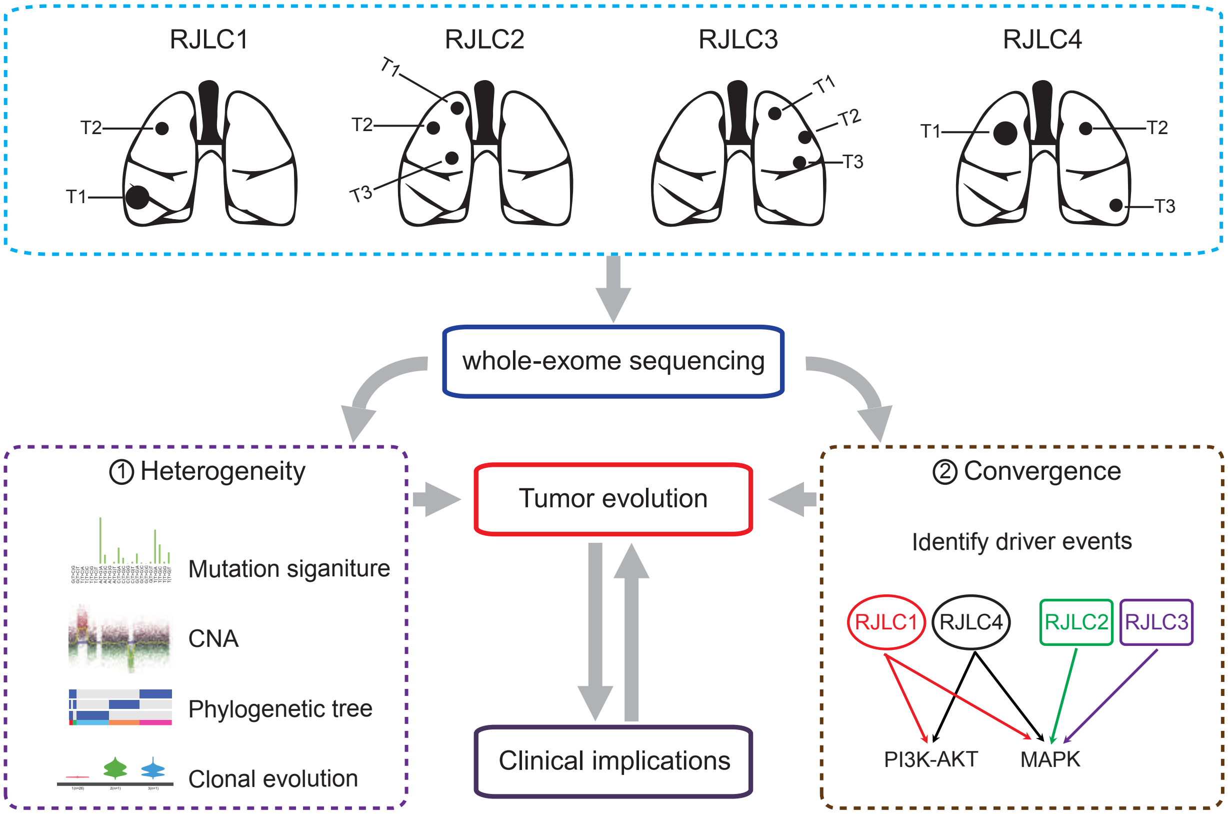
# Description of Supplementary Files

File Name: Supplementary Information
Description: Supplementary Figures and Supplementary Tables

File Name: Supplementary Data 1
Description: Identification of 167-679 somatic alterations per tumor, including a total of 373 non-synonymous exonic mutations present in at least one tumor region.

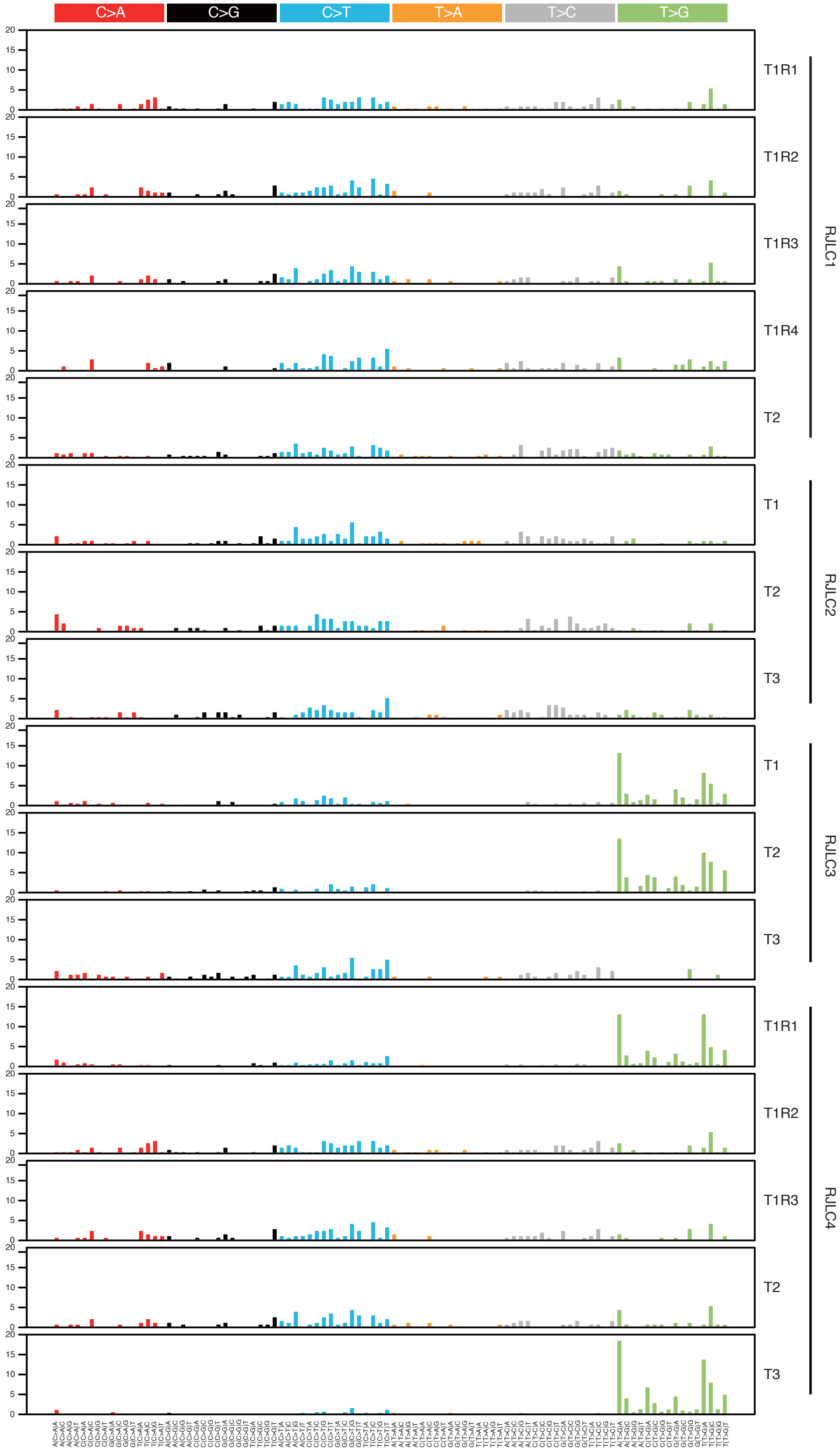
File Name: Peer Review File

Supplementary Figure 1.



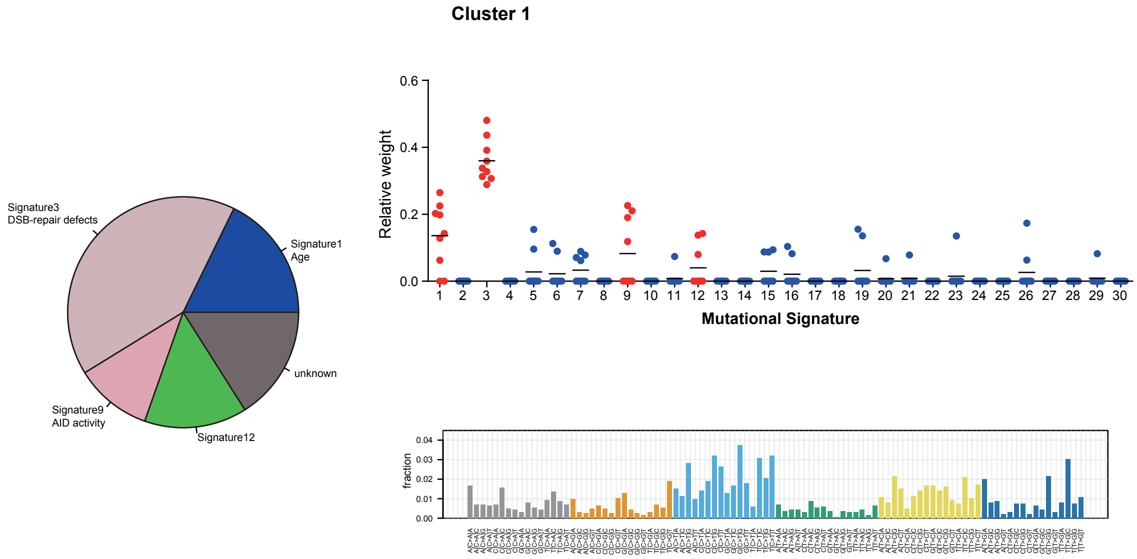
Supplementary Figure 1. A schematic overview of the study design.

Supplementary Figure 2.

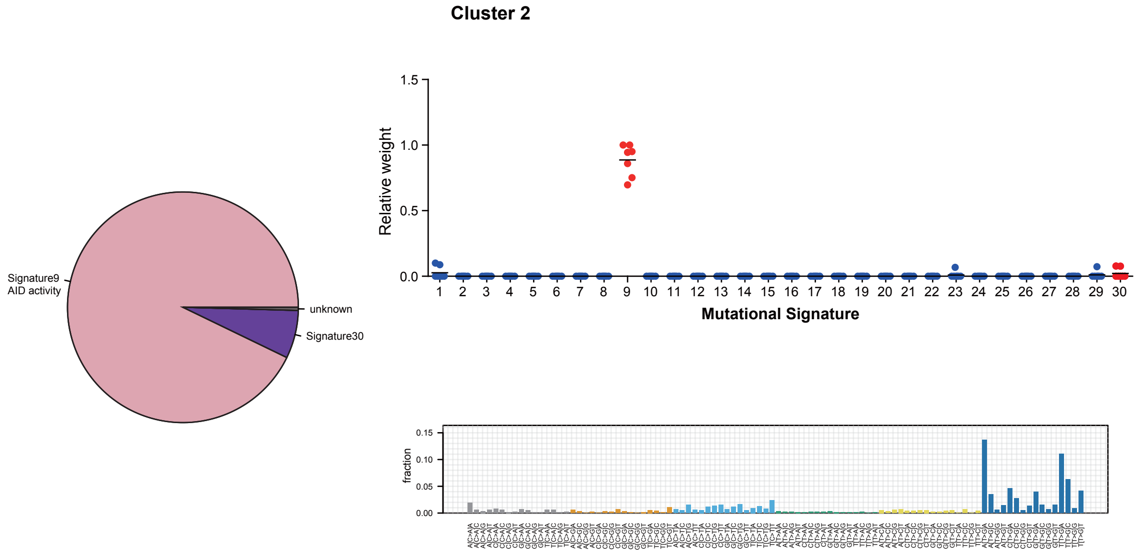


Supplementary Figure 2. Mutational signatures of sequenced tumor samples.

# Supplementary Figure 3.



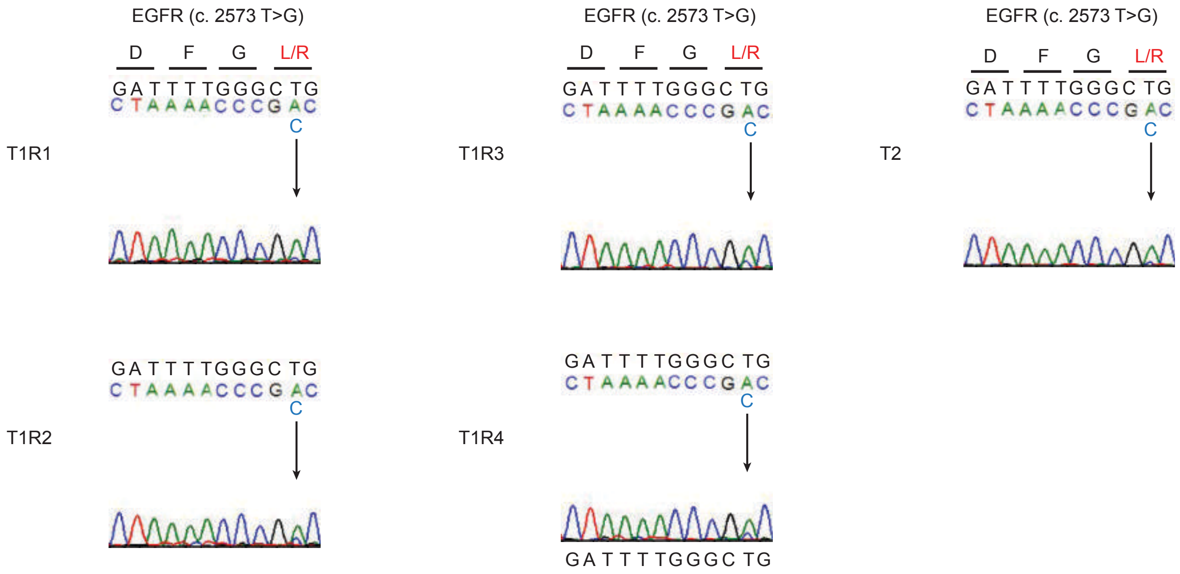
Signature1:0.178 & Signature3: 0.41 & Signature9: 0.108 & Signature12: 0.144



Signature9: 0.928 & Signature30: 0.067

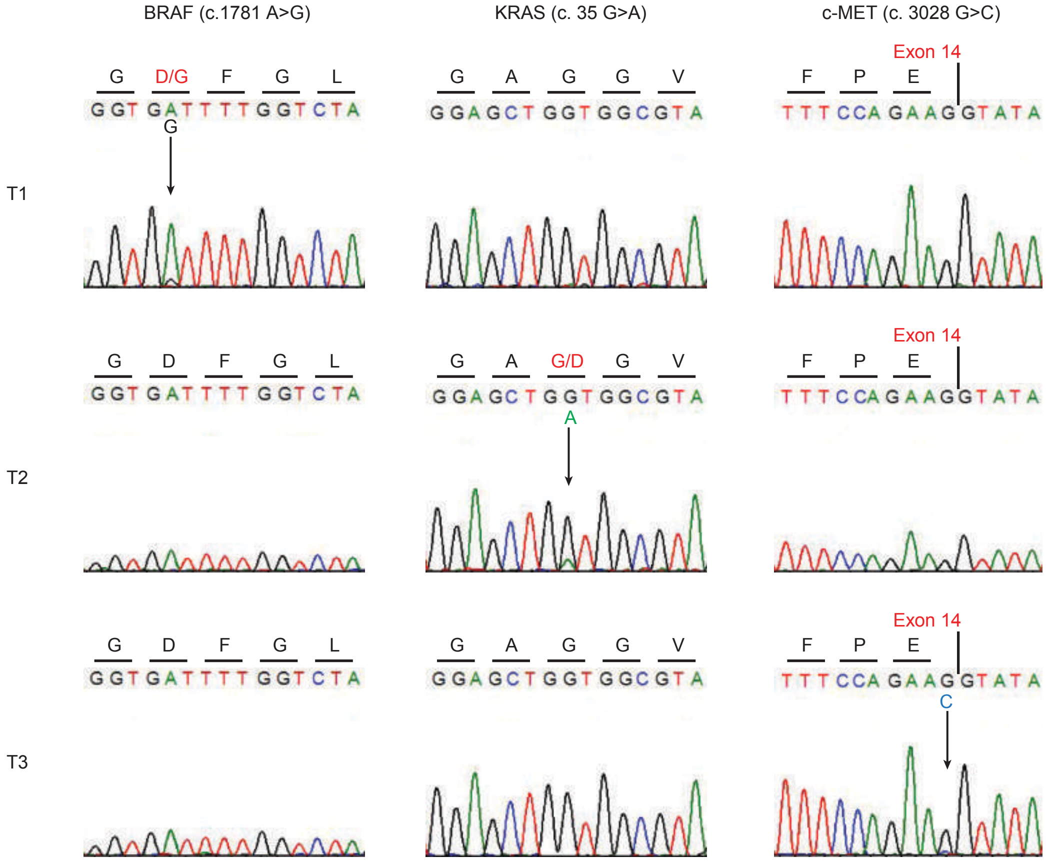
Supplementary Figure 3. A multiple regression approach, deconstructSigs, was used to extract known signatures based on the Wellcome Trust Sanger Institute Mutational Signature Framework and to statistically quantify the contribution of each signature for each cluster.

# Supplementary Figure 4.



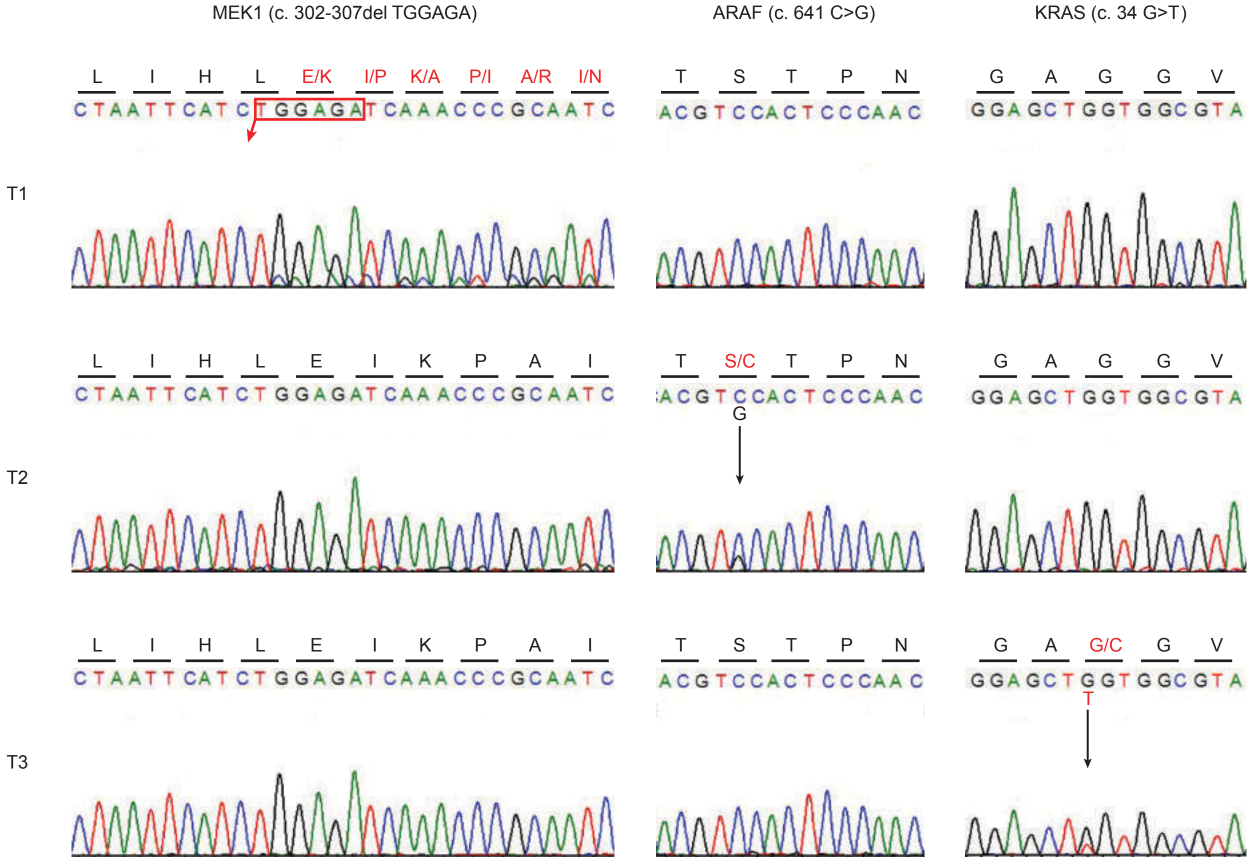
Supplementary Figure 4. Sanger sequencing validation of EGFR mutation in RJLC1.

Supplementary Figure 5.



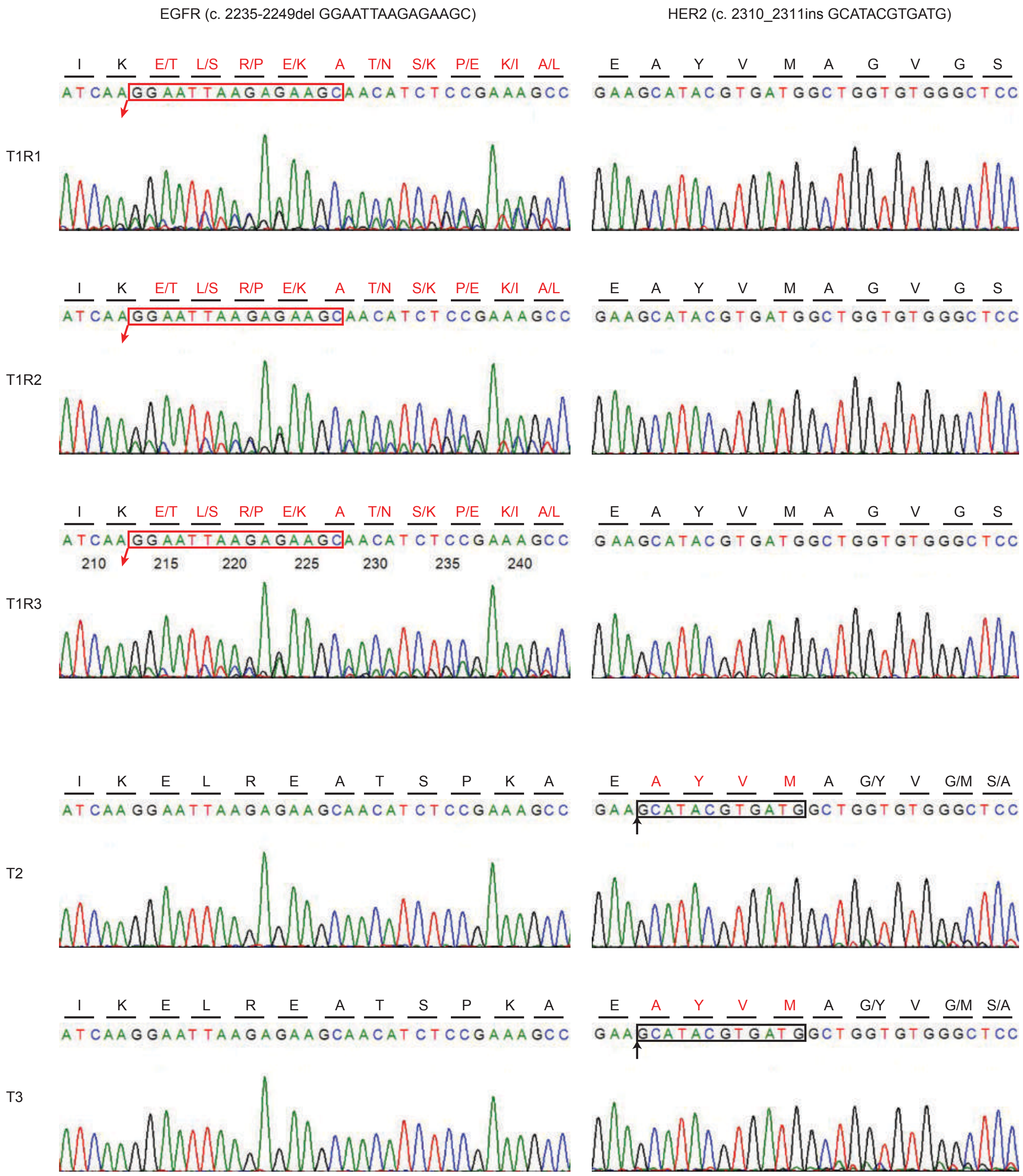
Supplementary Figure 5. Sanger sequencing validation of BRAF, KRAS and c-MET mutations in RJLC2.

