wwPDB EM Validation Summary Report ⓘ

Mar 4, 2024 – 03:02 AM EST

PDB ID	:	8DUJ
EMDB ID	:	EMD-27721
Title	:	Global map in C1 of RyR1 particles in complex with ImperaCalcin
Authors	:	Haji-Ghassemi, O.; Van Petegm, F.
Deposited on	:	2022-07-27
Resolution	:	3.70 Å(reported)
Based on initial model	:	6M2W

This is a wwPDB EM Validation Summary Report for a publicly released PDB entry.

We welcome your comments at *validation@mail.wwpdb.org*
A user guide is available at
https://www.wwpdb.org/validation/2017/EMValidationReportHelp
with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at
http://www.wwpdb.org/validation/2017/FAQs#types.

The following versions of software and data (see references ⓘ) were used in the production of this report:

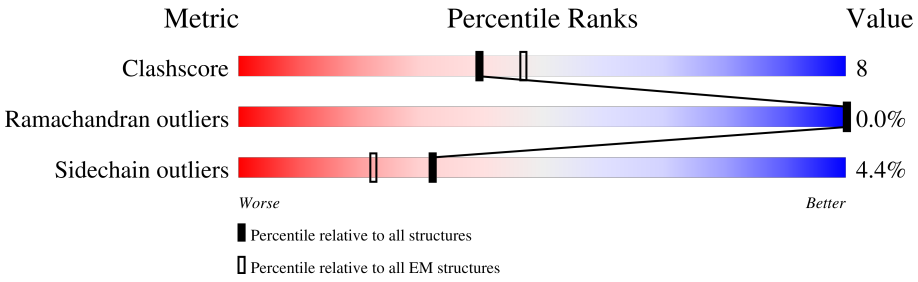
EMDB validation analysis	:	0.0.1.dev70
Mogul	:	1.8.5 (274361), CSD as541be (2020)
MolProbity	:	4.02b-467
buster-report	:	1.1.7 (2018)
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
MapQ	:	1.9.13
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.36

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
ELECTRON MICROSCOPY

The reported resolution of this entry is 3.70 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	EM structures (#Entries)
Clashscore	158937	4297
Ramachandran outliers	154571	4023
Sidechain outliers	154315	3826

The table below summarises the geometric issues observed across the polymeric chains and their fit to the map. The red, orange, yellow and green segments of the bar indicate the fraction of residues that contain outliers for >=3, 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions <=5% The upper red bar (where present) indicates the fraction of residues that have poor fit to the EM map (all-atom inclusion < 40%). The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	M	33	24% 67% 33%
2	A	5037	11% 64% 12% 24%
2	D	5037	15% 68% 8% 23%
2	G	5037	8% 66% 12% 22%
2	J	5037	7% 67% 10% 23%
3	B	107	86% 13%
3	E	107	12% 86% 13%
3	H	107	72% 28%

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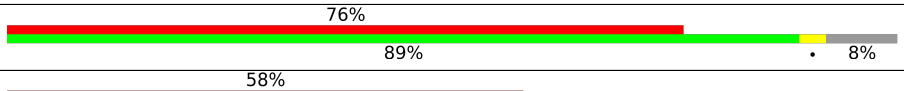
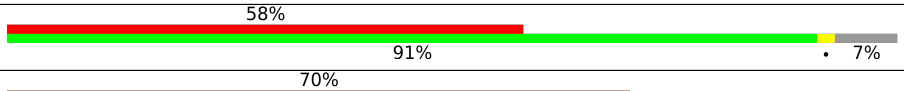
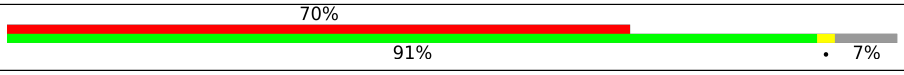
Mol	Chain	Length	Quality of chain
3	K	107	
4	C	149	
4	F	149	
4	I	149	
4	L	149	

2 Entry composition (i)

There are 8 unique types of molecules in this entry. The entry contains 106156 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called Imperacalcin.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	M	33	Total	C	N	O	S	33	0
			514	296	116	90	12		

- Molecule 2 is a protein called Ryanodine receptor 1.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	G	3933	Total	C	N	O	S	0	0
			26285	16856	4666	4625	138		
2	A	3823	Total	C	N	O	S	1	0
			24845	15885	4439	4407	114		
2	D	3865	Total	C	N	O	S	1	0
			23336	14719	4259	4281	77		
2	J	3892	Total	C	N	O	S	0	0
			25245	16153	4530	4440	122		

- Molecule 3 is a protein called Peptidyl-prolyl cis-trans isomerase FKBP1B.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	H	107	Total	C	N	O	S	0	0
			759	483	134	138	4		
3	B	107	Total	C	N	O	S	0	0
			735	465	130	136	4		
3	E	106	Total	C	N	O	S	0	0
			657	415	115	125	2		
3	K	106	Total	C	N	O	S	0	0
			758	483	135	136	4		

- Molecule 4 is a protein called Calmodulin-1.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	I	138	Total	C	N	O	S	0	0
			711	431	139	139	2		

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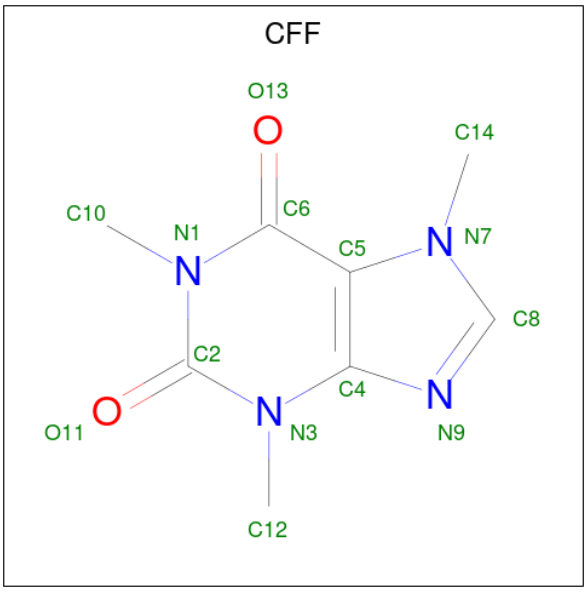
Mol	Chain	Residues	Atoms	AltConf	Trace
4	C	137	Total C N O S 707 430 137 139 1	0	0
4	F	137	Total C N O 710 434 137 139	0	0
4	L	139	Total C N O S 706 427 139 139 1	0	0

There are 16 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
I	32	ALA	GLU	engineered mutation	UNP P0DP23
I	68	ALA	GLU	engineered mutation	UNP P0DP23
I	105	ALA	GLU	engineered mutation	UNP P0DP23
I	141	ALA	GLU	engineered mutation	UNP P0DP23
C	32	ALA	GLU	engineered mutation	UNP P0DP23
C	68	ALA	GLU	engineered mutation	UNP P0DP23
C	105	ALA	GLU	engineered mutation	UNP P0DP23
C	141	ALA	GLU	engineered mutation	UNP P0DP23
F	32	ALA	GLU	engineered mutation	UNP P0DP23
F	68	ALA	GLU	engineered mutation	UNP P0DP23
F	105	ALA	GLU	engineered mutation	UNP P0DP23
F	141	ALA	GLU	engineered mutation	UNP P0DP23
L	32	ALA	GLU	engineered mutation	UNP P0DP23
L	68	ALA	GLU	engineered mutation	UNP P0DP23
L	105	ALA	GLU	engineered mutation	UNP P0DP23
L	141	ALA	GLU	engineered mutation	UNP P0DP23

- Molecule 5 is CAFFEINE (three-letter code: CFF) (formula: $C_8H_{10}N_4O_2$).

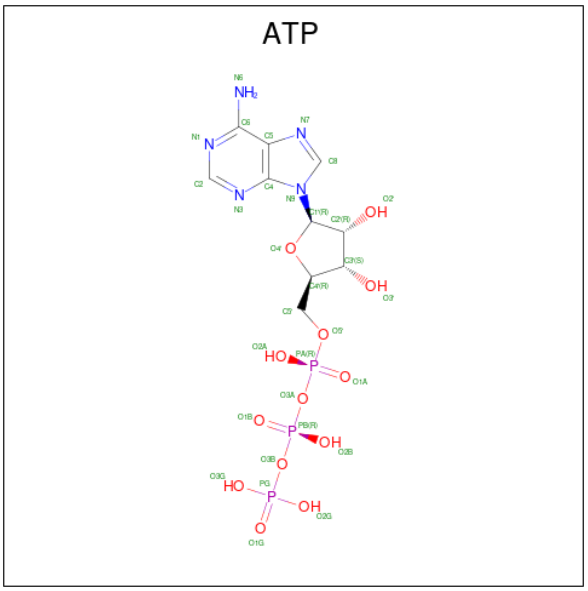


Mol	Chain	Residues	Atoms	AltConf
5	G	1	Total C N O 14 8 4 2	0
5	A	1	Total C N O 14 8 4 2	0
5	D	1	Total C N O 14 8 4 2	0
5	J	1	Total C N O 14 8 4 2	0

- Molecule 6 is CALCIUM ION (three-letter code: CA) (formula: Ca).

Mol	Chain	Residues	Atoms	AltConf
6	G	1	Total Ca 1 1	0
6	A	1	Total Ca 1 1	0
6	D	1	Total Ca 1 1	0
6	J	1	Total Ca 1 1	0

- Molecule 7 is ADENOSINE-5'-TRIPHOSPHATE (three-letter code: ATP) (formula: $C_{10}H_{16}N_5O_{13}P_3$).



Mol	Chain	Residues	Atoms					AltConf
7	G	1	Total	C	N	O	P	0
			31	10	5	13	3	
7	A	1	Total	C	N	O	P	0
			31	10	5	13	3	
7	D	1	Total	C	N	O	P	0
			31	10	5	13	3	
7	J	1	Total	C	N	O	P	0
			31	10	5	13	3	

- Molecule 8 is ZINC ION (three-letter code: ZN) (formula: Zn).

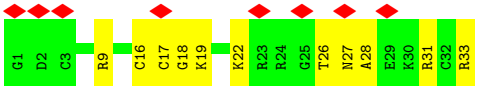
Mol	Chain	Residues	Atoms		AltConf
8	G	1	Total	Zn	0
			1	1	
8	A	1	Total	Zn	0
			1	1	
8	D	1	Total	Zn	0
			1	1	
8	J	1	Total	Zn	0
			1	1	

3 Residue-property plots (i)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and atom inclusion in map density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red diamond above a residue indicates a poor fit to the EM map for this residue (all-atom inclusion < 40%). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

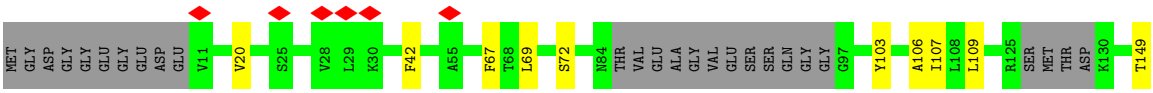
• Molecule 1: Imperacalcin

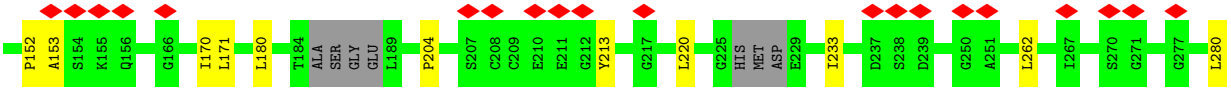
Chain M:

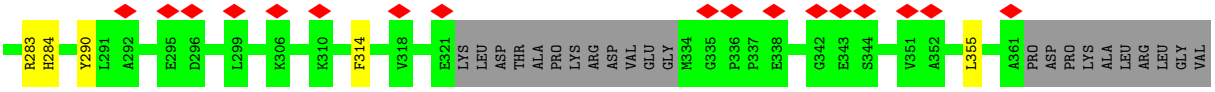


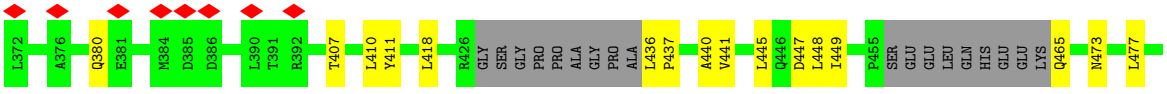
• Molecule 2: Ryanodine receptor 1

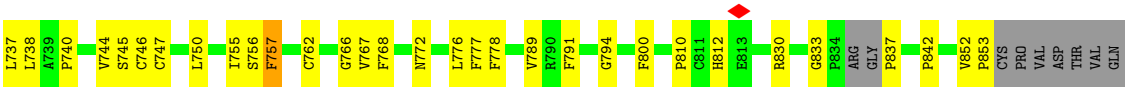
Chain G:

