



wwPDB EM Validation Summary Report ⓘ

Jun 3, 2023 – 02:20 pm BST

PDB ID : 8BH3
EMDB ID : EMD-16044
Title : DNA-PK Ku80 mediated dimer bound to PAXX
Authors : Hardwick, S.W.; Chaplin, A.K.
Deposited on : 2022-10-28
Resolution : 4.55 Å(reported)

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.dev50
MolProbity : 4.02b-467
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
MapQ : 1.9.9
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.33

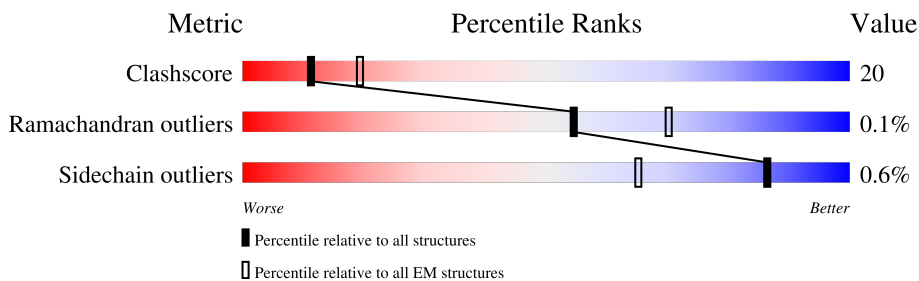
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 4.55 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	4128	
1	S	4128	
2	B	609	
2	T	609	
3	C	732	
3	L	732	
4	D	204	
4	M	204	

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
5	G	336	<p>18% 43% 16% 40%</p>
5	H	336	<p>26% 44% 12% 42%</p>
5	P	336	<p>25% 51% 8% 40%</p>
5	Q	336	<p>26% 48% 9% 42%</p>
6	I	911	<p>17% 10% 73%</p>
6	R	911	<p>17% 10% 73%</p>
7	j	25	<p>100%</p>
8	i	27	<p>100%</p>
9	d	26	<p>96%</p>
10	e	28	<p>96%</p>

2 Entry composition [i](#)

There are 10 unique types of molecules in this entry. The entry contains 89245 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 DNA-dependent protein kinase catalytic subunit.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	3550	Total	C	N	O	S	0	0
			27927	17939	4728	5074	186		
1	S	3540	Total	C	N	O	S	0	0
			27999	18001	4725	5087	186		

- Molecule 2 is a protein called X-ray repair cross-complementing protein 6.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
2	B	507	Total	C	N	O	S	0	0
			4038	2587	686	747	18		
2	T	502	Total	C	N	O	S	0	0
			4014	2569	680	747	18		

- Molecule 3 is a protein called X-ray repair cross-complementing protein 5.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
3	C	668	Total	C	N	O	S	0	0
			5292	3382	884	1000	26		
3	L	652	Total	C	N	O	S	0	0
			5174	3304	871	973	26		

- Molecule 4 is a protein called Protein PAXX.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
4	D	147	Total	C	N	O	S	0	0
			1075	689	183	197	6		
4	M	164	Total	C	N	O	S	0	0
			1195	754	207	228	6		

- Molecule 5 is a protein called DNA repair protein XRCC4.

Mol	Chain	Residues	Atoms					AltConf	Trace
5	G	201	Total	C	N	O	S	0	0
			1628	1031	278	312	7		
5	H	194	Total	C	N	O	S	0	0
			1589	1009	271	302	7		
5	P	201	Total	C	N	O	S	0	0
			1628	1031	278	312	7		
5	Q	194	Total	C	N	O	S	0	0
			1589	1009	271	302	7		

- Molecule 6 is a protein called DNA ligase 4.

Mol	Chain	Residues	Atoms					AltConf	Trace
6	I	246	Total	C	N	O	S	0	0
			1977	1256	336	372	13		
6	R	246	Total	C	N	O	S	0	0
			1958	1240	332	373	13		

- Molecule 7 is a DNA chain called DNA (25-MER).

Mol	Chain	Residues	Atoms					AltConf	Trace
7	j	25	Total	C	N	O	P	0	0
			509	244	86	154	25		

- Molecule 8 is a DNA chain called DNA (27-MER).

Mol	Chain	Residues	Atoms					AltConf	Trace
8	i	27	Total	C	N	O	P	0	0
			552	265	102	158	27		

- Molecule 9 is a DNA chain called DNA (26-MER).

Mol	Chain	Residues	Atoms					AltConf	Trace
9	d	26	Total	C	N	O	P	0	0
			528	253	89	160	26		

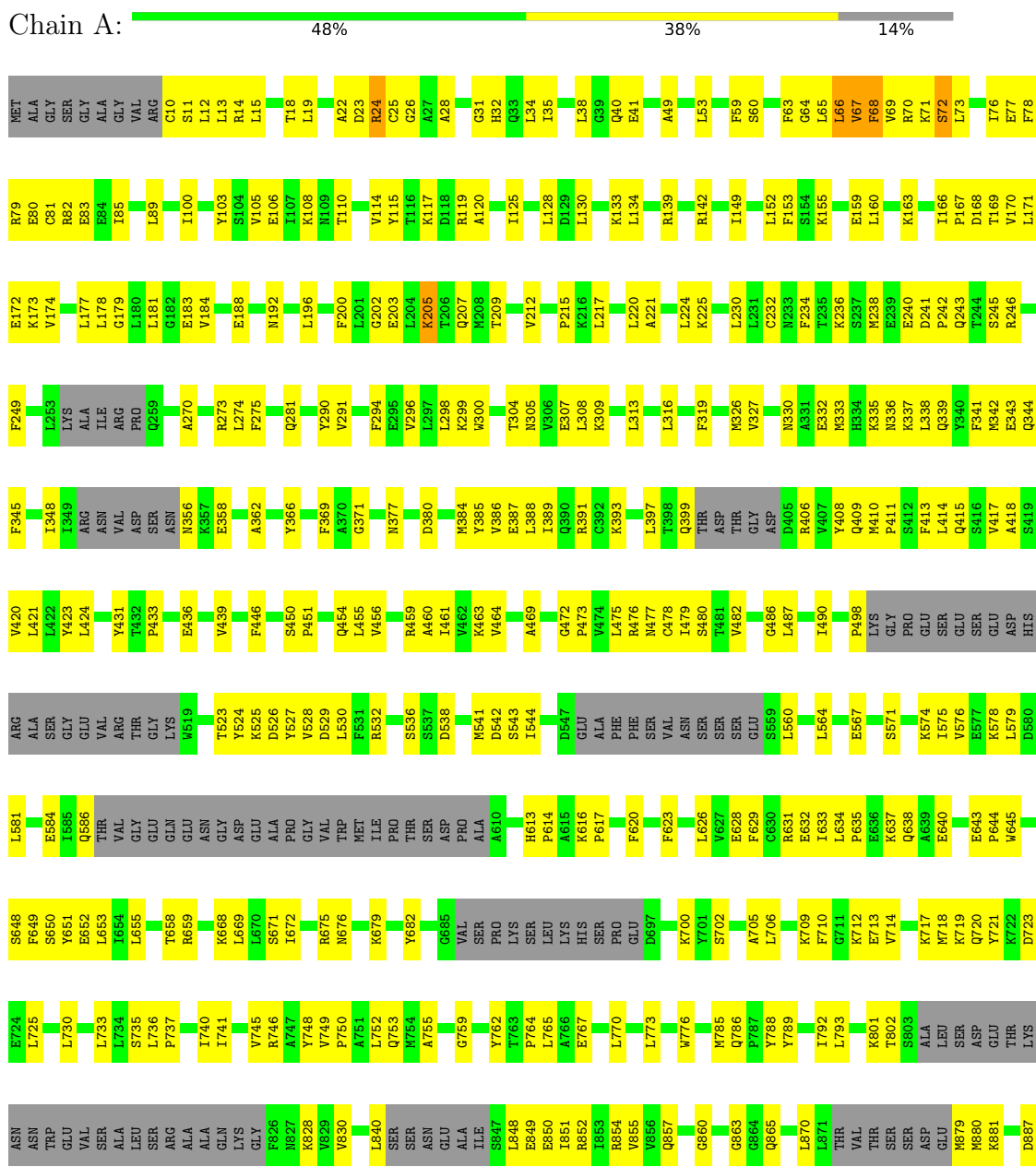
- Molecule 10 is a DNA chain called DNA (28-MER).

Mol	Chain	Residues	Atoms					AltConf	Trace
10	e	28	Total	C	N	O	P	0	0
			573	275	107	163	28		

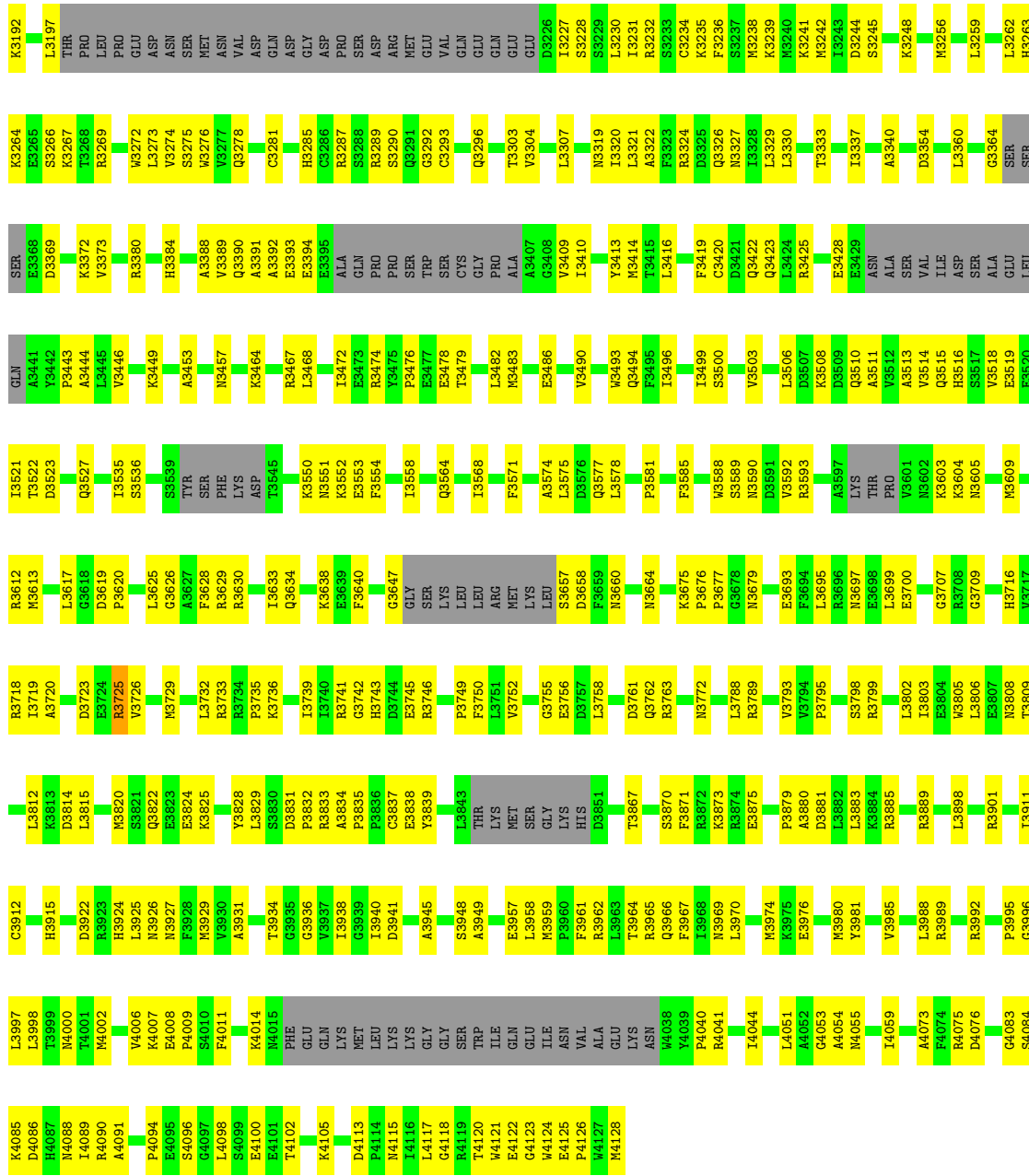
3 Residue-property plots

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.