## Supplementary Figure 6.



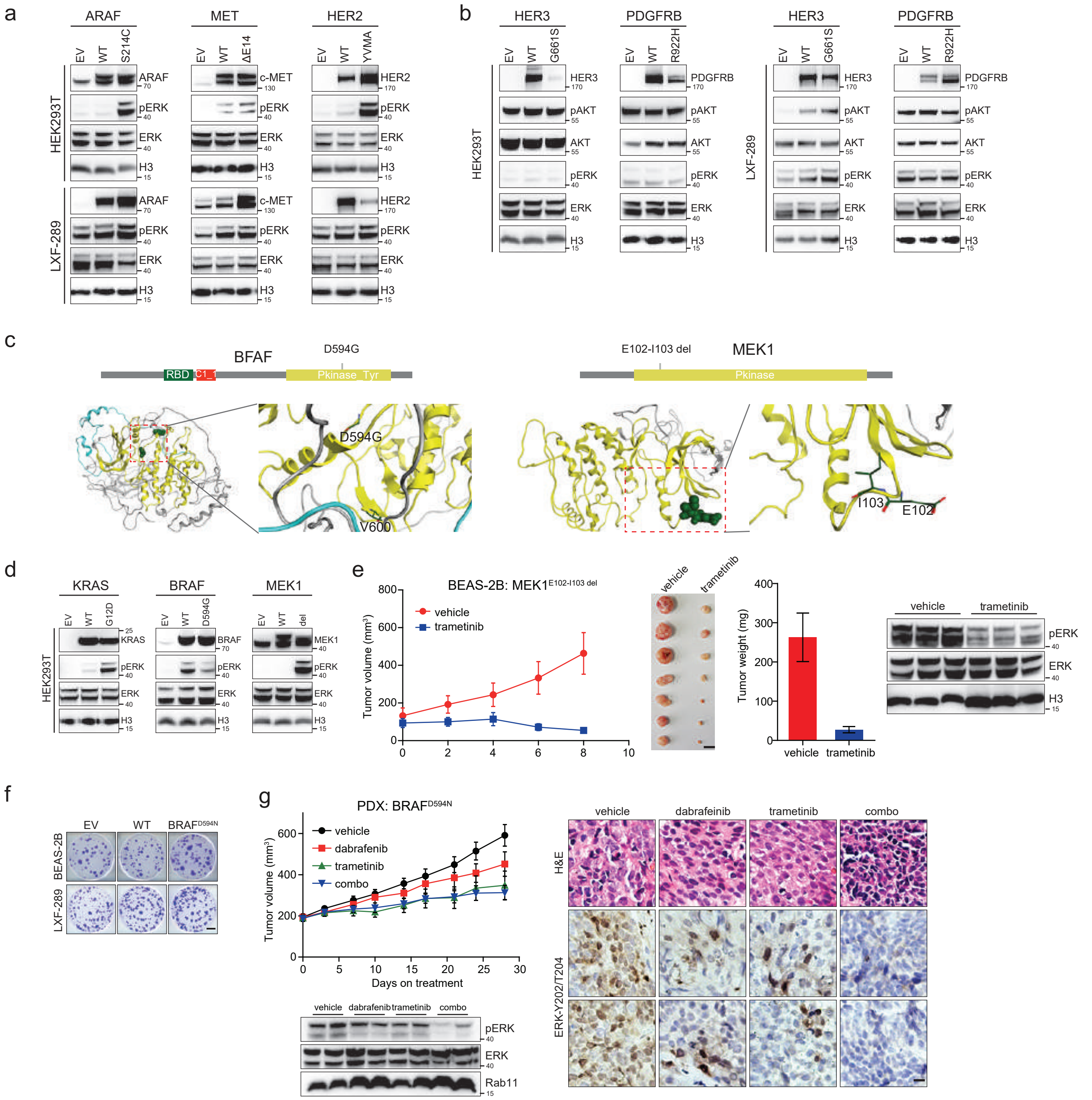
Supplementary Figure 6. Sanger sequencing validation of MEK1, ARAF and KRAS mutations in RJLC3.

## Supplementary Figure 7.



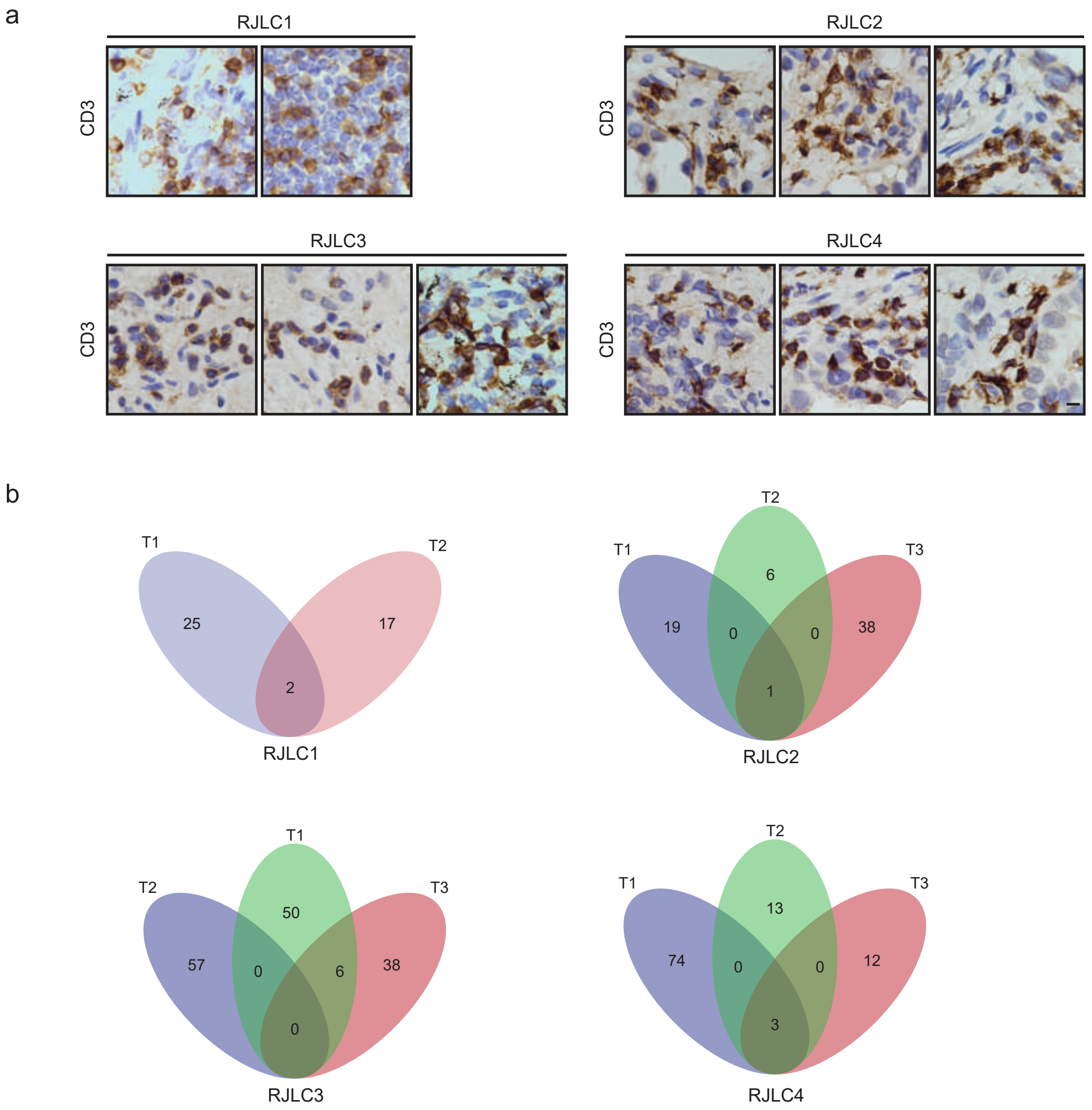
Supplementary Figure 7. Sanger sequencing validation of EGFR and HER2 mutations in RJLC4.

# Supplementary Figure 8.



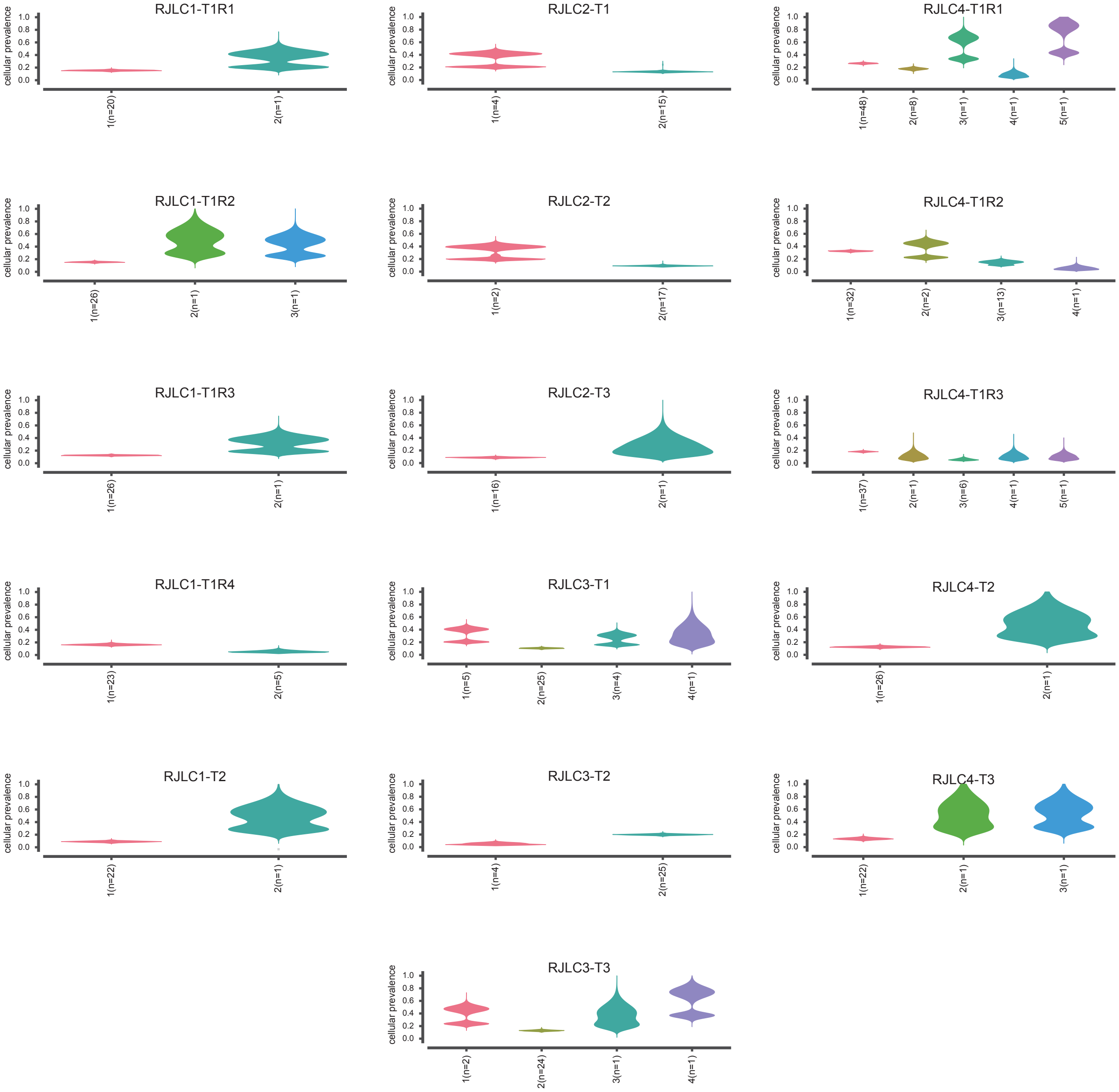
Supplementary Figure 8. (a) Overexpression of indicated wild-type or mutant genes in HEK293T or LXF-289 cells. Gene expression and ERK phosphorylation were measured by immunoblotting. (b) Overexpression of indicated wild-type or mutant genes in HEK293T or LXF-289 cells. AKT and ERK phosphorylation was measured by immunoblotting. (c) The mutated protein structures were generated by Phyre2 web portal and figures were prepared by using PyMOL. (d) Overexpression of indicated wild-type or mutant genes in HEK293T cells. Gene expression and ERK phosphorylation were measured by immunoblotting. (e) Tumor growth of BEAS-2B xenografts treated with trametinib or vehicle control. Each line represented mean tumor volume of the respective group, and error bars indicated standard deviation (10 mice per group). ERK phosphorylation was measured by immunoblotting. Scale bar, 10 mm. (f) Indicated wild-type or mutant genes were lentivirally introduced into BEAS-2B or LXF-289 cells. Cells were cultured for two weeks and stained with crystal violet. Scale bar, 5 mm. (g) Tumor growth of BRAF$^{D594N}$ PDX treated with indicated drugs. Each line represented mean tumor volume of the respective group, and error bars indicated standard deviation (10 mice per group). ERK phosphorylation was measured by immunoblotting or IHC. Scale bar, 5 µm.

# Supplementary Figure 9.



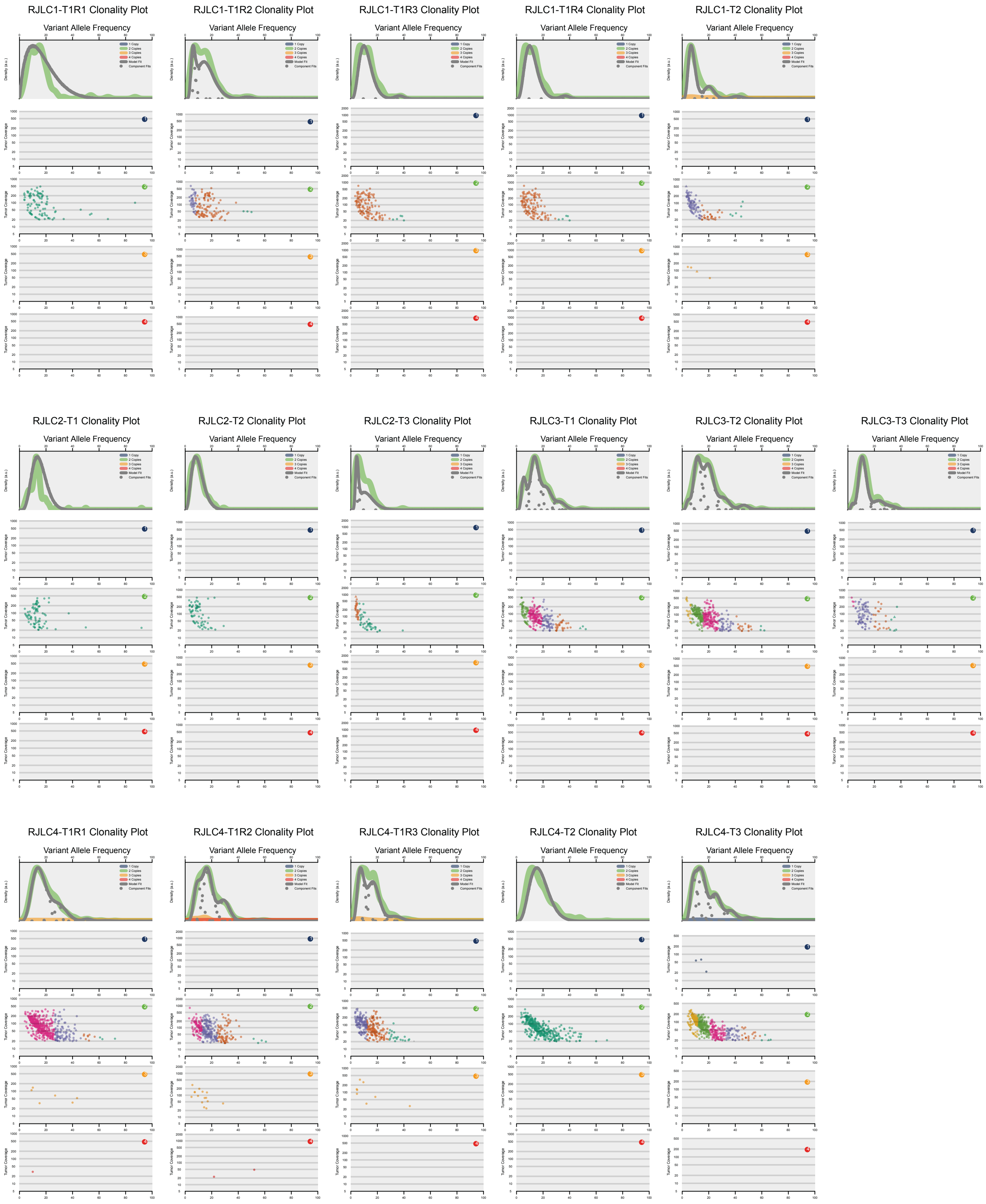
Supplementary Figure 9. (a) IHC of CD3 in different MSLC tumors. Scale bar, 5 μm. (b) Load and overlap of predicted neoantigens in each MSLC case using NetMHCpan algorithm.

# Supplementary Figure 10.



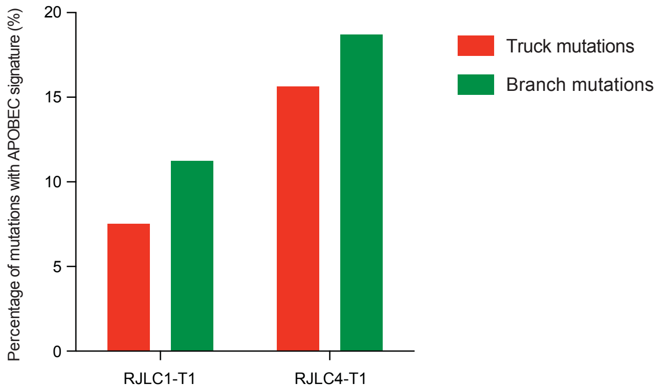
Supplementary Figure 10. PyClone analysis of sequenced tumor samples.

# Supplementary Figure 11.



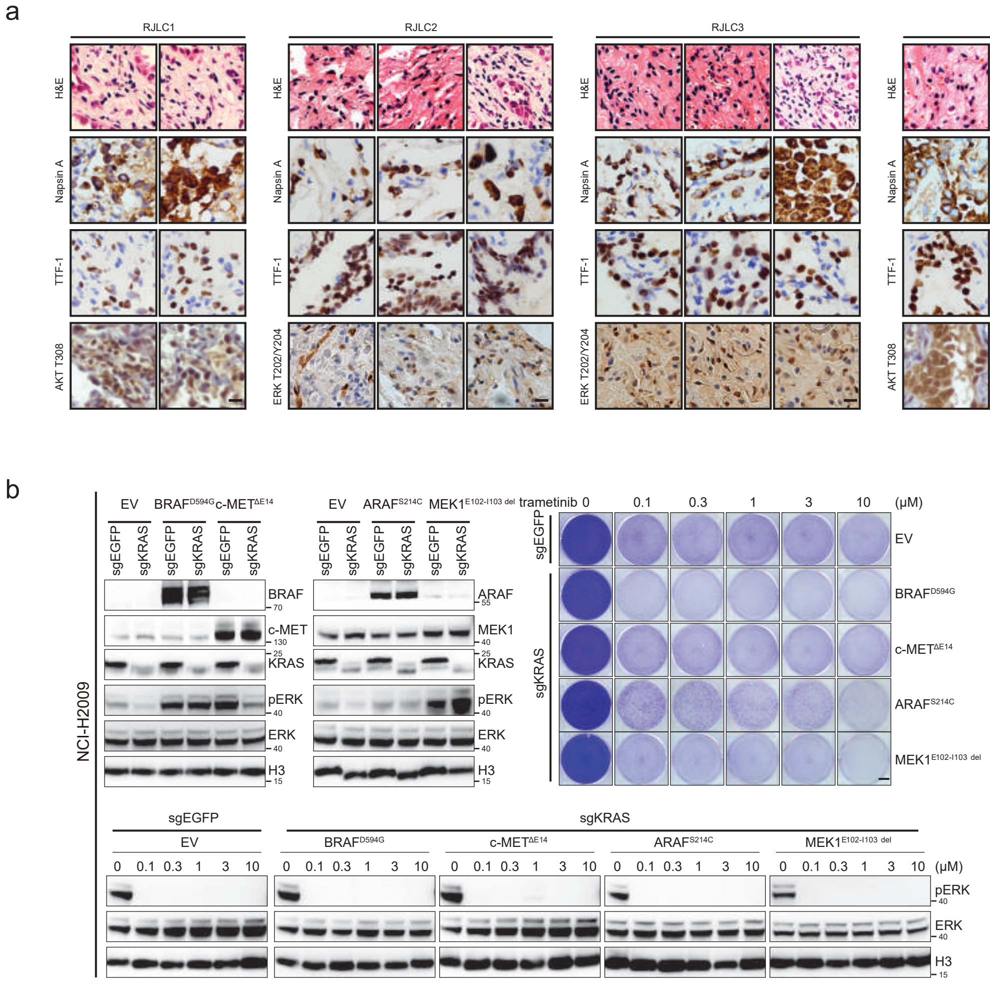
Supplementary Figure 11. SciClone analysis of sequenced tumor samples.

## Supplementary Figure 12.



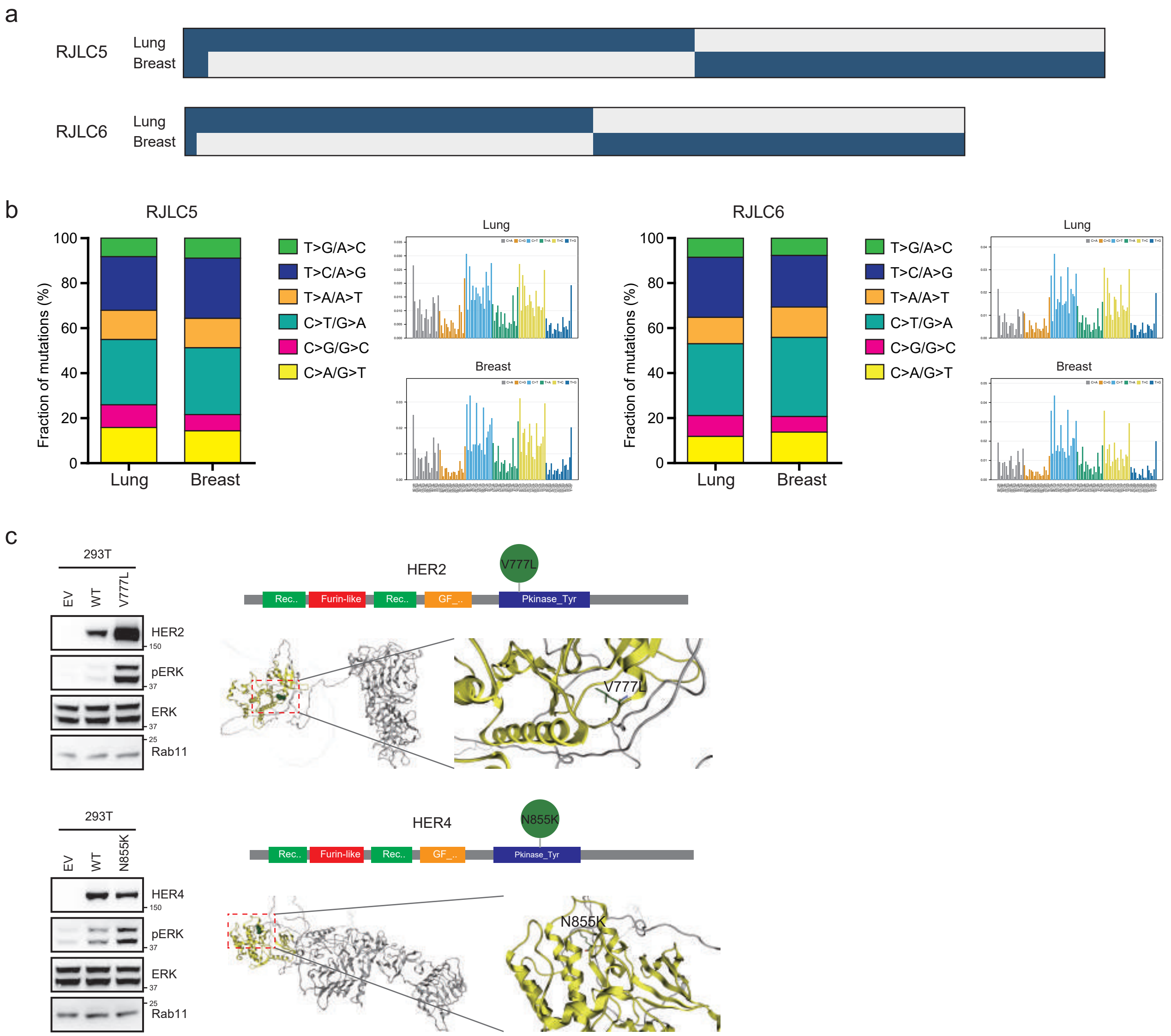
Supplementary Figure 12. Percentage of mutations with APOBEC signature for trunk and branch mutations in two M-seq tumors.

Supplementary Figure 13.