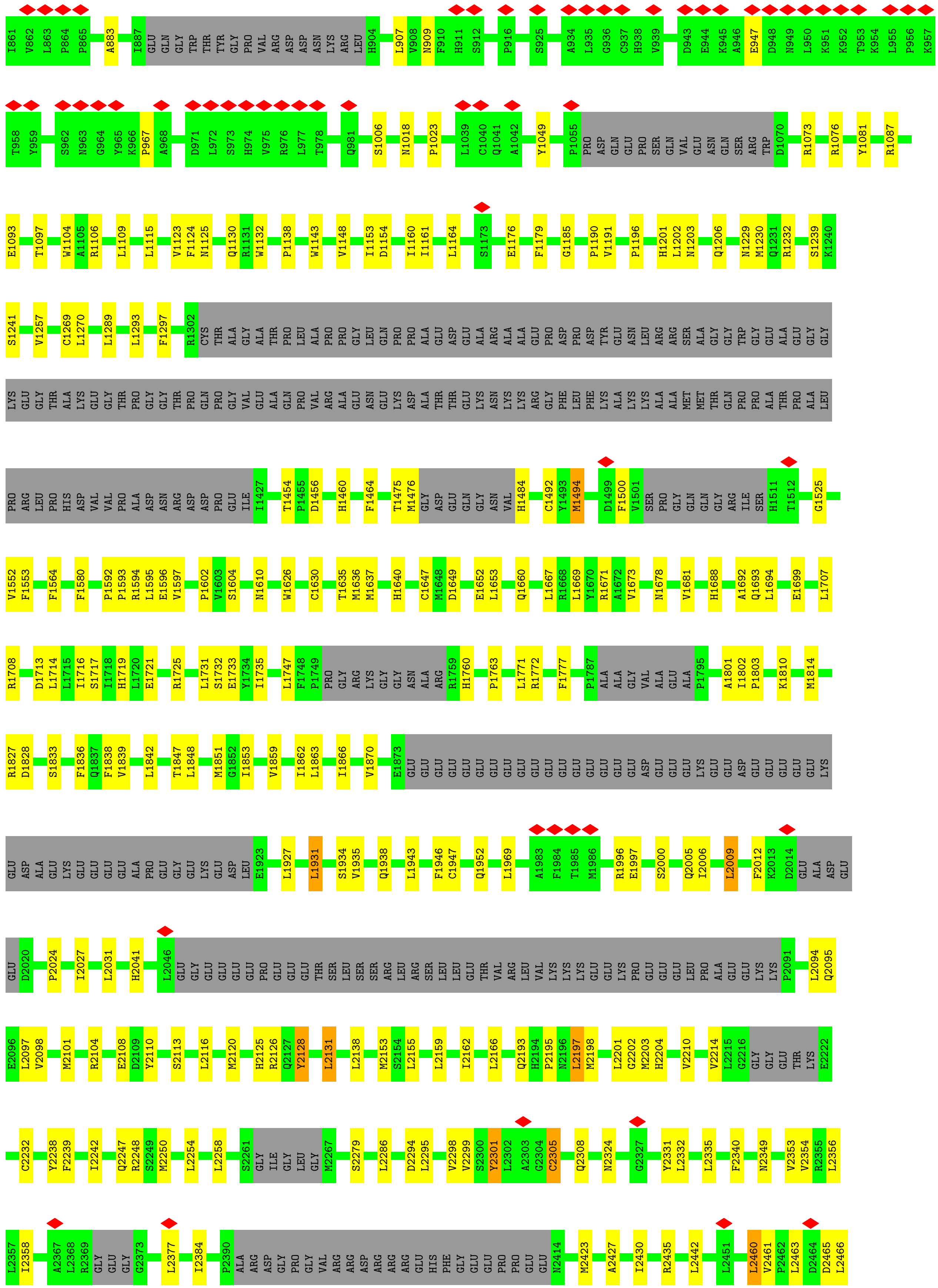








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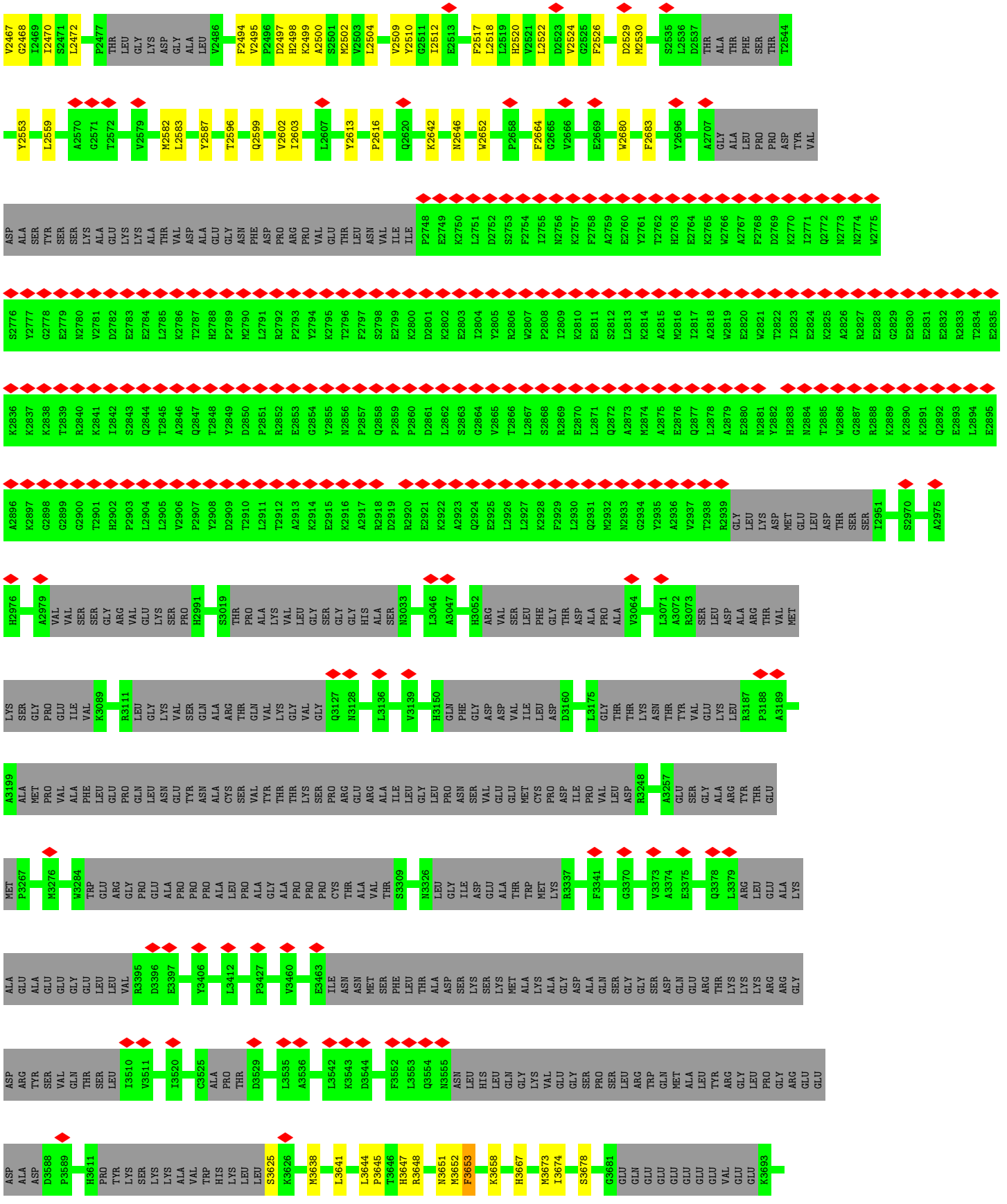
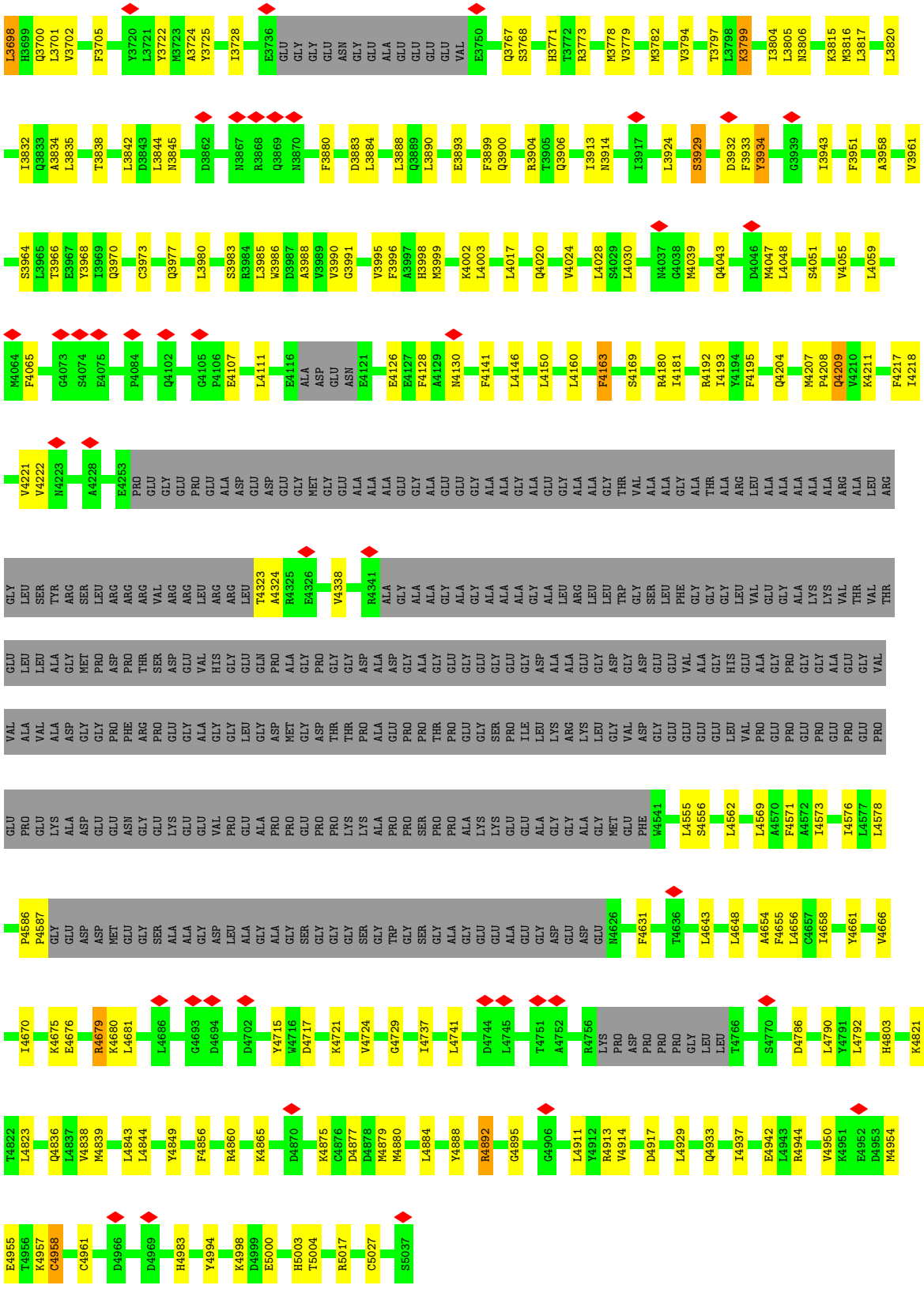
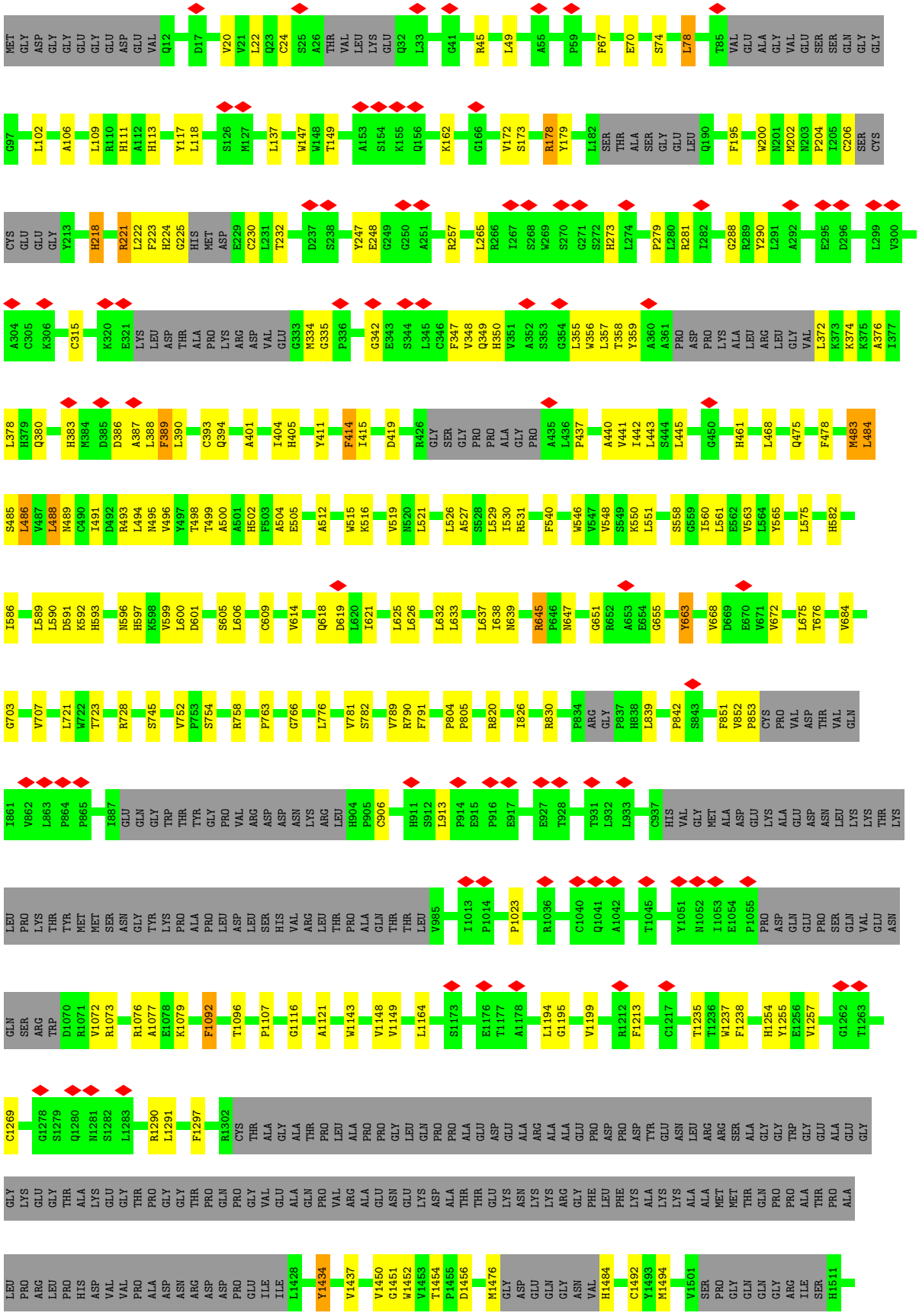
T958 Y959 S962 N963 G964 Y965 K966 P967 A968 D971 L972 S973 H974 V975 R976 L977 T978 Q981 S1006 N1018 P1023 L1039 C1040 Q1041 A1042 Y1049 P1055 PRO ASP GLN GLU PRO SER GLN VAL GLU ASN GLN SER ARG TRP D1070 R1073 R1076 Y1081 R1087
E1093 T1097 W1104 A1105 R1106 L1109 L1115 V1123 F1124 N1125 Q1130 R1131 W1132 P1138 W1143 V1148 I1153 D1154 I1160 I1161 L1164 S1173 E1176 F1179 G1185 P1190 V1191 P1196 H1201 L1202 N1203 Q1206 N1229 M1230 Q1231 R1232 S1239 K1240
S1241 V1257 C1269 L1270 L1289 L1293 F1297 R1302 CYS THR ALA GLY ALA THR PRO LEU ALA PRO PRO GLY LEU GLN PRO PRO ALA GLU ASP GLU ALA ARG ALA ALA GLU PRO ASP PRO ASP TYR GLU ASN LEU ARG ARG SER ALA GLY GLY TRP GLY GLU ALA GLU GLY GLY
LYS GLU GLY THR ALA LYS GLU GLY THR PRO GLY GLY THR PRO GLN PRO GLY VAL GLU ALA GLN PRO VAL ARG ALA GLU ASN GLU LYS ASP ALA THR THR GLU LYS ASN LYS LYS ARG GLY PHE LEU PHE LYS ALA LYS LYS ALA ALA MET MET THR GLN PRO PRO ALA THR PRO ALA LEU
PRO ARG LEU PRO HIS ASP VAL VAL PRO ALA ASP ASN ARG ASP ASP PRO GLU ILE I1427 T1454 P1455 D1456 H1460 F1464 T1475 M1476 GLY ASP GLU GLN GLY ASN VAL H1484 C1492 Y1493 M1494 D1499 F1500 V1501 SER PRO GLY GLN GLN GLY ARG ILE SER H1511 T1512 G1525
V1552 F1553 F1564 F1580 P1592 P1593 R1594 L1595 E1596 V1597 P1602 V1603 S1604 N1610 W1626 C1630 T1635 M1636 M1637 H1640 C1647 M1648 D1649 E1652 L1653 Q1660 L1667 R1668 L1669 Y1670 R1671 A1672 V1673 N1678 V1681 H1688 A1692 Q1693 L1694 E1699 L1707
R1708 D1713 L1714 L1715 I1716 S1717 I1718 H1719 L1720 E1721 R1725 L1731 S1732 E1733 Y1734 I1735 L1747 F1748 P1749 PRO GLY ARG LYS GLY GLY ASN ALA ARG R1759 H1760 P1763 L1771 R1772 F1777 P1787 ALA ALA GLY VAL ALA GLU ALA P1795 A1801 I1802 P1803 K1810 M1814
R1827 D1828 S1833 F1836 Q1837 F1838 V1839 L1842 T1847 L1848 M1851 G1852 I1853 V1859 I1862 L1863 I1866 V1870 E1873 GLU GLU GLU GLU GLU GLU GLU GLU GLU GLU GLU GLU GLU GLU GLU GLU ASP GLU GLU GLU LYS GLU GLU ASP GLU GLU GLU GLU GLU LYS
GLU ASP ALA GLU LYS GLU GLU GLU GLU GLU ALA PRO GLU GLY GLU LYS GLU ASP LEU E1923 L1927 L1931 S1934 V1935 Q1938 L1943 F1946 C1947 Q1952 L1969 A1983 F1984 T1985 M1986 R1996 E1997 S2000 Q2005 I2006 L2009 F2012 K2013 D2014 GLU ALA ASP GLU
GLU D2020 P2024 I2027 L2031 H2041 L2046 GLU GLY GLU GLU GLU GLU PRO GLU GLU GLU THR SER LEU SER SER ARG LEU ARG SER LEU LEU GLU THR VAL ARG LEU VAL LYS LYS LYS GLU GLU LYS PRO GLU GLU GLU LEU PRO ALA GLU GLU LYS LYS P2091 L2094 Q2095
E2096 L2097 V2098 M2101 R2104 E2108 D2109 Y2110 S2113 L2116 M2120 H2125 R2126 Q2127 Y2128 L2131 L2138 M2153 S2154 L2155 L2159 I2162 L2166 Q2193 H2194 P2195 N2196 L2197 M2198 L2201 G2202 M2203 H2204 V2210 V2214 L2215 G2216 GLY GLY GLU THR LYS E2222
C2232 Y2238 F2239 I2242 Q2247 R2248 S2249 M2250 L2254 L2258 S2261 GLY ILE GLY LEU GLY M2267 S2279 L2286 D2294 L2295 V2298 V2299 S2300 Y2301 L2302 A2303 G2304 C2305 Q2308 N2324 G2327 Y2331 L2332 L2335 F2340 N2349 V2353 V2354 R2355 L2356
L2357 I2358 A2367 L2368 R2369 GLY GLU GLY G2373 L2377 I2384 P2390 ALA ARG ASP GLY PRO GLY VAL ARG ARG ASP ARG ARG GLU HIS PHE GLY GLU GLU PRO PRO GLU GLU N2414 M2423 A2427 I2430 R2435 L2442 L2451 L2460 V2461 P2462 L2463 D2464 D2465 L2466

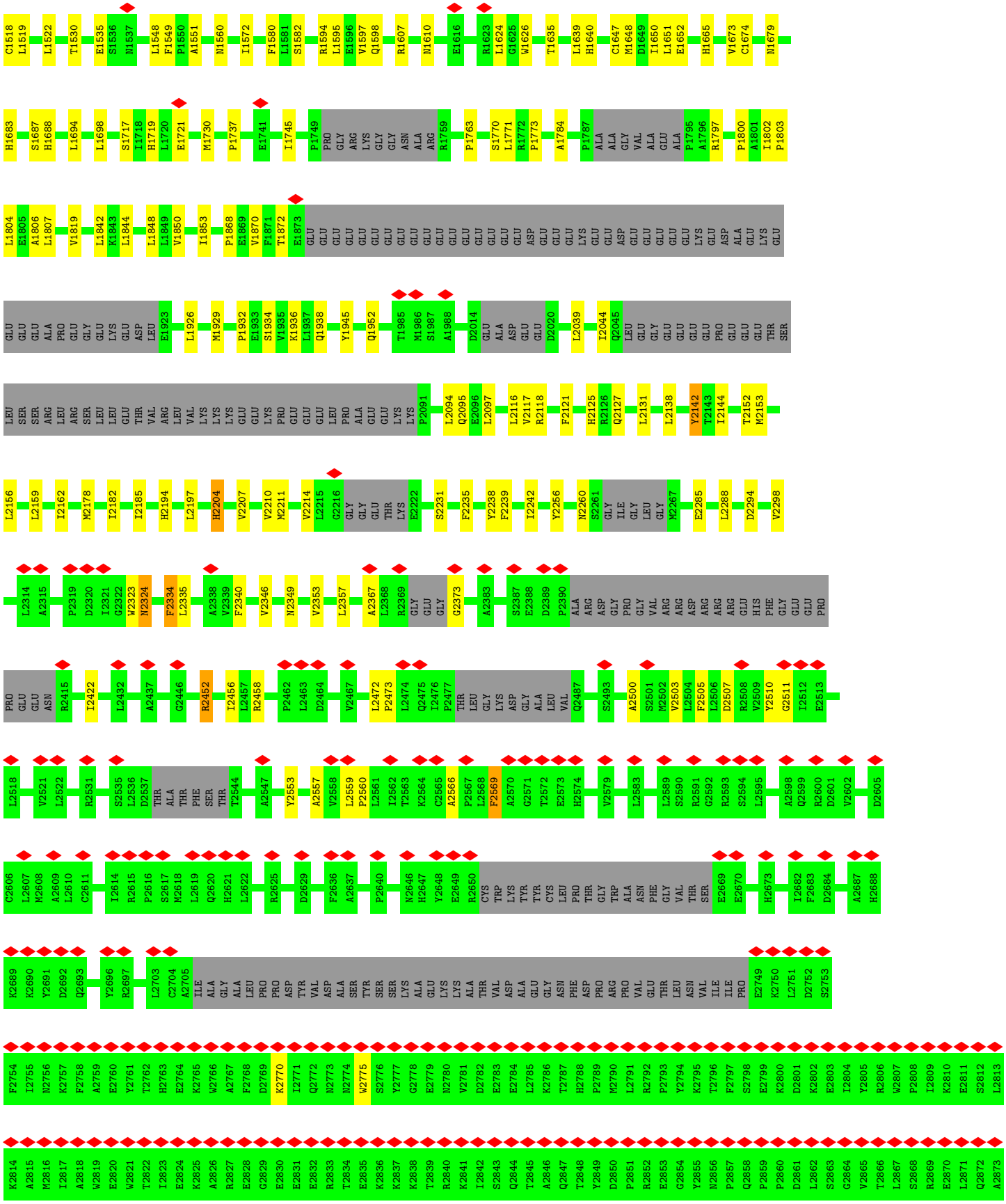

V2467 G2468 I2469 I2470 S2471 L2472 P2477 THR LEU GLY LYS ASP GLY ALA LEU V2486 F2494 V2495 P2496 D2497 H2498 K2499 A2500 S2501 M2502 V2503 L2504 V2509 Y2510 G2511 I2512 E2513 F2517 L2518 L2519 H2520 V2521 L2522 D2523 V2524 G2525 F2526 D2529 M2530 S2535 L2536 D2537 THR ALA THR PHE SER THR T2544
Y2553 L2559 A2570 G2571 T2572 V2579 M2582 L2583 Y2587 T2596 Q2599 V2602 I2603 L2607 Y2613 P2616 Q2620 K2642 N2646 W2652 P2658 F2664 G2665 V2666 E2669 W2680 F2683 Y2696 A2707 GLY ALA LEU PRO PRO ASP TYR VAL
ASP ALA SER TYR SER LYS ALA GLU LYS LYS ALA THR VAL ASP ALA GLU GLY ASN PHE ASP PRO ARG PRO VAL GLU THR LEU ASN VAL ILE ILE P2748 E2749 K2750 L2751 D2752 S2753 F2754 I2755 N2756 K2757 F2758 A2759 E2760 Y2761 T2762 H2763 E2764 K2765 W2766 A2767 F2768 D2769 K2770 I2771 Q2772 N2773 N2774 W2775
S2776 Y2777 G2778 E2779 N2780 V2781 D2782 E2783 E2784 L2785 K2786 T2787 H2788 P2789 M2790 L2791 R2792 P2793 Y2794 K2795 T2796 F2797 S2798 E2799 K2800 D2801 K2802 E2803 I2804 Y2805 R2806 W2807 P2808 I2809 K2810 E2811 S2812 L2813 K2814 A2815 M2816 I2817 A2818 W2819 E2820 W2821 T2822 I2823 E2824 K2825 A2826 R2827 E2828 G2829 E2830 E2831 E2832 R2833 T2834 E2835
K2836 K2837 K2838 T2839 R2840 K2841 I2842 S2843 Q2844 T2845 A2846 Q2847 T2848 Y2849 D2850 P2851 R2852 E2853 G2854 Y2855 N2856 P2857 Q2858 P2859 P2860 D2861 L2862 S2863 G2864 V2865 T2866 L2867 S2868 R2869 E2870 L2871 Q2872 A2873 M2874 A2875 E2876 Q2877 L2878 A2879 E2880 N2881 Y2882 H2883 N2884 T2885 W2886 G2887 R2888 K2889 K2890 K2891 Q2892 E2893 L2894 E2895
A2896 K2897 G2898 G2899 G2900 T2901 H2902 P2903 L2904 L2905 V2906 P2907 Y2908 D2909 T2910 L2911 T2912 A2913 K2914 E2915 K2916 A2917 R2918 D2919 R2920 E2921 K2922 A2923 Q2924 E2925 L2926 L2927 K2928 F2929 L2930 Q2931 M2932 N2933 G2934 Y2935 A2936 V2937 T2938 R2939 GLY LEU LYS ASP MET GLU LEU ASP THR SER SER I2951 S2970 A2975
H2976 A2979 VAL VAL SER SER GLY ARG VAL GLU LYS SER PRO H2991 S3019 THR PRO ALA LYS VAL LEU GLY SER GLY GLY HIS ALA SER N3033 L3046 A3047 H3062 ARG VAL SER LEU PHE GLY THR ASP ALA PRO ALA V3064 L3071 A3072 R3073 SER LEU ASP ALA ARG THR VAL MET
LYS SER GLY PRO GLU ILE VAL K3089 R3111 LEU LEU GLY LYS VAL SER GLN ALA ARG THR GLN VAL LYS GLY VAL GLY Q3127 N3128 L3136 V3139 H3150 GLN PHE GLY ASP ASP VAL ILE LEU ASP D3160 L3175 GLY THR THR LYS ASN THR TYR VAL GLU LYS LEU R3187 P3188 A3189
A3199 ALA MET PRO VAL ALA PHE LEU GLU PRO GLN LEU ASN GLU TYR ASN ALA CYS SER VAL VAL TYR THR THR LYS SER PRO ARG GLU ARG ALA ILE LEU GLY LEU PRO ASN SER VAL GLU GLU MET CYS PRO ASP ILE PRO VAL LEU ASP R3248 A3257 GLU SER GLY ALA ARG TYR THR GLU
MET P3267 M3276 W3284 TRP GLU ARG GLY PRO GLU ALA PRO PRO PRO ALA ALA LEU PRO ALA GLY ALA PRO PRO PRO CYS THR ALA VAL THR S3309 N3326 LEU GLY ILE ASP GLU ALA THR TRP MET LYS R3337 F3341 G3370 V3373 A3374 E3375 Q3378 L3379 ARG LEU GLU ALA LYS
ALA GLU ALA GLU GLU GLY GLU LEU LEU VAL R3395 D3396 E3397 Y3406 L3412 P3427 V3460 E3463 ILE ASN ASN MET SER PHE LEU THR ALA ASP SER LYS SER LYS MET ALA LYS ALA GLY ASP ALA GLN SER GLY GLY SER ASP GLN GLU ARG THR LYS LYS ARG ARG GLY
ASP ARG TYR SER VAL GLN THR SER LEU I3510 V3511 I3520 C3525 ALA PRO THR D3529 L3535 A3536 L3542 K3543 D3544 T3552 L3553 Q3554 N3555 ASN LEU HIS LEU GLN GLY LYS VAL GLU GLY SER PRO SER LEU ARG TRP GLN MET ALA LEU TYR ARG GLY LEU PRO GLY ARG GLU GLU
ASP ALA ASP D3588 P3589 H3611 PRO TYR LYS SER LYS LYS ALA VAL TRP HIS LYS LEU LEU S3625 K3626 M3638 L3641 L3644 P3645 T3646 H3647 R3648 N3651 M3652 F3653 K3658 H3667 M3673 I3674 S3678 G3681 GLU GLN GLU GLU GLU GLU GLU GLU GLU VAL GLU GLU K3693

