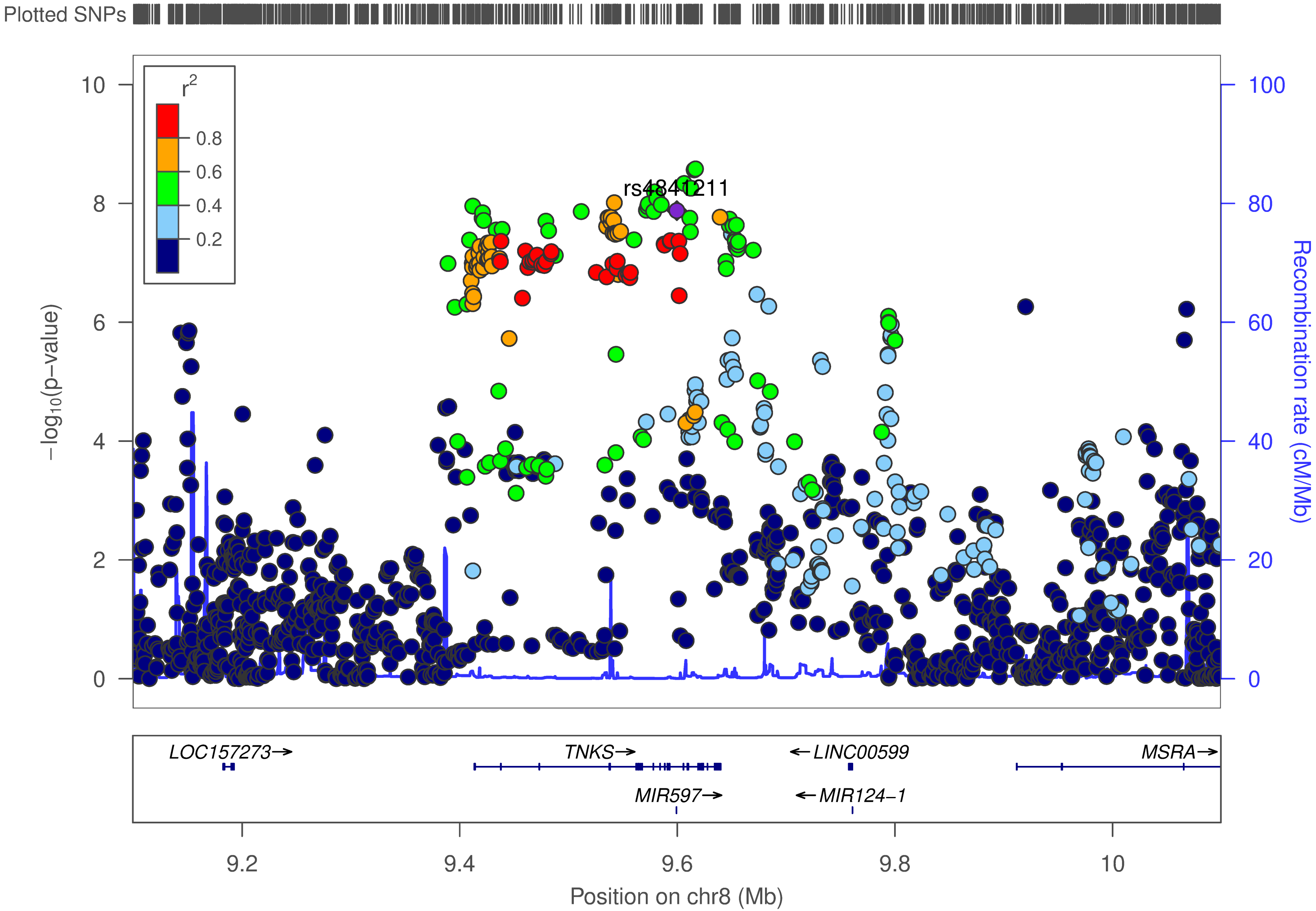
Plotted SNPs
rs13195040
−log10(p−value)
0
2
4
6
8
10
Recombination rate (cM/Mb)
0
20
40
60
80
100
r2
0.8
0.6
0.4
0.2
←GUSBP2
←HIST1H2BJ
PRSS16→
←ZNF204P
LINC01012→
←HIST1H4K
LINC00240→
←HIST1H2BK
←POM121L2
←ZNF184
LOC100131289→
←OR2B2
←LOC100270746
VN1R10P→
←HIST1H2BL
HIST1H2AG→
ZNF391→
HIST1H2AI→
HIST1H4I→
HIST1H3H→
HIST1H2AH→
←HIST1H2AJ
MIR3143→
HIST1H2BM→
HIST1H4J→
←HIST1H2AK
HIST1H2BN→
7 genes omitted
27
27.2
27.4
27.6
27.8
Position on chr6 (Mb)

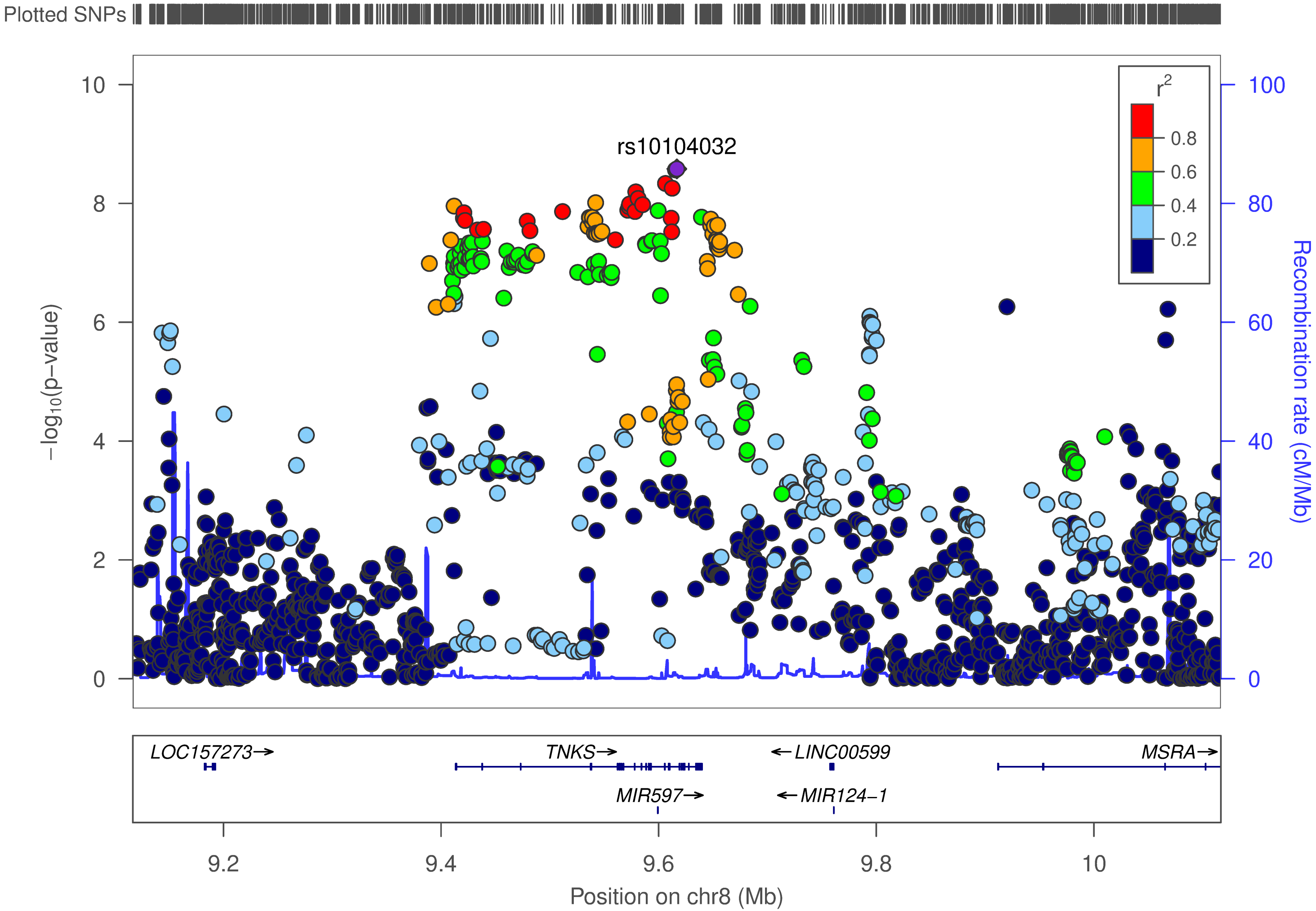

Plotted SNPs
r²
0.8
0.6
0.4
0.2
rs200968
−log10(p−value)
0
2
4
6
8
10
Recombination rate (cM/Mb)
0
20
40
60
80
100
ZNF391→
←ZNF184
LINC01012→
LOC100131289→
←HIST1H4K
←HIST1H2BL
HIST1H2AI→
HIST1H3H→
←HIST1H2AJ
HIST1H2BM→
HIST1H4J→
←HIST1H2AK
HIST1H2BN→
OR2B6→
←OR2B2
ZNF165→
ZSCAN12P1→
←ZSCAN16−AS1
ZSCAN16→
ZKSCAN8→
ZNF192P1→
←TOB2P1
ZSCAN9→
NKAPL→
←ZKSCAN4
ZSCAN26→
PGBD1→
←ZSCAN31
ZKSCAN3→
←ZSCAN12
7 genes omitted
27.4
27.6
27.8
28
28.2
Position on chr6 (Mb)

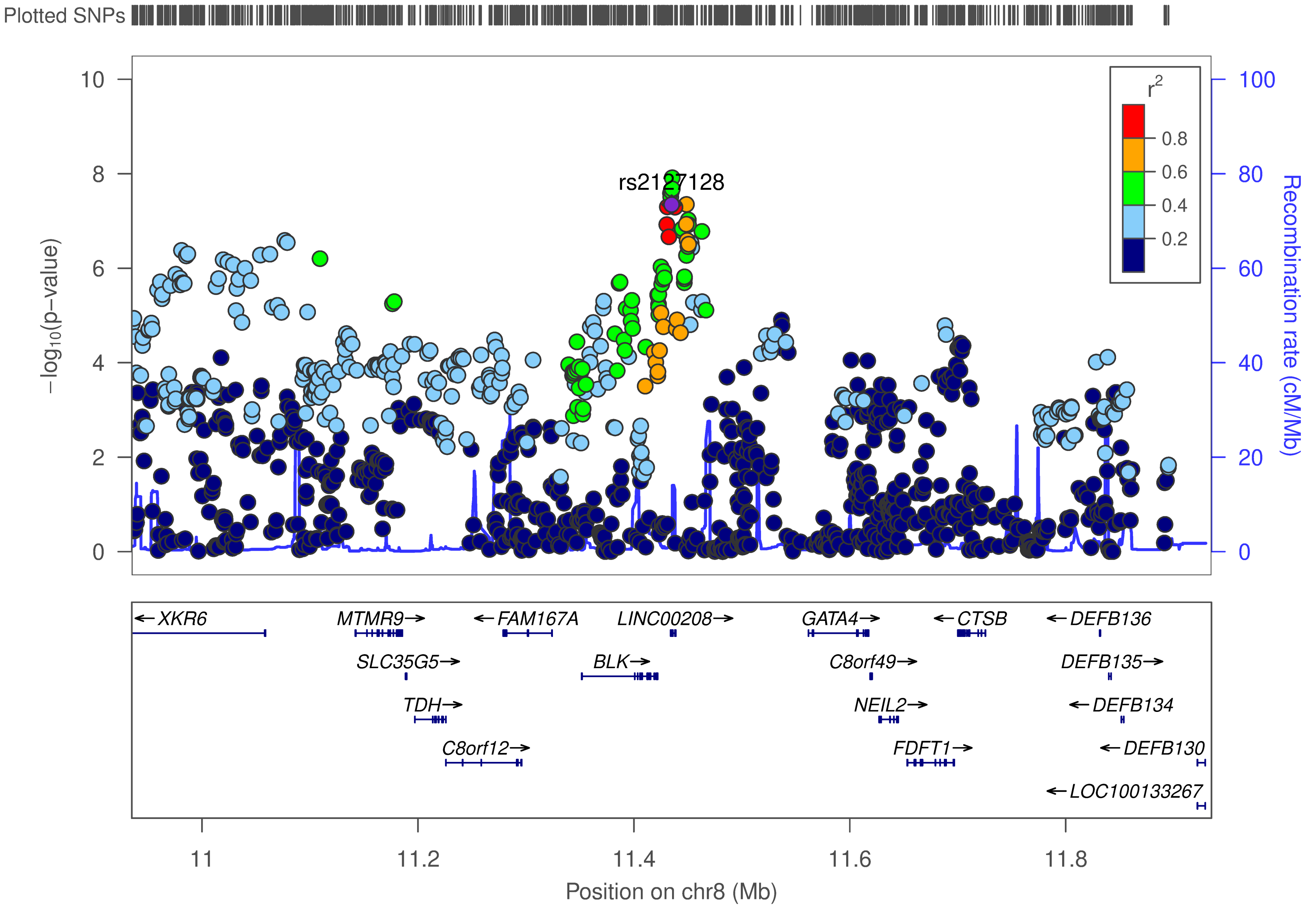

Plotted SNPs
−log10(p−value)
0
2
4
6
8
10
rs7752448
r²
0.8
0.6
0.4
0.2
Recombination rate (cM/Mb)
0
20
40
60
80
100
← HIST1H2AK
HIST1H2BN →
HIST1H2AL →
← HIST1H1B
← HIST1H3I
← HIST1H4L
← HIST1H3J
← HIST1H2AM
HIST1H2BO →
← OR2B2
ZNF165 →
ZSCAN12P1 →
← ZSCAN16−AS1
ZSCAN16 →
ZKSCAN8 →
ZNF192P1 →
← TOB2P1
ZSCAN9 →
NKAPL →
← ZKSCAN4
ZSCAN26 →
PGBD1 →
← ZSCAN31
ZKSCAN3 →
← ZSCAN12
← ZSCAN23
← GPX6
GPX5 →
← ZBED9
1 gene omitted
28
28.2
28.4
28.6
28.8
Position on chr6 (Mb)

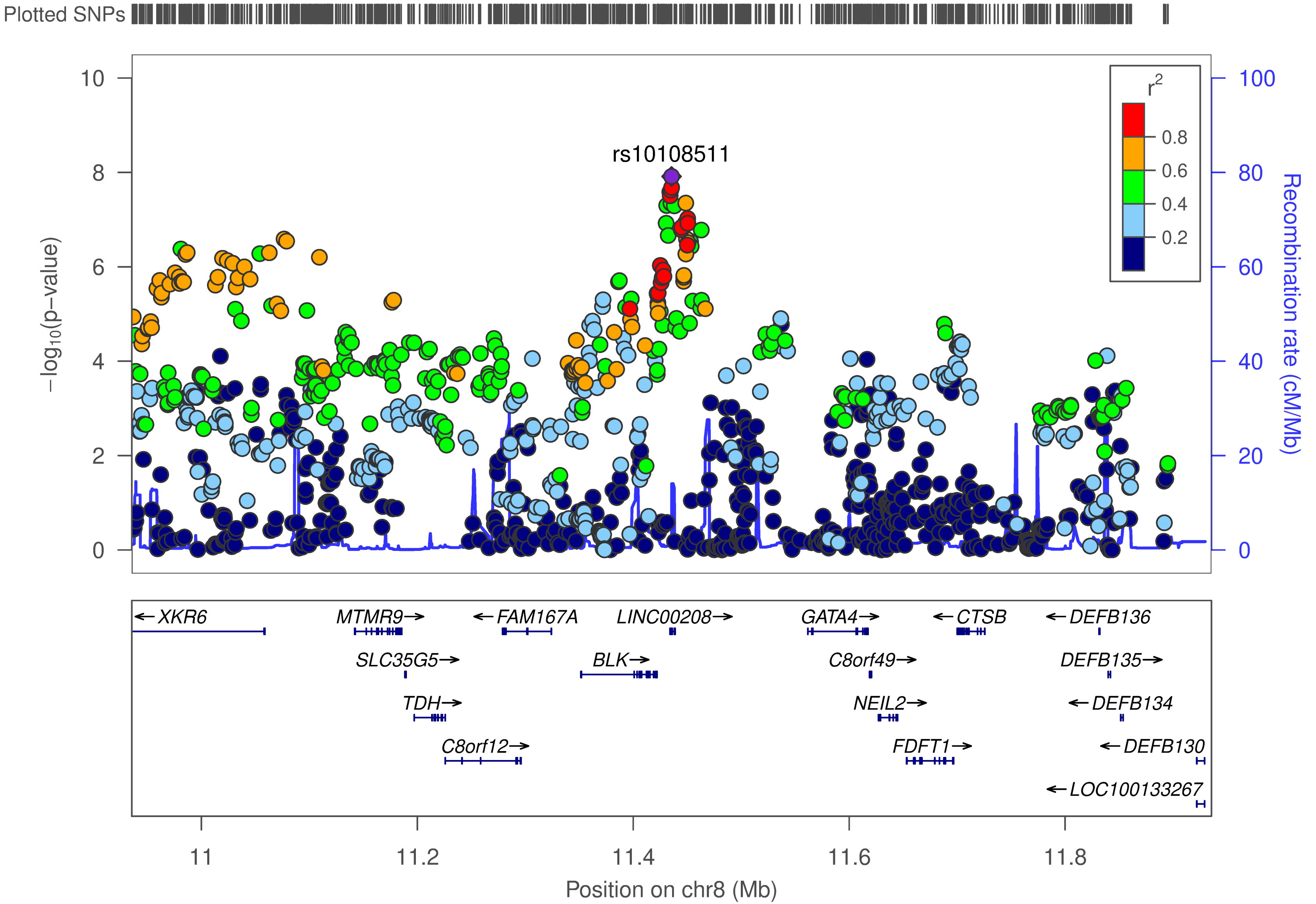

Plotted SNPs
r²
0.8
0.6
0.4
0.2
rs622217
−log10(p−value)
0
2
4
6
8
10
Recombination rate (cM/Mb)
0
20
40
60
80
100
MAS1→
IGF2R→
←SLC22A2
SLC22A3→
←LPA
PLG→
←AIRN
SLC22A1→
←LPAL2
LOC729603→
160.4
160.6
160.8
161
161.2
Position on chr6 (Mb)

