



wwPDB EM Validation Summary Report ⓘ

Sep 28, 2022 – 02:09 pm BST

PDB ID : 7OTY
EMDB ID : EMD-13069
Title : DNA-PKcs in complex with M3814
Authors : Liang, S.; Thomas, S.E.; Blundell, T.L.
Deposited on : 2021-06-10
Resolution : 2.96 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
Mogul : 1.8.4, CSD as541be (2020)
MolProbity : 4.02b-467
buster-report : 1.1.7 (2018)
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
MapQ : 1.9.9
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.31.2

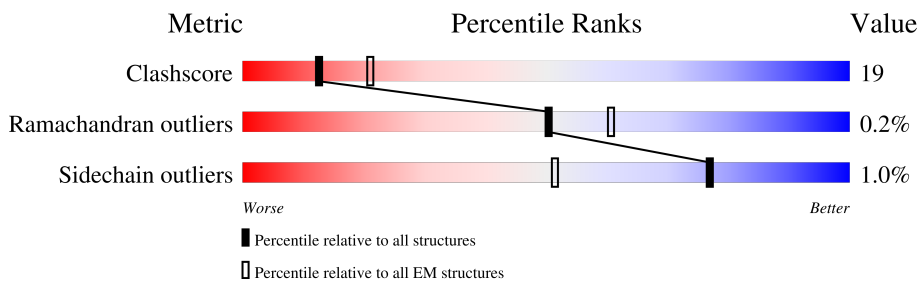
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 2.96 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	4148	

2 Entry composition [i](#)

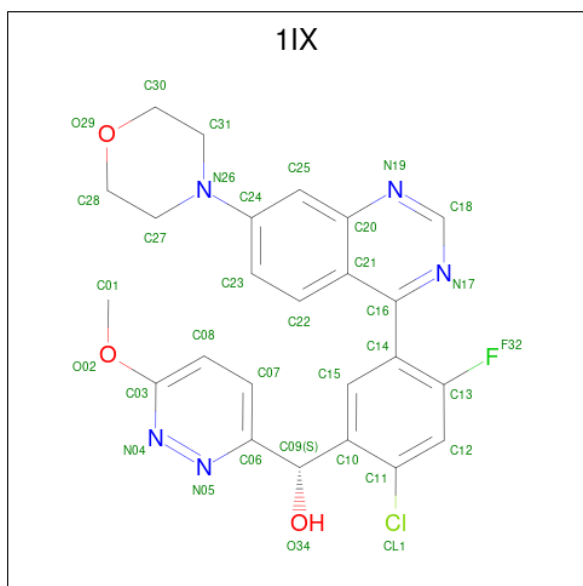
There are 2 unique types of molecules in this entry. The entry contains 29034 atoms, of which 0 are hydrogens and 0 are deuteriums.

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.

Mol	Chain	Residues	Atoms					AltConf	Trace
			Total	C	N	O	S		
1	A	3656	29000	18604	4900	5305	191	0	0

- Molecule 2 is ({S})-[2-chloranyl-4-fluoranyl-5-(7-morpholin-4-ylquinazolin-4-yl)phenyl]-(6-methoxypyridazin-3-yl)methanol (three-letter code: 1IX) (formula: C₂₄H₂₁ClFN₅O₃) (labeled as "Ligand of Interest" by depositor).