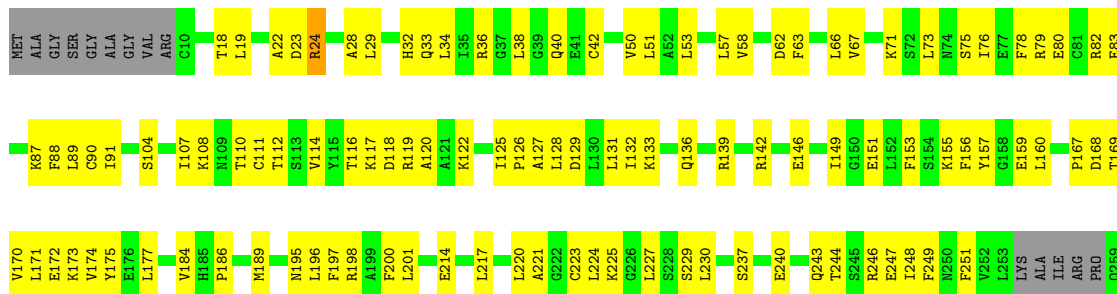
- Molecule 1: DNA-dependent protein kinase catalytic subunit



F1923	PHE	THR	R1783	L1710	TI621	SER	H1459	I1382	M1205	H1133	M1065	L972	R888
M1926	THR	R1784	R1787	R1711	TI625	SER	R1460	G1383	L1206	L1134	M1055	A973	E889
ALA	LYS	R1788	R1789	L1714	H1628	GLY	H1465	F1384	L1207	I1137	S1058	C974	K890
GLU	ASN	R1788	R1790	L1715	K1628	VAL	H1466	I1387	L1208	I1138	K1061	S993	
ASN	SER	R1788	R1791	E1715	P1469	ILE	L1467	G1387	E1215	E1139	R1062	F994	
THR	SER	T1793	T1794	I1718	W1632	H1552	P1469	K1311	S1218	L1145	L1066	A895	
GLN	VAL	Q1794	Q1795	F1722	S1637	F1553	H1477	C1312	G1228	H1146	R981	F898	
LEU	GLY	G1796	G1797	P1723	P1638	S1554	H1478	F1313	GLY	K1147	R982	R899	
LEU	ASN	D1864	D1865	M1724	M1639	Y1558	Y1479	THR	Q1231	A1148	L983	E900	
LEU	ASN	L1934	L1935	Q1725	Q1640	Y1559	G1480	ALA	P1232	K1149	M1070	M901	
ASN	SER	E1935	E1936	S1726	T1641	Y1560	T1481	ALA	I1235	R1150	N1071	K902	
GLN	THR	M1871	M1872	R1727	K1642	S1561	L1482	GLY	I1235	R1152	K1074	P903	
ASN	THR	G1872	G1873	E1728	L1482	L1562	L1483	ASN	Q1238	R1075	R1074	V904	
GLN	THR	Y1940	Y1941	F1729	L1488	L1563	L1488	ARG	P1239	L1076	L1075	V905	
LEU	THR	M1875	M1876	P1730	Y1488	E1564	Y1488	ARG	T1240	P1154	G1077	I905	
LEU	THR	E1803	E1804	F1731	Y1488	E1565	Y1488	ARG	LEU	G1077	A1078	F910	
LEU	THR	F1805	F1806	L1648	Y1488	E1566	Y1488	ARG	LEU	A1081	A1081	R913	
LEU	THR	R1806	R1807	L1649	Y1488	T1567	Y1488	ARG	LEU	F1082	F1082	V914	
LEU	THR	L1807	L1808	L1650	Y1488	T1568	Y1488	ARG	LEU	T995	T995	F995	
LEU	THR	M1880	M1881	L1651	Y1488	T1569	Y1488	ARG	LEU	F1082	F1082	E916	
LEU	THR	Y1881	Y1882	I1652	Y1488	T1570	Y1488	ARG	LEU	M1083	M1083	E916	
LEU	THR	M1881	M1882	I1652	Y1488	T1571	Y1488	ARG	LEU	N997	N997	L917	
LEU	THR	P1885	P1886	F1661	Y1488	L1574	Y1488	ARG	LEU	M1084	M1084	A918	
LEU	THR	L1885	L1886	M1662	Y1488	M1575	Y1488	ARG	LEU	N998	N998	L919	
LEU	THR	P1885	P1886	M1663	Y1488	L1576	Y1488	ARG	LEU	K1000	K1000	T920	
LEU	THR	L1885	L1886	M1663	Y1488	L1577	Y1488	ARG	LEU	Q1004	Q1004	A921	
LEU	THR	P1885	P1886	M1663	Y1488	L1578	Y1488	ARG	LEU	A1008	A1008	S922	
LEU	THR	L1885	L1886	M1663	Y1488	L1579	Y1488	ARG	LEU	L1009	L1009	R924	
LEU	THR	P1885	P1886	M1663	Y1488	L1580	Y1488	ARG	LEU	L1010	L1010	Q925	
LEU	THR	L1885	L1886	M1663	Y1488	L1581	Y1488	ARG	LEU	E1011	E1011	T926	
LEU	THR	P1885	P1886	M1663	Y1488	L1582	Y1488	ARG	LEU	A1012	A1012	V928	
LEU	THR	L1885	L1886	M1663	Y1488	L1583	Y1488	ARG	LEU	I1013	I1013	L933	
LEU	THR	P1885	P1886	M1663	Y1488	L1584	Y1488	ARG	LEU	D1015	D1015	L934	
LEU	THR	L1885	L1886	M1663	Y1488	L1585	Y1488	ARG	LEU	G1016	G1016	H935	
LEU	THR	P1885	P1886	M1663	Y1488	L1586	Y1488	ARG	LEU	I1017	I1017	S936	
LEU	THR	L1885	L1886	M1663	Y1488	L1587	Y1488	ARG	LEU	V1018	V1018	M937	
LEU	THR	P1885	P1886	M1663	Y1488	L1588	Y1488	ARG	LEU	M1019	M1019	V938	
LEU	THR	L1885	L1886	M1663	Y1488	L1589	Y1488	ARG	LEU	P1020	P1020	M941	
LEU	THR	P1885	P1886	M1663	Y1488	L1590	Y1488	ARG	LEU	D1022	D1022	M941	
LEU	THR	L1885	L1886	M1663	Y1488	L1591	Y1488	ARG	LEU	S1023	S1023	K944	
LEU	THR	P1885	P1886	M1663	Y1488	L1592	Y1488	ARG	LEU	T1024	T1024	K944	
LEU	THR	L1885	L1886	M1663	Y1488	L1593	Y1488	ARG	LEU	D1117	D1117	Q947	
LEU	THR	P1885	P1886	M1663	Y1488	L1594	Y1488	ARG	LEU	E1118	E1118	Q953	
LEU	THR	L1885	L1886	M1663	Y1488	L1595	Y1488	ARG	LEU	K1119	K1119	G954	
LEU	THR	P1885	P1886	M1663	Y1488	L1596	Y1488	ARG	LEU	S1120	S1120	G955	
LEU	THR	L1885	L1886	M1663	Y1488	L1597	Y1488	ARG	LEU	E1035	E1035	A955	
LEU	THR	P1885	P1886	M1663	Y1488	L1598	Y1488	ARG	LEU	W1039	W1039	P956	
LEU	THR	L1885	L1886	M1663	Y1488	L1599	Y1488	ARG	LEU	T1123	T1123	P957	
LEU	THR	P1885	P1886	M1663	Y1488	L1600	Y1488	ARG	LEU	C1127	C1127	M958	
LEU	THR	L1885	L1886	M1663	Y1488	L1601	Y1488	ARG	LEU	Q1043	Q1043	Y959	
LEU	THR	P1885	P1886	M1663	Y1488	L1602	Y1488	ARG	LEU	W1039	W1039	M958	
LEU	THR	L1885	L1886	M1663	Y1488	L1603	Y1488	ARG	LEU	Q1049	Q1049	Q960	
LEU	THR	P1885	P1886	M1663	Y1488	L1604	Y1488	ARG	LEU	I1131	I1131	L961	
LEU	THR	L1885	L1886	M1663	Y1488	L1605	Y1488	ARG	LEU	S1052	S1052	K963	
LEU	THR	P1885	P1886	M1663	Y1488	L1606	Y1488	ARG	LEU				
LEU	THR	L1885	L1886	M1663	Y1488	L1607	Y1488	ARG	LEU				
LEU	THR	P1885	P1886	M1663	Y1488	L1608	Y1488	ARG	LEU				
LEU	THR	L1885	L1886	M1663	Y1488	L1609	Y1488	ARG	LEU				
LEU	THR	P1885	P1886	M1663	Y1488	L1610	Y1488	ARG	LEU				
LEU	THR	L1885	L1886	M1663	Y1488	L1611	Y1488	ARG	LEU				
LEU	THR	P1885	P1886	M1663	Y1488	L1612	Y1488	ARG	LEU				
LEU	THR	L1885	L1886	M1663	Y1488	L1613	Y1488	ARG	LEU				
LEU	THR	P1885	P1886	M1663	Y1488	L1614	Y1488	ARG	LEU				
LEU	THR	L1885	L1886	M1663	Y1488	L1615	Y1488	ARG	LEU				
LEU	THR	P1885	P1886	M1663	Y1488	L1616	Y1488	ARG	LEU				
LEU	THR	L1885	L1886	M1663	Y1488	L1617	Y1488	ARG	LEU				
LEU	THR	P1885	P1886	M1663	Y1488	L1618	Y1488	ARG	LEU				

