



wwPDB EM Validation Summary Report ⓘ

Mar 19, 2024 – 09:38 PM JST

PDB ID : 6JGZ
EMDB ID : EMD-9824
Title : Structure of RyR2 (F/P/Ca²⁺ dataset)
Authors : Chi, X.M.; Gong, D.S.; Ren, K.; Zhou, G.W.; Huang, G.X.Y.; Lei, J.L.; Zhou, Q.; Yan, N.
Deposited on : 2019-02-16
Resolution : 4.60 Å(reported)

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

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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
MolProbity : 4.02b-467
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

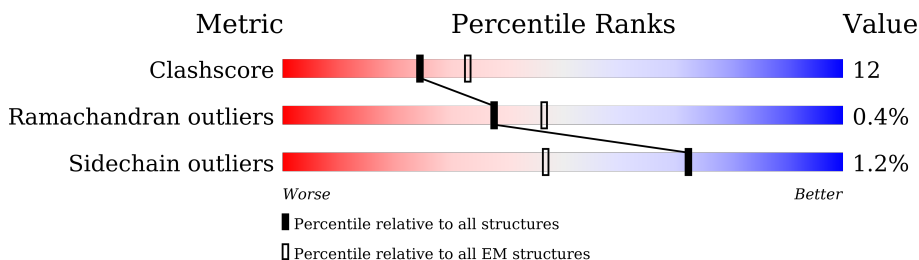
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 4.60 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 $\leq 5\%$. 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	A	108	
1	C	108	
1	E	108	
1	G	108	
2	B	4968	
2	D	4968	
2	F	4968	
2	H	4968	

2 Entry composition [i](#)

There are 3 unique types of molecules in this entry. The entry contains 109824 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 Peptidyl-prolyl cis-trans isomerase FKBP1B.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	107	819	516	144	155	4	0	0
1	C	107	819	516	144	155	4	0	0
1	E	107	819	516	144	155	4	0	0
1	G	107	819	516	144	155	4	0	0

- Molecule 2 is a protein called RyR2.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	B	3485	26636	16958	4556	4964	158	0	0
2	D	3485	26636	16958	4556	4964	158	0	0
2	F	3485	26636	16958	4556	4964	158	0	0
2	H	3485	26636	16958	4556	4964	158	0	0

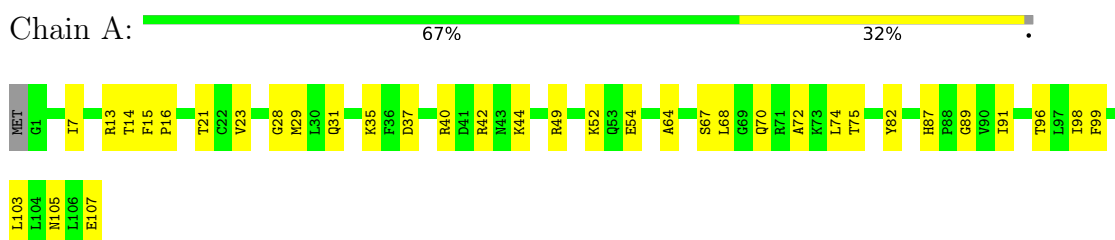
- Molecule 3 is ZINC ION (three-letter code: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		AltConf
3	B	1	Total	Zn	0
			1	1	
3	D	1	Total	Zn	0
			1	1	
3	F	1	Total	Zn	0
			1	1	
3	H	1	Total	Zn	0
			1	1	

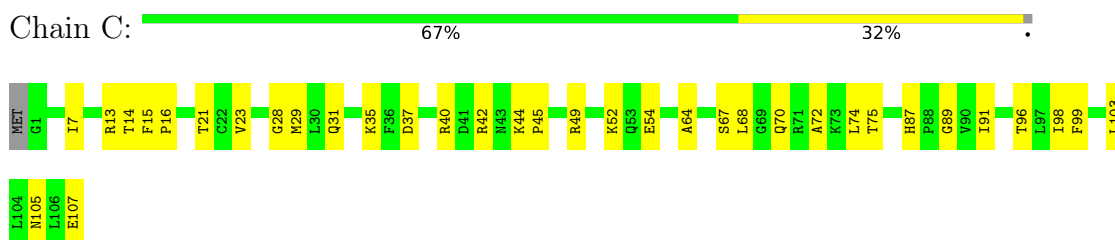
3 Residue-property plots [i](#)

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.

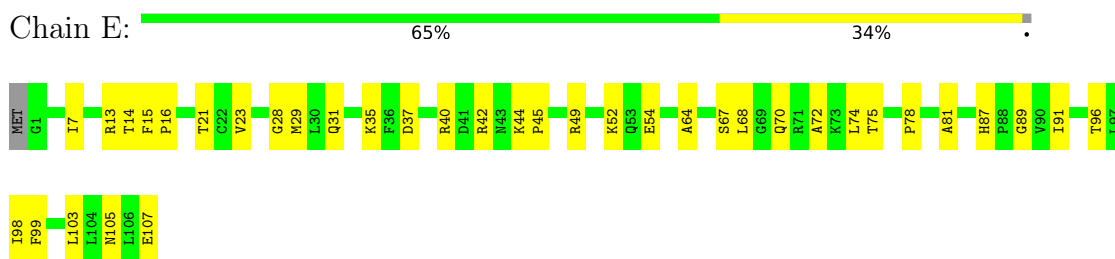
- Molecule 1: Peptidyl-prolyl cis-trans isomerase FKBP1B



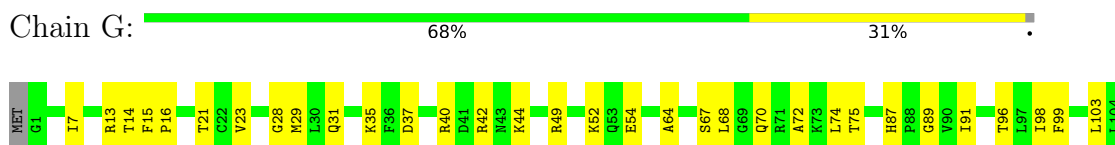
- Molecule 1: Peptidyl-prolyl cis-trans isomerase FKBP1B



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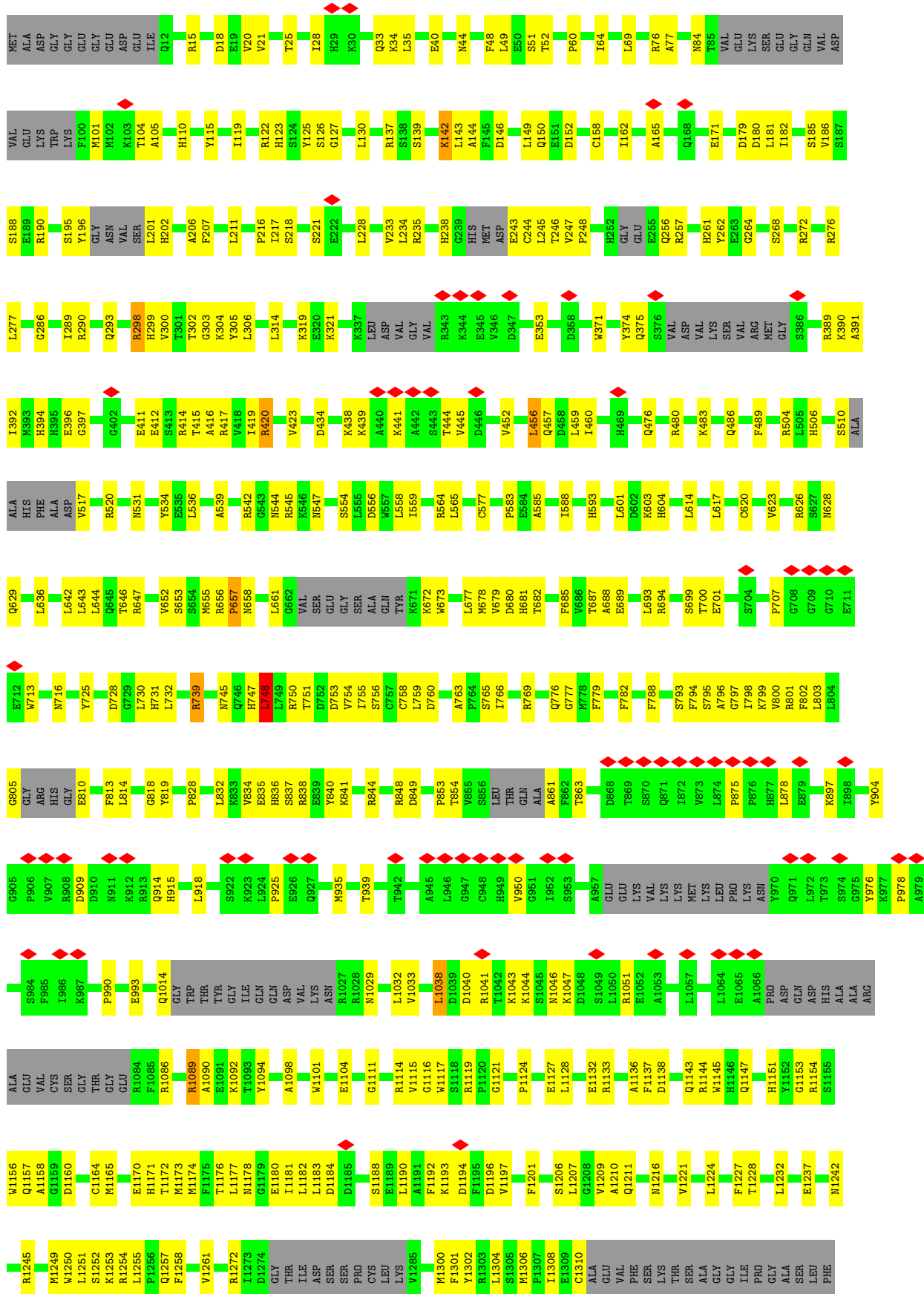
M105
L106
E107