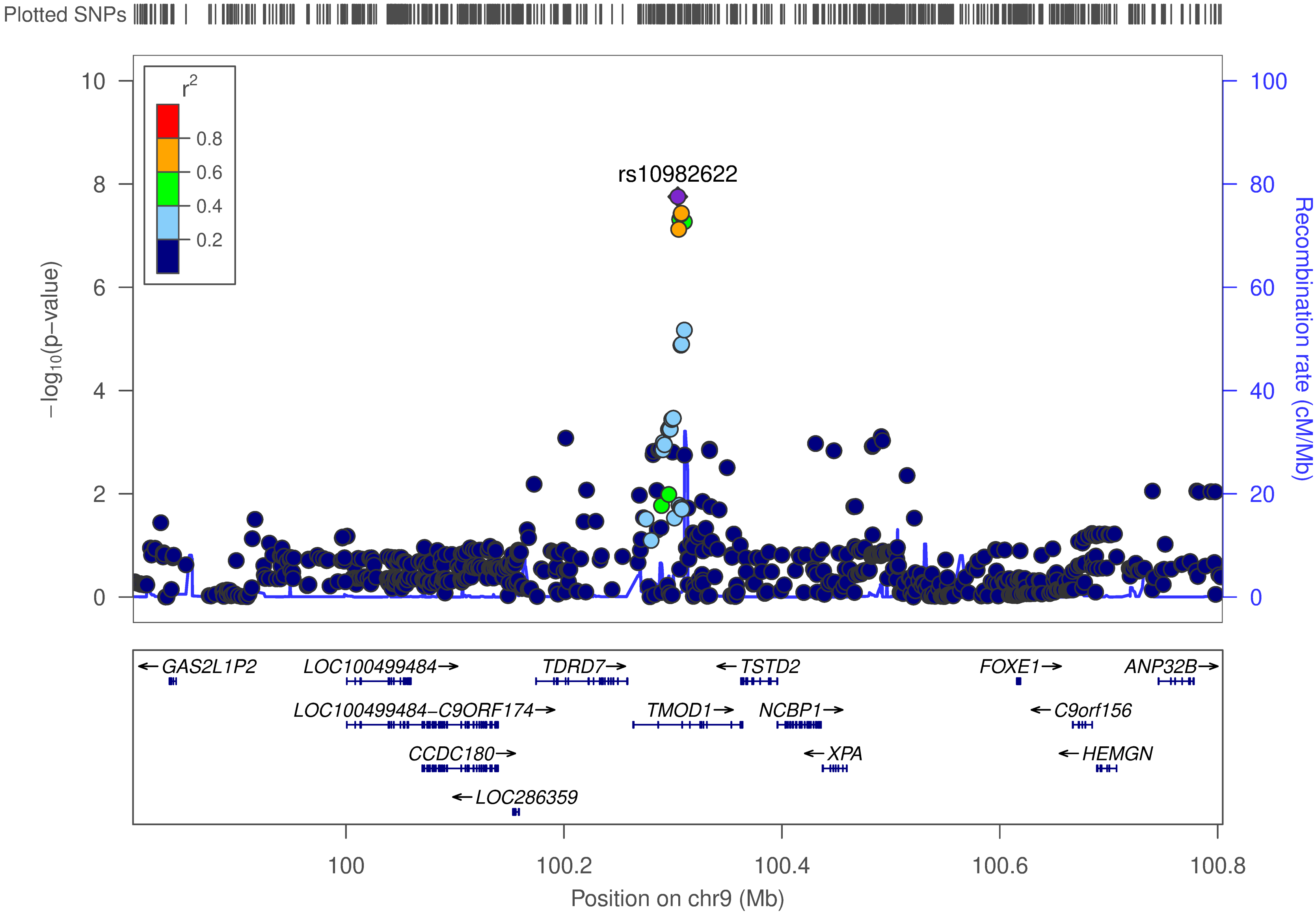

Plotted SNPs
rs2504930
r2
0.8
0.6
0.4
0.2
−log10(p−value)
10
8
6
4
2
0
Recombination rate (cM/Mb)
100
80
60
40
20
0
IGF2R→
←SLC22A2
SLC22A3→
←LPA
PLG→
←AIRN
SLC22A1→
←LPAL2
LOC729603→
160.4
160.6
160.8
161
161.2
Position on chr6 (Mb)

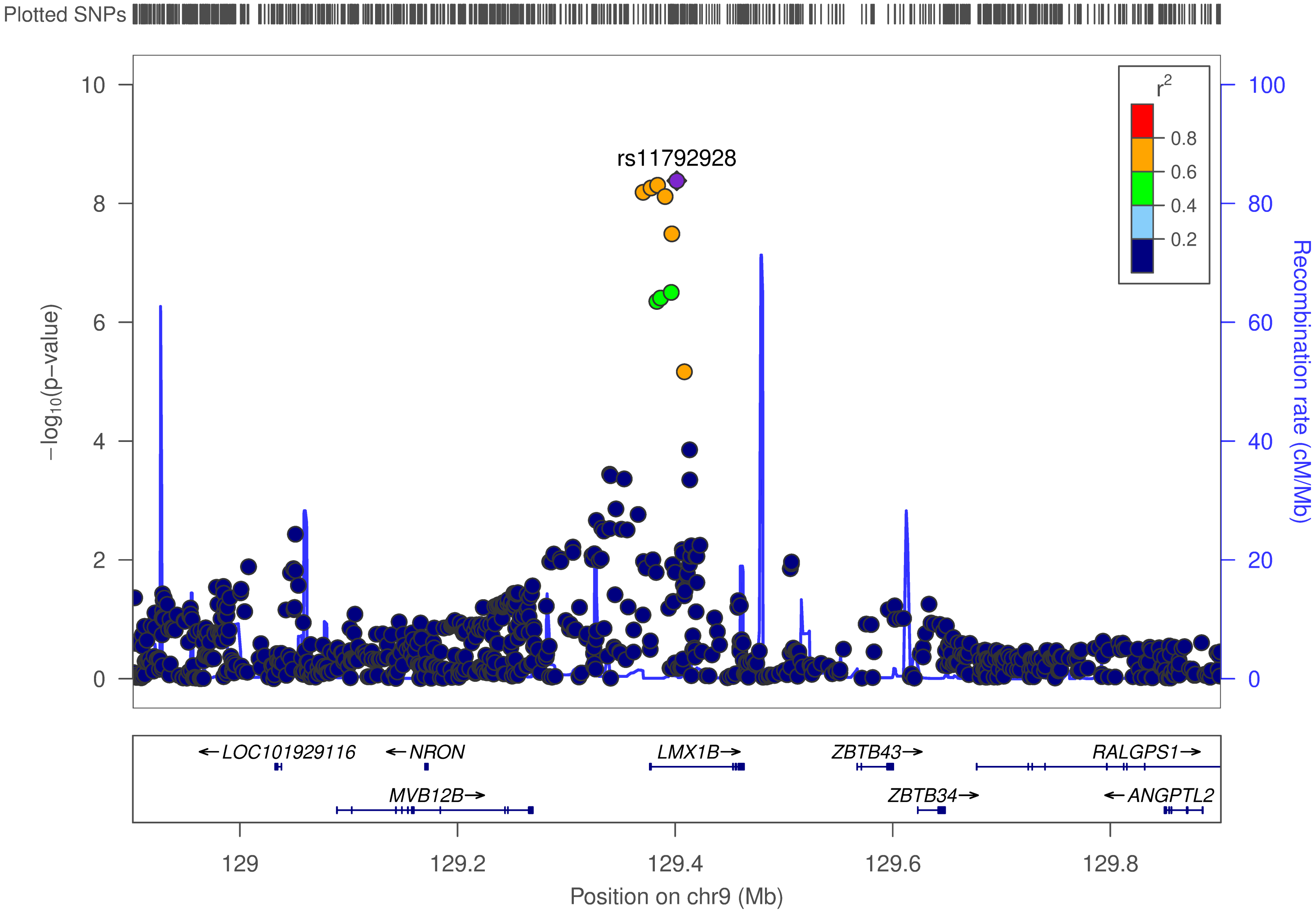

Plotted SNPs
r2
0.8
0.6
0.4
0.2
rs4841211
10
8
6
4
2
0
−log10(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
LOC157273→
TNKS→
←LINC00599
MSRA→
MIR597→
←MIR124−1
9.2
9.4
9.6
9.8
10
Position on chr8 (Mb)

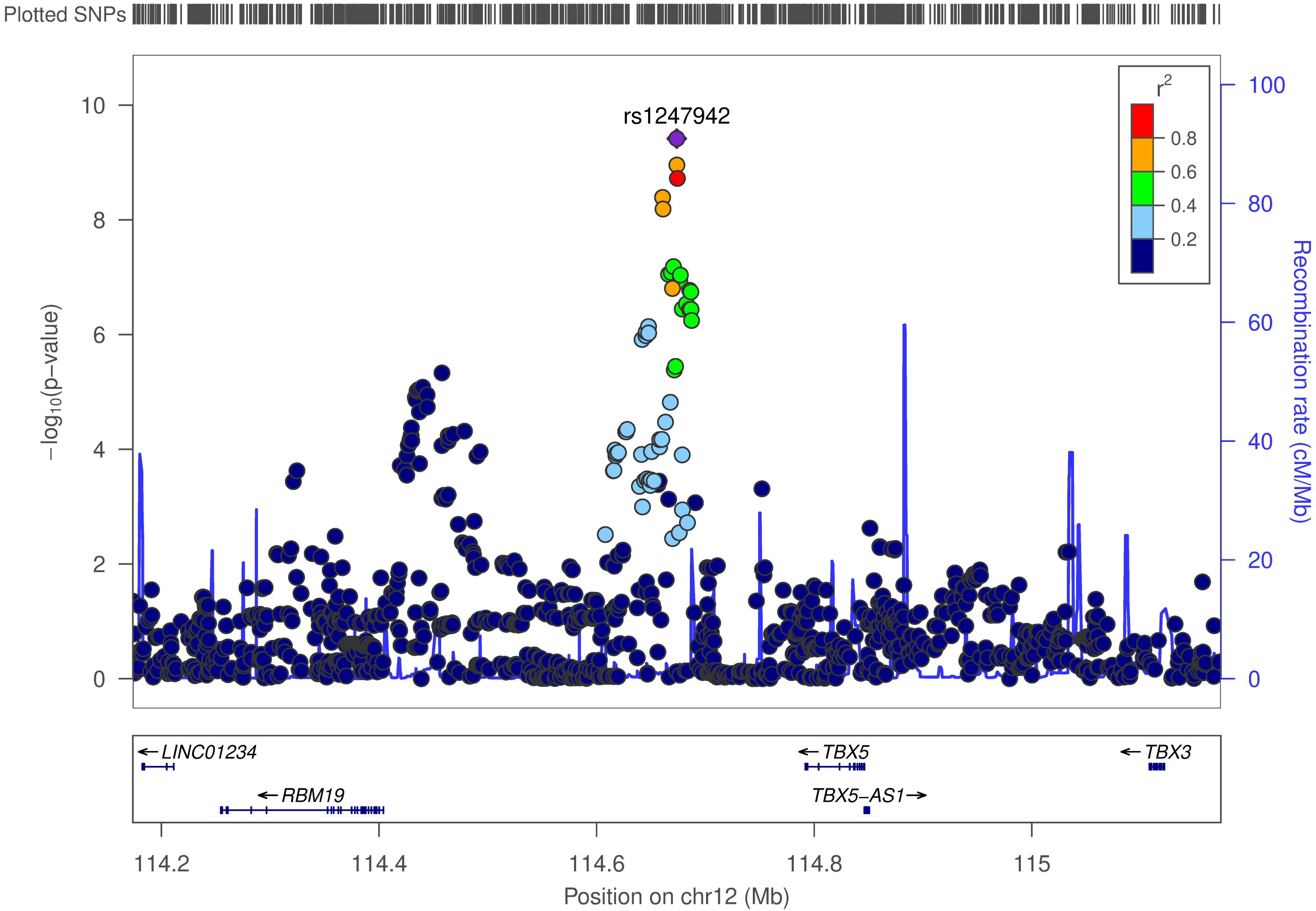

Plotted SNPs
rs10104032
r²
0.8
0.6
0.4
0.2
10
8
6
4
2
0
−log₁₀(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
LOC157273→
TNKS→
←LINC00599
MSRA→
MIR597→
←MIR124−1
9.2
9.4
9.6
9.8
10
Position on chr8 (Mb)

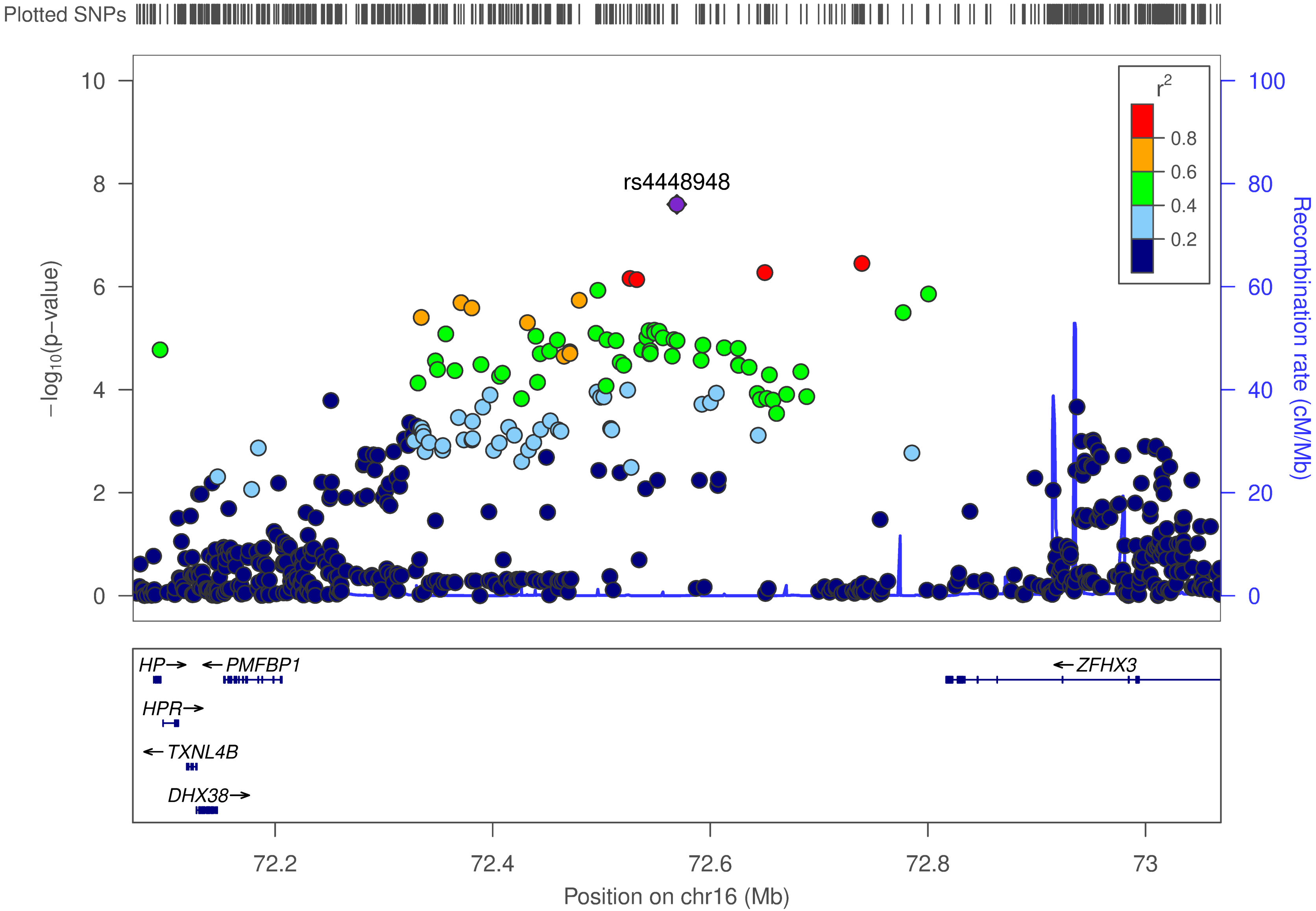

Plotted SNPs
rs2127128
r²
0.8
0.6
0.4
0.2
−log10(p−value)
10
8
6
4
2
0
Recombination rate (cM/Mb)
100
80
60
40
20
0
XKR6
MTMR9
FAM167A
LINC00208
GATA4
CTSB
DEFB136
SLC35G5
BLK
C8orf49
DEFB135
TDH
NEIL2
DEFB134
C8orf12
FDFT1
DEFB130
LOC100133267
11
11.2
11.4
11.6
11.8
Position on chr8 (Mb)