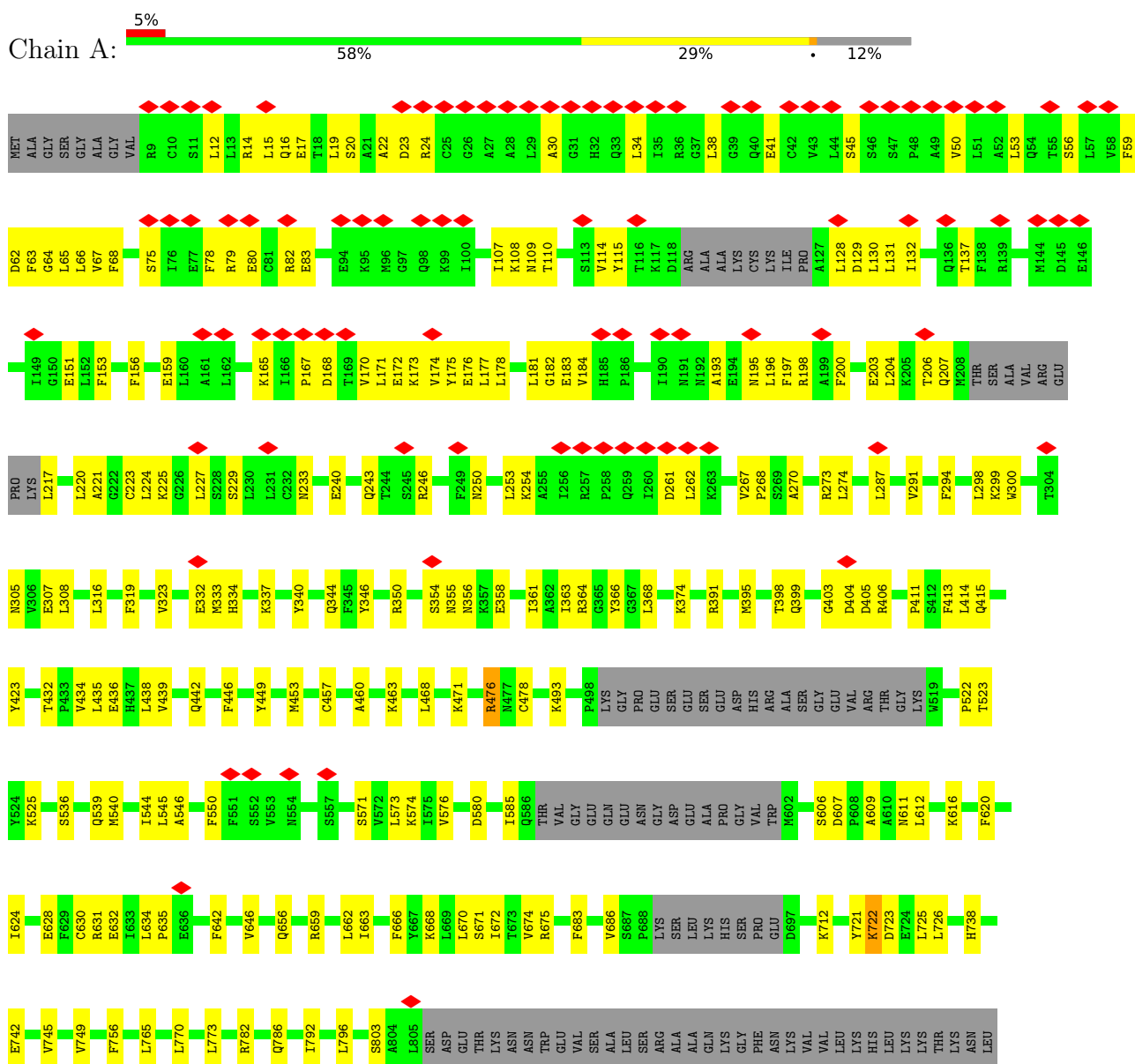


Mol	Chain	Residues	Atoms						AltConf
			Total	C	Cl	F	N	O	
2	A	1	34	24	1	1	5	3	0

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: DNA-dependent protein kinase catalytic subunit,DNA-PKCs



TYR	S1903	C1904	I1905	T1906	E1907	G1908	ALA	L1915	L1918	C1919	Y1920	T1924	M1931	Q1932	L1933	L1934	E1935	R1936	R1937	Y1940	H1941	C1942	Y1945	M1946	I1949	N1957	L1975	L1976	M1980	L1981	I1982	K1985	ARG	ARG	TYR	ASN	PHE	PRO	VAL	GLU	VAL	GLN	ASP	PRO	PRO	ARG	PRO	ALA	ALA	THR
R1822	S1823	L1824	L1825	T1826	L1827	L1828	C1831	S1832	R1837	E1838	F1839	F1840	S1841	T1842	I1843	V1850	L1851	K1852	R1854	F1855	L1860	S1861	T1862	F1863	D1864	T1865	Q1866	K1870	M1871	G1872	Y1874	K1875	L1876	D1878	M1880	L1884	P1885	K1886	A1891	K1892	E1893	M1897	V1899	F1900	H1901	G1902				
T1733	F1734	R1735	F1736	K1745	F1746	L1747	L1750	E1751	L1752	S1753	Q1754	P1755	M1757	L1758	L1759	E1760	L1761	M1762	V1765	L1766	C1767	R1768	E1769	Q1770	E1775	Q1779	S1780	F1781	R1782	L1783	R1784	I1785	A1786	L1797	L1798	E1799	S1800	V1801	E1803	M1804	F1805	R1806	L1811	L1812	S1813	F1814	F1819	V1820	D1821	
A1650	K1651	I1652	L1653	Q1654	I1655	D1656	S1657	V1658	V1659	S1660	F1661	M1662	S1664	F1665	S1666	I1667	M1668	T1669	E1670	T1674	Y1675	L1678	L1684	H1687	L1688	K1689	K1690	Q1691	V1693	T1694	L1695	L1702	E1708	E1709	L1710	R1711	R1712	V1713	L1714	E1715	Q1716	L1717	I1718	V1719	F1722	P1723	F1729	G1732		
L1448	V1452	S1453	Q1457	L1458	H1459	L1463	L1464	H1465	M1466	L1467	Q1471	S1472	T1473	D1474	L1475	H1476	H1477	S1478	V1479	E1482	L1483	L1484	S1485	L1486	D1495	Q1498	C1499	C1507	K1508	Q1509	L1510	L1514	F1521	G1523	L1524	C1525	E1526	R1527	V1537	L1538	S1539	T1540	L1541	LEU	GLY	SER				
L1162	L1163	C1164	L1165	L1168	V1169	E1182	K1186	L1190	F1194	V1195	L1198	R1202	S1203	P1204	M1205	L1206	L1208	K1209	D1210	V1211	L1212	K1213	E1214	V1217	L1220	I1221	M1222	T1223	F1224	E1225	Q1231	P1232	S1233	G1234	I1235	L1236	A1237	Q1238	T1239	L1240	L1241	L1242	R1245	A1252	T1253	L1254				
C1255	W1256	L1259	L1260	L1261	C1266	Y1267	R1274	L1279	A1286	S1289	L1290	F1296	F1297	I1301	H1304	K1311	C1312	PHE	GLY	T1315	G1316	A1317	N1320	R1321	S1322	S1323	P1324	Q1325	E1328	N1331	S1333	K1334	C1335	T1336	V1337	V1338	V1339	R1340	E1343	L1348	T1351									
G1355	L1358	L1359	K1360	K1361	D1362	M1365	T1366	H1367	M1369	R1370	V1371	L1372	T1375	P1379	F1384	V1389	Q1390	V1391	M1392	L1395	V1398	L1402	K1407	P1410	Y1411	K1412	D1413	L1414	L1415	T1417	R1420	T1424	S1427	L1431	V1434	M1435	L1436	Y1437	R1445											
E1035	T1045	P1046	Q1047	Q1048	Q1049	E1050	L1066	A1067	L1068	R1075	A1078	F1082	M1083	N1084	I1085	Y1086	R1087	E1097	F1101	L1104	V1105	Y1107	E1118	K1119	S1120	T1123	Q1126	L1134	C1135	H1142	L1145	M1146	K1150	R1151	P1154	F1157	P1158	P1159	S1160	A1161										
R941	L942	M948	PRO	GLU	GLY	GLN	Y959	K963	R964	T965	P966	P967	V968	L969	R971	D975	V976	Y984	L987	V988	M989	H993	K1000	F1001	E1002	L1009	L1010	I1013	L1014	D1015	G1016	V1018	P1019	P1020	D1022	S1023	R1026	G1029	C1030	M937	L1031	G1032	I1033							
SER	SER	ASN	GLU	ALA	ILE	S847	L848	I851	R852	V855	L859	G860	L870	S875	E878	M879	H880	R888	L892	P897	F898	M901	I905	L911	T915	E916	L917	A918	L919	T920	A921	S922	D923	R924	Q925	C931	E932	L933	L934	H935	S936	M937	V938	M939	F940					

