



wwPDB EM Validation Summary Report ⓘ

Dec 17, 2022 – 03:40 pm GMT

PDB ID : 6ZFP
EMDB ID : EMD-11185
Title : Cryo-EM structure of DNA-PKcs (State 2)
Authors : Chaplin, A.K.; Hardwick, S.W.; Chirgadze, D.Y.; Blundell, T.L.
Deposited on : 2020-06-17
Resolution : 3.24 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.dev43
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) : 2.31.3

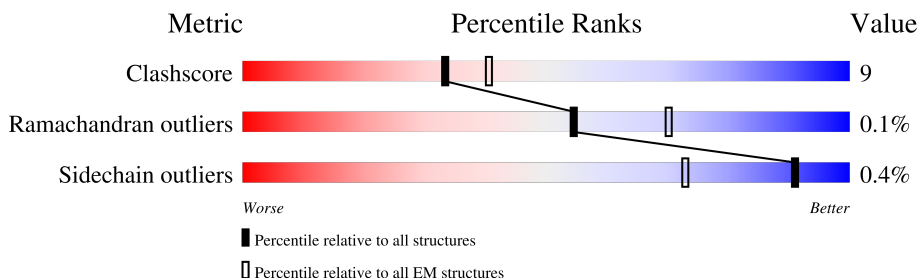
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 3.24 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	4156	 71% 18% 11%

2 Entry composition [i](#)

There is only 1 type of molecule in this entry. The entry contains 29385 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.

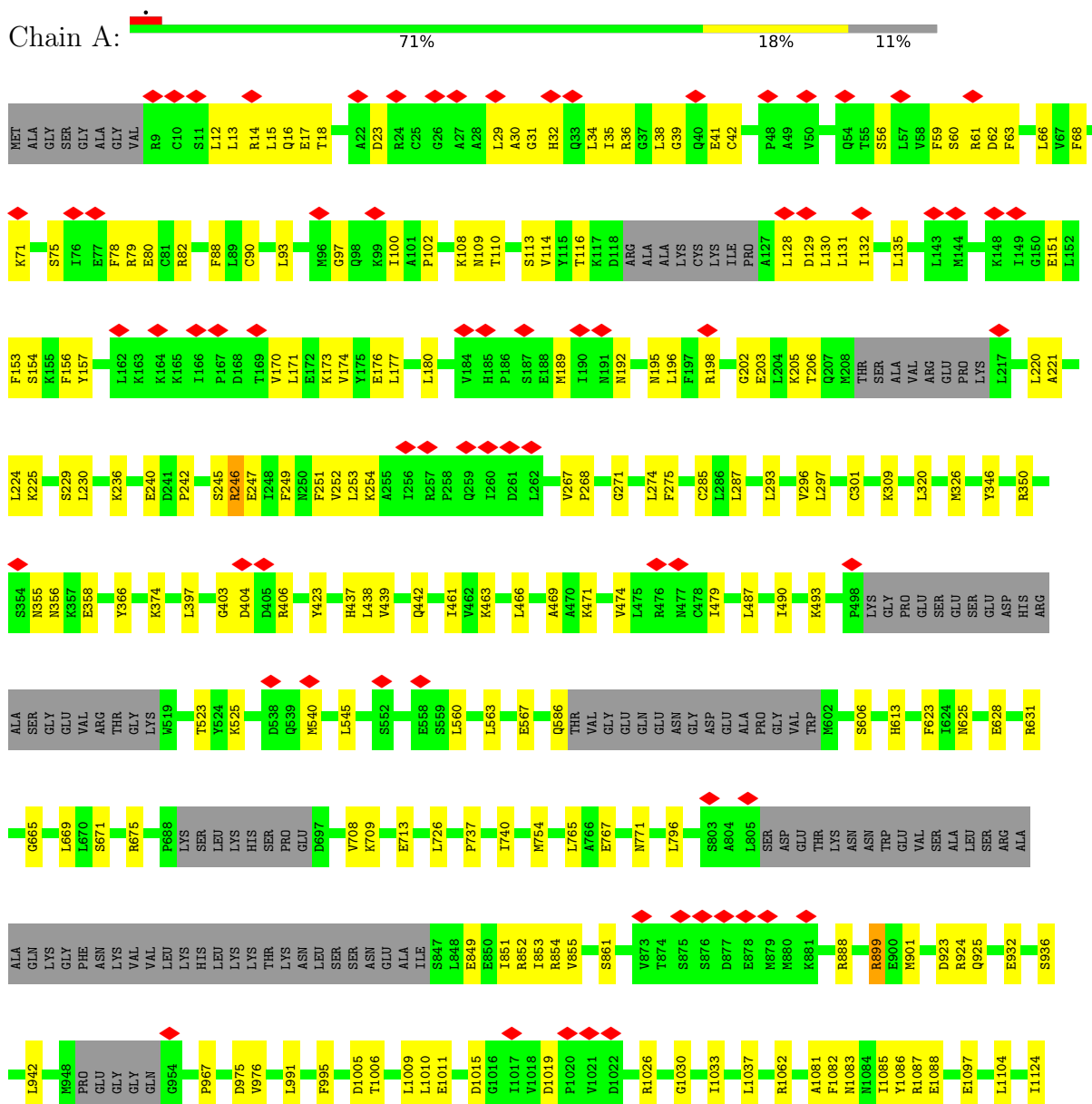
- Molecule 1 is a protein called DNA-dependent protein kinase catalytic subunit,DNA-PKcs, DNA-PKcs.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	3704	29385	18849	4964	5379	193	0	0