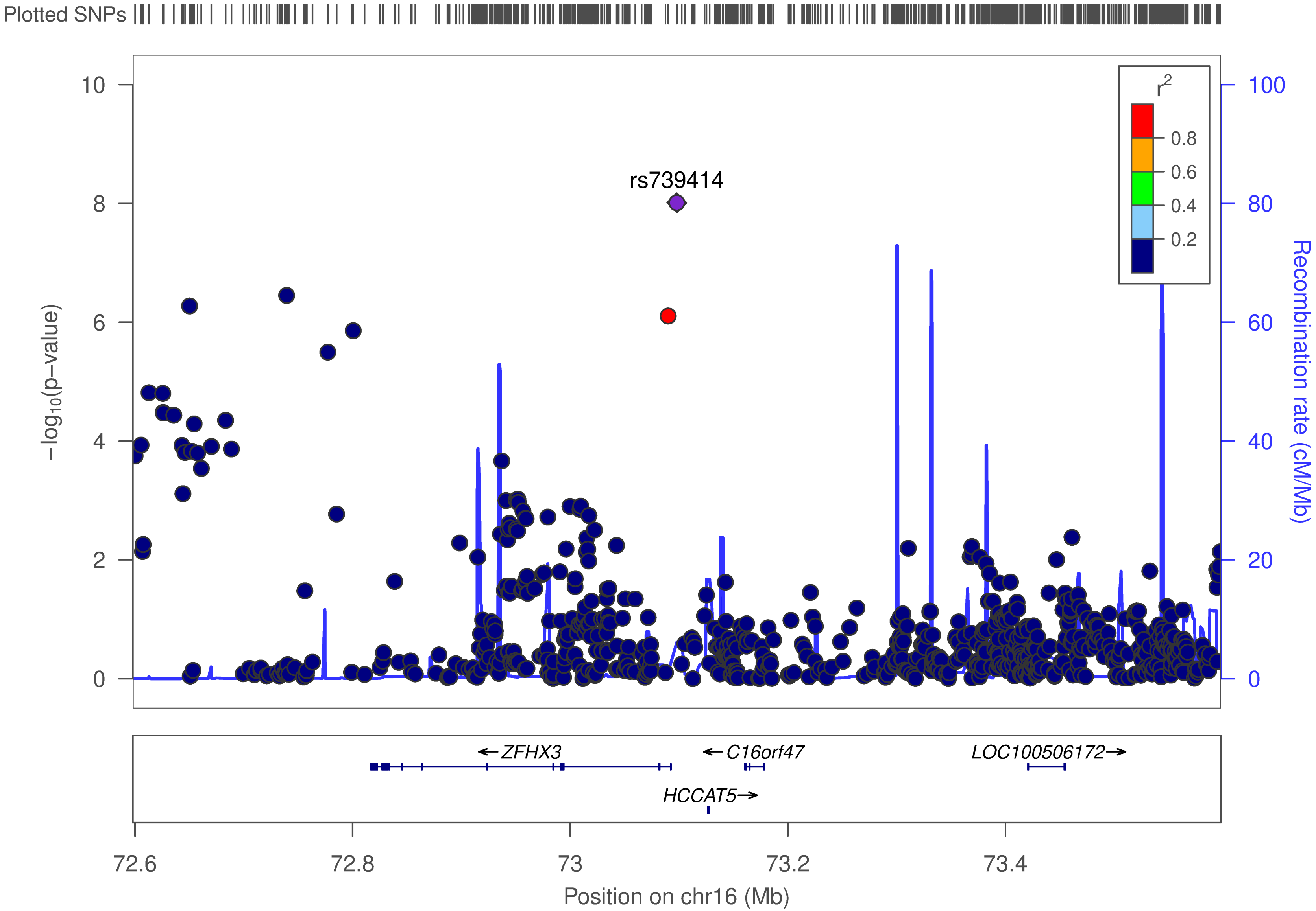

Plotted SNPs
rs10108511
−log10(p−value)
0
2
4
6
8
10
Recombination rate (cM/Mb)
0
20
40
60
80
100
r2
0.8
0.6
0.4
0.2
XKR6
MTMR9
FAM167A
LINC00208
GATA4
CTSB
DEFB136
SLC35G5
BLK
C8orf49
DEFB135
TDH
NEIL2
DEFB134
C8orf12
FDFT1
DEFB130
LOC100133267
11
11.2
11.4
11.6
11.8
Position on chr8 (Mb)

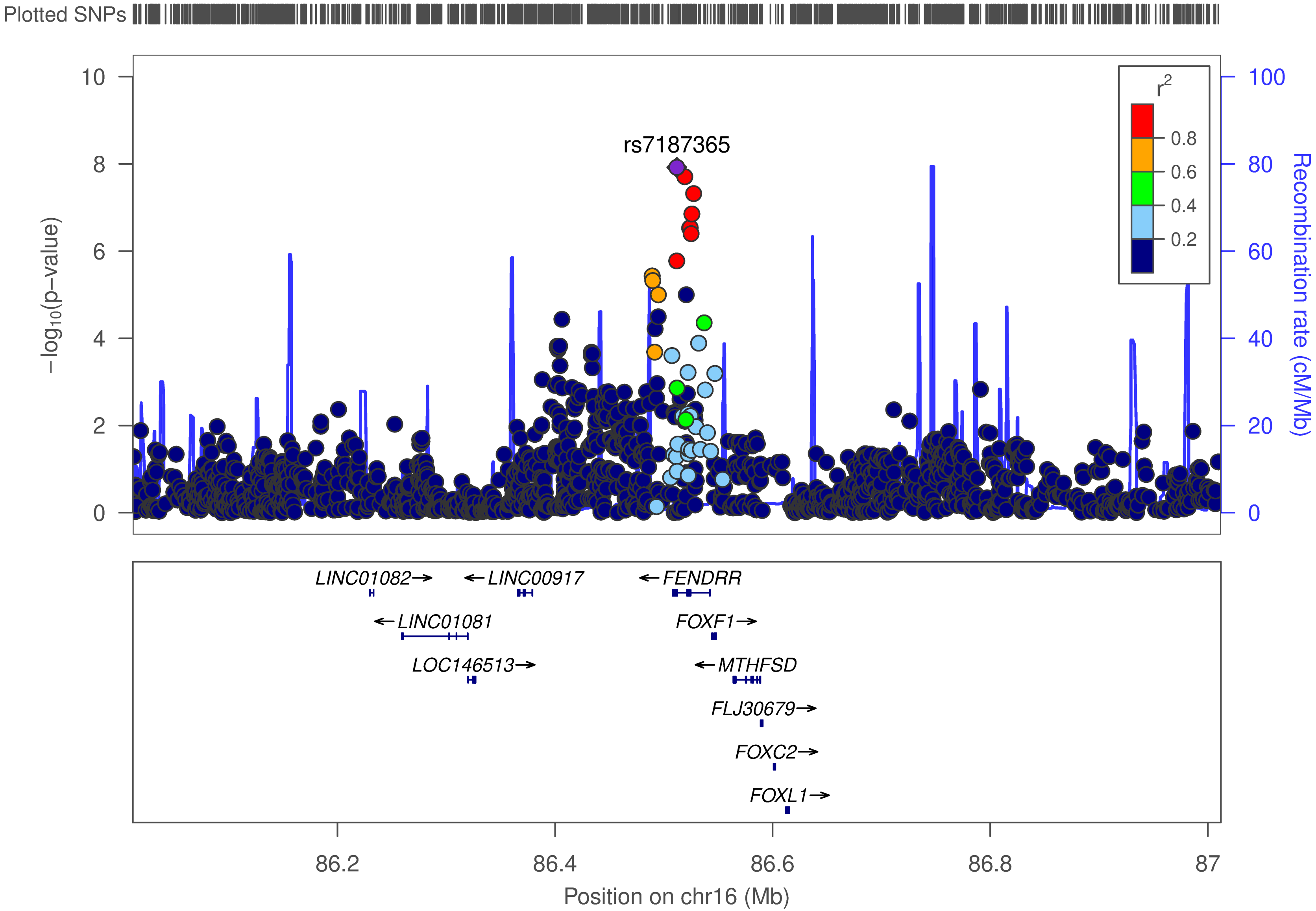

Plotted SNPs
r²
0.8
0.6
0.4
0.2
rs10982622
10
8
6
4
2
0
−log₁₀(p−value)
100
80
60
40
20
0
Recombination rate (cM/Mb)
←GAS2L1P2
LOC100499484→
TDRD7→
←TSTD2
FOXE1→
ANP32B→
LOC100499484−C9ORF174→
TMOD1→
NCBP1→
←C9orf156
CCDC180→
←XPA
←HEMGN
←LOC286359
100
100.2
100.4
100.6
100.8
Position on chr9 (Mb)

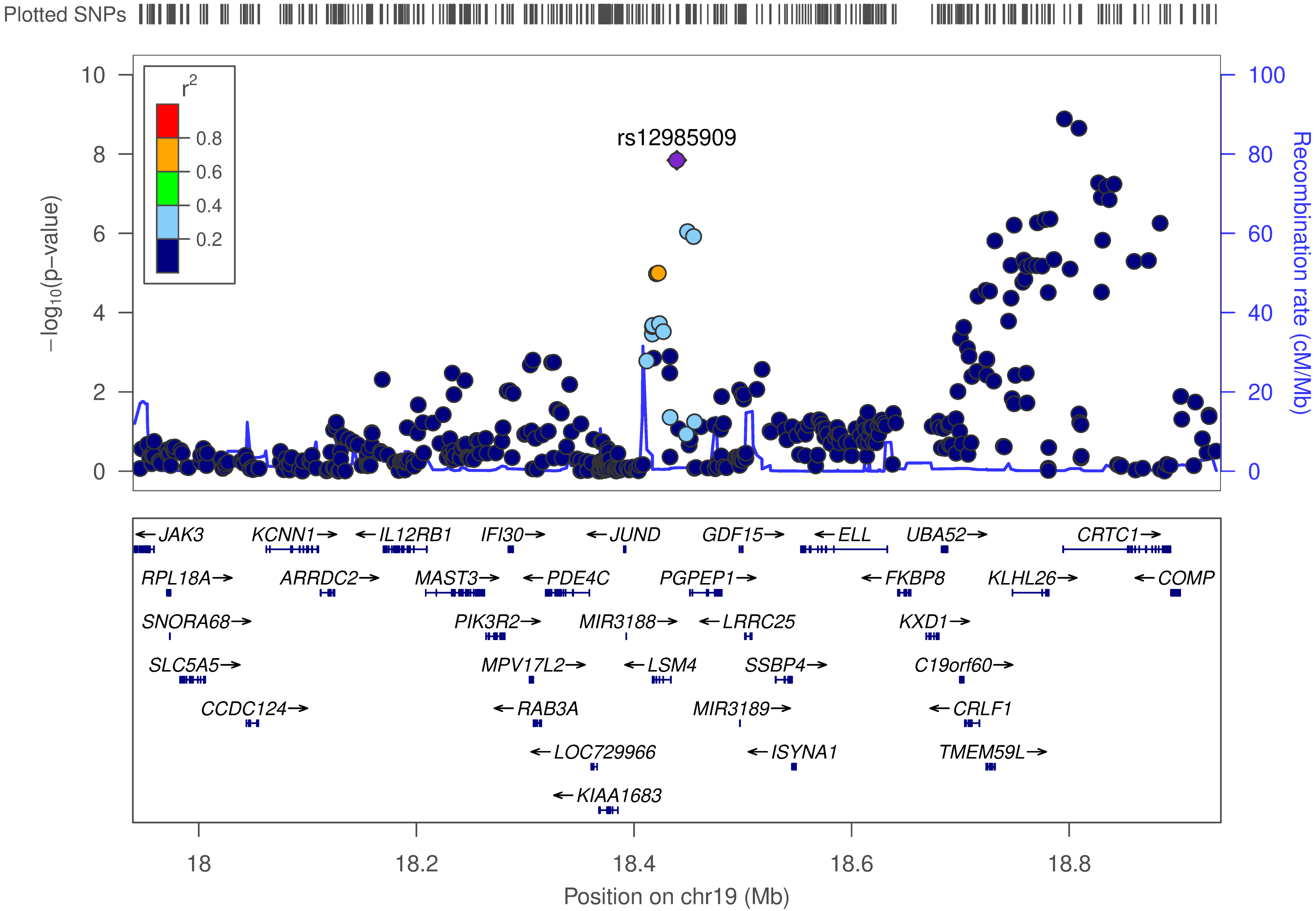

Plotted SNPs
rs11792928
r²
0.8
0.6
0.4
0.2
−log10(p−value)
10
8
6
4
2
0
Recombination rate (cM/Mb)
100
80
60
40
20
0
←LOC101929116
←NRON
LMX1B→
ZBTB43→
RALGPS1→
MVB12B→
ZBTB34→
←ANGPTL2
129
129.2
129.4
129.6
129.8
Position on chr9 (Mb)

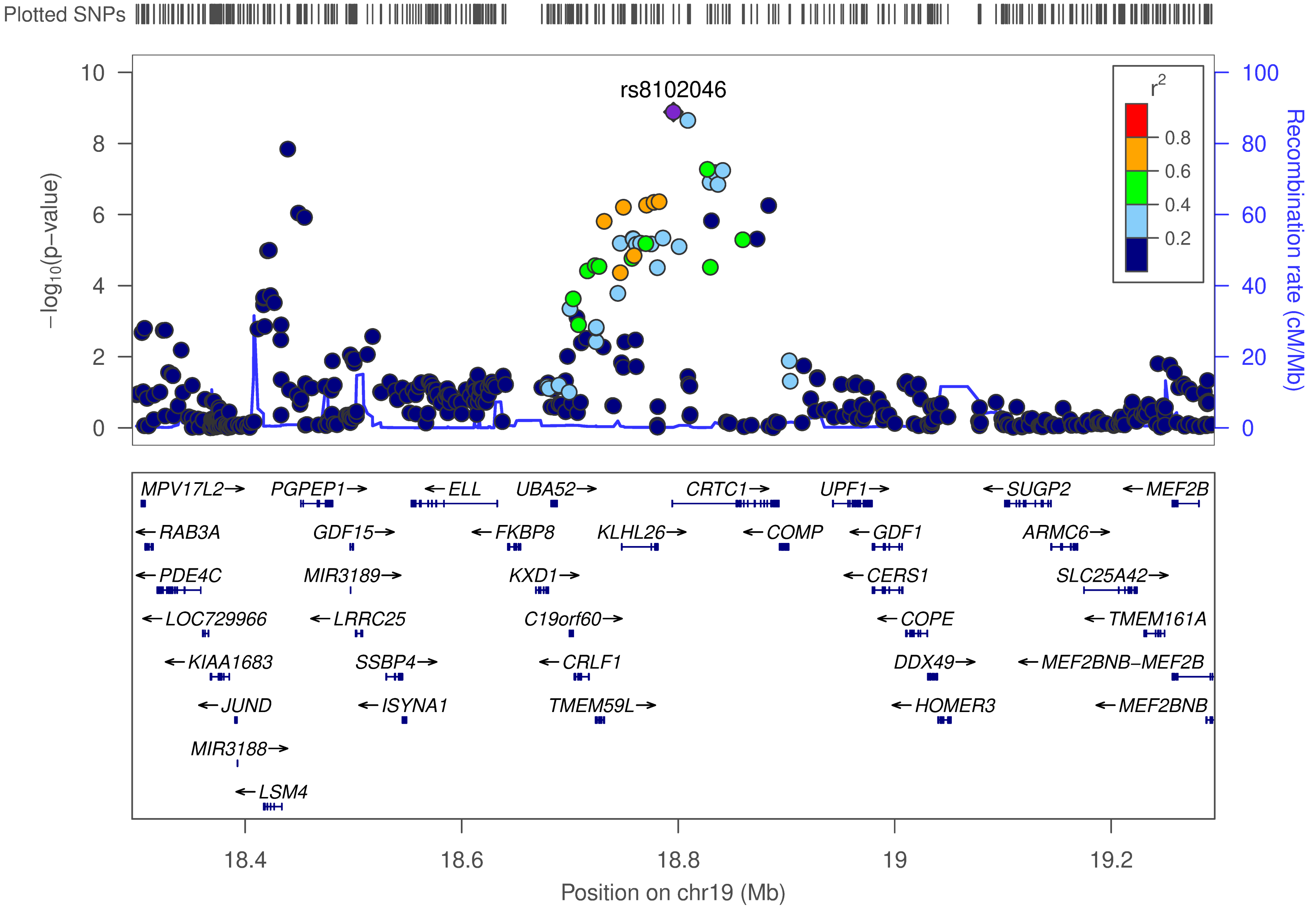

Plotted SNPs
rs1247942
r2
0.8
0.6
0.4
0.2
−log10(p−value)
0
2
4
6
8
10
Recombination rate (cM/Mb)
0
20
40
60
80
100
LINC01234
RBM19
TBX5
TBX5−AS1
TBX3
114.2
114.4
114.6
114.8
115
Position on chr12 (Mb)

