



Full wwPDB EM Validation Report ⓘ

Mar 9, 2026 – 04:12 PM UTC

PDB ID : 9EIL / pdb_00009eil
EMDB ID : EMD-48086
Title : SIRT6 bound to an H3K27Ac nucleosome
Authors : Markert, J.; Wang, Z.; Cole, P.; Farnung, L.
Deposited on : 2024-11-26
Resolution : 3.20 Å(reported)

This is a Full wwPDB EM Validation 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:

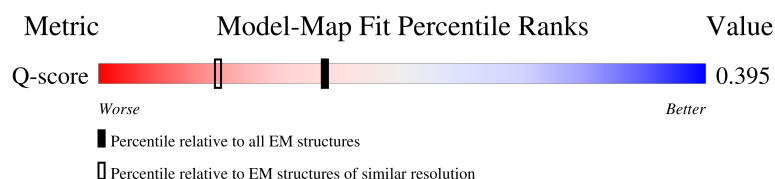
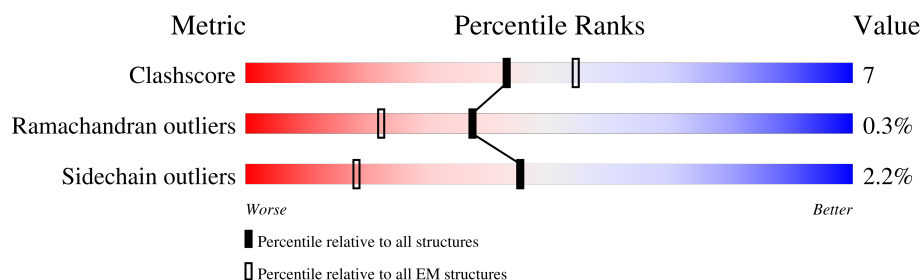
EMDB validation analysis : 0.0.1.dev132
Mogul : 2022.3.0, CSD as543be (2022)
MolProbity : 4-5-2 with Phenix2.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
EM percentile statistics : 202505.v01 (Using data in the EMDB archive up until May 2025)
MapQ : 1.9.13
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.49

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 3.20 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.



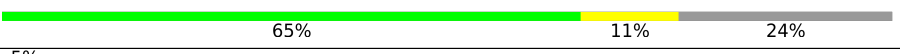
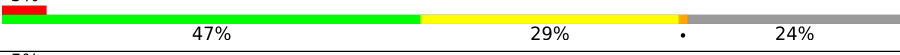
Metric	Whole archive (#Entries)	EM structures (#Entries)	Similar EM resolution (#Entries, resolution range(Å))
Clashscore	229148	23984	-
Ramachandran outliers	224038	23583	-
Sidechain outliers	223484	23102	-
Q-score	-	25397	15020 (2.70 - 3.70)

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	135	
1	E	135	
2	B	102	
2	F	102	

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Mol	Chain	Length	Quality of chain
3	C	129	
3	G	129	
4	D	122	
4	H	122	
5	I	185	
6	J	185	
7	K	355	

2 Entry composition

There are 9 unique types of molecules in this entry. The entry contains 14070 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 Histone H3.2.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	100	Total	C	N	O	S	0	0
			825	519	162	142	2		
1	E	95	Total	C	N	O	S	0	0
			784	495	151	136	2		

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	102	ALA	GLY	engineered mutation	UNP P84233
A	110	ALA	CYS	engineered mutation	UNP P84233
E	102	ALA	GLY	engineered mutation	UNP P84233
E	110	ALA	CYS	engineered mutation	UNP P84233

- Molecule 2 is a protein called Histone H4.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	B	83	Total	C	N	O	S	0	0
			662	418	129	114	1		
2	F	78	Total	C	N	O	S	0	0
			619	391	120	107	1		

- Molecule 3 is a protein called Histone H2A type 1.

Mol	Chain	Residues	Atoms				AltConf	Trace
3	C	112	Total	C	N	O	0	0
			861	541	170	150		
3	G	105	Total	C	N	O	0	0
			809	510	158	141		

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	99	ARG	GLY	engineered mutation	UNP P06897

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Chain	Residue	Modelled	Actual	Comment	Reference
C	123	SER	ALA	engineered mutation	UNP P06897
G	99	ARG	GLY	engineered mutation	UNP P06897
G	123	SER	ALA	engineered mutation	UNP P06897

- Molecule 4 is a protein called Histone H2B.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	D	93	Total	C	N	O	S	0	0
			726	457	130	137	2		
4	H	93	Total	C	N	O	S	0	0
			726	457	130	137	2		

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
D	29	THR	SER	engineered mutation	UNP P02281
H	29	THR	SER	engineered mutation	UNP P02281

- Molecule 5 is a DNA chain called DNA (185-MER).

Mol	Chain	Residues	Atoms					AltConf	Trace
5	I	141	Total	C	N	O	P	0	0
			2904	1375	542	846	141		

- Molecule 6 is a DNA chain called DNA (185-MER).

Mol	Chain	Residues	Atoms					AltConf	Trace
6	J	141	Total	C	N	O	P	0	0
			2874	1366	524	844	140		

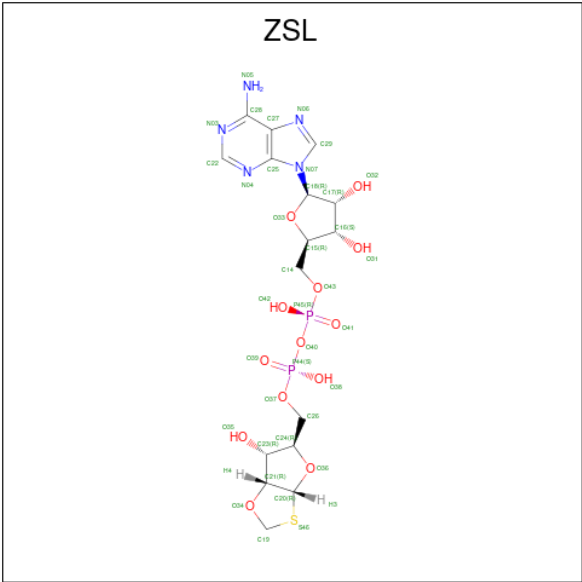
- Molecule 7 is a protein called NAD-dependent protein deacylase sirtuin-6.

Mol	Chain	Residues	Atoms					AltConf	Trace
7	K	289	Total	C	N	O	S	0	0
			2242	1406	415	410	11		

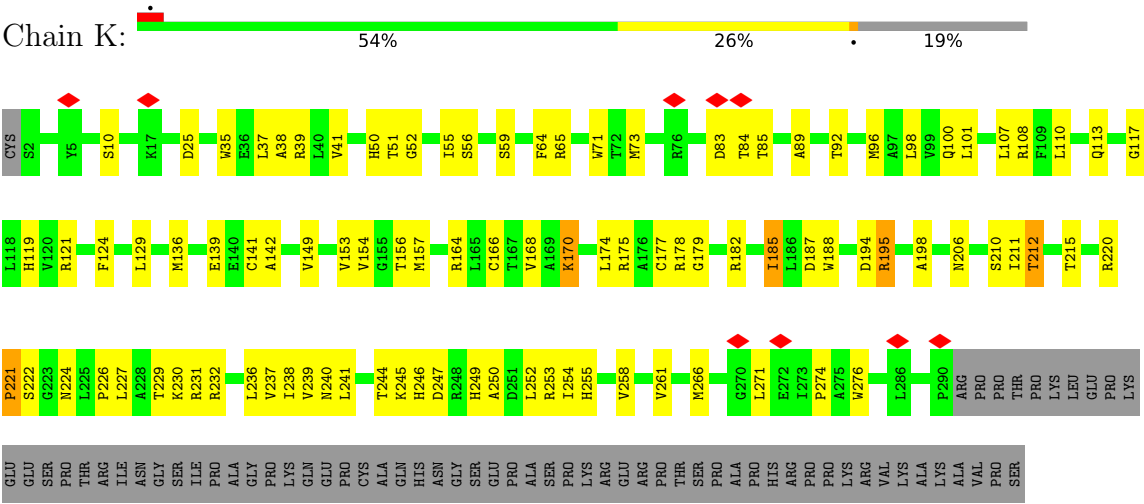
There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
K	1	CYS	-	expression tag	UNP Q8N6T7

- Molecule 8 is [(2R,3S,4R,5R)-5-(6-amino-9H-purin-9-yl)-3,4-dihydroxyoxolan-2-yl]methyl [(3aR,5R,6R,6aR)-6-hydroxytetrahydro-2H-furo[2,3-d][1,3]oxathiol-5-yl]methyl dihydrogen diphosphate (non-preferred name) (CCD ID: ZSL) (formula: C₁₆H₂₃N₅O₁₃P₂S) (labeled as "Ligand of Interest" by depositor).