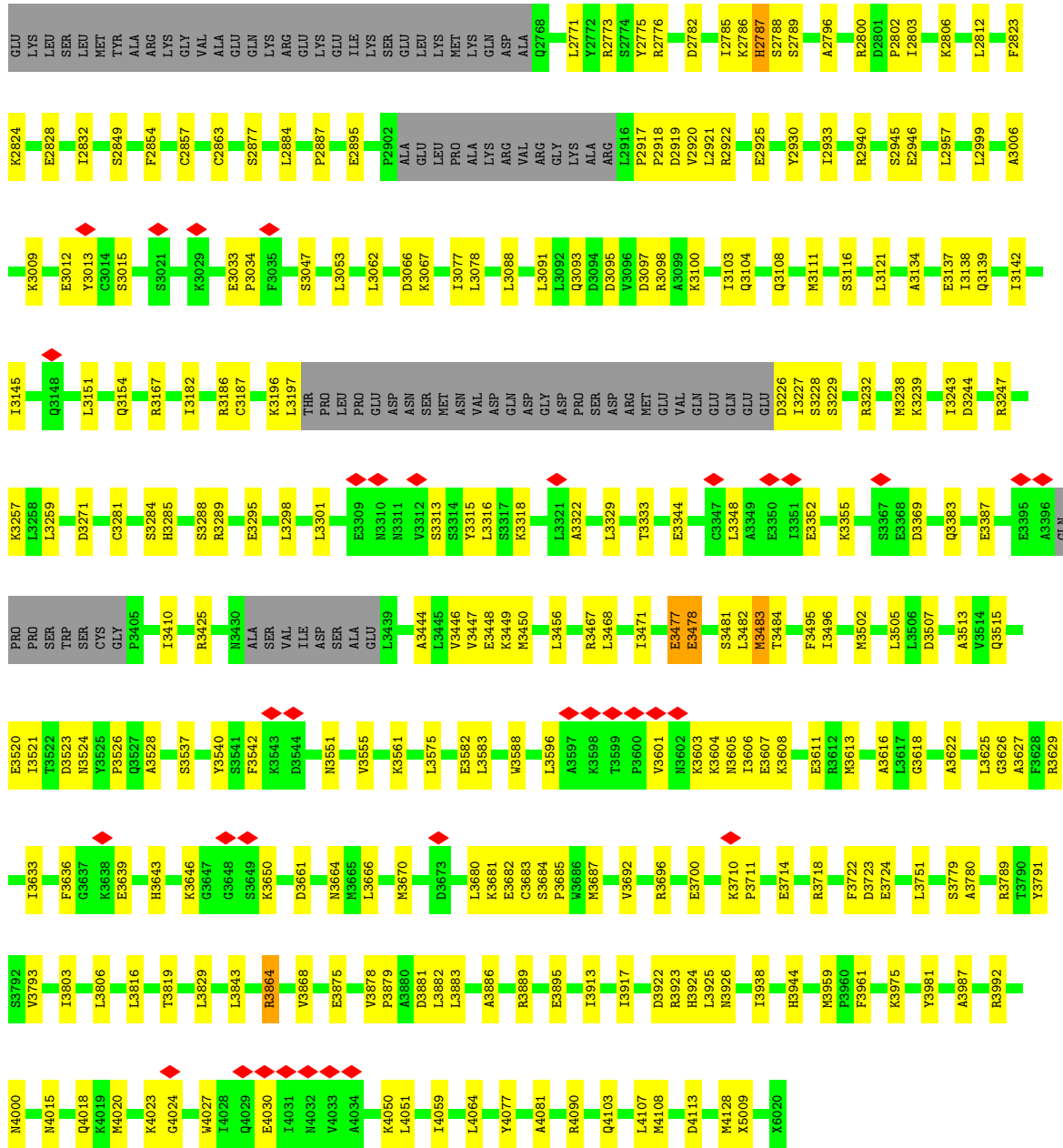
3 Residue-property plots

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,DNA-PKcs,DNA-PKCs



Q125	Y1267	F1519	D1685	R1822	F1961	SER	H2105	L2215	Q2351	Y2474	GLN
Q126	M1268	C1525	K1689	S1823	Y1962	THR	R2106	M2220	H2352	M2475	THR
D129	T1269	E1526	G1690	L1824	Q1963	LEU	S2107	F2224	E2357	I2476	ARG
R151	T1284	R1527	M1392	L1827	S1968	GLU	L2108	F2224	I2361	D2486	GLU
F158	L1290	L1528	V1693	S1832	L1976	GLU	PRO	F2231	M2365	E2488	GLY
P159	F1296	L1538	R1711	L1836	L1976	SER	GLN	L2235	T2368	S2489	SER
L163	S1300	L1538	E1715	R1837	L1981	PHE	GLU	P2252	F2371	E2490	LEU
L1168	H1304	A1541	E1715	E1838	K1985	PHE	ASP	R2254	P2372	I2498	ALA
R1178	E1310	SER	I1718	R1854	ARG	THR	VAL	L2255	P2373	L2517	TRP
E1182	K1311	GLY	F1722	K1857	ARG	THR	VAL	I2256	A2375	R2522	ALA
C1183	C1312	GLN	ASN	L1858	ASN	VAL	VAL	K2259	D2376	L2531	ALA
R1184	PHE	GLN	THR	M1859	PRO	GLN	GLN	S2261	L2385	L2531	GLY
H1185	GLY	GLY	G1732	D1864	VAL	THR	SER	G2262	L2389	T2535	ARG
I1188	T1315	V1550	F1733	I1867	GLU	TYR	TYR	D2269	F2389	L2539	ALA
V1195	G1316	F1553	R1735	I1867	VAL	SER	SER	S2271	V2392	L2555	THR
P1204	A1317	F1560	Q1754	M1871	VAL	SER	GLN	V2272	L2396	L2555	THR
L1208	A1318	Y1560	Q1754	Y1874	MET	PRO	ARG	L2277	C2397	E2551	HIS
L1212	G1319	S1561	E1760	K1875	GLU	PRO	THR	V2277	V2400	L2555	THR
V1217	M1320	L1562	E1769	R1883	LYS	ALA	ALA	V2280	R2404	L2558	LEU
S1218	R1321	I1567	Q1770	R1883	LYS	THR	GLY	V2280	V2405	T2559	LEU
F1219	T1322	E1570	F1782	E1893	TYR	GLY	ARG	D2289	E2406	M2560	PRO
L1220	S1323	L1571	I1785	M1897	ILE	ARG	PHE	C2292	L2411	F2561	GLY
I1221	Q1325	K1573	R1788	Q1898	ILE	ARG	ARG	G2293	Y2412	L2562	ASP
N1222	K1334	N1574	R1788	V1899	LYS	ARG	ARG	Q2301	L2413	L2563	GLY
T1223	V1339	L1575	G1789	F1900	GLU	GLU	GLU	V2304	F2414	M2568	ARG
F1224	R1340	S1585	S1790	H1901	ALA	GLN	GLN	M2305	L2415	P2575	SER
E1225	L1348	S1586	T1793	G1902	ARG	ARG	ARG	K2313	F2420	M2576	SER
Q1231	T1351	Q1614	Q1794	S1903	GLU	THR	THR	Y2316	Q2432	C2584	LEU
S1233	S1352	K1617	V1795	T1912	ALA	VAL	VAL	L2316	Y2440	E2585	LEU
G1234	P1353	L1618	G1796	I1916	ASN	HIS	ASP	L2323	M2441	R2596	GLY
L1236	L1358	E1482	L1484	Y1920	GLY	ASP	VAL	L2327	M2442	PHE	SER
T1240	L1359	L1485	L1486	A1928	PRO	GLU	LEU	V2330	LEU	ARG	THR
L1242	K1360	K1627	L1486	G1929	TYR	GLU	LEU	M2335	L2457	THR	THR
S1249	M1365	W1632	G1494	E1930	SER	LEU	GLU	L2335	V2457	V2607	VAL
L1259	T1366	W1633	D1495	L1933	MET	TYR	GLU	L2336	E2460	THR	ASP
L1261	L1372	K1635	E1496	L1934	SER	SER	SER	E2339	S2463	GLN	HIS
L1261	Q1374	D1636	E1497	E1935	SER	SER	THR	S2340	H2464	GLY	THR
E1265	V1377	E1640	Q1498	R1937	LEU	LEU	ASP	K2347	E2471	LEU	THR
G1266	L1377	K1642	C1499	R1938	TYR	ALA	GLU	L2349	K2550	LEU	LEU
	C1377	I1652	L1510	F1819	LEU	ALA	GLU				
	E1378	L1514	L1514	D1821	ASP	ASP	L2097				
	S1381										



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, C1	Depositor
Number of particles used	80688	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 ($e^-/\text{\AA}^2$)	53.95	Depositor
Minimum defocus (nm)	Not provided	
Maximum defocus (nm)	Not provided	
Magnification	Not provided	
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	0.352	Depositor
Minimum map value	-0.149	Depositor
Average map value	0.001	Depositor
Map value standard deviation	0.012	Depositor
Recommended contour level	0.055	Depositor
Map size (Å)	280.36002, 280.36002, 280.36002	wwPDB
Map dimensions	430, 430, 430	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.652, 0.652, 0.652	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	0.33	0/29848	0.46	0/40366

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 [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	29385	0	29509	506	0
All	All	29385	0	29509	506	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 9.