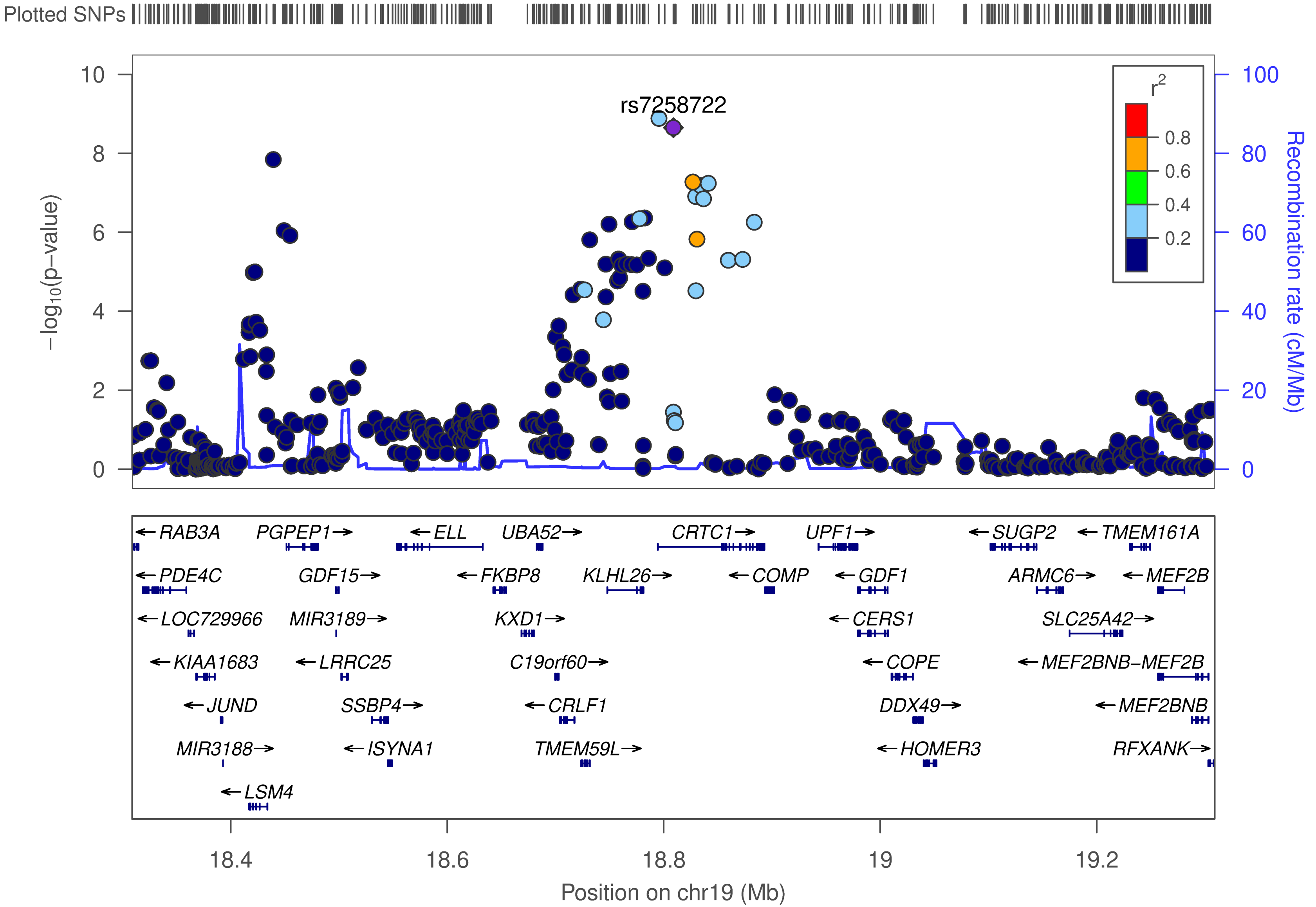

Plotted SNPs
rs4448948
r2
0.8
0.6
0.4
0.2
−log10(p−value)
10
8
6
4
2
0
Recombination rate (cM/Mb)
100
80
60
40
20
0
HP→
←PMFBP1
HPR→
←TXNL4B
DHX38→
←ZFHX3
72.2
72.4
72.6
72.8
73
Position on chr16 (Mb)

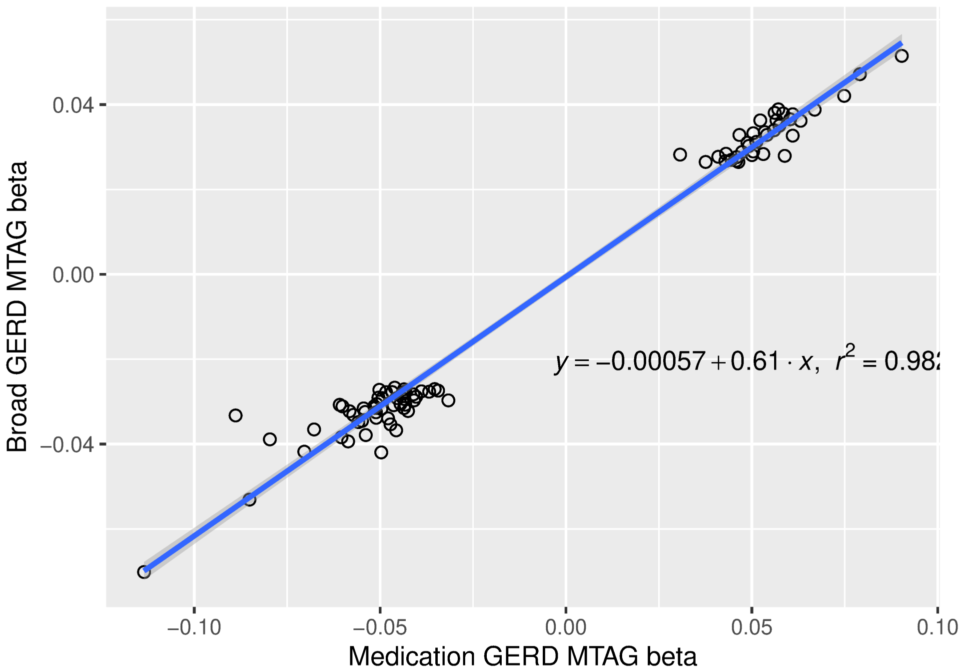

Plotted SNPs
rs739414
−log10(p−value)
10
8
6
4
2
0
Recombination rate (cM/Mb)
100
80
60
40
20
0
r2
0.8
0.6
0.4
0.2
← ZFHX3
← C16orf47
LOC100506172 →
HCCAT5 →
72.6
72.8
73
73.2
73.4
Position on chr16 (Mb)

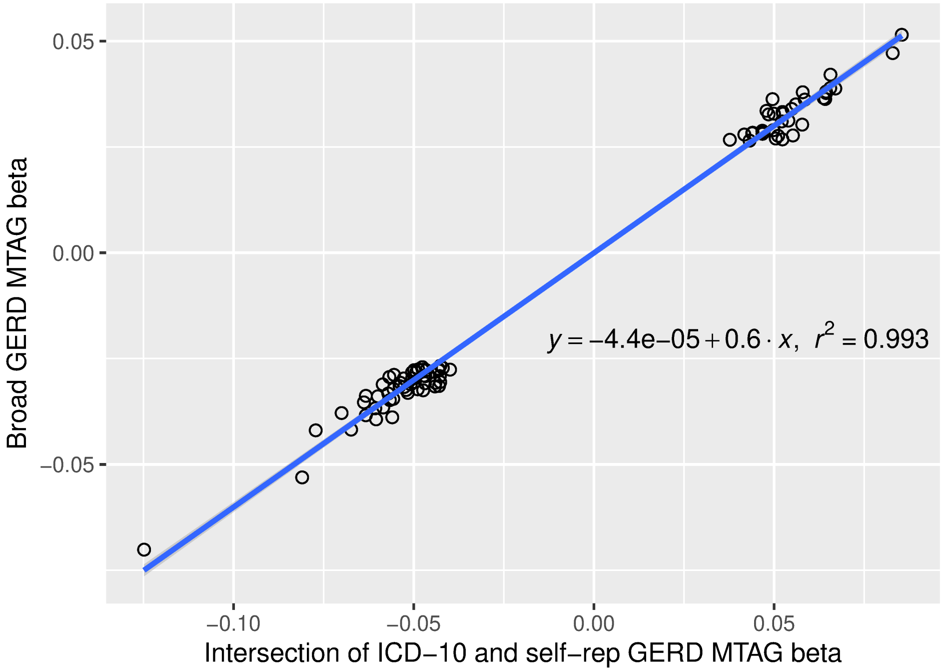

Plotted SNPs
rs7187365
−log10(p−value)
0
2
4
6
8
10
Recombination rate (cM/Mb)
0
20
40
60
80
100
r2
0.8
0.6
0.4
0.2
LINC01082→
←LINC00917
←FENDRR
←LINC01081
FOXF1→
LOC146513→
←MTHFSD
FLJ30679→
FOXC2→
FOXL1→
86.2
86.4
86.6
86.8
87
Position on chr16 (Mb)

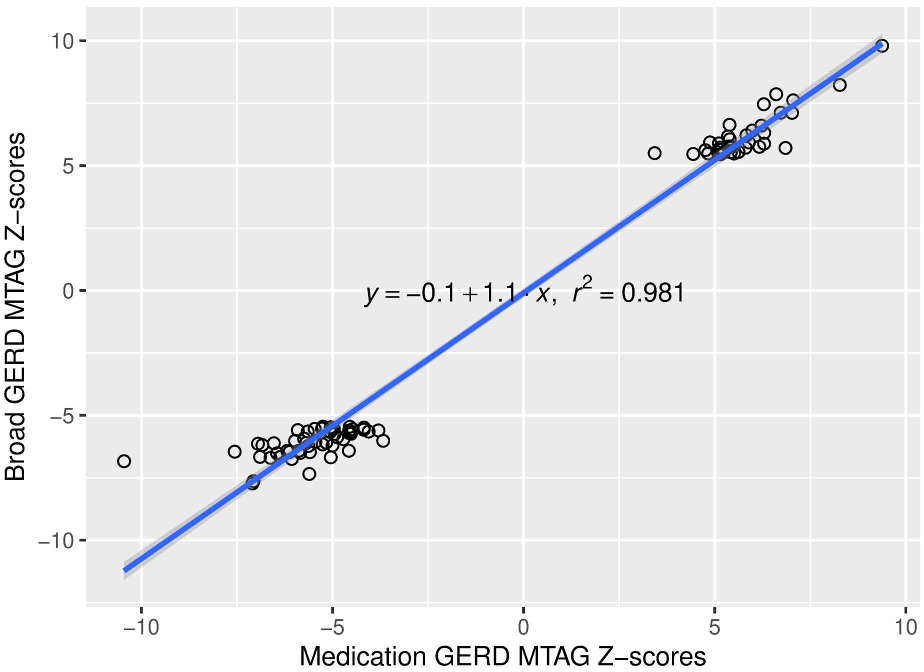

Plotted SNPs
r²
0.8
0.6
0.4
0.2
rs12985909
−log10(p−value)
10
8
6
4
2
0
Recombination rate (cM/Mb)
100
80
60
40
20
0
←JAK3
KCNN1→
←IL12RB1
IFI30→
←JUND
GDF15→
←ELL
UBA52→
CRTC1→
RPL18A→
ARRDC2→
MAST3→
←PDE4C
PGPEP1→
←FKBP8
KLHL26→
←COMP
SNORA68→
PIK3R2→
MIR3188→
←LRRC25
KXD1→
SLC5A5→
MPV17L2→
←LSM4
SSBP4→
C19orf60→
CCDC124→
←RAB3A
MIR3189→
←CRLF1
←LOC729966
←ISYNA1
TMEM59L→
←KIAA1683
18
18.2
18.4
18.6
18.8
Position on chr19 (Mb)

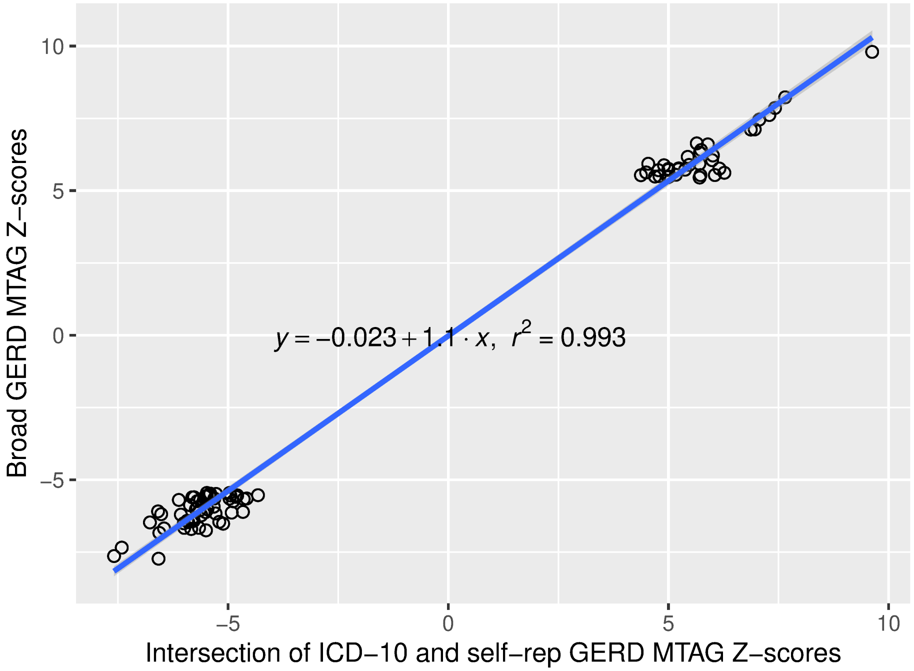

Plotted SNPs
rs8102046
r2
0.8
0.6
0.4
0.2
−log10(p−value)
Recombination rate (cM/Mb)
0
2
4
6
8
10
0
20
40
60
80
100
MPV17L2→
PGPEP1→
←ELL
UBA52→
CRTC1→
UPF1→
←SUGP2
←MEF2B
←RAB3A
GDF15→
←FKBP8
KLHL26→
←COMP
←GDF1
ARMC6→
←PDE4C
MIR3189→
KXD1→
←CERS1
SLC25A42→
←LOC729966
←LRRC25
C19orf60→
←COPE
←TMEM161A
←KIAA1683
SSBP4→
←CRLF1
DDX49→
←MEF2BNB−MEF2B
←JUND
←ISYNA1
TMEM59L→
←HOMER3
←MEF2BNB
MIR3188→
←LSM4
18.4
18.6
18.8
19
19.2
Position on chr19 (Mb)


Plotted SNPs
rs7258722
−log10(p−value)
0
2
4
6
8
10
Recombination rate (cM/Mb)
0
20
40
60
80
100
r2
0.8
0.6
0.4
0.2
←RAB3A
PGPEP1→
←ELL
UBA52→
CRTC1→
UPF1→
←SUGP2
←TMEM161A
←PDE4C
GDF15→
←FKBP8
KLHL26→
←COMP
←GDF1
ARMC6→
←MEF2B
←LOC729966
MIR3189→
KXD1→
←CERS1
SLC25A42→
←KIAA1683
←LRRC25
C19orf60→
←COPE
←MEF2BNB−MEF2B
←JUND
SSBP4→
←CRLF1
DDX49→
←MEF2BNB
MIR3188→
←ISYNA1
TMEM59L→
←HOMER3
RFXANK→
←LSM4
18.4
18.6
18.8
19
19.2
Position on chr19 (Mb)