● Molecule 7: NAD-dependent protein deacylase sirtuin-6



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	124274	Depositor
Resolution determination method	FSC 0.143 CUT-OFF	Depositor
CTF correction method	PHASE FLIPPING AND AMPLITUDE CORRECTION	Depositor
Microscope	TFS KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	50.45	Depositor
Minimum defocus (nm)	700	Depositor
Maximum defocus (nm)	1700	Depositor
Magnification	Not provided	
Image detector	GATAN K3 BIOQUANTUM (6k x 4k)	Depositor
Maximum map value	0.400	Depositor
Minimum map value	-0.191	Depositor
Average map value	-0.000	Depositor
Map value standard deviation	0.011	Depositor
Recommended contour level	0.042	Depositor
Map size (Å)	298.8, 298.8, 298.8	wwPDB
Map dimensions	360, 360, 360	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.83, 0.83, 0.83	Depositor

5 Model quality [i](#)

5.1 Standard geometry [i](#)

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

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	0.13	0/835	0.25	0/1117
1	E	0.14	0/794	0.31	1/1065 (0.1%)
2	B	0.15	0/669	0.28	0/894
2	F	0.15	0/626	0.23	0/837
3	C	0.14	0/871	0.29	0/1174
3	G	0.13	0/819	0.27	0/1106
4	D	0.12	0/737	0.24	0/993
4	H	0.12	0/737	0.24	0/993
5	I	0.22	0/3260	0.47	2/5033 (0.0%)
6	J	0.22	0/3221	0.40	0/4966
7	K	0.15	0/2289	0.35	0/3103
All	All	0.18	0/14858	0.37	3/21281 (0.0%)

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed($^{\circ}$)	Ideal($^{\circ}$)
5	I	20	DG	OP1-P-O3'	-9.02	80.93	108.00
5	I	20	DG	OP2-P-O3'	-6.83	87.51	108.00
1	E	117	VAL	N-CA-C	-5.19	108.44	113.53

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	825	0	866	10	0
1	E	784	0	826	8	0
2	B	662	0	709	7	0
2	F	619	0	659	6	0
3	C	861	0	922	15	0
3	G	809	0	864	7	0
4	D	726	0	747	10	0
4	H	726	0	747	9	0
5	I	2904	0	1583	35	0
6	J	2874	0	1584	35	0
7	K	2242	0	2255	59	0
8	A	37	0	0	3	0
9	K	1	0	0	0	0
All	All	14070	0	11762	169	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 7.

All (169) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:64:ASN:HB3	2:B:93:GLN:HE22	1.52	0.75
7:K:220:ARG:HB3	7:K:221:PRO:HD2	1.68	0.75
7:K:220:ARG:O	7:K:222:SER:N	2.20	0.75
4:D:83:ARG:NH1	5:I:33:DG:OP2	2.20	0.74
8:A:201:ZSL:O37	7:K:65:ARG:NH2	2.23	0.70
7:K:124:PHE:HB3	7:K:129:LEU:HD11	1.73	0.69
6:J:53:DT:H2''	6:J:54:DG:C8	2.32	0.65
7:K:187:ASP:OD1	7:K:188:TRP:N	2.30	0.65
1:A:116:ARG:NH1	1:A:118:THR:O	2.31	0.64
5:I:20:DG:H2''	5:I:21:DG:H5''	1.81	0.62
7:K:96:MET:HB3	7:K:274:PRO:HG2	1.82	0.62
7:K:230:LYS:NZ	7:K:249:HIS:O	2.30	0.61
2:F:64:ASN:HB3	2:F:93:GLN:HE22	1.65	0.61
7:K:56:SER:O	7:K:59:SER:OG	2.15	0.60
7:K:231:ARG:HG3	7:K:232:ARG:HD2	1.84	0.60
3:C:63:LEU:HD13	4:D:42:LEU:HB2	1.83	0.60
5:I:56:DG:H2''	5:I:55:DA:C8	2.37	0.60
7:K:139:GLU:HB3	7:K:154:VAL:HG11	1.82	0.60

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
7:K:10:SER:HG	7:K:188:TRP:CD1	2.21	0.59
3:C:90:ASP:OD2	7:K:175:ARG:NH2	2.35	0.59
7:K:136:MET:HB3	7:K:153:VAL:HG13	1.84	0.59
7:K:141:CYS:SG	7:K:179:GLY:HA3	2.43	0.57
1:A:121:PRO:HB3	2:F:53:GLU:HG3	1.87	0.57
4:H:29:THR:N	6:J:30:DT:OP1	2.38	0.56
1:A:118:THR:HG22	2:F:45:ARG:HE	1.70	0.56
5:I:-57:DT:H2''	5:I:-56:DG:C8	2.41	0.56
7:K:51:THR:HG23	7:K:55:ILE:HG13	1.88	0.56
7:K:100:GLN:HE22	7:K:271:LEU:HD13	1.71	0.55
6:J:-43:DT:C2'	6:J:-42:DT:H71	2.37	0.54
7:K:52:GLY:HA3	7:K:215:THR:HB	1.89	0.54
5:I:-7:DG:H2''	5:I:-6:DG:C8	2.42	0.54
7:K:211:ILE:HG22	7:K:237:VAL:HB	1.89	0.54
2:B:80:THR:OG1	1:E:83:ARG:O	2.22	0.54
5:I:15:DT:H2''	5:I:16:DA:C8	2.43	0.54
2:B:37:LEU:HD23	1:E:61:LEU:HD12	1.89	0.54
8:A:201:ZSL:O35	7:K:113:GLN:O	2.25	0.53
7:K:221:PRO:O	7:K:224:ASN:N	2.35	0.53
6:J:-43:DT:H2''	6:J:-42:DT:H71	1.91	0.53
3:C:13:LYS:HZ2	3:C:14:ALA:H	1.55	0.53
3:G:63:LEU:HD11	4:H:38:VAL:HG13	1.90	0.52
6:J:30:DT:H2'	6:J:31:DT:H71	1.91	0.52
3:G:102:ILE:HG23	4:H:58:ILE:HD13	1.91	0.51
7:K:108:ARG:NH1	7:K:206:ASN:OD1	2.43	0.51
4:H:73:GLU:OE1	4:H:76:ARG:NH2	2.41	0.51
7:K:98:LEU:HD23	7:K:110:LEU:HD11	1.91	0.51
7:K:237:VAL:HG13	7:K:252:LEU:HD22	1.92	0.51
5:I:-67:DT:H2''	5:I:-66:DG:C8	2.46	0.51
4:D:51:ILE:HD13	4:D:56:MET:HE2	1.93	0.50
1:A:72:ARG:NH2	6:J:-23:DC:OP2	2.44	0.50
3:C:23:LEU:HD11	4:D:114:ALA:HB1	1.94	0.50
5:I:56:DG:H2''	5:I:57:DG:N7	2.26	0.50
7:K:50:HIS:HB2	7:K:212:THR:HA	1.93	0.50
3:C:92:GLU:HB2	7:K:175:ARG:HH12	1.76	0.50
6:J:-4:DC:H2''	6:J:-3:DG:C8	2.47	0.50
6:J:55:DT:H2''	6:J:56:DC:C6	2.47	0.50
7:K:37:LEU:HD13	7:K:237:VAL:HG21	1.93	0.49
7:K:35:TRP:O	7:K:39:ARG:HG2	2.12	0.49
4:D:64:ASN:ND2	2:F:102:GLY:OXT	2.46	0.49
5:I:-65:DT:H2''	5:I:-64:DA:C8	2.48	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
5:I:-54:DC:H2''	5:I:-53:DA:N7	2.28	0.49
7:K:10:SER:HG	7:K:188:TRP:HD1	1.59	0.49
5:I:-61:DT:H2''	5:I:-60:DA:C8	2.47	0.49
6:J:-55:DG:H2''	6:J:-54:DA:C8	2.48	0.49
5:I:-37:DG:H2''	5:I:-36:DG:C8	2.48	0.49
5:I:30:DC:H2'	5:I:31:DT:H71	1.94	0.49
7:K:227:LEU:HD21	7:K:246:HIS:NE2	2.27	0.49
5:I:-5:DG:C8	5:I:-5:DG:H5'	2.47	0.48
1:A:58:THR:HG21	3:C:81:ARG:HB2	1.94	0.48
8:A:201:ZSL:N05	7:K:258:VAL:HG12	2.29	0.48
5:I:-63:DT:H2''	5:I:-62:DA:C8	2.48	0.48
5:I:61:DC:H2'	5:I:62:DG:C8	2.49	0.48
6:J:49:DC:H2''	6:J:50:DA:C8	2.48	0.48
6:J:-46:DC:H2''	6:J:-45:DA:C8	2.49	0.48
6:J:-45:DA:H2''	6:J:-44:DA:C8	2.49	0.48
7:K:83:ASP:OD1	7:K:84:THR:N	2.47	0.47
7:K:157:MET:HA	7:K:185:ILE:HD11	1.96	0.47
6:J:46:DA:H2''	6:J:47:DG:C8	2.49	0.47
6:J:56:DC:H2''	6:J:57:DA:C8	2.49	0.47
7:K:25:ASP:HB2	7:K:255:HIS:HB2	1.96	0.47
3:C:62:ILE:HD13	3:C:93:LEU:HD13	1.96	0.47
7:K:85:THR:O	7:K:89:ALA:N	2.47	0.47
7:K:245:LYS:HD3	7:K:246:HIS:CE1	2.50	0.47
7:K:38:ALA:HA	7:K:41:VAL:HG12	1.97	0.46
7:K:224:ASN:HA	7:K:227:LEU:HD13	1.96	0.46
7:K:51:THR:HG21	7:K:119:HIS:HE1	1.81	0.46
6:J:-62:DC:H2''	6:J:-61:DG:H8	1.80	0.46
3:C:79:ILE:HG12	3:C:82:HIS:ND1	2.29	0.46
6:J:57:DA:H2''	6:J:58:DG:C8	2.51	0.46
6:J:60:DT:H2''	6:J:61:DA:C8	2.51	0.46
5:I:47:DA:H2''	5:I:48:DG:N7	2.31	0.46
6:J:-23:DC:C2	6:J:-22:DA:N7	2.84	0.46
5:I:37:DC:H2''	5:I:38:DG:C8	2.51	0.46
7:K:254:ILE:HG21	7:K:261:VAL:HG11	1.97	0.46
1:E:41:TYR:HA	5:I:70:DC:H5''	1.98	0.45
7:K:101:LEU:HB3	7:K:107:LEU:HB2	1.98	0.45
7:K:238:ILE:HD12	7:K:250:ALA:HB2	1.98	0.45
3:G:16:THR:HA	6:J:-43:DT:H5''	1.99	0.45
6:J:26:DG:H2''	6:J:27:DG:C8	2.51	0.45
7:K:177:CYS:SG	7:K:178:ARG:N	2.89	0.45
6:J:64:DT:H2''	6:J:65:DA:C8	2.51	0.45