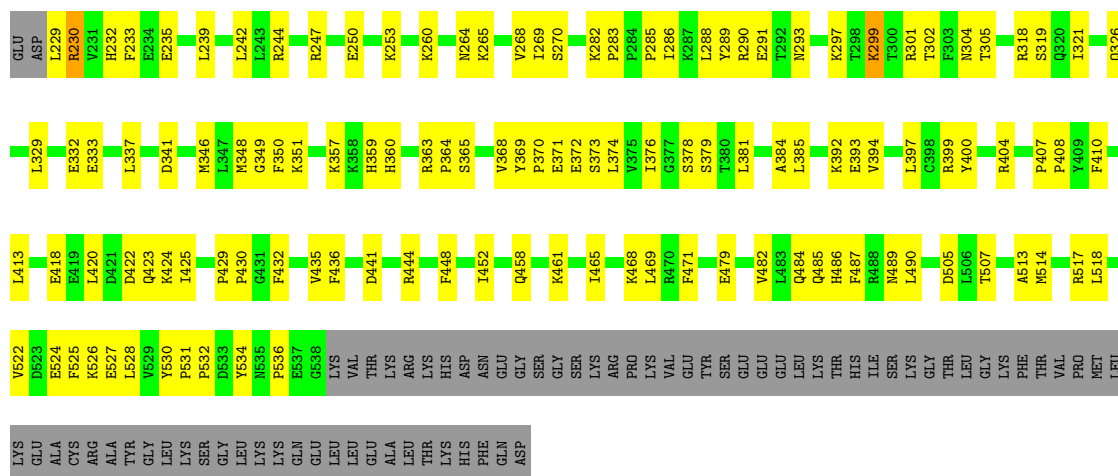


● Molecule 1: DNA-dependent protein kinase catalytic subunit

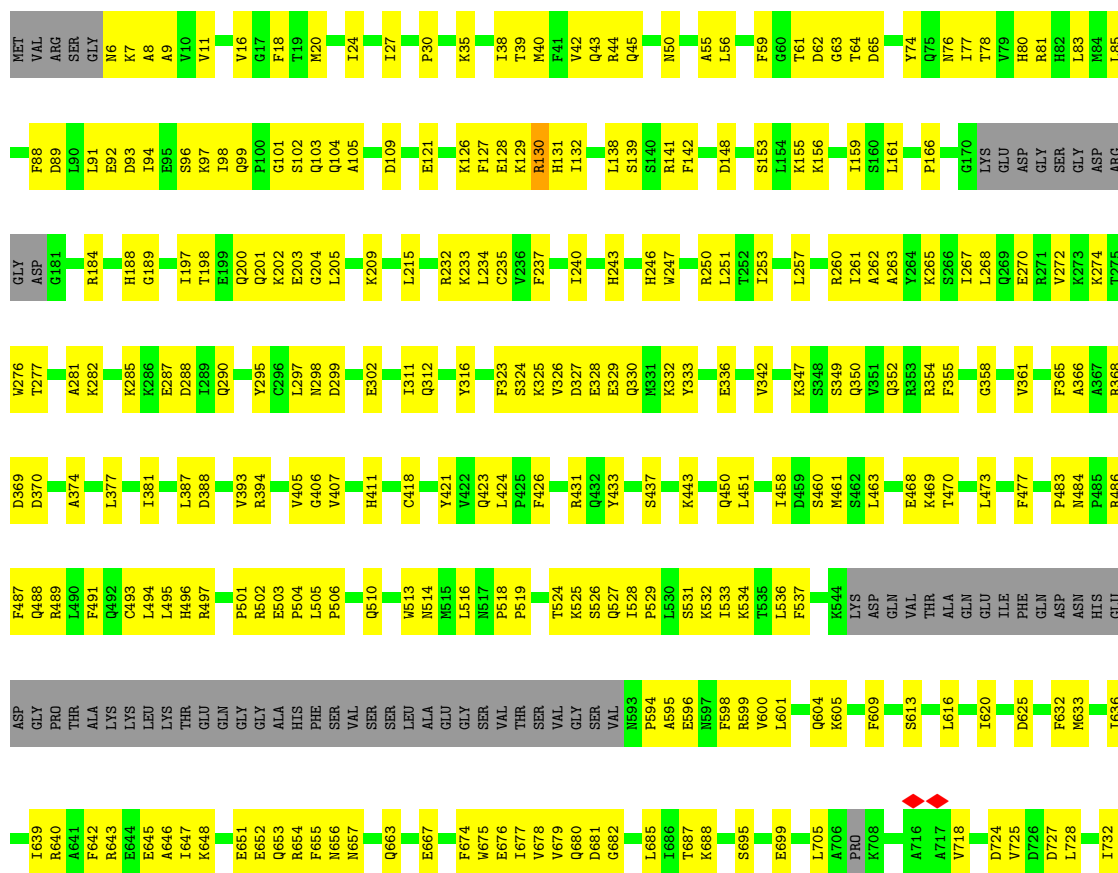


H1385	H1386	V1389	Q1390	V1391	D1397	V1398	W1400	N1401	H1403	H1404	A1405	L1406	S1409	P1410	K1412	D1413	I1414	L1415	E1416	L1417	H1418	L1419	R1420	E1421	K1422	L1423	T1424	Q1426	D1444	R1445	S1446	R1447	L1448	V1452	L1458	H1459	R1460	N1466	I1467	P1469	D1474	V1479	L1483	L1484															
H1304	D1305	I1306	I1307	C1312	F1313	GLY	THR	GLY	ALA	ALA	GLY	ASN	ARG	T1322	E1326	R1329	Y1330	N1331	Y1332	S1333	K1334	V1337	V1338	L1339	R1340	I1341	M1342	E1343	S1352	W1356	K1357	L1358	K1360	K1361	H1367	L1368	M1369	R1370	V1371	L1372	V1373	Q1374	L1376	C1377	E1378	P1379	T1382	I1383	F1384										
K1213	F1219	L1220	I1221	E1225	Q1231	P1232	S1233	G1234	I1235	L1236	T1240	LEU	LEU	TVR	LEU	ARG	GLY	PRO	PHE	S1249	I1253	L1254	C1255	M1256	L1257	D1258	L1259	L1260	L1261	A1262	E1265	G1266	Y1267	T1275	A1278	L1279	Q1280	V1281	L1282	G1283	T1284	A1293	F1296	F1297	L1298	E1299	S1300	I1301	L1212										
I1181	D1182	H1183	L1184	C1185	E1186	I1187	I1188	I1189	E1190	K1191	L1192	F1193	V1194	G1195	C1196	L1197	L1198	P1199	G1200	R1201	R1202	M1205	K1209	D1210	V1211	L1212	K1008	Q1004	E1011	A1012	I1013	D1014	D1015	G1016	I1017	V1018	D1019	S1023	D1026	F1028	C1029	G1030	R1031	C1032	I1033	R1034	L1037	K1038	W1039	M1042	Q1043	Q1044	T1045	C1128					
Q1048	K1051	N1055	T1056	K1057	S1058	R1062	L1063	Y1064	S1065	H1069	L1075	L1076	G1077	A1078	S1079	L1080	A1081	F1082	I1085	F1096	R1098	L1099	R1090	L1095	V1096	E1097	Q1098	F1099	V1100	F1101	E1102	A1103	L1104	V1105	I1106	Y1107	M1108	E1109	H1115	A1116	D1117	E1118	L1121	G1122	T1123	L1124	Q1125	Q1126	C1127	C1128									
V896	P897	F898	M901	K902	P903	V904	SER	SER	SER	ASN	GLU	ALA	ILE	S847	L848	D849	E850	E851	L851	R852	M853	Q854	P855	Y856	M858	L859	G860	S861	L862	C863	C864	Q865	R866	N867	L868	M869	L870	L871	THR	VAL	THR	SER	SER	ASP	GLU	M879	M880	K881	S882	Y883	D887	R888	E889	K890	R891	L892	S893	F894	A895
T965	F966	L972	A973	C974	D975	V976	D977	Q978	V979	T980	R981	Q982	R913	V914	E915	E916	L917	A918	L919	T920	R854	A921	S922	D923	E924	Q925	T926	K927	V928	E932	L933	L934	H935	N936	M937	V938	M939	F940	M941	L942	K944	A945	T946	Q947	G952	A955	P956	P957	M958	Y959	Q960	L961	Y962	K963	R964				
G759	L760	S761	T763	K681	L765	A766	E767	V768	G769	L770	W776	T780	D781	R782	H783	V784	M785	Q786	P787	Y788	Y789	K790	D791	L792	L793	G798	K801	T802	S803	ALA	LEU	SER	ASP	GLU	THR	THR	THR	LYS	ASN	ASN	TRP	GLU	VAL	SER	ALA	SER	LEU	SER	ARG	ALA	ALA	E742	GLN	LYS	GLY	F826	L831		
R675	K678	K679	I680	P681	V682	G685	V686	SER	PRD	PRD	LYS	SER	LEU	LYS	HIS	D542	S543	I544	D547	GLU	ALA	PHE	PHE	SER	VAL	P635	E636	K637	E640	F641	E643	F644	W645	L726	A727	S728	C729	F732	L733	S735	L736	P737	H738	N739	I740	F666	E742	GLN	LYS	GLY	F826	L831							
E260	D261	Y265	A270	L274	F275	H278	Q281	L286	F294	E295	V296	L297	L298	K299	W300	C301	A302	H303	T304	N305	L308	K309	S314	A315	L316	E317	S318	F319	L320	V323	M326	V327	N330	Q344	I348	I349	ARG	ASN	VAL	ASP	SER	ASN	K356	L357	E358														
L359	S360	A362	I363	R364	K374	D380	V381	F383	M384	Y385	V386	E387	L388	I389	Q390	R391	F396	L397	THR	GLN	THR	THR	ASP	THR	GLY	ASP	ARG	V407	S412	F413	L414	Q415	S416	V417	V420	L424	D425	E429	V430	Y431	T432	P433	W434	L435	L438														
F446	P447	Q448	S450	K452	M453	Q454	L455	A460	I461	A462	K463	V464	A469	L475	R476	N477	C478	I479	V482	G486	R489	I490	C491	S492	K493	P498	LYS	GLY	PRO	GLU	SER	GLU	ASP	HIS	ARG	ALA	SER	GLY	GLU	VAL	GLU	GLN	ARG	THR	GLY	ASP	ALA												
Y524	K525	D526	Y527	D528	L530	F531	R532	H533	L534	S537	M540	M541	D542	S543	I544	D547	GLU	ALA	PHE	PHE	SER	VAL	ASN	SER	SER	SER	E589	L560	L564	S571	V572	L573	K574	I575	T582	L583	E584	I585	Q586	THR	VAL	GLY	GLU	GLU	GLN	GLN	GLU	GLN	ASN	GLY	ASP	GLU	ALA						
GLY	VAL	TRP	MET	ILE	THR	SER	ASP	PRD	ALA	A610	H613	P614	A615	F620	M625	L626	V627	E628	R631	E632	P635	E636	K637	E640	F641	E643	F644	W645	F649	S650	Y651	E652	L653	L654	L655	R659	L662	T663	S664	G665	F666	E667	K668	L669	L670	S671	I672	L758											

K3873	V3770	S3657	D3570	R3467	R3380	V3272	K3029	L2921	E2828	K2746	LEU	THR
R3874	K3771	D3661	L3575	L3468	H3384	L3273	P3034	R2922	K2829	G2747	LEU	ARG
K3877	G3772	M3664	L3578	I3472	V3389	W3277	F3035	W2923	N2830	V2748	PHE	THR
R3889	L3774	M3665	L3579	R3474	E3393	R3276	F3036	W2924	N2831	A2749	ALA	GLN
S3893	L3775	L3666	S3579	R3475	E3394	W3277	Q3037	E2925	I2832	O2750	HIS	GLY
P3894	D3778	K3669	K3580	Y3475	E3395	R3282	E3038	A2927	T2833	Q2751	LYS	GLY
E3895	C3781	K3675	P3581	T3479	ALA	L3283	L3041	L2929	Q2834	K2752	ARG	SER
A3896	A3785	K3679	E3582	L3480	GLN	R3287	M3044	R2930	F2847	E2756	GLU	SER
F3897	P3676	M3483	V3588	L3480	PRO	Q3291	S3047	R2931	T2848	I2757	ARG	ALA
L3898	S3677	G3676	K3589	L3480	TRP	Q3291	K3048	Y2936	F2853	E2760	TRP	TRP
R3901	K3679	N3679	D3591	M3483	SER	Q3291	K3048	D2937	F2854	L2761	VAL	VAL
A3909	K3680	L3680	V3592	I3487	TRP	T3299	L3049	W2938	P2857	L2761	ALA	ALA
C3912	V3793	K3681	R3593	I3487	SER	V3300	K3050	L2939	C2857	K2764	GLY	GLY
I3913	K3682	E3682	A3594	V3490	CYS	L3301	L3051	R2940	D2860	Q2765	LEU	GLN
S3914	E3683	C3683	E3595	V3490	GLY	K3302	L3052	G2941	D2860	Q2765	LYS	GLN
E3915	S3684	S3684	L3596	M3493	PRO	T3303	L3053	G2942	D2860	V2769	VAL	ILE
H3915	P3685	P3685	A3597	I3496	ALA	V3304	A3134	F2943	C2863	V2769	VAL	ALA
M3915	M3687	M3687	L3597	I3496	A3407	S3305	L3135	Q3059	Q2864	R2773	GLY	ALA
I3920	G3707	G3707	V3601	I3499	I3410	L3307	T3136	L3061	H2865	R2776	ASP	GLN
H3924	L3712	L3712	N3602	I3499	Y3413	N3311	K3158	L3062	A2866	R2776	PHE	GLN
L3925	P3713	P3713	K3603	M3502	M3414	V3312	R3159	T3062	A2867	H2777	GLY	GLN
N3926	E3714	E3714	I3606	M3502	F3419	S3313	K3168	T3063	L2868	G2778	LYS	GLN
M3929	R3718	R3718	I3606	D3509	C3420	Y3315	D3066	I3138	L2868	H2778	LYS	HIS
V3930	R3719	R3719	M3613	V3512	Q3423	S3317	D3067	I3138	Q2885	D2779	LYS	ASP
T3934	A3720	A3720	V3614	V3512	L3424	K3318	K3075	E3140	Q2886	L2780	ARG	PHE
V3937	L3617	L3617	L3618	H3516	E3429	R3324	K3075	E3140	C2880	L2780	LEU	THR
I3938	E3724	E3724	D3619	I3521	ASN	R3324	L3078	S2966	R2891	H2787	LEU	THR
G3939	R3725	R3725	P3620	I3521	ALA	K3238	L3078	E2967	L2892	S2788	GLY	GLY
I3940	V3726	V3726	P3620	P3620	SER	K3239	A3171	P2986	L2893	S2789	VAL	ASP
D3941	T3727	T3727	K3621	Y3525	VAL	M3242	Y3082	P2986	E2894	L2790	ASN	SER
A3949	V3728	V3728	A3622	V3530	ILE	F3243	E3085	A2989	E2895	I2791	LYS	SER
P3956	M3729	M3729	F3628	V3530	ASP	D3244	E3085	A2989	L2897	T2792	VAL	PHE
E3957	R3734	R3734	R3628	S3539	SER	S3245	L3088	E2990	L2899	P2793	ASP	ASP
L3958	P3735	P3735	R3630	TVR	ALA	K3248	L3088	K2991	R2899	L2794	LEU	TRP
F3961	K3736	K3736	K3632	SER	LEU	Q3249	L3091	W2994	L2900	Q2795	ALA	ALA
R3962	R3741	R3741	Q3634	L3359	GLN	K3249	L3092	L2989	L2901	D2801	ALA	THR
L3963	G3742	G3742	Q3634	I3359	ALA	F3252	L3092	L2989	PRO	F2802	GLY	GLY
T3964	H3743	H3743	F3640	L3360	GLU	L3254	D3095	D3000	ALA	I2803	SER	SER
R3965	D3744	D3744	S3647	L3362	LEU	L3254	V3096	H3004	GLU	I2803	THR	THR
Q3966	E3745	E3745	T3547	L3363	GLN	L3258	R3098	L3005	LEU	A2805	ASP	ASP
F3967	R3746	R3746	K3550	G3364	V3446	L3259	K3099	L3005	PRO	Q2807	LEU	LEU
E3968	F3747	F3747	N3551	SER	R3449	L3260	K3100	C3014	LYS	L2817	VAL	VAL
N3969	K3750	K3750	F3554	SER	M3460	E3261	Y3101	S3015	ARG	L2817	ARG	ARG
L3970	F3751	F3751	V3555	SER	M3460	E3261	Y3101	S3015	VAL	E2819	VAL	HIS
M3971	T3867	T3867	V3559	SER	A3453	H3263	I3103	E3022	ARG	K2818	GLY	THR
L3972	S3870	S3870	K3559	SER	A3454	H3263	I3103	ASN	GLY	K2818	GLY	SER
P3973	L3767	L3767	K3559	SER	K3455	D3369	THR	PRO	LYS	Q2736	THR	SER
M3974	L3767	L3767	K3559	SER	K3455	D3369	THR	PRO	ALA	E2737	PRO	PRO
					A3461	R3268	PRO	LEU	ALA	F2823	SER	SER
					R3462	R3269	PRO	LEU	ARG	S2740	ASP	ASP
										L2825	ASP	SER