Molecule 2: RyR2



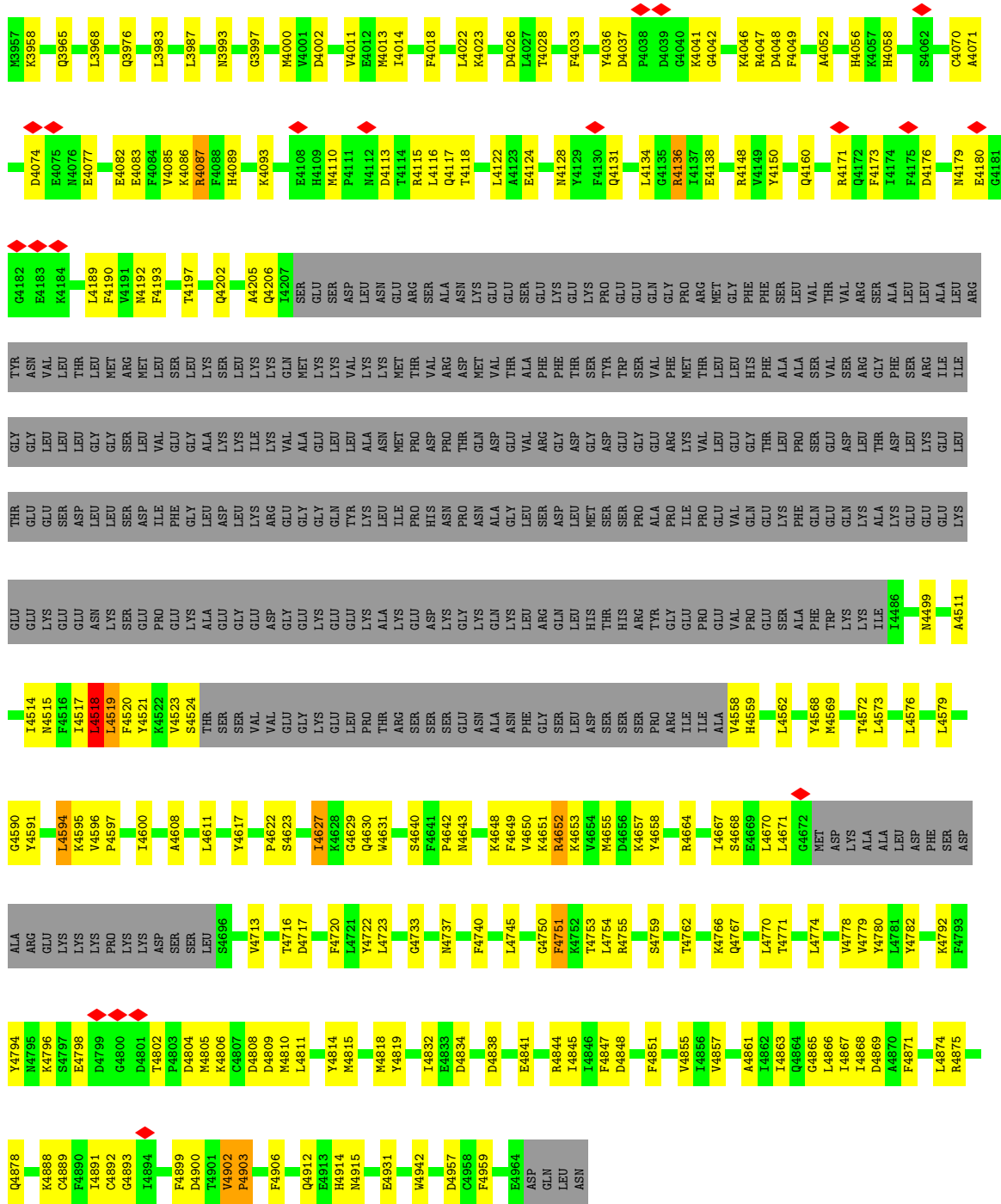
MET	ALA	ASP	GLY	LYS	TRP	GLY	GLY	GLU	GLU	GLU	ILE	ILE	Q12	R15	D18	E19	V20	V21	T25	A26	T27	I28	H29	K30	Q33	K34	L35	E40	M44	F48	L49	E50	S51	T52	P60	I64	L69	R76	A77	N84	T85	VAL	GLU	LYS	SER	GLY	GLN	VAL				
ASP	VAL	GLU	LYS	TRP	LYS	ASP	F100	M101	M102	L201	K103	T104	A105	H110	Y115	I119	R122	H123	S124	A26	T27	S126	G127	L130	R137	S138	S139	K142	L143	A144	F145	D146	L149	S51	V247	Q150	C158	I162	A165	Q168	E171	D179	D180	L181	I182	S185	V186	S187	S188			
H189	R190	S195	Y196	GLY	ASN	VAL	SER	H202	A206	F207	L211	Y305	P216	I217	S218	E221	E222	L228	V233	L234	R235	H238	G239	HIS	MET	V346	ASP	F145	E243	C244	T246	V247	Q150	P248	H252	GLY	GLU	E255	R257	H261	Y262	E263	G264	S268	R272	R276	L277					
G286	I289	R290	Q293	R298	V300	T301	G303	K304	Y305	L306	L314	K319	E320	K321	K337	LEU	ASP	VAL	L234	GLY	R235	R343	K344	E345	V346	D347	E353	D358	W371	L372	Y374	Q375	S376	VAL	ASP	VAL	VAL	LYS	SER	VAL	ARG	MET	GLY	S386	R389	K390	A391					
I392	H393	H394	H395	E396	G397	G402	E411	R414	T415	A416	R417	Y419	R420	V423	D434	K438	A440	K441	A442	S443	T444	V445	D446	V452	L456	Q457	I460	H469	Q476	R480	K483	Q486	F489	H506	S510	ALA	ALA	HIS	PHE	ALA												
ASP	V517	R520	M531	Y534	E535	L536	A539	R542	G543	M544	R545	K546	N547	F551	S554	L555	D556	M557	L558	I559	R564	L565	C577	P583	E584	A585	I588	H593	L601	D602	K603	H604	L614	L617	C620	V623	R626	S627	N628	Q629												
L636	L642	L643	L644	Q645	T646	R647	V652	S653	M654	R655	R656	P657	M658	L661	G662	VAL	SER	GLU	GLY	SER	ALA	GLN	TYR	K671	K672	V673	V674	V675	V676	V677	V678	V679	D680	H681	T682	F685	V686	T687	A688	E689	L693	R694	S699	T700	E701	L617	C620	V623	R626	S627	N628	Q629
E712	W713	N716	G717	L722	Y725	D728	G729	L730	H731	L732	R739	N745	Q746	H747	L748	R750	T751	D752	V753	V754	I755	S756	C757	C758	D760	A763	P764	S765	I766	R769	Q776	G777	M778	F779	F782	F788	S793	F794	S795	A796	G797	I798	K799	V800	R801							
F802	L803	L804	G805	ARG	HIS	GLY	E810	F813	L814	G818	Y819	P828	L832	K833	V834	E835	H836	S837	R838	E839	Y840	K841	R844	R848	D849	P853	T854	V855	S856	LEU	THR	GLN	ALA	A861	F862	T863	D868	T869	S870	Q871	I872	V873	L874	P875	P876	H877	L878	E879	K897			
I898	Y904	G905	P906	V907	R908	D909	N910	N911	K912	R913	Q914	H915	L918	S922	K923	L924	P925	E926	Q927	M935	T939	T942	A945	L946	G947	C948	H949	V950	G951	I952	S953	A957	GLU	GLU	LYS	VAL	LYS	LYS	MET	LYS	LEU	PRO	ASN	Y970	Q971	L972	T973	S974	P978			
A979	S984	F985	I986	K987	P990	E993	Q1014	GLY	TRP	THR	TYR	GLY	ILE	GLN	GLN	ASP	ASP	VAL	LYS	ASN	R1027	M1028	N1029	L1032	V1033	L1038	D1039	D1040	R1041	T1042	K1043	K1044	S1045	N1046	K1047	D1048	S1049	L1050	R1051	E1052	A1053	V1054	L1057	L1064	E1065	A1066	PRO	ASP	GLN	ASP	HIS	ALA
ALA	ARG	ALA	GLU	VAL	CYS	SER	GLY	THR	GLY	GLU	R1084	F1085	L1086	R1089	A1090	E1091	K1092	T1093	Y1094	A1098	W1101	E1104	G1111	R1114	V1115	G1116	W1117	S1118	R1119	P1120	G1121	P1124	E1127	L1128	E1132	R1133	A1136	F1137	D1138	G1139	Q1143	R1144	W1145	H1146	Q1147	H1151	Y1152					

D2301	IIE	A2071	CYS	P1820	L1719	Q1620	A1545	L1489	ALA	G1153
R2304	THR	Q2072	PRO	L1821	L1726	C1621	V1552	ASP	SER	RL154
I2326		V2075	CYS	T1827	I1726	I1827	V1552	ARG	LEU	S1156
R2328		I2076	PRO	L1910	I1736	F1627	E1566	VAL	GLY	Q1157
F2329		R2083	GLU	L1911	I1736	M1628	E1566	ARG	PRO	A1158
E2330		L2088	ILE	L1912	L1738	S1629	E1566	THR	LYS	G1159
P2344		R2091	R1994	Q1912	L1738	S1629	E1566	THR	ASN	D1160
P2348		R2092	R1995	Q1912	L1739	H1630	E1566	THR	ASP	C1164
U2350		R2096	R1996	Q1912	F1739	H1631	E1566	THR	ASP	M1165
U2354		Q2092	L1997	D1741	P1740	H1632	E1566	THR	GLY	K1252
U2358		I2096	I1926	L1843	GLU	F1633	E1566	THR	ASP	R1264
U2362		V2100	F1929	I1846	ASN	P1633	E1566	THR	ASP	L1265
U2366		R2101	V1934	P1848	L1847	A1634	E1566	THR	ASP	P1266
U2370		A2102	V1934	S1849	LYS	E1635	E1566	THR	ALA	Q1257
U2374		L2103	Q1938	P1848	HIS	S1638	E1566	THR	ASP	F1258
U2378		L2103	Q1938	I1847	GLY	D1640	E1566	THR	ASP	V1261
U2382		Q2106	R1942	I1847	ALA	L1642	E1566	THR	ALA	M1174
U2386		T2106	V1948	L1753	ALA	E1643	E1566	THR	GLU	F1176
U2390		D2116	U1948	L1753	GLY	E1648	E1566	THR	VAL	L1177
U2394		T2117	U1948	L1757	PRO	E1574	E1566	THR	LEU	L1177
U2398		I2118	U1948	R1758	GLU	H1575	E1566	THR	GLU	M1178
U2402		L2121	U1948	M1761	GLU	L1651	E1566	THR	GLY	G1179
U2406		A2122	U1948	S1764	ASP	H1654	E1566	THR	LEU	E1180
U2410		S2123	U1948	S1765	THR	Y1655	E1566	THR	VAL	L1181
U2414		Q2126	U1948	S1766	GLU	R1659	E1566	THR	ALA	L1182
U2418		I2127	U1948	S1767	LYS	A1666	E1566	THR	HIS	L1183
U2422		M2136	U1948	F1768	GLU	L1667	E1566	THR	GLY	D1184
U2426		Q2136	U1948	Y1768	GLU	G1668	E1566	THR	ASP	D1185
U2430		G2142	U1948	N1772	ALA	H1669	E1566	THR	VAL	S1188
U2434		M2143	U1948	N1773	ALA	L1670	E1566	THR	ASP	E1189
U2438		I2144	U1948	E1774	GLU	H1671	E1566	THR	VAL	A1191
U2442		R2145	U1948	C1775	ASP	L1676	E1566	THR	VAL	F1192
U2446		G2148	U1948	Y1776	ARG	E1682	E1566	THR	GLY	K1193
U2450		M2152	U1948	Q1777	ARG	P1683	E1566	THR	ASP	D1194
U2454		N2153	U1948	Y1778	LEU	Q1684	E1566	THR	ASP	F1195
U2458		K2154	U1948	S1779	GLY	L1685	E1566	THR	LEU	D1196
U2462		Y2157	U1948	A1789	GLY	L1686	E1566	THR	PRO	V1197
U2466		P2160	U1948	I1792	ALA	Y1687	E1566	THR	F201	
U2470		V2177	U1948	E1797	ALA	I1688	E1566	THR	S1206	
U2474		G2181	U1948	A1798	GLU	I1689	E1566	THR	VAL	Y1209
U2478		GLY	U1948	V1799	GLU	K1692	E1566	THR	GLU	A1210
U2482		ASP	U1948	S1803	LYS	G1696	E1566	THR	VAL	Q1211
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U2490		THR	U1948	R1807	LEU	V1608	E1566	THR	TYR	V1221
U2494		GLY	U1948	I1611	ASN	S1609	E1566	THR	LEU	L1224
U2498		GLU	U1948	L1612	ARG	R1610	E1566	THR	GLN	L1224
U2502		THR	U1948	E1613	PRO	P1531	E1566	THR	ALA	F1227
U2506		ILE	U1948	S1536	LYS	P1536	E1566	THR	GLY	T1228
U2510		HIS	U1948	L1539	ASP	L1539	E1566	THR	PRO	F1227
U2514		MET	U1948	G1615	ASP	G1615	E1566	THR	ARG	F1227
U2518		G2386	U1948	Q1616	GLY	Q1616	E1566	THR	LEU	L1232
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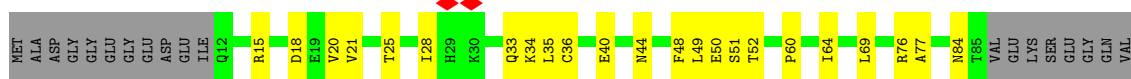