The worst 5 of 506 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)
1:A:3444:ALA:HA	1:A:3482:LEU:CD2	1.99	0.93
1:A:3618:GLY:H	1:A:3633:ILE:HD12	1.46	0.80
1:A:3444:ALA:O	1:A:3482:LEU:HD21	1.83	0.79
1:A:899:ARG:HE	1:A:2568:MET:HB2	1.48	0.78
1:A:403:GLY:H	1:A:406:ARG:HH12	1.29	0.78

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	3640/4156 (88%)	3332 (92%)	304 (8%)	4 (0%)	51 83

All (4) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	3481	SER
1	A	2787	HIS
1	A	1968	SER
1	A	1813	SER

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	3234/3671 (88%)	3222 (100%)	12 (0%)	91 95

5 of 12 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	3477	GLU
1	A	3478	GLU
1	A	3864	ARG
1	A	3483	MET
1	A	1321	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 9 such sidechains are listed below:

Mol	Chain	Res	Type
1	A	3139	GLN
1	A	3515	GLN
1	A	2091	HIS
1	A	2305	ASN
1	A	2351	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](#)

The following chains have linkage breaks:

Mol	Chain	Number of breaks
1	A	2

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	A	4128:MET	C	5009:UNK	N	95.34
1	A	5016:UNK	C	6001:UNK	N	49.10

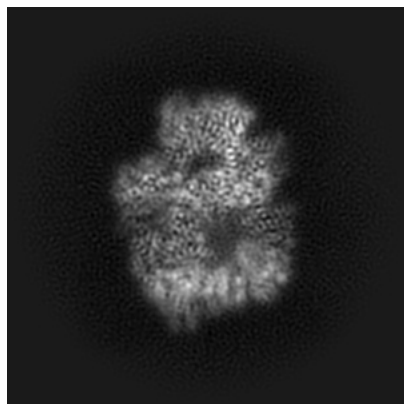
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-11185. These allow visual inspection of the internal detail of the map and identification of artifacts.

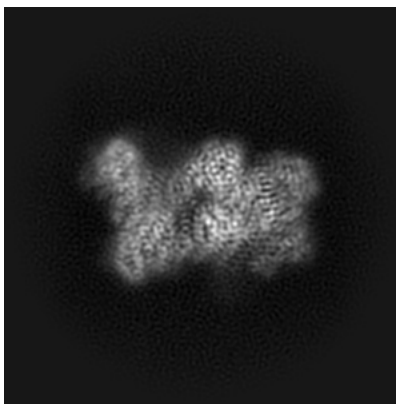
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

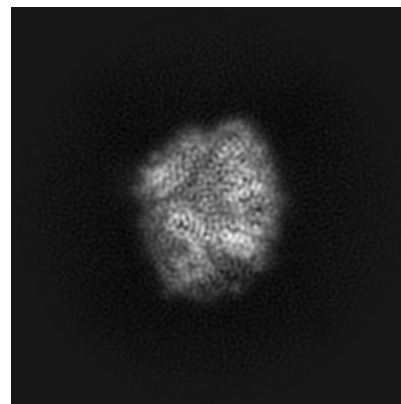
6.1.1 Primary map



X

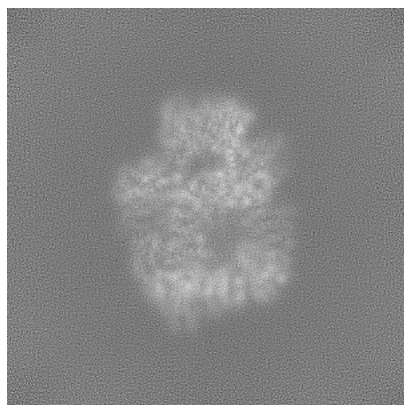


Y

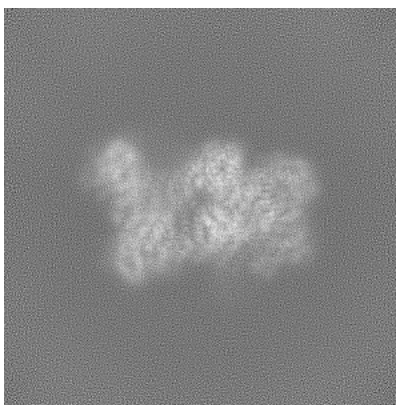


Z

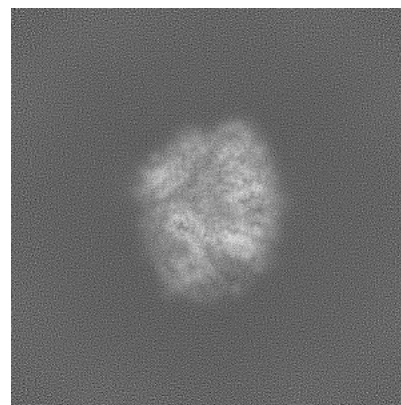
6.1.2 Raw map



X



Y

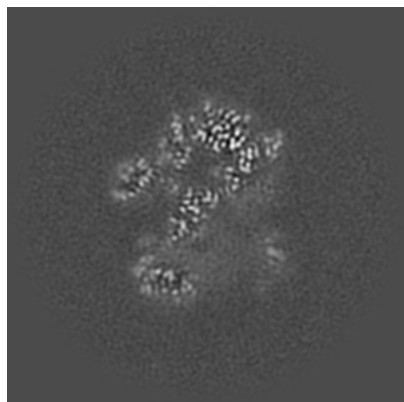


Z

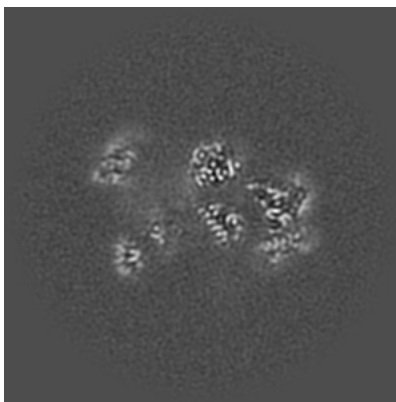
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