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
5:I:55:DC:H2''	5:I:56:DG:C8	2.51	0.45
1:A:108:ASN:HB2	2:F:43:VAL:HG22	1.98	0.45
4:H:77:LEU:HD13	4:H:93:THR:HB	1.99	0.45
4:D:99:LEU:O	4:D:104:ALA:HB2	2.18	0.44
3:G:63:LEU:HD13	4:H:42:LEU:HB2	1.99	0.44
5:I:46:DG:H2''	5:I:47:DA:N7	2.33	0.44
5:I:3:DC:H2''	5:I:4:DG:C8	2.52	0.44
7:K:258:VAL:HA	7:K:261:VAL:HG22	1.99	0.44
7:K:224:ASN:O	7:K:227:LEU:HB2	2.18	0.44
7:K:241:LEU:O	7:K:253:ARG:NH2	2.50	0.44
3:C:102:ILE:HG23	4:D:58:ILE:HD13	2.00	0.43
1:E:82:LEU:HD13	1:E:82:LEU:HA	1.93	0.43
7:K:64:PHE:HB3	7:K:71:TRP:HE3	1.83	0.43
5:I:-13:DA:H1'	5:I:-12:DA:H5'	2.01	0.43
5:I:-51:DG:C2	6:J:52:DG:C2	3.06	0.43
1:E:46:VAL:HG22	6:J:9:DG:P	2.59	0.43
1:E:121:PRO:O	1:E:125:GLN:NE2	2.52	0.43
5:I:-57:DT:H2''	5:I:-56:DG:H8	1.83	0.43
7:K:64:PHE:HB3	7:K:71:TRP:CE3	2.54	0.43
2:B:82:THR:OG1	2:B:85:ASP:OD1	2.37	0.43
3:C:16:THR:HG23	3:C:19:SER:H	1.83	0.43
7:K:166:CYS:SG	7:K:168:VAL:HG12	2.59	0.43
3:G:77:ARG:HH12	6:J:-54:DA:H4'	1.83	0.43
5:I:-8:DG:H2''	5:I:-7:DG:C8	2.54	0.43
5:I:35:DT:H2''	5:I:36:DA:N7	2.34	0.43
5:I:-47:DC:H2''	5:I:-46:DT:C7	2.49	0.42
2:B:34:ILE:HD13	2:B:54:THR:HB	2.01	0.42
7:K:170:LYS:HE3	7:K:175:ARG:O	2.20	0.42
1:A:68:GLN:HE21	1:A:72:ARG:HH12	1.68	0.42
1:A:126:LEU:HD22	1:E:113:HIS:CG	2.55	0.42
6:J:62:DT:H2''	6:J:63:DA:C8	2.55	0.42
7:K:239:VAL:HG11	7:K:261:VAL:HG21	2.01	0.42
3:C:27:VAL:HA	3:C:30:VAL:HG12	2.02	0.42
5:I:8:DG:C2	6:J:-7:DG:N2	2.87	0.42
6:J:-23:DC:H2''	6:J:-22:DA:H8	1.84	0.42
6:J:65:DA:H2''	6:J:66:DC:C6	2.55	0.42
7:K:55:ILE:O	7:K:92:THR:HG21	2.19	0.42
7:K:156:THR:O	7:K:185:ILE:HD11	2.20	0.42
4:H:105:LYS:O	4:H:108:VAL:HG12	2.20	0.42
6:J:4:DC:H2''	6:J:5:DC:C6	2.55	0.42
7:K:117:GLY:O	7:K:121:ARG:HG3	2.20	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:107:THR:HG23	1:E:123:ASP:HB2	2.02	0.41
3:G:39:TYR:OH	4:H:68:GLU:OE1	2.37	0.41
7:K:142:ALA:HB2	7:K:182:ARG:HD2	2.02	0.41
7:K:244:THR:OG1	7:K:247:ASP:OD1	2.36	0.41
6:J:35:DC:H2''	6:J:36:DC:C5	2.55	0.41
1:A:103:LEU:HD22	2:F:57:VAL:HG11	2.00	0.41
6:J:-28:DT:H2''	6:J:-27:DC:C6	2.54	0.41
6:J:19:DC:H2''	6:J:20:DG:H8	1.86	0.41
3:C:54:VAL:HG21	4:D:95:VAL:HG21	2.03	0.41
4:H:39:TYR:CE2	4:H:56:MET:HE3	2.55	0.41
2:B:44:LYS:HB2	3:G:115:LEU:HD13	2.03	0.41
5:I:-56:DG:H2''	5:I:-55:DA:H8	1.84	0.41
6:J:-32:DC:C2	6:J:-31:DA:N7	2.89	0.41
2:B:75:HIS:O	4:D:89:ARG:NH1	2.43	0.41
5:I:-17:DT:H4'	5:I:-16:DT:OP1	2.20	0.41
5:I:-9:DC:H2''	5:I:-8:DG:C8	2.55	0.41
6:J:-57:DC:H2''	6:J:-56:DC:C5	2.56	0.41
7:K:195:ARG:HA	7:K:198:ALA:HB3	2.02	0.41
7:K:252:LEU:HD23	7:K:253:ARG:N	2.36	0.41
5:I:66:DT:H2''	5:I:67:DT:H72	2.03	0.40
5:I:67:DT:H2''	5:I:68:DC:C5	2.56	0.40
1:A:69:ARG:O	1:A:73:GLU:HG2	2.22	0.40
7:K:240:ASN:OD1	7:K:241:LEU:N	2.54	0.40
3:C:16:THR:HA	5:I:-43:DA:H5''	2.03	0.40
7:K:226:PRO:HB2	7:K:236:LEU:HD13	2.04	0.40
3:C:13:LYS:NZ	3:C:14:ALA:H	2.20	0.40
3:C:63:LEU:HD11	4:D:38:VAL:HG13	2.03	0.40
6:J:38:DT:H2''	6:J:39:DA:C8	2.57	0.40

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	96/135 (71%)	94 (98%)	2 (2%)	0	100	100
1	E	93/135 (69%)	91 (98%)	2 (2%)	0	100	100
2	B	81/102 (79%)	79 (98%)	2 (2%)	0	100	100
2	F	76/102 (74%)	74 (97%)	2 (3%)	0	100	100
3	C	110/129 (85%)	106 (96%)	4 (4%)	0	100	100
3	G	103/129 (80%)	103 (100%)	0	0	100	100
4	D	91/122 (75%)	88 (97%)	3 (3%)	0	100	100
4	H	91/122 (75%)	90 (99%)	1 (1%)	0	100	100
7	K	287/355 (81%)	271 (94%)	13 (4%)	3 (1%)	12	45
All	All	1028/1331 (77%)	996 (97%)	29 (3%)	3 (0%)	37	68

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
7	K	221	PRO
7	K	276	TRP
7	K	194	ASP

5.3.2 Protein sidechains ⓘ

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	86/109 (79%)	85 (99%)	1 (1%)	63	79
1	E	82/109 (75%)	80 (98%)	2 (2%)	43	70
2	B	68/78 (87%)	67 (98%)	1 (2%)	57	76
2	F	63/78 (81%)	62 (98%)	1 (2%)	55	75
3	C	88/101 (87%)	87 (99%)	1 (1%)	65	79
3	G	83/101 (82%)	83 (100%)	0	100	100
4	D	79/102 (78%)	78 (99%)	1 (1%)	61	78
4	H	79/102 (78%)	78 (99%)	1 (1%)	61	78
7	K	240/298 (80%)	229 (95%)	11 (5%)	24	58

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles
All	All	868/1078 (80%)	849 (98%)	19 (2%)	45 71

All (19) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	120	MET
2	B	21	VAL
3	C	42	ARG
4	D	87	THR
1	E	46	VAL
1	E	65	LEU
2	F	25	ASN
4	H	36	ILE
7	K	73	MET
7	K	149	VAL
7	K	164	ARG
7	K	170	LYS
7	K	174	LEU
7	K	185	ILE
7	K	195	ARG
7	K	210	SER
7	K	212	THR
7	K	229	THR
7	K	266	MET

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (13) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	68	GLN
1	A	85	GLN
2	B	93	GLN
3	C	38	ASN
1	E	76	GLN
1	E	85	GLN
1	E	93	GLN
2	F	93	GLN
3	G	104	GLN
4	H	64	ASN
7	K	50	HIS
7	K	68	HIS
7	K	255	HIS

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.6 Ligand geometry ⓘ

Of 2 ligands modelled in this entry, 1 is monoatomic - leaving 1 for Mogul analysis.