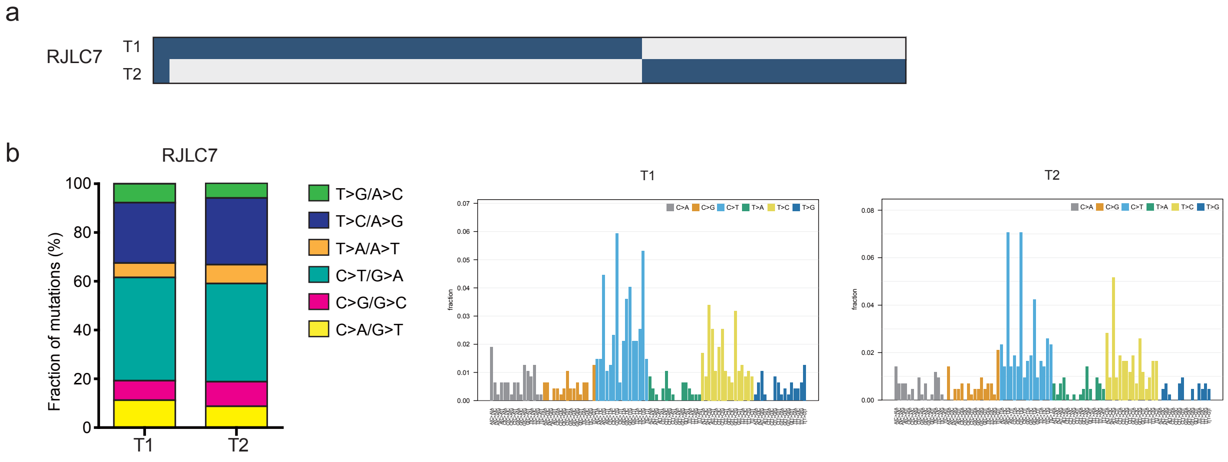
Supplementary Figure 13. (a) H&E and IHC of indicated markers in different MSLC tumors. Scale bar, 5 μm. (b) KRAS was knocked out using CRISPR-Cas9 system in NCI-H2009 cells and replaced with BRAF$^{D594G}$, c-MET$^{\Delta E14}$, ARAF$^{S214C}$ or MEK1$^{E102-I103\ del}$. ERK phosphorylation was measured by Western blot analysis. Indicated cells were treated with a serial dilution of trametinib for a week and stained with crystal violet. Scale bar, 5 mm. The corresponding cell lysates were analyzed by immunoblotting.

Supplementary Figure 14.



Supplementary Figure 14. (a) Heat maps showed the presence (blue) or absence (gray) of all non-silent somatic mutations in lung and breast tumors. (b) Mutation spectra and mutational signatures of lung and breast tumors in RJLC5 and RJLC6. (c) Overexpression of indicated wild-type or mutant genes in HEK293T cells. Gene expression and ERK phosphorylation were measured by immunoblotting. The mutated protein structures were generated by Phyre2 web portal and figures were prepared by using PyMOL.

# Supplementary Figure 15.



Supplementary Figure 15. (a) Heat maps showed the presence (blue) or absence (gray) of all non-silent somatic mutations in two tumors of RJLC7. (b) Mutation spectra and mutational signatures of two tumors in RJLC7.

# Supplementary Figure 16.

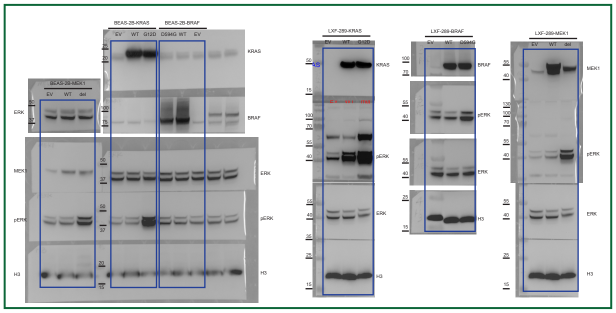


Figure 2c

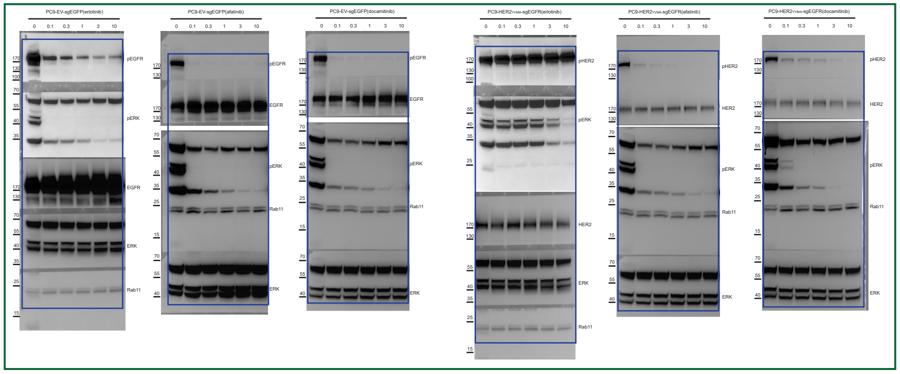


Figure 3d

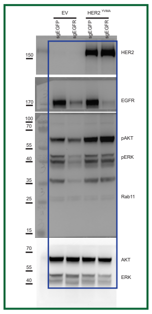


Figure 3c

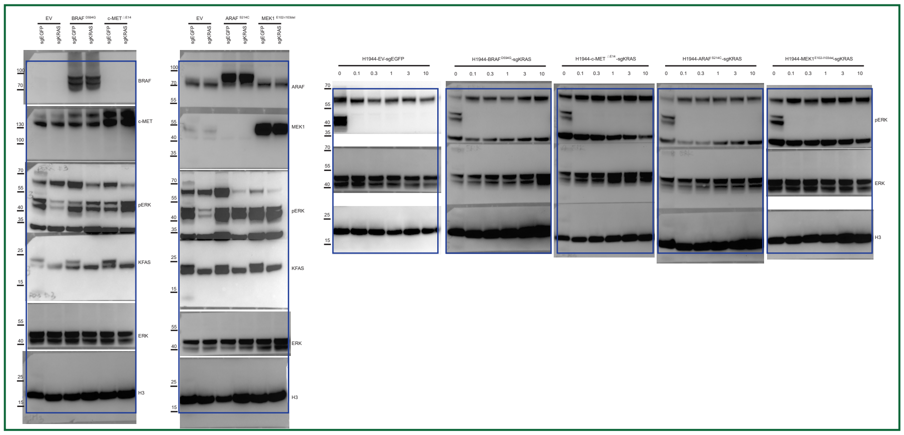
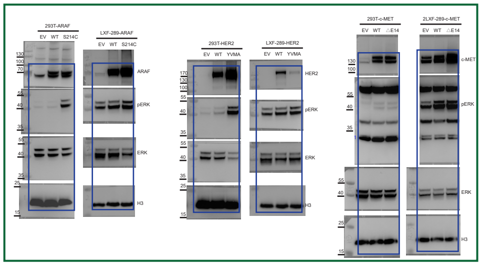
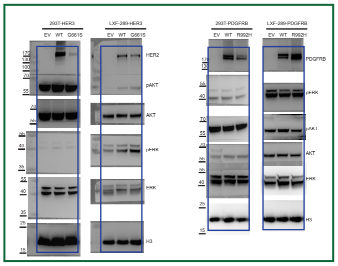
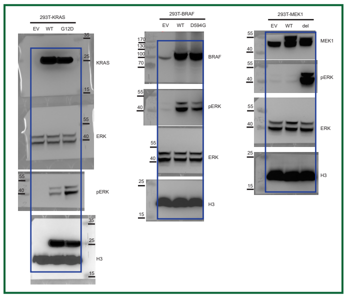
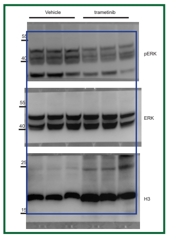


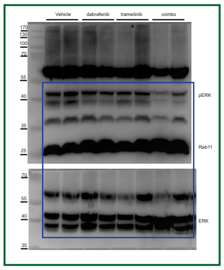
Figure 3e

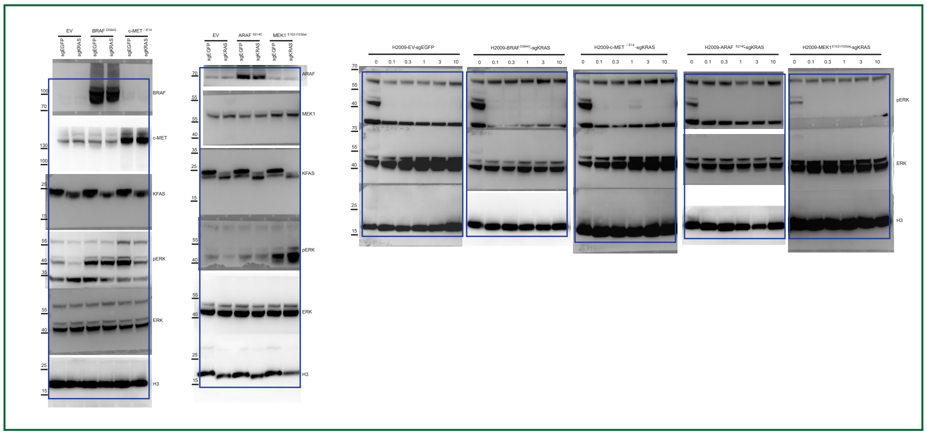

Supplementary Figure 8a

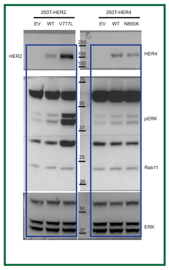

Supplementary Figure 8b


Supplementary Figure 8d


Supplementary Figure 8e


Supplementary Figure 8g


Supplementary Figure 13b


Supplementary Figure 14c

Supplementary Figure 16. All uncropped blots data.

## Supplementary Table 1: Sequencing statistics

| Sample ID | Description | Tissue | Coverage | >20X Coverage | Somatic SNVs | Mutation Rate | Protein-altering SNVs | Somatic Indels | Somatic CNVs | CNV gain | CNV loss |
|---|---|---|---|---|---|---|---|---|---|---|---|
| RJLC1-N | Normal | Frozen | 236.22 | 99.30% | NA | NA | NA | NA | NA | NA | NA |
| RJLC1-T1R1 | Tumor | Frozen | 262.55 | 99.30% | 180 | 0.658 | 28 | 1 | 48 | 36 | 12 |
| RJLC1-T1R2 | Tumor | Frozen | 295.77 | 99.40% | 232 | 0.897 | 35 | 5 | 15 | 14 | 1 |
| RJLC1-T1R3 | Tumor | Frozen | 281.14 | 99.40% | 219 | 0.877 | 33 | 3 | 25 | 23 | 2 |
| RJLC1-T1R4 | Tumor | Frozen | 281.36 | 99.40% | 229 | 0.797 | 32 | 3 | 25 | 25 | 0 |
| RJLC1-T2 | Tumor | Frozen | 249.27 | 99.30% | 296 | 0.758 | 26 | 2 | 199 | 199 | 0 |
| RJLC2-N | Normal | Frozen | 249.33 | 99.40% | NA | NA | NA | NA | NA | NA | NA |
| RJLC2-T1 | Tumor | Frozen | 256.62 | 99.40% | 173 | 0.578 | 21 | 2 | 26 | 26 | 0 |
| RJLC2-T2 | Tumor | Frozen | 265.06 | 99.40% | 177 | 0.458 | 20 | 3 | 34 | 32 | 2 |
| RJLC2-T3 | Tumor | Frozen | 263.22 | 99.40% | 167 | 0.538 | 20 | 2 | 49 | 47 | 2 |
| RJLC3-N | Normal | Frozen | 243.74 | 99.40% | NA | NA | NA | NA | NA | NA | NA |
| RJLC3-T1 | Tumor | Frozen | 234.68 | 99.50% | 443 | 0.857 | 35 | 4 | 88 | 88 | 0 |
| RJLC3-T2 | Tumor | Frozen | 211.45 | 99.10% | 525 | 0.818 | 30 | 9 | 58 | 44 | 14 |
| RJLC3-T3 | Tumor | Frozen | 225.54 | 99.30% | 224 | 0.797 | 31 | 13 | 73 | 72 | 1 |
| RJLC4-N | Normal | Frozen | 243.43 | 99.40% | NA | NA | NA | NA | NA | NA | NA |
| RJLC4-T1R1 | Tumor | Frozen | 221.46 | 99.30% | 679 | 1.500 | 59 | 11 | 311 | 308 | 3 |
| RJLC4-T1R2 | Tumor | Frozen | 235.33 | 99.40% | 531 | 1.375 | 51 | 10 | 747 | 714 | 33 |
| RJLC4-T1R3 | Tumor | Frozen | 214.65 | 99.30% | 441 | 1.356 | 52 | 8 | 282 | 279 | 3 |
| RJLC4-T2 | Tumor | Frozen | 204.98 | 99.20% | 495 | 0.619 | 28 | 1 | 32 | 30 | 2 |
| RJLC4-T3 | Tumor | Frozen | 212.78 | 99.30% | 662 | 0.638 | 26 | 3 | 130 | 102 | 28 |

# Supplementary Table 2: Driver mutation analysis

| Hugo_Symbol | Chromosome | Position | Ref_allele | Alt_allele | Variant_Classification | AAChange | dbSNP_RS | COSMIC | CGC | BertVogelstein125 | Comprehensive435 | SMG127 | Tumor_Sample_Name | ljb23_sift | ljb23_pp2hvar | ljb23_pp2hdiv | ljb23_mt |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DST | 6 | 56505297 | C | T | Missense_Mutation | DST:NM_001723:exon4:c.G523A:p.G175R | . | . | - | - | Candidate driver | - | RJLC1-T1R1 | 0.58,0.42,T | 1.0,D | 1.0,D | 0.833,0.833,D |
| EGFR | 7 | 55259515 | T | G | Missense_Mutation | EGFR:NM_005228:exon21:c.T2573G:p.L858R | rs121434568 | COSM6224 | a, NSCLCNS | Oncogene | High Confidence Drive | 4.60% | RJLC1-T1R1 | 0,1.00,D | 0.999,D | 1.0,D | 1.000,1.000,D |
| SPEG | 2 | 220309843 | G | A | Missense_Mutation | SPEG:NM_005876:exon3:c.G775A:p.A259T | . | OSM140563 | - | - | Candidate driver | - | RJLC1-T1R1 | 0.21,0.79,T | 0.011,B | 0.166,B | 1,1.0,D |
| RECQL4 | 8 | 145738379 | C | T | Missense_Mutation | RECQL4:NM_004260:exon16:c.G2606A:p.G869D | . | . | n basal cell, | - | - | - | RJLC1-T1R1 | . | . | . | . |
| STAG2 | X | 123220564 | A | T | Missense_Mutation | STAG2:NM_006603:exon29:c.A3221T:p.K1074I | . | . | elanoma, Ev | TSG | High Confidence Drive | 2.20% | RJLC1-T1R1 | 0.01,0.99,D | 0.921,D | 0.987,D | 1.000,1.000,D |
| TOP1 | 20 | 39742614 | C | T | Missense_Mutation | TOP1:NM_003286:exon15:c.C1457T:p.A486V | . | . | AML* | - | - | - | RJLC1-T1R1 | 0,1.00,D | 0.998,D | 1.0,D | 1,1.0,D |
| PLCG1 | 20 | 39801264 | G | A | Missense_Mutation | PLCG1:NM_002660:exon26:c.G3109A:p.A1037T | . | . | ngiosarcoma | - | High Confidence Drive | - | RJLC1-T1R1 | 0,1.00,D | 0.998,D | 1.0,D | 1,1.0,D |
| MYH11 | 16 | 15841968 | C | T | Missense_Mutation | MYH11:NM_002474:exon17:c.G2116A:p.E706K | . | . | AML | - | - | - | RJLC1-T1R2 | 0,1.00,D | 0.984,D | 1.0,D | 1,1.0,D |
| DST | 6 | 56505297 | C | T | Missense_Mutation | DST:NM_001723:exon4:c.G523A:p.G175R | . | . | - | - | Candidate driver | - | RJLC1-T1R2 | 0.58,0.42,T | 1.0,D | 1.0,D | 0.833,0.833,D |
| PLCG1 | 20 | 39801082 | G | C | Missense_Mutation | PLCG1:NM_002660:exon26:c.G2927C:p.C976S | . | . | ngiosarcoma | - | High Confidence Drive | - | RJLC1-T1R2 | 0.75,0.25,T | 0.03,B | 0.073,B | 1,1.0,D |
| EGFR | 7 | 55259515 | T | G | Missense_Mutation | EGFR:NM_005228:exon21:c.T2573G:p.L858R | rs121434568 | COSM6224 | a, NSCLCNS | Oncogene | High Confidence Drive | 4.60% | RJLC1-T1R2 | 0,1.00,D | 0.999,D | 1.0,D | 1.000,1.000,D |
| SPEG | 2 | 220309843 | G | A | Missense_Mutation | SPEG:NM_005876:exon3:c.G775A:p.A259T | . | OSM140563 | - | - | Candidate driver | - | RJLC1-T1R2 | 0.21,0.79,T | 0.011,B | 0.166,B | 1,1.0,D |
| RECQL4 | 8 | 145738379 | C | T | Missense_Mutation | RECQL4:NM_004260:exon16:c.G2606A:p.G869D | . | . | n basal cell, | - | - | - | RJLC1-T1R2 | . | . | . | . |
| STAG2 | X | 123220564 | A | T | Missense_Mutation | STAG2:NM_006603:exon29:c.A3221T:p.K1074I | . | . | elanoma, Ev | TSG | High Confidence Drive | 2.20% | RJLC1-T1R2 | 0.01,0.99,D | 0.921,D | 0.987,D | 1.000,1.000,D |
| TOP1 | 20 | 39742614 | C | T | Missense_Mutation | TOP1:NM_003286:exon15:c.C1457T:p.A486V | . | . | AML* | - | - | - | RJLC1-T1R2 | 0,1.00,D | 0.998,D | 1.0,D | 1,1.0,D |
| DST | 6 | 56505297 | C | T | Missense_Mutation | DST:NM_001723:exon4:c.G523A:p.G175R | . | . | - | - | Candidate driver | - | RJLC1-T1R3 | 0.58,0.42,T | 1.0,D | 1.0,D | 0.833,0.833,D |
| PTPRC | 1 | 198717250 | T | G | Missense_Mutation | PTPRC:NM_080921:exon24:c.T2377G:p.Y793D | . | . | T-ALL | - | - | - | RJLC1-T1R3 | 0.01,0.99,D | 0.993,D | 1.0,D | 1.000,1.000,D |
| EGFR | 7 | 55259515 | T | G | Missense_Mutation | EGFR:NM_005228:exon21:c.T2573G:p.L858R | rs121434568 | COSM6224 | a, NSCLCNS | Oncogene | High Confidence Drive | 4.60% | RJLC1-T1R3 | 0,1.00,D | 0.999,D | 1.0,D | 1.000,1.000,D |
| SPEG | 2 | 220309843 | G | A | Missense_Mutation | SPEG:NM_005876:exon3:c.G775A:p.A259T | . | OSM140563 | - | - | Candidate driver | - | RJLC1-T1R3 | 0.21,0.79,T | 0.011,B | 0.166,B | 1,1.0,D |
| RECQL4 | 8 | 145738379 | C | T | Missense_Mutation | RECQL4:NM_004260:exon16:c.G2606A:p.G869D | . | . | n basal cell, | - | - | - | RJLC1-T1R3 | . | . | . | . |
| STAG2 | X | 123220564 | A | T | Missense_Mutation | STAG2:NM_006603:exon29:c.A3221T:p.K1074I | . | . | elanoma, Ev | TSG | High Confidence Drive | 2.20% | RJLC1-T1R3 | 0.01,0.99,D | 0.921,D | 0.987,D | 1.000,1.000,D |
| TOP1 | 20 | 39742614 | C | T | Missense_Mutation | TOP1:NM_003286:exon15:c.C1457T:p.A486V | . | . | AML* | - | - | - | RJLC1-T1R3 | 0,1.00,D | 0.998,D | 1.0,D | 1,1.0,D |
| MYH11 | 16 | 15841968 | C | T | Missense_Mutation | MYH11:NM_002474:exon17:c.G2116A:p.E706K | . | . | AML | - | - | - | RJLC1-T1R4 | 0,1.00,D | 0.984,D | 1.0,D | 1,1.0,D |
| DST | 6 | 56505297 | C | T | Missense_Mutation | DST:NM_001723:exon4:c.G523A:p.G175R | . | . | - | - | Candidate driver | - | RJLC1-T1R4 | 0.58,0.42,T | 1.0,D | 1.0,D | 0.833,0.833,D |
| EGFR | 7 | 55259515 | T | G | Missense_Mutation | EGFR:NM_005228:exon21:c.T2573G:p.L858R | rs121434568 | COSM6224 | a, NSCLCNS | Oncogene | High Confidence Drive | 4.60% | RJLC1-T1R4 | 0,1.00,D | 0.999,D | 1.0,D | 1.000,1.000,D |
| SPEG | 2 | 220309843 | G | A | Missense_Mutation | SPEG:NM_005876:exon3:c.G775A:p.A259T | . | OSM140563 | - | - | Candidate driver | - | RJLC1-T1R4 | 0.21,0.79,T | 0.011,B | 0.166,B | 1,1.0,D |
| RECQL4 | 8 | 145738379 | C | T | Missense_Mutation | RECQL4:NM_004260:exon16:c.G2606A:p.G869D | . | . | n basal cell, | - | - | - | RJLC1-T1R4 | . | . | . | . |
| STAG2 | X | 123220564 | A | T | Missense_Mutation | STAG2:NM_006603:exon29:c.A3221T:p.K1074I | . | . | elanoma, Ev | TSG | High Confidence Drive | 2.20% | RJLC1-T1R4 | 0.01,0.99,D | 0.921,D | 0.987,D | 1.000,1.000,D |
| TOP1 | 20 | 39742614 | C | T | Missense_Mutation | TOP1:NM_003286:exon15:c.C1457T:p.A486V | . | . | AML* | - | - | - | RJLC1-T1R4 | 0,1.00,D | 0.998,D | 1.0,D | 1,1.0,D |
| EGFR | 7 | 55259515 | T | G | Missense_Mutation | EGFR:NM_005228:exon21:c.T2573G:p.L858R | rs121434568 | COSM6224 | a, NSCLCNS | Oncogene | High Confidence Drive | 4.60% | RJLC1-T2 | 0,1.00,D | 0.999,D | 1.0,D | 1.000,1.000,D |
| BCL9L | 11 | 118773748 | G | A | Missense_Mutation | BCL9L:NM_182557:exon5:c.C785T:p.S262F | . | . | - | - | Candidate driver | - | RJLC2-T1 | 0,1.00,D | 0.191,B | 0.662,P | 1.000,1.000,D |
| BRAF | 7 | 140453154 | T | C | Missense_Mutation | BRAF:NM_004333:exon15:c.A1781G:p.D594G | rs121913338 | COSM467 | ilocytic astro | Oncogene | High Confidence Drive | 1.50% | RJLC2-T1 | 0,1.00,D | 0.983,D | 0.994,D | 1,1.0,D |
| USP9X | X | 41058006 | A | C | Splice_Site | NM_001039590:exon30:c.4603+3A>C | . | . | - | - | Candidate driver | 2.10% | RJLC2-T1 | . | . | . | . |
| KRAS | 12 | 25398284 | C | T | Missense_Mutation | KRAS:NM_004985:exon2:c.G35A:p.G12D | rs121913529 | 1135366,CO | ng, thyroid, | Oncogene | High Confidence Drive | 6.70% | RJLC2-T2 | 0,1.00,D | 0.361,B | 0.517,P | 1,1.0,D |
| RAB11FIP5 | 2 | 73315825 | G | C | Missense_Mutation | RAB11FIP5:NM_015470:exon3:c.C921G:p.S307R | . | . | - | - | Candidate driver | - | RJLC2-T3 | 0,1.00,D | 0.986,D | 1.0,D | 0.994,0.994,D |
| MET | 7 | 116412043 | G | C | Missense_Mutation | MET:NM_000245:exon14:c.G3028C:p.D1010H | . | . | neck squame | Oncogene | High Confidence Drive | - | RJLC2-T3 | 0.01,0.99,D | 0.994,D | 1.0,D | 1,1.0,D |
| PDGFRB | 5 | 149499063 | C | T | Missense_Mutation | PDGFRB:NM_002609:exon20:c.G2765A:p.R922H | . | COSM21596 | AML, CMML | - | - | - | RJLC2-T3 | 0,1.00,D | 1.0,D | 1.0,D | 1.000,1.000,D |
| MAP2K1 | 15 | 66729093 | CTGGAGA | C | In_Frame_Del | MAP2K1:NM_002755:exon3:c.302_307del:p.101_103del | . | COSM40499 | melanoma, c | Oncogene | High Confidence Drive | - | RJLC3-T1 | . | . | . | . |
| CREB3L2 | 7 | 137686411 | C | A | Missense_Mutation | CREB3L2:NM_001253775:exon1:c.G41T:p.W14L | . | . | myxoid sarc | - | - | - | RJLC3-T1 | 0.02,0.98,D | 0.998,D | 1.0,D | 1,1.0,D |
| AKR1B1 | 7 | 134136481 | C | A | Missense_Mutation | AKR1B1:NM_001628:exon2:c.G91T:p.A31S | . | . | - | Oncogene | High Confidence Drive | 1.20% | RJLC3-T2 | 0.07,0.93,T | 0.966,D | 0.98,D | 1.000,1.000,D |
| PIK3CA | 3 | 178921572 | G | A | Missense_Mutation | PIK3CA:NM_006218:exon5:c.G1054A:p.D352N | . | . | stric, gliobla | Oncogene | High Confidence Drive | 17.80% | RJLC3-T2 | 0.5,0.50,T | 0.284,B | 0.606,P | 1,1.0,D |
| SDHAF2 | 11 | 61205278 | A | C | Missense_Mutation | SDHAF2:NM_017841:exon2:c.A218C:p.E73A | . | . | aragangliom | - | - | - | RJLC3-T2 | 0.01,0.99,D | 0.936,D | 0.996,D | 1,1.0,D |
| ARAF | X | 47426121 | C | G | Missense_Mutation | ARAF:NM_001256196:exon7:c.C650G:p.S217C | . | . | - | - | High Confidence Drive | - | RJLC3-T2 | 0,1.00,D | 0.926,D | 0.997,D | 1,1.0,D |
| PIK3CA | 3 | 178922324 | G | A | Missense_Mutation | PIK3CA:NM_006218:exon6:c.G1093A:p.E365K | . | 6044,COSM | stric, gliobla | Oncogene | High Confidence Drive | 17.80% | RJLC3-T2 | 0.62,0.38,T | 0.285,B | 0.536,P | 1,1.0,D |
| PIK3CA | 3 | 178928079 | G | C | Missense_Mutation | PIK3CA:NM_006218:exon8:c.G1357C:p.E453Q | . | 758,COSM1 | stric, gliobla | Oncogene | High Confidence Drive | 17.80% | RJLC3-T2 | 0.31,0.69,T | 0.265,B | 0.364,B | 1,1.0,D |
| NAA15 | 4 | 140262101 | A | C | Missense_Mutation | NAA15:NM_057175:exon4:c.A280C:p.K94Q | . | . | - | - | Candidate driver | - | RJLC3-T3 | 0.06,0.94,T | 0.994,D | 0.997,D | 1,1.0,D |
| PLEC | 8 | 145003289 | G | T | Missense_Mutation | PLEC:NM_201378:exon25:c.C3200A:p.S1067Y | . | . | - | - | High Confidence Drive | - | RJLC3-T3 | 0,1.00,D | 0.999,D | 1.0,D | 1,1.0,D |
| TAL2 | 9 | 108424781 | A | G | Missense_Mutation | TAL2:NM_005421:exon1:c.A4G:p.T2A | . | . | T-ALL | - | - | - | RJLC3-T3 | 0.52,0.48,T | 0.016,B | 0.008,B | 0.951,0.951,D |
| KRAS | 12 | 25398285 | C | A | Missense_Mutation | KRAS:NM_004985:exon2:c.G34T:p.G12C | rs121913530 | 1140136,CO | ng, thyroid, | Oncogene | High Confidence Drive | 6.70% | RJLC3-T3 | 0.01,0.99,D | 0.993,D | 1.0,D | 1,1.0,D |
| BRAF | 7 | 140481400 | TTCCAAATGA | T | In_Frame_Del | BRAF:NM_004333:exon11:c.1399_1407del:p.467_469del | . | . | ilocytic astro | Oncogene | High Confidence Drive | 1.50% | RJLC3-T3 | . | . | . | . |
| EGFR | 7 | 55242464 | AGGAATTAAGAGAAGC | A | In_Frame_Del | EGFR:NM_005228:exon19:c.2235_2249del:p.745_750del | rs121913421 | COSM6223 | a, NSCLCNS | Oncogene | High Confidence Drive | 4.60% | RJLC4-T1R1 | . | . | . | . |
| VEZT | 12 | 95693937 | G | T | Splice_Site | NM_017599:exon12:c.1832-4G>T | . | . | - | - | Candidate driver | - | RJLC4-T1R1 | . | . | . | . |
| KMT2C | 7 | 151882672 | C | A | Missense_Mutation | KMT2C:NM_170606:exon34:c.G5053T:p.A1685S | rs145848316 | 49561,COSM | edulloblastor | TSG | High Confidence Drive | 6.60% | RJLC4-T1R1 | 0.07,0.93,T | 0.997,D | 1.0,D | 1,1.0,D |
| TET2 | 4 | 106157834 | C | T | Missense_Mutation | TET2:NM_001127208:exon3:c.C2735T:p.A912V | . | . | MDS | TSG | High Confidence Drive | 1.60% | RJLC4-T1R1 | 0.04,0.96,D | 0.009,B | 0.03,B | 1,0.0,N |
| TP53 | 17 | 7576897 | G | A | Nonsense_Mutation | TP53:NM_001126115:exon5:c.C553T:p.Q185X | . | OSM165085 | her tumour t | TSG | High Confidence Drive | 42.00% | RJLC4-T1R1 | 0.92,0.08,T | . | . | 1,1,A |
| PTEN | 10 | 89720649 | A | T | Splice_Site | NM_000314:exon8:c.802-2A>T | . | COSM1373 | harmartoma | TSG | High Confidence Drive | 9.70% | RJLC4-T1R1 | . | . | . | 1,1.0,D |
| DST | 6 | 56392520 | A | C | Nonsense_Mutation | DST:NM_015548:exon49:c.T9824G:p.L3275X | . | . | - | - | Candidate driver | - | RJLC4-T1R1 | 0.5,0.50,T | . | . | 1.000,1.000,A |
| MAP3K3 | 17 | 61744340 | G | A | Missense_Mutation | MAP3K3:NM_002401:exon6:c.G422A:p.R141Q | . | . | - | - | High Confidence Drive | - | RJLC4-T1R1 | 0.27,0.73,T | 0.145,B | 0.757,P | 1.000,1.000,D |
| CUX1 | 7 | 101747612 | G | T | Splice_Site | NM_001202543:exon6:c.440-4G>T | . | . | lorectal, AML | - | Candidate driver | - | RJLC4-T1R1 | . | . | . | . |
| TP53 | 17 | 7577535 | C | T | Missense_Mutation | TP53:NM_001126115:exon3:c.G350A:p.R117K | . | OSM129832 | her tumour t | TSG | High Confidence Drive | 42.00% | RJLC4-T1R1 | 0,1.00,D | 0.961,D | 0.995,D | 0.999,0.999,D |
| EGFR | 7 | 55242464 | AGGAATTAAGAGAAGC | A | In_Frame_Del | EGFR:NM_005228:exon19:c.2235_2249del:p.745_750del | rs121913421 | COSM6223 | a, NSCLCNS | Oncogene | High Confidence Drive | 4.60% | RJLC4-T1R2 | . | . | . | . |
| TP53 | 17 | 7576897 | G | A | Nonsense_Mutation | TP53:NM_001126115:exon5:c.C553T:p.Q185X | . | OSM165085 | her tumour t | TSG | High Confidence Drive | 42.00% | RJLC4-T1R2 | 0.92,0.08,T | . | . | 1,1,A |
| MAP3K3 | 17 | 61744340 | G | A | Missense_Mutation | MAP3K3:NM_002401:exon6:c.G422A:p.R141Q | . | . | - | - | High Confidence Drive | - | RJLC4-T1R2 | 0.27,0.73,T | 0.145,B | 0.757,P | 1.000,1.000,D |
| TET2 | 4 | 106157834 | C | T | Missense_Mutation | TET2:NM_001127208:exon3:c.C2735T:p.A912V | . | . | MDS | TSG | High Confidence Drive | 1.60% | RJLC4-T1R2 | 0.04,0.96,D | 0.009,B | 0.03,B | 1,0.0,N |
| TP53 | 17 | 7577535 | C | T | Missense_Mutation | TP53:NM_001126115:exon3:c.G350A:p.R117K | . | OSM129832 | her tumour t | TSG | High Confidence Drive | 42.00% | RJLC4-T1R2 | 0,1.00,D | 0.961,D | 0.995,D | 0.999,0.999,D |
| EGFR | 7 | 55242464 | AGGAATTAAGAGAAGC | A | In_Frame_Del | EGFR:NM_005228:exon19:c.2235_2249del:p.745_750del | rs121913421 | COSM6223 | a, NSCLCNS | Oncogene | High Confidence Drive | 4.60% | RJLC4-T1R3 | . | . | . | . |
| ASPM | 1 | 197060124 | A | C | Nonsense_Mutation | ASPM:NM_001206846:exon22:c.T4737G:p.Y1579X | rs143931757 | . | - | - | High Confidence Drive | - | RJLC4-T1R3 | 1,0.00,T | . | . | 1,1,A |
| TP53 | 17 | 7576897 | G | A | Nonsense_Mutation | TP53:NM_001126115:exon5:c.C553T:p.Q185X | . | OSM165085 | her tumour t | TSG | High Confidence Drive | 42.00% | RJLC4-T1R3 | 0.92,0.08,T | . | . | 1,1,A |
| MAP3K3 | 17 | 61744340 | G | A | Missense_Mutation | MAP3K3:NM_002401:exon6:c.G422A:p.R141Q | . | . | - | - | High Confidence Drive | - | RJLC4-T1R3 | 0.27,0.73,T | 0.145,B | 0.757,P | 1.000,1.000,D |
| TET2 | 4 | 106157834 | C | T | Missense_Mutation | TET2:NM_001127208:exon3:c.C2735T:p.A912V | . | . | MDS | TSG | High Confidence Drive | 1.60% | RJLC4-T1R3 | 0.04,0.96,D | 0.009,B | 0.03,B | 1,0.0,N |
| TP53 | 17 | 7577535 | C | T | Missense_Mutation | TP53:NM_001126115:exon3:c.G350A:p.R117K | . | OSM129832 | her tumour t | TSG | High Confidence Drive | 42.00% | RJLC4-T1R3 | 0,1.00,D | 0.961,D | 0.995,D | 0.999,0.999,D |
| ASPM | 1 | 197060124 | A | C | Nonsense_Mutation | ASPM:NM_001206846:exon22:c.T4737G:p.Y1579X | rs143931757 | . | - | - | High Confidence Drive | - | RJLC4-T2 | 1,0.00,T | . | . | 1,1,A |
| CNOT1 | 16 | 58585156 | A | C | Missense_Mutation | CNOT1:NM_001265612:exon24:c.T3207G:p.N1069K | . | . | - | - | Candidate driver | - | RJLC4-T2 | 0.12,0.88,T | 0.989,D | 1.0,D | 1,1.0,D |
| ERBB2 | 17 | 37880981 | A | AGCATACGTGATG | In_Frame_Ins | ERBB2:NM_001289937:exon20:c.2310_2311insGCATACGTGATG:p.E770delinsEAYVM | . | . | er tumour typ | Oncogene | High Confidence Drive | - | RJLC4-T2 | . | . | . | . |
| BRAF | 7 | 140434574 | C | A | Splice_Site | NM_004333:exon19:c.2128-4G>T | . | . | ilocytic astro | Oncogene | High Confidence Drive | 1.50% | RJLC4-T3 | . | . | . | . |
| ERBB2 | 17 | 37880981 | A | AGCATACGTGATG | In_Frame_Ins | ERBB2:NM_001289937:exon20:c.2310_2311insGCATACGTGATG:p.E770delinsEAYVM | . | . | er tumour typ | Oncogene | High Confidence Drive | - | RJLC4-T3 | . | . | . | . |