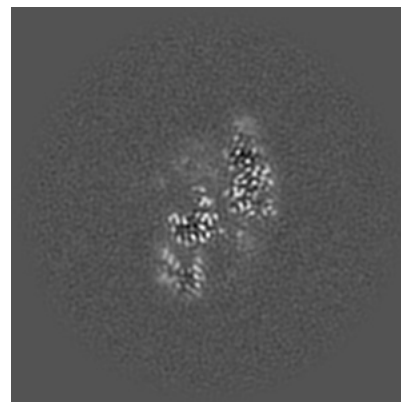
6.2.1 Primary map



X Index: 215

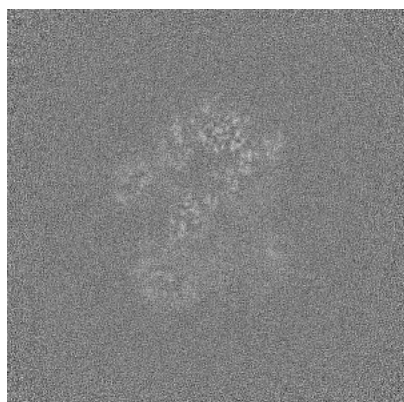


Y Index: 215

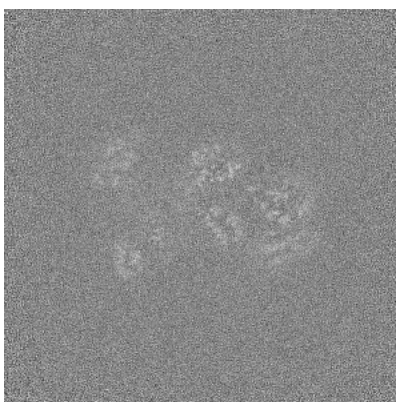


Z Index: 215

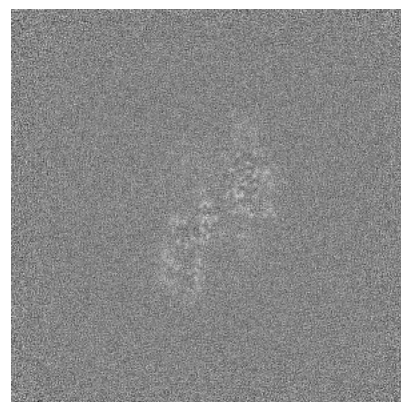
6.2.2 Raw map



X Index: 215



Y Index: 215

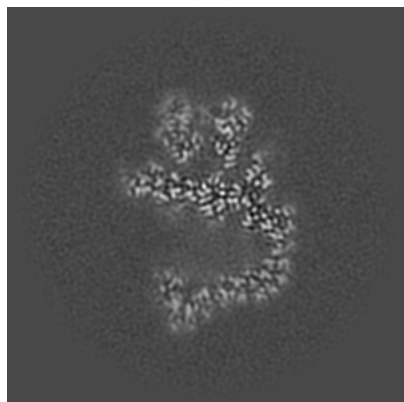


Z Index: 215

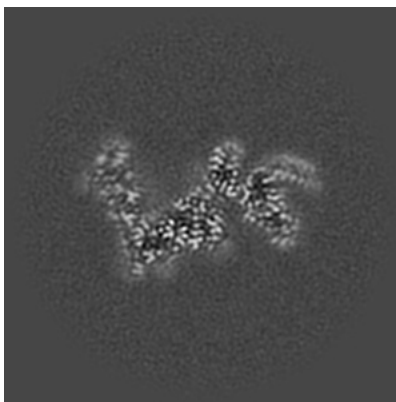
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

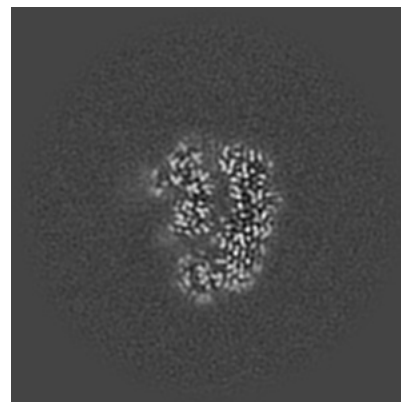
6.3.1 Primary map



X Index: 247

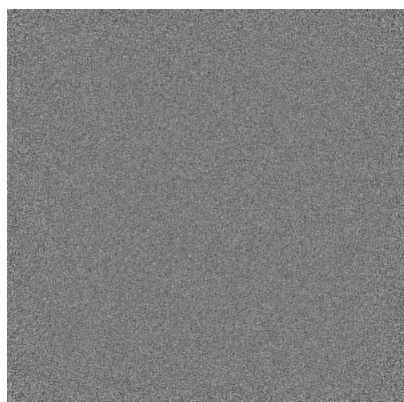


Y Index: 187

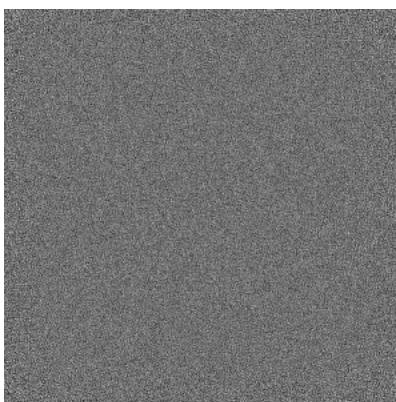


Z Index: 232

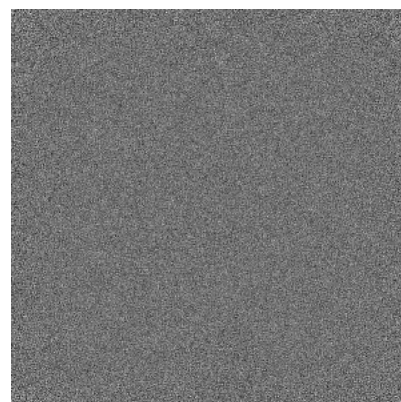
6.3.2 Raw map



X Index: 0



Y Index: 0

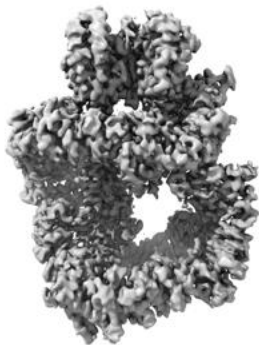


Z Index: 0

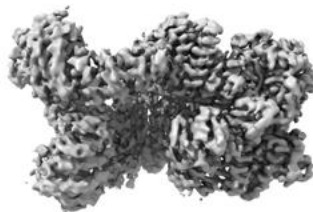
The images above show the largest variance slices of the map in three orthogonal directions.

