**Table S4. Positions and frequency of break regions.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **chromosome** | **break range\*** | **distance start-end** | **total** | **clone corrected** |
| 1 | AB\*A\_348338-351714 | 3376 | 1 | 1 |
| 1 | AB\*A\_348338-354626 | 6288 | 1 | 1 |
| 1 | AB\*A\_351729-354626 | 2897 | 1 | 1 |
| 1 | AB\*AA\_373699-383072 | 9373 | 1 | 1 |
| 1 | BB\*AA\_398914-404241 | 5327 | 1 | 1 |
| 1 | AA\*AB\_410519-415077 | 4558 | 1 | 1 |
| 1 | AB\*AA\_433746-438349 | 4603 | 9 | 8 |
| 1 | AB\*AA\_433746-448543 | 14797 | 1 | 1 |
| 1 | AB\*AA\_433746-460915 | 27169 | 1 | 1 |
| 1 | AB\*AA\_438349-439257 | 908 | 1 | 1 |
| 1 | AB\*AA\_448653-449000 | 347 | 1 | 1 |
| 1 | AB\*AA\_448667-460915 | 12248 | 1 | 1 |
| 1 | AA\*AB\_460915-462498 | 1583 | 2 | 2 |
| 1 | AA\*AB\_462504-462656 | 152 | 13 | 8 |
| 1 | AA\*AB\_462687-466990 | 4303 | 2 | 2 |
| 1 | AA\*AB\_481640-482323 | 683 | 1 | 1 |
| 1 | AA\*BB\_482379-501248 | 18869 | 1 | 1 |
| 1 | AA\*AB\_483352-491069 | 7717 | 4 | 4 |
| 1 | AA\*AB\_495589-501334 | 5745 | 1 | 1 |
| 1 | AA\*AB\_499908-501334 | 1481 | 1 | 1 |
| 1 | AA\*AB\_499853-501334 | 1426 | 1 | 1 |
| 1 | AA\*BB\_499853-520149 | 20296 | 1 | 1 |
| 1 | AA\*AB\_501334-520149 | 18815 | 2 | 2 |
| 1 | AA\*AB\_501248-501334 | 86 | 1 | 1 |
| 1 | AA\*AB\_508746-515713 | 6967 | 1 | 1 |
| 1 | AA\*AB\_519602-519621 | 19 | 1 | 1 |
| 1 | AA\*AB\_519649-520144 | 495 | 1 | 1 |
| 1 | AA\*AB\_520344-536048 | 124 | 1 | 1 |
| 1 | BB\*AB\_520154-522742 | 2588 | 1 | 1 |
| 1 | AA\*AB\_520344-536048 | 15704 | 3 | 2 |
| 1 | AA\*BB\_536048-541932 | 5884 | 2 | 2 |
| 1 | A\*AB\_536070-541932 | 5862 | 2 | 2 |
| 1 | AA\*AB\_541932-544154 | 2222 | 1 | 1 |
| 1 | AB\*AA\_544671-545864 | 1193 | 1 | 1 |
| 1 | BB\*AA\_545882-545915 | 33 | 1 | 1 |
| 1 | AA\*AB\_552620-570867 | 18247 | 2 | 2 |
| 1 | AA\*AB\_553810-558000 | 4190 | 2 | 2 |
| 1 | AA\*AB\_553810-570867 | 17057 | 1 | 1 |
| 1 | AA\*AB\_587692-587699 | 7 | 3 | 3 |
| 1 | AA\*AB\_593710-594642 | 932 | 3 | 2 |
| 1 | AB\*BB\_599602-600725 | 1123 | 1 | 1 |
| 1 | AA\*AB\_612193-613582 | 1389 | 1 | 1 |
| 1 | BB\*AB\_622026-628644 | 6618 | 2 | 2 |
| 1 | AA\*BB\_673088-705013 | 31925 | 1 | 1 |
| 1 | AA\*AB\_694109-694185 | 76 | 3 | 3 |
| 1 | AA\*AB\_694109-705013 | 10904 | 1 | 1 |
| 1 | AA\*AB\_694185-719955 | 25770 | 1 | 1 |
| 1 | AA\*BB\_694268-719955 | 25687 | 1 | 1 |
| 1 | AA\*AB\_706684-719955 | 13271 | 1 | 1 |
| 1 | AA\*AB\_714659-719955 | 5296 | 1 | 1 |
| 1 | AA\*AB\_709206-719955 | 10749 | 1 | 1 |