4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	209036	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 ($e^-/\text{\AA}^2$)	47.9	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	4.272	Depositor
Minimum map value	-2.388	Depositor
Average map value	0.002	Depositor
Map value standard deviation	0.081	Depositor
Recommended contour level	0.29	Depositor
Map size (\AA)	339.04, 339.04, 339.04	wwPDB
Map dimensions	260, 260, 260	wwPDB
Map angles ($^\circ$)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (\AA)	1.304, 1.304, 1.304	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: 1IX

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	0.58	0/29492	0.60	0/39881

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	29000	0	29178	1038	0
2	A	34	0	0	1	0
All	All	29034	0	29178	1038	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 19.

The worst 5 of 1038 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:1019:ASP:H	1:A:1020:PRO:CD	1.54	1.21
1:A:3575:LEU:CD1	1:A:3802:LEU:HD11	1.71	1.19

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:3752:VAL:HG22	1:A:3802:LEU:CD2	1.75	1.17
1:A:3075:LYS:O	1:A:3079:GLU:HG2	1.49	1.13
1:A:1019:ASP:H	1:A:1020:PRO:HD2	1.10	1.08

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	3602/4148 (87%)	3230 (90%)	365 (10%)	7 (0%)	47 79

5 of 7 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	1019	ASP
1	A	3692	VAL
1	A	3495	PHE
1	A	2787	HIS
1	A	3406	ALA

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	3194/3671 (87%)	3162 (99%)	32 (1%)	76 90

5 of 32 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	3898	LEU
1	A	3963	LEU
1	A	2328	ARG
1	A	2097	LEU
1	A	3972	LEU

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 16 such sidechains are listed below:

Mol	Chain	Res	Type
1	A	3501	HIS
1	A	3494	GLN
1	A	2352	HIS
1	A	3390	GLN
1	A	2305	ASN

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](#)

1 ligand is modelled in this entry.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	1IX	A	6101	-	37,38,38	2.94	14 (37%)	50,54,54	2.48	23 (46%)

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

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	1IX	A	6101	-	-	2/18/26/26	0/5/5/5

The worst 5 of 14 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	6101	1IX	O29-C30	-10.40	1.00	1.42
2	A	6101	1IX	C12-C13	5.40	1.46	1.37
2	A	6101	1IX	C14-C16	5.26	1.55	1.49
2	A	6101	1IX	C21-C20	-5.11	1.34	1.42
2	A	6101	1IX	C14-C13	-4.48	1.32	1.39

The worst 5 of 23 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	A	6101	1IX	C30-O29-C28	7.73	135.69	109.89
2	A	6101	1IX	C21-C20-N19	-4.74	117.78	122.83
2	A	6101	1IX	C21-C16-N17	-4.70	119.95	123.04
2	A	6101	1IX	C18-N19-C20	4.60	121.74	115.40
2	A	6101	1IX	C24-C25-C20	-3.93	118.26	121.02

There are no chirality outliers.

All (2) torsion outliers are listed below:

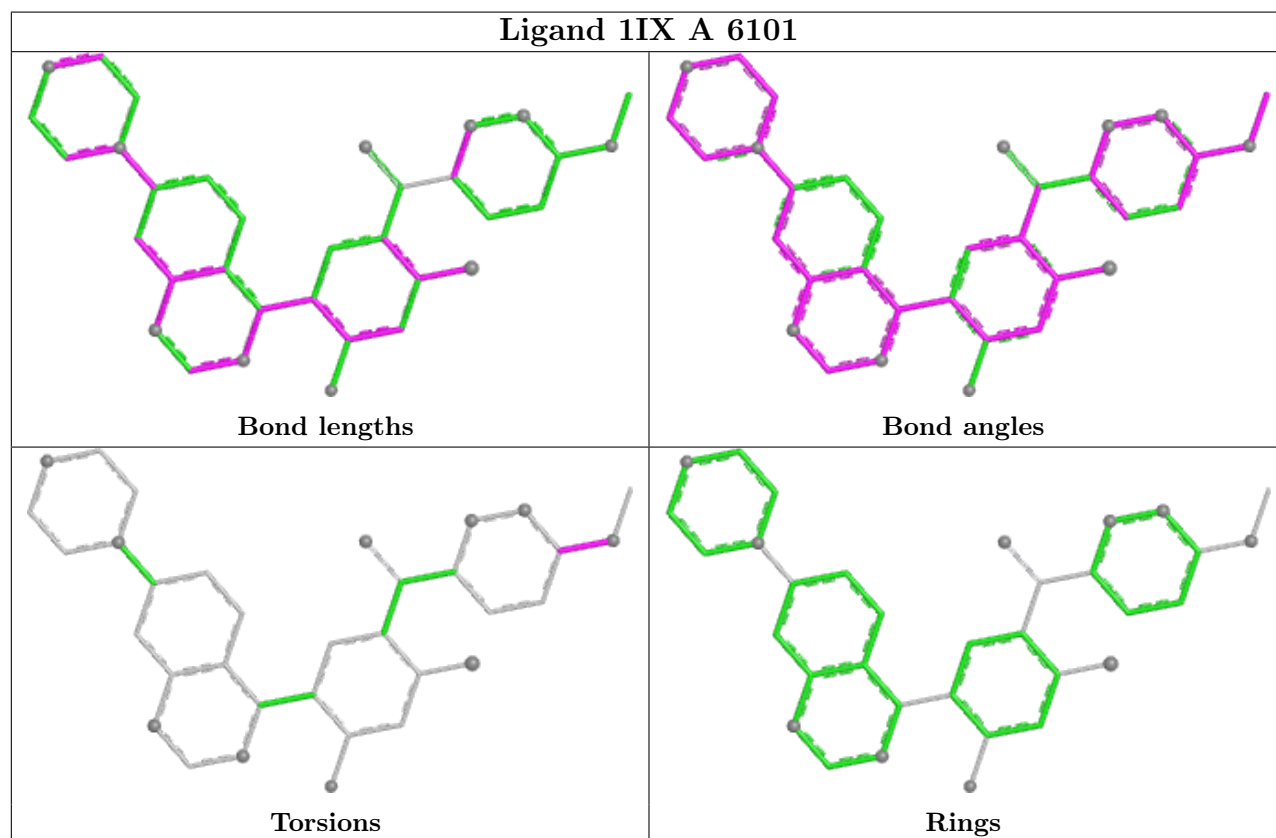
Mol	Chain	Res	Type	Atoms
2	A	6101	1IX	N04-C03-O02-C01
2	A	6101	1IX	C08-C03-O02-C01