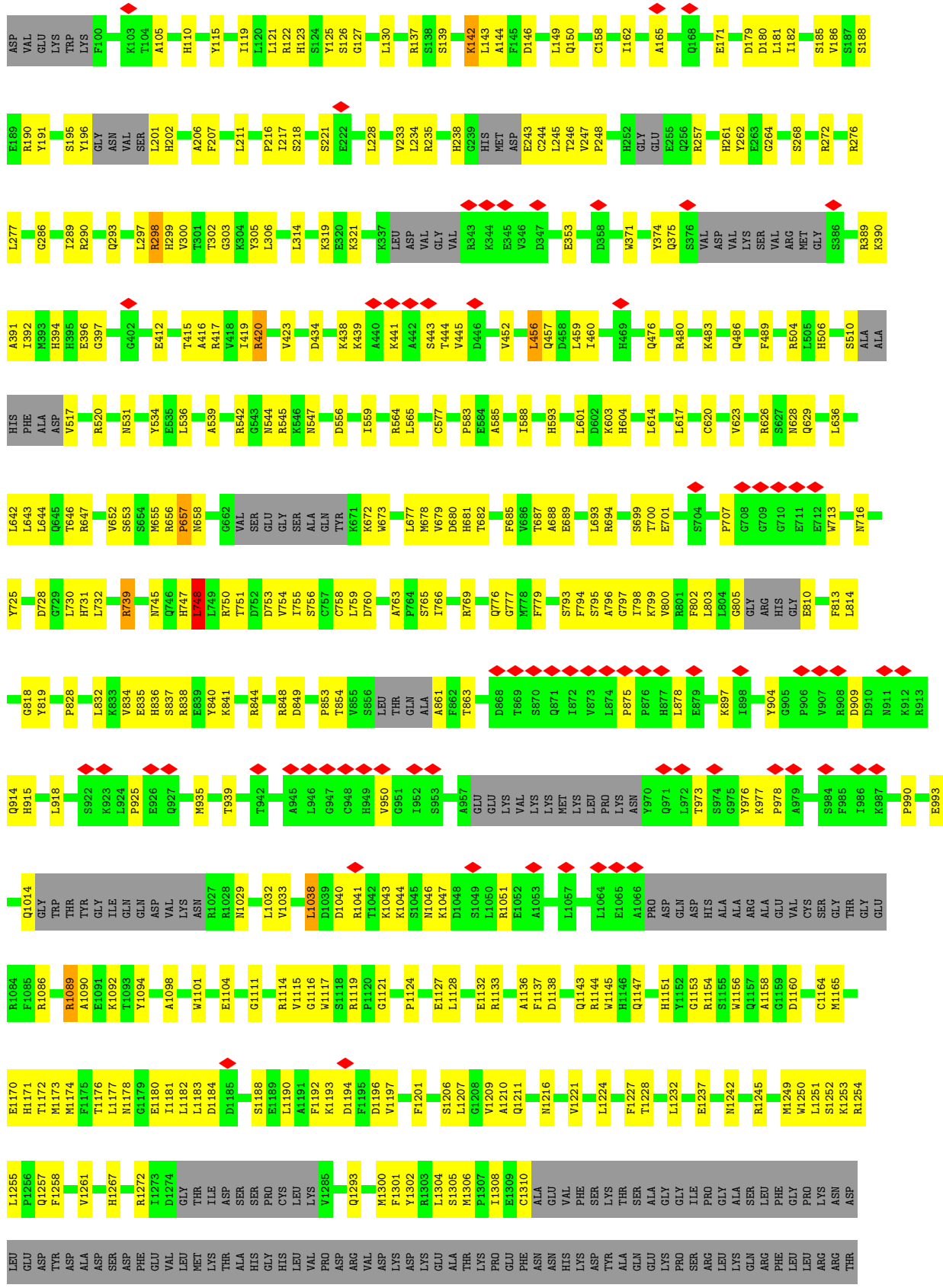
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PRO	LEU	ARG	VAL	V1552	L1621	I1737	L1843	R1922	D1995	I2076	C2197	R2329	ILE	R2421	R2461	GLY	L2803
LYS	ARG	ARG	ARG	V1556	L1622	F1738	L1844	R1926	Q1996	R2083	C2198	E2330	HIS	S2422	F2473	ILE	L2804
ASN	THR	THR	THR	E1556	F1627	P1740	E1846	I1926	L1998	L2088	R2199	E2331	ALA	I2423	S2424	ALA	L2805
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LEU	ASP	ASP	GLY	T1466	M1629	GLU	P1848	F1934	D2003	R2091	L2201	GLY	PRO	S2426	L2202	PRO	L2807
GLU	ASP	ASP	GLY	V1467	S1630	ASN	S1849	V1934	D2013	Q2092	C2202	ALA	ALA	S2427	C2202	ALA	L2808
TYR	TYR	THR	ILE	G1470	H1631	LYS	VAL	V1934	G2013	I2096	I2096	ALA	GLY	S2428	F2204	ALA	L2809
ASP	THR	ALA	ASN	K1473	H1632	HIS	PHE	Q1938	ASP	L2099	C2205	ARG	GLY	S2429	R2206	ARG	L2810
ALA	THR	ALA	ASN	G1474	H1633	LYS	GLU	Q1938	ASP	V2100	R2206	GLY	GLY	S2430	I2207	GLY	L2811
THR	THR	ALA	ASN	K1475	H1634	GLY	ALA	R1942	SER	R2101	I2207	GLY	GLY	S2431	I2207	GLY	L2812
THR	THR	ALA	ASN	R1482	H1635	GLY	GLY	V1948	ASP	A2102	Q2211	GLY	GLY	S2432	Q2211	GLY	L2813
THR	THR	ARG	LEU	S1483	H1638	GLY	PRO	MET	GLN	L2103	Q2212	ASN	ASN	S2433	L2103	ASN	L2814
VAL	LEU	ARG	LEU	G1483	H1639	GLY	GLY	MET	ALA	T2106	Y2221	GLY	GLY	S2434	T2106	GLY	L2815
LEU	THR	ARG	LEU	S1484	H1640	GLY	GLU	GLN	ALA	D2116	Y2221	GLY	GLY	S2435	T2117	GLY	L2816
LEU	THR	ARG	LEU	N1484	H1641	GLU	GLU	ALA	ASN	I2118	Y2222	GLY	GLY	S2436	I2117	GLY	L2817
LYS	ASP	ASP	ASP	CYS	H1642	R1758	SER	ASN	S2023	I2117	L2222	ALA	ALA	S2437	I2118	ALA	L2818
THR	VAL	THR	VAL	Y1486	H1643	M1761	THR	MET	D2023	R2121	S2232	ALA	ALA	S2438	R2121	ALA	L2819
ALA	LEU	LEU	LEU	M1487	H1644	M1762	LEU	ALA	L2024	A2122	P2233	GLY	GLY	S2439	R2122	GLY	L2820
HIS	ALA	LEU	LEU	E1574	H1645	S1764	GLU	ALA	T2025	A2123	P2233	GLY	GLY	S2440	R2123	GLY	L2821
GLY	ALA	ASP	ASP	C1489	T1645	S1765	LYS	LEU	R2027	A2124	P2233	THR	THR	S2441	S2123	THR	L2822
HIS	ASP	ASP	ASP	A1490	E1648	P1766	LYS	THR	L2030	G2124	D2250	PRO	PRO	S2442	S2123	PRO	L2823
LEU	ARG	ARG	ARG	GLY	L1651	P1766	GLY	ALA	V2034	Q2126	D2250	SER	SER	S2443	Q2126	SER	L2824
VAL	ASP	ASP	ASP	LEU	H1654	N1772	PRO	ALA	V2034	I2127	L2256	ARG	ARG	S2444	I2127	ARG	L2825
VAL	ASP	ASP	ASP	LEU	H1654	N1773	CYS	ALA	V2034	I2127	L2256	ARG	ARG	S2445	I2127	ARG	L2826
THR	TYR	TYR	TYR	VAL	H1666	E1774	ALA	ALA	T2038	M2135	G2274	THR	THR	S2446	M2135	THR	L2827
ASP	TYR	TYR	TYR	VAL	H1667	E1775	ALA	ALA	T2038	G2136	G2274	THR	THR	S2447	M2136	THR	L2828
ASP	LEU	LEU	LEU	GLY	H1668	Q1777	ASP	GLY	Y2039	L2040	LEU	LEU	LEU	S2448	L2040	LEU	L2829
LYS	GLN	GLN	GLN	GLY	Q1688	Q1777	SER	PHE	LYS	LYS	GLN	GLY	GLY	S2449	LYS	GLN	L2830
LYS	GLY	GLY	GLY	GLY	M1669	Y1778	ARG	ARG	LYS	LYS	GLY	GLY	GLY	S2450	LYS	GLY	L2831
ASP	THR	THR	THR	ARG	H1670	S1779	LEU	LEU	LYS	LYS	GLY	GLY	GLY	S2451	LYS	GLY	L2832
ALA	GLY	GLY	GLY	ARG	R1671	A1789	GLY	GLY	LYS	LYS	GLY	GLY	GLY	S2452	LYS	GLY	L2833
ALA	SER	SER	SER	SER	E1682	A1789	GLY	GLY	LYS	LYS	GLY	GLY	GLY	S2453	LYS	GLY	L2834
THR	THR	THR	THR	THR	P1683	I1792	ALA	ALA	LYS	LYS	GLY	GLY	GLY	S2454	LYS	GLY	L2835
LYS	PHO	PHO	PHO	PHO	Q1684	I1792	ALA	ALA	LYS	LYS	GLY	GLY	GLY	S2455	LYS	GLY	L2836
LYS	GLY	GLY	GLY	GLY	L1685	E1797	GLY	GLY	LYS	LYS	GLY	GLY	GLY	S2456	LYS	GLY	L2837
GLY	PHO	PHO	PHO	PHO	L1686	E1797	GLY	GLY	LYS	LYS	GLY	GLY	GLY	S2457	LYS	GLY	L2838
GLY	PHO	PHO	PHO	PHO	L1686	A1798	GLY	GLY	LYS	LYS	GLY	GLY	GLY	S2458	LYS	GLY	L2839
ASN	ASN	ASN	ASN	ASN	Y1687	A1799	SER	SER	LYS	LYS	GLY	GLY	GLY	S2459	LYS	GLY	L2840
ASN	ASN	ASN	ASN	ASN	A1688	V1799	LYS	LYS	LYS	LYS	GLY	GLY	GLY	S2460	LYS	GLY	L2841
HIS	HIS	HIS	HIS	HIS	I1689	S1803	GLY	GLY	LYS	LYS	GLY	GLY	GLY	S2461	LYS	GLY	L2842
ASP	ASP	ASP	ASP	ASP	K1692	R1807	GLY	GLY	LYS	LYS	GLY	GLY	GLY	S2462	LYS	GLY	L2843
GLY	GLY	GLY	GLY	GLY	K1696	D1808	GLY	GLY	LYS	LYS	GLY	GLY	GLY	S2463	LYS	GLY	L2844
GLN	ALA	ALA	ALA	ALA	G1696	P1809	PRO	PRO	LYS	LYS	GLY	GLY	GLY	S2464	LYS	GLY	L2845
GLY	ALA	ALA	ALA	ALA	R1699	F1816	GLY	GLY	LYS	LYS	GLY	GLY	GLY	S2465	LYS	GLY	L2846
GLY	GLY	GLY	GLY	GLY	R1699	L1817	GLY	GLY	LYS	LYS	GLY	GLY	GLY	S2466	LYS	GLY	L2847
GLY	GLY	GLY	GLY	GLY	Y1703	L1817	L1894	SER	LYS	LYS	GLY	GLY	GLY	S2467	LYS	GLY	L2848
GLY	GLY	GLY	GLY	GLY	T1716	P1820	M1907	GLY	LYS	LYS	GLY	GLY	GLY	S2468	LYS	GLY	L2849
GLY	GLY	GLY	GLY	GLY	L1719	L1821	C1908	PRO	LYS	LYS	GLY	GLY	GLY	S2469	LYS	GLY	L2850
GLY	GLY	GLY	GLY	GLY	L1719	L1821	C1908	PRO	LYS	LYS	GLY	GLY	GLY	S2470	LYS	GLY	L2851
GLY	GLY	GLY	GLY	GLY	L1719	L1821	C1908	PRO	LYS	LYS	GLY	GLY	GLY	S2471	LYS	GLY	L2852
GLY	GLY	GLY	GLY	GLY	L1719	L1821	C1908	PRO	LYS	LYS	GLY	GLY	GLY	S2472	LYS	GLY	L2853
GLY	GLY	GLY	GLY	GLY	L1719	L1821	C1908	PRO	LYS	LYS	GLY	GLY	GLY	S2473	LYS	GLY	L2854
GLY	GLY	GLY	GLY	GLY	L1719	L1821	C1908	PRO	LYS	LYS	GLY	GLY	GLY	S2474	LYS	GLY	L2855
GLY	GLY	GLY	GLY	GLY	L1719	L1821	C1908	PRO	LYS	LYS	GLY	GLY	GLY	S2475	LYS	GLY	L2856
GLY	GLY	GLY	GLY	GLY	L1719	L1821	C1908	PRO	LYS	LYS	GLY	GLY	GLY	S2476	LYS	GLY	L2857
GLY	GLY	GLY	GLY	GLY	L1719	L1821	C1908	PRO	LYS	LYS	GLY	GLY	GLY	S2477	LYS	GLY	L2858
GLY	GLY	GLY	GLY	GLY	L1719	L1821	C1908	PRO	LYS	LYS	GLY	GLY	GLY	S2478	LYS	GLY	L2859
GLY	GLY	GLY	GLY	GLY	L1719	L1821	C1908	PRO	LYS	LYS	GLY	GLY	GLY	S2479	LYS	GLY	L2860
GLY	GLY	GLY	GLY	GLY	L1719	L1821	C1908	PRO	LYS	LYS	GLY	GLY	GLY	S2480	LYS	GLY	L2861
GLY	GLY	GLY	GLY	GLY	L1719	L1821	C1908	PRO	LYS	LYS	GLY	GLY	GLY	S2481	LYS	GLY	L2862
GLY	GLY	GLY	GLY	GLY	L1719	L1821	C1908	PRO	LYS	LYS	GLY	GLY	GLY	S2482	LYS	GLY	L2863
GLY	GLY	GLY	GLY	GLY	L1719	L1821	C1908	PRO	LYS	LYS	GLY	GLY	GLY	S2483	LYS	GLY	L2864
GLY	GLY	GLY	GLY	GLY	L1719	L1821	C1908	PRO	LYS	LYS	GLY	GLY	GLY	S2484	LYS	GLY	L2865
GLY	GLY	GLY	GLY	GLY	L1719	L1821	C1908	PRO	LYS	LYS	GLY	GLY	GLY	S2485	LYS	GLY	L2866
GLY	GLY	GLY	GLY	GLY	L1719	L1821	C1908	PRO	LYS	LYS	GLY	GLY	GLY	S2486	LYS	GLY	L2867
GLY	GLY	GLY	GLY	GLY	L1719	L1821	C1908	PRO	LYS	LYS	GLY	GLY	GLY	S2487	LYS	GLY	L2868
GLY	GLY	GLY	GLY	GLY	L1719	L1821	C1908	PRO	LYS	LYS	GLY	GLY	GLY	S2488	LYS	GLY	L2869
GLY	GLY	GLY	GLY	GLY	L1719	L1821	C1908	PRO	LYS	LYS	GLY	GLY	GLY	S2489	LYS	GLY	L2870
GLY	GLY	GLY	GLY	GLY	L1719	L1821	C1908	PRO	LYS	LYS	GLY	GLY	GLY	S2490	LYS	GLY	L2871
GLY	GLY	GLY	GLY	GLY	L1719	L1821	C1908	PRO	LYS	LYS	GLY	GLY	GLY	S2491	LYS	GLY	L2872
GLY	GLY	GLY	GLY	GLY	L1719	L1821	C1908	PRO	LYS	LYS	GLY	GLY	GLY	S2492	LYS	GLY	L2873
GLY	GLY	GLY	GLY	GLY	L1719	L1821	C1908	PRO	LYS	LYS	GLY	GLY	GLY	S2493	LYS	GLY	L2874
GLY	GLY	GLY	GLY	GLY	L1719	L1821	C1908	PRO	LYS	LYS	GLY	GLY	GLY	S2494	LYS	GLY	L2875
GLY	GLY	GLY	GLY	GLY	L1719	L1821	C1908	PRO	LYS	LYS	GLY	GLY	GLY	S2495	LYS	GLY	L2876
GLY	GLY	GLY	GLY	GLY	L1719	L1821	C1908	PRO	LYS	LYS	GLY	GLY	GLY	S2496	LYS	GLY	L2877
GLY	GLY	GLY															