## Supplementary Table 3: Driver mutation prevalence in lung cancer samples

| Driver genes | Prevalence in pan-lung cancer of TCGA (n=1144 samples) | Prevalence in LUAC of TCGA (n=230 samples) | Mutations identified in this study | Mutated tumors | Mutations functionally implicated in lung tumorigenesis |
|---|---|---|---|---|---|
| KRAS | 23.0% | 36.0% | G12C; G12D | RJLC2-T2; RJLC3-T3 | Yes |
| EGFR | 14.0% | 17.0% | L858R; E746-A750 deletion | RJLC1-T1; RJLC1-T2; RJLC4-T1 | Yes |
| ERBB2 | 4.0% | 5.0% | Y772-A775 duplication | RJLC4-T2; RJLC4-T3 | Yes |
| MET | 5.0% | 12.0% | Exon 14 splice site | RJLC2-T3 | Yes |
| ARAF | 2.7% | 2.6% | S214C | RJLC3-T2 | Yes |
| BRAF | 7.0% | 11.0% | D594G | RJLC2-T1 | No |
| MAP2K1 | 1.7% | 1.7% | E102-I103 deletion | RJLC3-T1 | No |

# Supplementary Table 4: Neoantigen repertoires predicted by NetMHCpan algorithm

| Sample | MutatatedGene | Mutation information | Chr | Position | ref | alt | T_vaf | T(DV/DN) | N(DV/DN) | HLA | wildPeptide | Neoantigens | wildPeptide-Aff(nM) | Neoantigens-Aff(nM) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RJLC1-T1 | NBPF10 | NM_001039703:exon6:c.T836G:p.L279W | 1 | 145299787 | T | G | 0.12 | 3:22 | 0:17 | HLA-A*11:01 | SAGPLSSEK | SAGPWSSEK | 135.7 | 73.8 |
| RJLC1-T1 | SPEG | NM_005876:exon3:c.G775A:p.A259T | 2 | 220309843 | G | A | 0.171 | 0.855555556 | 0.084027778 | HLA-A*11:01 | SAFSLYRGR | STFSLYRGR | 309.5 | 42.5 |
| RJLC1-T1 | PRR21 | NM_001080835:exon1:c.C847T:p.P283S | 2 | 240981553 | G | A | 0.167 | 3:15 | 1:21 | HLA-A*11:01 | GPSSMPLHPR | GSSSMPLHPR | 134.5 | 76.5 |
| RJLC1-T1 | PRR21 | NM_001080835:exon1:c.C847T:p.P283S | 2 | 240981553 | G | A | 0.167 | 3:15 | 1:21 | HLA-A*11:01 | PSSMPLHPR | SSSMPLHPR | 1123.5 | 27 |
| RJLC1-T1 | PGK2 | NM_138733:exon1:c.A679T:p.M227L | 6 | 49754222 | T | A | 0.08 | 26:300 | 0.157638889 | HLA-A*11:01 | QLIKNMLDK | QLIKNLLDK | 245.4 | 233.4 |
| RJLC1-T1 | RSPH3 | NM_031924:exon6:c.C1273A:p.P425T | 6 | 159401818 | G | T | 0.118 | 0.984027778 | 0.088888889 | HLA-A*11:01 | SGYFYDPIER | SGYFYDTIER | 556.6 | 313.5 |
| RJLC1-T1 | RECQL4 | NM_004260:exon16:c.G2606A:p.G869D | 8 | 145738379 | C | T | 0.175 | 37:174 | 0.122222222 | HLA-A*11:01 | AVGGERPVPK | AVDGERPVPK | 135.2 | 99.8 |
| RJLC1-T1 | SERPINA5 | NM_000624:exon3:c.C452T:p.T151M | 14 | 95054151 | C | T | 0.151 | 50:281 | 0.289583333 | HLA-A*11:01 | TFVSAMKTLY | TFVSAMKMLY | 1622.6 | 249.1 |
| RJLC1-T1 | SERPINA5 | NM_000624:exon3:c.C452T:p.T151M | 14 | 95054151 | C | T | 0.151 | 50:281 | 0.289583333 | HLA-A*11:01 | FVSAMKTLY | FVSAMKMLY | 1495 | 275.2 |
| RJLC1-T1 | PLA2G4D | NM_178034:exon3:c.G160A:p.A54T | 15 | 42379593 | C | T | 0.036 | 0.6 | 0.154861111 | HLA-A*11:01 | LQLSTAPGMK | LQLSTTPGMK | 402.1 | 354.6 |
| RJLC1-T1 | PLA2G4D | NM_178034:exon3:c.G160A:p.A54T | 15 | 42379593 | C | T | 0.036 | 0.6 | 0.154861111 | HLA-A*11:01 | TAPGMKFKTK | TTPGMKFKTK | 1452.9 | 244 |
| RJLC1-T1 | TOP1 | NM_003286:exon15:c.C1457T:p.A486V | 20 | 39742614 | C | T | 0.118 | 0.65625 | 0.051388889 | HLA-A*11:01 | KLALRAGNEK | KLVLRAGNEK | 326.3 | 251.8 |
| RJLC1-T1 | TOP1 | NM_003286:exon15:c.C1457T:p.A486V | 20 | 39742614 | C | T | 0.118 | 0.65625 | 0.051388889 | HLA-A*11:01 | LALRAGNEK | LVLRAGNEK | 453 | 101.2 |
| RJLC1-T1 | CHM | NM_000390:exon13:c.G1570C:p.V524L | X | 85134009 | C | G | 0.064 | 0.311111111 | 0.045138889 | HLA-A*11:01 | SVVQKLFVPY | SVLQKLFVPY | 97.4 | 88.7 |
| RJLC1-T1 | STAG2 | NM_006603:exon29:c.A3221T:p.K1074I | X | 123220564 | A | T | 0.156 | 35:189 | 0.113194444 | HLA-A*11:01 | GSTVRSKKSK | GSTVRSKISK | 2400.8 | 112 |
| RJLC1-T1 | STAG2 | NM_006603:exon29:c.A3221T:p.K1074I | X | 123220564 | A | T | 0.156 | 35:189 | 0.113194444 | HLA-A*11:01 | SKKSKPSTGK | SKISKPSTGK | 18407.8 | 118.9 |
| RJLC1-T1 | STAG2 | NM_006603:exon29:c.A3221T:p.K1074I | X | 123220564 | A | T | 0.156 | 35:189 | 0.113194444 | HLA-A*11:01 | STVRSKKSK | STVRSKISK | 239.6 | 18.3 |
| RJLC1-T1 | STAG2 | NM_006603:exon29:c.A3221T:p.K1074I | X | 123220564 | A | T | 0.156 | 35:189 | 0.113194444 | HLA-A*11:01 | KKSKPSTGK | KISKPSTGK | 11479.2 | 44.9 |
| RJLC1-T1 | CYBRD1 | NM_001256909:exon4:c.C413T:p.P138L | 2 | 172411063 | C | T | 0.032 | 0.438888889 | 0.129166667 | HLA-A*24:02 | AYSTFPPEGVF | AYSTFPLEGVF | 891 | 380.5 |
| RJLC1-T1 | SERPINA5 | NM_000624:exon3:c.C452T:p.T151M | 14 | 95054151 | C | T | 0.151 | 50:281 | 0.289583333 | HLA-A*24:02 | KTLYLADTF | KMLYLADTF | 1044.4 | 147.1 |
| RJLC1-T1 | RALGAPA2 | NM_020343:exon10:c.G1222T:p.V408L | 20 | 20610018 | C | A | 0.043 | 0.343055556 | 0.063194444 | HLA-A*24:02 | RGYVNFVNEV | RGYVNFVNEL | 383.8 | 180.3 |
| RJLC1-T1 | RALGAPA2 | NM_020343:exon10:c.G1222T:p.V408L | 20 | 20610018 | C | A | 0.043 | 0.343055556 | 0.063194444 | HLA-A*24:02 | GYVNFVNEVF | GYVNFVNELF | 78.7 | 36.7 |
| RJLC1-T1 | RALGAPA2 | NM_020343:exon10:c.G1222T:p.V408L | 20 | 20610018 | C | A | 0.043 | 0.343055556 | 0.063194444 | HLA-A*24:02 | GYVNFVNEV | GYVNFVNEL | 667.6 | 342.8 |
| RJLC1-T1 | CYBRD1 | NM_001256909:exon4:c.C413T:p.P138L | 2 | 172411063 | C | T | 0.032 | 0.438888889 | 0.129166667 | HLA-B*40:01 | PEGVFVNTL | LEGVFVNTL | 1314.5 | 32.8 |
| RJLC1-T1 | WNT9B | NM_003396:exon3:c.C446T:p.P149L | 17 | 44952578 | C | T | 0.038 | 0.652777778 | 0.185416667 | HLA-B*40:01 | MERCTCDDSP | MERCTCDDSL | 19257.5 | 155.1 |
| RJLC1-T1 | CHM | NM_000390:exon13:c.G1570C:p.V524L | X | 85134009 | C | G | 0.064 | 0.311111111 | 0.045138889 | HLA-B*40:01 | REDLESVV | REDLESVL | 1546.7 | 284.2 |
| RJLC1-T1 | EPM2AIP1 | NM_014805:exon1:c.C1024T:p.L342F | 3 | 37033545 | G | A | 0.184 | 99:438 | 0.311805556 | HLA-C*07:02 | LRRGKTLKL | FRRGKTLKL | 158 | 31 |
| RJLC1-T2 | NBPF10 | NM_001039703:exon6:c.T836G:p.L279W | 1 | 145299787 | T | G | 0.19 | 0.178472222 | 0.011805556 | HLA-A*11:01 | SAGPLSSEK | SAGPWSSEK | 135.7 | 73.8 |
| RJLC1-T2 | TAF1B | NM_005680:exon13:c.C1317A:p.D439E | 2 | 10059215 | C | A | 0.036 | 0.6 | 0.203472222 | HLA-A*11:01 | KPLYYSFVDK | KPLYYSFVEK | 232.4 | 76.7 |
| RJLC1-T2 | TAF1B | NM_005680:exon13:c.C1317A:p.D439E | 2 | 10059215 | C | A | 0.036 | 0.6 | 0.203472222 | HLA-A*11:01 | PLYYSFVDK | PLYYSFVEK | 764.6 | 221.5 |
| RJLC1-T2 | MANEA | NM_024641:exon5:c.G1283T:p.R428L | 6 | 96054175 | G | T | 0.034 | 0.733333333 | 0.214583333 | HLA-A*11:01 | NTVYLDYRPHK | NTVYLDYLPHK | 1243.7 | 300.6 |
| RJLC1-T2 | MANEA | NM_024641:exon5:c.G1283T:p.R428L | 6 | 96054175 | G | T | 0.034 | 0.733333333 | 0.214583333 | HLA-A*11:01 | TVYLDYRPHK | TVYLDYLPHK | 63.8 | 19.4 |
| RJLC1-T2 | ERCC6L2 | NM_001010895:exon6:c.G1099T:p.A367S | 9 | 98678624 | G | T | 0.079 | 0.397916667 | 0.063888889 | HLA-A*11:01 | RKAMQRLAKK | RKSMQRLAKK | 121.6 | 53.1 |
| RJLC1-T2 | ERCC6L2 | NM_001010895:exon6:c.G1099T:p.A367S | 9 | 98678624 | G | T | 0.079 | 0.397916667 | 0.063888889 | HLA-A*11:01 | ATGRKAMQR | ATGRKSMQR | 266.2 | 217.4 |
| RJLC1-T2 | ERCC6L2 | NM_001010895:exon6:c.G1099T:p.A367S | 9 | 98678624 | G | T | 0.079 | 0.397916667 | 0.063888889 | HLA-A*11:01 | KAMQRLAKK | KSMQRLAKK | 29.5 | 14 |
| RJLC1-T2 | TFF1 | NM_003225:exon2:c.C140T:p.T47M | 21 | 43783462 | G | A | 0.091 | 0.486111111 | 0.077083333 | HLA-A*11:01 | GVTPSQCANK | GVMPSQCANK | 187.9 | 30.4 |
| RJLC1-T2 | F9 | NM_000133:exon8:c.G1012C:p.D338H | X | 138643856 | G | C | 0.03 | 0.966666667 | 0.333333333 | HLA-A*11:01 | YVTPICIADK | YVTPICIAHK | 137 | 92 |
| RJLC1-T2 | F9 | NM_000133:exon8:c.G1012C:p.D338H | X | 138643856 | G | C | 0.03 | 0.966666667 | 0.333333333 | HLA-A*11:01 | VTPICIADK | VTPICIAHK | 410.7 | 179.6 |
| RJLC1-T2 | DGAT2 | NM_001253891:exon2:c.T143G:p.L48R | 11 | 75501254 | T | G | 0.106 | 0.332638889 | 0.044444444 | HLA-A*24:02 | LMYIFCTDCW | RMYIFCTDCW | 226.1 | 83.2 |
| RJLC1-T2 | SLC9A7 | NM_001257291:exon15:c.G1790T:p.W597L | X | 46480445 | C | A | 0.038 | 0.413888889 | 0.139583333 | HLA-A*24:02 | WIFRLWYSF | LIFRLWYSF | 424.4 | 208.6 |
| RJLC1-T2 | F9 | NM_000133:exon8:c.G1012C:p.D338H | X | 138643856 | G | C | 0.03 | 0.966666667 | 0.333333333 | HLA-A*24:02 | DKEYTNIFLKF | HKEYTNIFLKF | 550.5 | 258.5 |
| RJLC1-T2 | ADD3 | NM_001121:exon2:c.A119G:p.N40S | 10 | 111860530 | A | G | 0.046 | 0.504861111 | 0.11875 | HLA-B*40:01 | RERNMSPDL | RERSMSPDL | 195.6 | 138.1 |
| RJLC1-T2 | SLC9A7 | NM_001257291:exon15:c.G1790T:p.W597L | X | 46480445 | C | A | 0.038 | 0.413888889 | 0.139583333 | HLA-B*40:01 | KQESAWIFRL | KQESALIFRL | 502.6 | 314.5 |
| RJLC1-T2 | SLC9A7 | NM_001257291:exon15:c.G1790T:p.W597L | X | 46480445 | C | A | 0.038 | 0.413888889 | 0.139583333 | HLA-B*40:01 | QESAWIFRL | QESALIFRL | 31.4 | 21.9 |
| RJLC1-T2 | KIF26B | NM_018012:exon10:c.G2107C:p.G703R | 1 | 245809431 | G | C | 0.101 | 0.430555556 | 0.069444444 | HLA-C*07:02 | GGRSRLHLI | GRRSRLHLI | 7981.9 | 415.2 |
| RJLC1-T2 | DLK1 | NM_003836:exon5:c.G779A:p.S260N | 14 | 101200860 | G | A | 0.032 | 0.377083333 | 0.138888889 | HLA-C*07:02 | TRLPSGYGL | TRLPNGYGL | 733.2 | 420.6 |
| RJLC2-T1 | BRAF | NM_004333:exon15:c.A1781G:p.D594G | 7 | 140453154 | T | C | 0.075 | 0.301388889 | 0.065277778 | HLA-A*11:01 | GDFGLATVK | GGFGLATVK | 3782.6 | 396.7 |
| RJLC2-T1 | CSMD3 | NM_052900:exon3:c.G481T:p.V161F | 8 | 114290854 | C | A | 0.219 | 61:217 | 0.147222222 | HLA-A*11:01 | SDFAVSAHGFK | SDFAFSAHGFK | 1022.9 | 272.7 |
| RJLC2-T1 | CSMD3 | NM_052900:exon3:c.G481T:p.V161F | 8 | 114290854 | C | A | 0.219 | 61:217 | 0.147222222 | HLA-A*11:01 | DFAVSAHGFK | DFAFSAHGFK | 1152 | 290 |
| RJLC2-T1 | CSMD3 | NM_052900:exon3:c.G481T:p.V161F | 8 | 114290854 | C | A | 0.219 | 61:217 | 0.147222222 | HLA-A*11:01 | FAVSAHGFK | FAFSAHGFK | 112.5 | 28.7 |
| RJLC2-T1 | F7 | NM_001267554:exon6:c.C871T:p.R291W | 13 | 113773044 | C | T | 0.127 | 29:199 | 0.193055556 | HLA-A*11:01 | MTQDCLQQSRK | MTQDCLQQSWK | 660.1 | 340.9 |
| RJLC2-T1 | RYR1 | NM_001042723:exon90:c.A12865G:p.T4289A | 19 | 39055854 | A | G | 0.286 | 0.173611111 | 0.008333333 | HLA-A*11:01 | ATAAAGATAR | ATAAAGAAAR | 184.8 | 184.6 |
| RJLC2-T1 | SLC5A1 | NM_001256314:exon7:c.G310A:p.A104T | 22 | 32480452 | G | A | 0.106 | 25:211 | 0.180555556 | HLA-A*11:01 | EVGGYDAFMEK | EVGGYDTFMEK | 512.8 | 496.3 |
| RJLC2-T1 | SLC5A1 | NM_001256314:exon7:c.G310A:p.A104T | 22 | 32480452 | G | A | 0.106 | 25:211 | 0.180555556 | HLA-A*11:01 | GYDAFMEKYMK | GYDTFMEKYMK | 1500 | 268.1 |
| RJLC2-T1 | SLC5A1 | NM_001256314:exon7:c.G310A:p.A104T | 22 | 32480452 | G | A | 0.106 | 25:211 | 0.180555556 | HLA-A*11:01 | VGGYDAFMEK | VGGYDTFMEK | 221.7 | 202.2 |
| RJLC2-T1 | SLC5A1 | NM_001256314:exon7:c.G310A:p.A104T | 22 | 32480452 | G | A | 0.106 | 25:211 | 0.180555556 | HLA-A*11:01 | YDAFMEKYMK | YDTFMEKYMK | 166.8 | 43.2 |
| RJLC2-T1 | SLC5A1 | NM_001256314:exon7:c.G310A:p.A104T | 22 | 32480452 | G | A | 0.106 | 25:211 | 0.180555556 | HLA-A*11:01 | DAFMEKYMK | DTFMEKYMK | 2400.8 | 398.1 |
| RJLC2-T1 | IL13RA2 | NM_000640:exon9:c.C1090T:p.R364C | X | 114239786 | G | A | 0.12 | 0.654861111 | 0.08125 | HLA-A*11:01 | LLLRKPNTYPK | LLLCKPNTYPK | 326.5 | 286.4 |
| RJLC2-T1 | IL13RA2 | NM_000640:exon9:c.C1090T:p.R364C | X | 114239786 | G | A | 0.12 | 0.654861111 | 0.08125 | HLA-A*11:01 | LLRKPNTYPK | LLCKPNTYPK | 210.9 | 72.5 |
| RJLC2-T1 | CSMD3 | NM_052900:exon3:c.G481T:p.V161F | 8 | 114290854 | C | A | 0.219 | 61:217 | 0.147222222 | HLA-A*24:02 | SDFAVSAHGF | SDFAFSAHGF | 763.8 | 347.6 |
| RJLC2-T1 | CSMD3 | NM_052900:exon3:c.G481T:p.V161F | 8 | 114290854 | C | A | 0.219 | 61:217 | 0.147222222 | HLA-B*15:02 | FAVSAHGFKVY | FAFSAHGFKVY | 271 | 135.8 |
| RJLC2-T1 | CSMD3 | NM_052900:exon3:c.G481T:p.V161F | 8 | 114290854 | C | A | 0.219 | 61:217 | 0.147222222 | HLA-B*15:02 | SLRLTSDFAV | SLRLTSDFAF | 11626.4 | 116.6 |
| RJLC2-T1 | CSMD3 | NM_052900:exon3:c.G481T:p.V161F | 8 | 114290854 | C | A | 0.219 | 61:217 | 0.147222222 | HLA-B*15:02 | VSAHGFKVYY | FSAHGFKVYY | 776.1 | 190.9 |
| RJLC2-T1 | CSMD3 | NM_052900:exon3:c.G481T:p.V161F | 8 | 114290854 | C | A | 0.219 | 61:217 | 0.147222222 | HLA-B*15:02 | VSAHGFKVY | FSAHGFKVY | 184.6 | 41 |
| RJLC2-T1 | IL13RA2 | NM_000640:exon9:c.C1090T:p.R364C | X | 114239786 | G | A | 0.12 | 0.654861111 | 0.08125 | HLA-B*15:02 | LLLRKPNTY | LLLCKPNTY | 480.2 | 295.3 |
| RJLC2-T1 | BCL9L | NM_182557:exon5:c.C785T:p.S262F | 11 | 118773748 | G | A | 0.133 | 0.923611111 | 0.140277778 | HLA-C*14:02 | GRADSILAY | GRADFILAY | 287.4 | 155 |
| RJLC2-T2 | PCDHA1 | NM_018900:exon1:c.G715T:p.A239S | 5 | 140166590 | G | T | 0.085 | 30:322 | 0.249305556 | HLA-A*11:01 | APLFDQAVYR | SPLFDQAVYR | 116.3 | 103 |
| RJLC2-T2 | RYR1 | NM_001042723:exon90:c.A12865G:p.T4289A | 19 | 39055854 | A | G | 0.357 | 5:09 | 0:12 | HLA-A*11:01 | ATAAAGATAR | ATAAAGAAAR | 184.8 | 184.6 |
| RJLC2-T2 | CDK5RAP1 | NM_001278167:exon5:c.C541G:p.L181V | 20 | 31979951 | G | C | 0.048 | 0.333333333 | 0.102777778 | HLA-A*11:01 | ILGCMAERLK | IVGCMAERLK | 674.9 | 291.6 |
| RJLC2-T2 | FAM65C | NM_080829:exon19:c.G2501A:p.R834K | 20 | 49208945 | C | T | 0.091 | 0.971527778 | 0.122222222 | HLA-A*11:01 | ALLQLDGTPR | ALLQLDGTPK | 2920.1 | 251.7 |
| RJLC2-T2 | CDK2 | NM_001798:exon4:c.C469T:p.R157C | 12 | 56362715 | C | T | 0.033 | 0.309027778 | 0.122916667 | HLA-B*15:02 | RAFGVPVRTY | RAFGVPVCTY | 203.4 | 137.6 |
| RJLC2-T2 | MED13L | NM_015335:exon23:c.G5179T:p.V1727L | 12 | 116418740 | C | A | 0.122 | 0.466666667 | 1:47 | HLA-B*15:02 | LQIVPCQYM | LQILPCQYM | 325.2 | 312.4 |
| RJLC2-T2 | ZNF496 | NM_032752:exon3:c.C167T:p.P56L | 1 | 247492714 | G | A | 0.104 | 0.38125 | 0.050694444 | HLA-C*14:02 | FRYQEAAGP | FRYQEAAGL | 17812.5 | 109.9 |
| RJLC2-T3 | AK5 | NM_012093:exon6:c.A662T:p.N221I | 1 | 77806102 | A | T | 0.039 | 0.880555556 | 0.258333333 | HLA-A*11:01 | ANQRLKERLLK | AIQRLKERLLK | 11169.7 | 490.9 |
| RJLC2-T3 | AK5 | NM_012093:exon6:c.A662T:p.N221I | 1 | 77806102 | A | T | 0.039 | 0.880555556 | 0.258333333 | HLA-A*11:01 | VVFLACANQR | VVFLACAIQR | 517.3 | 199.1 |
| RJLC2-T3 | AK5 | NM_012093:exon6:c.A662T:p.N221I | 1 | 77806102 | A | T | 0.039 | 0.880555556 | 0.258333333 | HLA-A*11:01 | FLACANQRLK | FLACAIQRLK | 479.5 | 282.3 |
| RJLC2-T3 | AK5 | NM_012093:exon6:c.A662T:p.N221I | 1 | 77806102 | A | T | 0.039 | 0.880555556 | 0.258333333 | HLA-A*11:01 | LACANQRLK | LACAIQRLK | 853.9 | 377.3 |
| RJLC2-T3 | RAB11FIP5 | NM_015470:exon3:c.C921G:p.S307R | 2 | 73315825 | G | C | 0.061 | 0.575694444 | 0.1375 | HLA-A*11:01 | KLFTHKRTYS | KLFTHKRTYR | 15020.5 | 213.9 |
| RJLC2-T3 | HJURP | NM_001282963:exon5:c.G1193T:p.R398L | 2 | 234749978 | C | A | 0.036 | 0.660416667 | 0.194444444 | HLA-A*11:01 | TRRLSLPSSK | TLRLSLPSSK | 17822.4 | 141.8 |
| RJLC2-T3 | ERBB3 | NM_001982:exon17:c.G1981A:p.G661S | 12 | 56489516 | G | A | 0.043 | 0.799305556 | 0.213194444 | HLA-A*11:01 | MMLGGTFLYWR | MMLGSTFLYWR | 592.4 | 358.5 |
| RJLC2-T3 | ERBB3 | NM_001982:exon17:c.G1981A:p.G661S | 12 | 56489516 | G | A | 0.043 | 0.799305556 | 0.213194444 | HLA-A*11:01 | FMMLGGTFLY | FMMLGSTFLY | 243.1 | 160.7 |
| RJLC2-T3 | ERBB3 | NM_001982:exon17:c.G1981A:p.G661S | 12 | 56489516 | G | A | 0.043 | 0.799305556 | 0.213194444 | HLA-A*11:01 | MLGGTFLYWR | MLGSTFLYWR | 371.5 | 165.7 |
| RJLC2-T3 | ERBB3 | NM_001982:exon17:c.G1981A:p.G661S | 12 | 56489516 | G | A | 0.043 | 0.799305556 | 0.213194444 | HLA-A*11:01 | GTFLYWRGRR | STFLYWRGRR | 418.5 | 130.2 |
| RJLC2-T3 | ERBB3 | NM_001982:exon17:c.G1981A:p.G661S | 12 | 56489516 | G | A | 0.043 | 0.799305556 | 0.213194444 | HLA-A*11:01 | MMLGGTFLY | MMLGSTFLY | 35.5 | 29.6 |
| RJLC2-T3 | ERBB3 | NM_001982:exon17:c.G1981A:p.G661S | 12 | 56489516 | G | A | 0.043 | 0.799305556 | 0.213194444 | HLA-A*11:01 | GTFLYWRGR | STFLYWRGR | 135.5 | 46 |
| RJLC2-T3 | RYR1 | NM_001042723:exon90:c.A12865G:p.T4289A | 19 | 39055854 | A | G | 0.412 | 7:10 | 0:12 | HLA-A*11:01 | ATAAAGATAR | ATAAAGAAAR | 184.8 | 184.6 |
| RJLC2-T3 | NRARP | NM_001004354:exon1:c.C166T:p.H56Y | 9 | 140196215 | G | A | 0.046 | 0.953472222 | 0.236805556 | HLA-A*24:02 | LHQSVIDGNL | LYQSVIDGNL | 16227.2 | 282.3 |
| RJLC2-T3 | PCNXL3 | NM_032223:exon22:c.G3698T:p.S1233I | 11 | 65395049 | G | T | 0.045 | 0.507638889 | 0.129166667 | HLA-A*24:02 | DYFLMSLLCS | DYFLMSLLCI | 21915.4 | 344.9 |
| RJLC2-T3 | ERBB3 | NM_001982:exon17:c.G1981A:p.G661S | 12 | 56489516 | G | A | 0.043 | 0.799305556 | 0.213194444 | HLA-A*24:02 | VIFMMLGGTF | VIFMMLGSTF | 245.5 | 72.6 |