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	6101	1IX	1	0

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



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:

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Mol	Chain	Number of breaks
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Mol	Chain	Number of breaks
1	A	1

All chain breaks are listed below:

Model	Chain	Residue-1	Atom-1	Residue-2	Atom-2	Distance (Å)
1	A	4128:MET	C	6001:UNK	N	82.32

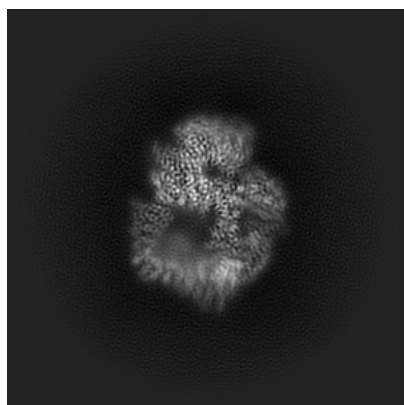
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-13069. These allow visual inspection of the internal detail of the map and identification of artifacts.

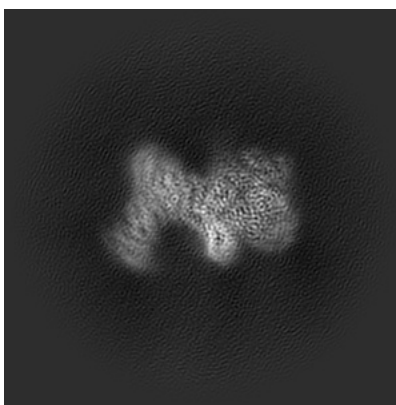
No raw map or half-maps were deposited for this entry and therefore no images, graphs, etc. pertaining to the raw map can be shown.

6.1 Orthogonal projections [i](#)

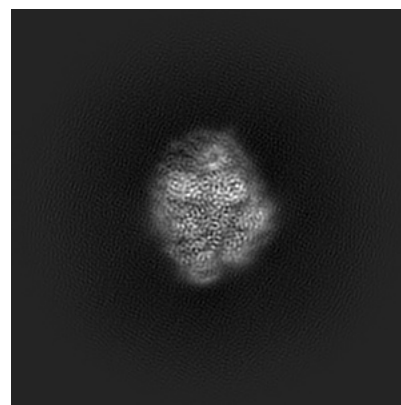
6.1.1 Primary map



X



Y

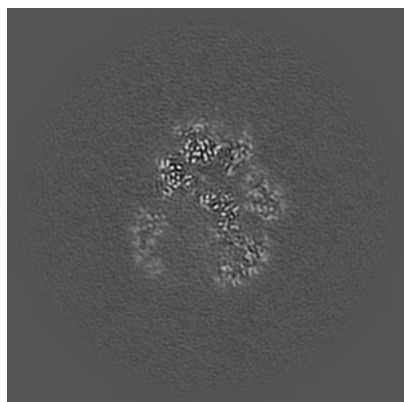


Z

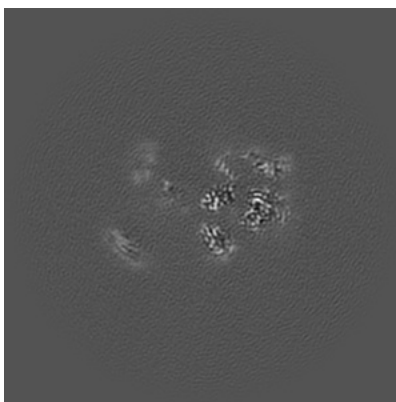
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