6.4 Orthogonal surface views [i](#)

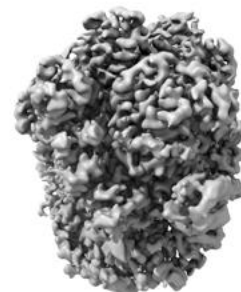
6.4.1 Primary map



X



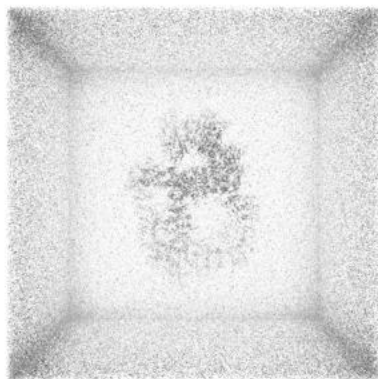
Y



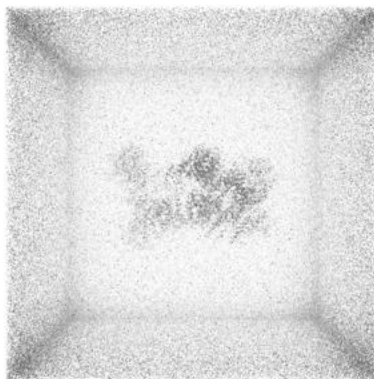
Z

The images above show the 3D surface view of the map at the recommended contour level 0.055. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

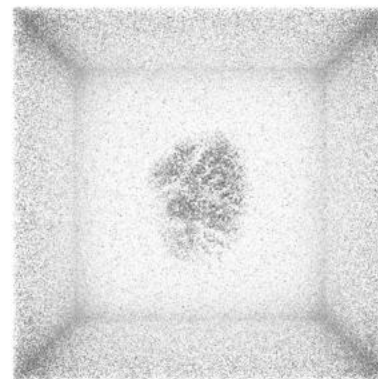
6.4.2 Raw map



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.

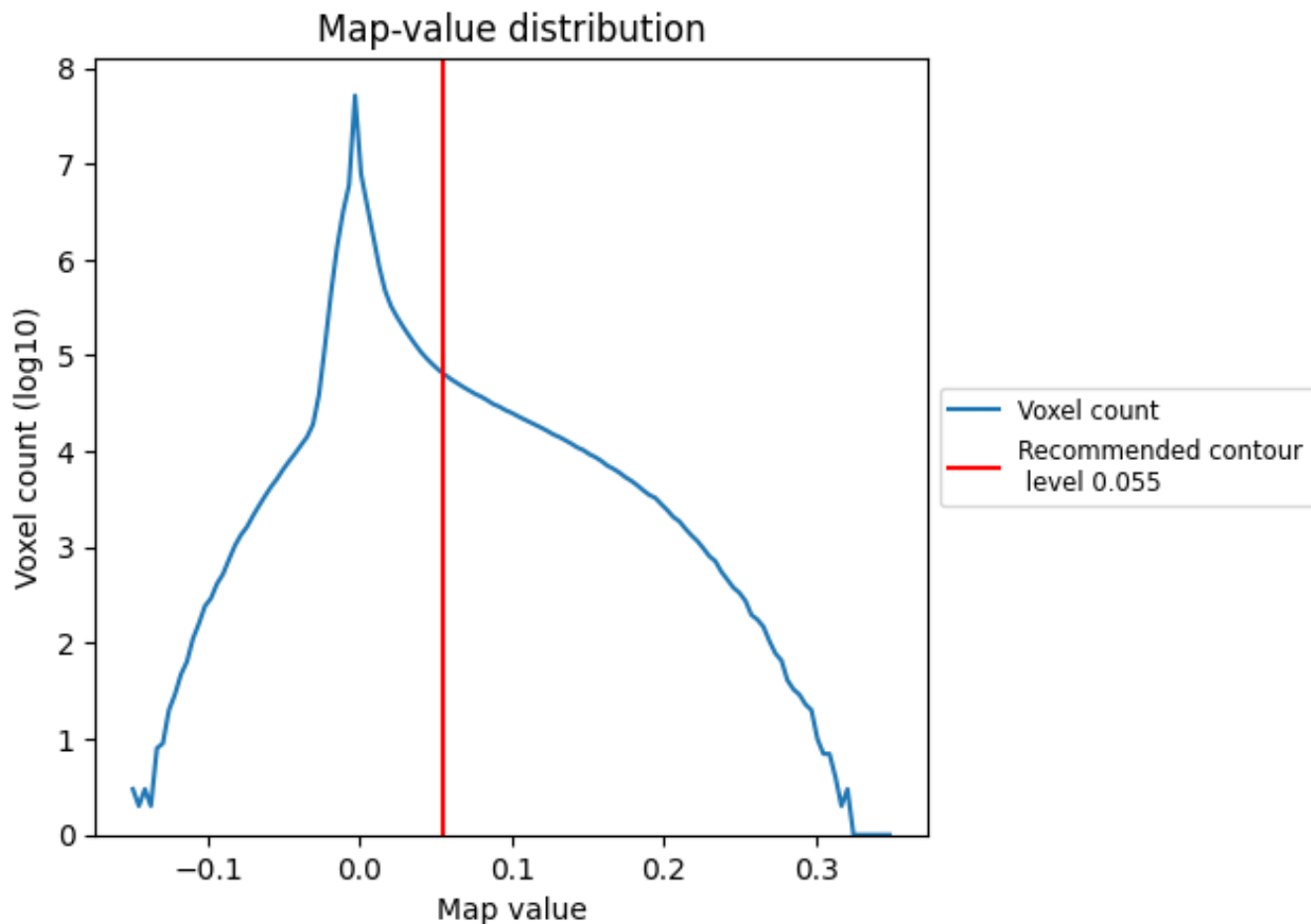
6.5 Mask visualisation [i](#)