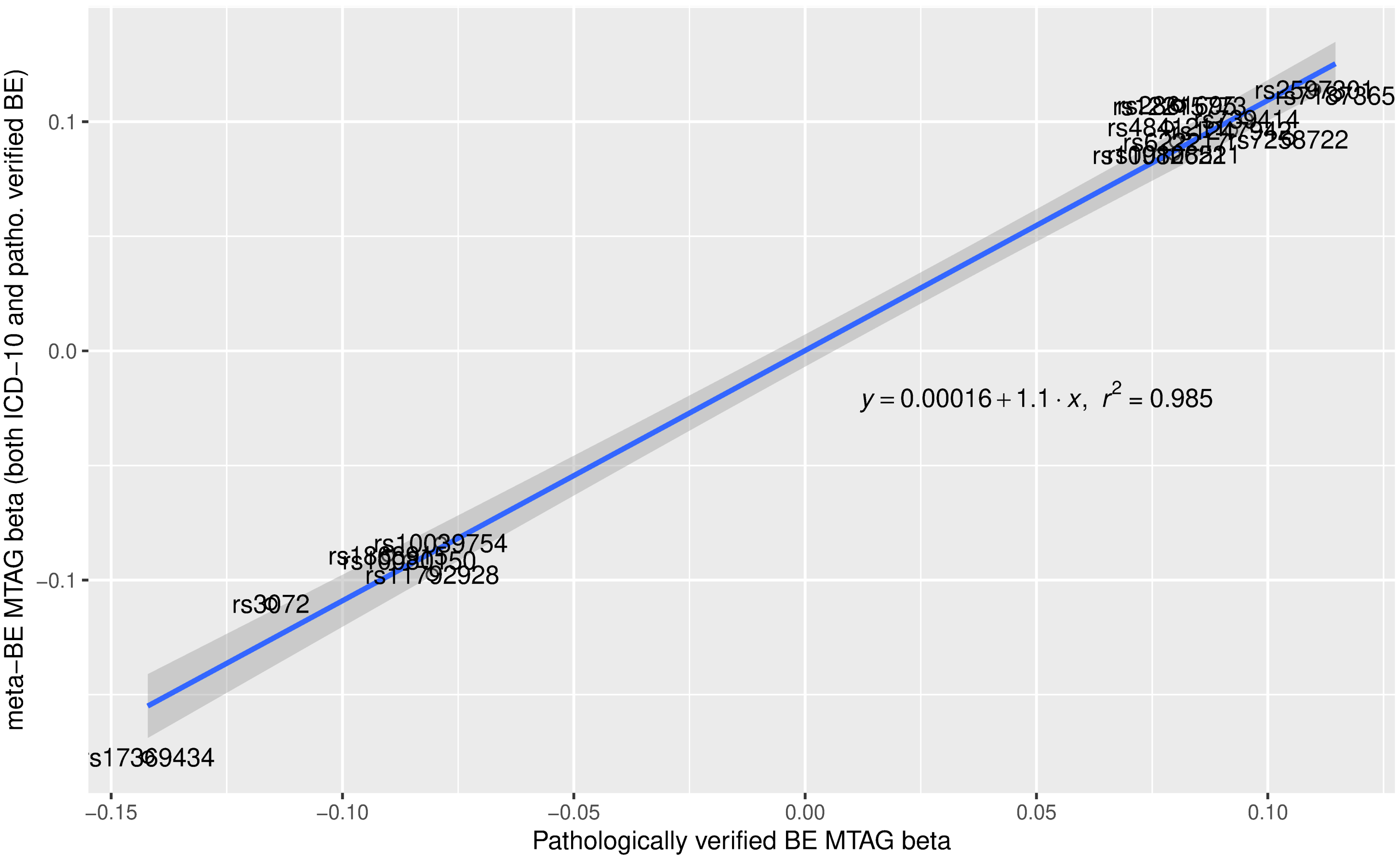

Panel (A) Comparison of MTAG GERD betas


Panel (B) Comparison of MTAG GERD betas

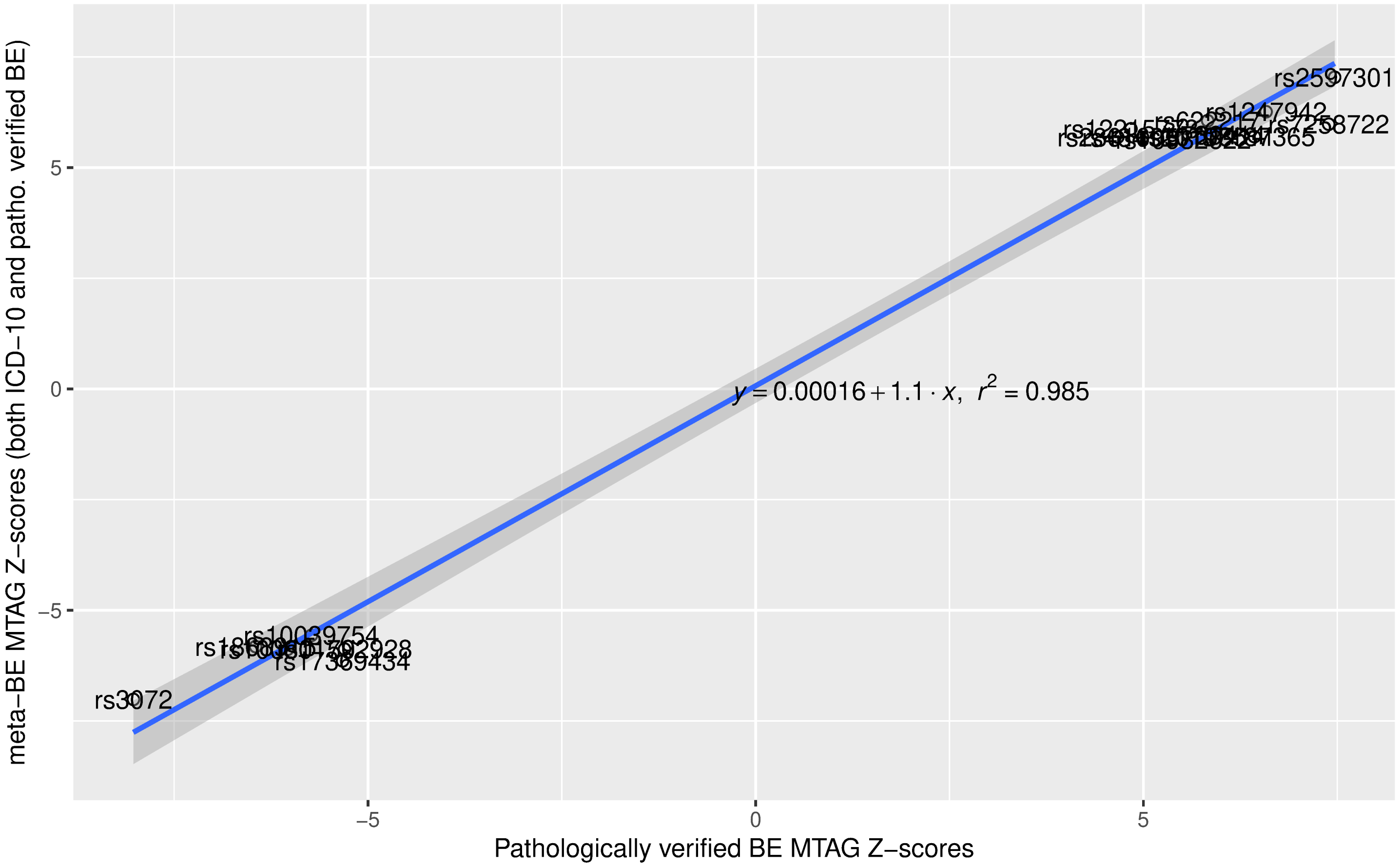

Panel (C) Comparison of MTAG GERD Z−scores


Panel (D) Comparison of MTAG GERD z−scores

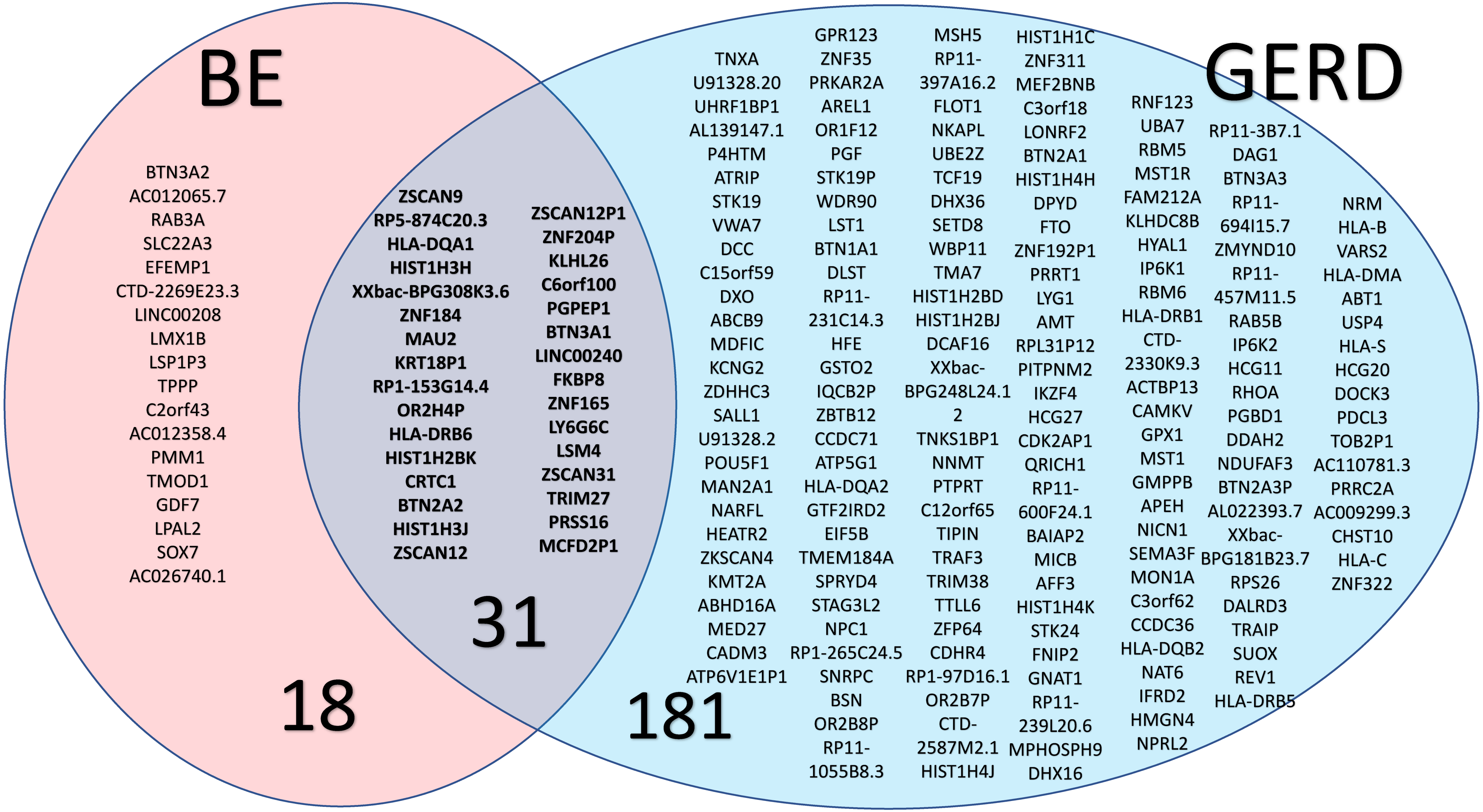
Panel (A) Comparison of MTAG BE beta estimates



Panel (B) Comparison of MTAG BE Z−scores



Putative genes identified with GERD and BE susceptibility from the MTAG model using multiXcan



BE

BTN3A2
AC012065.7
RAB3A
SLC22A3
EFEMP1
CTD-2269E23.3
LINC00208
LMX1B
LSP1P3
TPPP
C2orf43
AC012358.4
PMM1
TMOD1
GDF7
LPAL2
SOX7
AC026740.1

18

ZSCAN9
RP5-874C20.3
HLA-DQA1
HIST1H3H
XXbac-BPG308K3.6
ZNF184
MAU2
KRT18P1
RP1-153G14.4
OR2H4P
HLA-DRB6
HIST1H2BK
CRTC1
BTN2A2
HIST1H3J
ZSCAN12

ZSCAN12P1
ZNF204P
KLHL26
C6orf100
PGPEP1
BTN3A1
LINC00240
FKBP8
ZNF165
LY6G6C
LSM4
ZSCAN31
TRIM27
PRSS16
MCFD2P1

31

GERD

TNXA
U91328.20
UHRF1BP1
AL139147.1
P4HTM
ATRIP
STK19
VWA7
DCC
C15orf59
DXO
ABCB9
MDFIC
KCNG2
ZDHHC3
SALL1
U91328.2
POU5F1
MAN2A1
NARFL
HEATR2
ZKSCAN4
KMT2A
ABHD16A
MED27
CADM3
ATP6V1E1P1

GPR123
ZNF35
PRKAR2A
AREL1
OR1F12
PGF
STK19P
WDR90
LST1
BTN1A1
DLST
RP11-231C14.3
HFE
GSTO2
IQCB2P
ZBTB12
CCDC71
ATP5G1
HLA-DQA2
GTF2IRD2
EIF5B
TMEM184A
SPRYD4
STAG3L2
NPC1
RP1-265C24.5
SNRPC
BSN
OR2B8P
RP11-1055B8.3

MSH5
RP11-397A16.2
FLOT1
NKAPL
UBE2Z
TCF19
DHX36
SETD8
WBP11
TMA7
HIST1H2BD
HIST1H2BJ
DCAF16
XXbac-BPG248L24.12
TNKS1BP1
NNMT
PTPRT
C12orf65
TIPIN
TRAF3
TRIM38
TTLL6
ZFP64
CDHR4
RP1-97D16.1
OR2B7P
CTD-2587M2.1
HIST1H4J

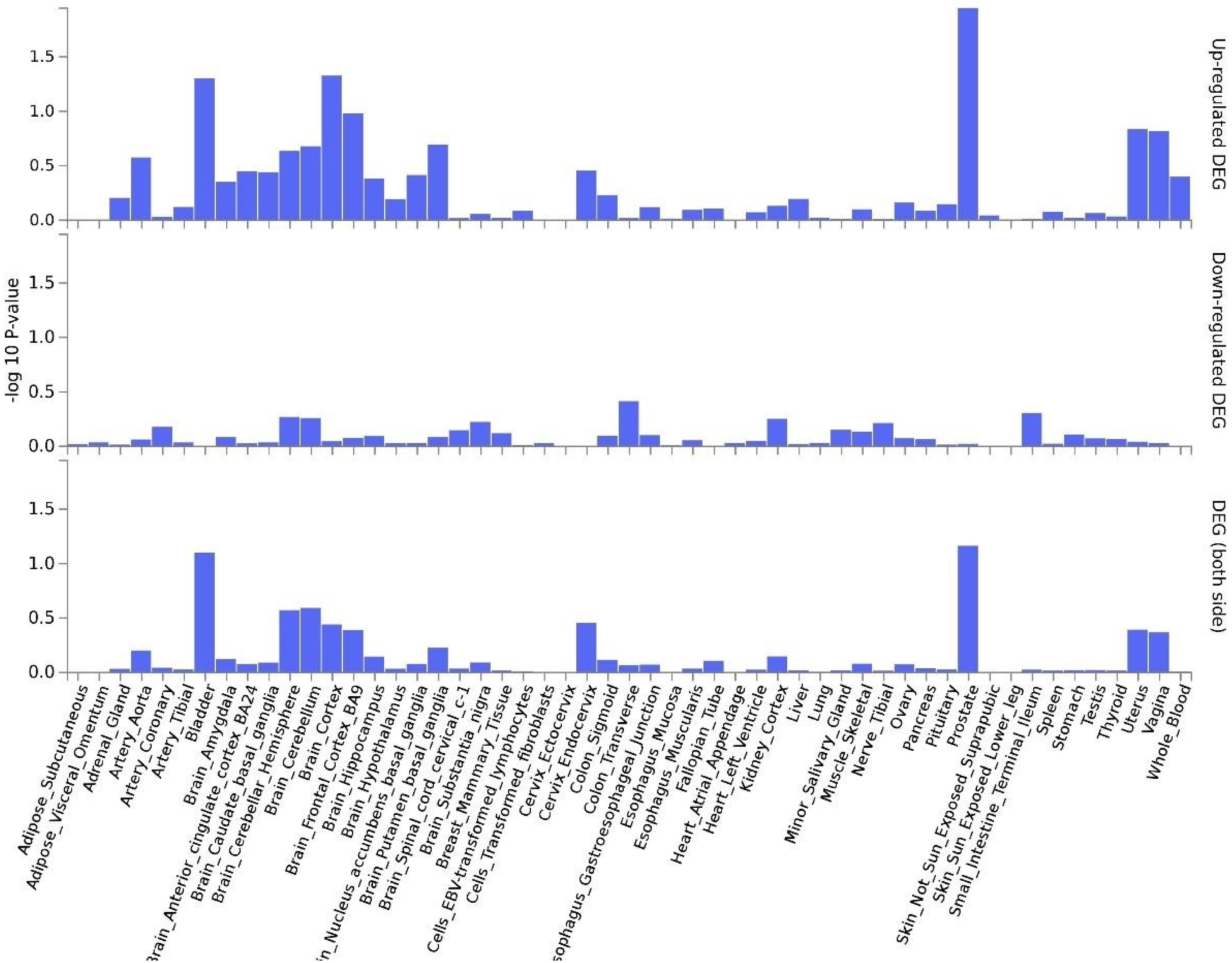
HIST1H1C
ZNF311
MEF2BNB
C3orf18
LONRF2
BTN2A1
HIST1H4H
DPYD
FTO
ZNF192P1
PRRT1
LYG1
AMT
RPL31P12
PITPNM2
IKZF4
HCG27
CDK2AP1
QRICH1
RP11-600F24.1
BAIAP2
MICB
AFF3
HIST1H4K
STK24
FNIP2
GNAT1
RP11-239L20.6
MPHOSPH9
DHX16

RNF123
UBA7
RBM5
MST1R
FAM212A
KLHDC8B
HYAL1
IP6K1
RBM6
HLA-DRB1
CTD-2330K9.3
ACTBP13
CAMKV
GPX1
MST1
GMPPB
APEH
NICN1
SEMA3F
MON1A
C3orf62
CCDC36
HLA-DQB2
NAT6
IFRD2
HMGN4
NPRL2