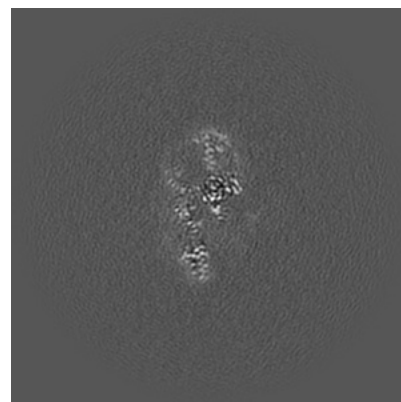
6.2.1 Primary map



X Index: 130



Y Index: 130

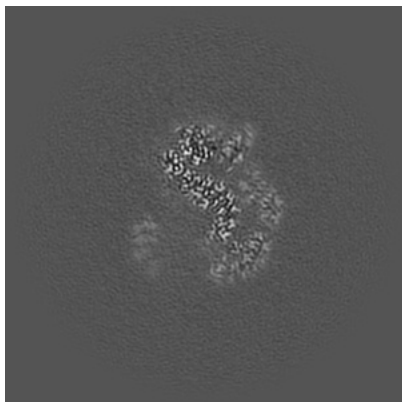


Z Index: 130

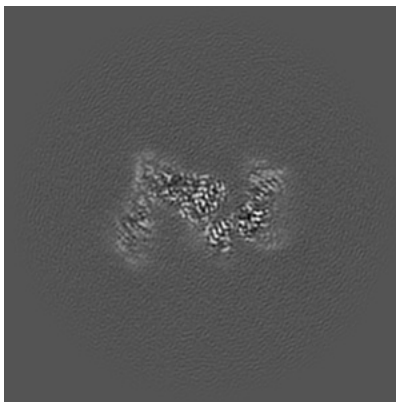
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

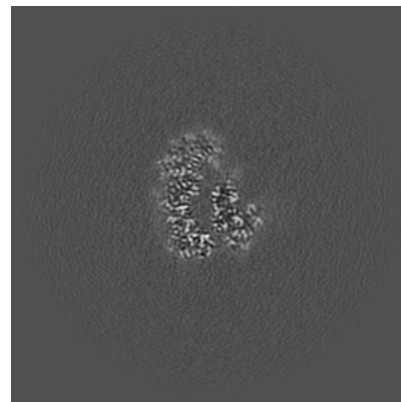
6.3.1 Primary map



X Index: 134



Y Index: 142



Z Index: 141

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 0.29. These images, in conjunction with the slice images, may facilitate assessment of whether an appropriate contour level has been provided.