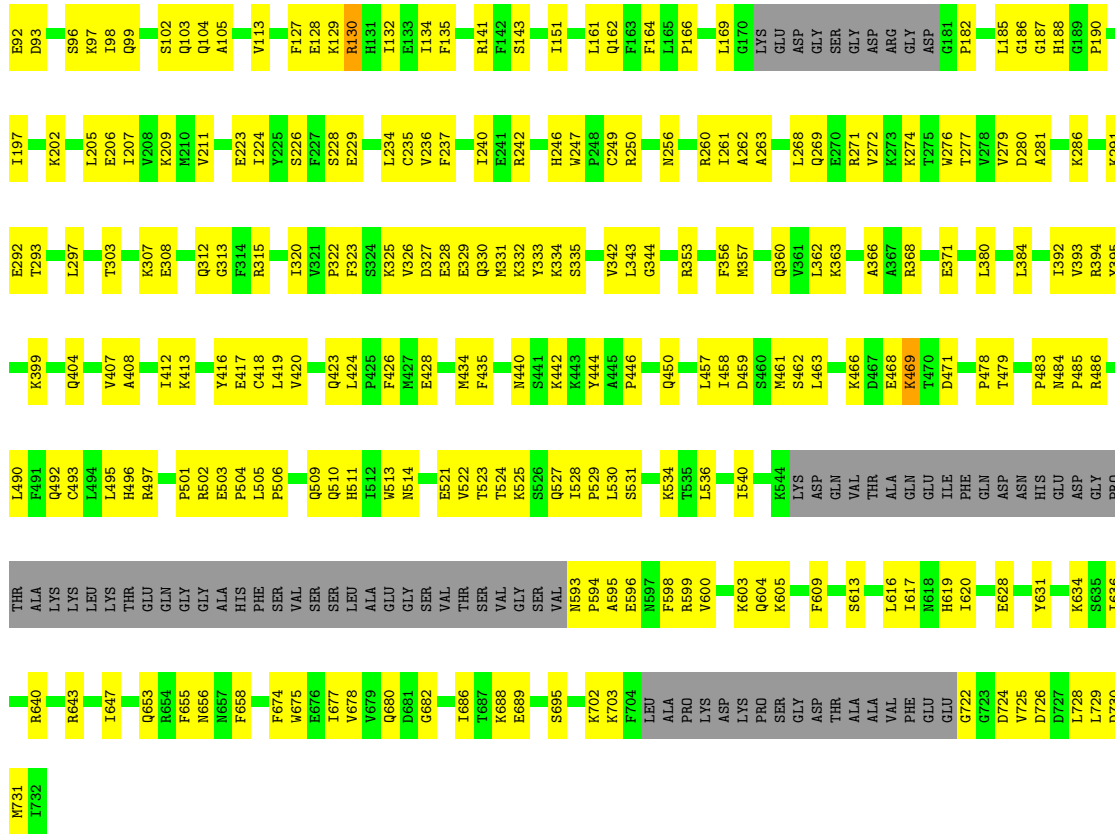


● Molecule 3: X-ray repair cross-complementing protein 5

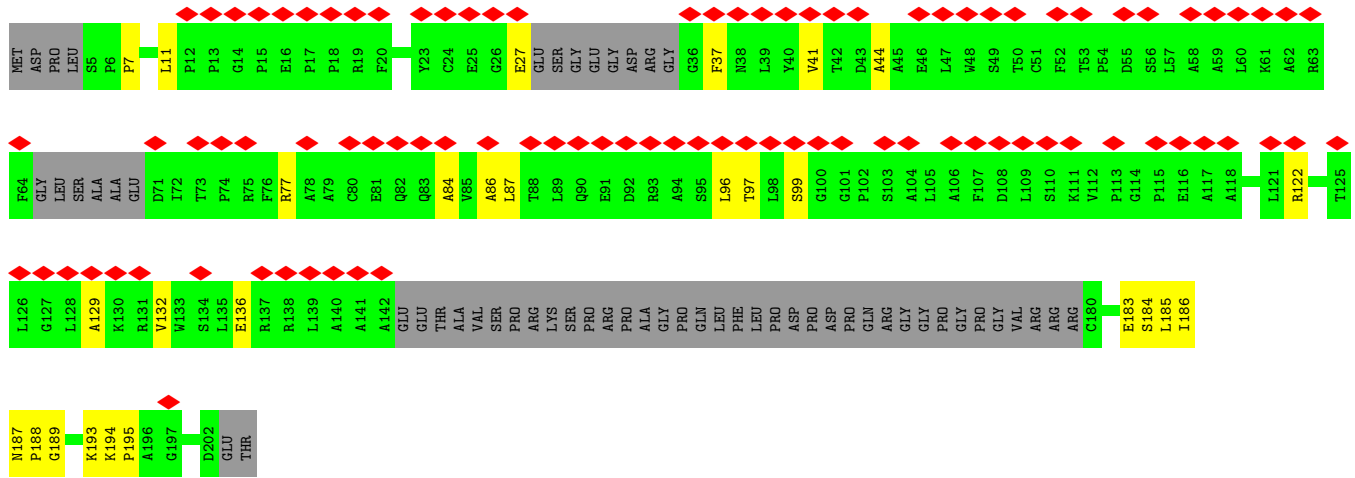


● Molecule 3: X-ray repair cross-complementing protein 5

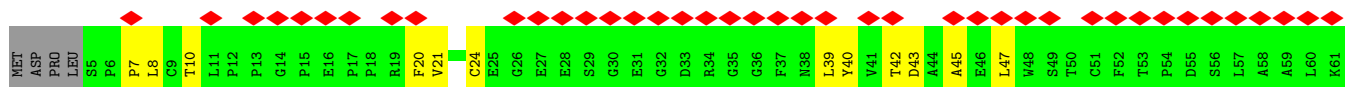


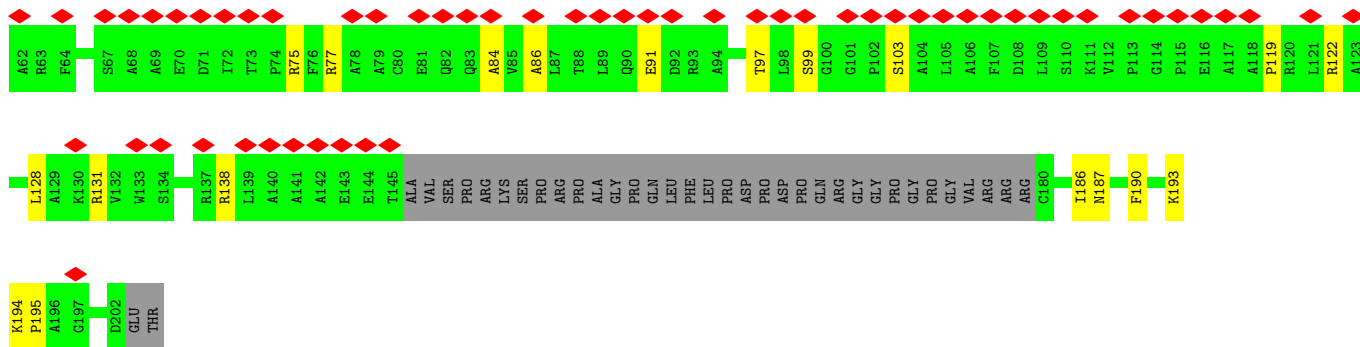


● Molecule 4: Protein PAXX

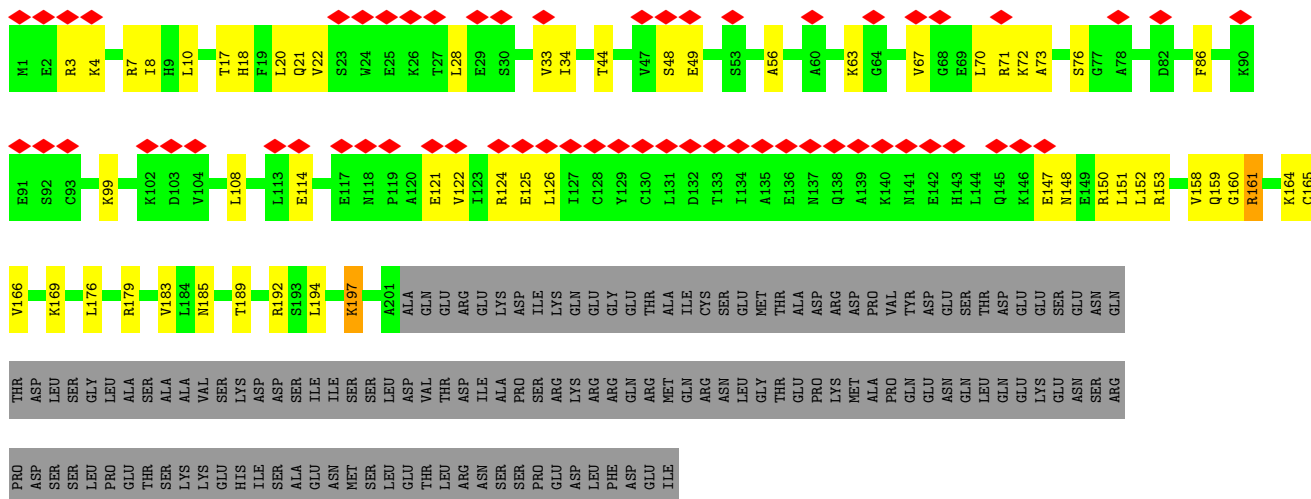
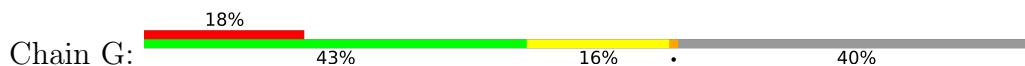


● Molecule 4: Protein PAXX

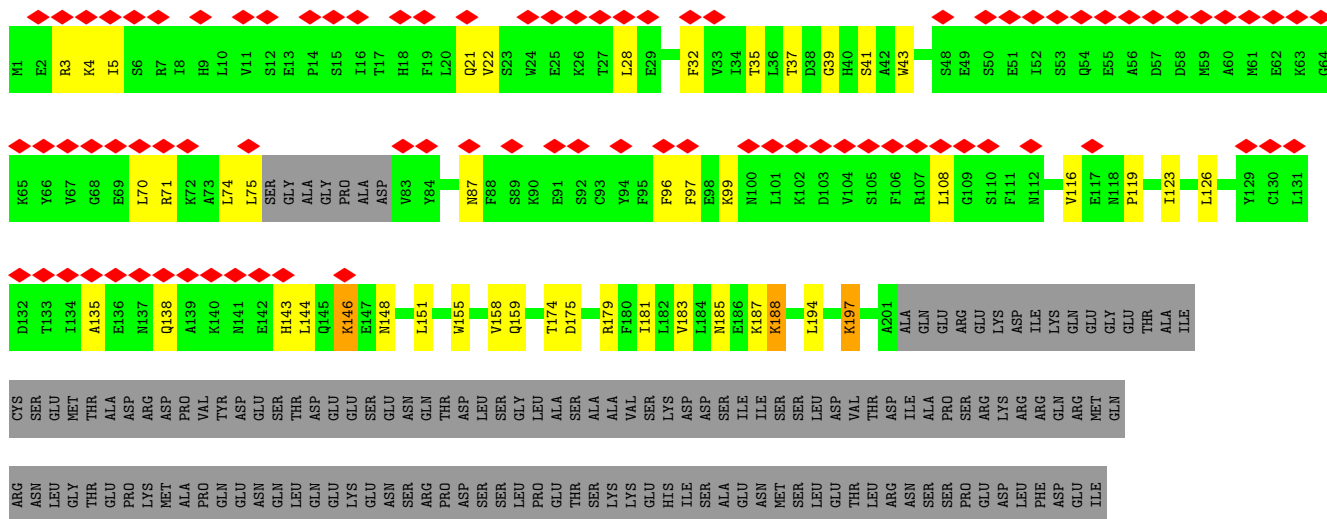
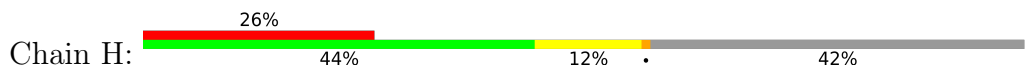