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

7 Map analysis [i](#)

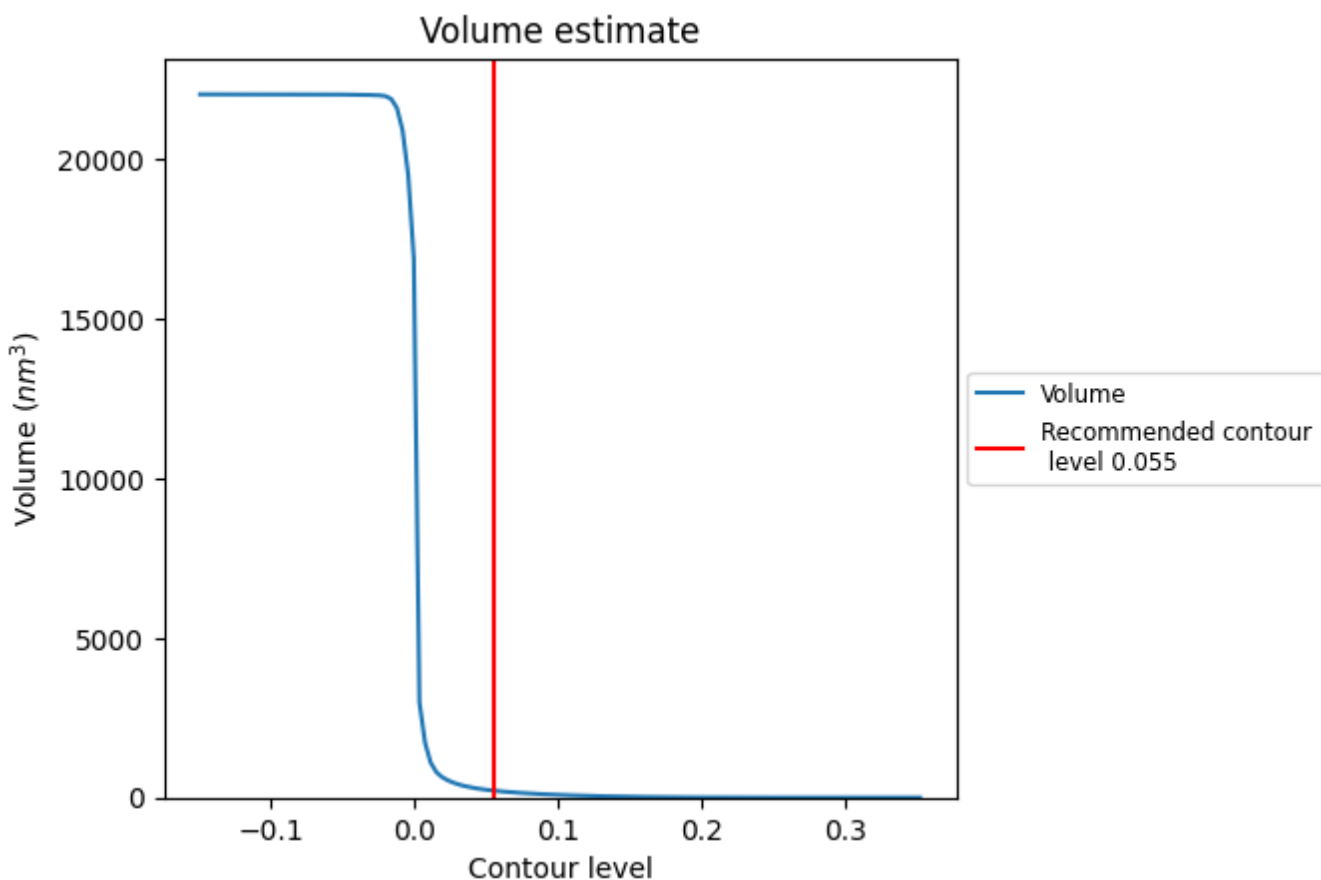
This section contains the results of statistical analysis of the map.

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.

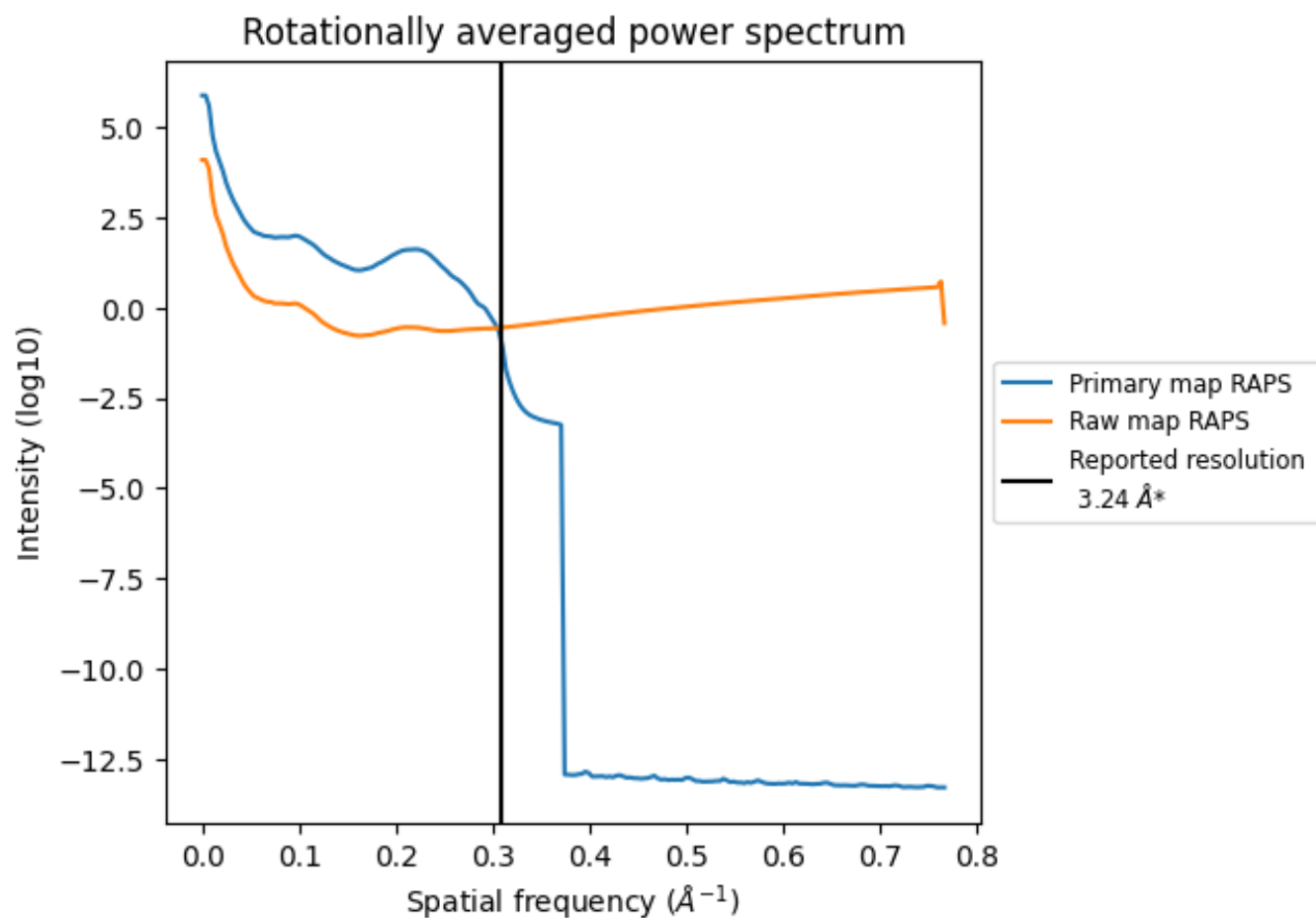
7.2 Volume estimate [\(i\)](#)



The volume at the recommended contour level is 218 nm³; this corresponds to an approximate mass of 197 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](#)