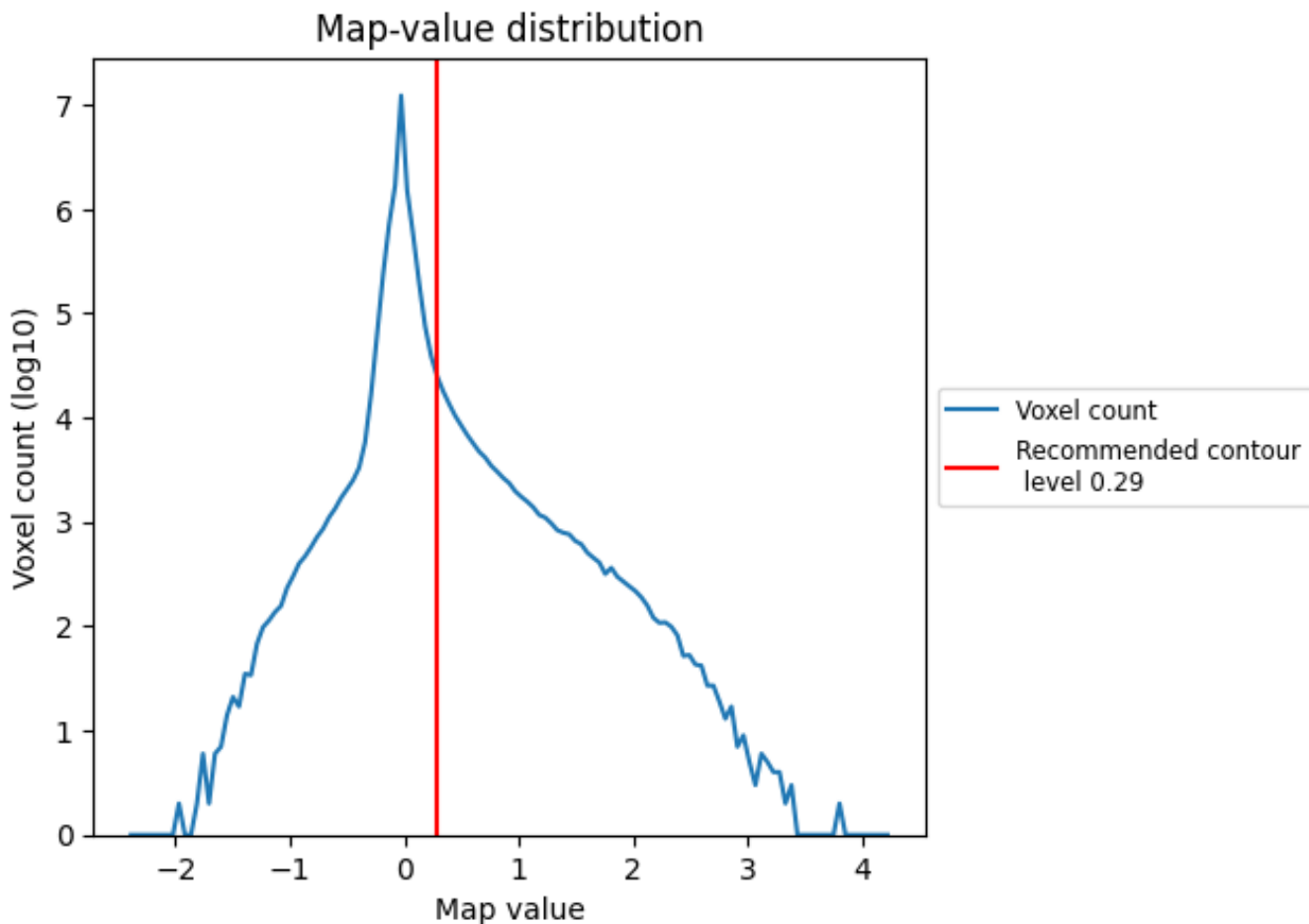
6.5 Mask visualisation

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

7 Map analysis [i](#)

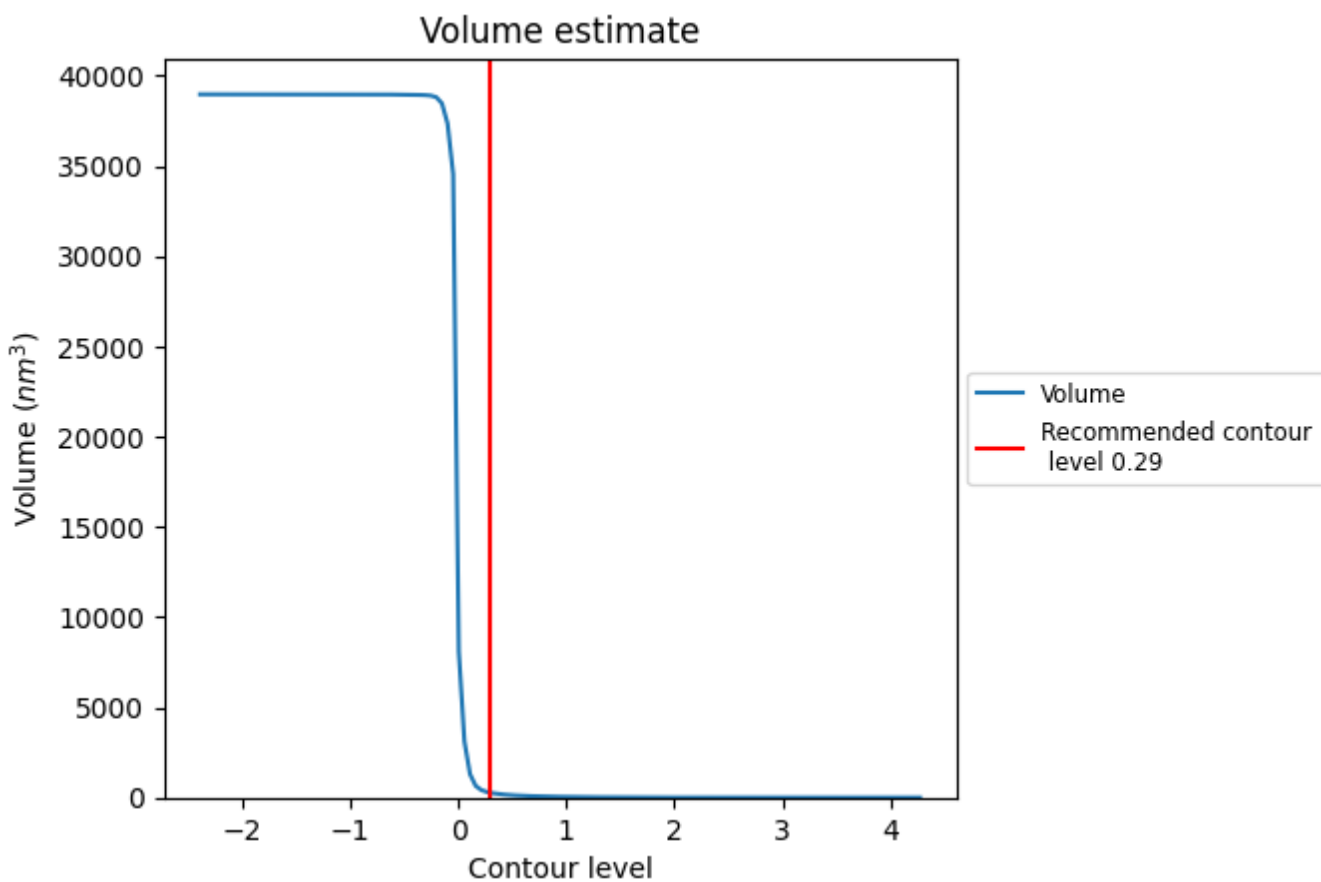
This section contains the results of statistical analysis of the map.

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.

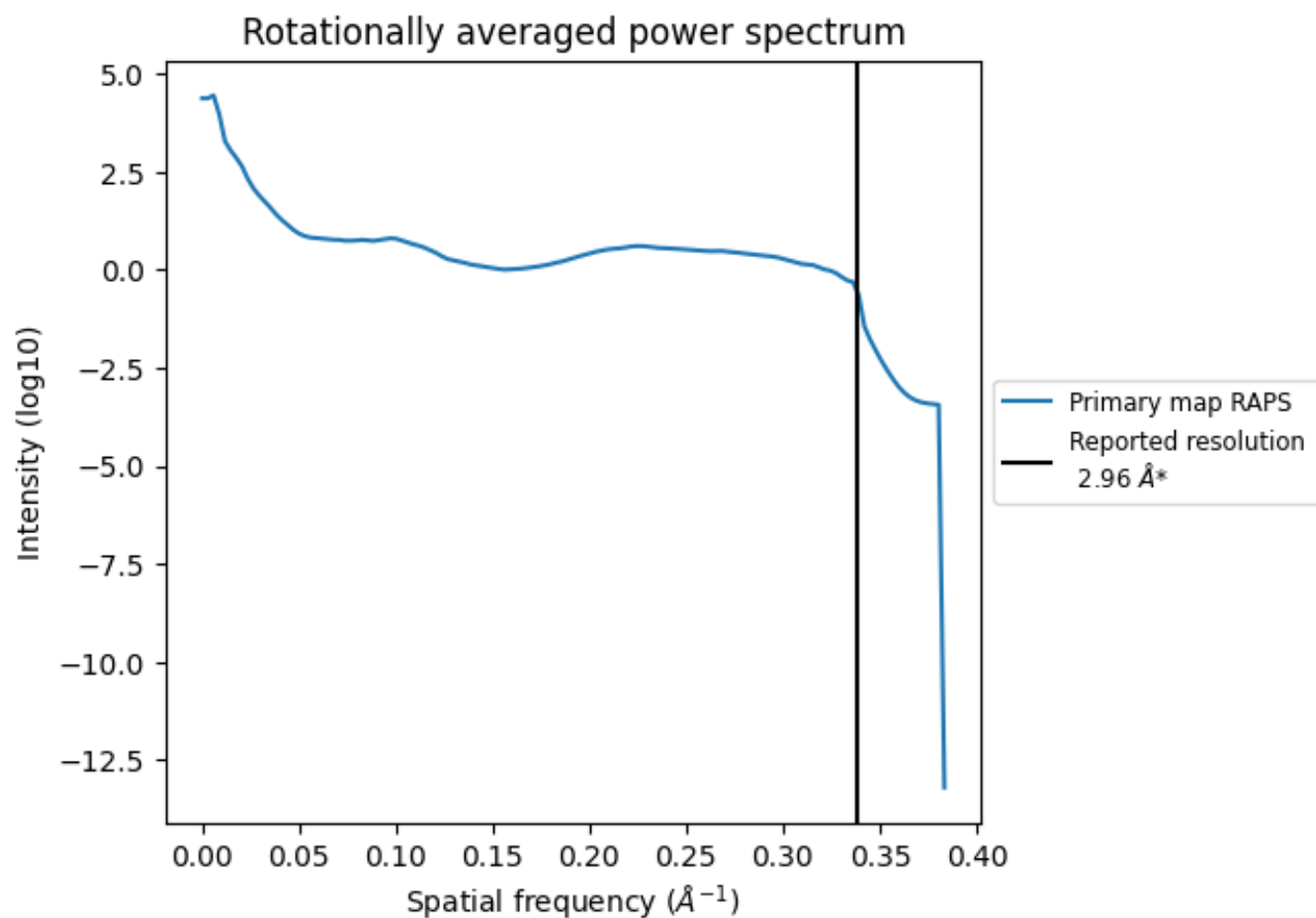
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 279 nm³; this corresponds to an approximate mass of 252 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 0.338\AA^{-1}