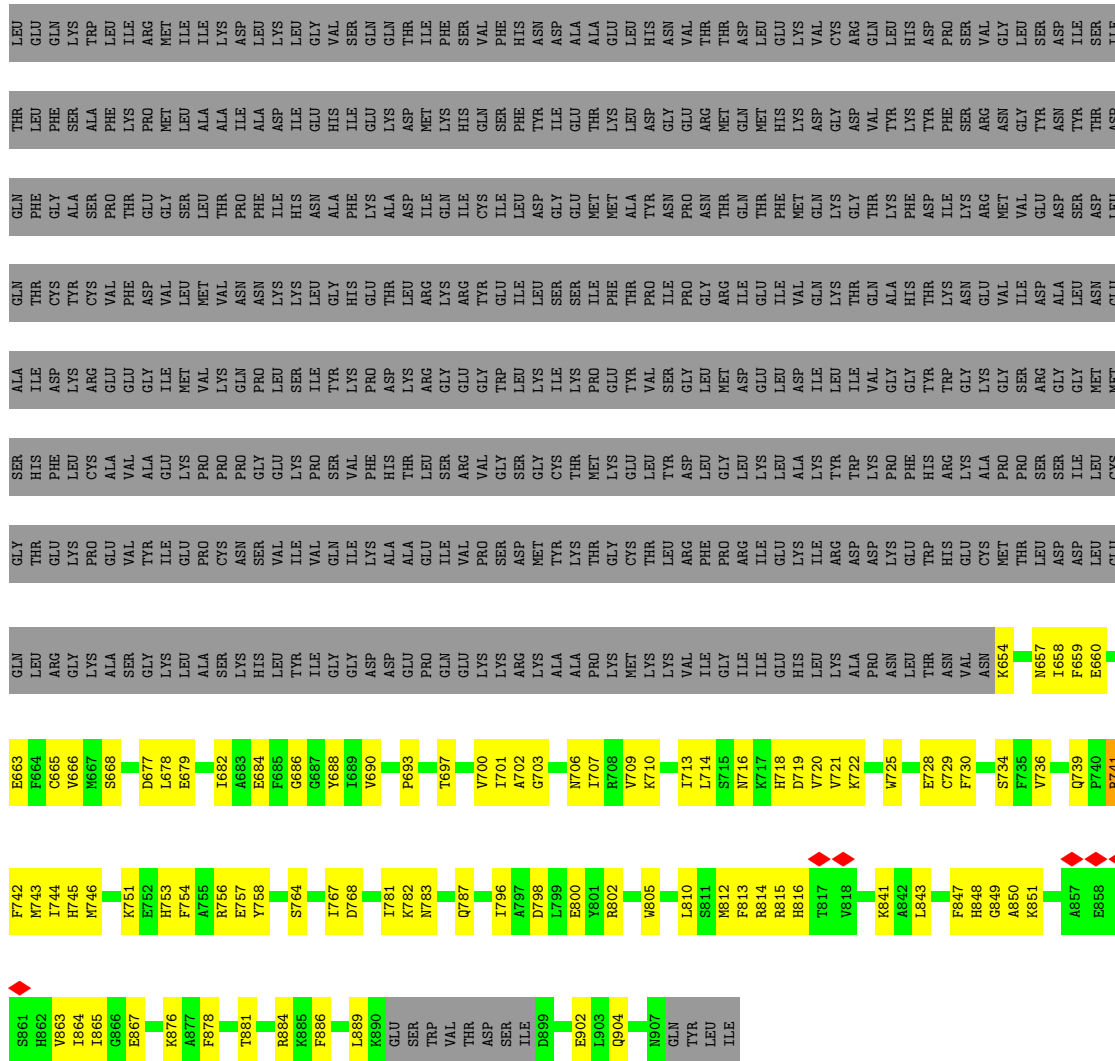


• Molecule 5: DNA repair protein XRCC4

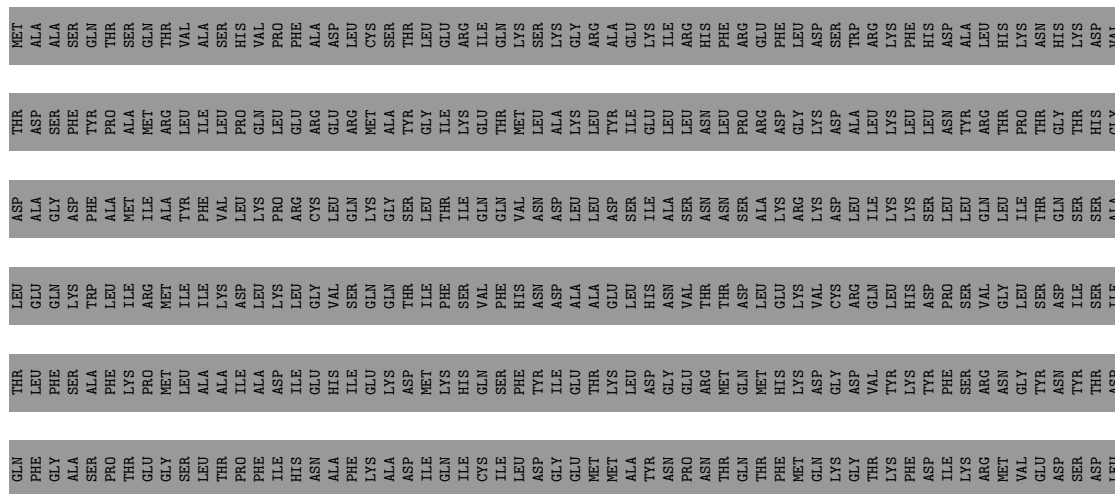


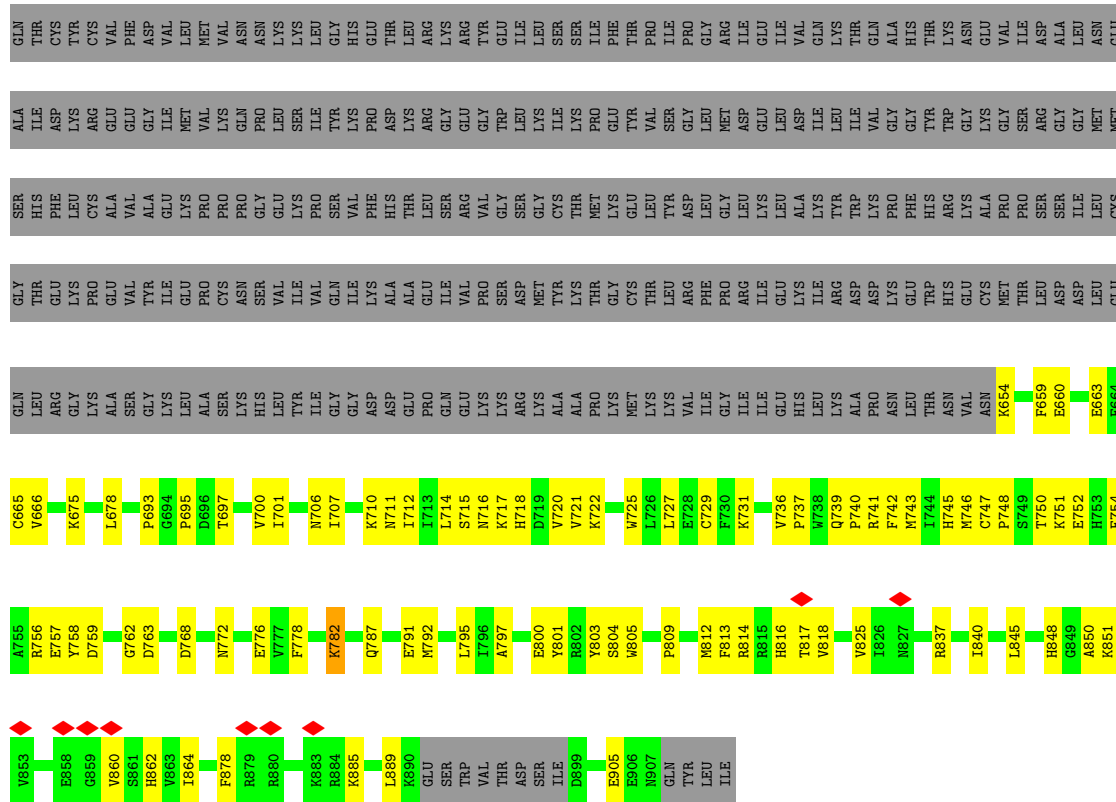
• Molecule 5: DNA repair protein XRCC4





• Molecule 6: DNA ligase 4





- Molecule 7: DNA (25-MER)

Chain j: 100%

There are no outlier residues recorded for this chain.

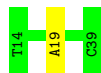
- Molecule 8: DNA (27-MER)

Chain i: 100%

There are no outlier residues recorded for this chain.

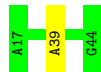
- Molecule 9: DNA (26-MER)

Chain d: 96%



- Molecule 10: DNA (28-MER)

Chain e: 96%



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	35211	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 ($e^-/\text{\AA}^2$)	52.1	Depositor
Minimum defocus (nm)	800	Depositor
Maximum defocus (nm)	2500	Depositor
Magnification	130000	Depositor
Image detector	GATAN K3 BIOQUANTUM (6k x 4k)	Depositor
Maximum map value	0.940	Depositor
Minimum map value	-0.499	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.024	Depositor
Recommended contour level	0.061	Depositor
Map size (Å)	704.16003, 704.16003, 704.16003	wwPDB
Map dimensions	540, 540, 540	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.304, 1.304, 1.304	Depositor

5 Model quality [i](#)

5.1 Standard geometry [i](#)

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	0.27	0/28471	0.50	0/38509
1	S	0.26	0/28549	0.49	0/38591
2	B	0.27	0/4118	0.50	0/5556
2	T	0.26	0/4092	0.50	0/5516
3	C	0.25	0/5393	0.46	0/7273
3	L	0.25	0/5272	0.47	0/7107
4	D	0.25	0/1101	0.47	0/1500
4	M	0.27	0/1223	0.51	0/1665
5	G	0.24	0/1657	0.47	0/2228
5	H	0.24	0/1616	0.45	0/2170
5	P	0.24	0/1657	0.46	0/2228
5	Q	0.24	0/1616	0.45	0/2170
6	I	0.25	0/2021	0.49	0/2727
6	R	0.24	0/1999	0.49	0/2697
7	j	0.53	0/570	1.03	0/876
8	i	0.60	0/620	0.99	0/953
9	d	0.63	0/591	1.05	1/908 (0.1%)
10	e	0.56	0/644	0.96	1/990 (0.1%)
All	All	0.27	0/91210	0.51	2/123664 (0.0%)

There are no bond length outliers.

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
10	e	39	DA	O4'-C4'-C3'	-5.48	102.31	104.50
9	d	19	DA	O4'-C4'-C3'	-5.10	102.46	104.50

There are no chirality outliers.

There are no planarity outliers.

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	27927	0	27803	1226	0
1	S	27999	0	28062	1170	0
2	B	4038	0	4071	210	0
2	T	4014	0	4065	180	0
3	C	5292	0	5264	222	0
3	L	5174	0	5164	215	0
4	D	1075	0	1060	20	0
4	M	1195	0	1157	21	0
5	G	1628	0	1620	45	0
5	H	1589	0	1587	35	0
5	P	1628	0	1620	22	0
5	Q	1589	0	1587	23	0
6	I	1977	0	1923	91	0
6	R	1958	0	1905	72	0
7	j	509	0	271	0	0
8	i	552	0	301	0	0
9	d	528	0	282	0	0
10	e	573	0	312	0	0
All	All	89245	0	88054	3398	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 20.

The worst 5 of 3398 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)
6:R:814:ARG:H	6:R:850:ALA:H	1.08	0.95
2:T:318:ARG:HB2	2:T:329:LEU:O	1.68	0.94
1:A:174:VAL:O	1:A:177:LEU:HB2	1.69	0.92
2:T:400:TYR:O	2:T:408:PRO:HA	1.68	0.92
1:A:67:VAL:HB	1:A:85:ILE:HD13	1.54	0.89

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone

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	3476/4128 (84%)	3213 (92%)	259 (8%)	4 (0%)	51	85
1	S	3464/4128 (84%)	3210 (93%)	252 (7%)	2 (0%)	51	85
2	B	505/609 (83%)	471 (93%)	34 (7%)	0	100	100
2	T	498/609 (82%)	470 (94%)	28 (6%)	0	100	100
3	C	660/732 (90%)	619 (94%)	41 (6%)	0	100	100
3	L	644/732 (88%)	615 (96%)	29 (4%)	0	100	100
4	D	139/204 (68%)	137 (99%)	2 (1%)	0	100	100
4	M	160/204 (78%)	160 (100%)	0	0	100	100
5	G	199/336 (59%)	195 (98%)	4 (2%)	0	100	100
5	H	190/336 (56%)	188 (99%)	2 (1%)	0	100	100
5	P	199/336 (59%)	196 (98%)	3 (2%)	0	100	100
5	Q	190/336 (56%)	188 (99%)	2 (1%)	0	100	100
6	I	242/911 (27%)	219 (90%)	23 (10%)	0	100	100
6	R	242/911 (27%)	216 (89%)	26 (11%)	0	100	100
All	All	10808/14512 (74%)	10097 (93%)	705 (6%)	6 (0%)	54	85

5 of 6 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	72	SER
1	S	3304	VAL
1	A	68	PHE
1	A	1231	GLN
1	A	66	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	2999/3671 (82%)	2984 (100%)	15 (0%)	88	93
1	S	3045/3671 (83%)	3030 (100%)	15 (0%)	88	93
2	B	443/548 (81%)	441 (100%)	2 (0%)	88	93
2	T	446/548 (81%)	441 (99%)	5 (1%)	73	85
3	C	581/649 (90%)	579 (100%)	2 (0%)	92	95
3	L	570/649 (88%)	566 (99%)	4 (1%)	84	90
4	D	110/160 (69%)	109 (99%)	1 (1%)	78	87
4	M	120/160 (75%)	118 (98%)	2 (2%)	60	78
5	G	180/303 (59%)	177 (98%)	3 (2%)	60	78
5	H	177/303 (58%)	174 (98%)	3 (2%)	60	78
5	P	180/303 (59%)	180 (100%)	0	100	100
5	Q	177/303 (58%)	176 (99%)	1 (1%)	86	92
6	I	218/808 (27%)	217 (100%)	1 (0%)	88	93
6	R	217/808 (27%)	214 (99%)	3 (1%)	67	81
All	All	9463/12884 (73%)	9406 (99%)	57 (1%)	86	92

5 of 57 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	L	469	LYS
2	T	297	LYS
6	R	782	LYS
2	T	230	ARG
1	S	3621	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 48 such sidechains are listed below:

Mol	Chain	Res	Type
6	I	904	GLN

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	S	561	ASN
3	L	188	HIS
1	S	33	GLN
1	S	865	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](#)

There are no ligands in this entry.

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.

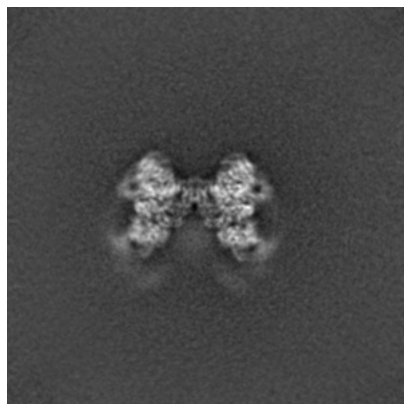
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-16044. These allow visual inspection of the internal detail of the map and identification of artifacts.