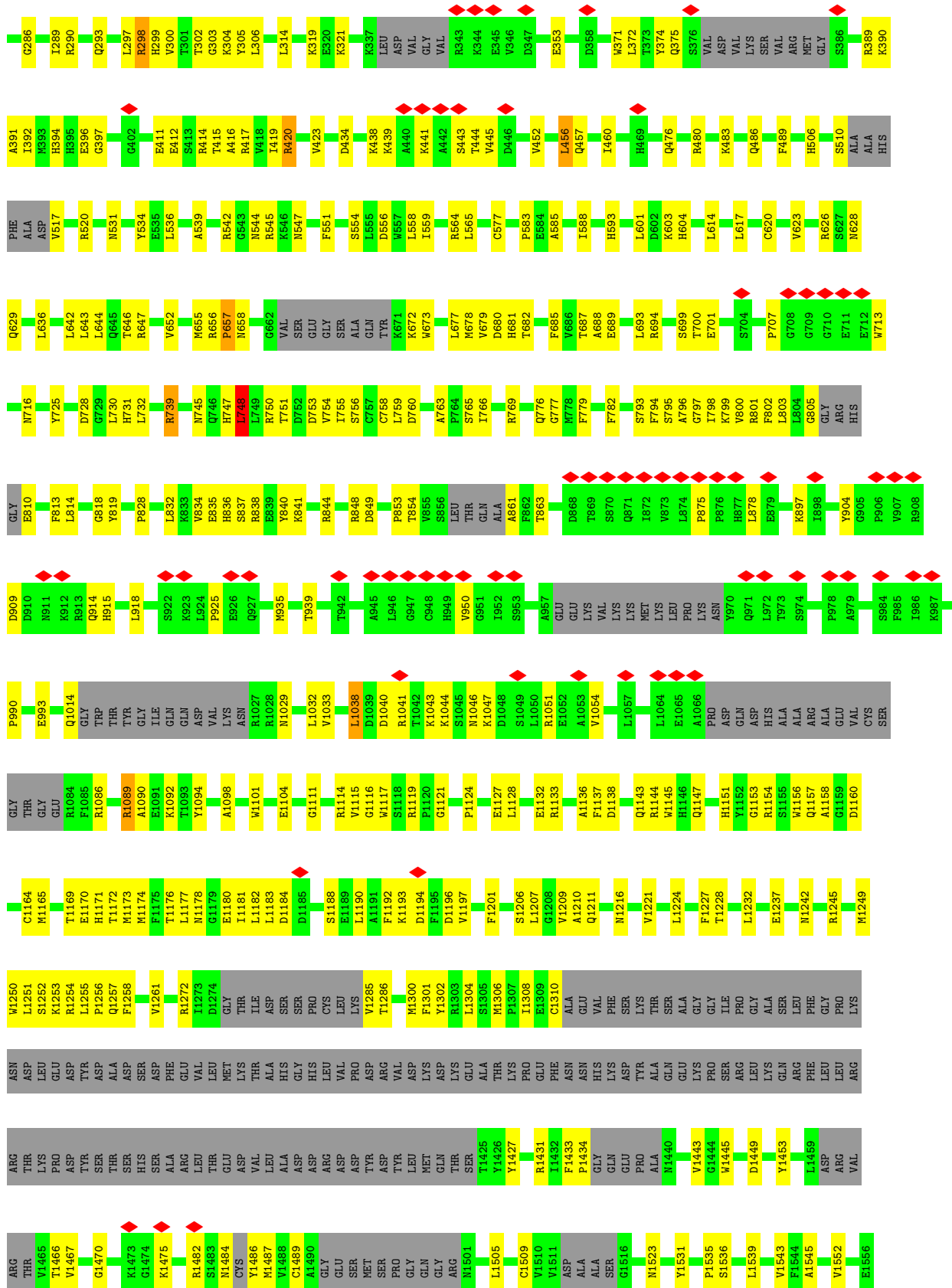
Table with 10 columns and multiple rows, containing protein residue IDs and codes. The table is organized into several vertical bands of data. Red diamonds are placed above certain residue IDs, and yellow bars highlight specific residue IDs. The bands are separated by vertical lines.