| RJLC2-T3 | ERBB3 | NM_001982:exon17:c.G1981A:p.G661S | 12 | 56489516 | G | A | 0.043 | 0.799305556 | 0.213194444 | HLA-A*24:02 | IFMMLGGTFL | IFMMLGSTFL | 1059 | 378.4 |
| RJLC2-T3 | ERBB3 | NM_001982:exon17:c.G1981A:p.G661S | 12 | 56489516 | G | A | 0.043 | 0.799305556 | 0.213194444 | HLA-A*24:02 | MMLGGTFLYW | MMLGSTFLYW | 160.7 | 127.1 |
| RJLC2-T3 | ERBB3 | NM_001982:exon17:c.G1981A:p.G661S | 12 | 56489516 | G | A | 0.043 | 0.799305556 | 0.213194444 | HLA-A*24:02 | IFMMLGGTF | IFMMLGSTF | 86.5 | 27.1 |
| RJLC2-T3 | ERBB3 | NM_001982:exon17:c.G1981A:p.G661S | 12 | 56489516 | G | A | 0.043 | 0.799305556 | 0.213194444 | HLA-A*24:02 | MLGGTFLYW | MLGSTFLYW | 498 | 284.7 |
| RJLC2-T3 | DPY19L2 | NM_173812:exon5:c.T610C:p.C204R | 12 | 64041124 | A | G | 0.053 | 0.215972222 | 0:59 | HLA-A*24:02 | YCTFMGIMNLF | YRTFMGIMNLF | 313.2 | 189.8 |
| RJLC2-T3 | DPY19L2 | NM_173812:exon5:c.T610C:p.C204R | 12 | 64041124 | A | G | 0.053 | 0.215972222 | 0:59 | HLA-A*24:02 | VIIASWYCTF | VIIASWYRTF | 226.4 | 221.3 |
| RJLC2-T3 | DPY19L2 | NM_173812:exon5:c.T610C:p.C204R | 12 | 64041124 | A | G | 0.053 | 0.215972222 | 0:59 | HLA-A*24:02 | CTFMGIMNLF | RTFMGIMNLF | 104.7 | 17.8 |
| RJLC2-T3 | DPY19L2 | NM_173812:exon5:c.T610C:p.C204R | 12 | 64041124 | A | G | 0.053 | 0.215972222 | 0:59 | HLA-A*24:02 | SWYCTFMGI | SWYRTFMGI | 158.8 | 86.6 |
| RJLC2-T3 | TPI1 | NM_001159287:exon1:c.C88T:p.L30F | 12 | 6976707 | C | T | 0.049 | 0.330555556 | 0.083333333 | HLA-B*15:02 | DLQRLGSSAM | DFQRLGSSAM | 377.6 | 279.1 |
| RJLC2-T3 | TPI1 | NM_001159287:exon1:c.C88T:p.L30F | 12 | 6976707 | C | T | 0.049 | 0.330555556 | 0.083333333 | HLA-B*15:02 | LQRLGSSAM | FQRLGSSAM | 25.4 | 16.6 |
| RJLC2-T3 | ERBB3 | NM_001982:exon17:c.G1981A:p.G661S | 12 | 56489516 | G | A | 0.043 | 0.799305556 | 0.213194444 | HLA-B*15:02 | FMMLGGTFL | FMMLGSTFL | 222.2 | 159.4 |
| RJLC2-T3 | ERBB3 | NM_001982:exon17:c.G1981A:p.G661S | 12 | 56489516 | G | A | 0.043 | 0.799305556 | 0.213194444 | HLA-B*15:02 | FMMLGGTF | FMMLGSTF | 335 | 167.5 |
| RJLC2-T3 | HPS5 | NM_007216:exon4:c.C43T:p.L15F | 11 | 18332380 | G | A | 0.041 | 1.159027778 | 0.326388889 | HLA-C*08:01 | TALCWDTAI | TAFCWDTAI | 420.4 | 171.6 |
| RJLC2-T3 | AK5 | NM_012093:exon6:c.A662T:p.N221I | 1 | 77806102 | A | T | 0.039 | 0.880555556 | 0.258333333 | HLA-C*14:02 | FLACANQRL | FLACAIQRL | 207.3 | 166.7 |
| RJLC2-T3 | RAB11FIP5 | NM_015470:exon3:c.C921G:p.S307R | 2 | 73315825 | G | C | 0.061 | 0.575694444 | 0.1375 | HLA-C*14:02 | RTYSDEANQM | RTYRDEANQM | 910.5 | 444.3 |
| RJLC2-T3 | RAB11FIP5 | NM_015470:exon3:c.C921G:p.S307R | 2 | 73315825 | G | C | 0.061 | 0.575694444 | 0.1375 | HLA-C*14:02 | TYSDEANQM | TYRDEANQM | 48.9 | 19.6 |
| RJLC2-T3 | PDGFRB | NM_002609:exon20:c.G2765A:p.R922H | 5 | 149499063 | C | T | 0.093 | 35:340 | 0.250694444 | HLA-C*14:02 | FYNAIKRGYRM | FYNAIKRGYHM | 444.6 | 443.1 |
| RJLC2-T3 | PCNXL3 | NM_032223:exon22:c.G3698T:p.S1233I | 11 | 65395049 | G | T | 0.045 | 0.507638889 | 0.129166667 | HLA-C*14:02 | YFLMSLLCS | YFLMSLLCI | 8048.5 | 496.8 |
| RJLC2-T3 | DPY19L2 | NM_173812:exon5:c.T610C:p.C204R | 12 | 64041124 | A | G | 0.053 | 0.215972222 | 0:59 | HLA-C*14:02 | SWYCTFMGIM | SWYRTFMGIM | 395.6 | 207.7 |
| RJLC2-T3 | DPY19L2 | NM_173812:exon5:c.T610C:p.C204R | 12 | 64041124 | A | G | 0.053 | 0.215972222 | 0:59 | HLA-C*14:02 | YCTFMGIMNL | YRTFMGIMNL | 3363.4 | 406.8 |
| RJLC2-T3 | DPY19L2 | NM_173812:exon5:c.T610C:p.C204R | 12 | 64041124 | A | G | 0.053 | 0.215972222 | 0:59 | HLA-C*14:02 | IASWYCTFM | IASWYRTFM | 481.8 | 173.2 |
| RJLC2-T3 | DPY19L2 | NM_173812:exon5:c.T610C:p.C204R | 12 | 64041124 | A | G | 0.053 | 0.215972222 | 0:59 | HLA-C*14:02 | WYCTFMGIM | WYRTFMGIM | 224.5 | 53.9 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RJLC2-T3 | DPY19L2 | NM_173812:exon5:c.T610C:p.C204R | 12 | 64041124 | A | G | 0.053 | 0.215972222 | 0:59 | HLA-C*14:02 | CTFMGIMNL | RTFMGIMNL | 1170.1 | 350.4 |
| RJLC3-T1 | LRRC66 | NM_001024611:exon1:c.A355G:p.N119D | 4 | 52883425 | T | C | 0.156 | 25:135 | 0.159027778 | HLA-A*02:01 | NLSNNAIHSL | NLSNDAIHSL | 1655.2 | 433.7 |
| RJLC3-T1 | VPS13B | NM_017890:exon44:c.G8148T:p.Q2716H | 8 | 100821734 | G | T | 0.041 | 0.577083333 | 0.201388889 | HLA-A*02:01 | SLIIKVQQL | SLIIKVHQL | 392.5 | 103.3 |
| RJLC3-T1 | MROH6 | NM_001100878:exon3:c.C583G:p.R195G | 8 | 144653856 | G | C | 0.062 | 0.3125 | 0.065277778 | HLA-A*02:01 | LLPRSLPADRV | LLPGSLPADRV | 884.9 | 330.2 |
| RJLC3-T1 | MROH6 | NM_001100878:exon3:c.C583G:p.R195G | 8 | 144653856 | G | C | 0.062 | 0.3125 | 0.065277778 | HLA-A*02:01 | CALLPRSLPA | CALLPGSLPA | 529.9 | 379.4 |
| RJLC3-T1 | MROH6 | NM_001100878:exon3:c.C583G:p.R195G | 8 | 144653856 | G | C | 0.062 | 0.3125 | 0.065277778 | HLA-A*02:01 | ALLPRSLPA | ALLPGSLPA | 92.1 | 51.1 |
| RJLC3-T1 | GOLGA2 | NM_004486:exon19:c.G1939A:p.V647M | 9 | 131021523 | C | T | 0.226 | 14:48 | 0.047222222 | HLA-A*02:01 | LLQTQLVDQL | LLQTQLMDQL | 539.3 | 493.7 |
| RJLC3-T1 | OR10G4 | NM_001004462:exon1:c.G319A:p.G107R | 11 | 123886600 | G | A | 0.048 | 0.777777778 | 0.292361111 | HLA-A*02:01 | GSTECFLYTV | RSTECFLYTV | 571.3 | 431.3 |
| RJLC3-T1 | TRAPPC1 | NM_021210:exon4:c.C395G:p.S132C | 17 | 7833967 | G | C | 0.13 | 0.972916667 | 0.115277778 | HLA-A*02:01 | RLDSYVRSL | RLDCYVRSL | 104.1 | 66.7 |
| RJLC3-T1 | PAGE2 | NM_207339:exon4:c.C286G:p.P96A | X | 55117857 | C | G | 0.029 | 0.456944444 | 0.243055556 | HLA-A*02:01 | GIMPTFDLTKV | GIMATFDLTKV | 798.4 | 314.8 |
| RJLC3-T1 | PAGE2 | NM_207339:exon4:c.C286G:p.P96A | X | 55117857 | C | G | 0.029 | 0.456944444 | 0.243055556 | HLA-A*02:01 | IMPTFDLTKVL | IMATFDLTKVL | 1878.2 | 448.4 |
| RJLC3-T1 | PAGE2 | NM_207339:exon4:c.C286G:p.P96A | X | 55117857 | C | G | 0.029 | 0.456944444 | 0.243055556 | HLA-A*02:01 | IMPTFDLTKV | IMATFDLTKV | 88.8 | 18.9 |
| RJLC3-T1 | GLRA4 | NM_001024452:exon7:c.C757T:p.R253W | X | 102974161 | G | A | 0.154 | 26:143 | 0.136805556 | HLA-A*02:01 | HLERQMGYYL | HLEWQMGYYL | 1389.5 | 51.8 |
| RJLC3-T1 | GLRA4 | NM_001024452:exon7:c.C757T:p.R253W | X | 102974161 | G | A | 0.154 | 26:143 | 0.136805556 | HLA-A*02:01 | RQMGYYLIQM | WQMGYYLIQM | 208.3 | 144.8 |
| RJLC3-T1 | GLRA4 | NM_001024452:exon7:c.C757T:p.R253W | X | 102974161 | G | A | 0.154 | 26:143 | 0.136805556 | HLA-A*02:01 | RQMGYYLI | WQMGYYLI | 1163.1 | 383.9 |
| RJLC3-T1 | ZRANB2 | NM_005455:exon1:c.A35C:p.D12A | 1 | 71546644 | T | G | 0.134 | 32:207 | 0.229166667 | HLA-A*11:01 | GDWICPDKK | GAWICPDKK | 16072.8 | 219.8 |
| RJLC3-T1 | PITX1 | NM_002653:exon2:c.A332G:p.N111S | 5 | 134367036 | T | C | 0.202 | 65:256 | 0.200694444 | HLA-A*11:01 | RNRYPDMSMR | RSRYPDMSMR | 6817.8 | 309.3 |
| RJLC3-T1 | TNIP1 | NM_001252386:exon13:c.C1348G:p.L450V | 5 | 150415157 | G | C | 0.134 | 26:168 | 0.111111111 | HLA-A*11:01 | TLSNAQLKAFK | TVSNAQLKAFK | 108.2 | 91.2 |
| RJLC3-T1 | TNIP1 | NM_001252386:exon13:c.C1348G:p.L450V | 5 | 150415157 | G | C | 0.134 | 26:168 | 0.111111111 | HLA-A*11:01 | LSNAQLKAFK | VSNAQLKAFK | 46.9 | 38.8 |
| RJLC3-T1 | WNK2 | NM_006648:exon25:c.C6137A:p.T2046K | 9 | 96062354 | C | A | 0.045 | 0.45 | 0.129166667 | HLA-A*11:01 | GQGWTVYHPT | GQGWTVYHPK | 31244 | 128.4 |
| RJLC3-T1 | WNK2 | NM_006648:exon25:c.C6137A:p.T2046K | 9 | 96062354 | C | A | 0.045 | 0.45 | 0.129166667 | HLA-A*11:01 | QGWTVYHPT | QGWTVYHPK | 33924.4 | 238.2 |
| RJLC3-T1 | OR10G4 | NM_001004462:exon1:c.G319A:p.G107R | 11 | 123886600 | G | A | 0.048 | 0.777777778 | 0.292361111 | HLA-A*11:01 | AQLYFFHFLG | AQLYFFHFLR | 17004.3 | 44.2 |
| RJLC3-T1 | OR10G4 | NM_001004462:exon1:c.G319A:p.G107R | 11 | 123886600 | G | A | 0.048 | 0.777777778 | 0.292361111 | HLA-A*11:01 | QLYFFHFLG | QLYFFHFLR | 15706.7 | 42.7 |
| RJLC3-T1 | FUT3 | NM_001097641:exon2:c.A1007C:p.D336A | 19 | 5843844 | T | G | 0.111 | 5:40 | 1:47 | HLA-A*11:01 | RSFSWALDFCK | RSFSWALAFCK | 35.6 | 28.5 |
| RJLC3-T1 | FUT3 | NM_001097641:exon2:c.A1007C:p.D336A | 19 | 5843844 | T | G | 0.111 | 5:40 | 1:47 | HLA-A*11:01 | SFSWALDFCK | SFSWALAFCK | 37.6 | 13.5 |
| RJLC3-T1 | FUT3 | NM_001097641:exon2:c.A1007C:p.D336A | 19 | 5843844 | T | G | 0.111 | 5:40 | 1:47 | HLA-A*11:01 | ALDFCKACWK | ALAFCKACWK | 146.7 | 64.1 |
| RJLC3-T1 | FUT3 | NM_001097641:exon2:c.A1007C:p.D336A | 19 | 5843844 | T | G | 0.111 | 5:40 | 1:47 | HLA-A*11:01 | RSFSWALDF | RSFSWALAF | 1138.2 | 486.1 |
| RJLC3-T1 | FUT3 | NM_001097641:exon2:c.A1007C:p.D336A | 19 | 5843844 | T | G | 0.111 | 5:40 | 1:47 | HLA-A*11:01 | FSWALDFCK | FSWALAFCK | 52.7 | 23.7 |
| RJLC3-T1 | FUT3 | NM_001097641:exon2:c.A1007C:p.D336A | 19 | 5843844 | T | G | 0.111 | 5:40 | 1:47 | HLA-A*11:01 | LDFCKACWK | LAFCKACWK | 3242.2 | 72.4 |
| RJLC3-T1 | PAGE2 | NM_207339:exon4:c.C286G:p.P96A | X | 55117857 | C | G | 0.029 | 0.456944444 | 0.243055556 | HLA-A*11:01 | IMPTFDLTK | IMATFDLTK | 93.2 | 17.9 |
| RJLC3-T1 | ARMCX2 | NM_014782:exon5:c.G1531A:p.A511T | X | 100911044 | C | T | 0.168 | 32:159 | 0.184027778 | HLA-A*11:01 | LVNSIANFFR | LVNSITNFFR | 57.9 | 48.2 |
| RJLC3-T1 | RNF17 | NM_001184993:exon10:c.G1234T:p.V412L | 13 | 25367478 | G | T | 0.172 | 36:173 | 0.225 | HLA-B*13:01 | VESSAELVF | LESSAELVF | 377 | 258.6 |
| RJLC3-T1 | PAGE2 | NM_207339:exon4:c.C286G:p.P96A | X | 55117857 | C | G | 0.029 | 0.456944444 | 0.243055556 | HLA-B*13:01 | REGIMPTFDL | REGIMATFDL | 799.5 | 490.4 |
| RJLC3-T1 | GLRA4 | NM_001024452:exon7:c.C757T:p.R253W | X | 102974161 | G | A | 0.154 | 26:143 | 0.136805556 | HLA-B*13:01 | LERQMGYYLI | LEWQMGYYLI | 832 | 81.6 |
| RJLC3-T1 | GLRA4 | NM_001024452:exon7:c.C757T:p.R253W | X | 102974161 | G | A | 0.154 | 26:143 | 0.136805556 | HLA-B*13:01 | LERQMGYYL | LEWQMGYYL | 569 | 47.3 |
| RJLC3-T1 | VWA5B1 | NM_001039500:exon5:c.G622A:p.A208T | 1 | 20644081 | G | A | 0.052 | 0.868055556 | 0.214583333 | HLA-B*27:05 | WNKLCLATLL | WNKLCLTTLL | 508.2 | 461.4 |
| RJLC3-T1 | GARS | NM_002047:exon13:c.A1697C:p.Y566S | 7 | 30665933 | A | C | 0.167 | 8:40 | 0.042361111 | HLA-B*27:05 | VKRFQKTLYV | VKRFQKTLSV | 347.6 | 156.2 |
| RJLC3-T1 | GARS | NM_002047:exon13:c.A1697C:p.Y566S | 7 | 30665933 | A | C | 0.167 | 8:40 | 0.042361111 | HLA-B*27:05 | KRFQKTLYVE | KRFQKTLSVE | 263.9 | 222.9 |
| RJLC3-T1 | GARS | NM_002047:exon13:c.A1697C:p.Y566S | 7 | 30665933 | A | C | 0.167 | 8:40 | 0.042361111 | HLA-B*27:05 | KRFQKTLYV | KRFQKTLSV | 44.1 | 23.4 |
| RJLC3-T1 | OR10G4 | NM_001004462:exon1:c.G319A:p.G107R | 11 | 123886600 | G | A | 0.048 | 0.777777778 | 0.292361111 | HLA-B*27:05 | FLGSTECFLY | FLRSTECFLY | 16946 | 366.9 |
| RJLC3-T1 | OR10G4 | NM_001004462:exon1:c.G319A:p.G107R | 11 | 123886600 | G | A | 0.048 | 0.777777778 | 0.292361111 | HLA-B*27:05 | LGSTECFLY | LRSTECFLY | 26173.9 | 331.1 |
| RJLC3-T1 | TRAPPC1 | NM_021210:exon4:c.C395G:p.S132C | 17 | 7833967 | G | C | 0.13 | 0.972916667 | 0.115277778 | HLA-B*27:05 | RSRLDSYVRSL | RSRLDCYVRSL | 635.8 | 326.4 |
| RJLC3-T1 | TRAPPC1 | NM_021210:exon4:c.C395G:p.S132C | 17 | 7833967 | G | C | 0.13 | 0.972916667 | 0.115277778 | HLA-B*27:05 | FRSRLDSYVR | FRSRLDCYVR | 146.2 | 139.3 |
| RJLC3-T1 | TRAPPC1 | NM_021210:exon4:c.C395G:p.S132C | 17 | 7833967 | G | C | 0.13 | 0.972916667 | 0.115277778 | HLA-B*27:05 | RSRLDSYVRS | RSRLDCYVRS | 870.3 | 397.3 |
| RJLC3-T1 | TRAPPC1 | NM_021210:exon4:c.C395G:p.S132C | 17 | 7833967 | G | C | 0.13 | 0.972916667 | 0.115277778 | HLA-B*27:05 | SRLDSYVRSL | SRLDCYVRSL | 45.6 | 26.7 |
| RJLC3-T1 | TRAPPC1 | NM_021210:exon4:c.C395G:p.S132C | 17 | 7833967 | G | C | 0.13 | 0.972916667 | 0.115277778 | HLA-B*27:05 | FRSRLDSYV | FRSRLDCYV | 551.3 | 493.7 |
| RJLC3-T1 | FUT3 | NM_001097641:exon2:c.A1007C:p.D336A | 19 | 5843844 | T | G | 0.111 | 5:40 | 1:47 | HLA-B*27:05 | RPRSFSWALD | RPRSFSWALA | 2184 | 279.1 |
| RJLC3-T1 | FCRL4 | NM_031282:exon7:c.G1165A:p.A389T | 1 | 157551405 | C | T | 0.086 | 3:32 | 1:44 | HLA-C*03:04 | AAGATGGLL | TAGATGGLL | 561 | 462.6 |
| RJLC3-T1 | LRRC66 | NM_001024611:exon1:c.A355G:p.N119D | 4 | 52883425 | T | C | 0.156 | 25:135 | 0.159027778 | HLA-C*03:04 | LSNNAIHSL | LSNDAIHSL | 33.2 | 26.1 |
| RJLC3-T1 | PITX1 | NM_002653:exon2:c.A332G:p.N111S | 5 | 134367036 | T | C | 0.202 | 65:256 | 0.200694444 | HLA-C*03:04 | RNRYPDMSM | RSRYPDMSM | 6887.4 | 312.8 |
| RJLC3-T1 | C2CD4A | NM_207322:exon2:c.C125T:p.T42I | 15 | 62359937 | C | T | 0.149 | 24:137 | 0.113194444 | HLA-C*03:04 | TAACANVLT | TAACANVLI | 10969.2 | 276.5 |
| RJLC3-T1 | CASC3 | NM_007359:exon7:c.A899G:p.N300S | 17 | 38319847 | A | G | 0.073 | 0.353472222 | 0.081944444 | HLA-C*03:04 | RNAAGTGRM | RSAAGTGRM | 6128.7 | 165.6 |
| RJLC3-T1 | MUC16 | NM_024690:exon3:c.C17771T:p.T5924I | 19 | 9069675 | G | A | 0.105 | 0.713888889 | 0.134027778 | HLA-C*03:04 | TSSPSSPVPL | ISSPSSPVPL | 1299.1 | 430.3 |
| RJLC3-T1 | PAGE2 | NM_207339:exon4:c.C286G:p.P96A | X | 55117857 | C | G | 0.029 | 0.456944444 | 0.243055556 | HLA-C*03:04 | MPTFDLTKVL | MATFDLTKVL | 1228.5 | 186.5 |
| RJLC3-T1 | PAGE2 | NM_207339:exon4:c.C286G:p.P96A | X | 55117857 | C | G | 0.029 | 0.456944444 | 0.243055556 | HLA-C*03:04 | MPTFDLTKV | MATFDLTKV | 3392.7 | 254.7 |
| RJLC3-T1 | PAGE2 | NM_207339:exon4:c.C286G:p.P96A | X | 55117857 | C | G | 0.029 | 0.456944444 | 0.243055556 | HLA-C*03:04 | PTFDLTKVL | ATFDLTKVL | 5463.4 | 113.2 |
| RJLC3-T1 | VWA5B1 | NM_001039500:exon5:c.G622A:p.A208T | 1 | 20644081 | G | A | 0.052 | 0.868055556 | 0.214583333 | HLA-C*15:02 | LATLLNTEV | LTTLLNTEV | 663 | 335.8 |
| RJLC3-T2 | NASP | NM_001195193:exon8:c.G1658C:p.R553T | 1 | 46080868 | G | C | 0.186 | 59:258 | 0.207638889 | HLA-A*02:01 | IEVIENRMAV | IEVIENTMAV | 1765.3 | 188 |
| RJLC3-T2 | NASP | NM_001195193:exon8:c.G1658C:p.R553T | 1 | 46080868 | G | C | 0.186 | 59:258 | 0.207638889 | HLA-A*02:01 | NRMAVLNEQV | NTMAVLNEQV | 1495.6 | 369.3 |
| RJLC3-T2 | PIK3CA | NM_006218:exon8:c.G1357C:p.E453Q | 3 | 178928079 | G | C | 0.195 | 57:235 | 0.2125 | HLA-A*02:01 | GLEDLLNPIGV | GLQDLLNPIGV | 688.8 | 147.4 |
| RJLC3-T2 | PIK3CA | NM_006218:exon8:c.G1357C:p.E453Q | 3 | 178928079 | G | C | 0.195 | 57:235 | 0.2125 | HLA-A*02:01 | HGLEDLLNPI | HGLQDLLNPI | 1026.7 | 246.4 |
| RJLC3-T2 | PIK3CA | NM_006218:exon8:c.G1357C:p.E453Q | 3 | 178928079 | G | C | 0.195 | 57:235 | 0.2125 | HLA-A*02:01 | LEDLLNPIGV | LQDLLNPIGV | 16812.7 | 489.3 |
| RJLC3-T2 | PIK3CA | NM_006218:exon8:c.G1357C:p.E453Q | 3 | 178928079 | G | C | 0.195 | 57:235 | 0.2125 | HLA-A*02:01 | GLEDLLNPI | GLQDLLNPI | 53 | 14.5 |
| RJLC3-T2 | SLC9B1 | NM_001100874:exon6:c.A651C:p.L217F | 4 | 103866352 | T | G | 0.153 | 0.864583333 | 0.088194444 | HLA-A*02:01 | WAFLLGFVLGA | WAFLFGFVLGA | 623.6 | 332.9 |
| RJLC3-T2 | SLC9B1 | NM_001100874:exon6:c.A651C:p.L217F | 4 | 103866352 | T | G | 0.153 | 0.864583333 | 0.088194444 | HLA-A*02:01 | AFLLGFVLGAV | AFLFGFVLGAV | 81.8 | 78.8 |
| RJLC3-T2 | SLC9B1 | NM_001100874:exon6:c.A651C:p.L217F | 4 | 103866352 | T | G | 0.153 | 0.864583333 | 0.088194444 | HLA-A*02:01 | FLLGFVLGAVS | FLFGFVLGAVS | 191.7 | 189 |
| RJLC3-T2 | SLC9B1 | NM_001100874:exon6:c.A651C:p.L217F | 4 | 103866352 | T | G | 0.153 | 0.864583333 | 0.088194444 | HLA-A*02:01 | WQWAFLLGFV | WQWAFLFGFV | 32.7 | 25 |
| RJLC3-T2 | SLC9B1 | NM_001100874:exon6:c.A651C:p.L217F | 4 | 103866352 | T | G | 0.153 | 0.864583333 | 0.088194444 | HLA-A*02:01 | AFLLGFVLGA | AFLFGFVLGA | 38.1 | 22.5 |
| RJLC3-T2 | SLC9B1 | NM_001100874:exon6:c.A651C:p.L217F | 4 | 103866352 | T | G | 0.153 | 0.864583333 | 0.088194444 | HLA-A*02:01 | FLLGFVLGAV | FLFGFVLGAV | 7.9 | 7.4 |
| RJLC3-T2 | SLC9B1 | NM_001100874:exon6:c.A651C:p.L217F | 4 | 103866352 | T | G | 0.153 | 0.864583333 | 0.088194444 | HLA-A*02:01 | FLLGFVLGA | FLFGFVLGA | 6.6 | 5.1 |
| RJLC3-T2 | RIOK2 | NM_001159749:exon4:c.A496C:p.K166Q | 5 | 96512822 | T | G | 0.139 | 0.505555556 | 0.057638889 | HLA-A*02:01 | AMKEFAYMKAL | AMKEFAYMQAL | 1060.2 | 190.1 |
| RJLC3-T2 | RIOK2 | NM_001159749:exon4:c.A496C:p.K166Q | 5 | 96512822 | T | G | 0.139 | 0.505555556 | 0.057638889 | HLA-A*02:01 | MKALYERKFPV | MQALYERKFPV | 45 | 44.7 |
| RJLC3-T2 | MUC2 | NM_002457:exon30:c.G4163T:p.C1388F | 11 | 1092344 | G | T | 0.205 | 41:159 | 0.172222222 | HLA-A*02:01 | KIRVNCCWPM | KIRVNFCWPM | 1000.6 | 338.8 |
| RJLC3-T2 | NASP | NM_001195193:exon8:c.G1658C:p.R553T | 1 | 46080868 | G | C | 0.186 | 59:258 | 0.207638889 | HLA-A*11:01 | NRMAVLNEQVK | NTMAVLNEQVK | 4395.8 | 111.9 |