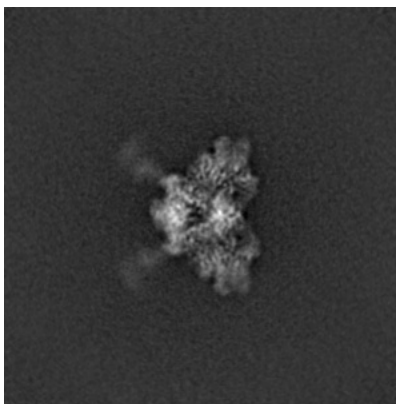
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

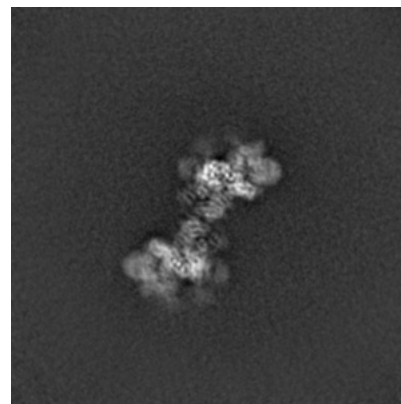
6.1.1 Primary map



X

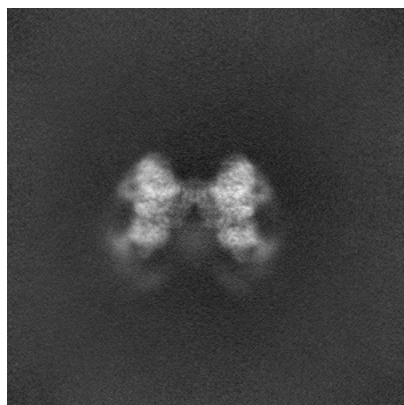


Y

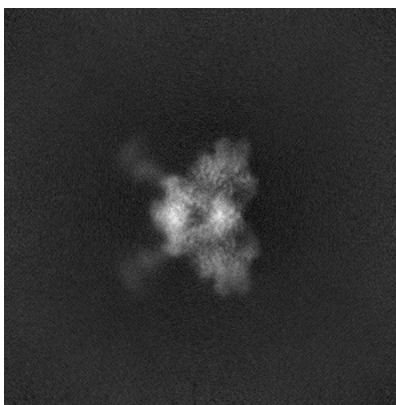


Z

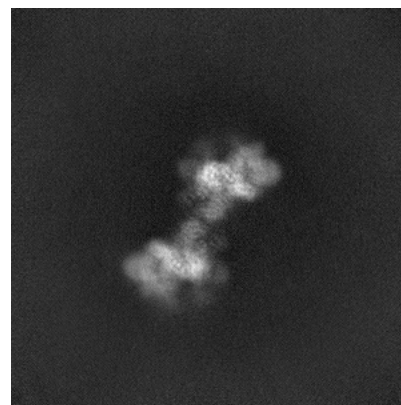
6.1.2 Raw map



X



Y

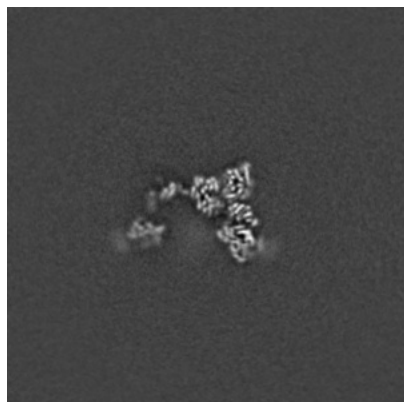


Z

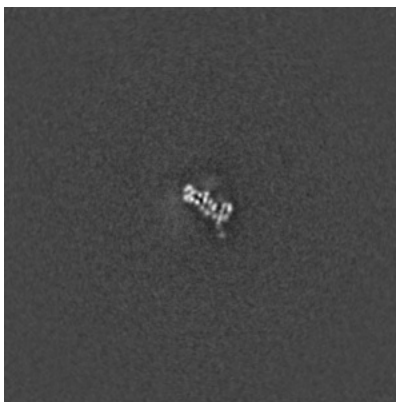
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

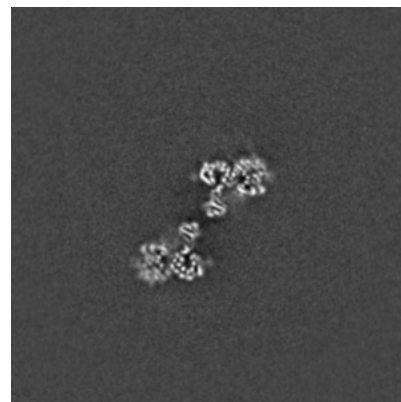
6.2.1 Primary map



X Index: 270



Y Index: 270

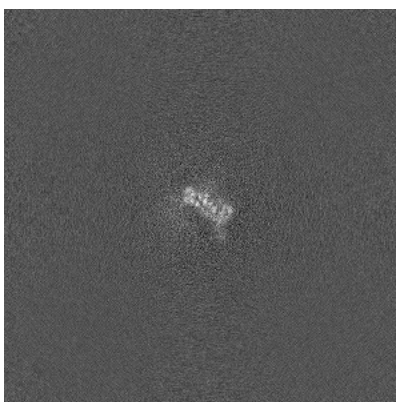


Z Index: 270

6.2.2 Raw map



X Index: 270



Y Index: 270

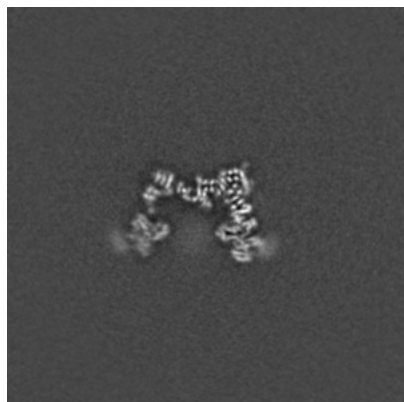


Z Index: 270

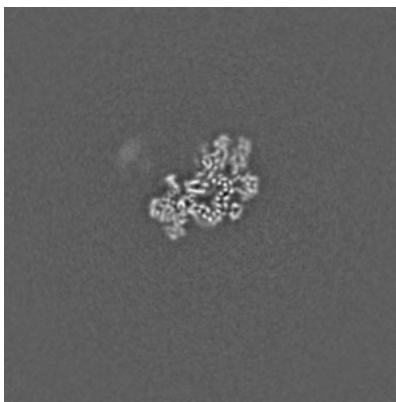
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

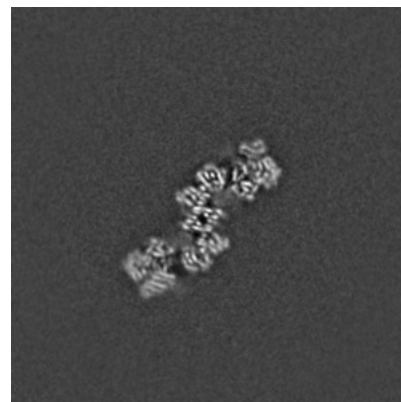
6.3.1 Primary map



X Index: 263

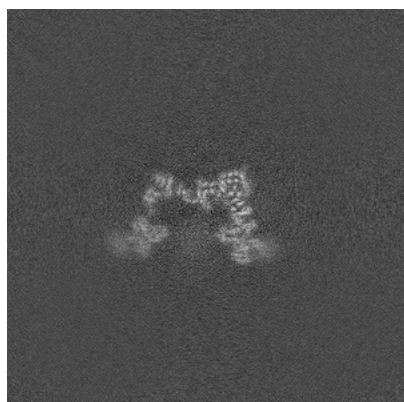


Y Index: 312

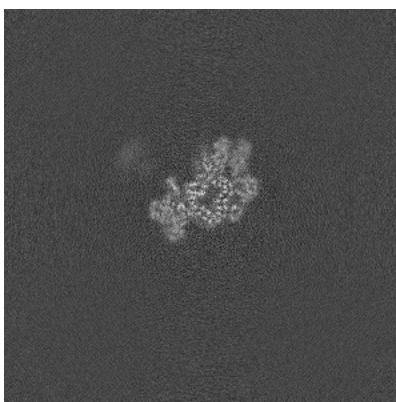


Z Index: 289

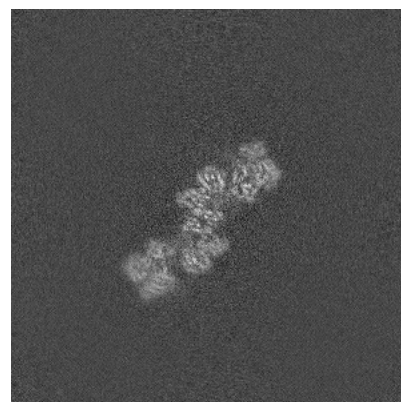
6.3.2 Raw map



X Index: 263



Y Index: 313

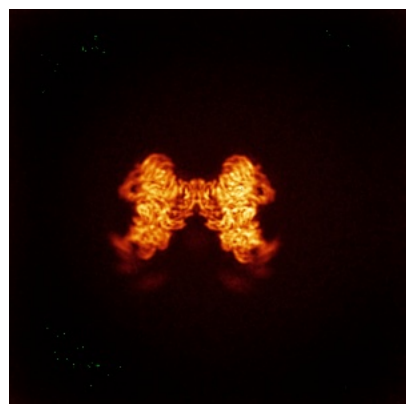


Z Index: 289

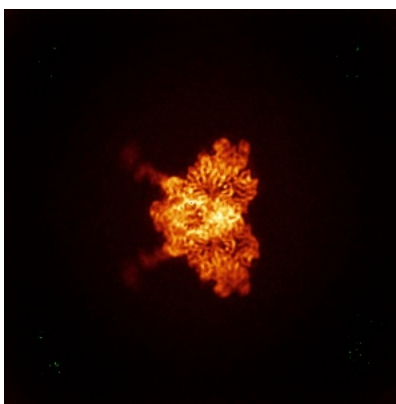
The images above show the largest variance slices of the map in three orthogonal directions.

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

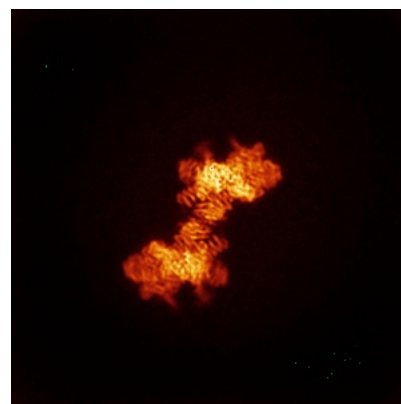
6.4.1 Primary map



X

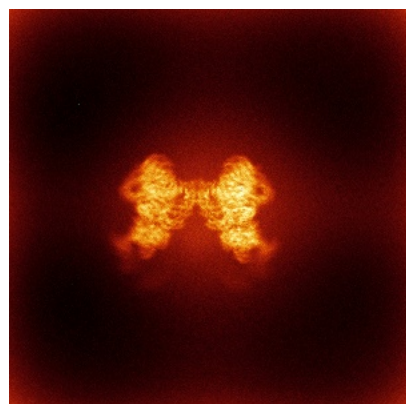


Y

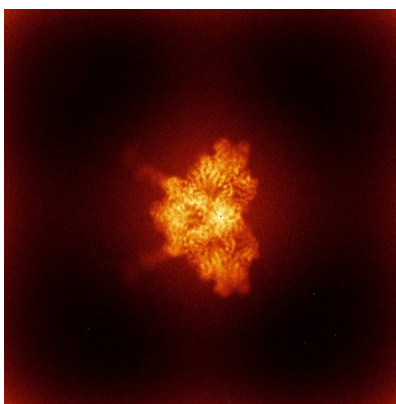


Z

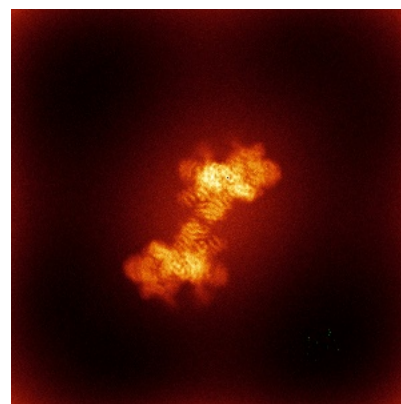
6.4.2 Raw map



X



Y

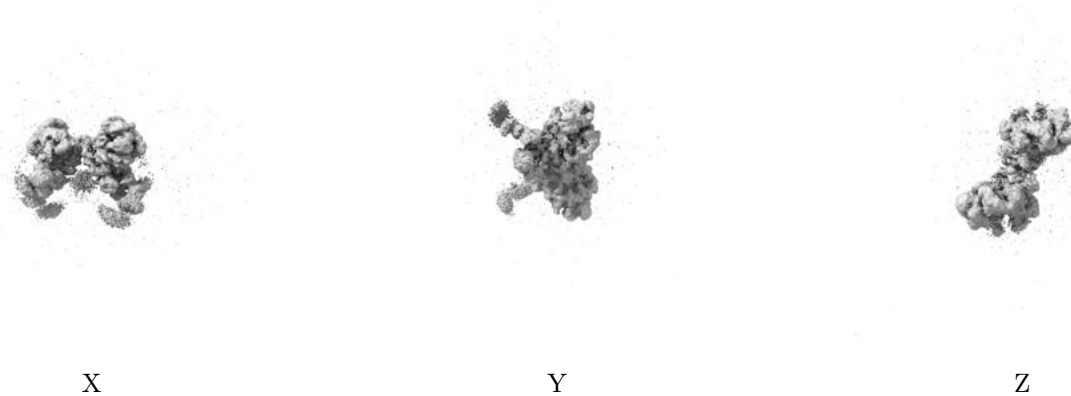


Z

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.