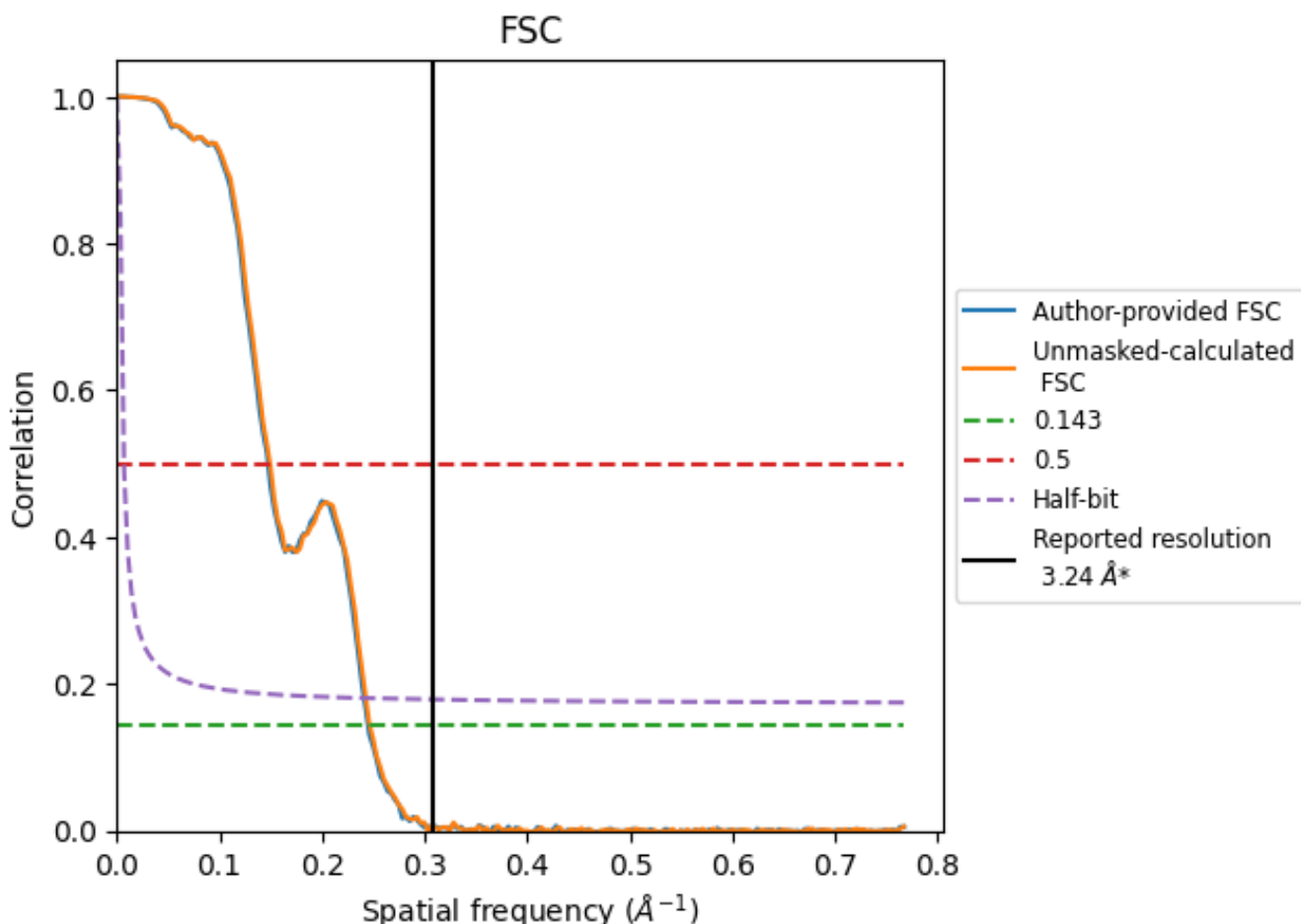


*Reported resolution corresponds to spatial frequency of 0.309 Å⁻¹

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 0.309 Å⁻¹

8.2 Resolution estimates [i](#)

Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.24	-	-
Author-provided FSC curve	4.08	6.78	4.15
Unmasked-calculated*	4.06	6.70	4.12

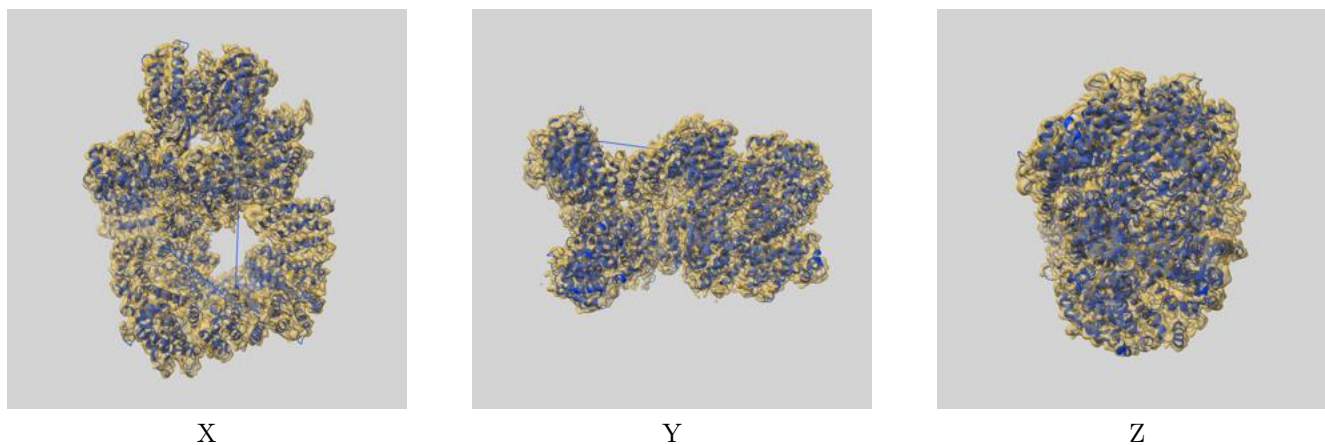
*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps. The value from author-provided FSC intersecting FSC 0.143 CUT-OFF 4.08 differs from the reported value 3.24 by more than 10 %

The value from deposited half-maps intersecting FSC 0.143 CUT-OFF 4.06 differs from the reported value 3.24 by more than 10 %

9 Map-model fit [i](#)

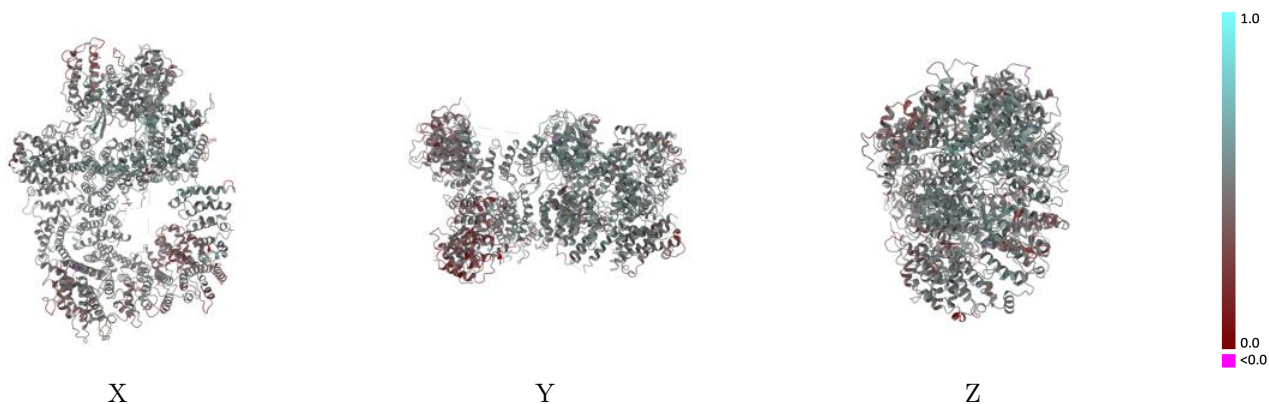
This section contains information regarding the fit between EMDB map EMD-11185 and PDB model 6ZFP. Per-residue inclusion information can be found in section 3 on page 4.