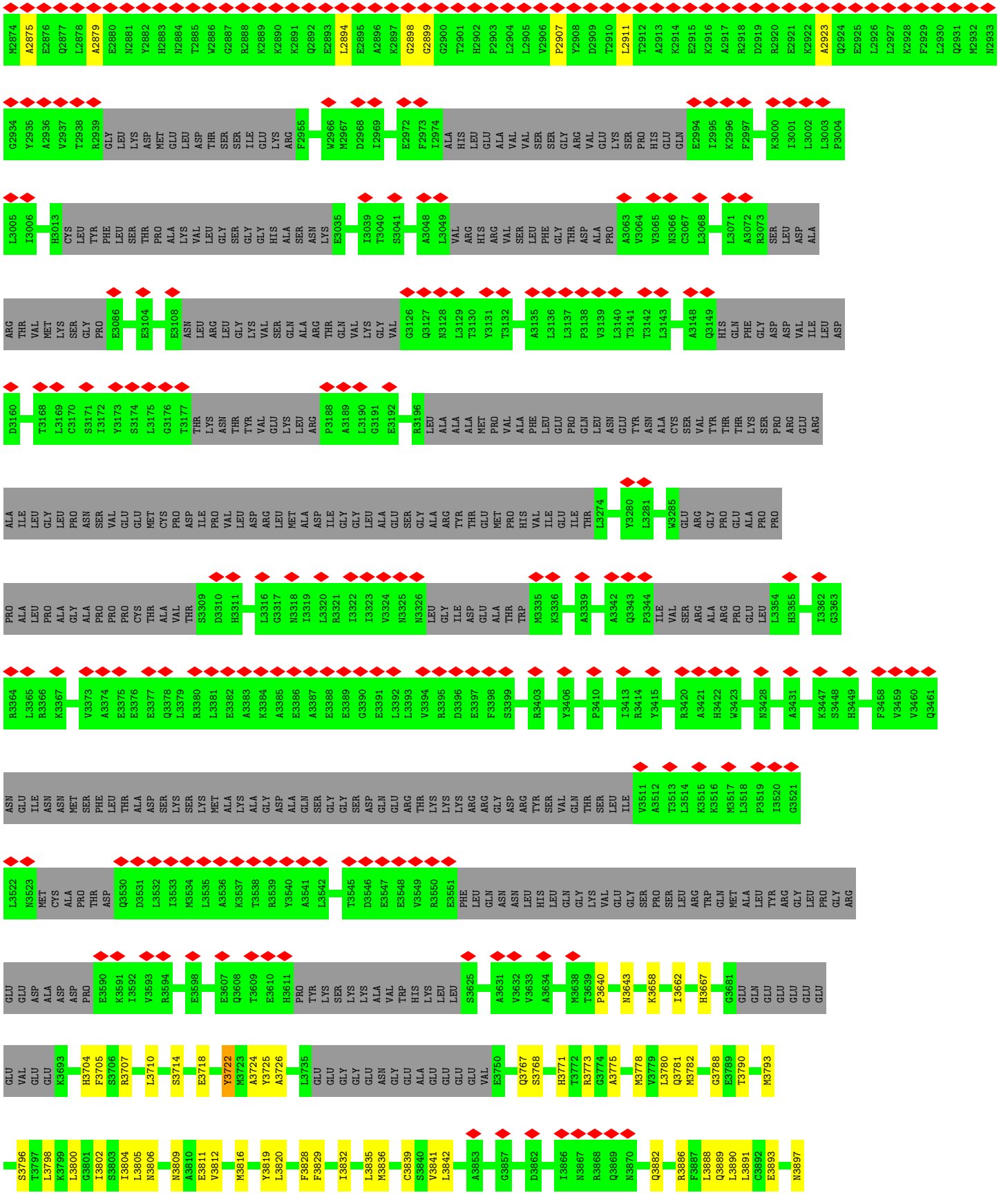


• Molecule 2: Ryanodine receptor 1

Chain A:



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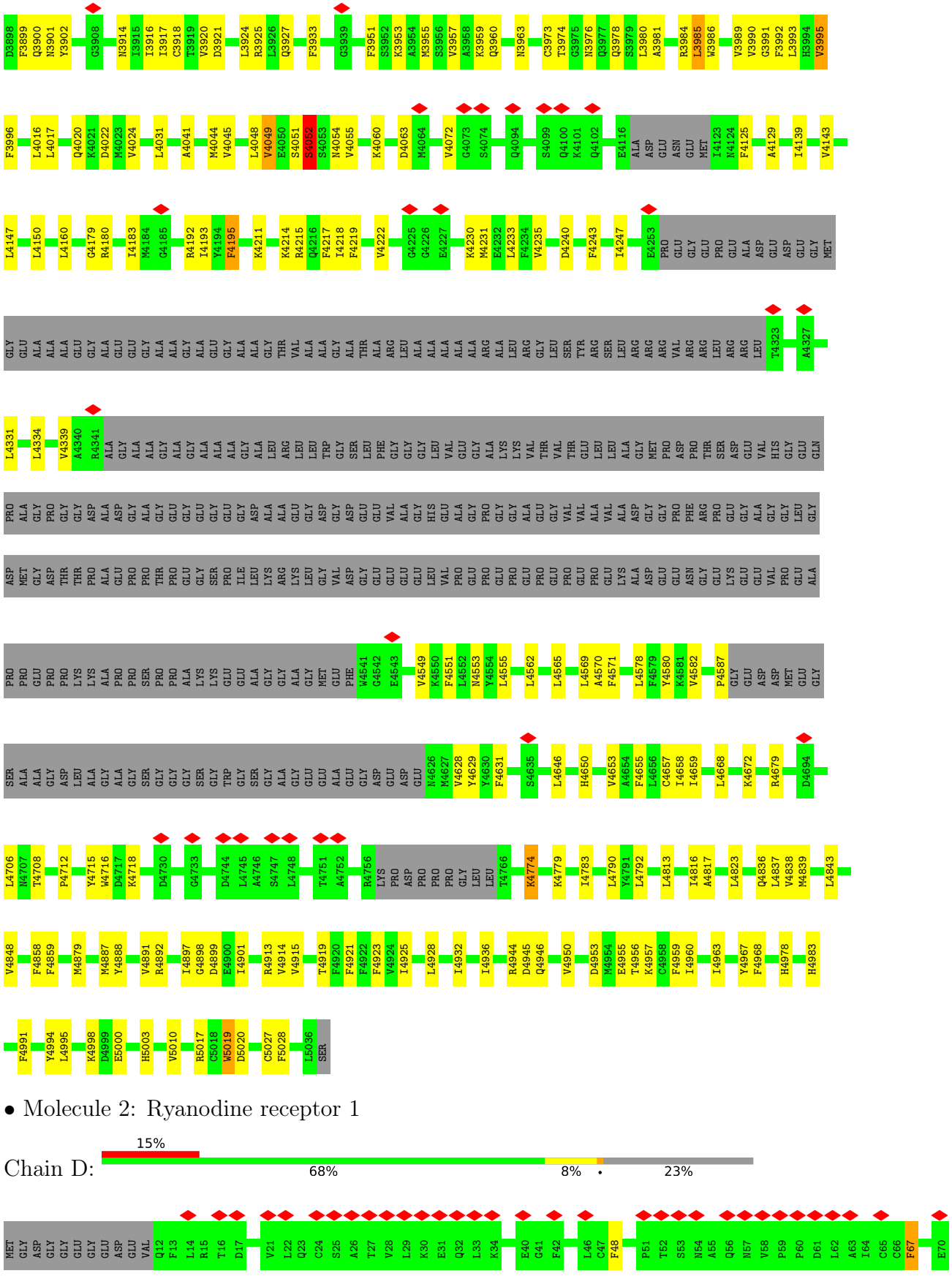
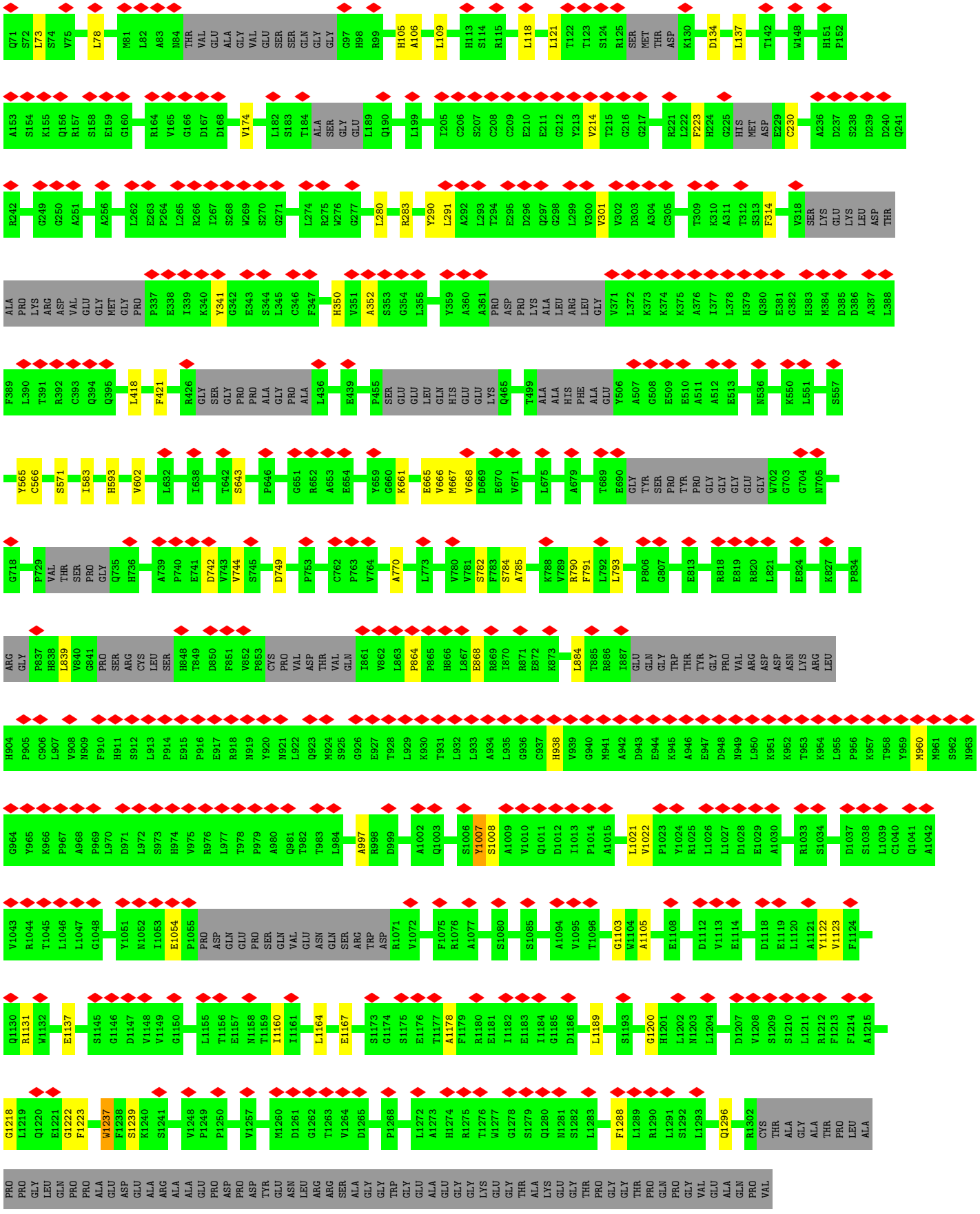
G2934 Y2935 A2936 V2937 T2938 R2939 GLY LEU LYS ASP MET GLU LEU ASP THR SER SER ILE GLU LYS ARG F2955 W2966 M2967 D2968 I2969 E2972 F2973 I2974 ALA HIS LEU GLU GLN ALA VAL VAL SER SER GLY ARG VAL GLU LYS SER PRO HIS GLU GLN E2994 I2995 K2996 F2997 K3000 I3001 L3002 L3003 P3004
L3005 I3006 H3013 CYS LEU TYR PHE LEU SER THR PRO ALA LYS VAL LEU GLY SER GLY GLY HIS ALA SER ASN LYS E3035 I3039 T3040 S3041 A3048 L3049 VAL ARG HIS ARG VAL SER LEU PHE GLY THR ASP ALA PRO A3063 V3064 V3065 N3066 C3067 L3068 L3071 A3072 R3073 SER LEU ASP ALA
ARG THR VAL MET LYS SER GLY PRO E3086 E3104 E3108 ASN LEU ARG LEU GLY LYS VAL SER GLN ALA ARG THR GLN VAL LYS GLY VAL G3126 Q3127 N3128 L3129 T3130 Y3131 T3132 A3135 L3136 L3137 P3138 V3139 L3140 T3141 T3142 L3143 A3148 Q3149 HIS GLN PHE GLY ASP ASP VAL ILE LEU ASP
D3160 T3168 L3169 C3170 S3171 I3172 Y3173 S3174 L3175 G3176 T3177 THR LYS ASN THR TYR VAL GLU LYS LEU ARG P3188 A3189 L3190 G3191 E3192 R3196 LEU ALA ALA ALA MET PRO VAL ALA PHE LEU GLU GLN LEU ASN GLU TYR ASN ALA CYS SER VAL TYR THR THR LYS SER PRO ARG GLU ARG
ALA ILE LEU GLY LEU PRO ASN SER VAL GLU GLU MET CYS PRO ASP ILE PRO VAL LEU ASP ARG LEU MET ALA ASP ILE GLY GLY LEU ALA GLU SER GLY ALA ARG TYR THR GLU MET PRO HIS VAL ILE GLU ILE THR L3274 Y3280 L3281 W3285 GLU ARG GLY PRO GLU ALA PRO PRO
PRO ALA LEU PRO ALA GLY ALA PRO PRO PRO CYS THR ALA VAL THR S3309 D3310 H3311 L3316 G3317 N3318 I3319 L3320 R3321 I3322 I3323 V3324 N3325 N3326 LEU GLY ILE ASP GLU ALA THR TRP M3335 K3336 A3339 A3342 Q3343 P3344 ILE VAL SER ARG ALA ARG PRO GLU LEU L3354 H3355 I3362 G3363
R3364 L3365 R3366 K3367 V3373 A3374 E3375 E3376 E3377 Q3378 L3379 R3380 L3381 E3382 A3383 K3384 A3385 E3386 A3387 E3388 E3389 G3390 E3391 L3392 L3393 V3394 R3395 D3396 E3397 F3398 S3399 R3403 Y3406 P3410 T3413 R3414 Y3415 R3420 A3421 H3422 W3423 N3428 A3431 K3447 S3448 H3449 F3458 V3459 V3460 Q3461
ASN GLU ILE ASN ASN MET SER PHE LEU THR ALA ASP SER LYS SER LYS MET ALA LYS ALA GLY ASP ALA GLN SER GLY GLY SER ASP GLN GLU ARG THR LYS LYS LYS ARG ARG GLY ASP ARG TYR SER VAL GLN THR SER LEU ILE V3511 A3512 T3513 L3514 K3515 K3516 M3517 L3518 P3519 I3520 G3521
L3522 N3523 MET CYS ALA PRO THR ASP Q3530 D3531 L3532 I3533 M3534 L3535 A3536 K3537 T3538 R3539 Y3540 A3541 L3542 T3545 D3546 E3547 E3548 V3549 R3550 E3551 PHE LEU GLN ASN ASN LEU HIS LEU GLN GLY LYS VAL GLU GLY SER PRO SER LEU ARG TRP GLN MET ALA LEU TYR ARG GLY LEU PRO GLY ARG
GLU GLU ASP ALA ASP ASP PRO E3590 K3591 I3592 V3593 R3594 E3598 E3607 Q3608 T3609 E3610 H3611 PRO TYR LYS SER LYS LYS ALA VAL TRP HIS LYS LEU LEU S3625 A3631 V3632 V3633 A3634 M3638 T3639 P3640 N3643 K3658 I3662 H3667 G3681 GLU GLN GLU GLU GLU GLU
GLU VAL GLU GLU K3693 H3704 F3705 S3706 R3707 L3710 S3714 E3718 Y3722 M3723 A3724 Y3725 A3726 L3735 GLU GLU GLY GLY GLU GLU ASN GLY GLU ALA GLU GLU GLU GLU VAL E3750 Q3767 S3768 H3771 T3772 R3773 G3774 A3775 M3778 V3779 L3780 Q3781 M3782 G3788 E3789 T3790 M3793
S3796 T3797 L3798 K3799 L3800 G3801 I3802 S3803 I3804 L3805 N3806 N3809 A3810 E3811 V3812 M3816 Y3819 L3820 F3828 F3829 I3832 L3835 M3836 C3839 S3840 V3841 L3842 A3853 G3857 D3862 I3866 N3867 R3868 Q3869 N3870 Q3882 R3886 F3887 L3888 Q3889 L3890 L3891 C3892 E3893 N3897