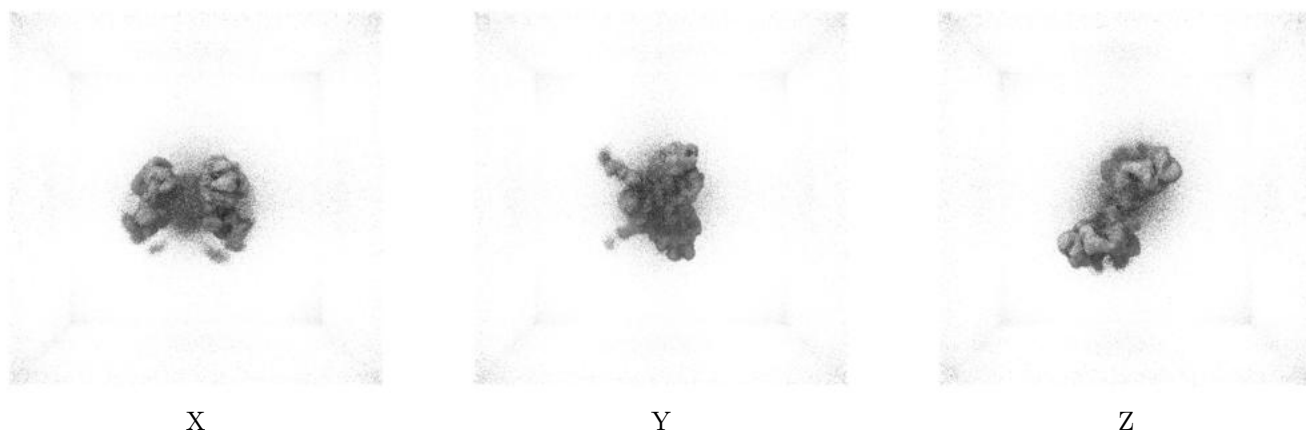
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.061. 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



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.

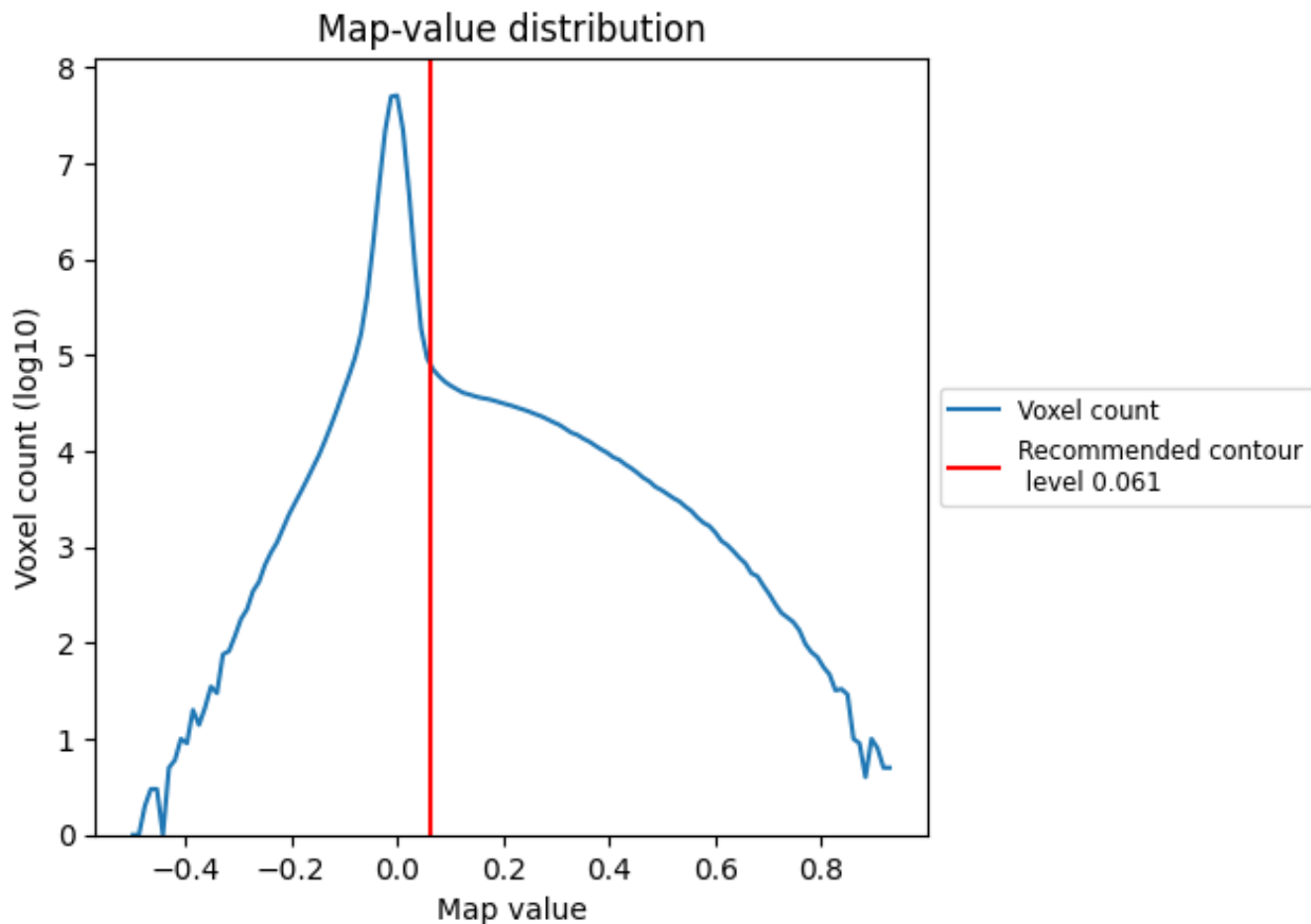
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

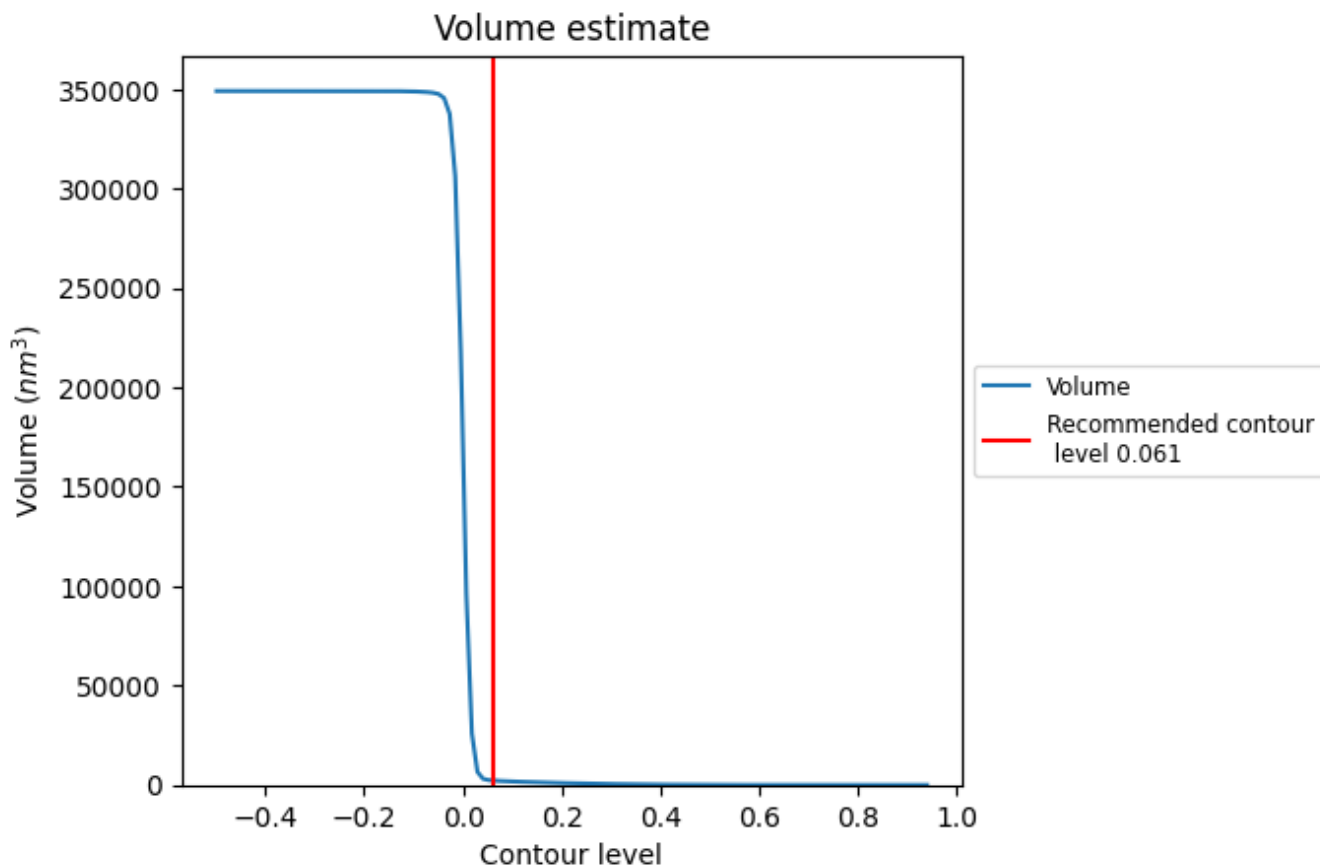
This section contains the results of statistical analysis of the map.

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.

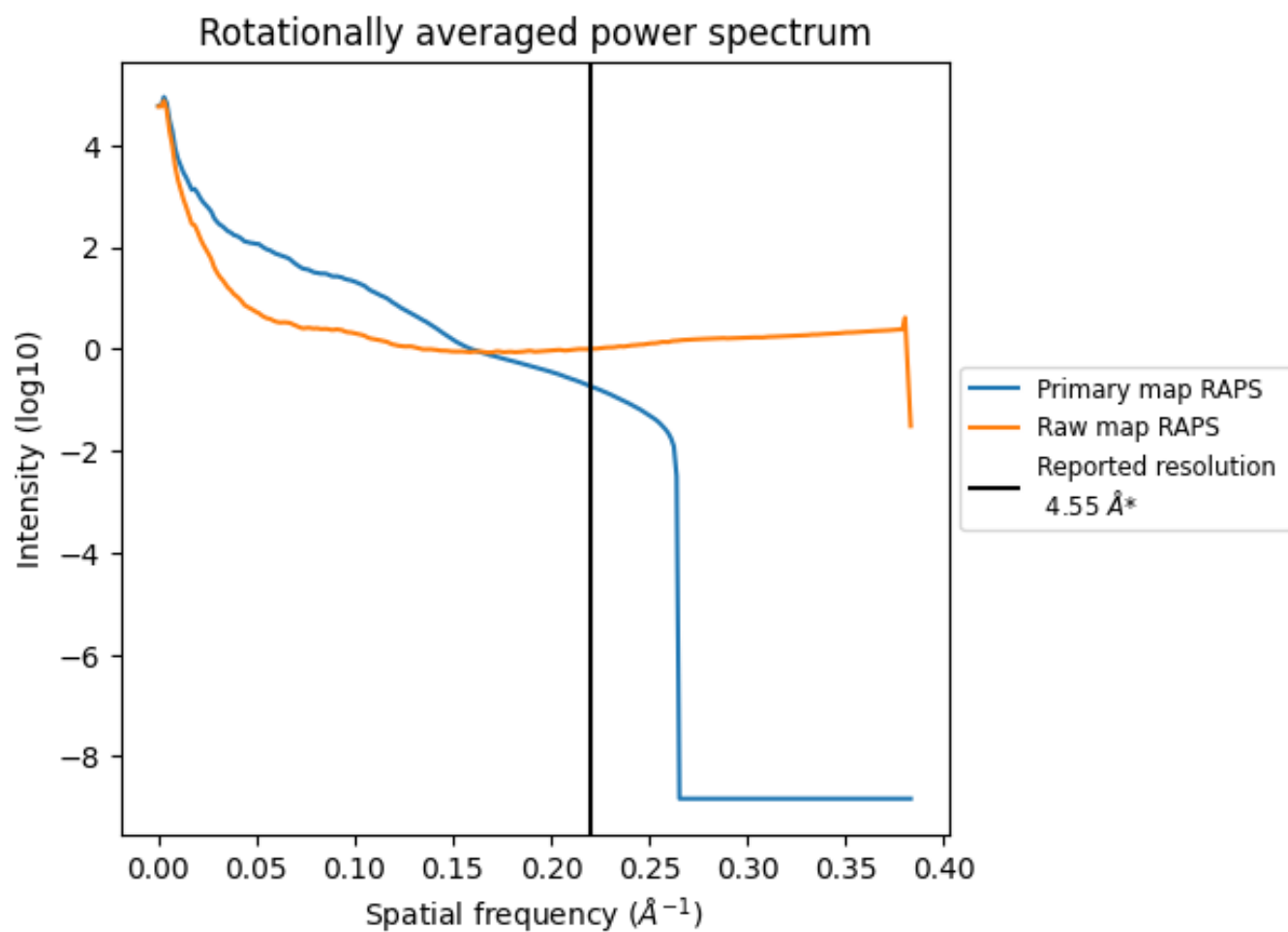
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 2251 nm^3 ; this corresponds to an approximate mass of 2033 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](#)