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

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
8	ZSL	A	201	1	39,41,41	1.61	8 (20%)	54,63,63	1.93	14 (25%)

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
8	ZSL	A	201	1	-	9/22/60/60	0/5/5/5

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
8	A	201	ZSL	C27-C25	4.51	1.47	1.39
8	A	201	ZSL	O34-C19	-4.10	1.34	1.42
8	A	201	ZSL	C20-S46	-3.91	1.74	1.82

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
8	A	201	ZSL	P44-O39	-3.04	1.40	1.50
8	A	201	ZSL	C29-N06	2.49	1.36	1.31
8	A	201	ZSL	C25-N07	-2.47	1.32	1.37
8	A	201	ZSL	C27-N06	-2.41	1.34	1.39
8	A	201	ZSL	C27-C28	2.32	1.47	1.41

All (14) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
8	A	201	ZSL	O34-C21-C20	6.04	114.43	106.33
8	A	201	ZSL	C19-O34-C21	4.73	116.18	107.69
8	A	201	ZSL	C25-N07-C29	4.16	110.11	105.74
8	A	201	ZSL	C27-C25-N04	-3.68	121.65	126.72
8	A	201	ZSL	N04-C25-N07	3.63	133.34	127.17
8	A	201	ZSL	C19-S46-C20	3.53	97.50	88.61
8	A	201	ZSL	O36-C24-C23	-3.01	99.17	105.15
8	A	201	ZSL	N07-C29-N06	-2.87	109.86	113.94
8	A	201	ZSL	O36-C24-C26	2.52	117.39	109.33
8	A	201	ZSL	O33-C18-N07	-2.27	103.72	108.09
8	A	201	ZSL	C27-N06-C29	2.25	106.99	103.45
8	A	201	ZSL	C22-N04-C25	2.24	117.30	111.83
8	A	201	ZSL	C25-C27-N06	-2.24	108.03	110.58
8	A	201	ZSL	N05-C28-N03	2.07	122.99	118.38

There are no chirality outliers.

All (9) torsion outliers are listed below:

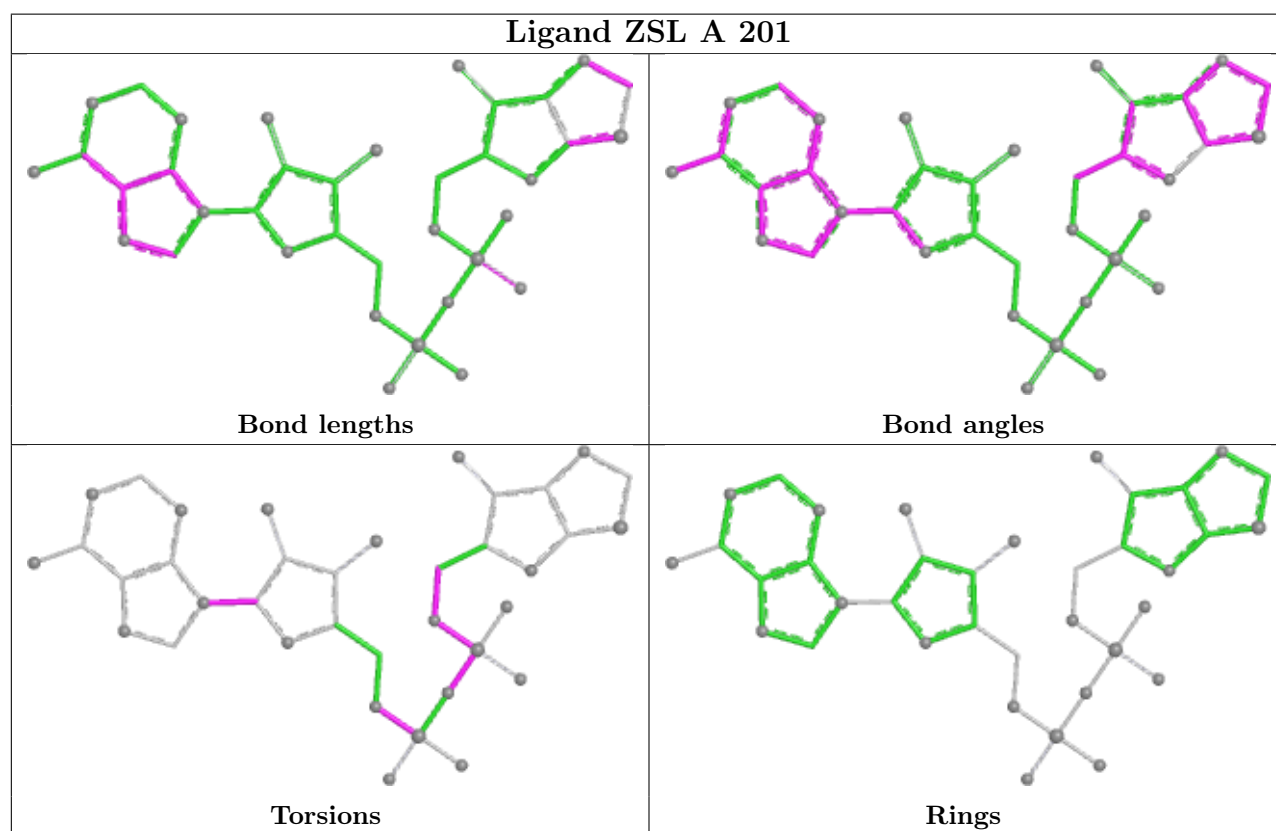
Mol	Chain	Res	Type	Atoms
8	A	201	ZSL	C24-C26-O37-P44
8	A	201	ZSL	C26-O37-P44-O40
8	A	201	ZSL	C14-O43-P45-O40
8	A	201	ZSL	C14-O43-P45-O41
8	A	201	ZSL	C14-O43-P45-O42
8	A	201	ZSL	P45-O40-P44-O37
8	A	201	ZSL	C17-C18-N07-C29
8	A	201	ZSL	C26-O37-P44-O39
8	A	201	ZSL	C17-C18-N07-C25

There are no ring outliers.

1 monomer is involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
8	A	201	ZSL	3	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](#)

There are no chain breaks in this entry.

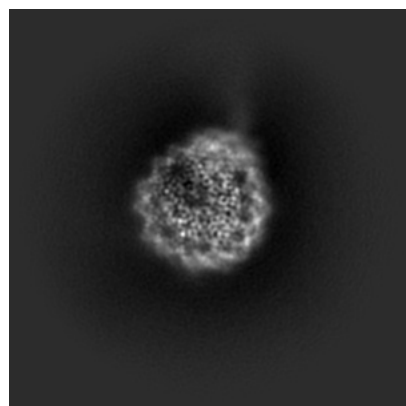
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-48086. These allow visual inspection of the internal detail of the map and identification of artifacts.

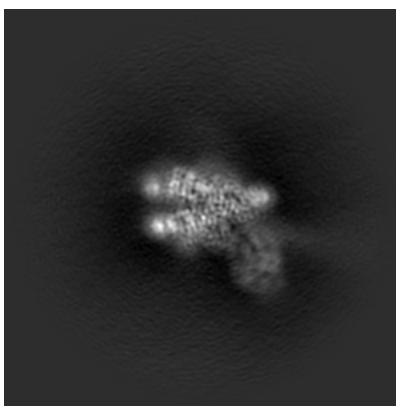
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