| 1 | AA\*AB\_719481-719955 | 474 | 1 | 1 |
| 1 | AA\*AB\_709206-713073 | 3867 | 1 | 1 |
| 1 | AA\*AB\_709855-713073 | 3218 | 2 | 2 |
| 1 | AA\*AB\_719955-725146 | 5191 | 2 | 2 |
| 1 | AA\*AB\_720839-725146 | 4307 | 1 | 1 |
| 1 | AA\*BB\_725146-733628 | 8482 | 1 | 1 |
| 1 | AA\*AB\_733715-735503 | 1788 | 1 | 1 |
| 1 | BB\*AB\_747211-753819 | 6608 | 3 | 3 |
| 1 | BB\*AB\_775349-778986 | 3637 | 2 | 2 |
| 1 | AA\*AB\_778986-779531 | 545 | 1 | 1 |
| 1 | AA\*AB\_779531-783099 | 3568 | 2 | 2 |
| 1 | AA\*AB\_783099-795054 | 11955 | 3 | 3 |
| 1 | AA\*AB\_795203-800550 | 5347 | 1 | 1 |
| 1 | AA\*AB\_803094-803790 | 696 | 1 | 1 |
| 1 | AA\*AB\_803326-803442 | 116 | 1 | 1 |
| 1 | AA\*AB\_803790-812392 | 8602 | 1 | 1 |
| 1 | AA\*AB\_803939-812392 | 8453 | 1 | 1 |
| 1 | AA\*BB\_813811-820778 | 6967 | 1 | 1 |
| 1 | AA\*AB\_821286-823473 | 2187 | 1 | 1 |
| 1 | AA\*AB\_826226-827220 | 994 | 1 | 1 |
| 1 | AA\*AB\_840086-841357 | 1271 | 6 | 4 |
| 1 | AA\*BB\_841357-842947 | 1590 | 1 | 1 |
| 1 | AA\*AB\_845366-846770 | 1404 | 1 | 1 |
| 1 | AA\*AB\_848155-854388 | 6233 | 1 | 1 |
| 1 | AA\*AB\_853510-854388 | 878 | 1 | 1 |
| 1 | AA\*AB\_854388-861694 | 7306 | 1 | 1 |
| 1 | AA\*AB\_859632-861694 | 2062 | 1 | 1 |
| 1 | AA\*AB\_861698-868372 | 6674 | 1 | 1 |
| 1 | AA\*BB\_866916-874728 | 7812 | 1 | 1 |
| 1 | AB\*BB\_868372-876881 | 8509 | 2 | 2 |
| 1 | AA\*AB\_871651-876881 | 5230 | 1 | 1 |
| 1 | AA\*AB\_873426-876881 | 3455 | 1 | 1 |
| 1 | AA\*AB\_877049-885671 | 8622 | 1 | 1 |
| 1 | AA\*AB\_879903-885671 | 5768 | 1 | 1 |
| 1 | AA\*AB\_880771-885671 | 4900 | 1 | 1 |
| 1 | AA\*AB\_885671-888188 | 2517 | 1 | 1 |
| 1 | AA\*AB\_885671-889618 | 3947 | 1 | 1 |
| 1 | AB\*AA\_890746-892820 | 2074 | 1 | 1 |
| 1 | AA\*AB\_892841-892964 | 123 | 2 | 2 |
| 1 | AA\*AB\_893632-900122 | 6490 | 1 | 1 |
| 1 | AA\*AB\_904498-905591 | 1093 | 1 | 1 |
| 1 | BB\*AB\_905591-909283 | 3692 | 1 | 1 |
| 1 | AA\*AB\_909149-909289 | 140 | 1 | 1 |
| 1 | AA\*AB\_909289-912377 | 3088 | 2 | 2 |
| 1 | AA\*AB\_921148-926233 | 5085 | 1 | 1 |
| 1 | AA\*AB\_932202-950486 | 18284 | 1 | 1 |
| 1 | BB\*AB\_933190-950486 | 17296 | 1 | 1 |
| 1 | AA\*AB\_950486-952444 | 1758 | 2 | 2 |
| 1 | AA\*AB\_950630-952444 | 1814 | 1 | 1 |
| 1 | AA\*AB\_975563- 984835 | 9272 | 2 | 2 |
| 1 | AA\*AB\_979811-984835 | 5024 | 3 | 3 |
| 1 | AA\*AB\_992546-993702 | 1156 | 1 | 1 |
| 1 | AA\*AB\_999227-1004280 | 2791 | 1 | 1 |
| 1 | AA\*AB\_999227-1002018 | 5053 | 1 | 1 |
| 1 | AB\*AA\_1006398-1007760 | 1362 | 1 | 1 |