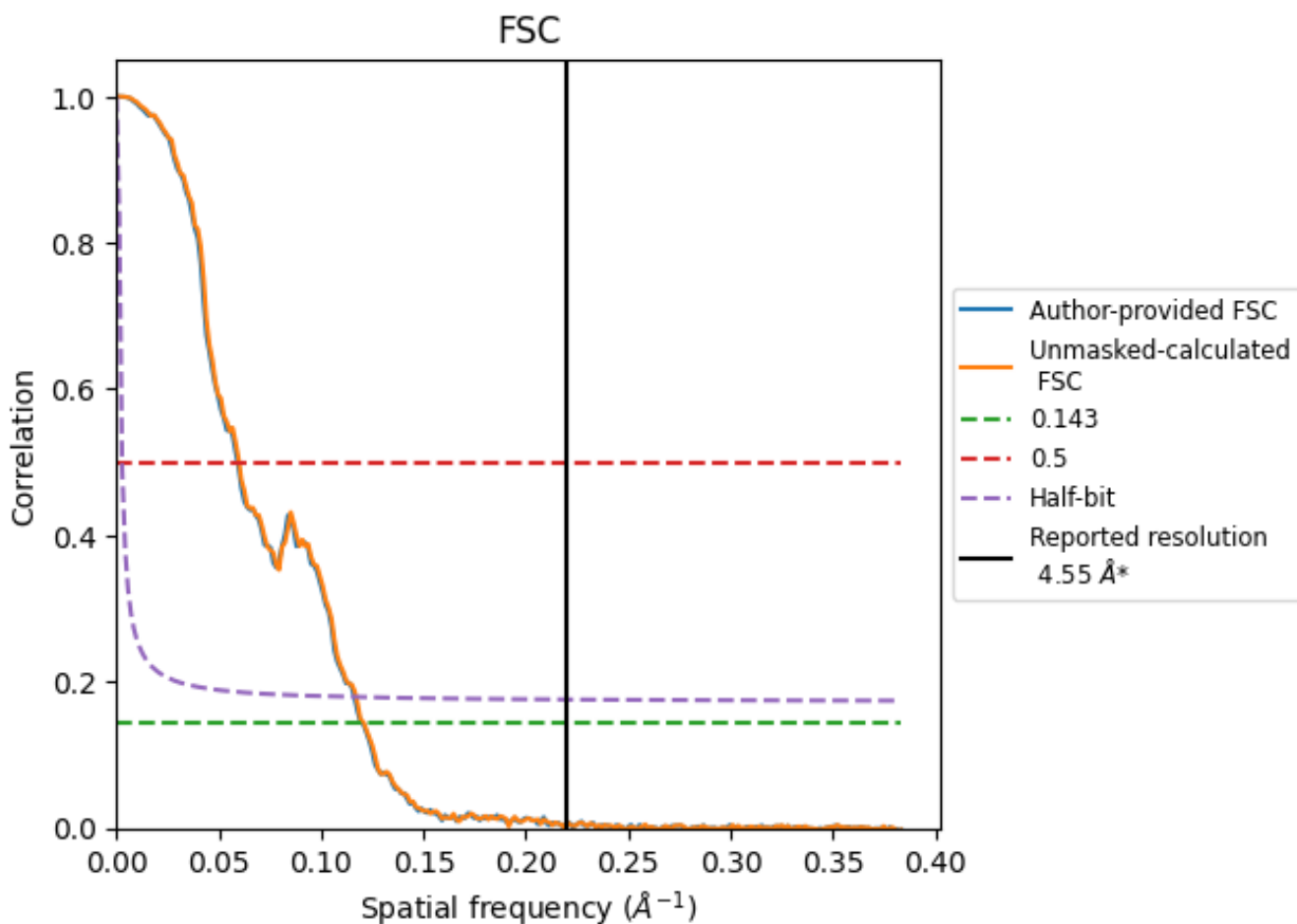


*Reported resolution corresponds to spatial frequency of 0.220 Å⁻¹

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 0.220 Å⁻¹

8.2 Resolution estimates [i](#)

Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	4.55	-	-
Author-provided FSC curve	8.33	16.86	8.61
Unmasked-calculated*	8.27	16.69	8.54

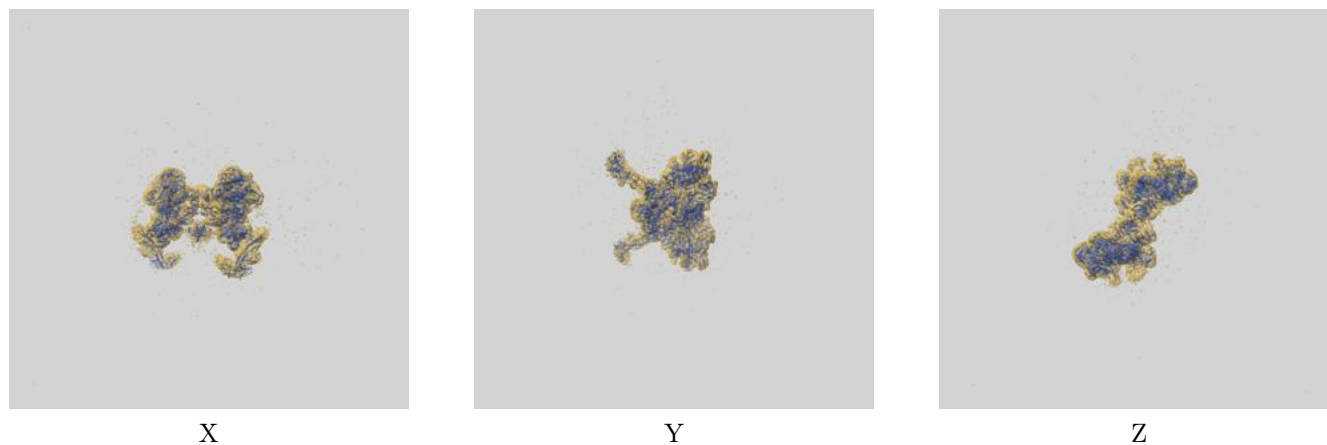
*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps. The value from author-provided FSC intersecting FSC 0.143 CUT-OFF 8.33 differs from the reported value 4.55 by more than 10 %

The value from deposited half-maps intersecting FSC 0.143 CUT-OFF 8.27 differs from the reported value 4.55 by more than 10 %

9 Map-model fit [i](#)

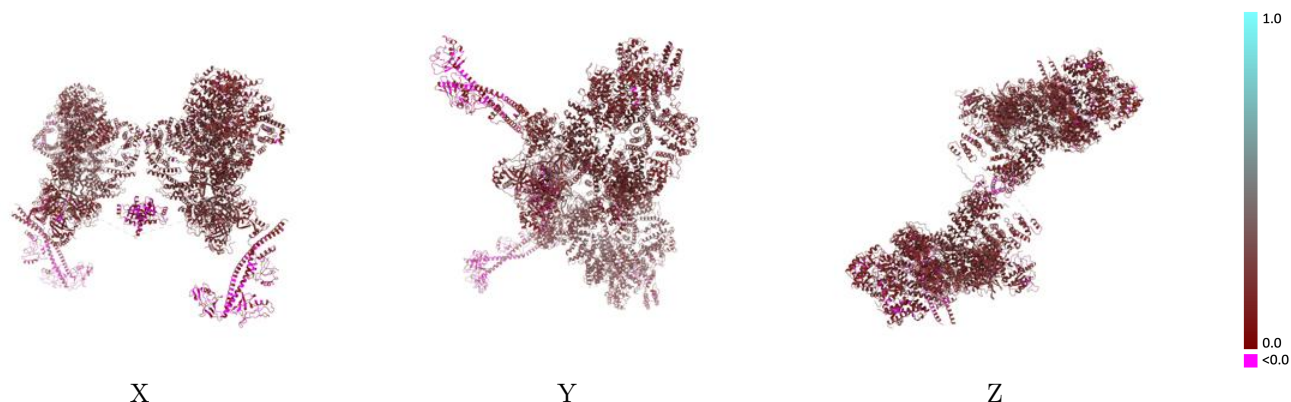
This section contains information regarding the fit between EMDB map EMD-16044 and PDB model 8BH3. Per-residue inclusion information can be found in section 3 on page 6.

9.1 Map-model overlay [i](#)



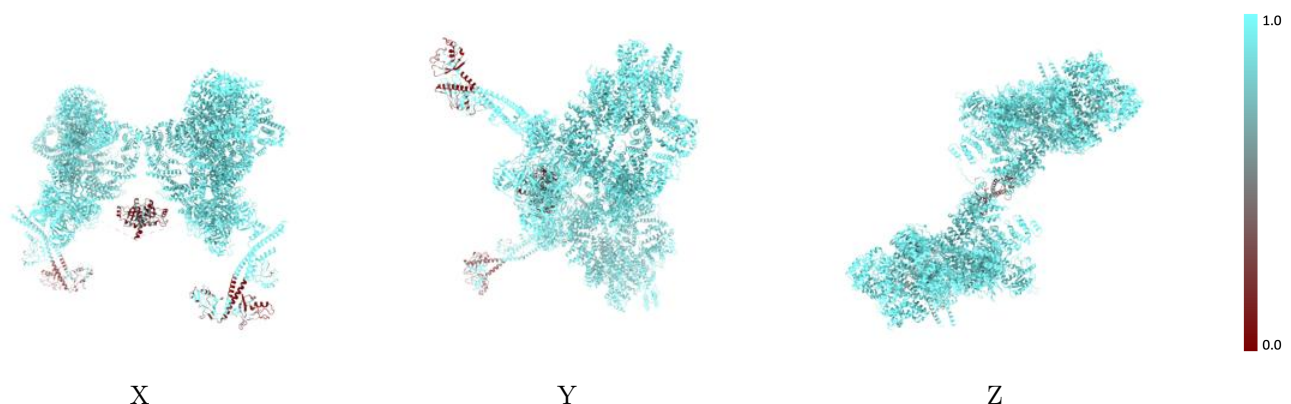
The images above show the 3D surface view of the map at the recommended contour level 0.061 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



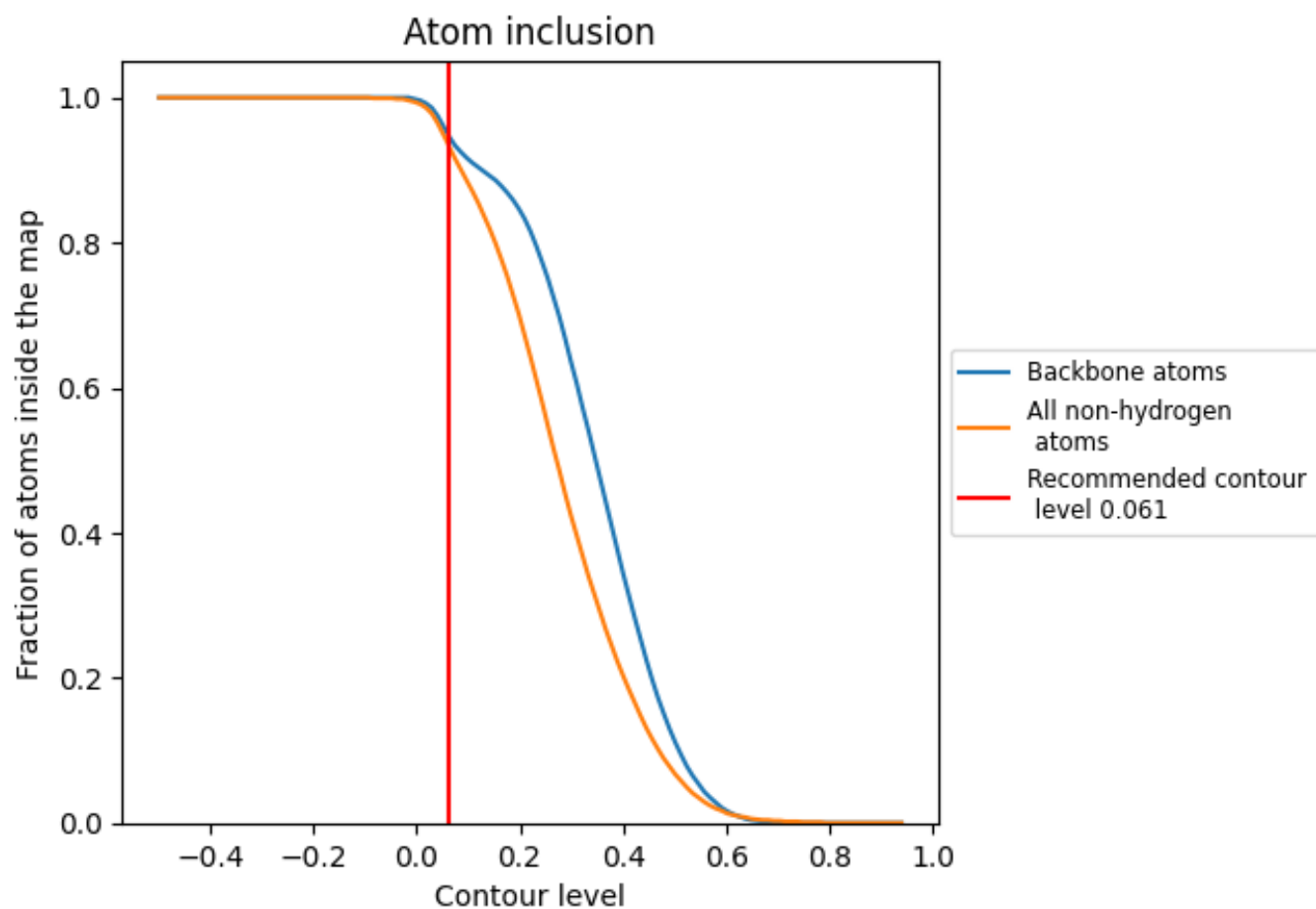
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.061).







































9.4 Atom inclusion [i](#)



At the recommended contour level, 95% of all backbone atoms, 94% 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 (0.061) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.9360	 0.1850
A	 0.9770	 0.2080
B	 0.9830	 0.2240
C	 0.9910	 0.2020
D	 0.3570	 0.0660
G	 0.6710	 0.0690
H	 0.5320	 0.0630
I	 0.9650	 0.1450
L	 0.9950	 0.1760
M	 0.3810	 0.0790
P	 0.5560	 0.0560
Q	 0.5170	 0.0730
R	 0.9550	 0.1280
S	 0.9800	 0.1910
T	 0.9870	 0.1920
d	 0.9920	 0.2600
e	 0.9970	 0.2720
i	 1.0000	 0.2550
j	 0.9900	 0.2460