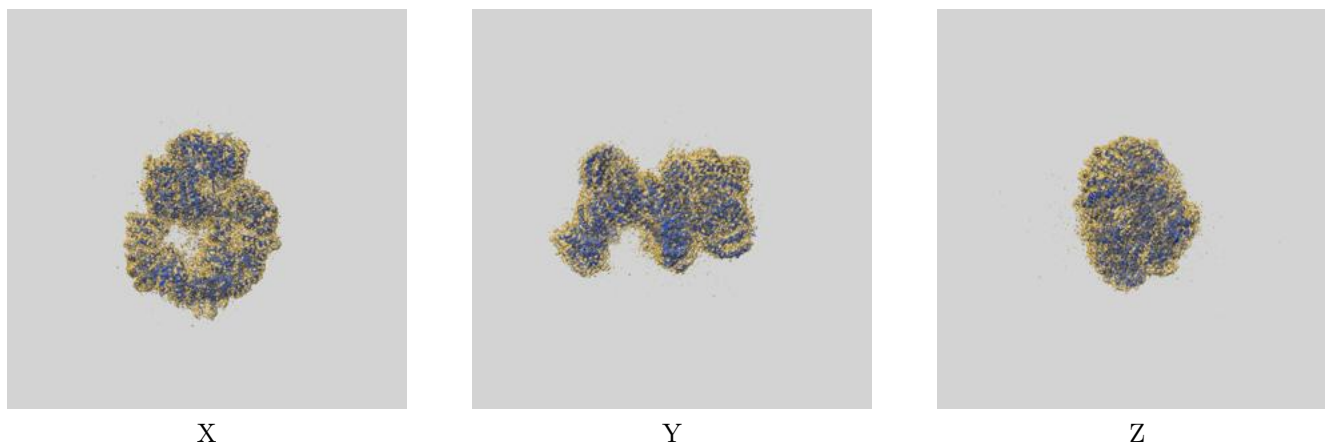
8 Fourier-Shell correlation

This section was not generated. No FSC curve or half-maps provided.

9 Map-model fit [i](#)

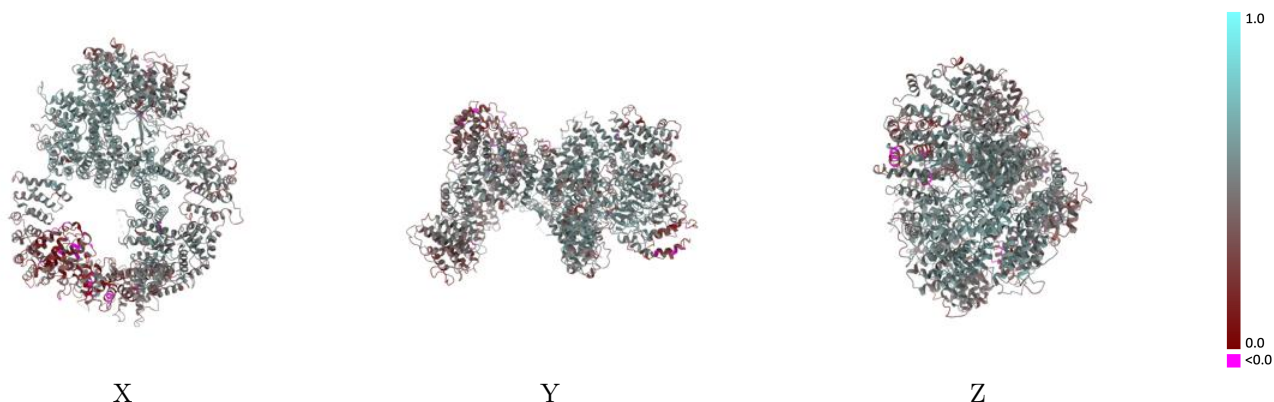
This section contains information regarding the fit between EMDB map EMD-13069 and PDB model 7OTY. Per-residue inclusion information can be found in section [3](#) on page [4](#).