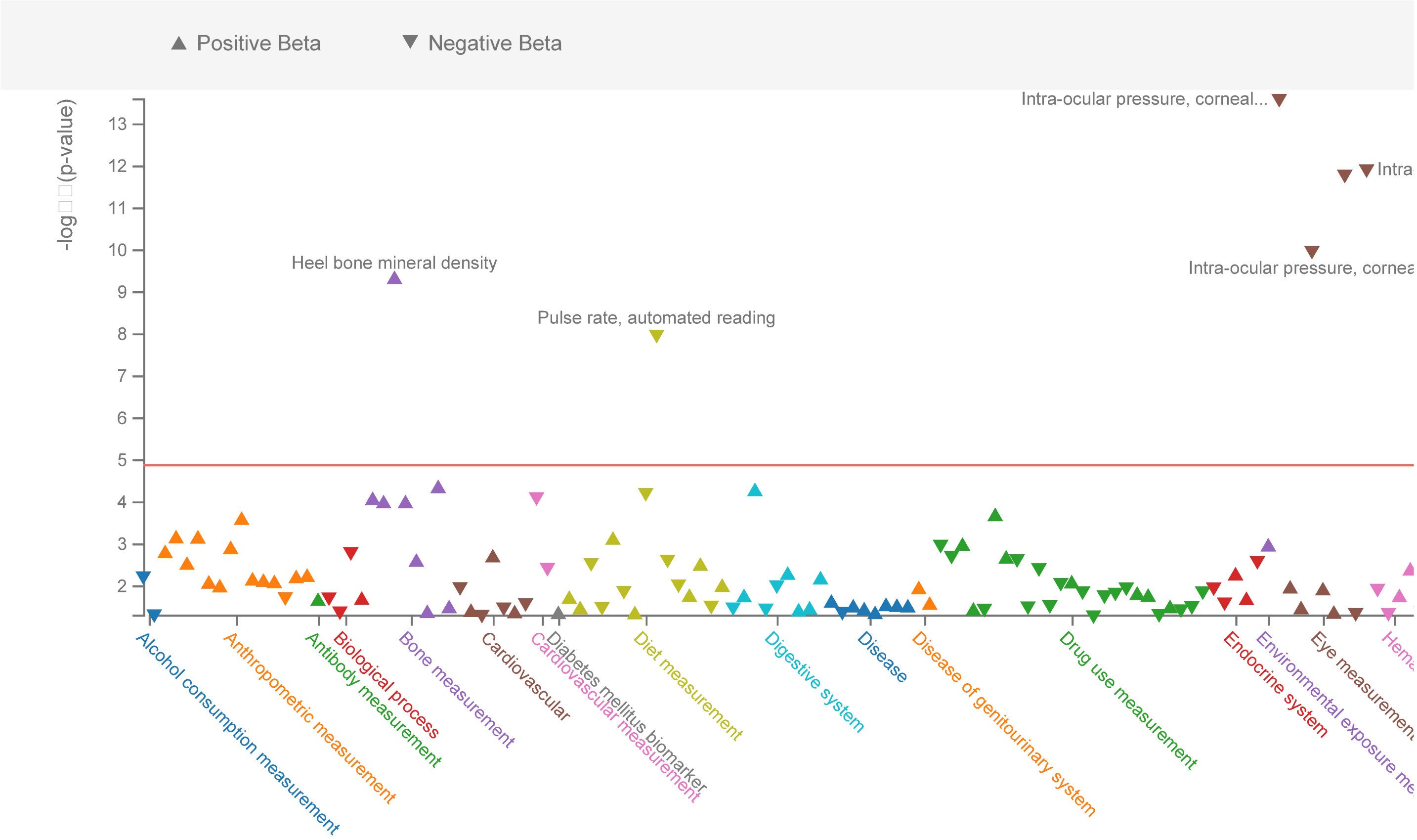
RP11-3B7.1
DAG1
BTN3A3
RP11-694I15.7
ZMYND10
RP11-457M11.5
RAB5B
IP6K2
HCG11
RHOA
PGBD1
DDAH2
NDUFAF3
BTN2A3P
AL022393.7
XXbac-BPG181B23.7
RPS26
DALRD3
TRAIP
SUOX
REV1
HLA-DRB5

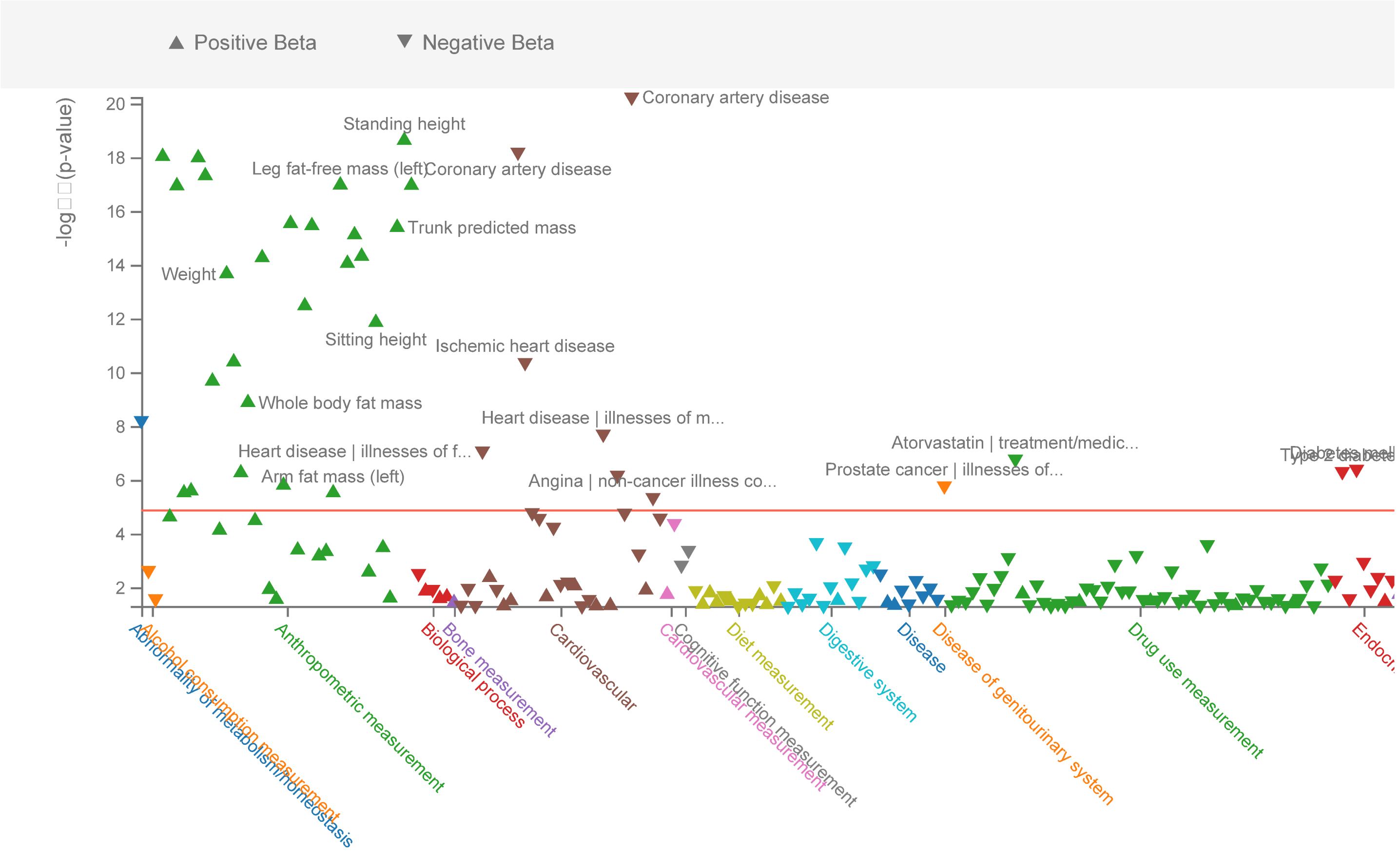
NRM
HLA-B
VARS2
HLA-DMA
ABT1
USP4
HLA-S
HCG20
DOCK3
PDCL3
TOB2P1
AC110781.3
PRRC2A
AC009299.3
CHST10
HLA-C
ZNF322

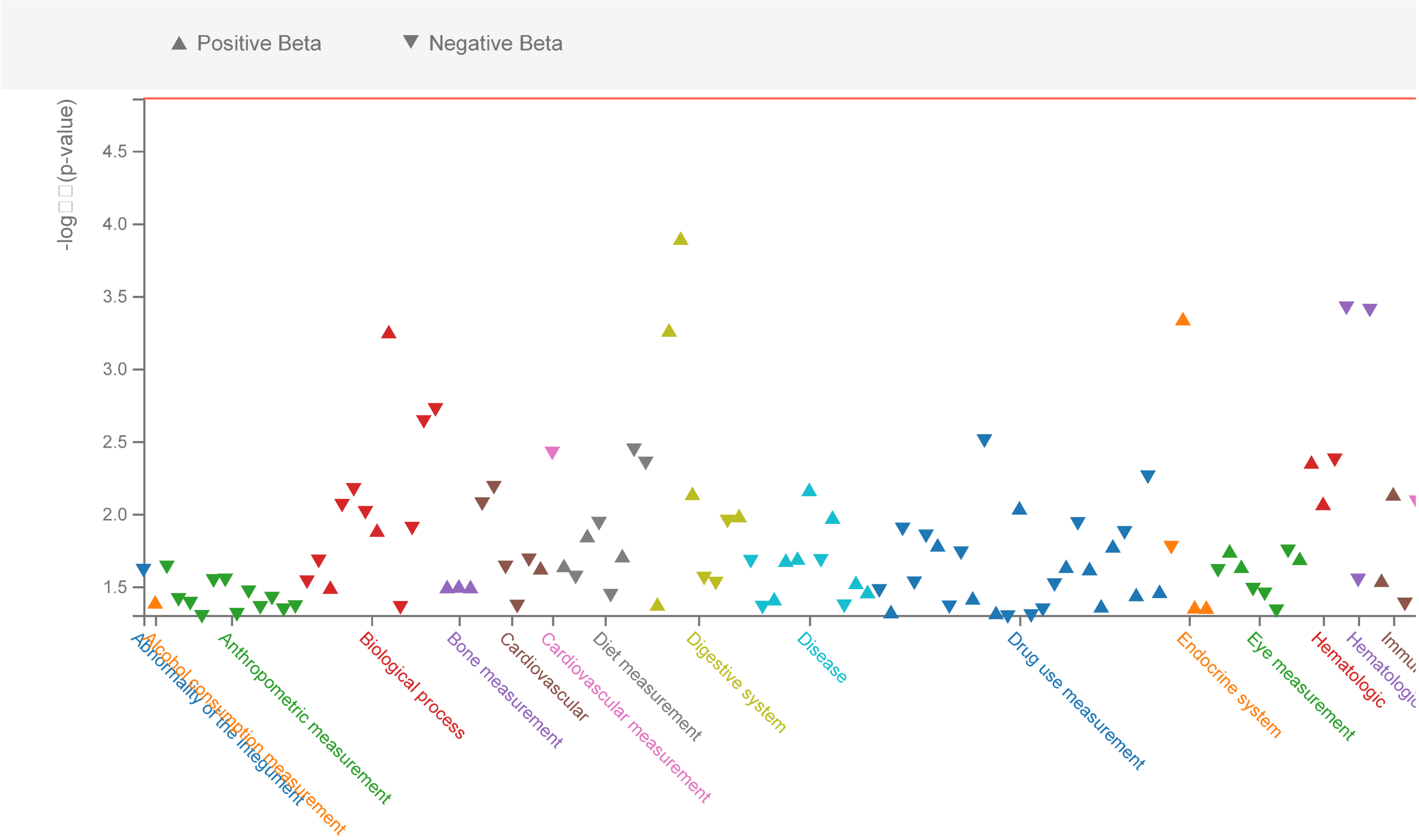
181


Up-regulated DEG
Down-regulated DEG
DEG (both side)
-log 10 P-value
0.0
0.5
1.0
1.5
Adipose_Subcutaneous
Adipose_Visceral_Omentum
Adrenal_Gland
Artery_Aorta
Artery_Coronary
Artery_Tibial
Bladder
Brain_Amygdala
rain_Anterior_cingulate_cortex_BA24
Brain_Caudate_basal_ganglia
Brain_Cerebellar_Hemisphere
Brain_Cerebellum
Brain_Cortex
Brain_Frontal_Cortex_BA9
Brain_Hippocampus
Brain_Hypothalamus
in_Nucleus_accumbens_basal_ganglia
Brain_Putamen_basal_ganglia
Brain_Spinal_cord_cervical_c-1
Brain_Substantia_nigra
Breast_Mammary_Tissue
Cells_EBV-transformed_lymphocytes
Cells_Transformed_fibroblasts
Cervix_Ectocervix
Cervix_Endocervix
Colon_Sigmoid
Colon_Transverse
sophagus_Gastroesophageal_Junction
Esophagus_Mucosa
Esophagus_Muscularis
Fallopian_Tube
Heart_Atrial_Appendage
Heart_Left_Ventricle
Kidney_Cortex
Liver
Lung
Minor_Salivary_Gland
Muscle_Skeletal
Nerve_Tibial
Ovary
Pancreas
Pituitary
Prostate
Skin_Not_Sun_Exposed_Suprapubic
Skin_Sun_Exposed_Lower_leg
Small_Intestine_Terminal_Ileum
Spleen
Stomach
Testis
Thyroid
Uterus
Vagina
Whole_Blood


Feeling miserable
Iron status biomarkers (total iron binding capacity)
Hand grip strength
Feeling guilty
Iron status biomarkers
Number of sexual partners
Cognitive ability
Social science traits (pleiotropy) (HIPO component 1)
Smoking status (ever vs never smokers)
Depression
Household income
Worry too long after an embarrassing experience
General risk tolerance (MTAG)
Iron status biomarkers (transferrin saturation)
Age at first sexual intercourse
Cholangiocarcinoma in primary sclerosing cholangitis (time to event)
Takayasu arteritis
Risk-taking tendency (4-domain principal component model)
Iron status biomarkers (iron levels)
Coronary artery disease
Feeling fed-up
Feeling tense
Attention deficit hyperactivity disorder or cannabis use
Daytime sleep phenotypes
Adventurousness
Body mass index (joint analysis main effects and physical activity interaction)
Smoking initiation
Irritable mood
Insomnia symptoms (never/rarely vs. sometimes/usually)
Body mass index in physically active individuals
Allergic disease (asthma, hay fever or eczema)
Diastolic blood pressure
Alcohol consumption (drinks per week)
Parental longevity (combined parental attained age, Martingale residuals)
Menarche (age at onset)
Mental health study participation (completed survey)
Insomnia symptoms (never/rarely vs. usually)
BMI in non-smokers
Body mass index (joint analysis main effects and smoking interaction)
BMI (adjusted for smoking behaviour)
Chronotype
Height
Feeling worry
Self-reported risk-taking behaviour
Vitiligo
Ovarian cancer
Blood pressure
Amyotrophic lateral sclerosis (age of onset)
Weight
Asthma or allergic disease (pleiotropy)
Sleep duration
Waist-to-hip ratio adjusted for BMI (additive genetic model)
Hodgkin's lymphoma
Gait speed in old age
Alcohol use disorder
Subcutaneous adipose tissue
Type 1 diabetes
Urate levels in overweight individuals
Prostate cancer (advanced)
Resting heart rate
Mental health study participation (provided email address)
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
10
20
30
40
50
60
70
80
90
100
Proportion
-log10 adjusted P-value
PTPRF
KDM4A
ST3GAL3
ARTN
IPO13
CCDC24
SLC6A9
DPYD
CCDC62
ANTXR2
VWDE
PDCL3
HTT
ANKRD52
NAA11
HEMK1
FAM19A5
DNAH10
NEK9
OR2J1
SALL1
RERG
PTPRT
POLN
PRDM8
UBE2D3
IFI30
ZCCHC8
STAT2
TMTC2
TMED10
SCUBE3
FANCE
NEBL
CASC10
SKIDA1
DNAJC1
IPO5

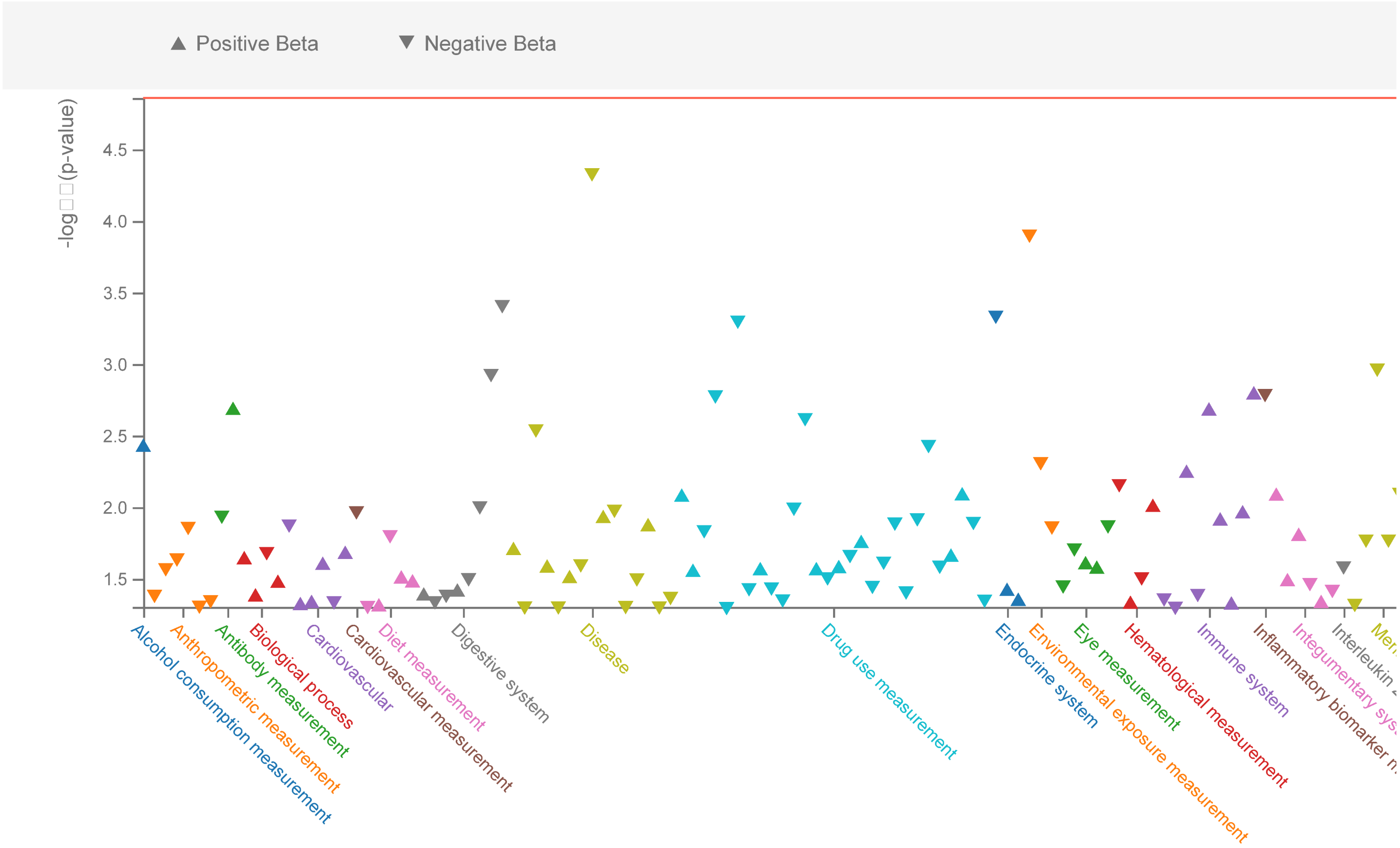

▲ Positive Beta
▼ Negative Beta
-log□□(p-value)
13
12
11
10
9
8
7
6
5
4
3
2
Intra-ocular pressure, corneal...
Intra
Intra-ocular pressure, cornea
Heel bone mineral density
Pulse rate, automated reading
Alcohol consumption measurement
Anthropometric measurement
Antibody measurement
Biological process
Bone measurement
Cardiovascular
Cardiovascular measurement
Diabetes mellitus biomarker
Diet measurement
Digestive system
Disease
Disease of genitourinary system
Drug use measurement
Endocrine system
Environmental exposure me
Eye measuremen
Hema