| 1 | AA\*AB\_1013851-1014472 | 621 | 1 | 1 |
| 1 | AA\*AB\_1013900-1014472 | 572 | 1 | 1 |
| 1 | AA\*AB\_1017572-1026496 | 8924 | 1 | 1 |
| 1 | AA\*AB\_1052535-1053309 | 774 | 1 | 1 |
| 1 | AA\*AB\_1071841-1073938 | 2097 | 1 | 1 |
| 1 | AA\*BB\_1077331-1081665 | 4334 | 1 | 1 |
| 1 | AA\*AB\_1079007-1081665 | 2658 | 4 | 3 |
| 1 | AA\*AB\_1080578-1081665 | 1087 | 1 | 1 |
| 1 | AA\*AB\_1084255-1084469 | 241 | 1 | 1 |
| 1 | BB\*AB\_1095441-1095948 | 507 | 2 | 1 |
| 1 | BB\*AB\_1100912-1137075 | 36163 | 1 | 1 |
| 1 | AA\*AB\_1133323-1138268 | 4945 | 1 | 1 |
| 1 | AA\*AB\_1136215-1138268 | 2053 | 1 | 1 |
| 1 | AA\*AB\_1174261-1187083 | 12822 | 1 | 1 |
| 1 | AA\*AB\_1193318-1197703 | 4385 | 1 | 1 |
| 1 | AA\*BB\_1204081-1214089 | 10008 | 1 | 1 |
| 1 | AA\*AB\_1221582-1221946 | 364 | 1 | 1 |
| 1 | AA\*AB\_1221946-1231309 | 9363 | 1 | 1 |
| 1 | AA\*AB\_1221946-1233582 | 11636 | 1 | 1 |
| 1 | AA\*AB\_1233582-1233595 | 13 | 1 | 1 |
| 1 | AA\*AB\_1237270-1249345 | 12075 | 1 | 1 |
| 1 | AA\*AB\_1249285-1249345 | 60 | 1 | 1 |
| 1 | AA\*AB\_1256173-1262713 | 6540 | 3 | 2 |
| 1 | AA\*AB\_1280749-1283533 | 2784 | 2 | 2 |
| 1 | AA\*AB\_1283542-1288242 | 4700 | 1 | 1 |
| 1 | AA\*AB\_1314972-1316244 | 1272 | 1 | 1 |
| 1 | AA\*BB\_1328397-1334763 | 6366 | 3 | 2 |
| 1 | AA\*AB\_1345127-1347880 | 2753 | 1 | 1 |
| 1 | AA\*AB\_1385105-1385156 | 51 | 4 | 4 |
| 1 | AA\*AB\_1432503-1433451 | 947 | 1 | 1 |
| 1 | AA\*AB\_1442432-1446524 | 4092 | 1 | 1 |
| 1 | BB\*AB\_1458251-1473966 | 15715 | 1 | 1 |
| 1 | BB\*AB\_1473966-1481932 | 7966 | 1 | 1 |
| 1 | AA\*AB\_1515654-1524961 | 9307 | 1 | 1 |
| 1 | AA\*BB\_1521728-1524961 | 3233 | 2 | 1 |
| 1 | AA\*AB\_1536657-1558261 | 21604 | 2 | 2 |
| 1 | BB\*AB\_1546175-1558261 | 12086 | 2 | 1 |
| 1 | AA\*AB\_1546199-1558261 | 12062 | 1 | 1 |
| 1 | AA\*AB\_1525930-1536343 | 10413 | 1 | 1 |
| 1 | AA\*AB\_1536481-1536486 | 5 | 1 | 1 |
| 1 | AB\*AA\_2797146-2803046 | 5900 | 1 | 1 |
| 1 | AB\*AA\_2797146-2799734 | 2588 | 1 | 1 |
| 1 | AB\*BB\_2809380-2810762 | 1382 | 2 | 1 |
| 1 | AB\*BB\_2861512-2861706 | 194 | 1 | 1 |
| 2 | AAA\*AA\_1019775-1019776 | 1 | 1 | 1 |
| 2 | AB\*AA\_1989334-1999602 | 10268 | 1 | 1 |
| 2 | AA\*AB\_2042893-2052515 | 9622 | 1 | 1 |
| 2 | AA\*AB\_1736091-1744957 | 8866 | 1 | 1 |
| 2 | AA\*AB\_1745361-1745441 | 80 | 1 | 1 |
| 2 | BB\*AB\_1869108-1876906 | 7798 | 1 | 1 |
| 3 | AB\*B\_346803-350068 | 3265 | 1 | 1 |
| 3 | B\*AB\_387398-409603 | 22214 | 1 | 1 |
| 3 | BB\*AB\_817627-823833 | 6506 | 1 | 1 |
| 4 | B\*A\_44778-74140 | 29362 | 1 | 1 |