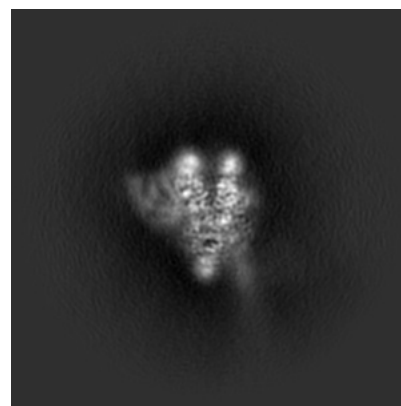
6.1.1 Primary map



X

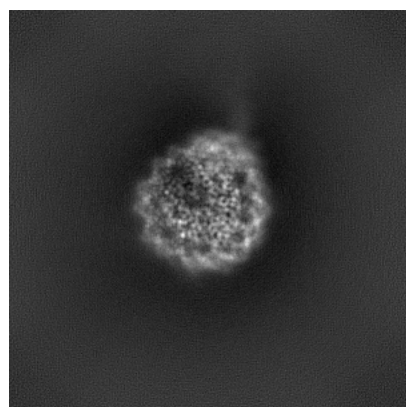


Y

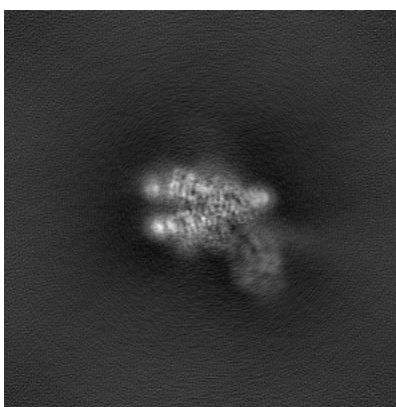


Z

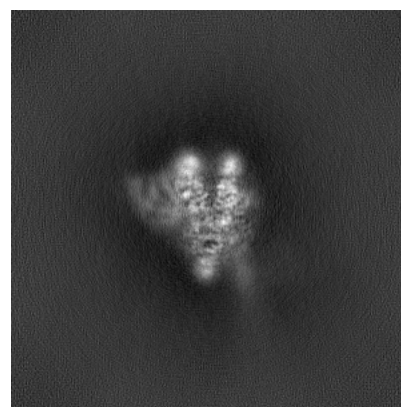
6.1.2 Raw map



X



Y

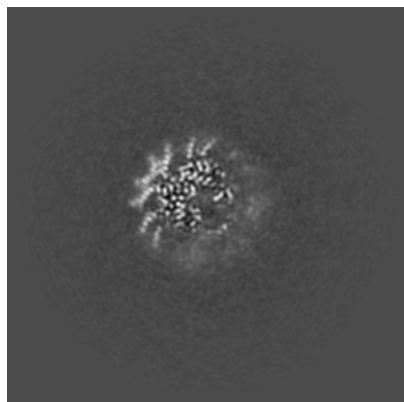


Z

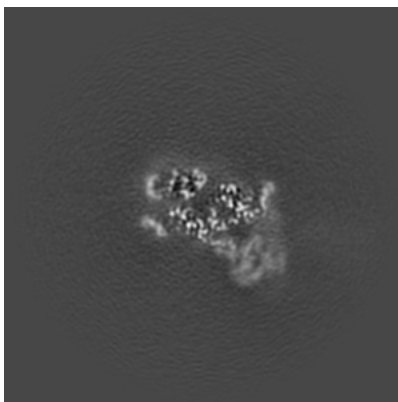
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

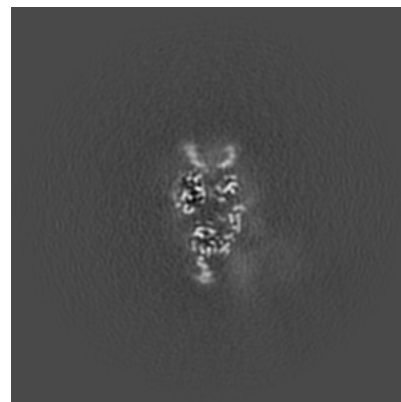
6.2.1 Primary map



X Index: 180

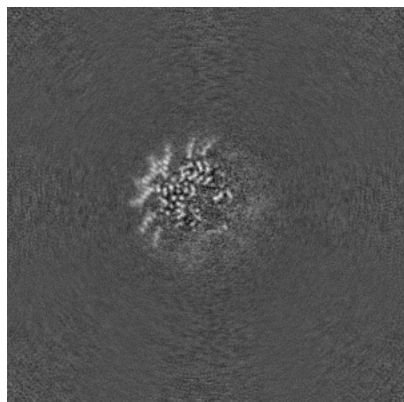


Y Index: 180

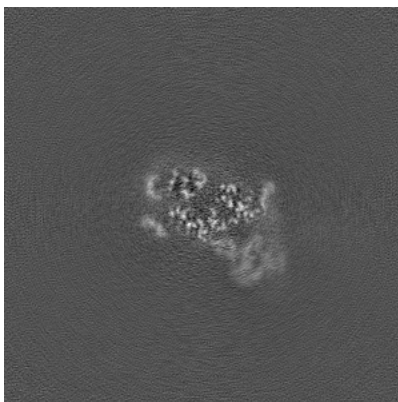


Z Index: 180

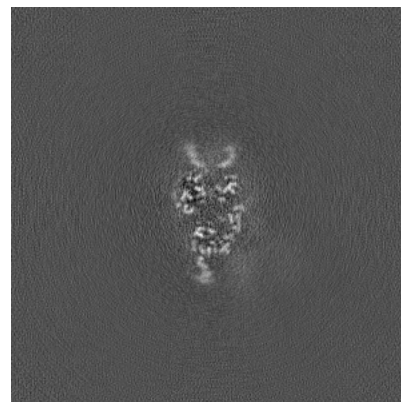
6.2.2 Raw map



X Index: 180



Y Index: 180

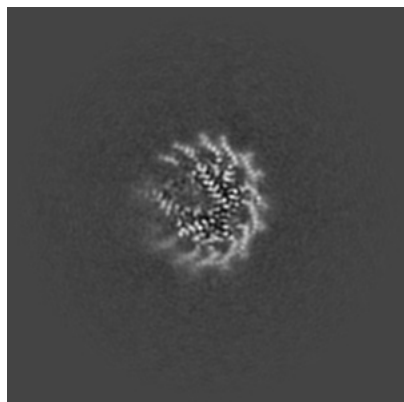


Z Index: 180

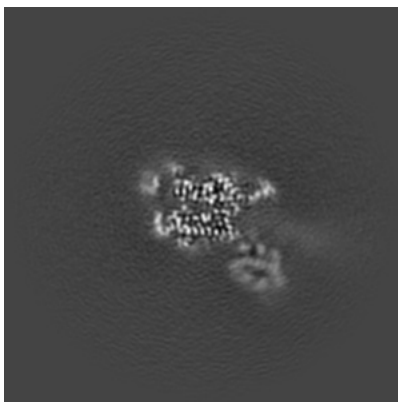
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