▲ Positive Beta
▼ Negative Beta
-log□□(p-value)
20
18
16
14
12
10
8
6
4
2
Coronary artery disease
Standing height
Leg fat-free mass (left)
Coronary artery disease
Trunk predicted mass
Weight
Sitting height
Ischemic heart disease
Whole body fat mass
Heart disease | illnesses of m...
Heart disease | illnesses of f...
Arm fat mass (left)
Angina | non-cancer illness co...
Atorvastatin | treatment/medic...
Prostate cancer | illnesses of...
Diabetes mell
Type 2 diabete
Abnormality of metabolism/homeostasis
Alcohol consumption measurement
Anthropometric measurement
Biological process
Bone measurement
Cardiovascular
Cardiovascular measurement
Cognitive function measurement
Diet measurement
Digestive system
Disease
Disease of genitourinary system
Drug use measurement
Endocr

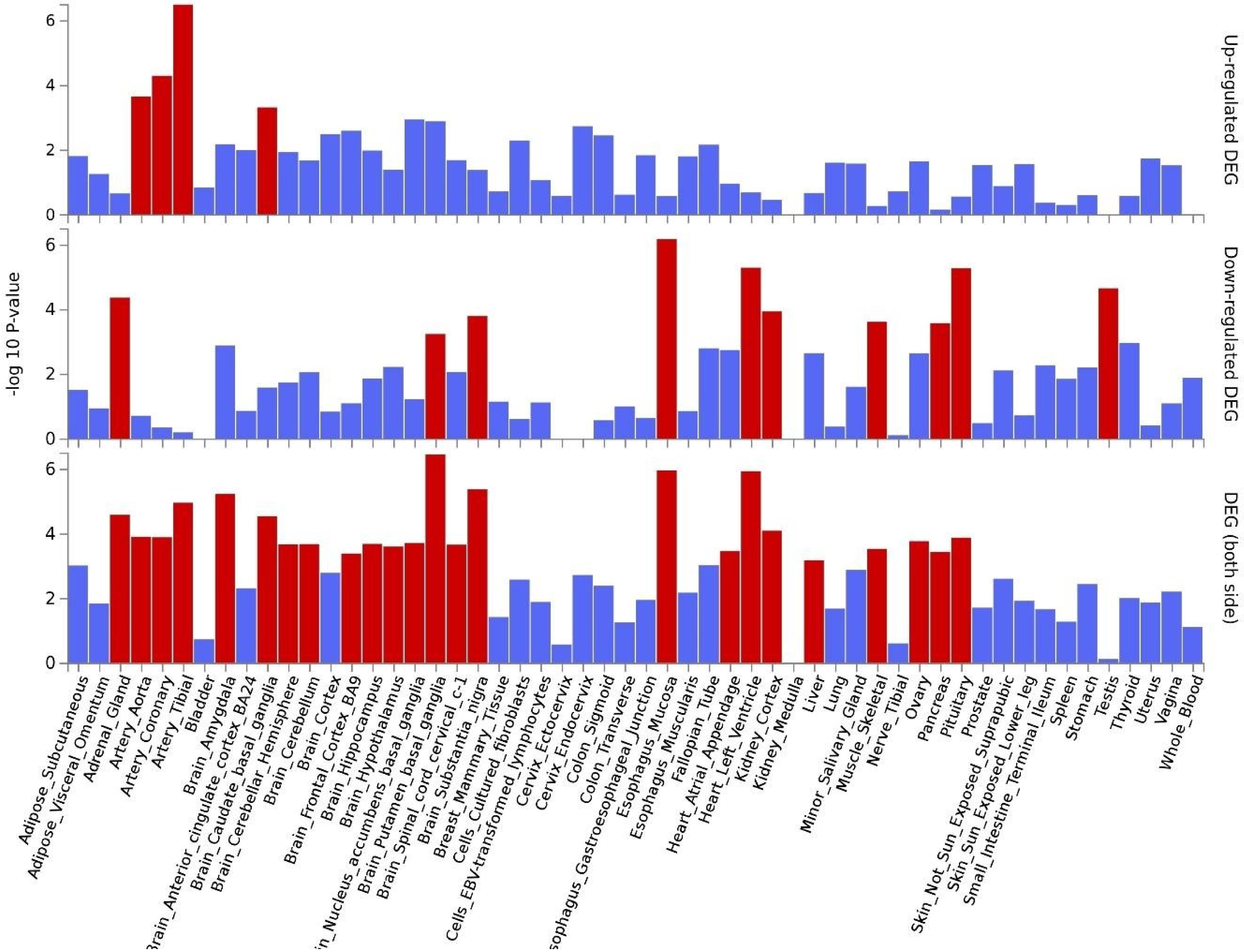

▲ Positive Beta
▼ Negative Beta
-log□□(p-value)
4.5
4.0
3.5
3.0
2.5
2.0
1.5
Abnormality of the integument
Alcohol consumption measurement
Anthropometric measurement
Biological process
Bone measurement
Cardiovascular
Cardiovascular measurement
Diet measurement
Digestive system
Disease
Drug use measurement
Endocrine system
Eye measurement
Hematologic
Hematologic
Immu

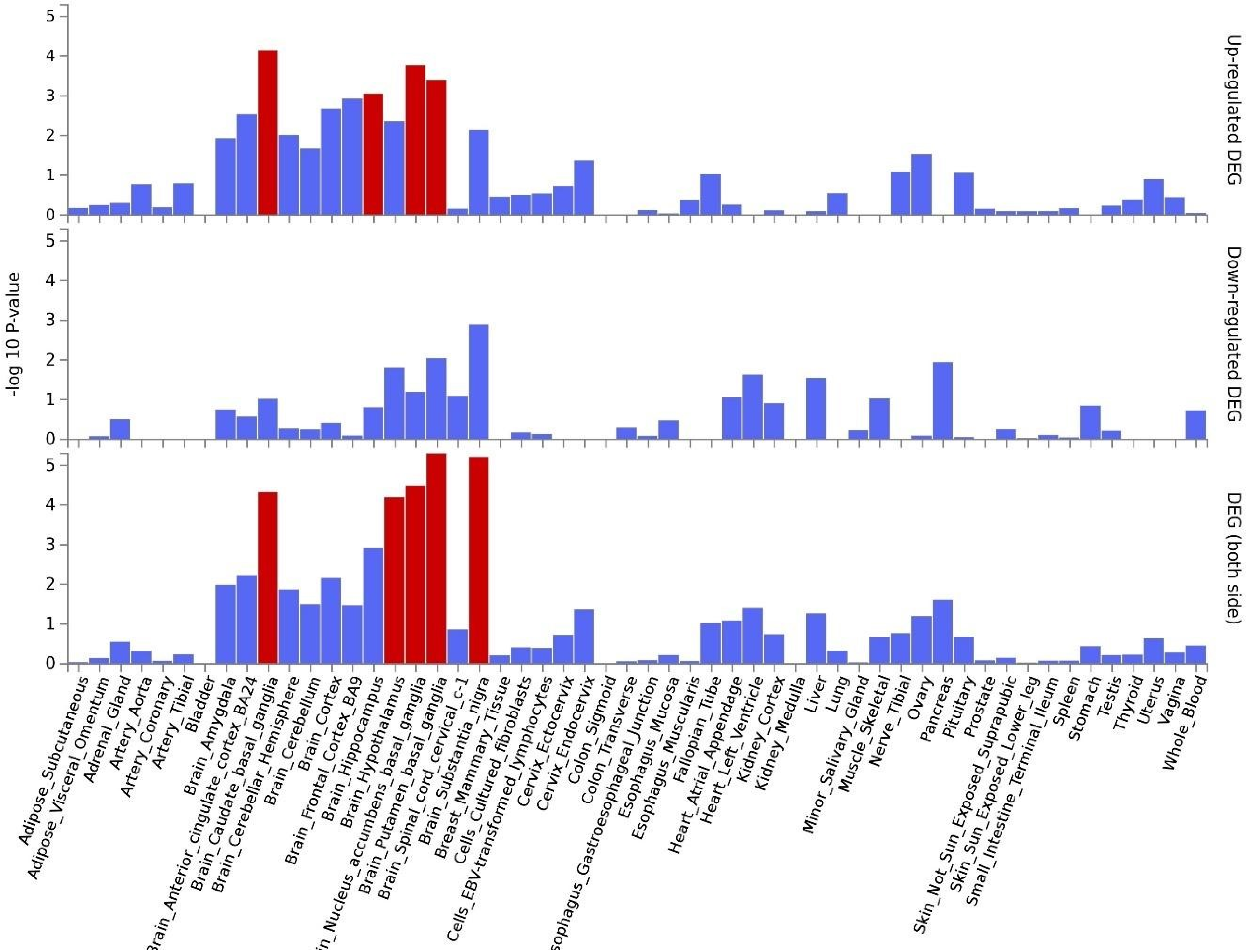

▲ Positive Beta
▼ Negative Beta
-log□□(p-value)
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
Diseases of esophagus
Alcohol consumption measurement
Anthropometric measurement
Biological process
Bone measurement
Cardiovascular
Cognitive function measurement
Diet measurement
Digestive system
Disease
Disease of genitourinary system
Drug use measurement
Endocrine system
Environmenta
Eye

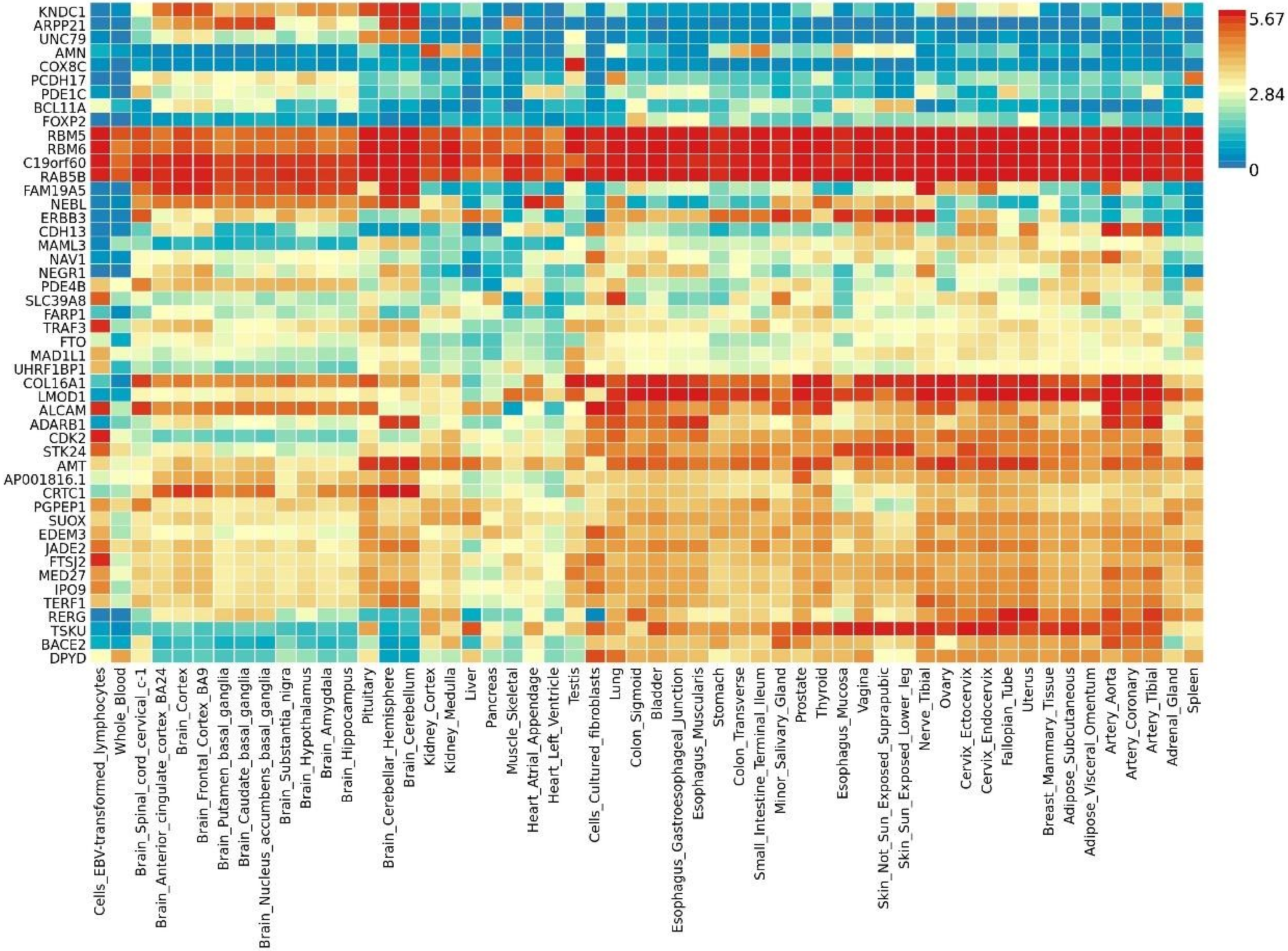

▲ Positive Beta
▼ Negative Beta
-log₁₀(p-value)
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
Diaphragmatic hernia
Abnormality of metabolism/homeostasis
Alcohol consumption measurement
Anthropometric measurement
Antibody measurement
Biological process
Bone measurement
Cardiovascular
Cardiovascular measurement
Cognitive function measurement
Diet measurement
Digestive system
Disease
Drug use measurement
Endocrine system
Environmental exposure measurement
Eye measurement
Hair morphology measurement
Hematologic
Hematological measurement
Immune

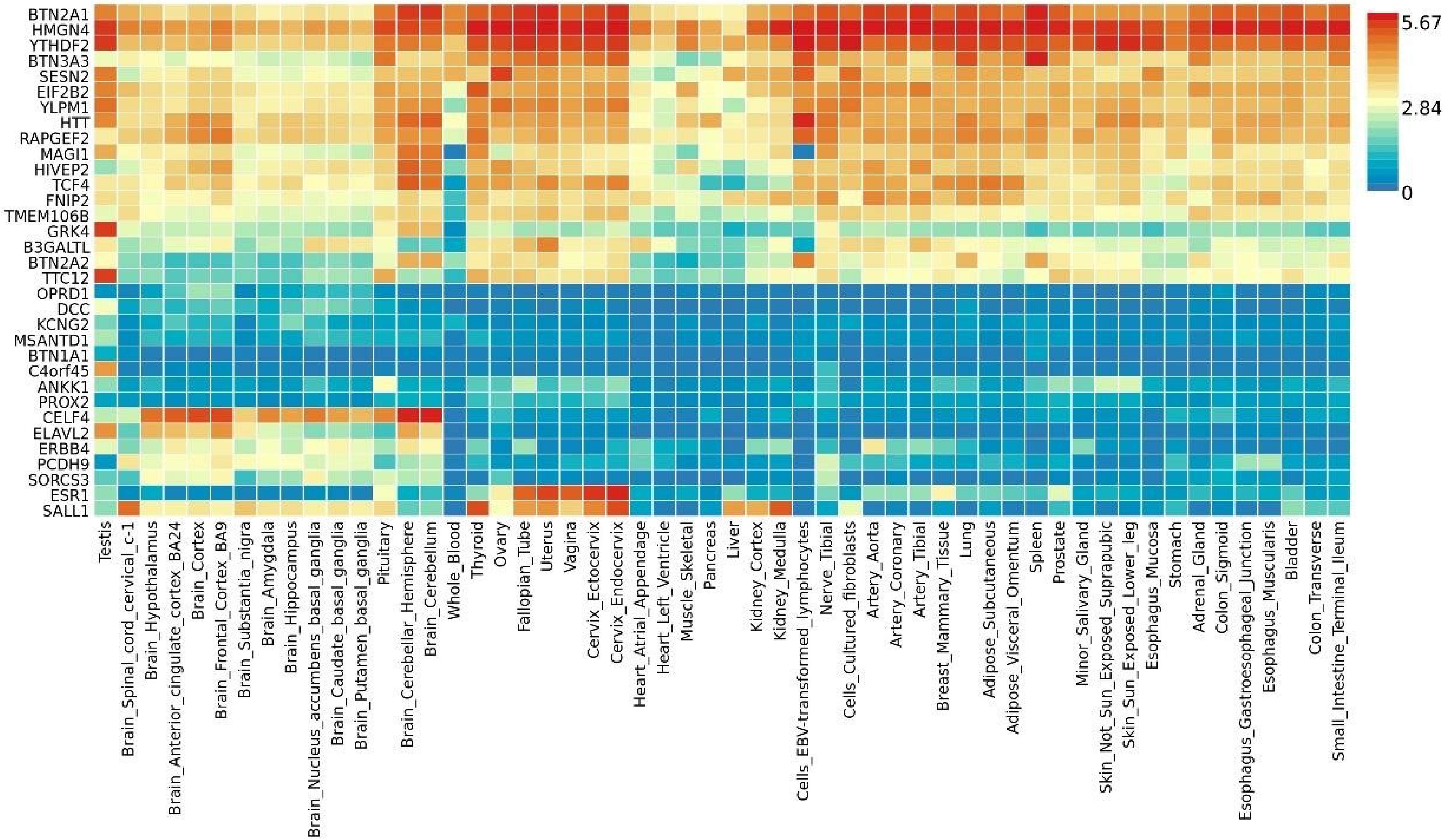

▲ Positive Beta
▼ Negative Beta
-log□□(p-value)
4.5
4.0
3.5
3.0
2.5
2.0
1.5
Alcohol consumption measurement
Anthropometric measurement
Antibody measurement
Biological process
Cardiovascular
Cardiovascular measurement
Diet measurement
Digestive system
Disease
Drug use measurement
Endocrine system
Environmental exposure measurement
Eye measurement
Hematological measurement
Immune system
Inflammatory biomarker m
Integumentary sys
Interleukin
Men