| 4 | B\*A\_46751-74140 | 27389 | 1 | 1 |
| 4 | ABB\*AAB\_35768-35803 | 35 | 1 | 1 |
| 4 | AB\*AA\_991708-1023244 | 31536 | 2 | 1 |
| 4 | AB\*AA\_1211172-1214930 | 3758 | 1 | 1 |
| 4 | AB\*AA\_1341107-1371065 | 29958 | 1 | 1 |
| 4 | AB\*BB\_1477098-1483634 | 6536 | 1 | 1 |
| 4 | AB\*BB\_1517843-1520397 | 2554 | 1 | 1 |
| 4 | AB\*BB\_1568467-1585078 | 16621 | 6 | 3 |
| 4 | AB\*BB\_1581357-1585101 | 3744 | 3 | 1 |
| 4 | AB\*BB\_1585078-1585101 | 23 | 1 | 1 |
| 4 | AB\*BB\_1581394-1585078 | 3684 | 2 | 1 |
| 4 | AB\*BB\_1581357-1585078 | 3721 | 1 | 1 |
| 4 | AB\*BB\_1581271-1595078 | 13807 | 1 | 1 |
| 5 | A\*AABB\_490555-492366 | 1811 | 1 | 1 |
| 5 | AA\*AAB\_361161-363177 | 2016 | 1 | 1 |
| 5 | AA\*AB\_139011-147434 | 8423 | 1 | 1 |
| 5 | AAA\*AAB\_144239-160630 | 16391 | 1 | 1 |
| 5 | AA\*AB\_234404-238029 | 3625 | 1 | 1 |
| 5 | BB\*AA\_254105-259598 | 5493 | 1 | 1 |
| 5 | AB\*AA\_254105-259598 | 5493 | 1 | 1 |
| 5 | AA\*AB\_259598-262164 | 2566 | 1 | 1 |
| 5 | AA\*BB\_273198-275969 | 2771 | 1 | 1 |
| 5 | AA\*AB\_299651-393938 | 94287 | 1 | 1 |
| 5 | BB\*AB\_336605-337269 | 664 | 1 | 1 |
| 5 | AA\*AB\_352851-363177 | 10326 | 1 | 1 |
| 5 | AB\*AA\_642449-642890 | 441 | 1 | 1 |
| 5 | AB\*BB\_1028982-1133037 | 104055 | 1 | 1 |
| 5 | AB\*BB\_1133037-1144616 | 11579 | 1 | 1 |
| 6 | A\*AB\_981668-981881 | 213 | 2 | 1 |
| 6 | B\*ABB\_54645-57861 | 3216 | 1 | 1 |
| 6 | BBB\*ABB\_23678-23735 | 57 | 10 | 1 |
| 6 | BB\*ABB\_23678-23735 | 57 | 1 | 1 |
| 6 | BB\*AB\_34050-44130 | 10080 | 2 | 1 |
| 6 | BB\*AB\_44380-46492 | 2184 | 1 | 1 |
| 6 | BB\*AB\_66149-69457 | 3308 | 1 | 1 |
| 6 | BB\*AB\_137426-138077 | 651 | 1 | 1 |
| 6 | AAB\*ABB\_378844-398163 | 19292 | 1 | 1 |
| 6 | AAB\*ABB\_393012-398163 | 5151 | 1 | 1 |
| 7 | AB\*AA\_655949-657915 | 1966 | 1 | 1 |
| R | A\*AA\_77364-77365 | 1 | 1 | 1 |
| R | ABB\*AA\_1894370-1894503 | 133 | 1 | 1 |
| R | ABB\*AA\_1880139-1894503 | 14364 | 2 | 2 |
| R | AA\*AB\_1275088-1281111 | 6023 | 1 | 1 |
| R | BB\*AB\_1278014-1281111 | 3097 | 1 | 1 |
| R | AA\*AB\_1288635-1296712 | 8077 | 1 | 1 |
| R | BBB\*ABB\_1470689-1473884 | 3195 | 1 | 1 |
| R | AA\*BB\_1487741-1490645 | 2904 | 1 | 1 |
| R | AA\*AB\_1531445-1531458 | 13 | 1 | 1 |
| R | AAB\*AAA\_1540520-1542599 | 2079 | 1 | 1 |
| R | BB\*AA\_1572871-1574662 | 1791 | 1 | 1 |
| R | AA\*BB\_1701501-1718730 | 17229 | 1 | 1 |
| R | AB\*AA\_1735098-1740146 | 5048 | 1 | 1 |
| R | AB\*AA\_1757458-1765965 | 8507 | 1 | 1 |
| R | AB\*AA\_1781210-1785981 | 4771 | 1 | 1 |