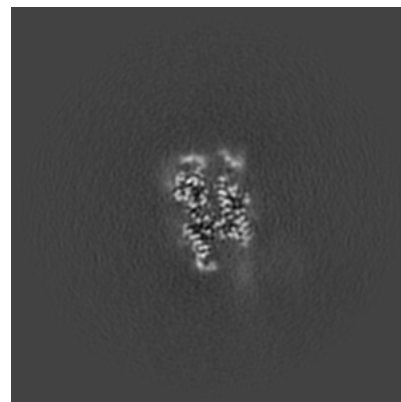
6.3.1 Primary map



X Index: 195

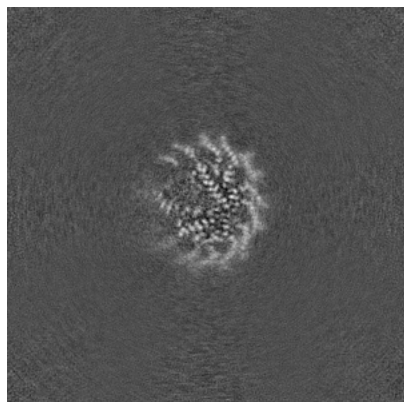


Y Index: 195

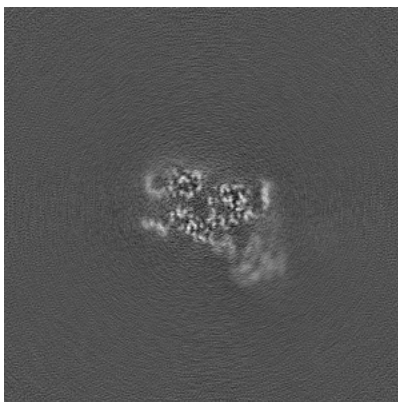


Z Index: 167

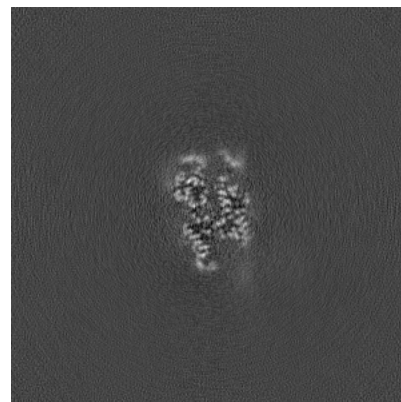
6.3.2 Raw map



X Index: 195



Y Index: 182

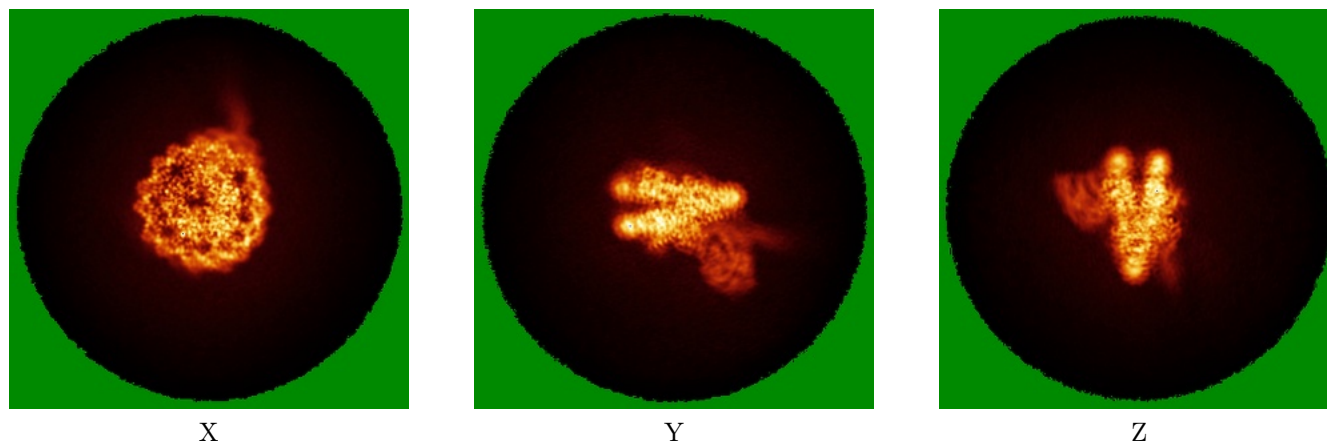


Z Index: 167

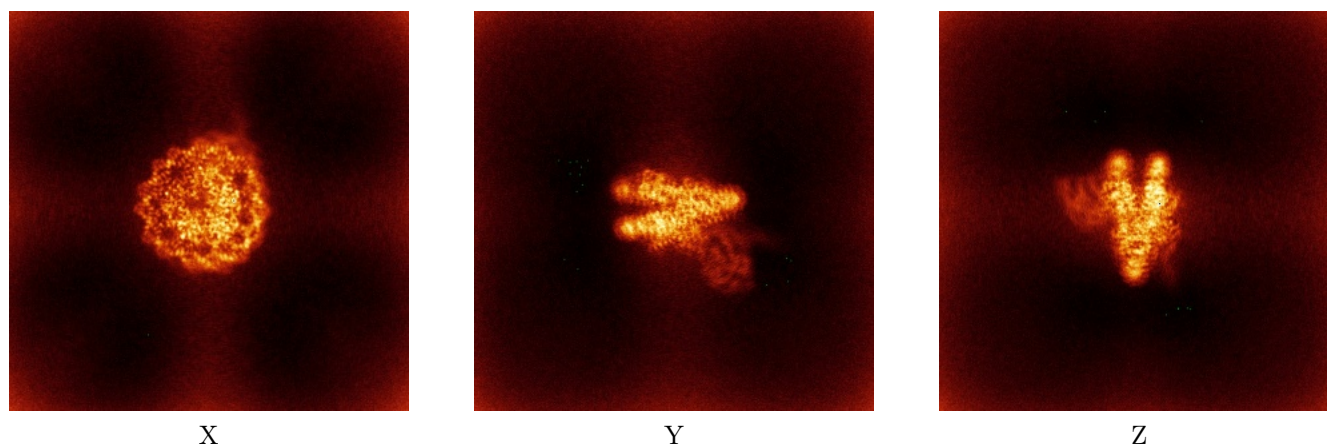
The images above show the largest variance slices of the map in three orthogonal directions.

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

6.4.1 Primary map



6.4.2 Raw map



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](#)

This section was not generated.

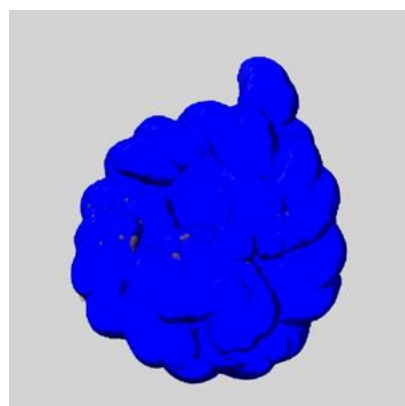
6.6 Mask visualisation [i](#)

This section shows the 3D surface view of the primary map at 50% transparency overlaid with the specified mask at 0% transparency

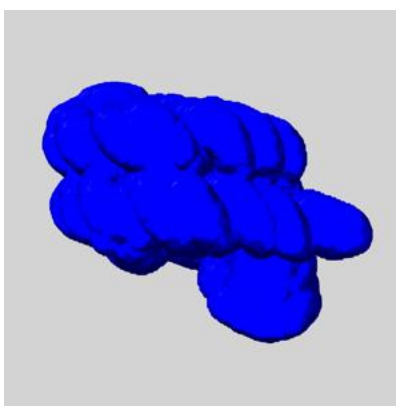
A mask typically either:

- Encompasses the whole structure
- Separates out a domain, a functional unit, a monomer or an area of interest from a larger structure

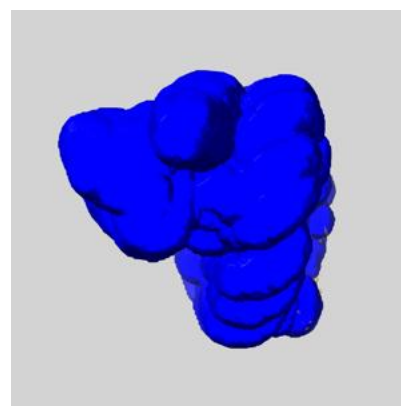
6.6.1 emd_48086_msk_1.map [i](#)