• Molecule 2: Ryanodine receptor 1

Chain D: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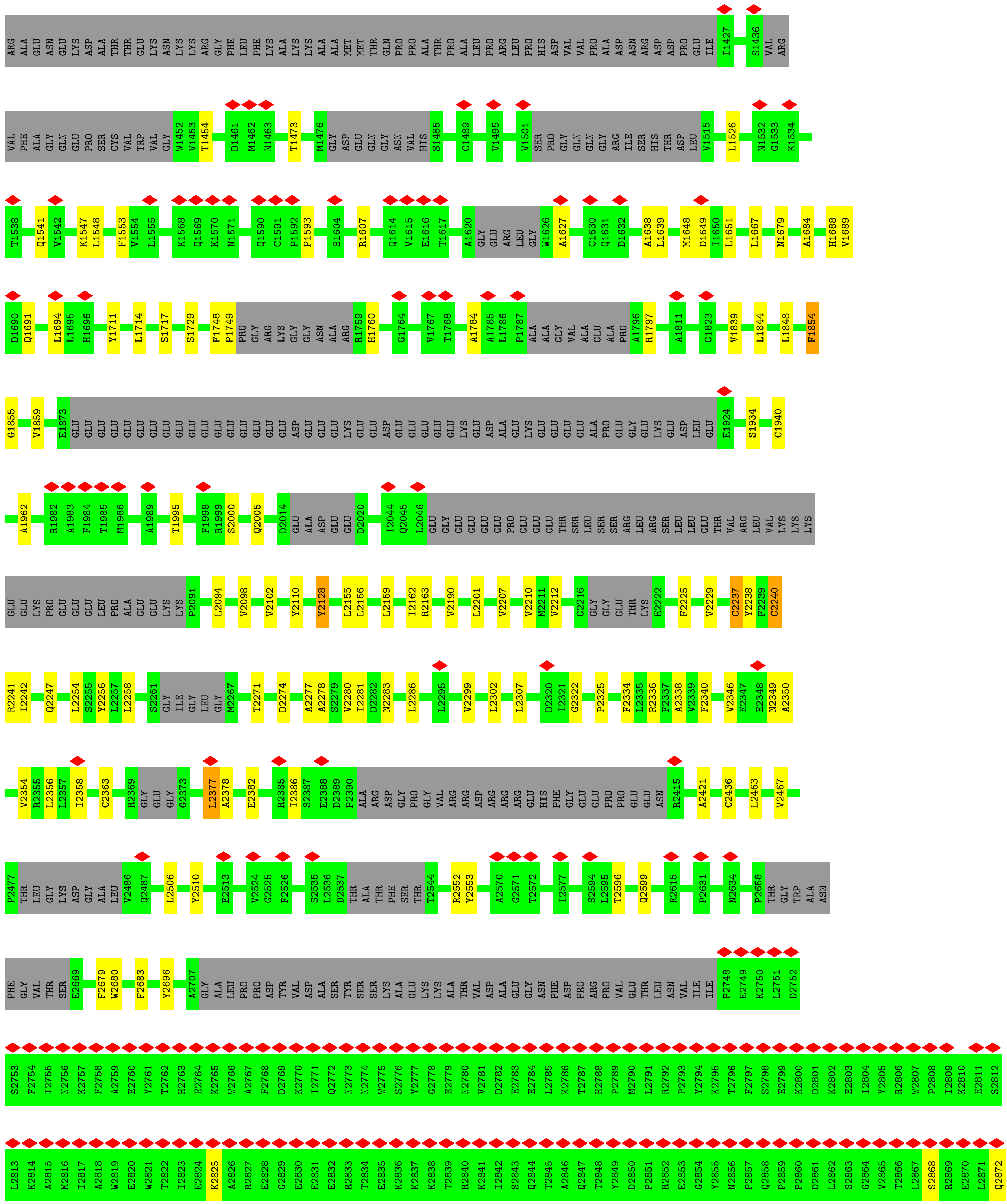
A153 S154 K155 Q156 R157 S158 E159 G160 R164 V165 G166 D167 D168 V174 L182 S183 T184 ALA SER GLY GLU L189 Q190 L199 I205 C206 S207 C208 C209 E210 E211 G212 Y213 V214 T215 G216 G217 R221 L222 F223 H224 G225 HIS MET ASP E229 C230 A236 D237 S238 D239 D240 Q241
R242 G249 G250 A251 A256 L262 E263 P264 L265 R266 I267 S268 W269 S270 G271 L274 R275 W276 G277 L280 R283 Y290 L291 A292 L293 T294 E295 D296 Q297 G298 L299 V300 V301 V302 D303 A304 C305 T309 K310 A311 T312 S313 F314 V318 SER LYS GLU LYS LEU ASP THR
ALA PRO LYS ARG ASP VAL GLU GLY MET GLY PRO P337 E338 I339 K340 Y341 G342 E343 S344 L345 C346 F347 H350 V351 A352 S353 G354 L355 Y359 A360 A361 PRO ASP PRO LYS ALA LEU ARG LEU GLY V371 L372 K373 K374 K375 A376 I377 L378 H379 Q380 E381 G382 H383 M384 D385 D386 A387 L388
F389 L390 T391 R392 C393 Q394 Q395 L418 F421 R426 GLY SER GLY PRO PRO ALA GLY PRO ALA L436 E439 P455 SER GLU GLU LEU GLN HIS GLU GLU LYS Q465 T499 ALA ALA HIS PHE ALA GLU Y506 A507 G508 E509 E510 A511 A512 E513 N536 K550 L551 S557
Y565 C566 S571 I583 H593 V602 L632 I638 T642 S643 P646 G651 R652 A653 E654 Y659 G660 K661 E665 V666 M667 V668 D669 E670 V671 L675 A679 T689 E690 GLY TYR SER PRO TYR PRO GLY GLY GLY GLU GLY W702 G703 G704 N705
G718 P729 VAL THR SER PRO GLY Q735 H736 A739 P740 E741 D742 V743 V744 S745 D749 P753 C762 P763 V764 A770 L773 V780 V781 S782 F783 S784 A785 K788 V789 R790 F791 L792 L793 P806 G807 E813 R818 E819 R820 L821 E824 K827 P834
ARG GLY P837 H838 L839 V840 G841 PRO SER ARG CYS LEU SER H848 T849 D850 F851 V852 P853 CYS PRO VAL ASP THR VAL GLN I861 V862 L863 P864 P865 H866 L867 E868 R869 I870 R871 E872 K873 L884 T885 R886 I887 GLU GLN GLY TRP THR TYR GLY PRO VAL ARG ASP ASP ASN LYS ARG LEU
H904 P905 C906 L907 V908 N909 F910 H911 S912 L913 P914 E915 P916 E917 R918 N919 Y920 N921 L922 Q923 M924 S925 G926 E927 T928 L929 K930 T931 L932 L933 A934 L935 G936 C937 H938 V939 G940 M941 A942 D943 E944 K945 A946 E947 D948 N949 L950 K951 K952 T953 K954 L955 P956 K957 T958 Y959 M960 M961 S962 N963
G964 Y965 K966 P967 A968 P969 L970 D971 L972 S973 H974 V975 R976 L977 T978 P979 A980 Q981 T982 T983 L984 A997 R998 D999 A1002 Q1003 S1006 Y1007 S1008 A1009 V1010 Q1011 D1012 I1013 P1014 A1015 L1021 V1022 P1023 Y1024 R1025 L1026 L1027 D1028 E1029 A1030 R1033 S1034 D1037 S1038 L1039 C1040 Q1041 A1042
V1043 R1044 T1045 L1046 L1047 G1048 Y1051 N1052 I1053 E1054 P1055 PRO ASP GLN GLU PRO SER GLN VAL GLU ASN GLN SER ARG TRP ASP R1071 V1072 F1075 R1076 A1077 S1080 S1085 A1094 V1095 T1096 G1103 W1104 A1105 E1108 D1112 V1113 E1114 D1118 E1119 L1120 A1121 Y1122 V1123 F1124
Q1130 R1131 W1132 E1137 S1145 G1146 D1147 V1148 V1149 G1150 L1155 T1156 E1157 N1158 T1159 I1160 I1161 L1164 E1167 S1173 G1174 S1175 E1176 T1177 A1178 F1179 R1180 E1181 I1182 E1183 I1184 G1185 D1186 L1189 S1193 G1200 H1201 L1202 N1203 L1204 D1207 V1208 S1209 S1210 L1211 R1212 F1213 F1214 A1215
G1218 L1219 Q1220 E1221 G1222 F1223 W1237 F1238 S1239 K1240 S1241 V1248 P1249 P1250 V1257 M1260 D1261 G1262 T1263 V1264 D1265 P1268 L1272 A1273 H1274 R1275 T1276 W1277 G1278 S1279 Q1280 N1281 S1282 L1283 F1288 L1289 R1290 L1291 S1292 L1293 Q1296 R1302 CYS THR ALA GLY ALA THR PRO LEU ALA
PRO PRO GLY LEU GLN PRO PRO ALA GLU ASP GLU ALA ARG ALA ALA GLU PRO ASP PRO ASP TYR GLU ASN LEU ARG ARG SER ALA GLY GLY TRP GLY GLU ALA GLU GLY GLY LYS GLU GLY THR ALA LYS GLU GLY THR PRO GLY GLY THR PRO GLN PRO GLY VAL GLU ALA GLN PRO VAL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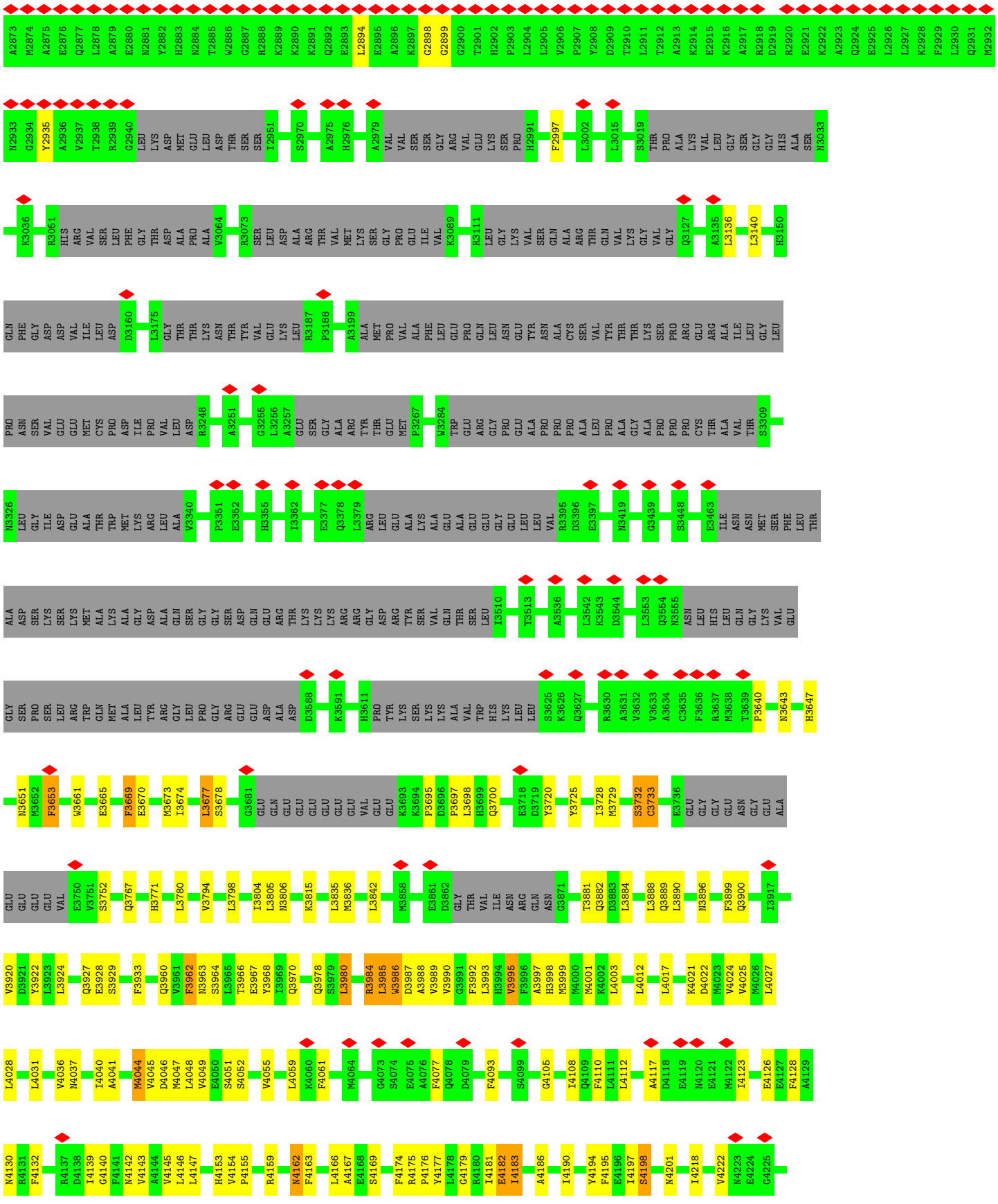
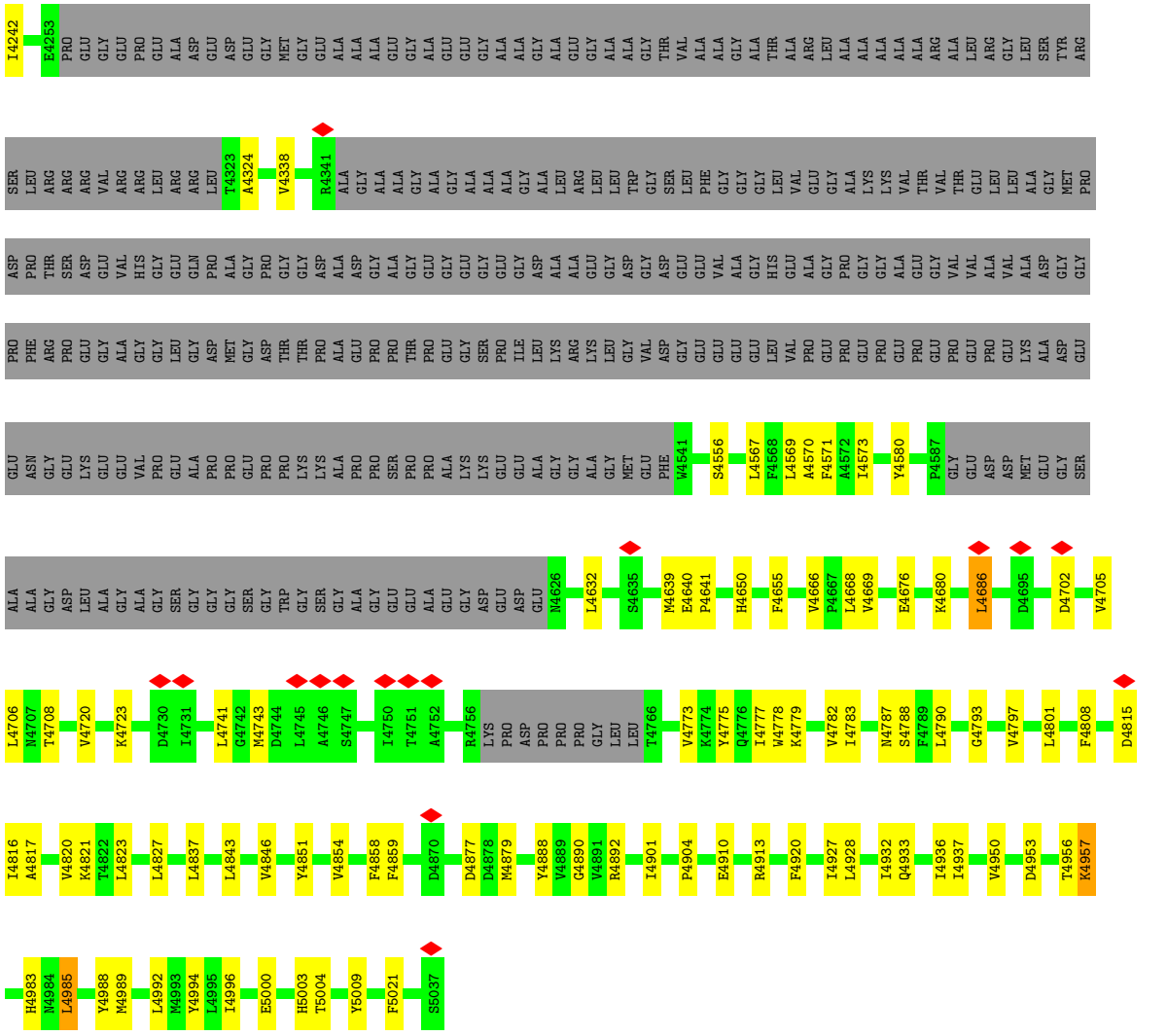
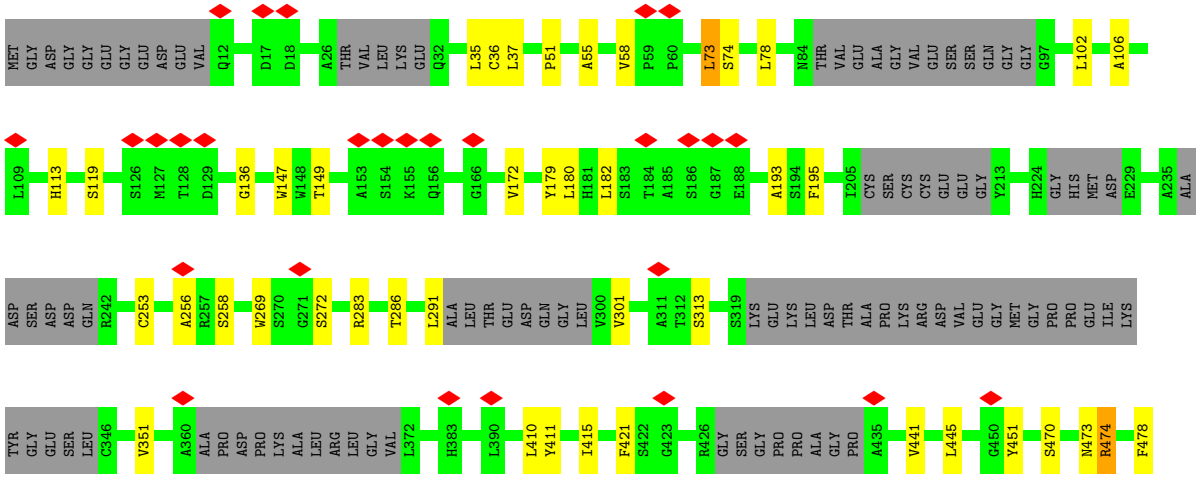
VAL PHE ALA GLY GLN GLU PRO SER CYS VAL TRP VAL GLY W1452 V1453 T1454 D1461 M1462 N1463 T1473 M1476 GLY ASP GLU GLN GLY ASN VAL HIS S1485 C1489 V1495 V1501 SER PRO GLY GLN GLN GLY ARG ILE SER HIS THR ASP LEU V1515 L1526 N1532 G1533 K1534
T1538 Q1541 V1542 K1547 L1548 F1553 V1554 L1555 K1568 Q1569 K1570 N1571 Q1590 C1591 P1592 P1593 S1604 R1607 Q1614 V1615 E1616 T1617 A1620 GLY GLU ARG LEU GLY W1626 A1627 C1630 Q1631 D1632 A1638 L1639 M1648 D1649 I1650 L1651 L1667 N1679 A1684 H1688 V1689
D1690 Q1691 L1694 L1695 H1696 Y1711 L1714 S1717 S1729 F1748 P1749 PRO GLY ARG LYS GLY GLY ASN ALA ARG R1759 H1760 G1764 V1767 T1768 A1784 A1785 L1786 P1787 ALA ALA GLY VAL ALA GLU ALA PRO A1796 R1797 A1811 G1823 V1839 L1844 L1848 F1854
G1855 V1859 E1873 GLU GLU GLU GLU GLU GLU GLU GLU GLU GLU GLU GLU GLU GLU GLU GLU GLU ASP GLU GLU GLU LYS GLU GLU ASP GLU GLU GLU GLU GLU LYS GLU ASP ALA GLU LYS GLU GLU GLU GLU ALA PRO GLU GLY GLU LYS GLU ASP LEU GLU E1924 S1934 C1940
A1962 R1982 A1983 F1984 T1985 M1986 A1989 T1995 F1998 R1999 S2000 Q2005 D2014 GLU ALA ASP GLU GLU D2020 I2044 Q2045 L2046 GLU GLY GLU GLU GLU GLU PRO GLU GLU GLU THR SER LEU SER SER ARG LEU ARG SER LEU LEU GLU THR VAL ARG LEU VAL LYS LYS LYS
GLU GLU LYS PRO GLU GLU GLU LEU PRO ALA GLU GLU LYS LYS P2091 L2094 V2098 V2102 Y2110 Y2128 L2155 L2156 L2159 I2162 R2163 V2190 L2201 V2207 V2210 M2211 V2212 G2216 GLY GLY GLU THR LYS E2222 F2225 V2229 C2237 Y2238 F2239 C2240
R2241 I2242 Q2247 L2254 S2255 Y2256 L2257 L2258 S2261 GLY ILE GLY LEU GLY M2267 T2271 D2274 A2277 A2278 S2279 V2280 I2281 D2282 N2283 L2286 L2295 V2299 L2302 L2307 D2320 I2321 G2322 P2325 F2334 L2335 R2336 F2337 A2338 V2339 F2340 V2346 E2347 E2348 N2349 A2350
V2354 R2355 L2356 L2357 I2358 C2363 R2369 GLY GLU GLY G2373 L2377 A2378 E2382 R2385 I2386 S2387 E2388 D2389 P2390 ALA ARG ASP GLY PRO GLY VAL ARG ARG ASP ARG ARG ARG GLU HIS PHE GLY GLU GLU PRO PRO GLU GLU ASN R2415 A2421 C2436 L2463 V2467
P2477 THR LEU GLY LYS ASP GLY ALA LEU V2486 Q2487 L2506 Y2510 E2513 V2524 G2525 F2526 S2535 L2536 D2537 THR ALA THR PHE SER THR T2544 R2552 Y2553 A2570 G2571 T2572 I2577 S2594 L2595 T2596 Q2599 R2615 P2631 N2634 P2658 THR GLY TRP ALA ASN
PHE GLY VAL THR SER E2669 F2679 W2680 F2683 Y2696 A2707 GLY ALA LEU PRO PRO ASP TYR VAL ASP ALA SER TYR SER SER LYS ALA GLU LYS LYS ALA THR VAL ASP ALA GLU GLY ASN PHE ASP PRO ARG PRO VAL GLU THR LEU ASN VAL ILE ILE P2748 E2749 K2750 L2751 D2752
S2753 F2754 I2755 N2756 K2757 F2758 A2759 E2760 Y2761 T2762 H2763 E2764 K2765 W2766 A2767 F2768 D2769 K2770 I2771 Q2772 N2773 N2774 W2775 S2776 Y2777 G2778 E2779 N2780 V2781 D2782 E2783 E2784 L2785 K2786 T2787 H2788 P2789 M2790 L2791 R2792 P2793 Y2794 K2795 T2796 F2797 S2798 E2799 K2800 D2801 K2802 E2803 I2804 Y2805 R2806 W2807 P2808 I2809 K2810 E2811 S2812
L2813 K2814 A2815 M2816 I2817 A2818 W2819 E2820 W2821 T2822 I2823 E2824 K2825 A2826 R2827 E2828 G2829 E2830 I2831 E2832 R2833 T2834 E2835 K2836 K2837 K2838 T2839 R2840 K2841 I2842 S2843 Q2844 T2845 A2846 Q2847 T2848 Y2849 D2850 P2851 R2852 E2853 G2854 Y2855 N2856 P2857 Q2858 P2859 P2860 D2861 L2862 S2863 G2864 V2865 T2866 L2867 S2868 R2869 E2870 L2871 Q2872

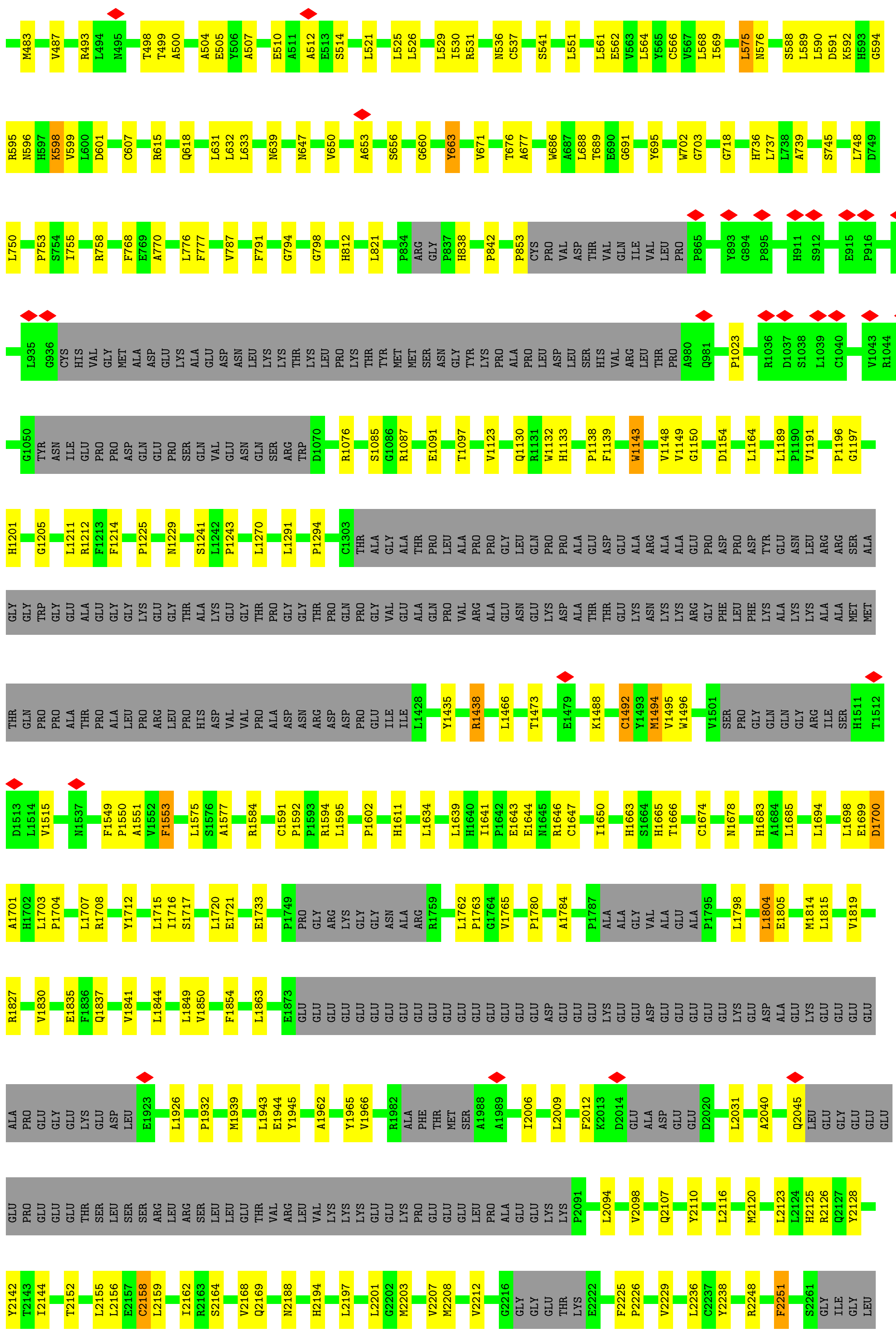




• Molecule 2: Ryanodine receptor 1

Chain J:

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R595 N596 H597 K598 V599 L600 D601 C607 R615 Q618 L631 L632 L633 N639 N647 V650 A653 S656 G660 Y663 V671 T676 A677 W686 A687 L688 T689 E690 G691 Y695 W702 G703 G718 H736 L737 L738 A739 S745 L748 D749
L750 P753 S754 I755 R758 F768 E769 A770 L776 F777 V787 F791 G794 G798 H812 L821 P834 ARG GLY P837 H838 P842 P853 CYS PRO VAL ASP THR VAL GLN ILE VAL LEU PRO P865 Y893 G894 P895 H911 S912 E915 P916 S925
L935 G936 CYS HIS VAL GLY MET ALA ASP GLU LYS ALA GLU ASP ASN LEU LYS LYS THR LYS LEU PRO LYS THR TYR MET MET SER ASN GLY TYR LYS PRO ALA PRO LEU ASP LEU SER HIS VAL ARG LEU THR PRO A980 Q981 P1023 R1036 D1037 S1038 L1039 C1040 V1043 R1044 T1045
G1050 TYR ASN ILE GLU PRO PRO ASP GLN GLU PRO SER GLN VAL GLU ASN GLN SER ARG TRP D1070 R1076 S1085 G1086 R1087 E1091 T1097 V1123 Q1130 R1131 W1132 H1133 P1138 F1139 W1143 V1148 V1149 G1150 D1154 L1164 L1189 P1190 V1191 P1196 G1197
H1201 G1205 L1211 R1212 F1213 F1214 P1225 N1229 S1241 L1242 P1243 L1270 L1291 P1294 C1303 THR ALA GLY ALA THR PRO LEU ALA PRO PRO GLY LEU GLN PRO PRO ALA GLU ASP GLU ALA ARG ALA ALA GLU PRO ASP PRO ASP TYR GLU ASN LEU ARG ARG SER ALA
GLY GLY TRP GLY GLU ALA GLU GLY GLY LYS GLU GLY THR ALA LYS GLU GLY THR PRO GLY GLY THR PRO GLN PRO GLY VAL GLU ALA GLN PRO VAL ARG ALA GLU ASN GLU LYS ASP ALA THR THR GLU LYS ASN LYS LYS ARG GLY PHE LEU PHE LYS ALA LYS LYS ALA ALA MET MET
THR GLN PRO PRO ALA THR PRO ALA LEU PRO ARG LEU PRO HIS ASP VAL VAL PRO ALA ASP ASN ARG ASP ASP PRO GLU ILE ILE L1428 Y1435 R1438 L1466 T1473 E1479 K1488 C1492 Y1493 M1494 V1495 W1496 V1501 SER PRO GLY GLN GLN GLY ARG ILE SER H1511 T1512
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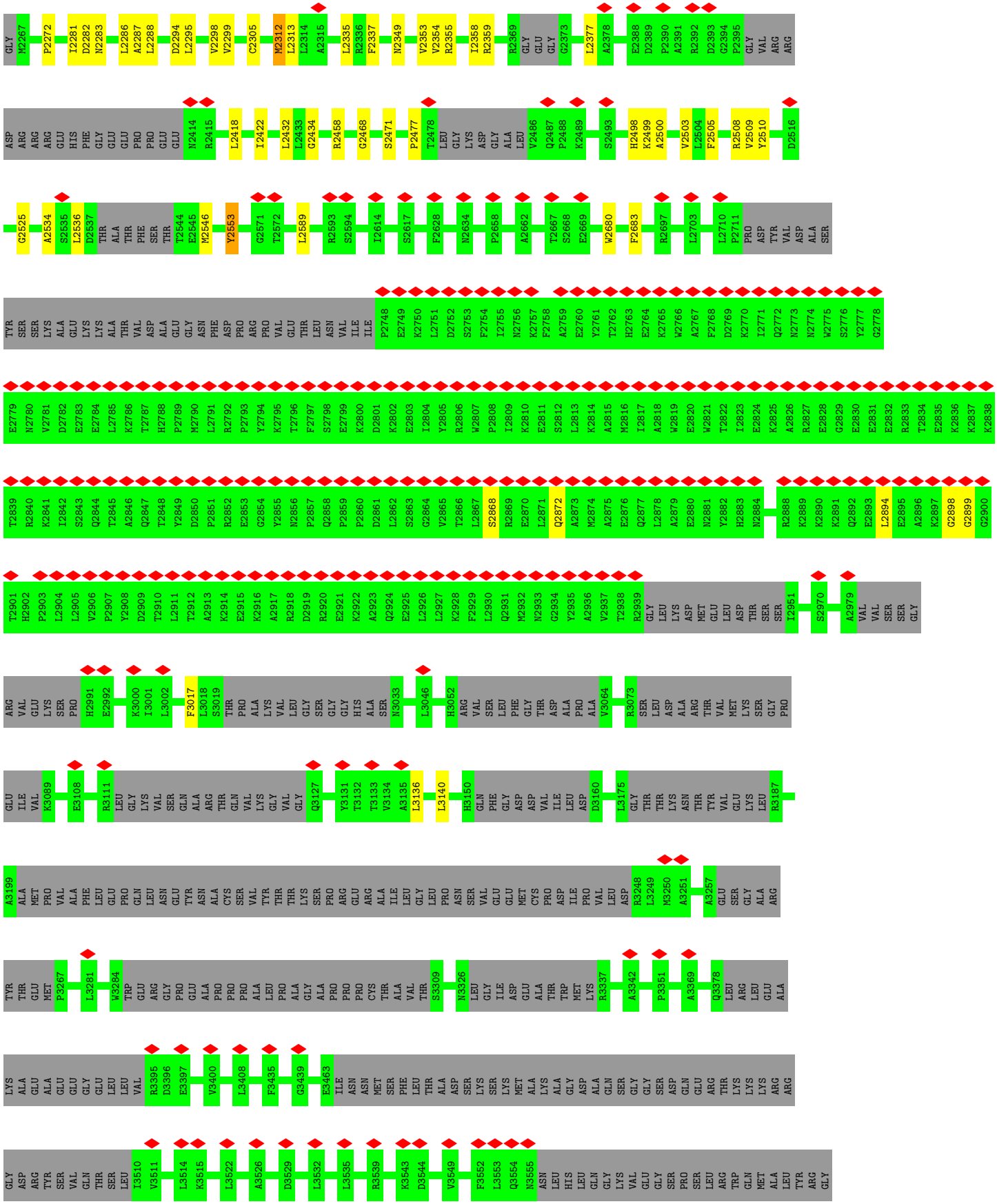
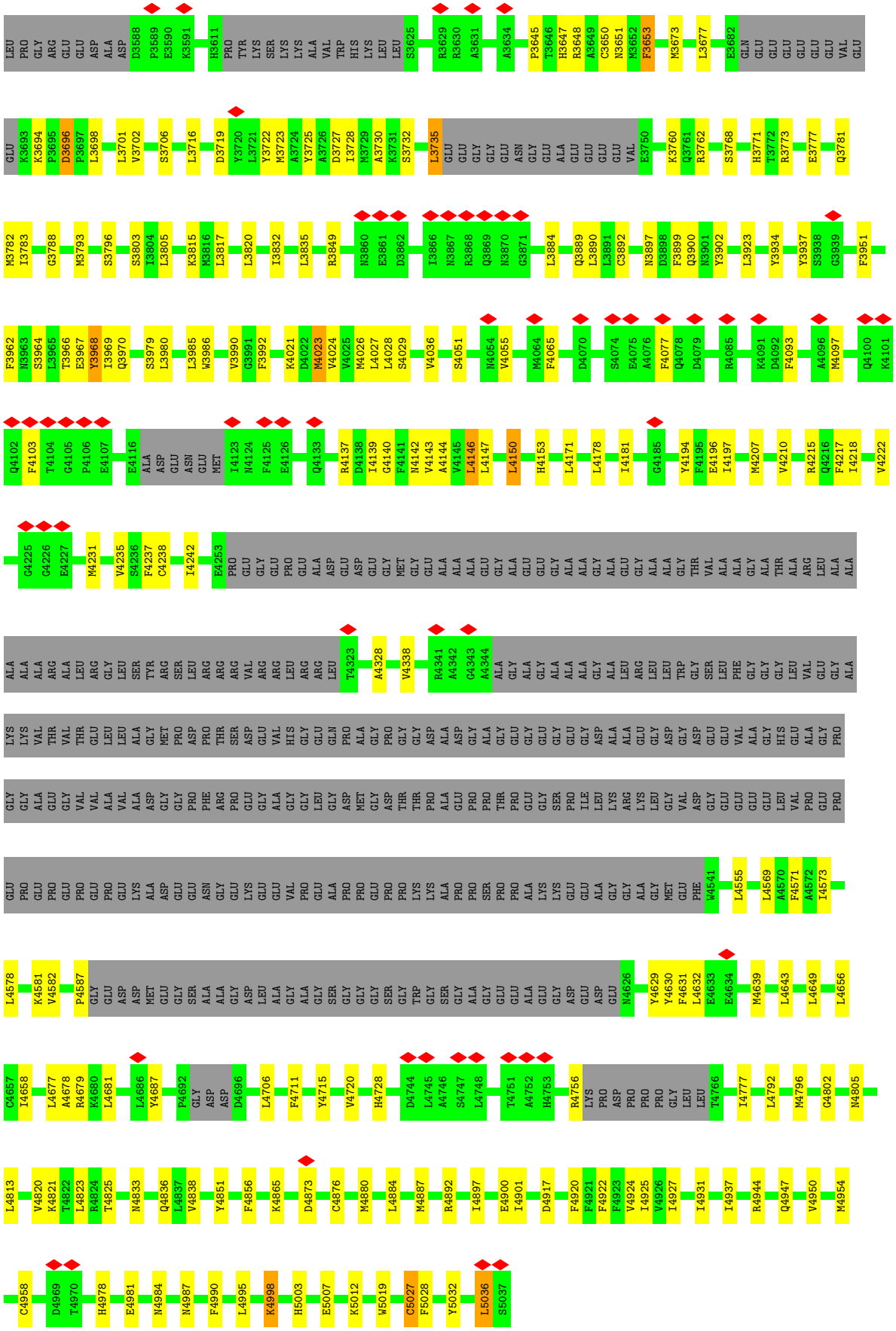
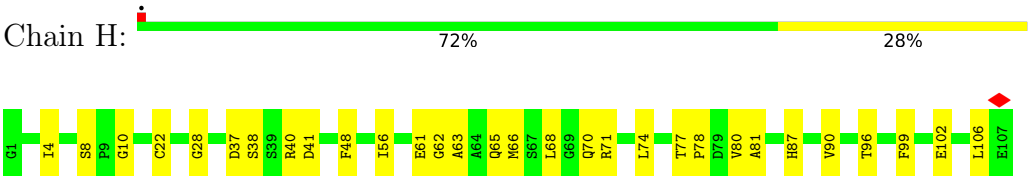
A1701 H1702 L1703 P1704 L1707 R1708 Y1712 L1715 I1716 S1717 L1720 E1721 E1733 P1749 PRO GLY ARG LYS GLY GLY ASN ALA ARG R1759 L1762 P1763 G1764 V1765 P1780 A1784 P1787 ALA ALA GLY VAL ALA GLU ALA P1795 L1798 L1804 E1805 M1814 L1815 V1819
R1827 V1830 E1835 F1836 Q1837 V1841 L1844 L1849 V1850 F1854 L1863 E1873 GLU GLU GLU GLU GLU GLU GLU GLU GLU GLU GLU GLU GLU GLU GLU ASP GLU GLU GLU LYS GLU GLU ASP GLU GLU GLU GLU GLU LYS GLU ASP ALA GLU LYS GLU GLU GLU GLU
ALA PRO GLU GLY GLU LYS GLU ASP LEU E1923 L1926 P1932 M1939 L1943 E1944 Y1945 A1962 Y1965 V1966 R1982 ALA PHE THR MET SER A1988 A1989 I2006 L2009 F2012 K2013 D2014 GLU ALA ASP GLU GLU D2020 L2031 A2040 Q2045 LEU GLU GLY GLU GLU GLU
GLU PRO GLU GLU GLU THR SER LEU SER SER ARG LEU ARG SER LEU LEU GLU THR VAL ARG LEU VAL LYS LYS LYS GLU GLU LYS PRO GLU GLU GLU LEU PRO ALA GLU GLU LYS LYS P2091 L2094 V2098 Q2107 Y2110 L2116 M2120 L2123 L2124 H2125 R2126 Q2127 Y2128
Y2142 T2143 I2144 T2152 L2155 L2156 E2157 C2158 L2159 I2162 R2163 S2164 V2168 Q2169 N2188 H2194 L2197 L2201 G2202 M2203 V2207 M2208 V2212 G2216 GLY GLY GLU THR LYS E2222 F2225 P2226 V2229 L2236 C2237 Y2238 R2248 F2251 S2261 GLY ILE GLY LEU





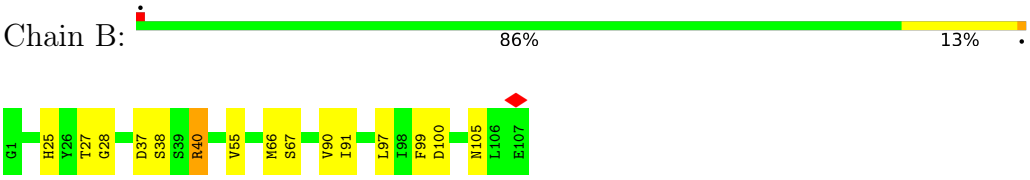
• Molecule 3: Peptidyl-prolyl cis-trans isomerase FKBP1B

Chain H:



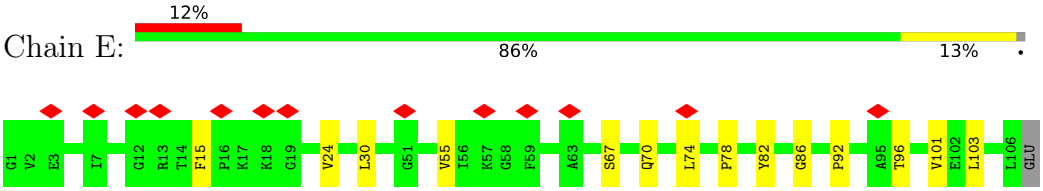
• Molecule 3: Peptidyl-prolyl cis-trans isomerase FKBP1B

Chain B:



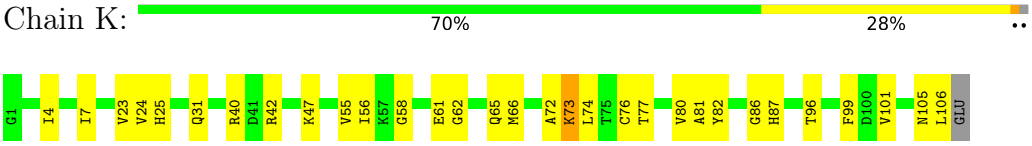
• Molecule 3: Peptidyl-prolyl cis-trans isomerase FKBP1B

Chain E:



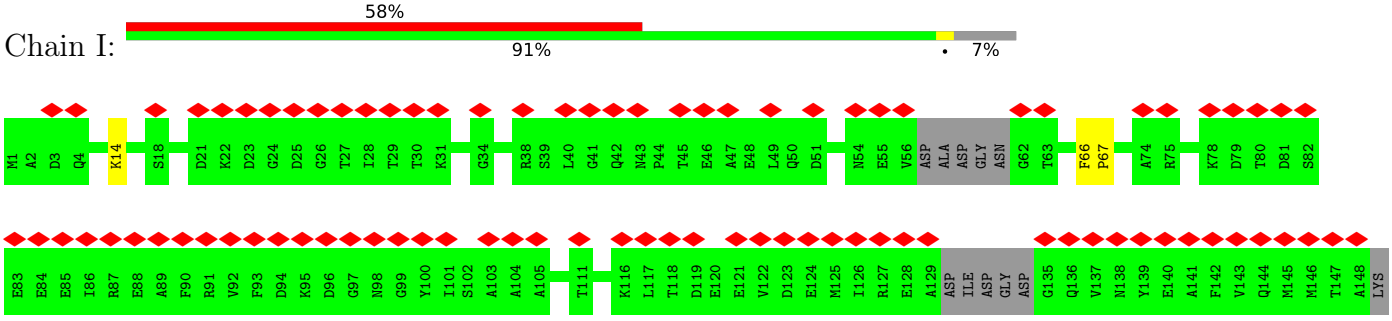
• Molecule 3: Peptidyl-prolyl cis-trans isomerase FKBP1B

Chain K:



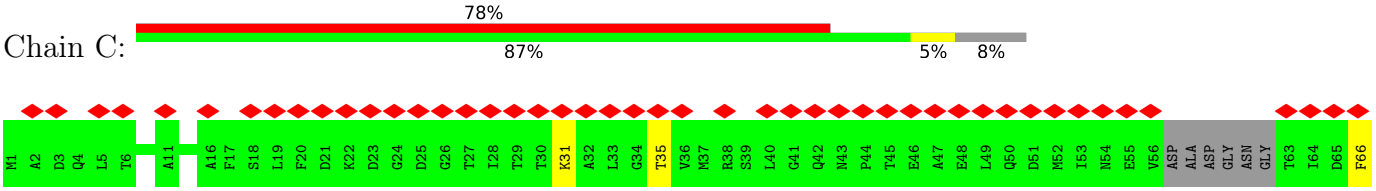
• Molecule 4: Calmodulin-1

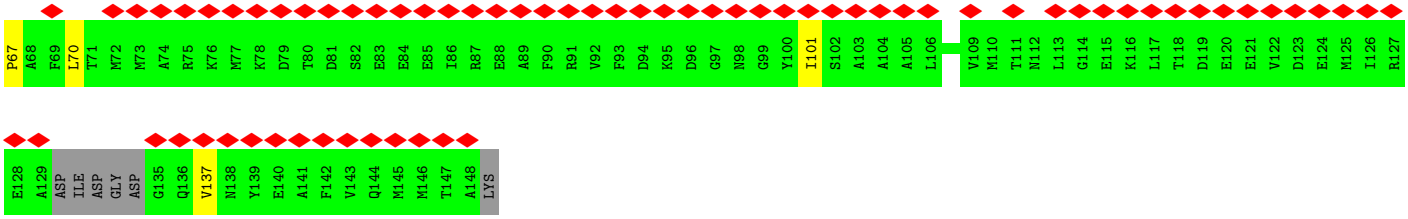
Chain I:



• Molecule 4: Calmodulin-1

Chain C:



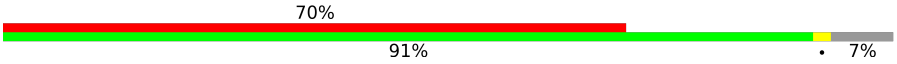


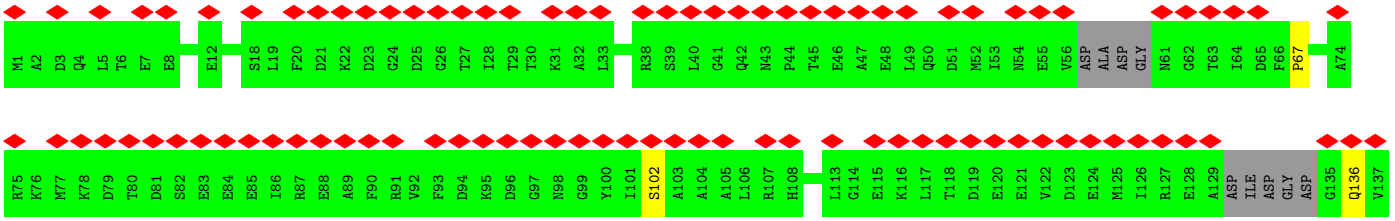
• Molecule 4: Calmodulin-1

Chain F:

• Molecule 4: Calmodulin-1

Chain L:





4 Experimental information (i)

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	144529	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	FEI TITAN KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/Å^2$)	50	Depositor
Minimum defocus (nm)	1000	Depositor
Maximum defocus (nm)	3000	Depositor
Magnification	Not provided	
Image detector	FEI FALCON III (4k x 4k)	Depositor
Maximum map value	2.559	Depositor
Minimum map value	-1.060	Depositor
Average map value	0.011	Depositor
Map value standard deviation	0.066	Depositor
Recommended contour level	0.35	Depositor
Map size (Å)	479.36002, 479.36002, 479.36002	wwPDB
Map dimensions	448, 448, 448	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.07, 1.07, 1.07	Depositor

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: CFF, CA, ATP, ZN

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	#$\|Z\|>5$	RMSZ	#$\|Z\|>5$
1	M	0.25	0/516	0.62	0/672
2	A	0.27	0/25342	0.46	0/34836
2	D	0.27	0/23698	0.43	0/32668
2	G	0.25	0/26809	0.45	0/36763
2	J	0.26	0/25729	0.44	0/35328
3	B	0.26	0/751	0.55	0/1025
3	E	0.24	0/671	0.42	0/926
3	H	0.27	0/775	0.55	0/1054
3	K	0.32	0/774	0.55	0/1051
4	C	0.24	0/707	0.38	0/978
4	F	0.24	0/711	0.35	0/984
4	I	0.23	0/711	0.35	0/981
4	L	0.24	0/706	0.35	0/976
All	All	0.26	0/107900	0.45	0/148242

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	M	514	0	522	9	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	A	24845	0	19916	424	0
2	D	23336	0	16446	294	0
2	G	26285	0	21941	392	0
2	J	25245	0	20257	321	0
3	B	735	0	669	11	0
3	E	657	0	537	7	0
3	H	759	0	724	19	0
3	K	758	0	735	21	0
4	C	707	0	386	5	0
4	F	710	0	386	3	0
4	I	711	0	383	4	0
4	L	706	0	363	2	0
5	A	14	0	10	0	0
5	D	14	0	10	1	0
5	G	14	0	10	0	0
5	J	14	0	10	0	0
6	A	1	0	0	0	0
6	D	1	0	0	0	0
6	G	1	0	0	0	0
6	J	1	0	0	0	0
7	A	31	0	12	2	0
7	D	31	0	12	1	0
7	G	31	0	12	3	0
7	J	31	0	12	0	0
8	A	1	0	0	0	0
8	D	1	0	0	0	0
8	G	1	0	0	0	0
8	J	1	0	0	0	0
All	All	106156	0	83353	1461	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 8.