▲ Positive Beta
▼ Negative Beta
-log□□(p-value)
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
Leg fat-free mass (right)
Weight
Leg predicted mass (left)
Arm fat-free mass (right)
Whole body fat-free mass
Ulcerative colitis
Alcohol consumption measurement
Anthropometric measurement
Antibody measurement
Biological process
Bone measurement
Cancer biomarker measurement
Cardiovascular
Cardiovascular measurement
Cognitive function measurement
Diet measurement
Digestive system
Disease
Drug use measurement
Endocrine system
Environmental exposure measureme
Eye measurement
Hair morphology mea
Hearing measurem
Hematologic
Hematolog
Im

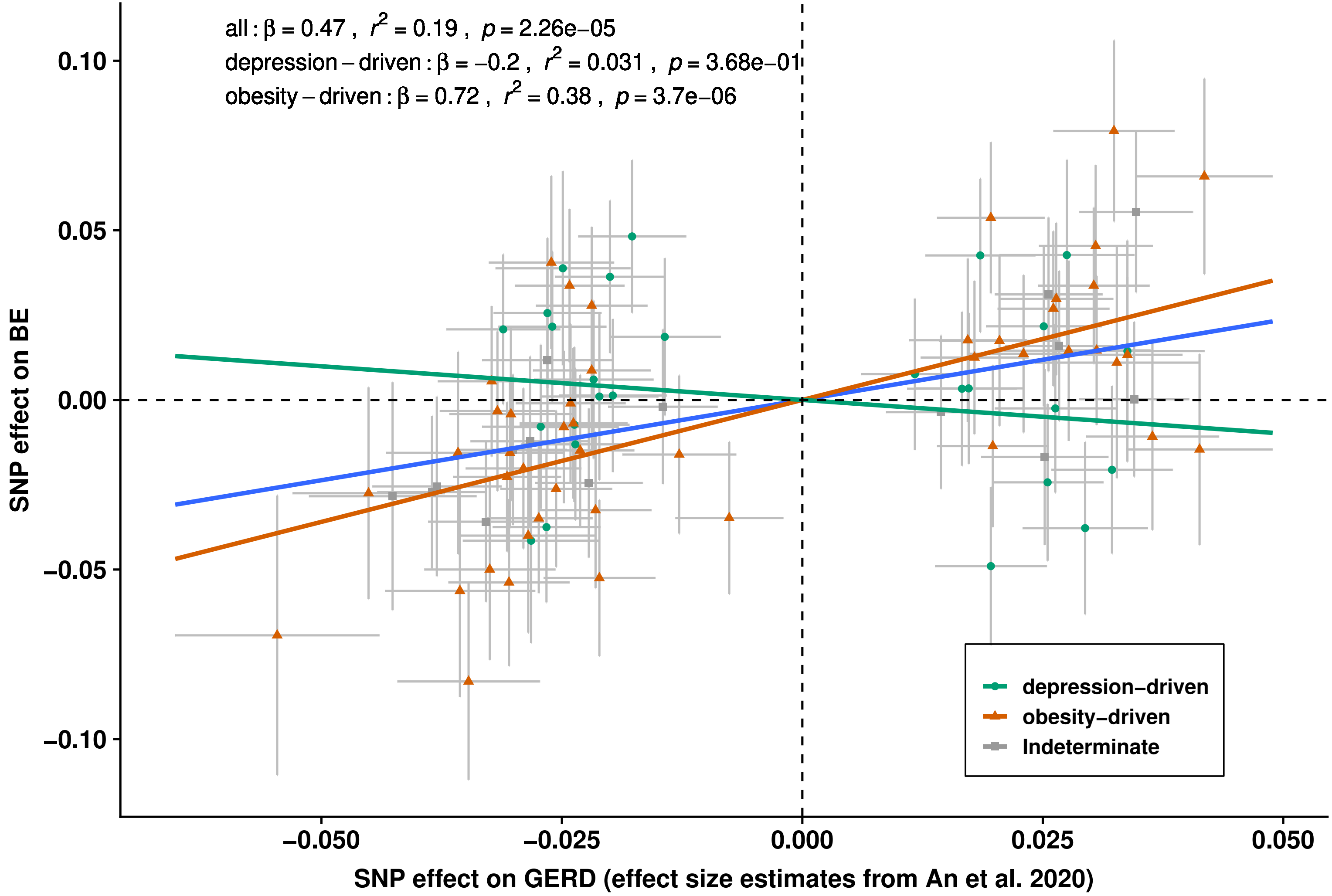

-log 10 P-value
0
2
4
6
Up-regulated DEG
Down-regulated DEG
DEG (both side)
Adipose_Subcutaneous
Adipose_Visceral_Omentum
Adrenal_Gland
Artery_Aorta
Artery_Coronary
Artery_Tibial
Bladder
Brain_Amygdala
Brain_Anterior_cingulate_cortex_BA24
Brain_Caudate_basal_ganglia
Brain_Cerebellar_Hemisphere
Brain_Cerebellum
Brain_Cortex
Brain_Frontal_Cortex_BA9
Brain_Hippocampus
Brain_Hypothalamus
in_Nucleus_accumbens_basal_ganglia
Brain_Putamen_basal_ganglia
Brain_Spinal_cord_cervical_c-1
Brain_Substantia_nigra
Breast_Mammary_Tissue
Cells_Cultured_fibroblasts
Cells_EBV-transformed_lymphocytes
Cervix_Ectocervix
Cervix_Endocervix
Colon_Sigmoid
Colon_Transverse
sophagus_Gastroesophageal_Junction
Esophagus_Mucosa
Esophagus_Muscularis
Fallopian_Tube
Heart_Atrial_Appendage
Heart_Left_Ventricle
Kidney_Cortex
Kidney_Medulla
Liver
Lung
Minor_Salivary_Gland
Muscle_Skeletal
Nerve_Tibial
Ovary
Pancreas
Pituitary
Prostate
Skin_Not_Sun_Exposed_Suprapubic
Skin_Sun_Exposed_Lower_leg
Small_Intestine_Terminal_Ileum
Spleen
Stomach
Testis
Thyroid
Uterus
Vagina
Whole_Blood

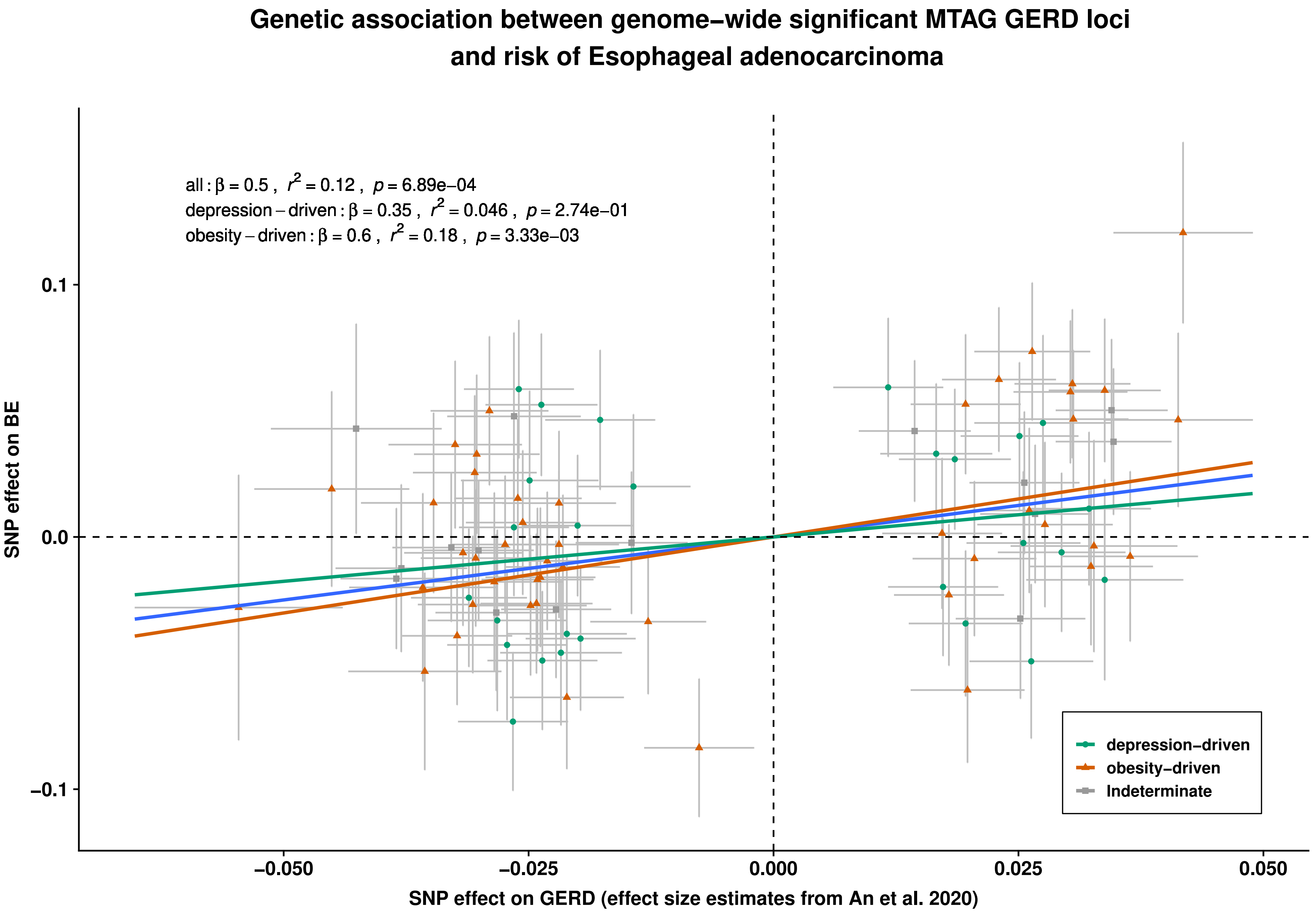

-log 10 P-value
Up-regulated DEG
Down-regulated DEG
DEG (both side)
0
1
2
3
4
5
Adipose_Subcutaneous
Adipose_Visceral_Omentum
Adrenal_Gland
Artery_Aorta
Artery_Coronary
Artery_Tibial
Bladder
Brain_Amygdala
rain_Anterior_cingulate_cortex_BA24
Brain_Caudate_basal_ganglia
Brain_Cerebellar_Hemisphere
Brain_Cerebellum
Brain_Cortex
Brain_Frontal_Cortex_BA9
Brain_Hippocampus
Brain_Hypothalamus
in_Nucleus_accumbens_basal_ganglia
Brain_Putamen_basal_ganglia
Brain_Spinal_cord_cervical_c-1
Brain_Substantia_nigra
Breast_Mammary_Tissue
Cells_Cultured_fibroblasts
Cells_EBV-transformed_lymphocytes
Cervix_Ectocervix
Cervix_Endocervix
Colon_Sigmoid
Colon_Transverse
sophagus_Gastroesophageal_Junction
Esophagus_Mucosa
Esophagus_Muscularis
Fallopian_Tube
Heart_Atrial_Appendage
Heart_Left_Ventricle
Kidney_Cortex
Kidney_Medulla
Liver
Lung
Minor_Salivary_Gland
Muscle_Skeletal
Nerve_Tibial
Ovary
Pancreas
Pituitary
Prostate
Skin_Not_Sun_Exposed_Suprapubic
Skin_Sun_Exposed_Lower_leg
Small_Intestine_Terminal_Ileum
Spleen
Stomach
Testis
Thyroid
Uterus
Vagina
Whole_Blood


5.67
2.84
0
KNDC1
ARPP21
UNC79
AMN
COX8C
PCDH17
PDE1C
BCL11A
FOXP2
RBM5
RBM6
C19orf60
RAB5B
FAM19A5
NEBL
ERBB3
CDH13
MAML3
NAV1
NEGR1
PDE4B
SLC39A8
FARP1
TRAF3
FTO
MAD1L1
UHRF1BP1
COL16A1
LMOD1
ALCAM
ADARB1
CDK2
STK24
AMT
AP001816.1
CRTC1
PGPEP1
SUOX
EDEM3
JADE2
FTSJ2
MED27
IPO9
TERF1
RERG
TSKU
BACE2
DPYD
Cells_EBV-transformed_lymphocytes
Whole_Blood
Brain_Spinal_cord_cervical_c-1
Brain_Anterior_cingulate_cortex_BA24
Brain_Cortex
Brain_Frontal_Cortex_BA9
Brain_Putamen_basal_ganglia
Brain_Caudate_basal_ganglia
Brain_Nucleus_accumbens_basal_ganglia
Brain_Substantia_nigra
Brain_Hypothalamus
Brain_Amygdala
Brain_Hippocampus
Pituitary
Brain_Cerebellar_Hemisphere
Brain_Cerebellum
Kidney_Cortex
Kidney_Medulla
Liver
Pancreas
Muscle_Skeletal
Heart_Atrial_Appendage
Heart_Left_Ventricle
Testis
Cells_Cultured_fibroblasts
Lung
Colon_Sigmoid
Bladder
Esophagus_Gastroesophageal_Junction
Esophagus_Muscularis
Stomach
Colon_Transverse
Small_Intestine_Terminal_Ileum
Minor_Salivary_Gland
Prostate
Thyroid
Esophagus_Mucosa
Vagina
Skin_Not_Sun_Exposed_Suprapubic
Skin_Sun_Exposed_Lower_leg
Nerve_Tibial
Ovary
Cervix_Ectocervix
Cervix_Endocervix
Fallopian_Tube
Uterus
Breast_Mammary_Tissue
Adipose_Subcutaneous
Adipose_Visceral_Omentum
Artery_Aorta
Artery_Coronary
Artery_Tibial
Adrenal_Gland
Spleen


BTN2A1
HMGN4
YTHDF2
BTN3A3
SESN2
EIF2B2
YLPM1
HTT
RAPGEF2
MAGI1
HIVEP2
TCF4
FNIP2
TMEM106B
GRK4
B3GALTL
BTN2A2
TTC12
OPRD1
DCC
KCNG2
MSANTD1
BTN1A1
C4orf45
ANKK1
PROX2
CELF4
ELAVL2
ERBB4
PCDH9
SORCS3
ESR1
SALL1
Testis
Brain_Spinal_cord_cervical_c-1
Brain_Hypothalamus
Brain_Anterior_cingulate_cortex_BA24
Brain_Cortex
Brain_Frontal_Cortex_BA9
Brain_Substantia_nigra
Brain_Amygdala
Brain_Hippocampus
Brain_Nucleus_accumbens_basal_ganglia
Brain_Caudate_basal_ganglia
Brain_Putamen_basal_ganglia
Pituitary
Brain_Cerebellar_Hemisphere
Brain_Cerebellum
Whole_Blood
Thyroid
Ovary
Fallopian_Tube
Uterus
Vagina
Cervix_Ectocervix
Cervix_Endocervix
Heart_Atrial_Appendage
Heart_Left_Ventricle
Muscle_Skeletal
Pancreas
Liver
Kidney_Cortex
Kidney_Medulla
Cells_EBV-transformed_lymphocytes
Nerve_Tibial
Cells_Cultured_fibroblasts
Artery_Aorta
Artery_Coronary
Artery_Tibial
Breast_Mammary_Tissue
Lung
Adipose_Subcutaneous
Adipose_Visceral_Omentum
Spleen
Prostate
Minor_Salivary_Gland
Skin_Not_Sun_Exposed_Suprapubic
Skin_Sun_Exposed_Lower_leg
Esophagus_Mucosa
Stomach
Adrenal_Gland
Colon_Sigmoid
Esophagus_Gastroesophageal_Junction
Esophagus_Muscularis
Bladder
Colon_Transverse
Small_Intestine_Terminal_Ileum
5.67
2.84
0

Genetic association between genome−wide significant MTAG GERD loci and risk of Barrett's Esophagus




Genetic association between genome−wide significant MTAG GERD loci
and risk of Esophageal adenocarcinoma
all : β = 0.5 , r² = 0.12 , p = 6.89e−04
depression − driven : β = 0.35 , r² = 0.046 , p = 2.74e−01
obesity − driven : β = 0.6 , r² = 0.18 , p = 3.33e−03
0.1
0.0
−0.1
SNP effect on BE
−0.050
−0.025
0.000
0.025
0.050
SNP effect on GERD (effect size estimates from An et al. 2020)
depression−driven
obesity−driven
Indeterminate