| RJLC3-T2 | SRSF11 | NM_001190987:exon7:c.T597G:p.N199K | 1 | 70703114 | T | G | 0.162 | 11:57 | 0.047222222 | HLA-A*11:01 | KLMSTVDPKLN | KLMSTVDPKLK | 8648.5 | 336.3 |
| RJLC3-T2 | SRSF11 | NM_001190987:exon7:c.T597G:p.N199K | 1 | 70703114 | T | G | 0.162 | 11:57 | 0.047222222 | HLA-A*11:01 | LMSTVDPKLN | LMSTVDPKLK | 33738.4 | 240.6 |
| RJLC3-T2 | HDLBP | NM_005336:exon6:c.A632C:p.E211A | 2 | 242196040 | T | G | 0.17 | 0.675694444 | 0.096527778 | HLA-A*11:01 | EVLLISAEQDK | AVLLISAEQDK | 4363.8 | 275.1 |
| RJLC3-T2 | CXXC11 | NM_173821:exon2:c.C478G:p.P160A | 2 | 242814185 | C | G | 0.143 | 0.504166667 | 0.073611111 | HLA-A*11:01 | DPAWSANATK | DAAWSANATK | 6521.6 | 404.9 |
| RJLC3-T2 | CXXC11 | NM_173821:exon2:c.C478G:p.P160A | 2 | 242814185 | C | G | 0.143 | 0.504166667 | 0.073611111 | HLA-A*11:01 | PAWSANATK | AAWSANATK | 1625.3 | 40.6 |
| RJLC3-T2 | ZNF860 | NM_001137674:exon2:c.C1414T:p.H472Y | 3 | 32031985 | C | T | 0.217 | 81:293 | 0.261805556 | HLA-A*11:01 | VIHKAIHTGEK | VIYKAIHTGEK | 1490.9 | 343.7 |
| RJLC3-T2 | ZNF860 | NM_001137674:exon2:c.C1414T:p.H472Y | 3 | 32031985 | C | T | 0.217 | 81:293 | 0.261805556 | HLA-A*11:01 | HHNSALVIHK | HHNSALVIYK | 1738.7 | 232.8 |
| RJLC3-T2 | ZNF860 | NM_001137674:exon2:c.C1414T:p.H472Y | 3 | 32031985 | C | T | 0.217 | 81:293 | 0.261805556 | HLA-A*11:01 | HNSALVIHK | HNSALVIYK | 513.9 | 71.1 |
| RJLC3-T2 | PIK3CA | NM_006218:exon5:c.G1054A:p.D352N | 3 | 178921572 | G | A | 0.184 | 0.85 | 0.079166667 | HLA-A*11:01 | VNVNIRDIDK | VNVNIRDINK | 1850.4 | 459.7 |
| RJLC3-T2 | PIK3CA | NM_006218:exon5:c.G1054A:p.D352N | 3 | 178921572 | G | A | 0.184 | 0.85 | 0.079166667 | HLA-A*11:01 | NVNIRDIDK | NVNIRDINK | 1809.3 | 388.4 |
| RJLC3-T2 | PIK3CA | NM_006218:exon6:c.G1093A:p.E365K | 3 | 178922324 | G | A | 0.133 | 0.508333333 | 0.103472222 | HLA-A*11:01 | RTGIYHGGE | RTGIYHGGK | 20161.3 | 123.1 |
| RJLC3-T2 | RIOK2 | NM_001159749:exon4:c.A496C:p.K166Q | 5 | 96512822 | T | G | 0.139 | 0.505555556 | 0.057638889 | HLA-A*11:01 | FAYMKALYERK | FAYMQALYERK | 169.9 | 169 |
| RJLC3-T2 | RIOK2 | NM_001159749:exon4:c.A496C:p.K166Q | 5 | 96512822 | T | G | 0.139 | 0.505555556 | 0.057638889 | HLA-A*11:01 | AYMKALYERK | AYMQALYERK | 508.1 | 311.5 |
| RJLC3-T2 | RIOK2 | NM_001159749:exon4:c.A496C:p.K166Q | 5 | 96512822 | T | G | 0.139 | 0.505555556 | 0.057638889 | HLA-A*11:01 | YMKALYERK | YMQALYERK | 560 | 205.3 |
| RJLC3-T2 | C9orf3 | NM_001193329:exon1:c.T41G:p.L14R | 9 | 97522106 | T | G | 0.105 | 0.856944444 | 0.110416667 | HLA-A*11:01 | LMANTSHILVK | RMANTSHILVK | 333.4 | 189.8 |
| RJLC3-T2 | MUC2 | NM_002457:exon30:c.G4163T:p.C1388F | 11 | 1092344 | G | T | 0.205 | 41:159 | 0.172222222 | HLA-A*11:01 | IRVNCCWPMDK | IRVNFCWPMDK | 1157.7 | 407.2 |
| RJLC3-T2 | MUC2 | NM_002457:exon30:c.G4163T:p.C1388F | 11 | 1092344 | G | T | 0.205 | 41:159 | 0.172222222 | HLA-A*11:01 | RVNCCWPMDK | RVNFCWPMDK | 58.6 | 20.8 |
| RJLC3-T2 | MUC2 | NM_002457:exon30:c.G4163T:p.C1388F | 11 | 1092344 | G | T | 0.205 | 41:159 | 0.172222222 | HLA-A*11:01 | VNCCWPMDK | VNFCWPMDK | 1543.3 | 182.4 |
| RJLC3-T2 | SDHAF2 | NM_017841:exon2:c.A218C:p.E73A | 11 | 61205278 | A | C | 0.109 | 0.99375 | 0.166666667 | HLA-A*11:01 | RARLLYESRK | RARLLYASRK | 675 | 188.6 |
| RJLC3-T2 | ZNF208 | NM_007153:exon4:c.G1010C:p.G337A | 19 | 22156826 | C | G | 0.09 | 0.486805556 | 0.092361111 | HLA-A*11:01 | KAIHAGEKPYK | KAIHAAEKPYK | 613.9 | 351 |
| RJLC3-T2 | ZNF208 | NM_007153:exon4:c.G1010C:p.G337A | 19 | 22156826 | C | G | 0.09 | 0.486805556 | 0.092361111 | HLA-A*11:01 | AIHAGEKPYK | AIHAAEKPYK | 117.4 | 77.4 |
| RJLC3-T2 | XRCC1 | NM_006297:exon7:c.T670G:p.S224A | 19 | 44057175 | A | C | 0.194 | 0.846527778 | 0.066666667 | HLA-A*11:01 | AASSASPVSR | AASAASPVSR | 321.2 | 235.7 |
| RJLC3-T2 | XRCC1 | NM_006297:exon7:c.T670G:p.S224A | 19 | 44057175 | A | C | 0.194 | 0.846527778 | 0.066666667 | HLA-A*11:01 | ASSASPVSR | ASAASPVSR | 92.7 | 64.6 |
| RJLC3-T2 | LILRB1 | NM_001278398:exon13:c.A1643C:p.E548A | 19 | 55147988 | A | C | 0.667 | 2:01 | 0:12 | HLA-A*11:01 | VTYAEVKHSR | VTYAAVKHSR | 224.9 | 132 |
| RJLC3-T2 | LILRB1 | NM_001278398:exon13:c.A1643C:p.E548A | 19 | 55147988 | A | C | 0.667 | 2:01 | 0:12 | HLA-A*11:01 | QAVTYAEVK | QAVTYAAVK | 1288.5 | 376 |
| RJLC3-T2 | SDC4 | NM_002999:exon4:c.G321C:p.E107D | 20 | 43959130 | C | G | 0.062 | 0.365277778 | 0.088888889 | HLA-A*11:01 | KLEENEVIPK | KLDENEVIPK | 356.5 | 234.8 |
| RJLC3-T2 | SLC9B1 | NM_001100874:exon6:c.A651C:p.L217F | 4 | 103866352 | T | G | 0.153 | 0.864583333 | 0.088194444 | HLA-B*13:01 | WQWAFLLGF | WQWAFLFGF | 374.1 | 265.7 |
| RJLC3-T2 | RIOK2 | NM_001159749:exon4:c.A496C:p.K166Q | 5 | 96512822 | T | G | 0.139 | 0.505555556 | 0.057638889 | HLA-B*13:01 | MKEFAYMKAL | MKEFAYMQAL | 534.3 | 205.2 |
| RJLC3-T2 | RIOK2 | NM_001159749:exon4:c.A496C:p.K166Q | 5 | 96512822 | T | G | 0.139 | 0.505555556 | 0.057638889 | HLA-B*13:01 | KEFAYMKAL | KEFAYMQAL | 231.4 | 79.7 |
| RJLC3-T2 | NASP | NM_001195193:exon8:c.G1658C:p.R553T | 1 | 46080868 | G | C | 0.186 | 59:258 | 0.207638889 | HLA-C*03:04 | EVIENRMAV | EVIENTMAV | 687 | 235.8 |
| RJLC3-T2 | NASP | NM_001195193:exon8:c.G1658C:p.R553T | 1 | 46080868 | G | C | 0.186 | 59:258 | 0.207638889 | HLA-C*03:04 | VIENRMAVL | VIENTMAVL | 1334.5 | 424.4 |
| RJLC3-T2 | TTN | NM_003319:exon45:c.A12290T:p.E4097V | 2 | 179604581 | T | A | 0.034 | 1.10625 | 0.447916667 | HLA-C*03:04 | IIEDVDPQM | IIVDVDPQM | 2380.4 | 370.6 |
| RJLC3-T2 | SLC9B1 | NM_001100874:exon6:c.A651C:p.L217F | 4 | 103866352 | T | G | 0.153 | 0.864583333 | 0.088194444 | HLA-C*03:04 | WAFLLGFVL | WAFLFGFVL | 103 | 94.9 |
| RJLC3-T2 | AKR1D1 | NM_001190906:exon4:c.A386T:p.D129V | 7 | 137782619 | A | T | 0.286 | 6:15 | 0:37 | HLA-C*03:04 | MAFKPGDEI | MAFKPGVEI | 14.5 | 7.1 |
| RJLC3-T2 | SDHAF2 | NM_017841:exon2:c.A218C:p.E73A | 11 | 61205278 | A | C | 0.109 | 0.99375 | 0.166666667 | HLA-C*03:04 | YESRKRGML | YASRKRGML | 19220.7 | 129.8 |
| RJLC3-T2 | XRCC1 | NM_006297:exon7:c.T670G:p.S224A | 19 | 44057175 | A | C | 0.194 | 0.846527778 | 0.066666667 | HLA-C*03:04 | SAASSASPV | SAASAASPV | 16.6 | 12.1 |
| RJLC3-T2 | HDLBP | NM_005336:exon6:c.A632C:p.E211A | 2 | 242196040 | T | G | 0.17 | 0.675694444 | 0.096527778 | HLA-C*15:02 | KARHEVLLI | KARHAVLLI | 149.5 | 68.5 |
| RJLC3-T2 | LIN54 | NM_001288996:exon2:c.C464T:p.A155V | 4 | 83905534 | G | A | 0.033 | 0.86875 | 0.267361111 | HLA-C*15:02 | KSGSPIVLAL | KSGSPIVLVL | 285.6 | 271.6 |
| RJLC3-T2 | LIN54 | NM_001288996:exon2:c.C464T:p.A155V | 4 | 83905534 | G | A | 0.033 | 0.86875 | 0.267361111 | HLA-C*15:02 | KSGSPIVLA | KSGSPIVLV | 1428.8 | 180.6 |
| RJLC3-T2 | XRCC1 | NM_006297:exon7:c.T670G:p.S224A | 19 | 44057175 | A | C | 0.194 | 0.846527778 | 0.066666667 | HLA-C*15:02 | SASPVSRAI | AASPVSRAI | 214.2 | 198.1 |
| RJLC3-T3 | PRAMEF11 | NM_001146344:exon3:c.G683A:p.R228H | 1 | 12887174 | C | T | 0.061 | 3:46 | 1:41 | HLA-A*02:01 | FLKLRCLQKL | FLKLHCLQKL | 79.3 | 54.4 |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RJLC3-T3 | PRAMEF11 | NM_001146344:exon3:c.G683A:p.R228H | 1 | 12887174 | C | T | 0.061 | 3:46 | 1:41 | HLA-A*02:01 | KLRCLQKLYM | KLHCLQKLYM | 2109.3 | 383.6 |
| RJLC3-T3 | FBXO41 | NM_001080410:exon2:c.C1003T:p.R335W | 2 | 73493713 | G | A | 0.208 | 10:38 | 0.04375 | HLA-A*02:01 | FIEELLERA | FIEELLEWA | 503.7 | 133.6 |
| RJLC3-T3 | HRH1 | NM_001098211:exon2:c.T446C:p.L149P | 3 | 11301169 | T | C | 0.125 | 35:244 | 0.217361111 | HLA-A*02:01 | ATILGAWFL | ATIPGAWFL | 257.7 | 61.5 |
| RJLC3-T3 | CSN1S1 | NM_001025104:exon11:c.C307A:p.L103I | 4 | 70806770 | C | A | 0.095 | 0.338194444 | 0:58 | HLA-A*02:01 | RLNEYNQLQL | RLNEYNQIQL | 98.5 | 67.9 |
| RJLC3-T3 | PLEC | NM_201378:exon25:c.C3200A:p.S1067Y | 8 | 145003289 | G | T | 0.091 | 4:40 | 0:47 | HLA-A*02:01 | SLSAIYLEKL | SLYAIYLEKL | 104.1 | 49.1 |
| RJLC3-T3 | TMEM245 | NM_032012:exon15:c.T2210C:p.V737A | 9 | 111800311 | A | G | 0.043 | 0.797916667 | 0.272222222 | HLA-A*02:01 | TMFGINIVFI | TMFGINIAFI | 39.1 | 38.6 |
| RJLC3-T3 | TMEM245 | NM_032012:exon15:c.T2210C:p.V737A | 9 | 111800311 | A | G | 0.043 | 0.797916667 | 0.272222222 | HLA-A*02:01 | GINIVFIPSA | GINIAFIPSA | 1059.6 | 251.7 |
| RJLC3-T3 | TMEM245 | NM_032012:exon15:c.T2210C:p.V737A | 9 | 111800311 | A | G | 0.043 | 0.797916667 | 0.272222222 | HLA-A*02:01 | TMFGINIVF | TMFGINIAF | 699.2 | 457.8 |
| RJLC3-T3 | KRAS | NM_004985:exon2:c.G34T:p.G12C | 12 | 25398285 | C | A | 0.37 | 74:126 | 0.140277778 | HLA-A*02:01 | KLVVVGAGGV | KLVVVGACGV | 392.9 | 203.6 |
| RJLC3-T3 | DCT | NM_001922:exon8:c.A1498G:p.K500E | 13 | 95092214 | T | C | 0.08 | 1.041666667 | 0.206944444 | HLA-A*02:01 | RLRKGYTPL | RLREGYTPL | 1051.2 | 138.6 |
| RJLC3-T3 | ALDH1A3 | NM_000693:exon13:c.G1477A:p.A493T | 15 | 101454916 | G | A | 0.036 | 0.725 | 0.252777778 | HLA-A*02:01 | YALAEYTEV | YTLAEYTEV | 84.9 | 26.7 |
| RJLC3-T3 | MC2R | NM_000529:exon2:c.T184A:p.F62I | 18 | 13885334 | A | T | 0.23 | 73:244 | 0.255555556 | HLA-A*02:01 | KNLQAPMYFF | KNLQAPMYFI | 7092.3 | 149.4 |
| RJLC3-T3 | MC2R | NM_000529:exon2:c.T184A:p.F62I | 18 | 13885334 | A | T | 0.23 | 73:244 | 0.255555556 | HLA-A*02:01 | NLQAPMYFF | NLQAPMYFI | 3530.4 | 46.9 |
| RJLC3-T3 | C18orf63 | NM_001174123:exon3:c.G211C:p.A71P | 18 | 71987824 | G | C | 0.11 | 0.425694444 | 0.073611111 | HLA-A*02:01 | ILNQIWVVMAI | ILNQIWVVMPI | 817.6 | 301.3 |
| RJLC3-T3 | C18orf63 | NM_001174123:exon3:c.G211C:p.A71P | 18 | 71987824 | G | C | 0.11 | 0.425694444 | 0.073611111 | HLA-A*02:01 | LNQIWVVMAI | LNQIWVVMPI | 409.5 | 143.7 |
| RJLC3-T3 | C18orf63 | NM_001174123:exon3:c.G211C:p.A71P | 18 | 71987824 | G | C | 0.11 | 0.425694444 | 0.073611111 | HLA-A*02:01 | NQIWVVMAI | NQIWVVMPI | 105.7 | 33.6 |
| RJLC3-T3 | MPP1 | NM_001166460:exon1:c.C43A:p.H15N | X | 154033606 | G | T | 0.134 | 0.784722222 | 0.110416667 | HLA-A*02:01 | SMHTALSDL | SMNTALSDL | 964.7 | 471.4 |
| RJLC3-T3 | FSTL1 | NM_007085:exon10:c.G806A:p.G269E | 3 | 120118806 | C | T | 0.127 | 0.743055556 | 0.099305556 | HLA-A*11:01 | VCTAMTCDGK | VCTAMTCDEK | 306.4 | 258.2 |
| RJLC3-T3 | PCDHB13 | NM_018933:exon1:c.C889T:p.P297S | 5 | 140594584 | C | T | 0.082 | 26:292 | 0.2375 | HLA-A*11:01 | NPLTGEIELK | NSLTGEIELK | 9636.1 | 264 |
| RJLC3-T3 | PCDHB13 | NM_018933:exon1:c.C889T:p.P297S | 5 | 140594584 | C | T | 0.082 | 26:292 | 0.2375 | HLA-A*11:01 | PLTGEIELKK | SLTGEIELKK | 2531.3 | 173.7 |
| RJLC3-T3 | PCDHB13 | NM_018933:exon1:c.C889T:p.P297S | 5 | 140594584 | C | T | 0.082 | 26:292 | 0.2375 | HLA-A*11:01 | PLTGEIELK | SLTGEIELK | 10884.2 | 272.1 |
| RJLC3-T3 | PLEC | NM_201378:exon25:c.C3200A:p.S1067Y | 8 | 145003289 | G | T | 0.091 | 4:40 | 0:47 | HLA-A*11:01 | RSLSAIYLEK | RSLYAIYLEK | 15.9 | 14.8 |
| RJLC3-T3 | PLEC | NM_201378:exon25:c.C3200A:p.S1067Y | 8 | 145003289 | G | T | 0.091 | 4:40 | 0:47 | HLA-A*11:01 | SLSAIYLEK | SLYAIYLEK | 8.2 | 7.6 |
| RJLC3-T3 | KRAS | NM_004985:exon2:c.G34T:p.G12C | 12 | 25398285 | C | A | 0.37 | 74:126 | 0.140277778 | HLA-A*11:01 | VVVGAGGVGK | VVVGACGVGK | 271.4 | 165.8 |
| RJLC3-T3 | KRAS | NM_004985:exon2:c.G34T:p.G12C | 12 | 25398285 | C | A | 0.37 | 74:126 | 0.140277778 | HLA-A*11:01 | VVGAGGVGK | VVGACGVGK | 139.3 | 90.6 |
| RJLC3-T3 | ALDH1A3 | NM_000693:exon13:c.G1477A:p.A493T | 15 | 101454916 | G | A | 0.036 | 0.725 | 0.252777778 | HLA-A*11:01 | YALAEYTEVK | YTLAEYTEVK | 416.4 | 74.3 |
| RJLC3-T3 | C18orf63 | NM_001174123:exon3:c.G211C:p.A71P | 18 | 71987824 | G | C | 0.11 | 0.425694444 | 0.073611111 | HLA-A*11:01 | IWVVMAIPFYK | IWVVMPIPFYK | 11.1 | 10.1 |
| RJLC3-T3 | C18orf63 | NM_001174123:exon3:c.G211C:p.A71P | 18 | 71987824 | G | C | 0.11 | 0.425694444 | 0.073611111 | HLA-A*11:01 | WVVMAIPFYKA | WVVMPIPFYKA | 197.1 | 152.6 |
| RJLC3-T3 | C18orf63 | NM_001174123:exon3:c.G211C:p.A71P | 18 | 71987824 | G | C | 0.11 | 0.425694444 | 0.073611111 | HLA-A*11:01 | WVVMAIPFYK | WVVMPIPFYK | 6.2 | 5.8 |
| RJLC3-T3 | FUT3 | NM_001097641:exon2:c.A1007C:p.D336A | 19 | 5843844 | T | G | 0.06 | 3:47 | 1:47 | HLA-A*11:01 | RSFSWALDFCK | RSFSWALAFCK | 35.6 | 28.5 |
| RJLC3-T3 | FUT3 | NM_001097641:exon2:c.A1007C:p.D336A | 19 | 5843844 | T | G | 0.06 | 3:47 | 1:47 | HLA-A*11:01 | SFSWALDFCK | SFSWALAFCK | 37.6 | 13.5 |
| RJLC3-T3 | FUT3 | NM_001097641:exon2:c.A1007C:p.D336A | 19 | 5843844 | T | G | 0.06 | 3:47 | 1:47 | HLA-A*11:01 | ALDFCKACWK | ALAFCKACWK | 146.7 | 64.1 |
| RJLC3-T3 | FUT3 | NM_001097641:exon2:c.A1007C:p.D336A | 19 | 5843844 | T | G | 0.06 | 3:47 | 1:47 | HLA-A*11:01 | RSFSWALDF | RSFSWALAF | 1138.2 | 486.1 |
| RJLC3-T3 | FUT3 | NM_001097641:exon2:c.A1007C:p.D336A | 19 | 5843844 | T | G | 0.06 | 3:47 | 1:47 | HLA-A*11:01 | FSWALDFCK | FSWALAFCK | 52.7 | 23.7 |
| RJLC3-T3 | FUT3 | NM_001097641:exon2:c.A1007C:p.D336A | 19 | 5843844 | T | G | 0.06 | 3:47 | 1:47 | HLA-A*11:01 | LDFCKACWK | LAFCKACWK | 3242.2 | 72.4 |
| RJLC3-T3 | MPP1 | NM_001166460:exon1:c.C43A:p.H15N | X | 154033606 | G | T | 0.134 | 0.784722222 | 0.110416667 | HLA-A*11:01 | GSMHTALSDLY | GSMNTALSDLY | 370.9 | 314.3 |
| RJLC3-T3 | MPP1 | NM_001166460:exon1:c.C43A:p.H15N | X | 154033606 | G | T | 0.134 | 0.784722222 | 0.110416667 | HLA-A*11:01 | SMHTALSDLY | SMNTALSDLY | 683.2 | 432.8 |
| RJLC3-T3 | LAMB2 | NM_002292:exon17:c.C2281T:p.P761S | 3 | 49163463 | G | A | 0.15 | 30:170 | 0.135416667 | HLA-B*13:01 | PSEACAPLLI | SSEACAPLLI | 1142.7 | 328.5 |
| RJLC3-T3 | PLEC | NM_201378:exon25:c.C3200A:p.S1067Y | 8 | 145003289 | G | T | 0.091 | 4:40 | 0:47 | HLA-B*13:01 | LEQVRSLSAI | LEQVRSLYAI | 953 | 317.6 |
| RJLC3-T3 | PLEC | NM_201378:exon25:c.C3200A:p.S1067Y | 8 | 145003289 | G | T | 0.091 | 4:40 | 0:47 | HLA-B*13:01 | EQVRSLSAI | EQVRSLYAI | 1165.5 | 194 |
| RJLC3-T3 | LAMB2 | NM_002292:exon17:c.C2281T:p.P761S | 3 | 49163463 | G | A | 0.15 | 30:170 | 0.135416667 | HLA-C*03:04 | SPSEACAPL | SSSEACAPL | 638.8 | 33.9 |
| RJLC3-T3 | TMEM245 | NM_032012:exon15:c.T2210C:p.V737A | 9 | 111800311 | A | G | 0.043 | 0.797916667 | 0.272222222 | HLA-C*03:04 | NIVFIPSAL | NIAFIPSAL | 671 | 419.2 |
| RJLC3-T3 | TMEM245 | NM_032012:exon15:c.T2210C:p.V737A | 9 | 111800311 | A | G | 0.043 | 0.797916667 | 0.272222222 | HLA-C*03:04 | IVFIPSAL | IAFIPSAL | 2381.1 | 484.5 |
| RJLC4-T1 | RSG1 | NM_030907:exon4:c.G505A:p.V169I | 1 | 16559027 | C | T | 0.122 | 0.420138889 | 0.046527778 | HLA-A*11:01 | GVVRMVIGSK | GVIRMVIGSK | 81.5 | 46 |
| RJLC4-T1 | SRSF11 | NM_001190987:exon7:c.T597G:p.N199K | 1 | 70703114 | T | G | 0.194 | 12:50 | 0.04375 | HLA-A*11:01 | KLMSTVDPKLN | KLMSTVDPKLK | 8648.5 | 336.3 |
| RJLC4-T1 | SRSF11 | NM_001190987:exon7:c.T597G:p.N199K | 1 | 70703114 | T | G | 0.194 | 12:50 | 0.04375 | HLA-A*11:01 | LMSTVDPKLN | LMSTVDPKLK | 33738.4 | 240.6 |
| RJLC4-T1 | LRIG2 | NM_014813:exon12:c.C1421G:p.P474R | 1 | 113650323 | C | G | 0.216 | 61:222 | 0.145138889 | HLA-A*11:01 | SVNVSCAHP | SVNVSCAHR | 28463.9 | 363 |
| RJLC4-T1 | NBPF8 | NM_001037501:exon12:c.T1721G:p.M574R | 1 | 148017582 | A | C | 0.25 | 3:09 | 1:13 | HLA-A*11:01 | STLSIPPEM | STLSIPPER | 6287.6 | 80.1 |
| RJLC4-T1 | SULT1C3 | NM_001008743:exon1:c.C29T:p.T10M | 2 | 108863679 | C | T | 0.152 | 48:267 | 0.281944444 | HLA-A*11:01 | KIEKNAPTMEK | KIEKNAPMMEK | 134 | 118.2 |
| RJLC4-T1 | ZFP62 | NM_001172638:exon2:c.T2399G:p.L800R | 5 | 180276096 | A | C | 0.328 | 79:162 | 0.154861111 | HLA-A*11:01 | KAYISHSSL | KAYISHSSR | 22978.2 | 256.4 |
| RJLC4-T1 | RP1-257A7.4 | NM_001242698:exon4:c.G186C:p.M62I | 6 | 13281740 | C | G | 0.19 | 0.713888889 | 0.045138889 | HLA-A*11:01 | AMISAHCNLR | AIISAHCNLR | 415.6 | 254.1 |
| RJLC4-T1 | VPS13B | NM_017890:exon48:c.A8849C:p.N2950T | 8 | 100831792 | A | C | 0.08 | 0.645833333 | 0.122222222 | HLA-A*11:01 | SLQPIWPYNKK | SLQPIWPYTKK | 148.3 | 141.5 |
| RJLC4-T1 | VPS13B | NM_017890:exon48:c.A8849C:p.N2950T | 8 | 100831792 | A | C | 0.08 | 0.645833333 | 0.122222222 | HLA-A*11:01 | SLQPIWPYNK | SLQPIWPYTK | 25.7 | 25.3 |
| RJLC4-T1 | VPS13B | NM_017890:exon48:c.A8849C:p.N2950T | 8 | 100831792 | A | C | 0.08 | 0.645833333 | 0.122222222 | HLA-A*11:01 | LQPIWPYNKK | LQPIWPYTKK | 494.4 | 319.9 |
| RJLC4-T1 | HHLA1 | NM_001145095:exon8:c.C561G:p.I187M | 8 | 133100120 | G | C | 0.341 | 72:139 | 0.152777778 | HLA-A*11:01 | IFICVMTGK | MFICVMTGK | 701.1 | 317.4 |