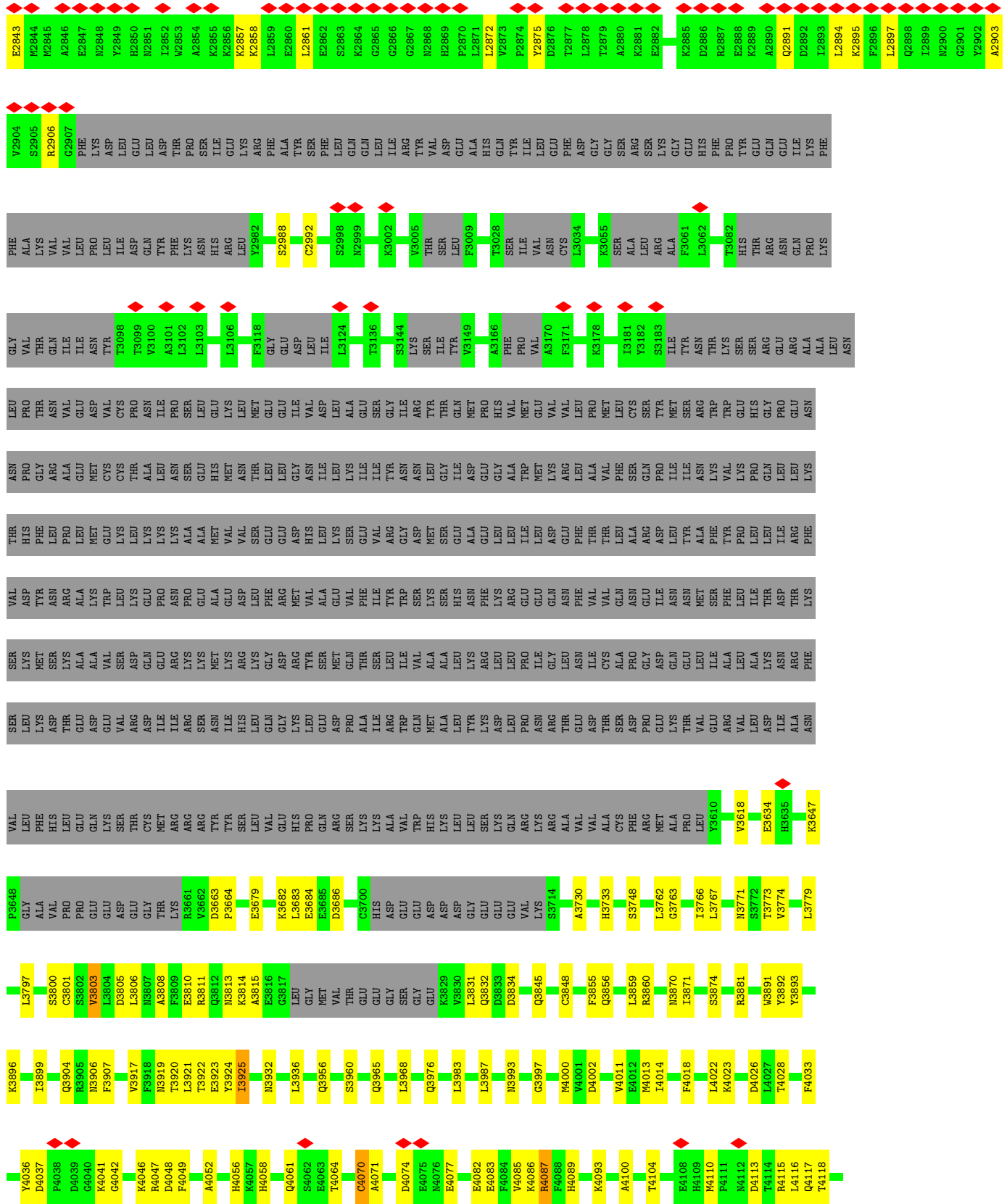


• Molecule 2: RyR2









4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C4	Depositor
Number of particles used	60287	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 ($e^-/\text{\AA}^2$)	48.6	Depositor
Minimum defocus (nm)	Not provided	
Maximum defocus (nm)	Not provided	
Magnification	Not provided	
Image detector	GATAN K2 SUMMIT (4k x 4k)	Depositor
Maximum map value	0.085	Depositor
Minimum map value	-0.039	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.004	Depositor
Recommended contour level	0.018	Depositor
Map size (Å)	522.616, 522.616, 522.616	wwPDB
Map dimensions	400, 400, 400	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.30654, 1.30654, 1.30654	Depositor

5 Model quality i

5.1 Standard geometry i

Bond lengths and bond angles in the following residue types are not validated in this section:
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	A	0.35	0/835	0.58	0/1123
1	C	0.35	0/835	0.58	0/1123
1	E	0.35	0/835	0.58	0/1123
1	G	0.35	0/835	0.58	0/1123
2	B	0.38	0/27132	0.62	12/36687 (0.0%)
2	D	0.38	0/27132	0.62	12/36687 (0.0%)
2	F	0.38	0/27132	0.62	12/36687 (0.0%)
2	H	0.38	0/27132	0.62	12/36687 (0.0%)
All	All	0.38	0/111868	0.61	48/151240 (0.0%)

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
2	B	0	29
2	D	0	29
2	F	0	29
2	H	0	29
All	All	0	116

There are no bond length outliers.

The worst 5 of 48 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	H	1753	LEU	CA-CB-CG	6.30	129.80	115.30
2	B	1753	LEU	CA-CB-CG	6.30	129.79	115.30
2	D	1753	LEU	CA-CB-CG	6.30	129.78	115.30
2	F	1753	LEU	CA-CB-CG	6.29	129.76	115.30

Continued on next page...

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	H	814	LEU	CA-CB-CG	5.94	128.97	115.30

There are no chirality outliers.

5 of 116 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
2	B	105	ALA	Peptide
2	B	142	LYS	Peptide
2	B	221	SER	Peptide
2	B	321	LYS	Peptide
2	B	657	PRO	Peptide

5.2 Too-close contacts [i](#)

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	A	819	0	824	25	0
1	C	819	0	824	25	0
1	E	819	0	824	26	0
1	G	819	0	824	24	0
2	B	26636	0	25174	673	0
2	D	26636	0	25174	667	0
2	F	26636	0	25174	671	0
2	H	26636	0	25174	682	0
3	B	1	0	0	0	0
3	D	1	0	0	0	0
3	F	1	0	0	0	0
3	H	1	0	0	0	0
All	All	109824	0	103992	2512	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 12.

The worst 5 of 2512 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:F:4520:PHE:CD1	2:F:4562:LEU:HD21	1.50	1.47
2:B:4520:PHE:CD1	2:B:4562:LEU:HD21	1.50	1.47
2:D:4520:PHE:CD1	2:D:4562:LEU:HD21	1.50	1.46
2:H:4520:PHE:CD1	2:H:4562:LEU:HD21	1.50	1.44
2:B:4808:ASP:HB3	2:D:4523:VAL:CG2	1.55	1.36

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	A	105/108 (97%)	95 (90%)	10 (10%)	0	100	100
1	C	105/108 (97%)	95 (90%)	10 (10%)	0	100	100
1	E	105/108 (97%)	95 (90%)	10 (10%)	0	100	100
1	G	105/108 (97%)	95 (90%)	10 (10%)	0	100	100
2	B	3365/4968 (68%)	2969 (88%)	382 (11%)	14 (0%)	34	72
2	D	3365/4968 (68%)	2969 (88%)	382 (11%)	14 (0%)	34	72
2	F	3365/4968 (68%)	2968 (88%)	383 (11%)	14 (0%)	34	72
2	H	3365/4968 (68%)	2968 (88%)	383 (11%)	14 (0%)	34	72
All	All	13880/20304 (68%)	12254 (88%)	1570 (11%)	56 (0%)	38	72

5 of 56 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
2	B	143	LEU
2	B	4595	LYS
2	D	143	LEU
2	D	4595	LYS
2	F	143	LEU

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	A	88/89 (99%)	87 (99%)	1 (1%)	73	85
1	C	88/89 (99%)	87 (99%)	1 (1%)	73	85
1	E	88/89 (99%)	87 (99%)	1 (1%)	73	85
1	G	88/89 (99%)	87 (99%)	1 (1%)	73	85
2	B	2688/4355 (62%)	2655 (99%)	33 (1%)	71	84
2	D	2688/4355 (62%)	2655 (99%)	33 (1%)	71	84
2	F	2688/4355 (62%)	2655 (99%)	33 (1%)	71	84
2	H	2689/4355 (62%)	2655 (99%)	34 (1%)	69	82
All	All	11105/17776 (62%)	10968 (99%)	137 (1%)	72	84

5 of 137 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
2	H	1054	VAL
2	H	2206	ARG
2	H	4518	LEU
2	D	2027	ARG
2	D	1089	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 198 such sidechains are listed below:

Mol	Chain	Res	Type
2	F	681	HIS
2	F	4160	GLN
2	F	1265	HIS
2	F	3813	ASN
2	H	23	GLN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

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

5.5 Carbohydrates [i](#)

There are no monosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 4 ligands modelled in this entry, 4 are monoatomic - leaving 0 for Mogul analysis.

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

No monomer is involved in short contacts.

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.

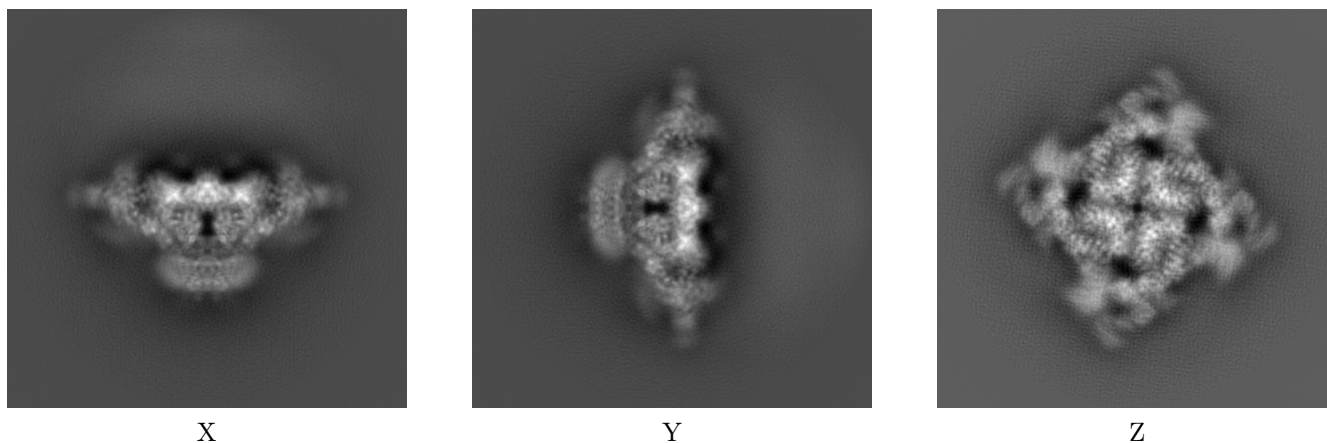
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-9824. These allow visual inspection of the internal detail of the map and identification of artifacts.