The worst 5 of 1461 close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:A:415:ILE:CD1	2:A:493:ARG:HD2	1.68	1.23
2:A:415:ILE:HD11	2:A:493:ARG:CD	1.68	1.21
2:D:4055:VAL:HG11	2:D:4163:PHE:CZ	1.91	1.05
2:A:4048:LEU:HD11	2:A:4055:VAL:HG21	1.36	1.03
2:A:357:LEU:HB2	2:A:378:LEU:HA	1.45	0.98

There are no symmetry-related clashes.

5.3 Torsion angles (i)

5.3.1 Protein backbone (i)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all PDB entries followed by that with respect to all EM entries.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	M	62/33 (188%)	56 (90%)	6 (10%)	0	100	100
2	A	3718/5037 (74%)	3668 (99%)	48 (1%)	2 (0%)	51	83
2	D	3750/5037 (74%)	3701 (99%)	49 (1%)	0	100	100
2	G	3827/5037 (76%)	3774 (99%)	53 (1%)	0	100	100
2	J	3786/5037 (75%)	3726 (98%)	60 (2%)	0	100	100
3	B	105/107 (98%)	101 (96%)	4 (4%)	0	100	100
3	E	104/107 (97%)	100 (96%)	4 (4%)	0	100	100
3	H	105/107 (98%)	99 (94%)	6 (6%)	0	100	100
3	K	104/107 (97%)	100 (96%)	4 (4%)	0	100	100
4	C	131/149 (88%)	131 (100%)	0	0	100	100
4	F	131/149 (88%)	130 (99%)	1 (1%)	0	100	100
4	I	132/149 (89%)	132 (100%)	0	0	100	100
4	L	133/149 (89%)	131 (98%)	2 (2%)	0	100	100
All	All	16088/21205 (76%)	15849 (98%)	237 (2%)	2 (0%)	100	100

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	A	4052	SER
2	A	614	VAL

5.3.2 Protein sidechains (i)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all PDB entries followed by that with respect to all EM

entries.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
1	M	56/28 (200%)	56 (100%)	0	100 100
2	A	1728/4276 (40%)	1650 (96%)	78 (4%)	27 57
2	D	1204/4276 (28%)	1137 (94%)	67 (6%)	21 53
2	G	1976/4276 (46%)	1902 (96%)	74 (4%)	34 61
2	J	1721/4276 (40%)	1640 (95%)	81 (5%)	26 56
3	B	67/88 (76%)	66 (98%)	1 (2%)	65 81
3	E	49/88 (56%)	48 (98%)	1 (2%)	55 74
3	H	73/88 (83%)	72 (99%)	1 (1%)	67 82
3	K	74/88 (84%)	72 (97%)	2 (3%)	44 68
4	C	9/123 (7%)	9 (100%)	0	100 100
4	F	9/123 (7%)	8 (89%)	1 (11%)	6 28
4	I	8/123 (6%)	8 (100%)	0	100 100
4	L	5/123 (4%)	5 (100%)	0	100 100
All	All	6979/17976 (39%)	6673 (96%)	306 (4%)	32 58

5 of 306 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	J	493	ARG
2	J	4065	PHE
2	J	702	TRP
2	J	2251	PHE
2	J	5012	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 17 such sidechains are listed below:

Mol	Chain	Res	Type
2	J	639	ASN
2	J	4142	ASN
2	A	2127	GLN
2	A	3900	GLN
2	A	4043	GLN

5.3.3 RNA

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates

There are no monosaccharides in this entry.

5.6 Ligand geometry

Of 16 ligands modelled in this entry, 8 are monoatomic - leaving 8 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\#\|Z\| > 2$	Counts	RMSZ	$\#\|Z\| > 2$
7	ATP	G	5103	-	26,33,33	0.59	0	31,52,52	0.74	2 (6%)
5	CFF	D	5101	-	8,15,15	1.24	1 (12%)	8,23,23	2.69	3 (37%)
7	ATP	A	5103	-	26,33,33	0.60	0	31,52,52	0.75	2 (6%)
7	ATP	J	5103	-	26,33,33	0.59	0	31,52,52	0.75	2 (6%)
5	CFF	G	5101	-	8,15,15	1.23	1 (12%)	8,23,23	2.70	3 (37%)
5	CFF	J	5101	-	8,15,15	1.23	1 (12%)	8,23,23	2.68	3 (37%)
5	CFF	A	5101	-	8,15,15	1.23	1 (12%)	8,23,23	2.67	3 (37%)
7	ATP	D	5103	-	26,33,33	0.59	0	31,52,52	0.73	2 (6%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
7	ATP	G	5103	-	-	6/18/38/38	0/3/3/3
5	CFF	D	5101	-	-	-	0/2/2/2
7	ATP	A	5103	-	-	7/18/38/38	0/3/3/3
7	ATP	J	5103	-	-	8/18/38/38	0/3/3/3
5	CFF	G	5101	-	-	-	0/2/2/2
5	CFF	J	5101	-	-	-	0/2/2/2
5	CFF	A	5101	-	-	-	0/2/2/2
7	ATP	D	5103	-	-	12/18/38/38	0/3/3/3

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	D	5101	CFF	C6-N1	3.03	1.42	1.38
5	J	5101	CFF	C6-N1	3.02	1.42	1.38
5	G	5101	CFF	C6-N1	3.02	1.42	1.38
5	A	5101	CFF	C6-N1	3.02	1.42	1.38

The worst 5 of 20 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(^{o})	Ideal(^{o})
5	D	5101	CFF	C5-C6-N1	-5.31	112.54	118.20
5	G	5101	CFF	C5-C6-N1	-5.29	112.56	118.20
5	A	5101	CFF	C5-C6-N1	-5.27	112.58	118.20
5	J	5101	CFF	C5-C6-N1	-5.27	112.58	118.20
5	G	5101	CFF	C4-C5-C6	4.60	122.92	119.96

There are no chirality outliers.

5 of 33 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
7	G	5103	ATP	PB-O3B-PG-O2G
7	G	5103	ATP	C5'-O5'-PA-O3A
7	G	5103	ATP	C4'-C5'-O5'-PA
7	A	5103	ATP	PB-O3A-PA-O5'
7	A	5103	ATP	C5'-O5'-PA-O2A

There are no ring outliers.

4 monomers are involved in 7 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
7	G	5103	ATP	3	0

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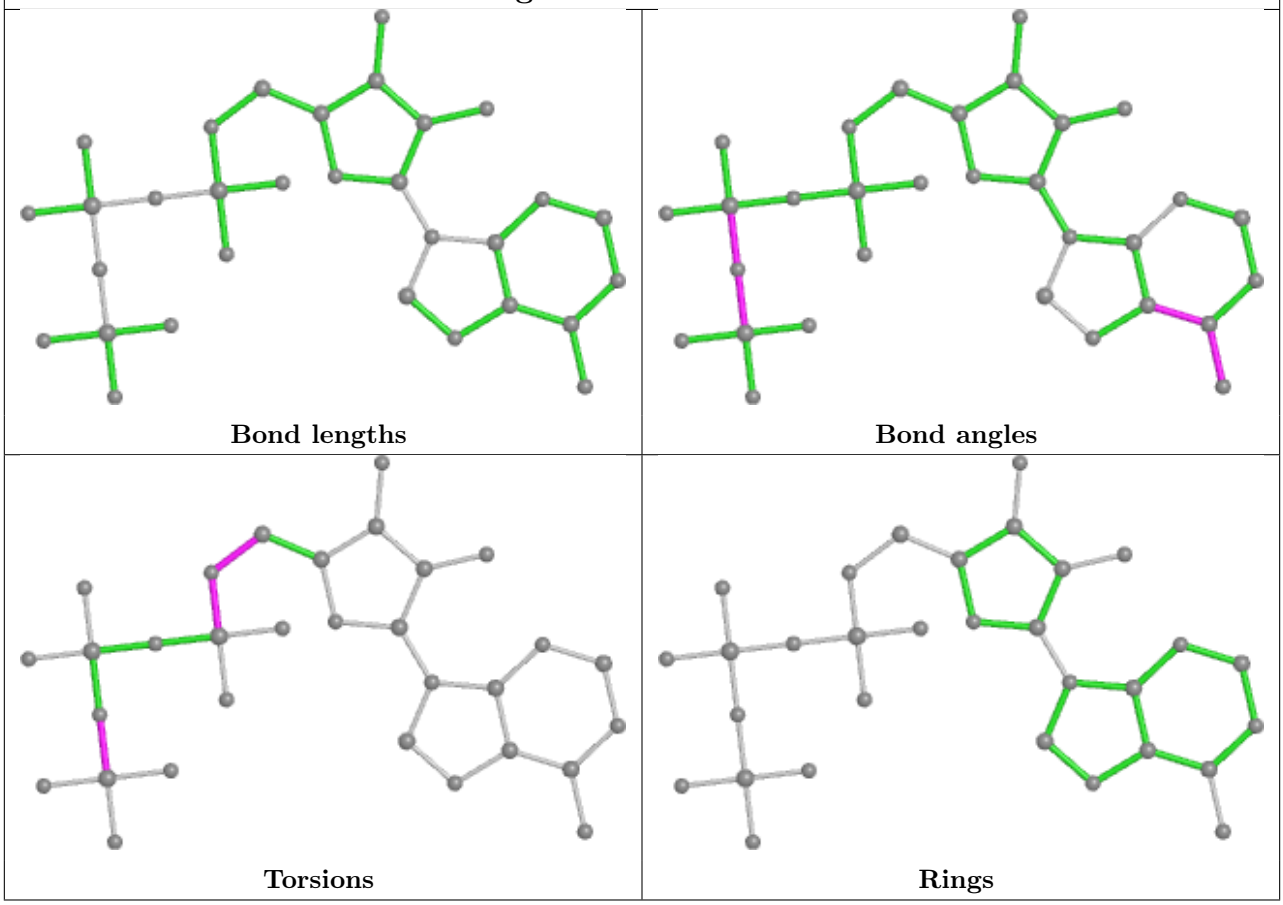
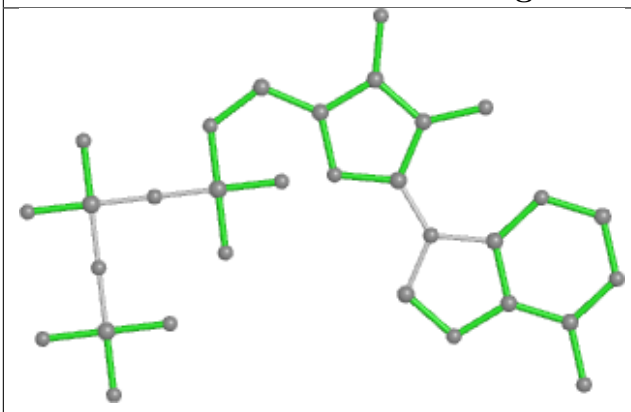
Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	D	5101	CFF	1	0
7	A	5103	ATP	2	0
7	D	5103	ATP	1	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less then 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

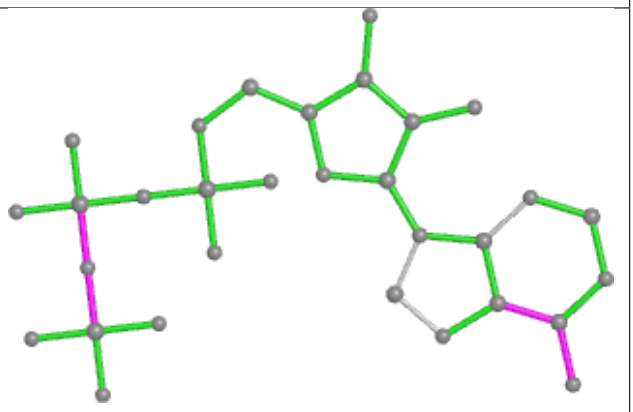
Ligand ATP G 5103



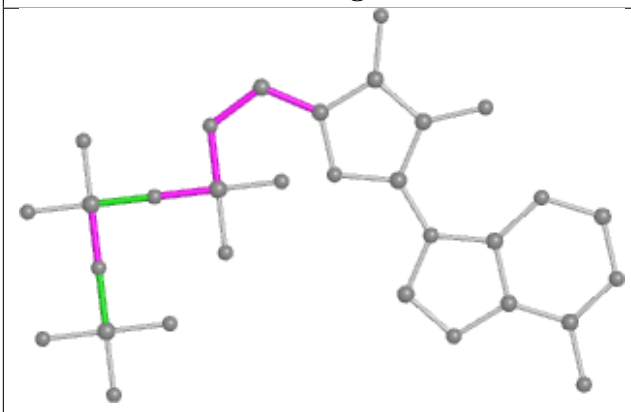
Ligand ATP A 5103



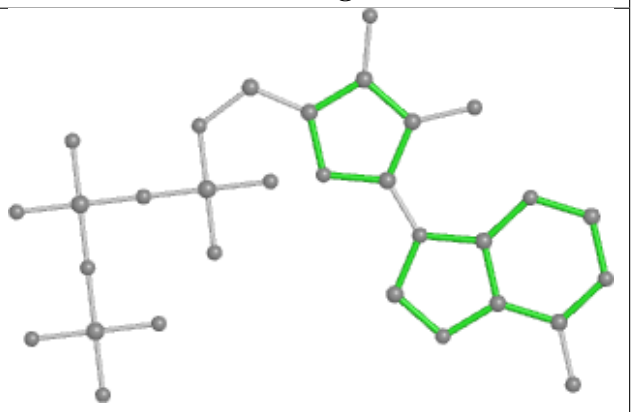
Bond lengths



Bond angles

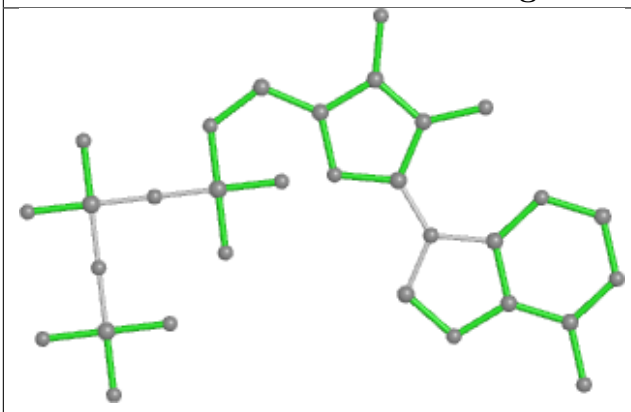


Torsions

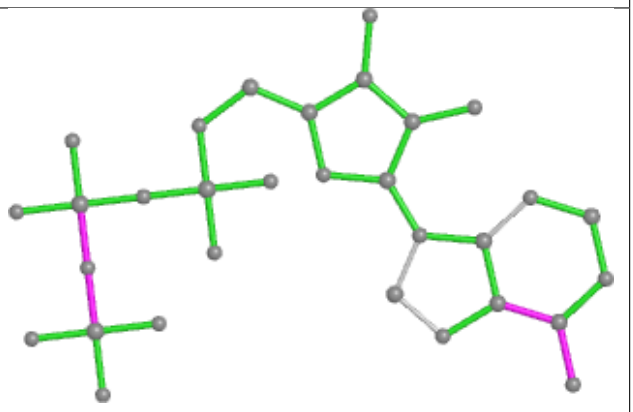


Rings

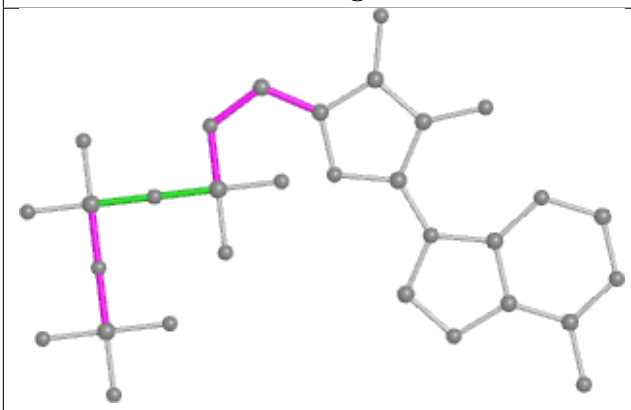
Ligand ATP J 5103



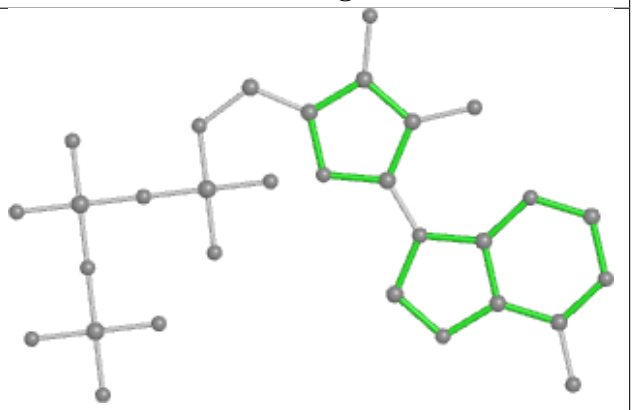
Bond lengths



Bond angles

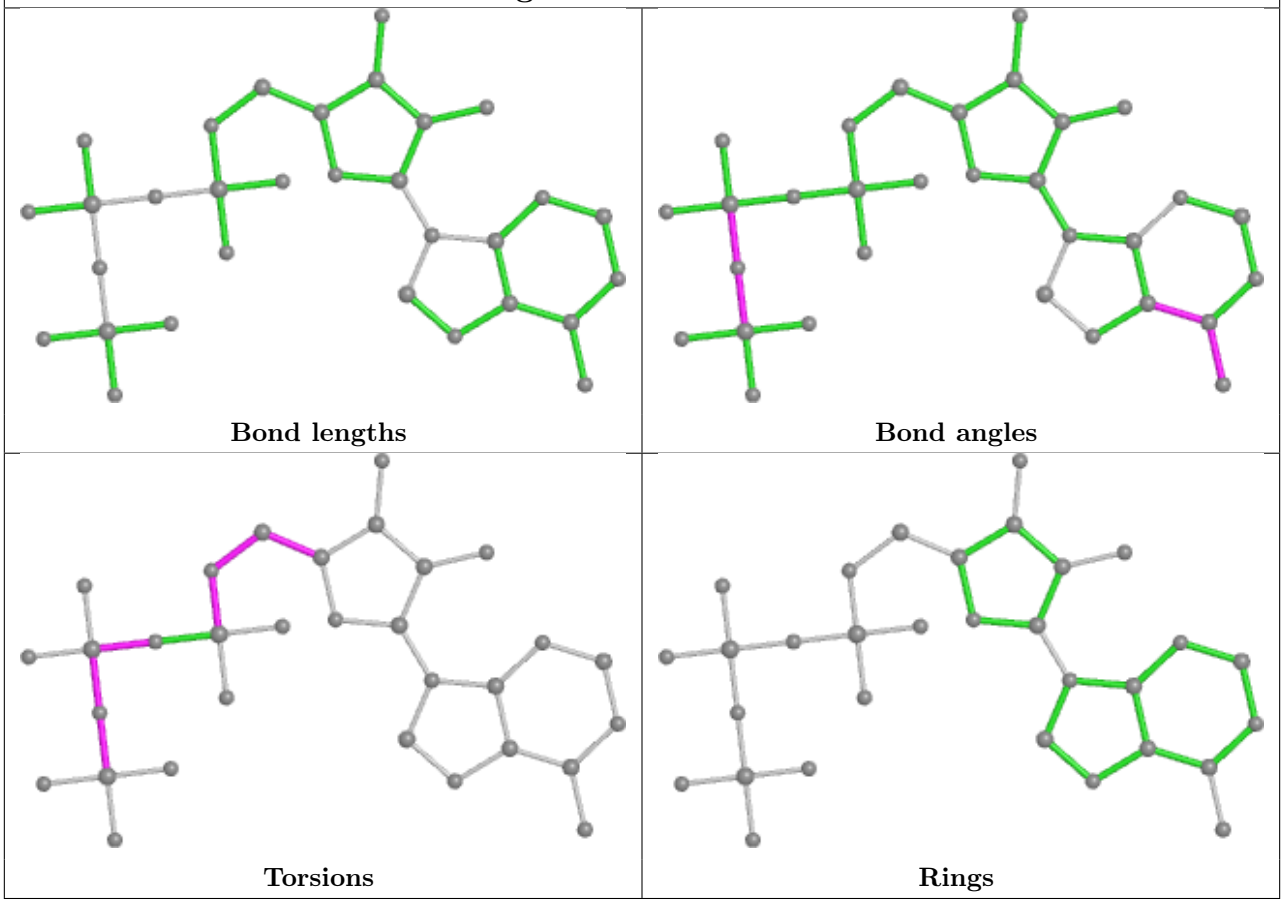


Torsions



Rings

Ligand ATP D 5103



5.7 Other polymers (i)

There are no such residues in this entry.