| RJLC4-T1 | C9orf3 | NM_001193329:exon1:c.T41G:p.L14R | 9 | 97522106 | T | G | 0.108 | 0.852777778 | 0.127777778 | HLA-A*11:01 | LMANTSHILVK | RMANTSHILVK | 333.4 | 189.8 |
| RJLC4-T1 | COQ4 | NM_016035:exon2:c.A188G:p.N63S | 9 | 131085412 | A | G | 0.123 | 0.652777778 | 0.045138889 | HLA-A*11:01 | SAAMALYNPYR | SAAMALYSPYR | 495.7 | 396.9 |
| RJLC4-T1 | COQ4 | NM_016035:exon2:c.A188G:p.N63S | 9 | 131085412 | A | G | 0.123 | 0.652777778 | 0.045138889 | HLA-A*11:01 | SAAMALYNPY | SAAMALYSPY | 242.3 | 161.6 |
| RJLC4-T1 | COQ4 | NM_016035:exon2:c.A188G:p.N63S | 9 | 131085412 | A | G | 0.123 | 0.652777778 | 0.045138889 | HLA-A*11:01 | AAMALYNPYR | AAMALYSPYR | 36.9 | 25.2 |
| RJLC4-T1 | COQ4 | NM_016035:exon2:c.A188G:p.N63S | 9 | 131085412 | A | G | 0.123 | 0.652777778 | 0.045138889 | HLA-A*11:01 | AAMALYNPY | AAMALYSPY | 78.1 | 49.4 |
| RJLC4-T1 | COQ4 | NM_016035:exon2:c.A188G:p.N63S | 9 | 131085412 | A | G | 0.123 | 0.652777778 | 0.045138889 | HLA-A*11:01 | AMALYNPYR | AMALYSPYR | 83 | 54.9 |
| RJLC4-T1 | MED27 | NM_004269:exon5:c.G607T:p.V203F | 9 | 134769346 | C | A | 0.1 | 0.622916667 | 0.095833333 | HLA-A*11:01 | IVVMRSLFIDR | IVFMRSLFIDR | 1601 | 314.8 |
| RJLC4-T1 | MED27 | NM_004269:exon5:c.G607T:p.V203F | 9 | 134769346 | C | A | 0.1 | 0.622916667 | 0.095833333 | HLA-A*11:01 | KVLKVIVVMR | KVLKVIVFMR | 661.6 | 186.3 |
| RJLC4-T1 | SCUBE2 | NM_001170690:exon18:c.G2411C:p.R804T | 11 | 9042605 | C | G | 0.148 | 31:178 | 0.176388889 | HLA-A*11:01 | SKVSRFLRPYK | SKVSRFLTPYK | 198 | 97.8 |
| RJLC4-T1 | SCUBE2 | NM_001170690:exon18:c.G2411C:p.R804T | 11 | 9042605 | C | G | 0.148 | 31:178 | 0.176388889 | HLA-A*11:01 | SKVSRFLRPY | SKVSRFLTPY | 292.5 | 106.8 |
| RJLC4-T1 | SCUBE2 | NM_001170690:exon18:c.G2411C:p.R804T | 11 | 9042605 | C | G | 0.148 | 31:178 | 0.176388889 | HLA-A*11:01 | KVSRFLRPYK | KVSRFLTPYK | 11.7 | 8.7 |
| RJLC4-T1 | SCUBE2 | NM_001170690:exon18:c.G2411C:p.R804T | 11 | 9042605 | C | G | 0.148 | 31:178 | 0.176388889 | HLA-A*11:01 | KVSRFLRPY | KVSRFLTPY | 136.9 | 50.5 |
| RJLC4-T1 | SCUBE2 | NM_001170690:exon18:c.G2411C:p.R804T | 11 | 9042605 | C | G | 0.148 | 31:178 | 0.176388889 | HLA-A*11:01 | VSRFLRPYK | VSRFLTPYK | 115.9 | 33.3 |
| RJLC4-T1 | GPRC5A | NM_003979:exon2:c.T133A:p.F45I | 12 | 13061316 | T | A | 0.24 | 56:177 | 0.284027778 | HLA-A*11:01 | FMLTLPILVCK | IMLTLPILVCK | 222.3 | 151.7 |
| RJLC4-T1 | LDHD | NM_153486:exon2:c.T133G:p.S45A | 16 | 75149498 | A | C | 0.165 | 0.813194444 | 0.058333333 | HLA-A*11:01 | SHVSTAAVVR | SHVATAAVVR | 570.7 | 496.5 |
| RJLC4-T1 | TP53 | NM_001126115:exon3:c.G350A:p.R117K | 17 | 7577535 | C | T | 0.264 | 19:53 | 0.06875 | HLA-A*11:01 | NSSCMGGMNRR | NSSCMGGMNRK | 2684.2 | 307.2 |
| RJLC4-T1 | TP53 | NM_001126115:exon3:c.G350A:p.R117K | 17 | 7577535 | C | T | 0.264 | 19:53 | 0.06875 | HLA-A*11:01 | SSCMGGMNRR | SSCMGGMNRK | 114.2 | 14.6 |
| RJLC4-T1 | TP53 | NM_001126115:exon3:c.G350A:p.R117K | 17 | 7577535 | C | T | 0.264 | 19:53 | 0.06875 | HLA-A*11:01 | SCMGGMNRR | SCMGGMNRK | 4430.2 | 472.7 |
| RJLC4-T1 | MAP3K3 | NM_002401:exon6:c.G422A:p.R141Q | 17 | 61744340 | G | A | 0.384 | 83:133 | 0.136805556 | HLA-A*11:01 | SGVSRQVRIK | SGVSRQVQIK | 530.3 | 282.1 |
| RJLC4-T1 | MAP3K3 | NM_002401:exon6:c.G422A:p.R141Q | 17 | 61744340 | G | A | 0.384 | 83:133 | 0.136805556 | HLA-A*11:01 | GVSRQVRIK | GVSRQVQIK | 368 | 159.6 |
| RJLC4-T1 | TXNL4A | NM_006701:exon2:c.G241A:p.V81I | 18 | 77737614 | C | T | 0.174 | 1.034027778 | 0.097222222 | HLA-A*11:01 | CTVMFFFRNK | CTIMFFFRNK | 19.2 | 18.9 |
| RJLC4-T1 | FBXL12 | NM_017703:exon1:c.C76T:p.R26C | 19 | 9929414 | G | A | 0.172 | 35:169 | 0.140972222 | HLA-A*11:01 | RIRISRVCHR | RICISRVCHR | 464.1 | 416.3 |
| RJLC4-T1 | S1PR5 | NM_001166215:exon2:c.A298G:p.T100A | 19 | 10625390 | T | C | 0.151 | 34:191 | 0.2125 | HLA-A*11:01 | NILLSGPLTLK | NILLSGPLALK | 438.1 | 409.3 |
| RJLC4-T1 | S1PR5 | NM_001166215:exon2:c.A298G:p.T100A | 19 | 10625390 | T | C | 0.151 | 34:191 | 0.2125 | HLA-A*11:01 | LLSGPLTLK | LLSGPLALK | 33 | 32.5 |
| RJLC4-T1 | MAP3K10 | NM_002446:exon9:c.C2270T:p.S757F | 19 | 40719856 | C | T | 0.324 | 55:115 | 0.090277778 | HLA-A*11:01 | SSVSDCNSTR | SSVSDCNFTR | 636.7 | 170.8 |
| RJLC4-T1 | MAP3K10 | NM_002446:exon9:c.C2270T:p.S757F | 19 | 40719856 | C | T | 0.324 | 55:115 | 0.090277778 | HLA-A*11:01 | SVSDCNSTR | SVSDCNFTR | 222.1 | 58.3 |
| RJLC4-T1 | LRIG2 | NM_014813:exon12:c.C1421G:p.P474R | 1 | 113650323 | C | G | 0.216 | 61:222 | 0.145138889 | HLA-B*40:01 | HPEWLAGQSIL | HREWLAGQSIL | 3413.9 | 432.7 |
| RJLC4-T1 | LRIG2 | NM_014813:exon12:c.C1421G:p.P474R | 1 | 113650323 | C | G | 0.216 | 61:222 | 0.145138889 | HLA-B*40:01 | HPEWLAGQSI | HREWLAGQSI | 78.7 | 75.3 |
| RJLC4-T1 | LRIG2 | NM_014813:exon12:c.C1421G:p.P474R | 1 | 113650323 | C | G | 0.216 | 61:222 | 0.145138889 | HLA-B*40:01 | PEWLAGQSIL | REWLAGQSIL | 1544 | 19.7 |
| RJLC4-T1 | LRIG2 | NM_014813:exon12:c.C1421G:p.P474R | 1 | 113650323 | C | G | 0.216 | 61:222 | 0.145138889 | HLA-B*40:01 | PEWLAGQSI | REWLAGQSI | 512.7 | 9.1 |
| RJLC4-T1 | IGSF8 | NM_052868:exon5:c.G1474A:p.V492I | 1 | 160062324 | C | T | 0.075 | 0.351388889 | 0.059722222 | HLA-B*40:01 | GELSSVPAQL | GELSSIPAQL | 34.8 | 33.5 |
| RJLC4-T1 | RP1-257A7.4 | NM_001242698:exon4:c.G186C:p.M62I | 6 | 13281740 | C | G | 0.19 | 0.713888889 | 0.045138889 | HLA-B*40:01 | LEFNGAMI | LEFNGAII | 350.1 | 184.7 |
| RJLC4-T1 | TONSL | NM_013432:exon15:c.C1852T:p.L618F | 8 | 145662178 | G | A | 0.187 | 34:148 | 0.136805556 | HLA-B*40:01 | LLERGASVTL | LFERGASVTL | 176.8 | 152.6 |
| RJLC4-T1 | TONSL | NM_013432:exon15:c.C1852T:p.L618F | 8 | 145662178 | G | A | 0.187 | 34:148 | 0.136805556 | HLA-B*40:01 | LERGASVTL | FERGASVTL | 23.2 | 14.4 |
| RJLC4-T1 | TMC3 | NM_001080532:exon14:c.C1535A:p.S512Y | 15 | 81636370 | G | T | 0.193 | 37:155 | 0.101388889 | HLA-B*40:01 | QEMLKLSII | QEMLKLYII | 147.4 | 107.6 |
| RJLC4-T1 | TXNL4A | NM_006701:exon2:c.G241A:p.V81I | 18 | 77737614 | C | T | 0.174 | 1.034027778 | 0.097222222 | HLA-B*40:01 | YELYDPCTV | YELYDPCTI | 113.4 | 41.3 |
| RJLC4-T1 | IL2RB | NM_000878:exon6:c.T481C:p.F161L | 22 | 37533683 | A | G | 0.164 | 0.904166667 | 0.150694444 | HLA-B*40:01 | WEISQASHYF | WEISQASHYL | 339.2 | 25.1 |
| RJLC4-T1 | LONRF3 | NM_024778:exon6:c.A1505C:p.E502A | X | 118143186 | A | C | 0.102 | 0.621527778 | 0.133333333 | HLA-B*40:01 | EEEMEELSNL | AEEMEELSNL | 1738.3 | 107 |
| RJLC4-T1 | IGSF8 | NM_052868:exon5:c.G1474A:p.V492I | 1 | 160062324 | C | T | 0.075 | 0.351388889 | 0.059722222 | HLA-B*55:02 | VPAQLVGGV | IPAQLVGGV | 301.8 | 193.8 |
| RJLC4-T1 | PCDHA2 | NM_018905:exon1:c.C1867T:p.R623C | 5 | 140176416 | C | T | 0.185 | 46:202 | 0.155555556 | HLA-B*55:02 | RIPFRVGLYT | RIPFCVGLYT | 635.5 | 293.6 |
| RJLC4-T1 | PCDHA2 | NM_018905:exon1:c.C1867T:p.R623C | 5 | 140176416 | C | T | 0.185 | 46:202 | 0.155555556 | HLA-B*55:02 | IPFRVGLYTG | IPFCVGLYTG | 381.3 | 193.6 |
| RJLC4-T1 | PCDHA2 | NM_018905:exon1:c.C1867T:p.R623C | 5 | 140176416 | C | T | 0.185 | 46:202 | 0.155555556 | HLA-B*55:02 | IPFRVGLYT | IPFCVGLYT | 78.2 | 59.3 |
| RJLC4-T1 | RP1-257A7.4 | NM_001242698:exon4:c.G186C:p.M62I | 6 | 13281740 | C | G | 0.19 | 0.713888889 | 0.045138889 | HLA-B*55:02 | LPRLEFNGAM | LPRLEFNGAI | 437.8 | 199.3 |
| RJLC4-T1 | C4B | NM_001002029:exon28:c.G3629T:p.R1210L | 6 | 31997068 | G | T | 0.072 | 0.505555556 | 0.099305556 | HLA-B*55:02 | KAPADLRGVA | KAPADLLGVA | 829.2 | 468.9 |
| RJLC4-T1 | C4B | NM_001002029:exon28:c.G3629T:p.R1210L | 6 | 31997068 | G | T | 0.072 | 0.505555556 | 0.099305556 | HLA-B*55:02 | APADLRGVA | APADLLGVA | 147.6 | 62.8 |
| RJLC4-T1 | ICK | NM_014920:exon6:c.C460A:p.P154T | 6 | 52884056 | G | T | 0.03 | 0.513888889 | 0.214583333 | HLA-B*55:02 | PPYTDYVST | TPYTDYVST | 10133.4 | 277.4 |
| RJLC4-T1 | COQ4 | NM_016035:exon2:c.A188G:p.N63S | 9 | 131085412 | A | G | 0.123 | 0.652777778 | 0.045138889 | HLA-B*55:02 | NPYRHDMVAV | SPYRHDMVAV | 220.5 | 120.2 |
| RJLC4-T1 | COQ4 | NM_016035:exon2:c.A188G:p.N63S | 9 | 131085412 | A | G | 0.123 | 0.652777778 | 0.045138889 | HLA-B*55:02 | NPYRHDMVA | SPYRHDMVA | 59.6 | 36.3 |
| RJLC4-T1 | THOC1 | NM_005131:exon1:c.C11A:p.T4K | 18 | 268009 | G | T | 0.312 | 65:143 | 0.138888889 | HLA-B*55:02 | MSPTPPLFSL | MSPKPPLFSL | 161.9 | 118.1 |
| RJLC4-T1 | THOC1 | NM_005131:exon1:c.C11A:p.T4K | 18 | 268009 | G | T | 0.312 | 65:143 | 0.138888889 | HLA-B*55:02 | SPTPPLFSL | SPKPPLFSL | 418.3 | 273.3 |
| RJLC4-T1 | FBXL12 | NM_017703:exon1:c.C76T:p.R26C | 19 | 9929414 | G | A | 0.172 | 35:169 | 0.140972222 | HLA-B*55:02 | LPVRDRIRI | LPVRDRICI | 415.1 | 371.7 |
| RJLC4-T1 | S1PR5 | NM_001166215:exon2:c.A298G:p.T100A | 19 | 10625390 | T | C | 0.151 | 34:191 | 0.2125 | HLA-B*55:02 | GPLTLKLSPA | GPLALKLSPA | 411.1 | 256.3 |
| RJLC4-T1 | RSG1 | NM_030907:exon4:c.G505A:p.V169I | 1 | 16559027 | C | T | 0.122 | 0.420138889 | 0.046527778 | HLA-C*03:04 | IAGEAPGVV | IAGEAPGVI | 333.5 | 221.4 |
| RJLC4-T1 | NFASC | NM_001005388:exon25:c.C2972T:p.T991M | 1 | 204966487 | C | T | 0.129 | 26:175 | 0.115972222 | HLA-C*03:04 | TTAAATTTT | TTAAATTTM | 4991.4 | 24.1 |
| RJLC4-T1 | SULT1C3 | NM_001008743:exon1:c.C29T:p.T10M | 2 | 108863679 | C | T | 0.152 | 48:267 | 0.281944444 | HLA-C*03:04 | MAKIEKNAPT | MAKIEKNAPM | 11231.1 | 76.8 |
| RJLC4-T1 | SLC9B1 | NM_001100874:exon6:c.A651C:p.L217F | 4 | 103866352 | T | G | 0.118 | 0.702777778 | 0.127083333 | HLA-C*03:04 | WAFLLGFVL | WAFLFGFVL | 103 | 94.9 |
| RJLC4-T1 | IRX1 | NM_024337:exon2:c.C1007T:p.P336L | 5 | 3600069 | C | T | 0.054 | 0.859722222 | 0.125694444 | HLA-C*03:04 | GAPKASPPP | GAPKASPPL | 33700.9 | 414.1 |
| RJLC4-T1 | RP1-257A7.4 | NM_001242698:exon4:c.G186C:p.M62I | 6 | 13281740 | C | G | 0.19 | 0.713888889 | 0.045138889 | HLA-C*03:04 | AMISAHCNL | AIISAHCNL | 310.4 | 250 |
| RJLC4-T1 | C4B | NM_001002029:exon28:c.G3629T:p.R1210L | 6 | 31997068 | G | T | 0.072 | 0.505555556 | 0.099305556 | HLA-C*03:04 | RGVAHNNLM | LGVAHNNLM | 579.6 | 256.4 |
| RJLC4-T1 | TONSL | NM_013432:exon15:c.C1852T:p.L618F | 8 | 145662178 | G | A | 0.187 | 34:148 | 0.136805556 | HLA-C*03:04 | LLLERGASV | LLFERGASV | 1061.3 | 356.1 |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RJLC4-T1 | MED27 | NM_004269:exon5:c.G607T:p.V203F | 9 | 134769346 | C | A | 0.1 | 0.622916667 | 0.095833333 | HLA-C*03:04 | IVVMRSLFI | IVFMRSLFI | 1310.5 | 488.4 |
| RJLC4-T1 | GPRC5A | NM_003979:exon2:c.T133A:p.F45I | 12 | 13061316 | T | A | 0.24 | 56:177 | 0.284027778 | HLA-C*03:04 | VAFMLTLPI | VAIMLTLPI | 15.6 | 13.5 |
| RJLC4-T1 | TMC3 | NM_001080532:exon14:c.C1535A:p.S512Y | 15 | 81636370 | G | T | 0.193 | 37:155 | 0.101388889 | HLA-C*03:04 | SIIDMLFTV | YIIDMLFTV | 886.7 | 156 |
| RJLC4-T1 | S1PR5 | NM_001166215:exon2:c.A298G:p.T100A | 19 | 10625390 | T | C | 0.151 | 34:191 | 0.2125 | HLA-C*03:04 | ILLSGPLTL | ILLSGPLAL | 89.9 | 52.6 |
| RJLC4-T1 | S1PR5 | NM_001166215:exon2:c.A298G:p.T100A | 19 | 10625390 | T | C | 0.151 | 34:191 | 0.2125 | HLA-C*03:04 | LTLKLSPAL | LALKLSPAL | 71.5 | 15.9 |
| RJLC4-T2 | SRSF11 | NM_001190987:exon7:c.T597G:p.N199K | 1 | 70703114 | T | G | 0.141 | 9:55 | 0.04375 | HLA-A*11:01 | KLMSTVDPKLN | KLMSTVDPKLK | 8648.5 | 336.3 |
| RJLC4-T2 | SRSF11 | NM_001190987:exon7:c.T597G:p.N199K | 1 | 70703114 | T | G | 0.141 | 9:55 | 0.04375 | HLA-A*11:01 | LMSTVDPKLN | LMSTVDPKLK | 33738.4 | 240.6 |
| RJLC4-T2 | ADCY10 | NM_018417:exon4:c.G261T:p.L87F | 1 | 167871285 | C | A | 0.145 | 9:53 | 0.102083333 | HLA-A*11:01 | KVLIFGGDILK | KVFIFGGDILK | 201.3 | 116.6 |
| RJLC4-T2 | CCDC132 | NM_017667:exon25:c.A2460C:p.L820F | 7 | 92979342 | A | C | 0.076 | 0.551388889 | 0.132638889 | HLA-A*11:01 | QHNIYVDALLK | QHNIYVDALFK | 810.7 | 375.5 |
| RJLC4-T2 | CCDC132 | NM_017667:exon25:c.A2460C:p.L820F | 7 | 92979342 | A | C | 0.076 | 0.551388889 | 0.132638889 | HLA-A*11:01 | HNIYVDALLK | HNIYVDALFK | 73 | 32.4 |
| RJLC4-T2 | CCDC132 | NM_017667:exon25:c.A2460C:p.L820F | 7 | 92979342 | A | C | 0.076 | 0.551388889 | 0.132638889 | HLA-A*11:01 | NIYVDALLK | NIYVDALFK | 51.9 | 24.4 |
| RJLC4-T2 | MYOF | NM_133337:exon34:c.A3833C:p.Y1278S | 10 | 95111003 | T | G | 0.085 | 0.736805556 | 0.139583333 | HLA-A*11:01 | LYMVPQGIR | LSMVPQGIR | 9937.8 | 479.3 |
| RJLC4-T2 | UBL7 | NM_001286740:exon5:c.A397G:p.M133V | 15 | 74743852 | T | C | 0.034 | 0.36875 | 0.144444444 | HLA-A*11:01 | AVFKMLSNKE | AVFKVLSNKE | 224.9 | 221.9 |
| RJLC4-T2 | KCNQ5 | NM_001160134:exon10:c.T1260G:p.F420L | 6 | 73900308 | T | G | 0.115 | 0.422916667 | 0.067361111 | HLA-B*40:01 | GEASSRIMKF | GEASSRIMKL | 508.4 | 93.2 |
| RJLC4-T2 | C5 | NM_001735:exon8:c.T765G:p.F255L | 9 | 123789546 | A | C | 0.111 | 0.425 | 0.055555556 | HLA-B*40:01 | FEITIKARYF | FEITIKARYL | 1198.4 | 112.4 |
| RJLC4-T2 | UBL7 | NM_001286740:exon5:c.A397G:p.M133V | 15 | 74743852 | T | C | 0.034 | 0.36875 | 0.144444444 | HLA-B*40:01 | REAVFKML | REAVFKVL | 720.9 | 326.3 |
| RJLC4-T2 | LMO7 | NM_015842:exon25:c.A3671T:p.E1224V | 13 | 76427233 | A | T | 0.055 | 0.804166667 | 0.224305556 | HLA-B*55:02 | LPGIMRRGE | LPGIMRRGV | 9281.9 | 355.4 |
| RJLC4-T2 | NAA11 | NM_032693:exon1:c.A188T:p.E63V | 4 | 80246844 | T | A | 0.035 | 0.605555556 | 0.220833333 | HLA-C*03:04 | YVLAKMEEE | YVLAKMEEV | 18273.4 | 248 |
| RJLC4-T2 | SLC9B1 | NM_001100874:exon6:c.A651C:p.L217F | 4 | 103866352 | T | G | 0.168 | 0.811805556 | 0.127083333 | HLA-C*03:04 | WAFLLGFVL | WAFLFGFVL | 103 | 94.9 |
| RJLC4-T2 | CCDC132 | NM_017667:exon25:c.A2460C:p.L820F | 7 | 92979342 | A | C | 0.076 | 0.551388889 | 0.132638889 | HLA-C*03:04 | YVDALLKEF | YVDALFKEF | 383.6 | 227.9 |
| RJLC4-T2 | PAK6 | NM_001276717:exon3:c.C224T:p.A75V | 15 | 40558062 | C | T | 0.066 | 0.669444444 | 0.151388889 | HLA-C*03:04 | VVRGSAMPV | VVRGSVMPV | 435 | 419.9 |
| RJLC4-T3 | MROH7 | NM_001039464:exon19:c.C3214T:p.R1072W | 1 | 55166924 | C | T | 0.103 | 0.381944444 | 0.063888889 | HLA-A*11:01 | KAVFKGRDQK | KAVFKGWDQK | 243.9 | 129.5 |
| RJLC4-T3 | MROH7 | NM_001039464:exon19:c.C3214T:p.R1072W | 1 | 55166924 | C | T | 0.103 | 0.381944444 | 0.063888889 | HLA-A*11:01 | AVFKGRDQK | AVFKGWDQK | 23.3 | 15.7 |
| RJLC4-T3 | SRSF11 | NM_001190987:exon7:c.T597G:p.N199K | 1 | 70703114 | T | G | 0.167 | 8:40 | 0.04375 | HLA-A*11:01 | KLMSTVDPKLN | KLMSTVDPKLK | 8648.5 | 336.3 |
| RJLC4-T3 | SRSF11 | NM_001190987:exon7:c.T597G:p.N199K | 1 | 70703114 | T | G | 0.167 | 8:40 | 0.04375 | HLA-A*11:01 | LMSTVDPKLN | LMSTVDPKLK | 33738.4 | 240.6 |
| RJLC4-T3 | HSD3B1 | NM_000862:exon4:c.C689T:p.A230V | 1 | 120056835 | C | T | 0.042 | 0.402083333 | 0.114583333 | HLA-A*11:01 | VAWAHILALR | VVWAHILALR | 322.8 | 204.6 |
| RJLC4-T3 | MRS2 | NM_001286266:exon3:c.A266T:p.Y89F | 6 | 24412451 | A | T | 0.296 | 8:19 | 1:28 | HLA-A*11:01 | SVAPVFTVYLK | SVAPVFTVFLK | 17.2 | 13.2 |
| RJLC4-T3 | MRS2 | NM_001286266:exon3:c.A266T:p.Y89F | 6 | 24412451 | A | T | 0.296 | 8:19 | 1:28 | HLA-A*11:01 | VAPVFTVYLK | VAPVFTVFLK | 55.6 | 37.9 |
| RJLC4-T3 | ALDH1A3 | NM_000693:exon9:c.C997T:p.R333W | 15 | 101440893 | C | T | 0.05 | 0.439583333 | 0.120833333 | HLA-A*11:01 | FVRRSVEYAK | FVRWSVEYAK | 267.8 | 127.3 |
| RJLC4-T3 | MRS2 | NM_001286266:exon3:c.A266T:p.Y89F | 6 | 24412451 | A | T | 0.296 | 8:19 | 1:28 | HLA-B*55:02 | APVFTVYLKA | APVFTVFLKA | 203.9 | 112.7 |
| RJLC4-T3 | TTC21B | NM_024753:exon18:c.A2456C:p.E819A | 2 | 166767842 | T | G | 0.128 | 0.463888889 | 0.109722222 | HLA-C*03:04 | LAHEPVNEL | LAHAPVNEL | 11.9 | 10.2 |
| RJLC4-T3 | MUC4 | NM_018406:exon2:c.C6506T:p.A2169V | 3 | 195511945 | G | A | 0.333 | 2:04 | 0:10 | HLA-C*03:04 | ASTGHATSL | VSTGHATSL | 51.7 | 25.6 |
| RJLC4-T3 | SLC9B1 | NM_001100874:exon6:c.A651C:p.L217F | 4 | 103866352 | T | G | 0.167 | 0.8125 | 0.127083333 | HLA-C*03:04 | WAFLLGFVL | WAFLFGFVL | 103 | 94.9 |
| RJLC4-T3 | MRS2 | NM_001286266:exon3:c.A266T:p.Y89F | 6 | 24412451 | A | T | 0.296 | 8:19 | 1:28 | HLA-C*03:04 | SVAPVFTVY | SVAPVFTVF | 757.8 | 47.8 |
| RJLC4-T3 | EML3 | NM_153265:exon19:c.A2246C:p.E749A | 11 | 62371212 | T | G | 0.093 | 0.532638889 | 0.060416667 | HLA-C*03:04 | MSNSGDYEI | MSNSGDYAI | 150 | 53.8 |
| RJLC4-T3 | MGA | NM_001164273:exon15:c.A5167C:p.I1723L | 15 | 42035325 | A | C | 0.096 | 0.675 | 0.13125 | HLA-C*03:04 | SSLGSVPII | SSLGSVPIL | 246.1 | 75.9 |