No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

6.1 Orthogonal projections [i](#)

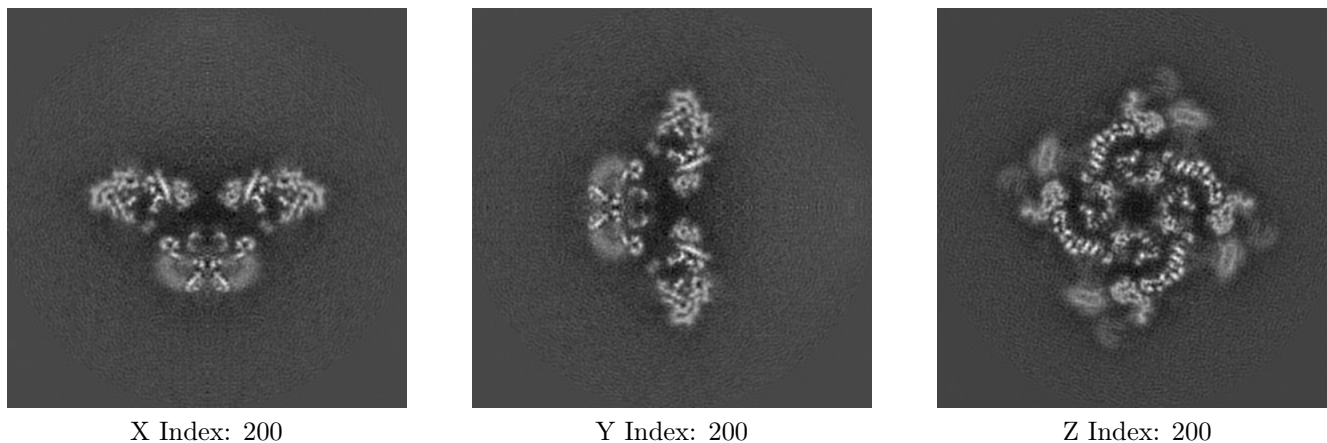
6.1.1 Primary map



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

6.2 Central slices [i](#)

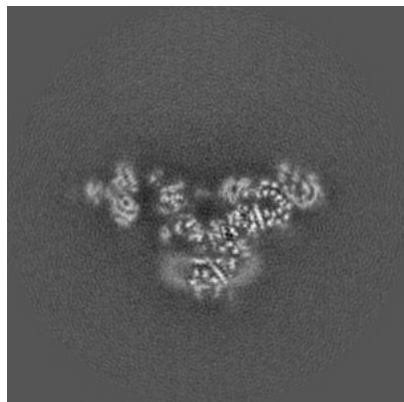
6.2.1 Primary map



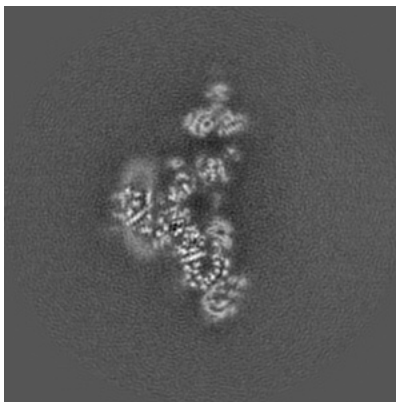
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [\(i\)](#)

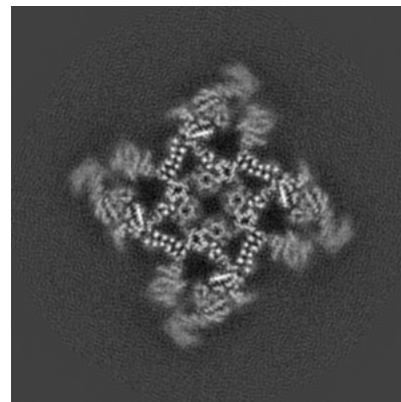
6.3.1 Primary map



X Index: 189



Y Index: 189

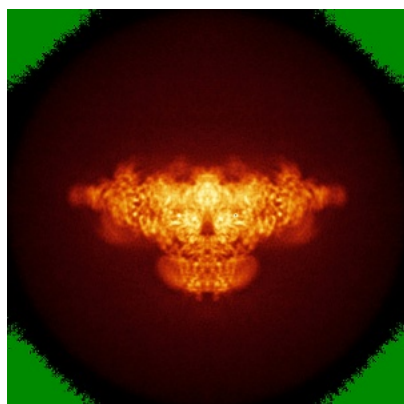


Z Index: 209

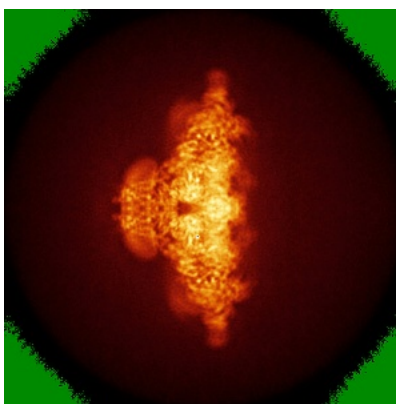
The images above show the largest variance slices of the map in three orthogonal directions.

6.4 Orthogonal standard-deviation projections (False-color) [\(i\)](#)

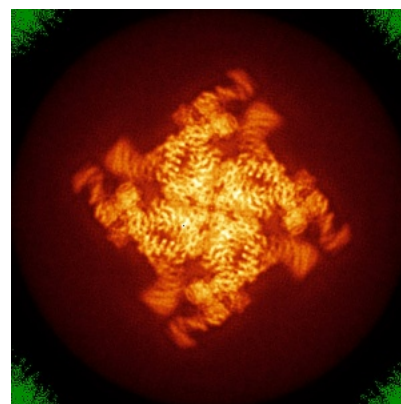
6.4.1 Primary map



X



Y

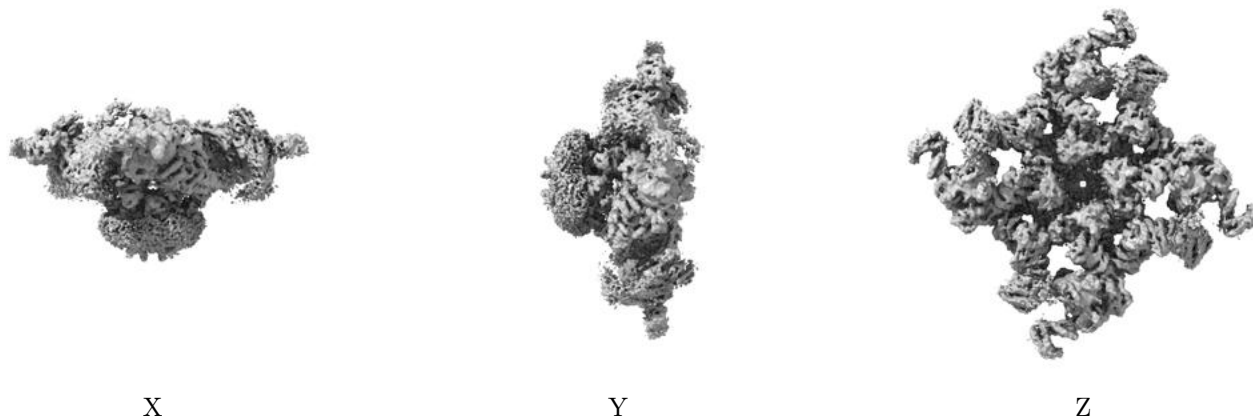


Z

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



The images above show the 3D surface view of the map at the recommended contour level 0.018. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

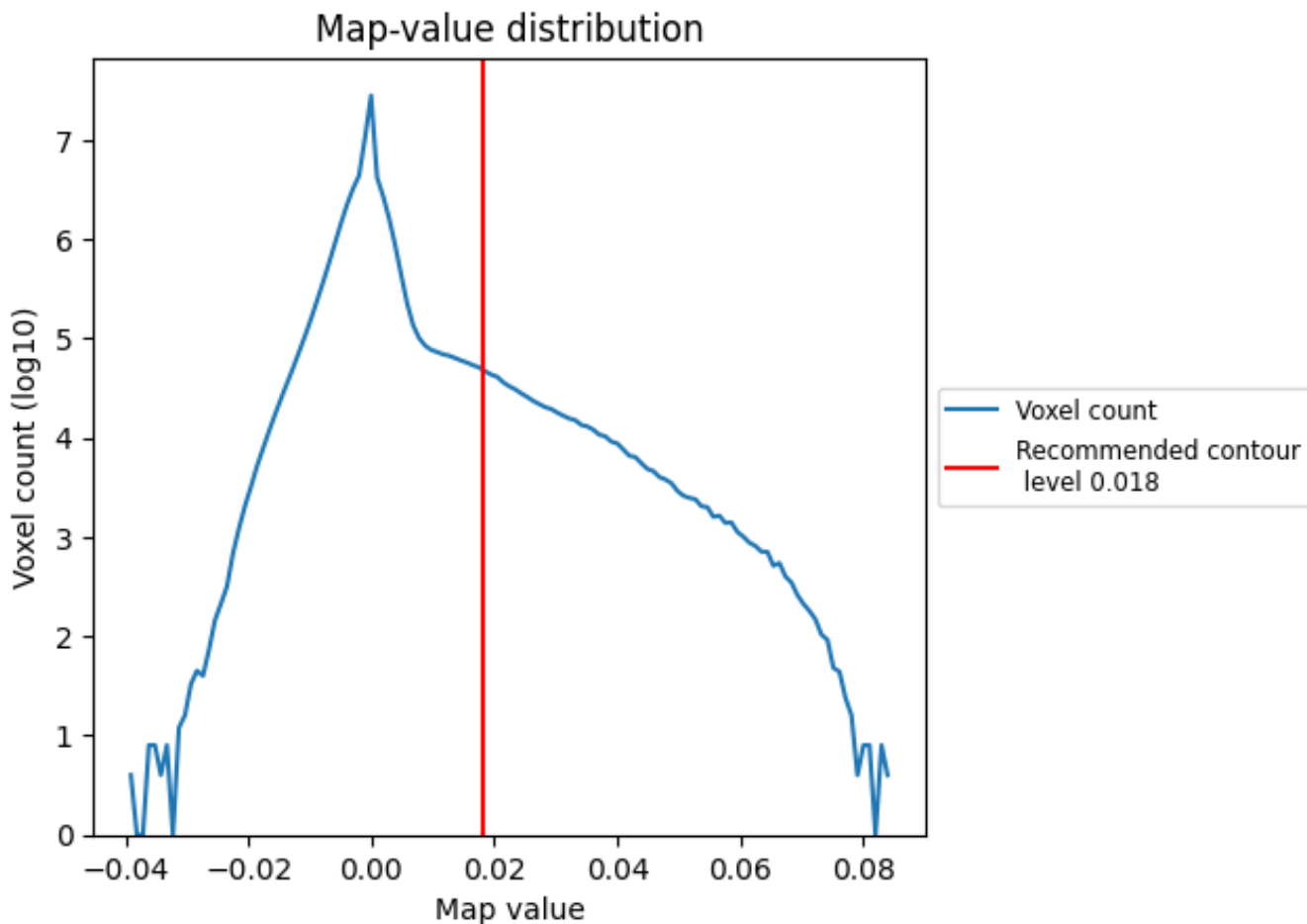
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