5.8 Polymer linkage issues (i)

There are no chain breaks in this entry.

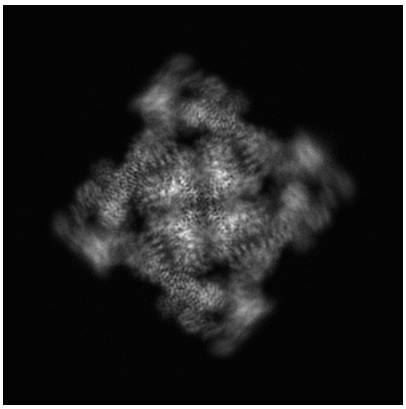
6 Map visualisation

This section contains visualisations of the EMDB entry EMD-27721. These allow visual inspection of the internal detail of the map and identification of artifacts.

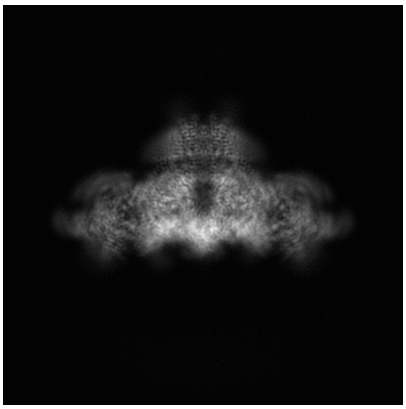
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections

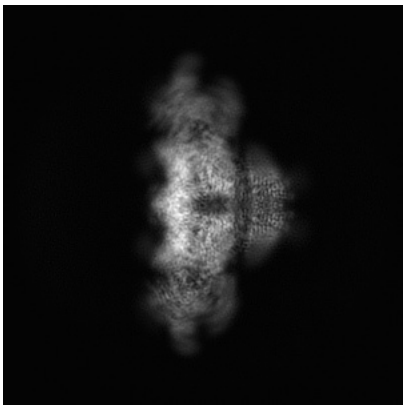
6.1.1 Primary map



X

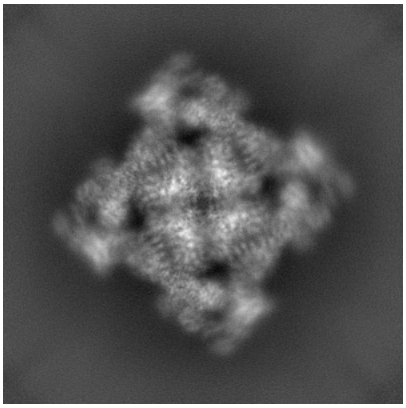


Y

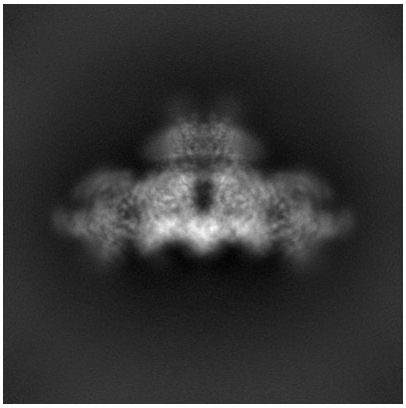


Z

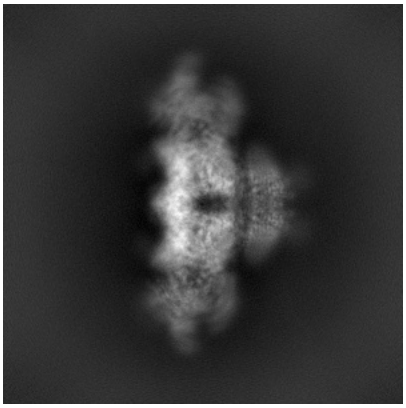
6.1.2 Raw map



X



Y

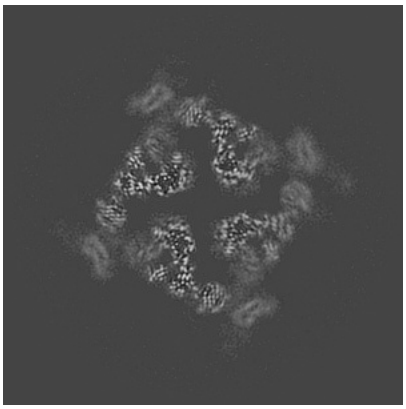


Z

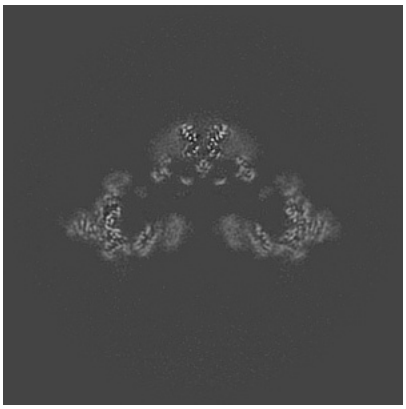
The images above show the map projected in three orthogonal directions.

6.2 Central slices (i)

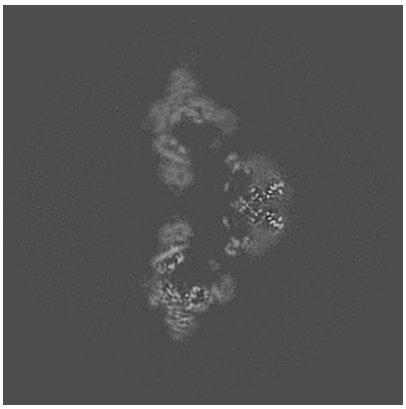
6.2.1 Primary map



X Index: 224

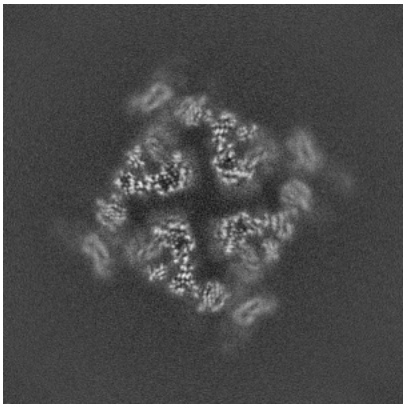


Y Index: 224

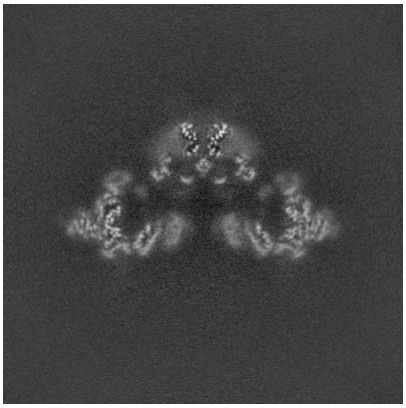


Z Index: 224

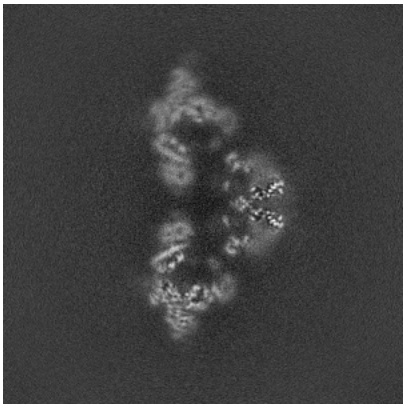
6.2.2 Raw map



X Index: 224



Y Index: 224

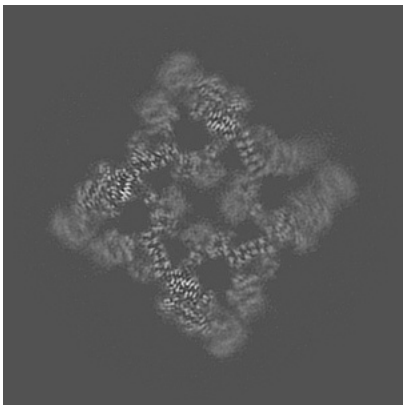


Z Index: 224

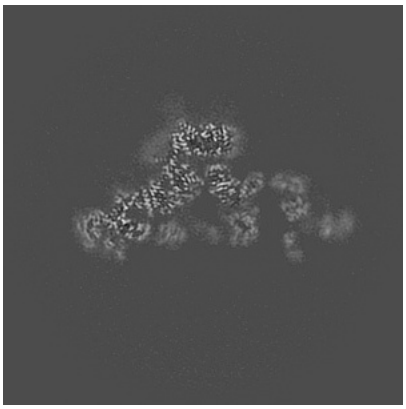
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices (i)

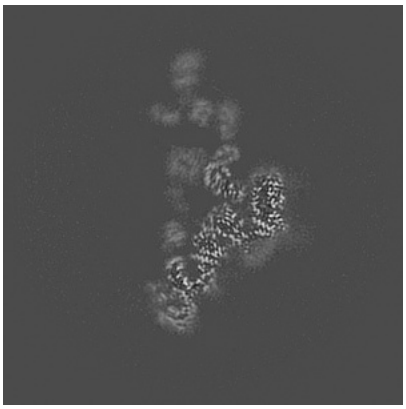
6.3.1 Primary map



X Index: 203

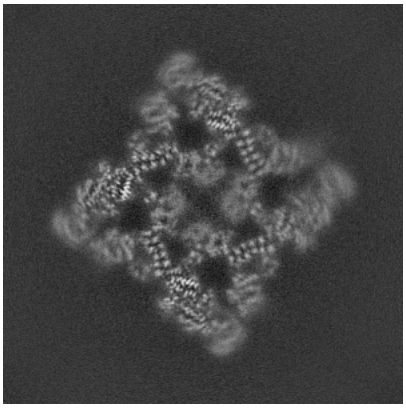


Y Index: 205

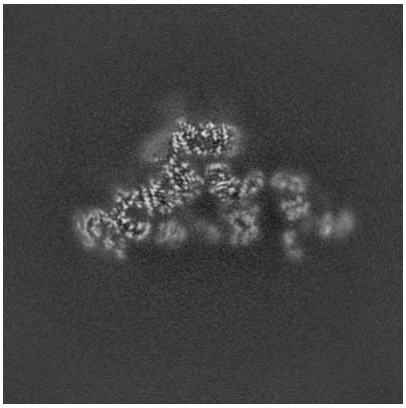


Z Index: 242

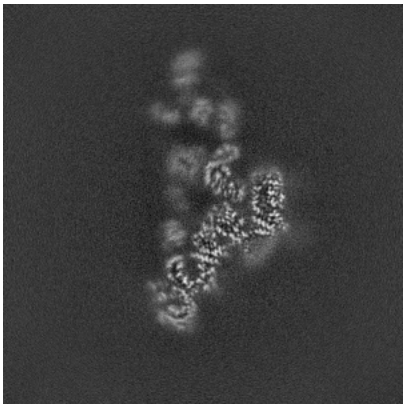
6.3.2 Raw map



X Index: 203



Y Index: 205

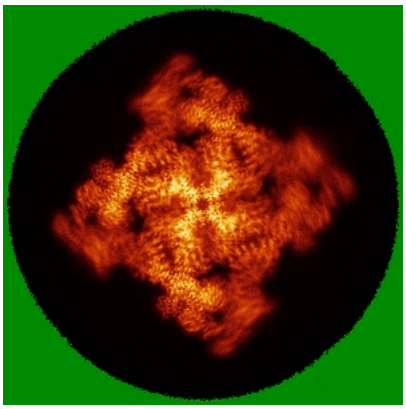


Z Index: 242

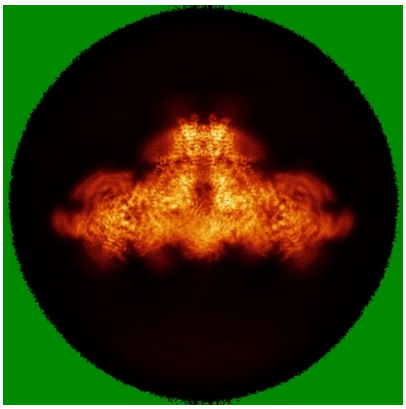
The images above show the largest variance slices of the map in three orthogonal directions.

6.4 Orthogonal standard-deviation projections (False-color) (i)

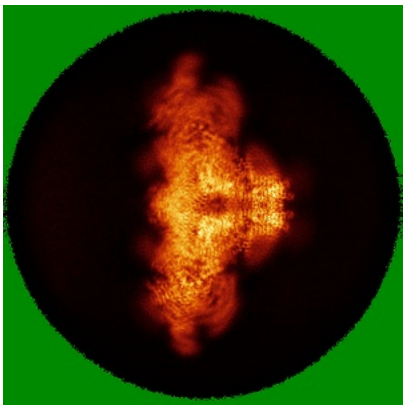
6.4.1 Primary map



X

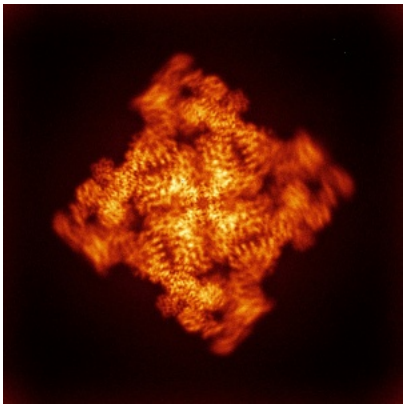


Y

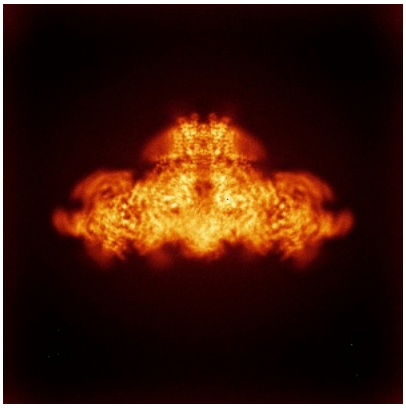


Z

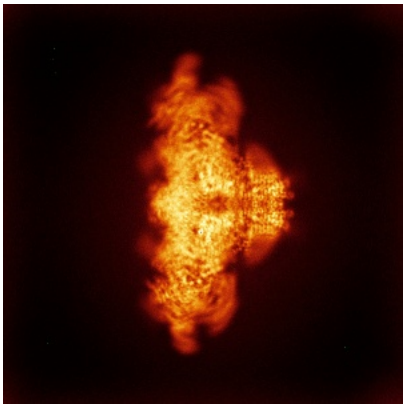
6.4.2 Raw map



X



Y

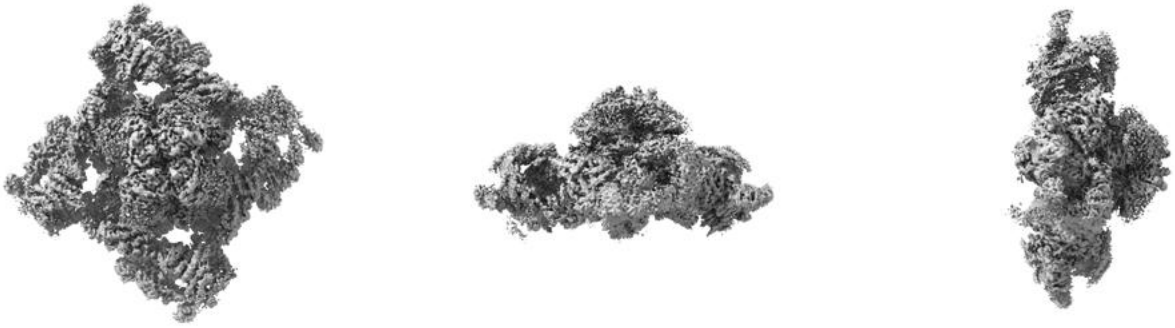


Z

The images above show the map standard deviation projections with false color in three orthogonal directions. Minimum values are shown in green, max in blue, and dark to light orange shades represent small to large values respectively.

6.5 Orthogonal surface views (i)

6.5.1 Primary map



X Y Z

The images above show the 3D surface view of the map at the recommended contour level 0.35. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

6.5.2 Raw map

X Y Z

These images show the 3D surface of the raw map. The raw map's contour level was selected so that its surface encloses the same volume as the primary map does at its recommended contour level.

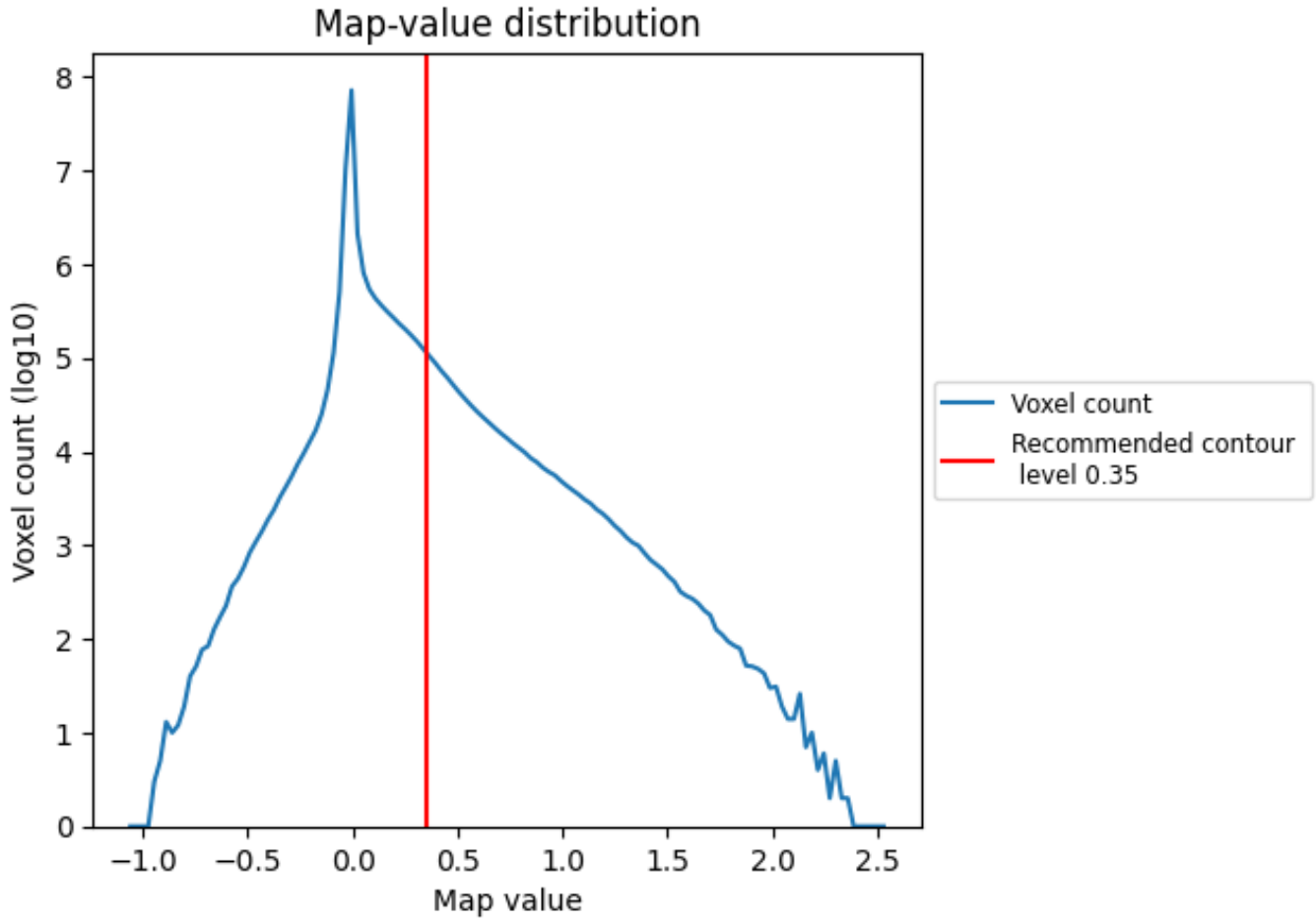
6.6 Mask visualisation (i)

This section was not generated. No masks/segmentation were deposited.