**Supplementary Table 5: Clonal numbers inferred by PyClone or SciClone analyses**

| Sample ID | PyClone | SciClone |
|---|---|---|
| RJLC1-T1R1 | 2 | 1 |
| RJLC1-T1R2 | 3 | 3 |
| RJLC1-T1R3 | 2 | 2 |
| RJLC1-T1R4 | 2 | 3 |
| RJLC1-T2 | 2 | 3 |
| RJLC2-T1 | 2 | 1 |
| RJLC2-T2 | 2 | 1 |
| RJLC2-T3 | 2 | 2 |
| RJLC3-T1 | 4 | 5 |
| RJLC3-T2 | 2 | 6 |
| RJLC3-T3 | 4 | 4 |
| RJLC4-T1R1 | 5 | 4 |
| RJLC4-T1R2 | 4 | 4 |
| RJLC4-T1R3 | 5 | 3 |
| RJLC4-T2 | 2 | 1 |
| RJLC4-T3 | 3 | 6 |

**Supplementary Table 6: Branch:trunk indices (ITB) from WES for MSLCs**

| Patient ID | Age | Sex | TNM stage | Smoking status | branch/trunk | ITB |
|---|---|---|---|---|---|---|
| RJLC1-T1 | 64 | Female | pTisN0M0 | Never | 30/23 | 1.304 |
| RJLC4-T1 | 60 | Female | pT1N0M0 | Never | 60/35 | 1.714 |
| | | | | | | |
| L001 | 59 | Female | pT2aN1M0 | Former | 4/15 | 0.267 |
| L002 | 78 | Male | pT3N2M0 | Current | 16/12 | 1.333 |
| L004 | 73 | Male | pT3N0M0 | Current | 7/23 | 0.304 |
| L011 | 49 | Female | pT2aN0M0 | Current | 3/29 | 0.103 |
| LS01 | 69 | Male | pT2aN0M0 | Former | 3/24 | 0.125 |
| 317 | 55 | Male | N0 | Former | 16/1424 | 0.011 |
| 499 | 73 | Female | N0 | Former | 2/98 | 0.02 |
| 292 | 57 | Female | N0 | Never | 2/20 | 0.1 |
| 324 | 68 | Female | N0 | Current | 23/147 | 0.156 |
| 283 | 50 | Male | N2 | Former | 2/11 | 0.182 |
| 339 | 73 | Male | N0 | Never | 13/40 | 0.325 |
| 472 | 74 | Female | N0 | Former | 16/41 | 0.39 |
| 330 | 59 | Female | N0 | Former | 116/223 | 0.52 |
| 4990 | 75 | Male | N1 | Former | 107/138 | 0.775 |
| 270 | 62 | Female | N1 | Former | 71/72 | 0.986 |
| 356 | 69 | Female | N0 | Never | 27/27 | 1 |

# Supplementary Table 7: Mutation co-occurrence in the same cancer gene of MSLC

| | Pa1 | | Pa4 | | Pa5 | | Pa6 | | | L003 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **T1** | **T3** | **T1** | **T2** | **T1** | **T2** | **T1** | **T2** | **T3** | **R2** | **R4** |
| **EGFR** | | | L858R | S229C | L858R | L858R | L858R | L858R | L858R | L858R | L858R |
| **KRAS** | G12A | G12V | | | | | | | | | |

Pa1,4,5,6 (Liu, Y. et al. Genomic heterogeneity of multiple synchronous lung cancer. *Nat Comun* 7, 13200 (2016))
L003 (de Bruin, E.C. et al. Spatial and temporal diversity in genomic instability processes defines lung cancer evolution. *Science* 346, 251-256 (2014))