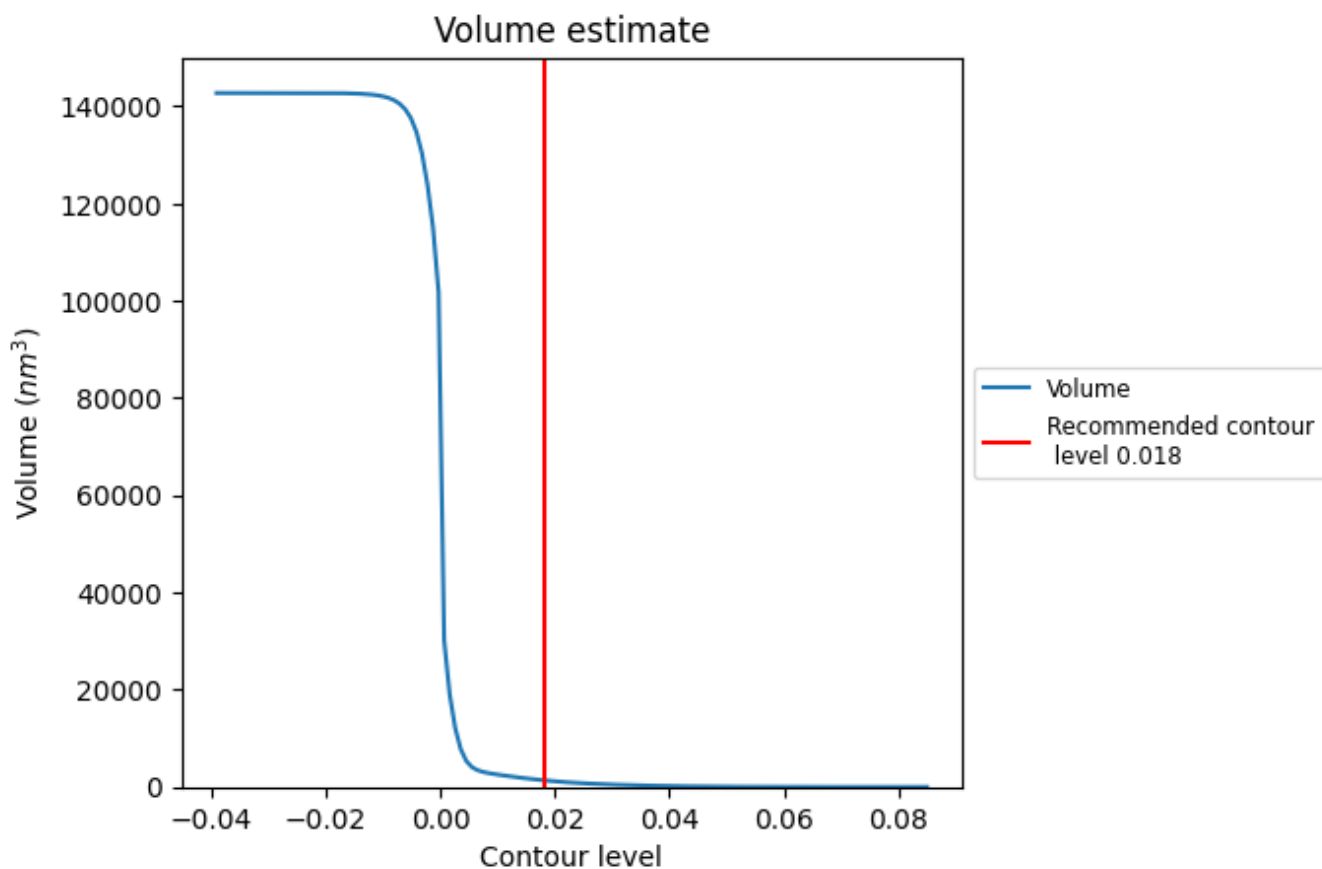
This section contains the results of statistical analysis of the map.

7.1 Map-value distribution [i](#)



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.

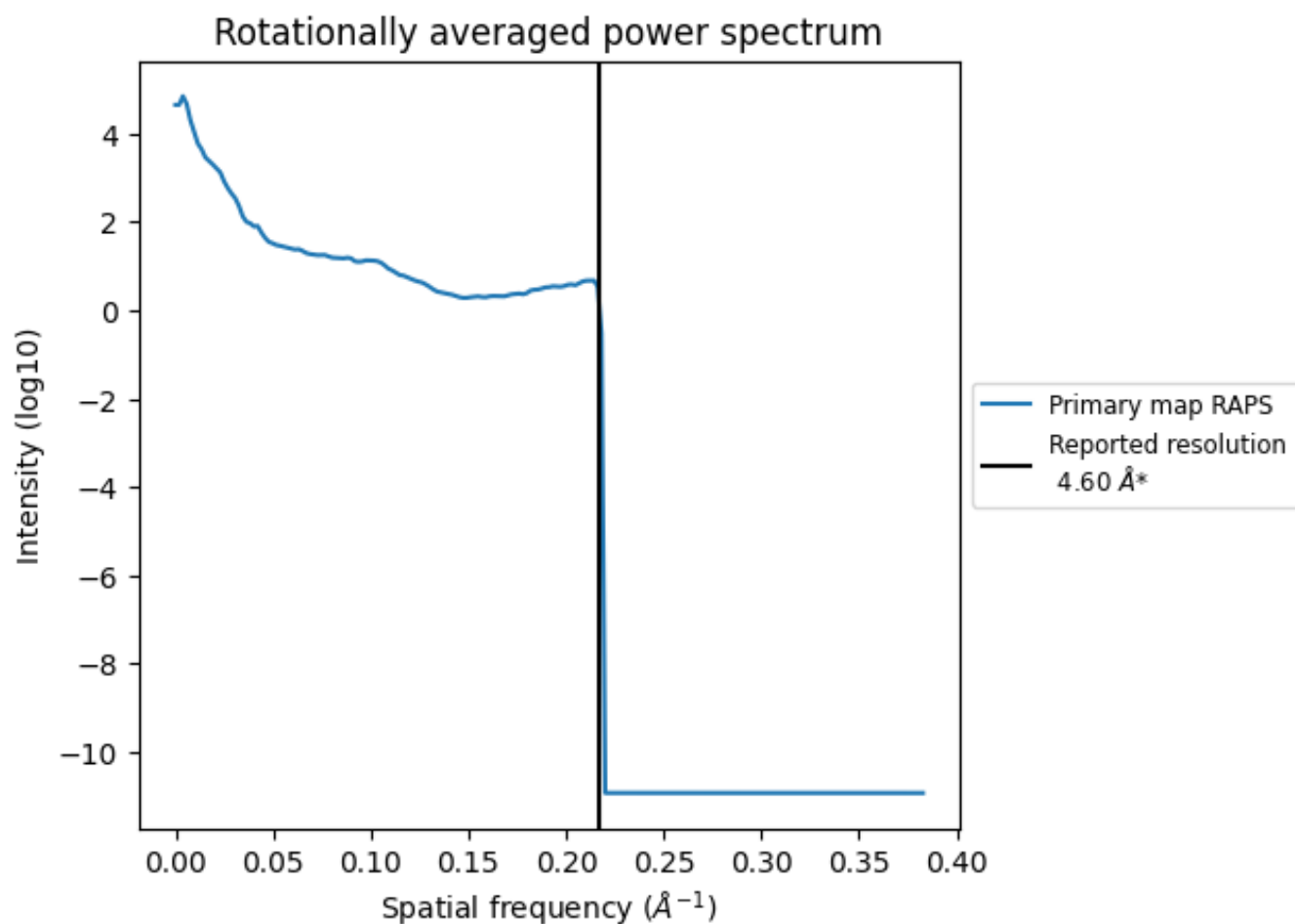
7.2 Volume estimate [\(i\)](#)



The volume at the recommended contour level is 1373 nm^3 ; this corresponds to an approximate mass of 1240 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 [\(i\)](#)

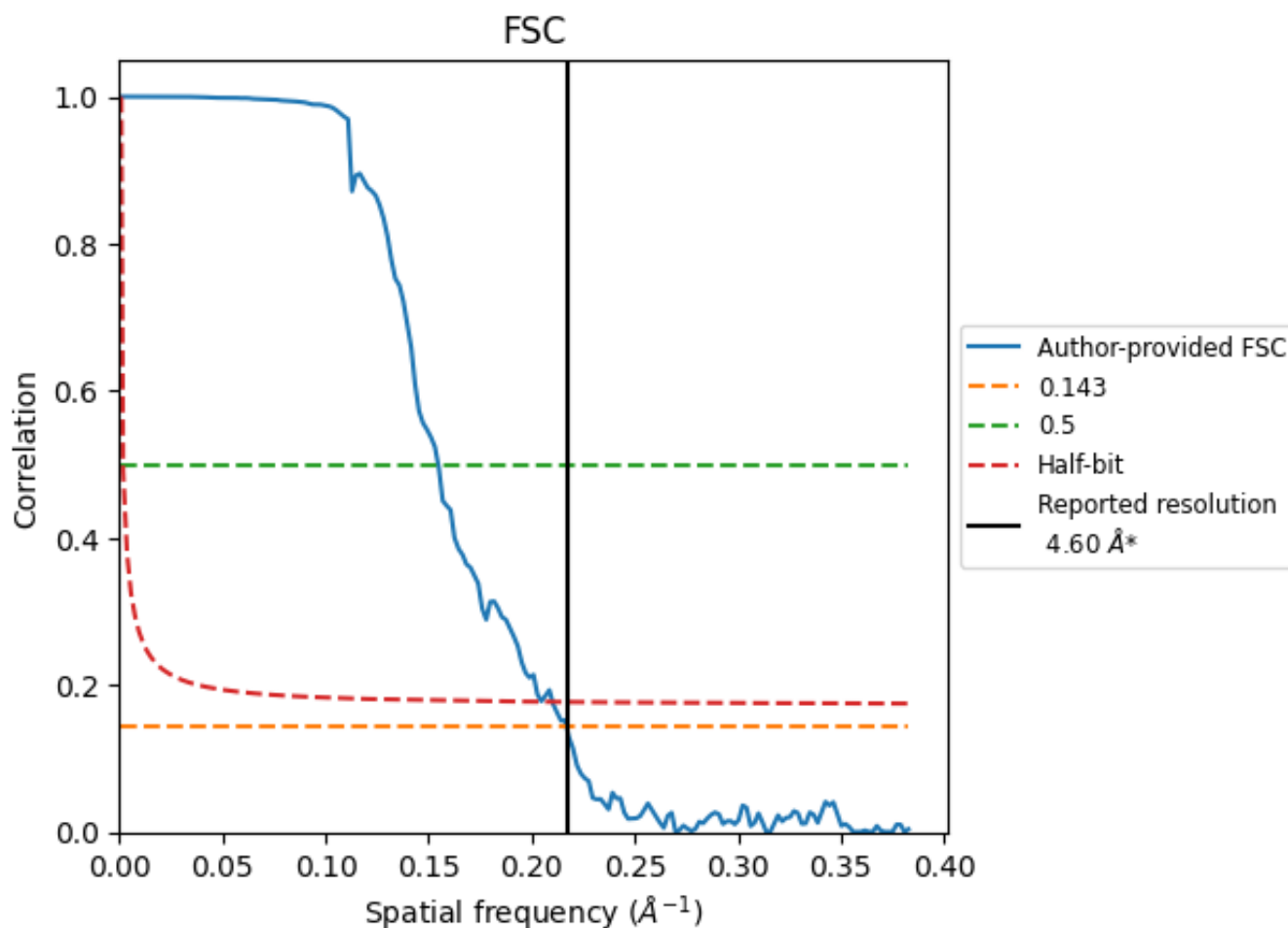


*Reported resolution corresponds to spatial frequency of 0.217 Å⁻¹

8 Fourier-Shell correlation [i](#)

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 [i](#)