7 Map analysis

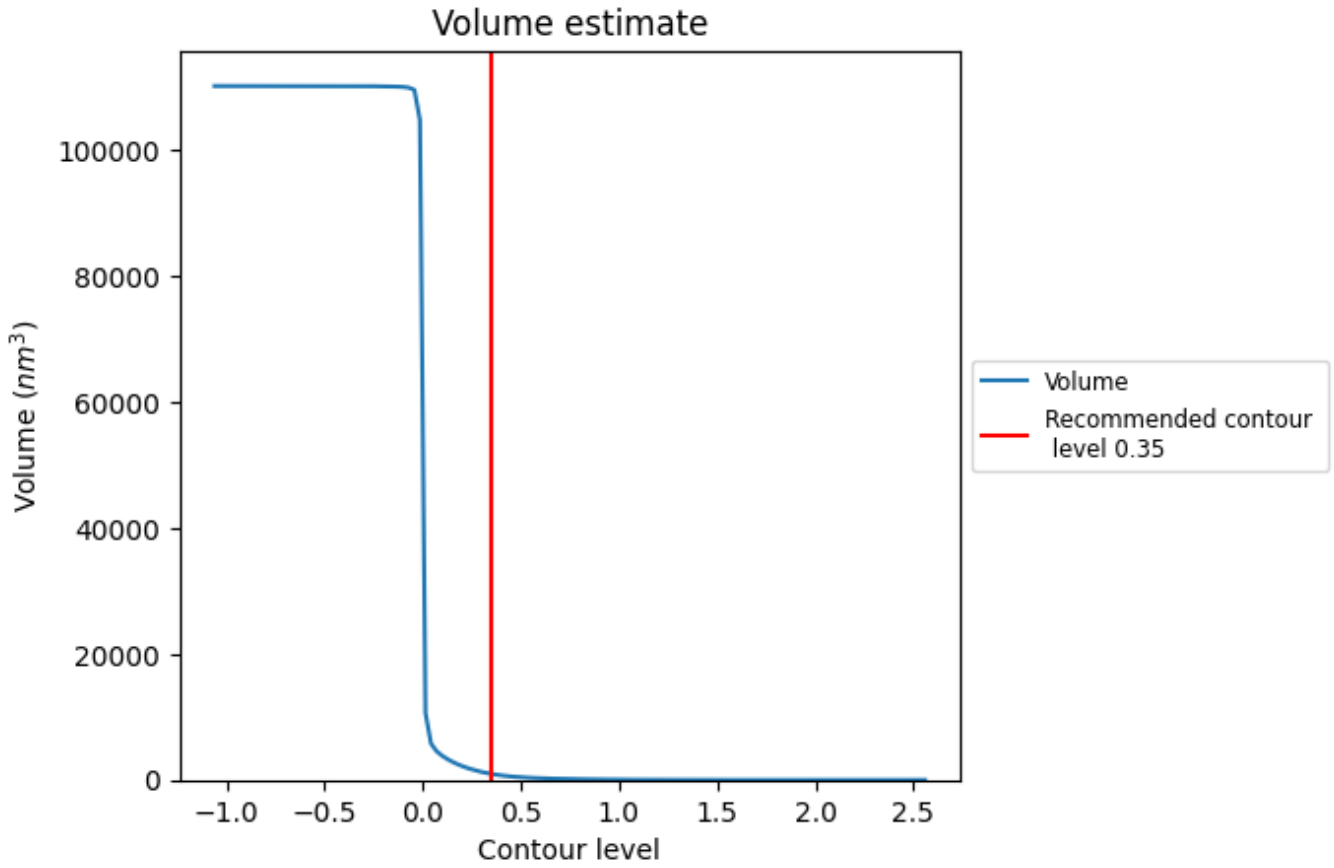
This section contains the results of statistical analysis of the map.

7.1 Map-value distribution



The map-value distribution is plotted in 128 intervals along the x-axis. The y-axis is logarithmic. A spike in this graph at zero usually indicates that the volume has been masked.

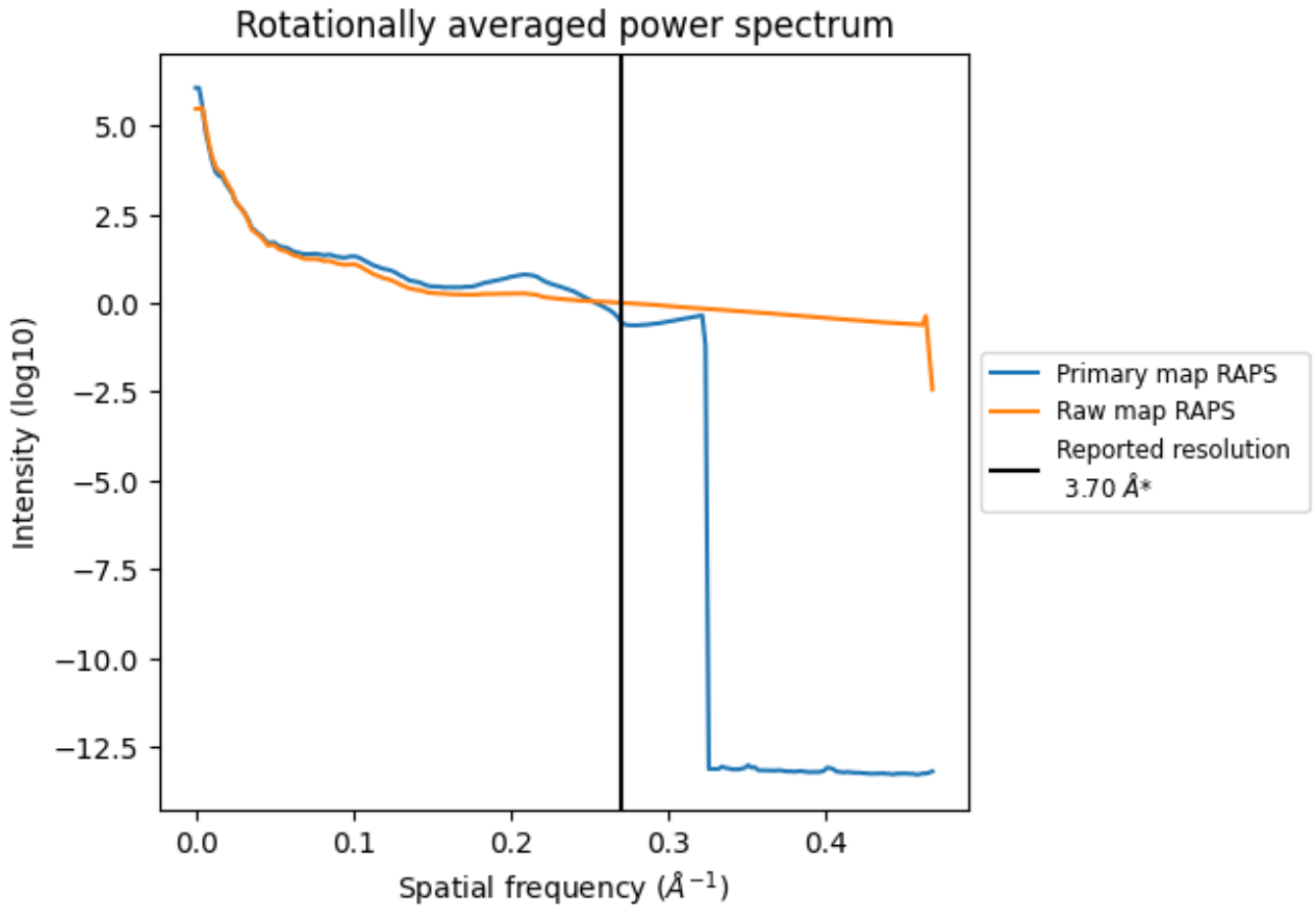
7.2 Volume estimate (i)



The volume at the recommended contour level is 957 nm^3; this corresponds to an approximate mass of 865 kDa.

The volume estimate graph shows how the enclosed volume varies with the contour level. The recommended contour level is shown as a vertical line and the intersection between the line and the curve gives the volume of the enclosed surface at the given level.

7.3 Rotationally averaged power spectrum (i)

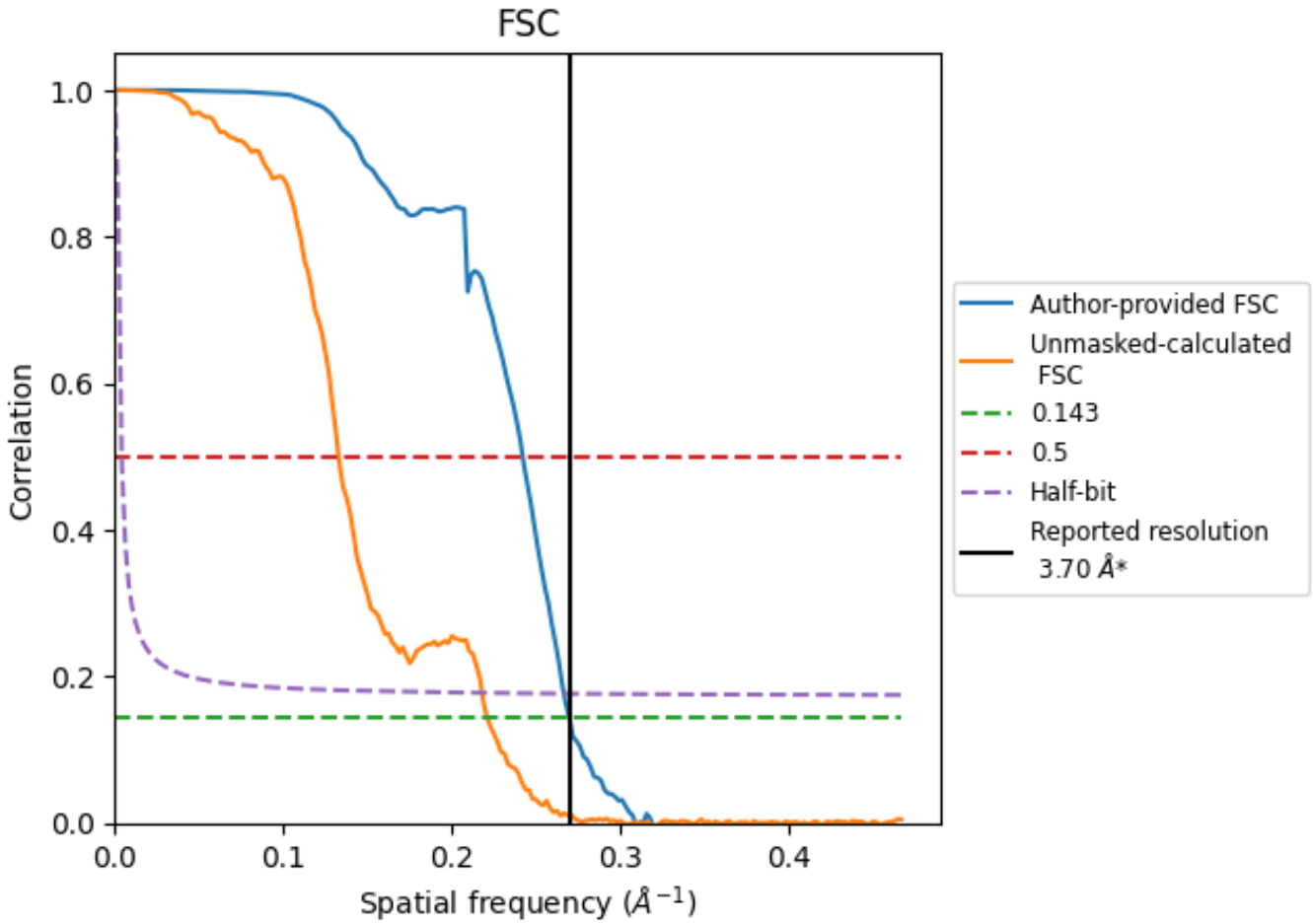


*Reported resolution corresponds to spatial frequency of 0.270 $Å^{-1}$

8 Fourier-Shell correlation

Fourier-Shell Correlation (FSC) is the most commonly used method to estimate the resolution of single-particle and subtomogram-averaged maps. The shape of the curve depends on the imposed symmetry, mask and whether or not the two 3D reconstructions used were processed from a common reference. The reported resolution is shown as a black line. A curve is displayed for the half-bit criterion in addition to lines showing the 0.143 gold standard cut-off and 0.5 cut-off.

8.1 FSC



*Reported resolution corresponds to spatial frequency of 0.270 Å^{-1}

8.2 Resolution estimates (i)

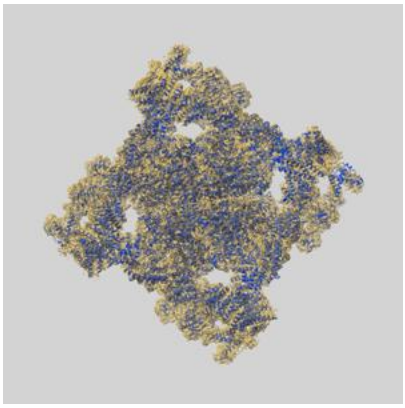
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.70	-	-
Author-provided FSC curve	3.71	4.13	3.75
Unmasked-calculated*	4.52	7.52	4.58

*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps. The value from deposited half-maps intersecting FSC 0.143 CUT-OFF 4.52 differs from the reported value 3.7 by more than 10 %

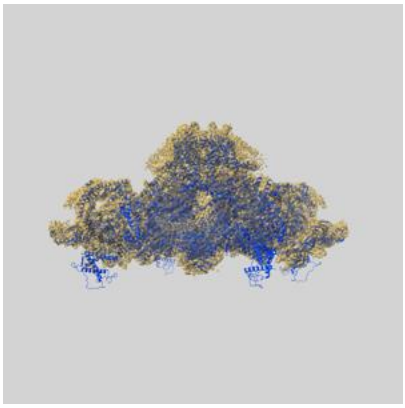
9 Map-model fit

This section contains information regarding the fit between EMDB map EMD-27721 and PDB model 8DUJ. Per-residue inclusion information can be found in section 3 on page 8.

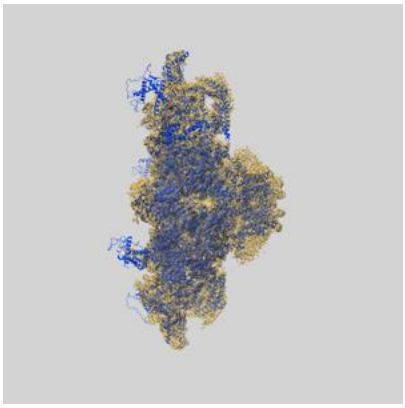
9.1 Map-model overlay



X



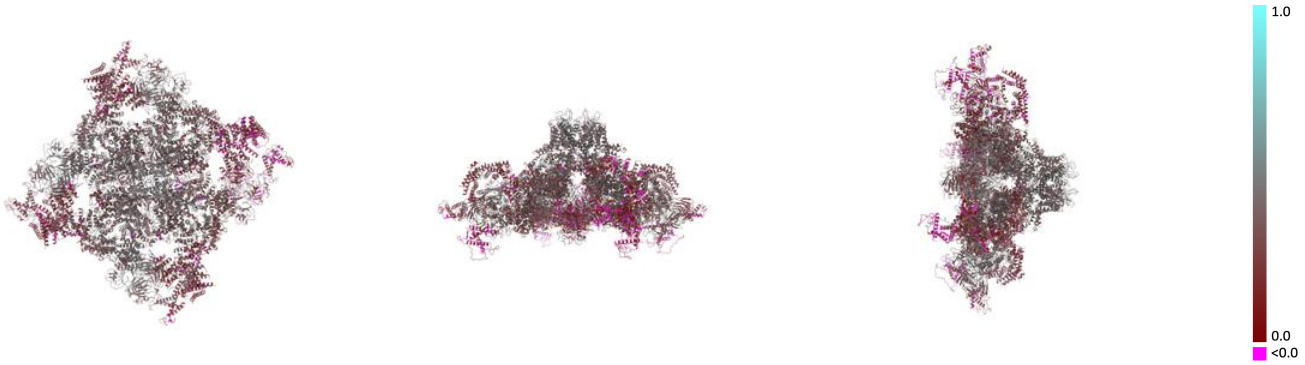
Y



Z

The images above show the 3D surface view of the map at the recommended contour level 0.35 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

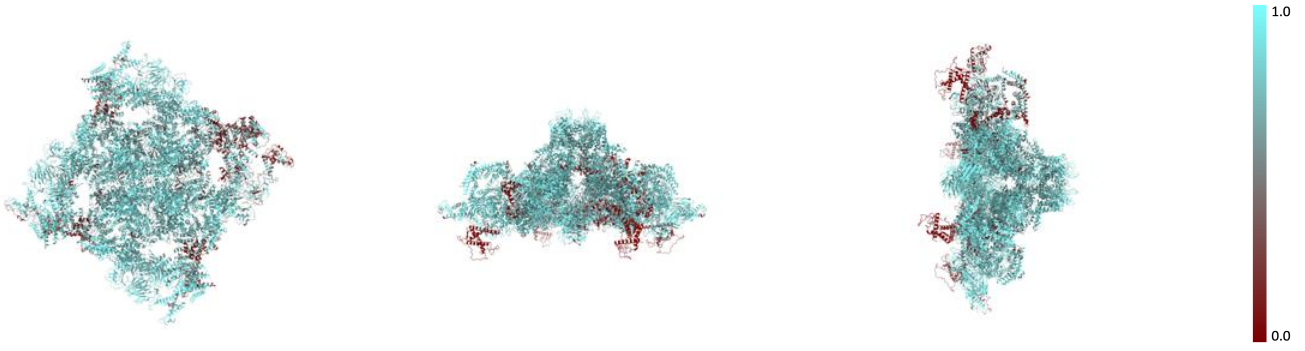
9.2 Q-score mapped to coordinate model



X Y Z

The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions at which atoms can be resolved. Low Q-score values may therefore be expected for many entries.

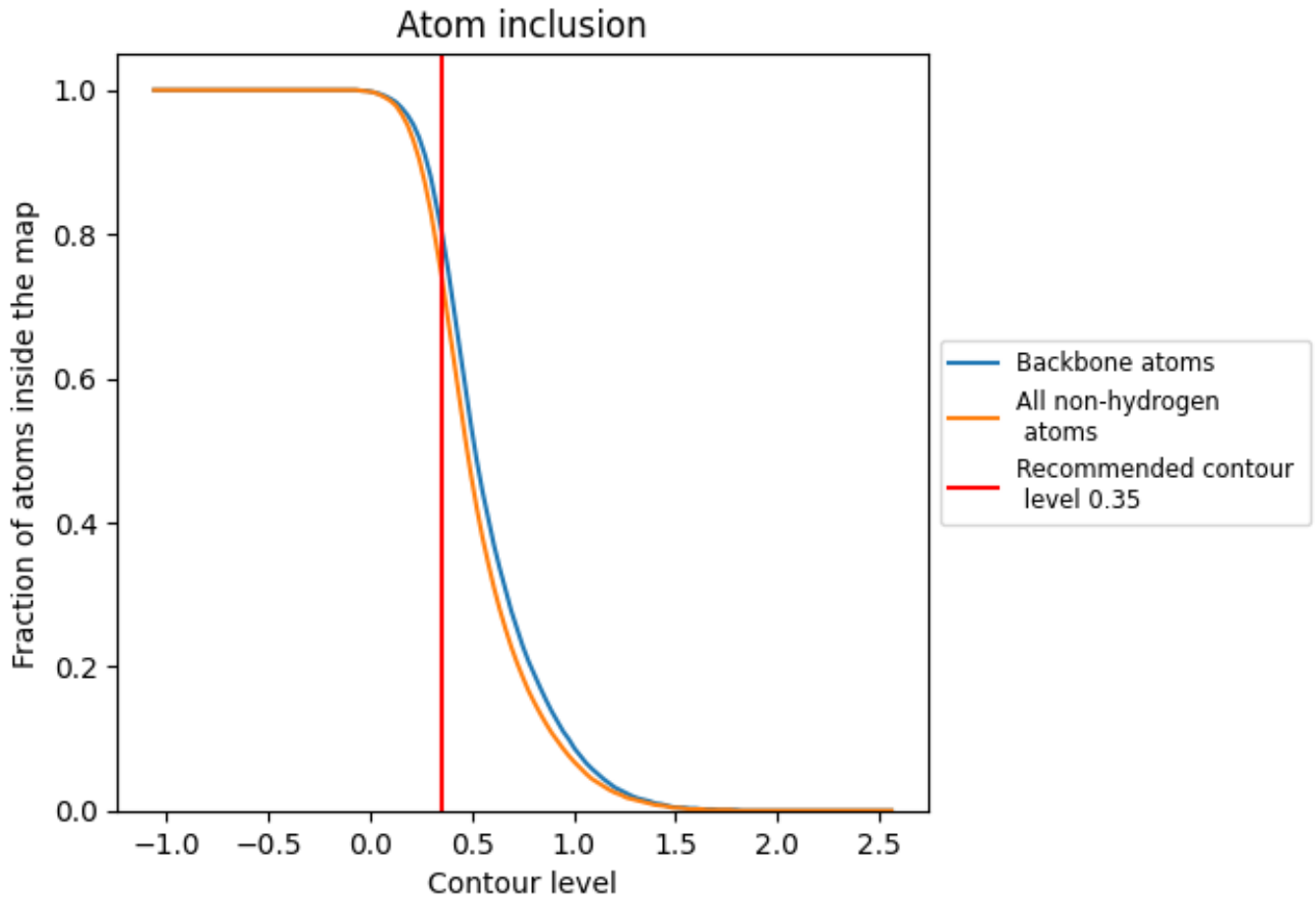
9.3 Atom inclusion mapped to coordinate model



X Y Z

The images above show the model with each residue coloured according to its atom inclusion. This shows to what extent they are inside the map at the recommended contour level (0.35).

9.4 Atom inclusion (i)



At the recommended contour level, 81% of all backbone atoms, 74% of all non-hydrogen atoms, are inside the map.

9.5 Map-model fit summary

The table lists the average atom inclusion at the recommended contour level (0.35) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	0.7430	0.3450
A	0.7390	0.3470
B	0.8290	0.3980
C	0.1920	0.2430
D	0.7080	0.3050
E	0.7030	0.2960
F	0.1970	0.2240
G	0.7760	0.3660
H	0.8610	0.4330
I	0.3760	0.2800
J	0.7910	0.3640
K	0.8640	0.4400
L	0.2950	0.2410
M	0.6070	0.3960