X



Y

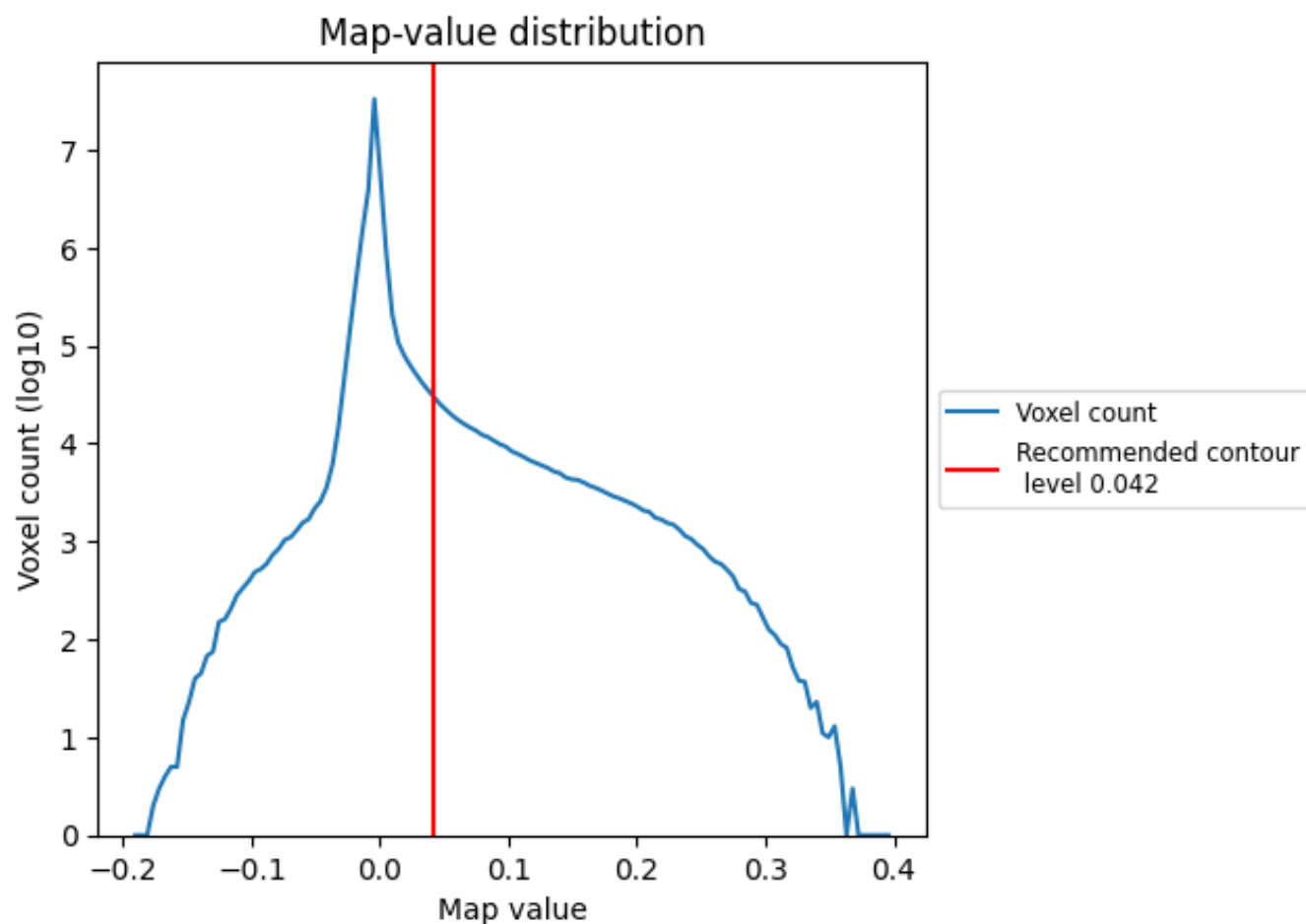


Z

7 Map analysis [i](#)

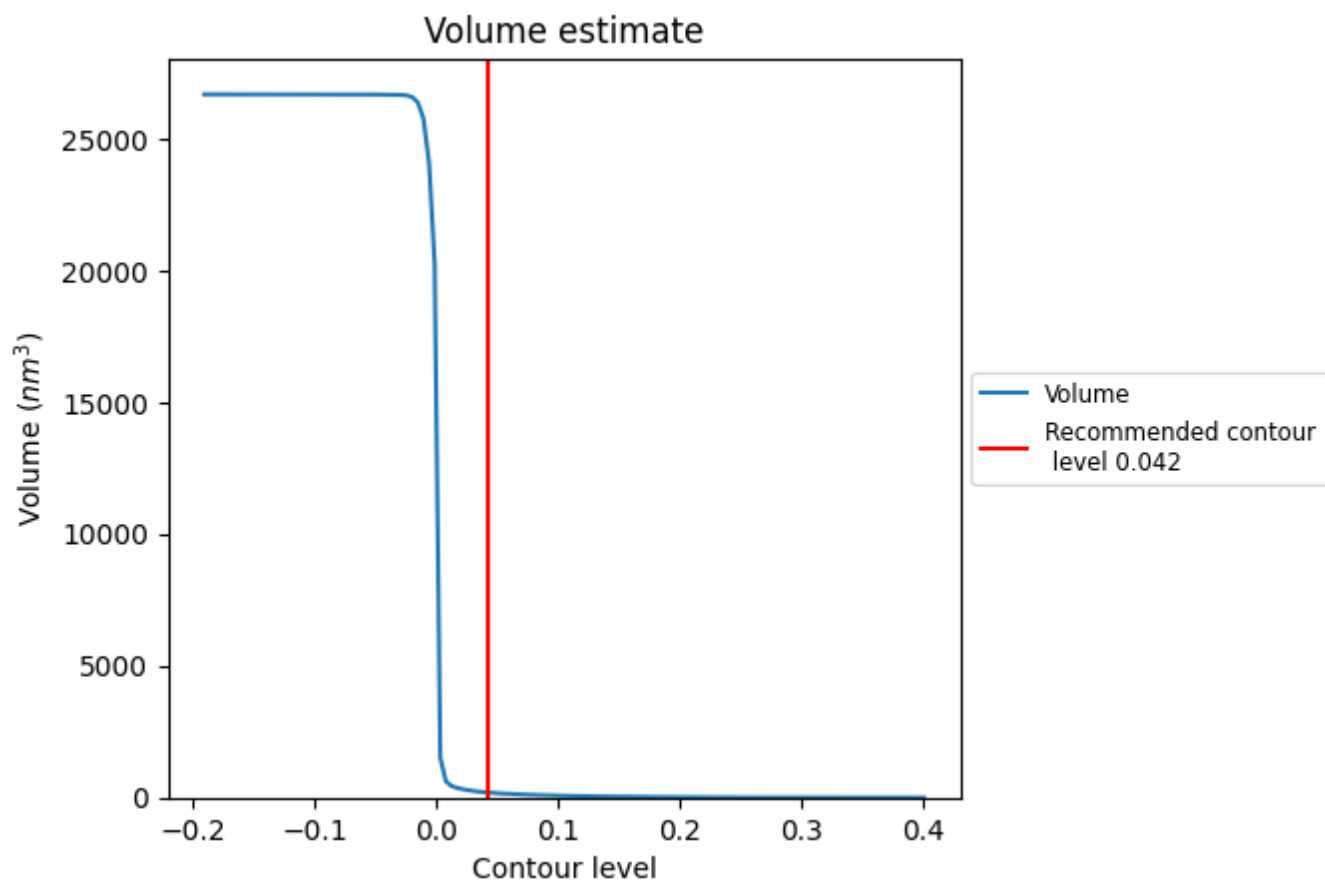
This section contains the results of statistical analysis of the map.

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.

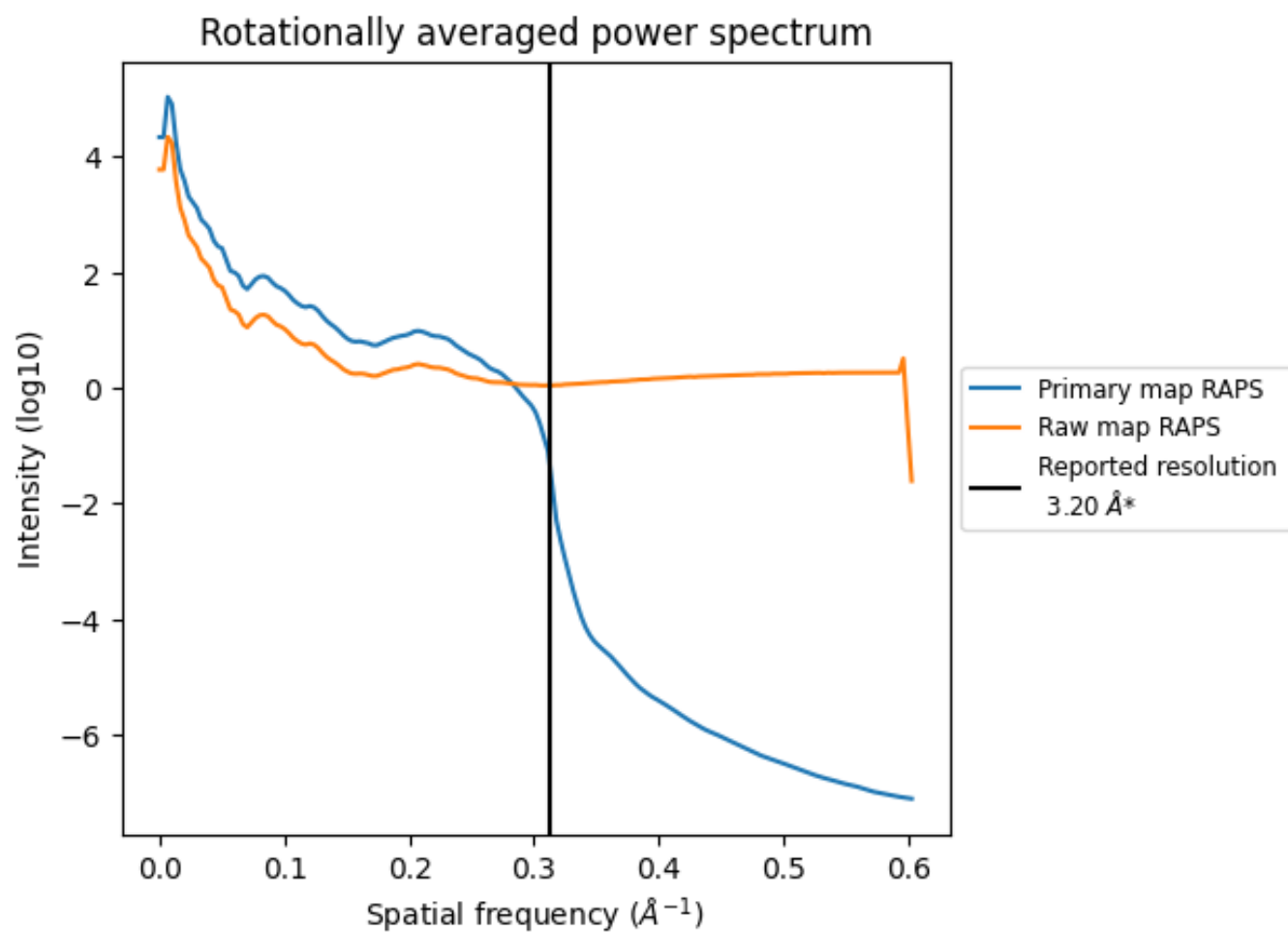
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 192 nm^3 ; this corresponds to an approximate mass of 174 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 ⓘ

