

**Table S1. List of surface residues.**

Spike surface residues
1, 2, 3, 4, <b>5</b> <sup>1</sup> , 6, 7, 8, 9, 10, 11, 12, <b>13</b> <sup>1</sup> , 14, 15, 16, 17, <b>18</b> <sup>2</sup> , <b>19</b> <sup>2</sup> , <b>20</b> <sup>1</sup> , 21, 22, 23, <b>24</b> <sup>1</sup> , <b>25</b> <sup>1</sup> , <b>26</b> <sup>3</sup> , <b>27</b> <sup>1</sup> , 28, 29, 30, 32, 33, 45, 46, 57, 58, 59, 60, 61, 64, <b>66</b> <sup>1</sup> , 68, <b>69</b> <sup>5</sup> , <b>70</b> <sup>5</sup> , 71, 72, 73, 74, <b>75</b> <sup>1</sup> , <b>76</b> <sup>1</sup> , 77, 78, 79, <b>80</b> <sup>1</sup> , 82, 83, 85, 87, 88, 96, 97, 98, 99, 102, 108, 109, 111, 112, 113, 122, 123, 124, 125, 127, 129, 132, 134, 135, 136, 137, <b>138</b> <sup>1</sup> , 139, 140, <b>141</b> <sup>1</sup> , <b>142</b> <sup>3</sup> , <b>143</b> <sup>2</sup> , <b>144</b> <sup>6</sup> , <b>145</b> <sup>3</sup> , 146, 147, 148, 149, 150, 151, <b>152</b> <sup>1</sup> , 153, <b>154</b> <sup>1</sup> , 155, <b>156</b> <sup>1</sup> , <b>157</b> <sup>1</sup> , <b>158</b> <sup>1</sup> , 159, 160, 161, 162, 163, 164, 165, 166, 167, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 206, 207, 208, 209, 210, <b>211</b> <sup>1</sup> , <b>212</b> <sup>1</sup> , <b>213</b> <sup>1</sup> , <b>214</b> <sup>1</sup> , <b>215</b> <sup>2</sup> , 216, 217, 218, 219, 220, 221, 224, 226, 234, 236, 237, 244, <b>245</b> <sup>1</sup> , <b>246</b> <sup>1</sup> , <b>247</b> <sup>1</sup> , <b>248</b> <sup>1</sup> , <b>249</b> <sup>1</sup> , <b>250</b> <sup>1</sup> , <b>251</b> <sup>1</sup> , <b>252</b> <sup>1</sup> , <b>253</b> <sup>2</sup> , 254, 255, 256, 257, 258, 259, 260, 261, 262, 269, 271, 272, 273, 278, 280, 281, 282, 284, 286, 287, 289, 292, 293, 294, 300, 305, 306, 307, 309, 310, 320, 321, 322, 323, 324, 325, 328, 330, 331, 332, 333, 334, 335, 336, 337, <b>339</b> <sup>2</sup> , 340, 342, 343, 344, 345, <b>346</b> <sup>1</sup> , 347, 348, 349, 351, 352, 354, 355, 356, 357, 359, 360, 362, 364, 366, 367, 370, <b>371</b> <sup>2</sup> , 372, <b>373</b> <sup>2</sup> , 374, <b>375</b> <sup>2</sup> , 385, 388, 403, 404, <b>405</b> <sup>1</sup> , 406, <b>408</b> <sup>1</sup> , 409, 415, 416, <b>417</b> <sup>4</sup> , 418, 420, 421, 424, 436, 437, 438, 439, <b>440</b> <sup>2</sup> , 441, 442, 443, 444, 445, <b>446</b> <sup>1</sup> , 447, 448, 449, 450, <b>452</b> <sup>5</sup> , 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, <b>477</b> <sup>3</sup> , <b>478</b> <sup>3</sup> , 479, 480, 481, 482, <b>483</b> <sup>1</sup> , <b>484</b> <sup>11</sup> , 485, <b>486</b> <sup>1</sup> , 487, 488, 489, <b>490</b> <sup>1</sup> , 491, 492, <b>493</b> <sup>1</sup> , 494, 495, <b>496</b> <sup>1</sup> , 497, <b>498</b> <sup>2</sup> , 499, 500, <b>501</b> <sup>7</sup> , 502, 503, 504, <b>505</b> <sup>2</sup> , 506, 521, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 551, 553, 554, 555, 556, 557, 558, 559, 560, 561, 568, 569, 577, 579, 580, 581, 582, 583, 584, 588, 590, 602, 603, 604, 605, 606, 607, 608, <b>614</b> <sup>15</sup> , 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 651, 652, 653, 654, <b>655</b> <sup>4</sup> , 656, 657, 658, 659, 660, 661, 668, 674, 675, 676, <b>677</b> <sup>1</sup> , 678, <b>679</b> <sup>2</sup> , 680, <b>681</b> <sup>8</sup> , 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 696, 698, 699, 700, <b>701</b> <sup>2</sup> , 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, <b>716</b> <sup>1</sup> , 717, 719, 721, 786, 787, 790, 791, 792, 793, 794, 795, <b>796</b> <sup>2</sup> , 798, 799, 801, 803, 804, 807, 808, 809, 810, 811, 812, 813, 814, 815, 817, 820, 821, 823, 824, 825, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 866, 867, 868, 869, 872, 891, 892, 893, 894, 895, 918, 919, 920, 921, 922, 925, 926, 928, 929, 932, 933, 935, 936, 937, 939, 940, 941, 942, 943, 1045, 1068, 1070, <b>1071</b> <sup>1</sup> , 1072, 1073, 1074, 1075, 1076, 1082, 1084, 1085, 1086, 1097, 1098, 1099, 1100, <b>1101</b> <sup>1</sup> , 1102, 1103, 1110, 1111, 1112, 1114, 1122, 1124, 1125, 1126, 1127, 1128, 1130, 1131, 1132, 1133, 1134, 1135, 1136, 1138, 1139, 1140, 1142, 1143, 1144, 1146, 1147, 1149, 1150, 1151, 1153, 1154, 1155, 1156, 1157, 1158, 1159, 1160, 1161, 1162, 1163, 1164, 1165, 1166, 1167, 1168, 1169, 1170, 1171, 1172, 1173, 1174, 1175, 1177, 1178, 1180, 1181, 1182, 1184, 1185, <b>1187</b> <sup>1</sup> , 1188, 1189, 1191, 1192, 1194, 1195, 1196, 1198, 1199, 1201, 1202, 1203, 1204, 1205, 1206, 1207

Sites with mutations in at least one of the variants considered are listed in bold. Superscripts indicate the mutation count across the variants, as described in Methods.