*Reported resolution corresponds to spatial frequency of 0.217 Å⁻¹

8.2 Resolution estimates [i](#)

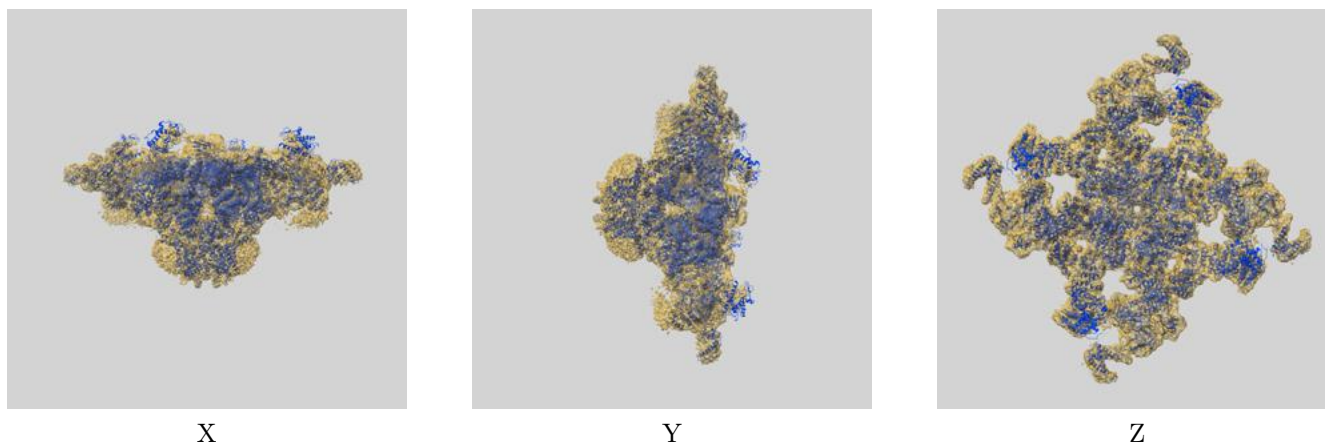
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	4.60	-	-
Author-provided FSC curve	4.61	6.46	4.76
Unmasked-calculated*	-	-	-

*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps.

9 Map-model fit [i](#)

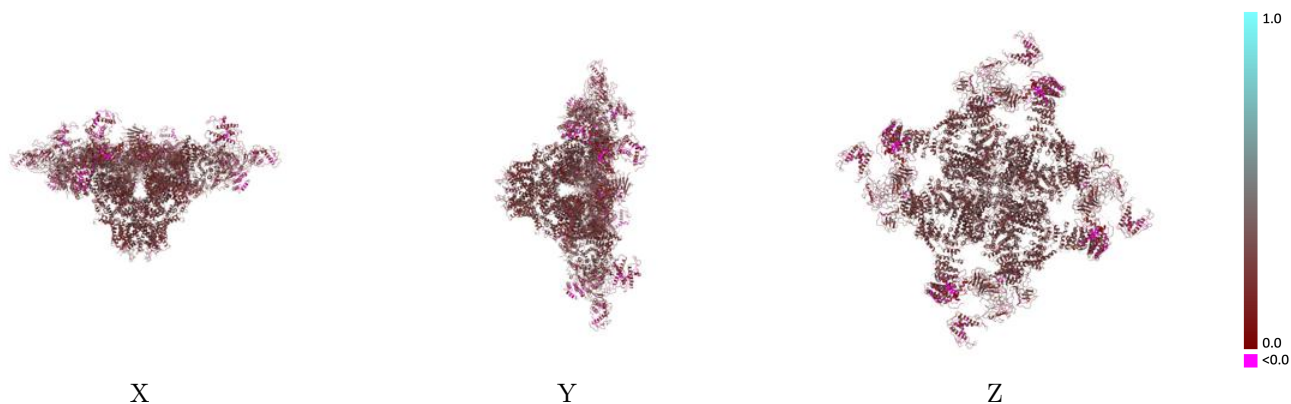
This section contains information regarding the fit between EMDB map EMD-9824 and PDB model 6JGZ. Per-residue inclusion information can be found in section [3](#) on page [4](#).

9.1 Map-model overlay [i](#)



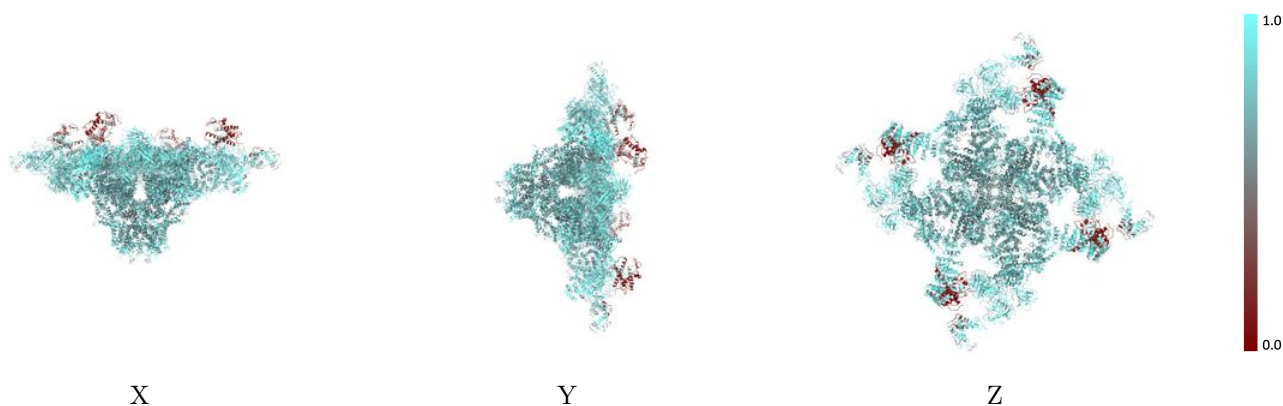
The images above show the 3D surface view of the map at the recommended contour level 0.018 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

9.2 Q-score mapped to coordinate model [i](#)



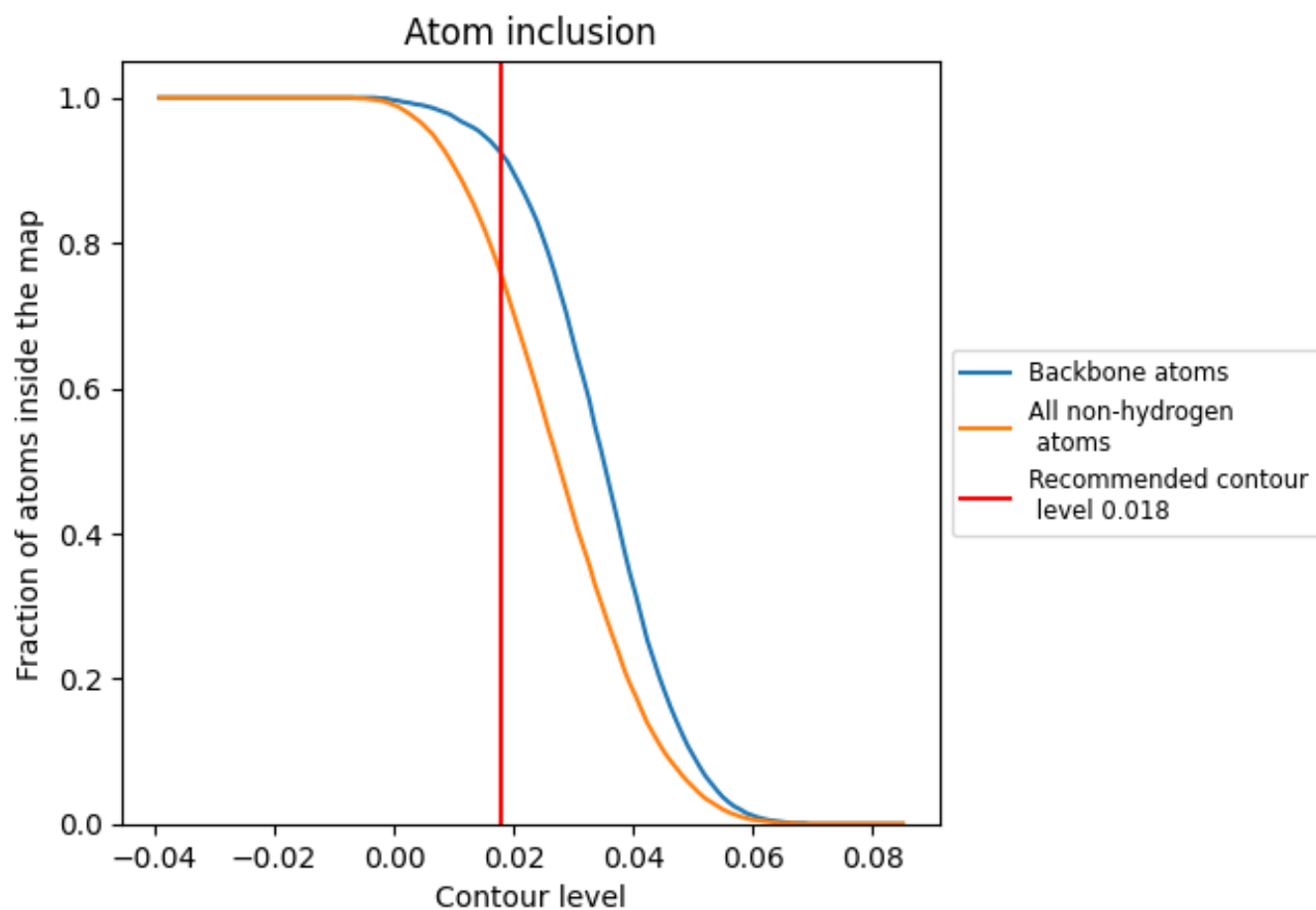
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 [i](#)



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 (0.018).



















9.4 Atom inclusion [i](#)



At the recommended contour level, 92% of all backbone atoms, 76% 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 (0.018) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.7550	 0.2490
A	 0.8170	 0.2650
B	 0.7530	 0.2480
C	 0.8190	 0.2650
D	 0.7530	 0.2490
E	 0.8170	 0.2650
F	 0.7530	 0.2480
G	 0.8140	 0.2650
H	 0.7530	 0.2480