9.1 Map-model overlay [i](#)



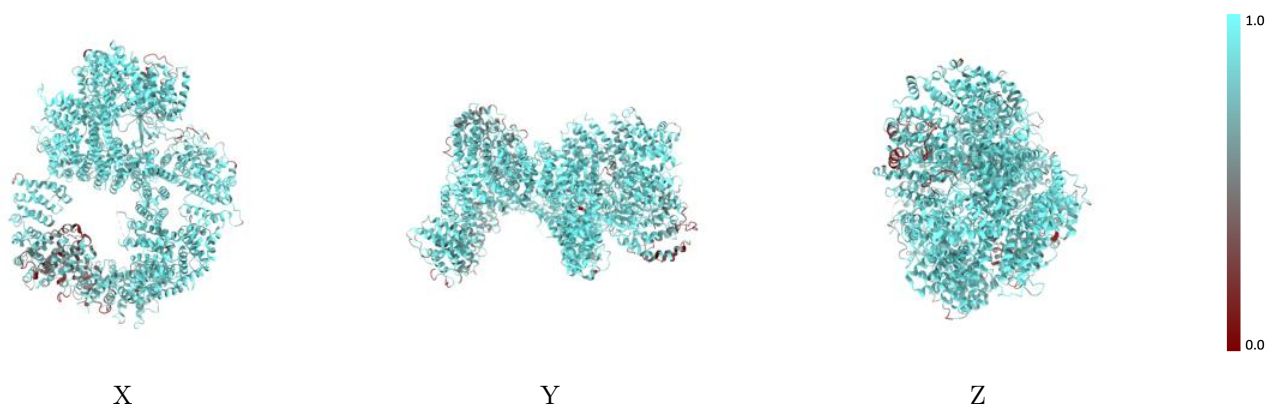
The images above show the 3D surface view of the map at the recommended contour level 0.29 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



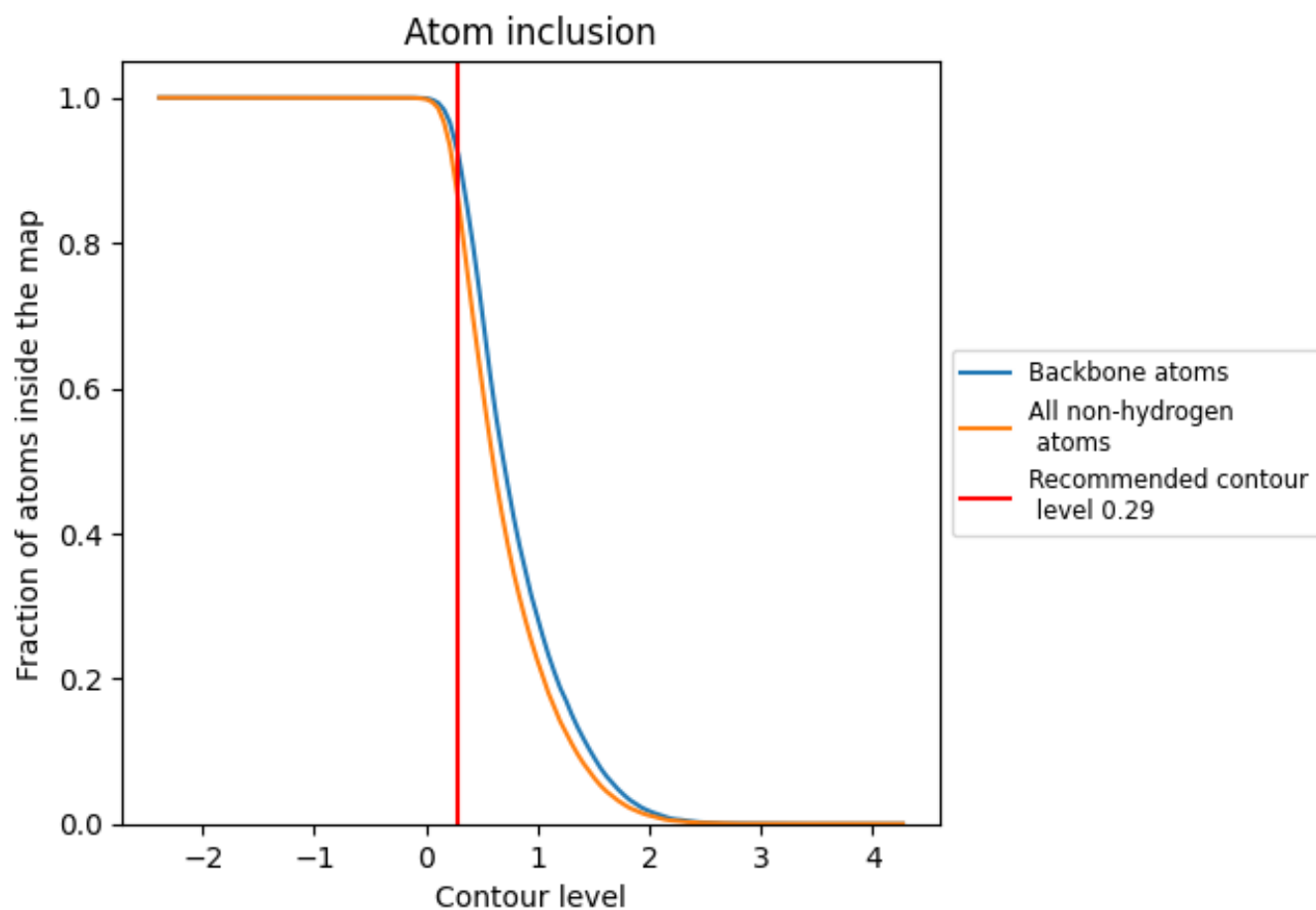
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.29).





9.4 Atom inclusion [i](#)



At the recommended contour level, 92% of all backbone atoms, 86% 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 (0.29) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.8587	 0.4620
A	 0.8587	 0.4620