9.1 Map-model overlay [i](#)



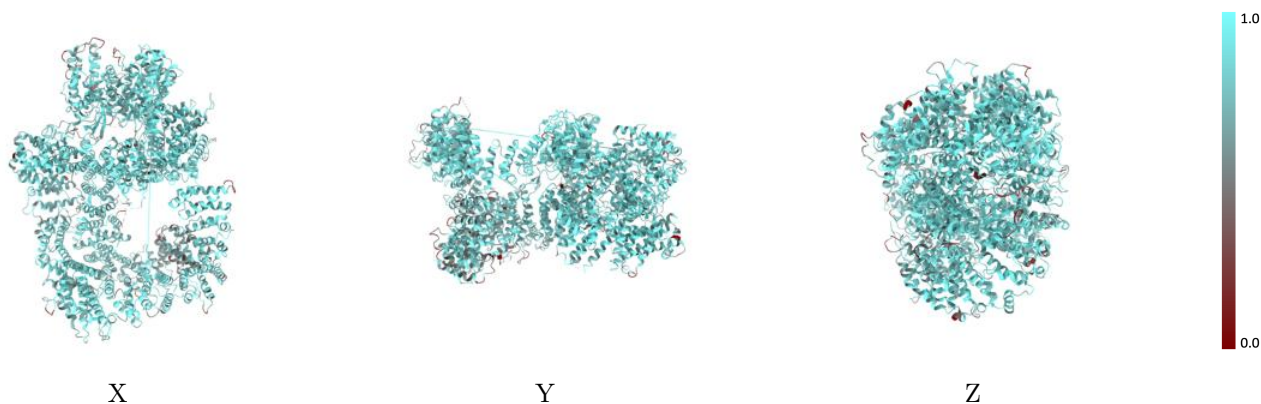
The images above show the 3D surface view of the map at the recommended contour level 0.055 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



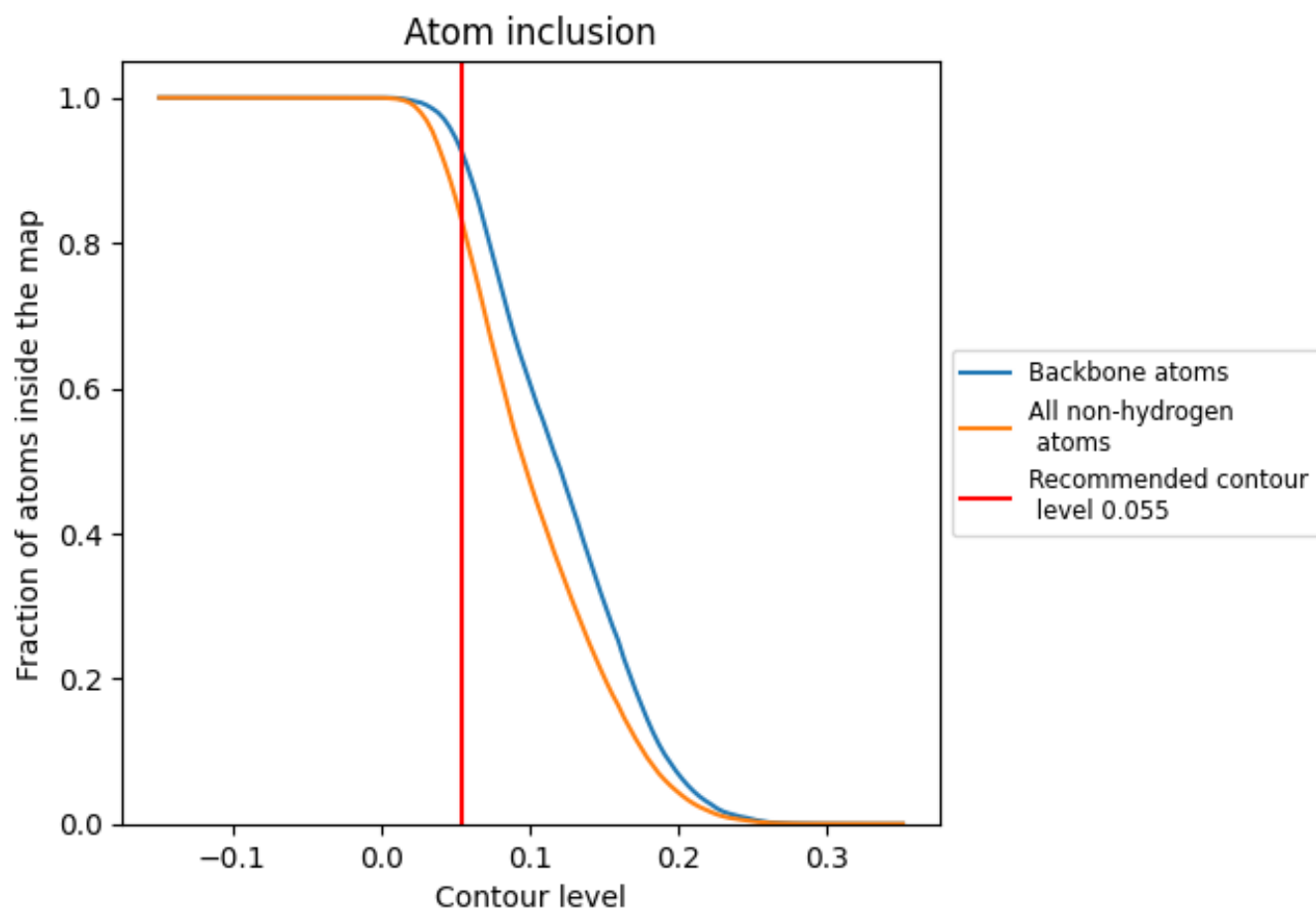
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.055).





9.4 Atom inclusion [i](#)



At the recommended contour level, 92% of all backbone atoms, 83% of all non-hydrogen atoms, are inside the map.

9.5 Map-model fit summary [i](#)

The table lists the average atom inclusion at the recommended contour level (0.055) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.8281	 0.4720
A	 0.8281	 0.4720