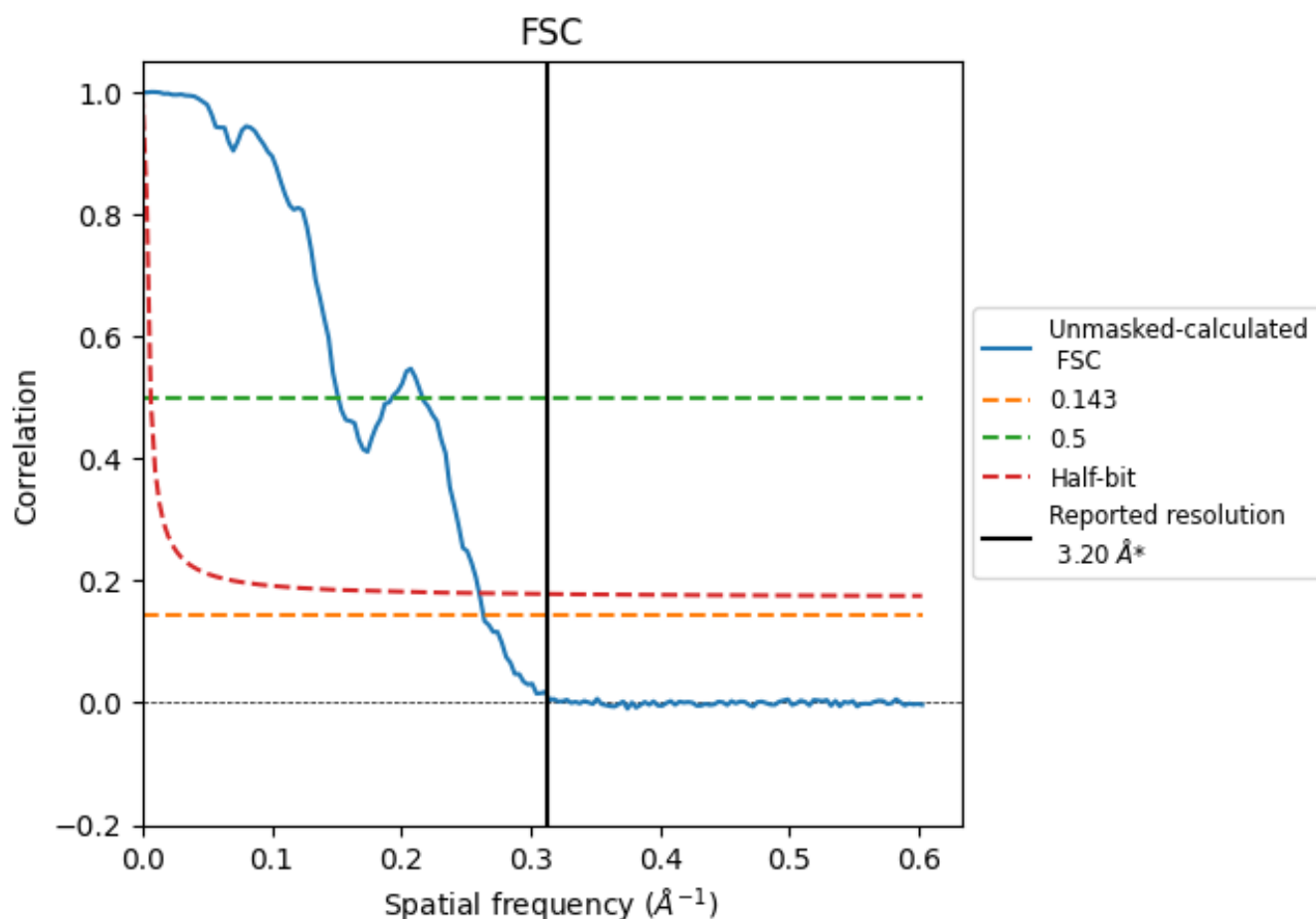


*Reported resolution corresponds to spatial frequency of 0.312 Å⁻¹

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 0.312 $\text{\AA}^{-1}$

8.2 Resolution estimates [i](#)

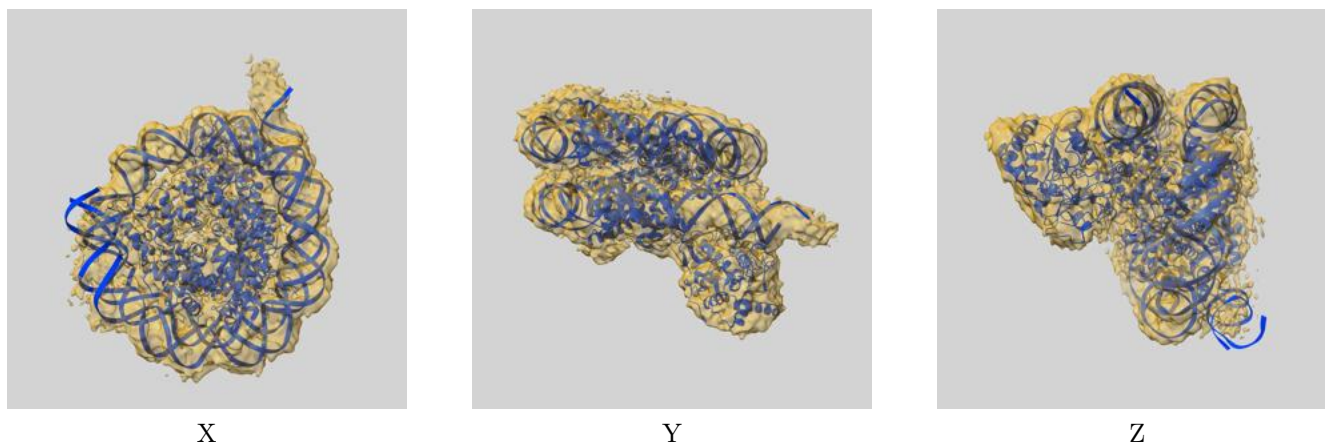
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.20	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	3.79	6.61	3.84

*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps. The value from deposited half-maps intersecting FSC 0.143 CUT-OFF 3.79 differs from the reported value 3.2 by more than 10 %

9 Map-model fit [i](#)

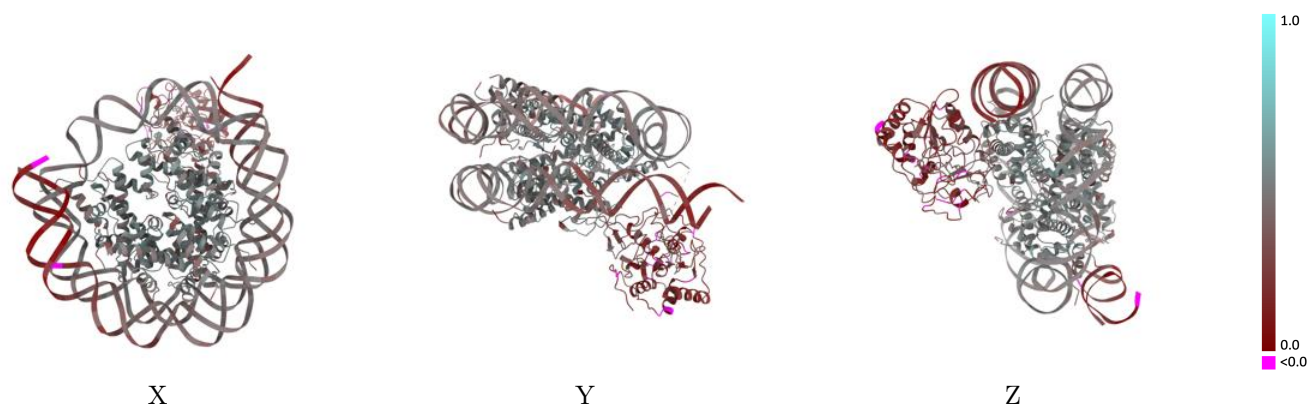
This section contains information regarding the fit between EMDB map EMD-48086 and PDB model 9EIL. Per-residue inclusion information can be found in section 3 on page 7.

9.1 Map-model overlay [i](#)



The images above show the 3D surface view of the map at the recommended contour level 0.042 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](#)



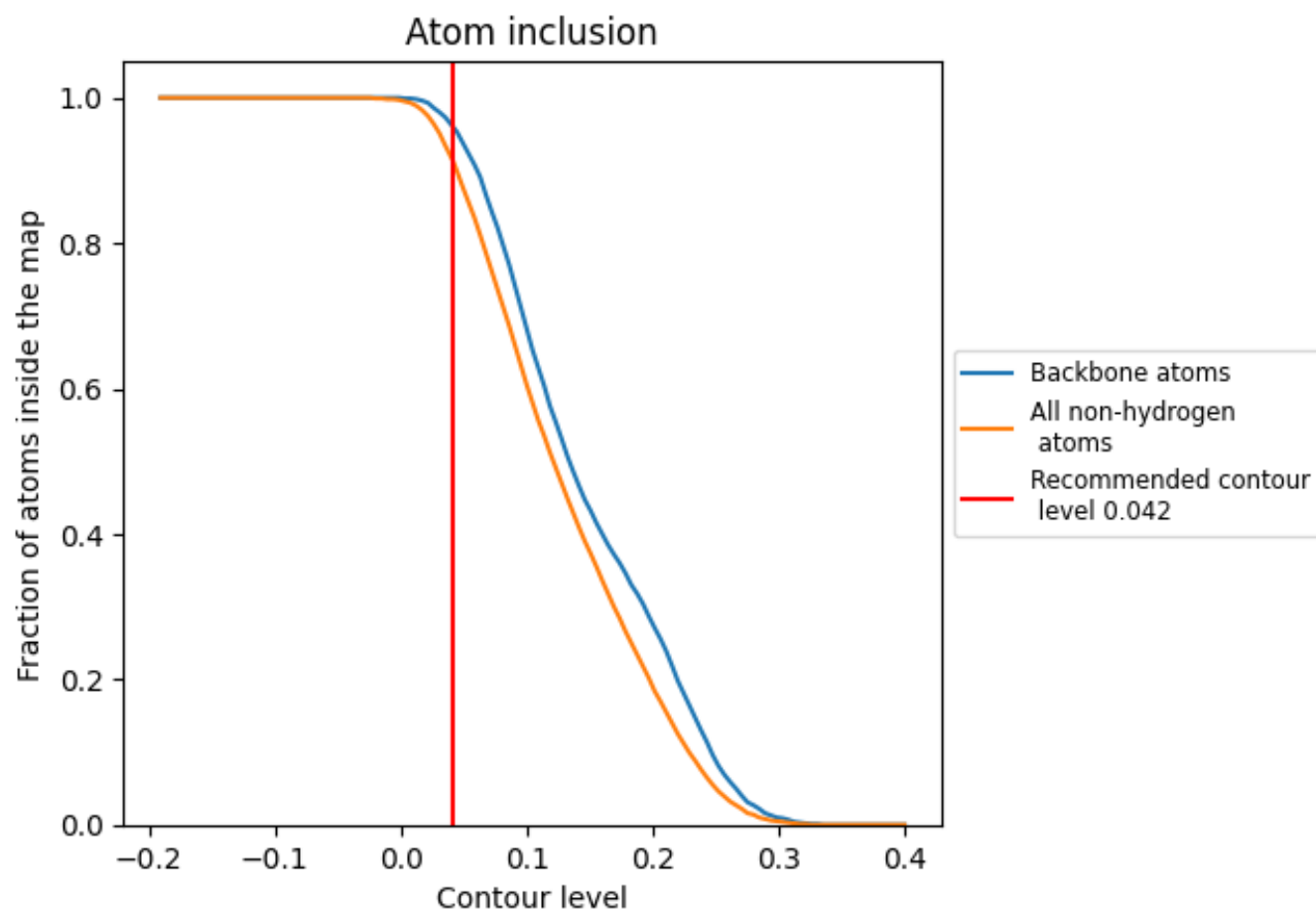
The images above show the model with each residue coloured according its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.042).

9.4 Atom inclusion [i](#)



At the recommended contour level, 96% of all backbone atoms, 91% 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 (0.042) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.9120	 0.3950
A	 0.9450	 0.4750
B	 0.9310	 0.5010
C	 0.9060	 0.4800
D	 0.9490	 0.4800
E	 0.9260	 0.4840
F	 0.9530	 0.5090
G	 0.9140	 0.4630
H	 0.9520	 0.4650
I	 0.9210	 0.3750
J	 0.9260	 0.3750
K	 0.8210	 0.2170

