



wwPDB EM Validation Summary Report ⓘ

Mar 20, 2026 – 05:32 AM UTC

PDB ID : 8TWA / pdb_00008twa
EMDB ID : EMD-41664
Title : Cryo-EM structure of *S. cerevisiae* Ctf18-RFC-PCNA-PolE-DNA complex
Authors : Yuan, Z.; Georgescu, R.; O'Donnell, M.; Li, H.
Deposited on : 2023-08-20
Resolution : 4.10 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.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

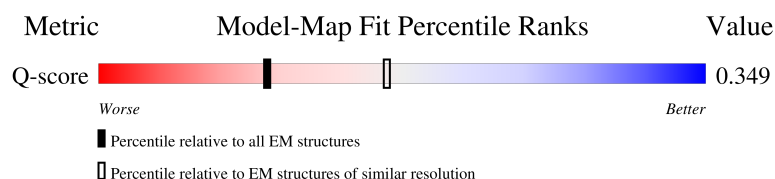
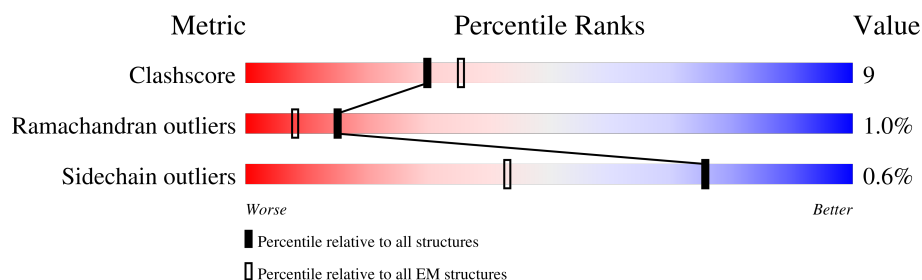
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 4.10 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	6458 (3.60 - 4.60)

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	C	26	 73% 27%
2	P	9	 33% 67%
3	T	15	 20% 40% 60%
4	E	2222	 42% 7% 49%

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
5	D	132	
6	B	380	
7	4	319	
8	3	327	
9	2	340	
10	5	354	
11	1	741	
12	X	258	
12	Y	258	
12	Z	258	

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
13	SF4	E	2301	-	-	X	-
16	ADP	5	401	-	-	X	-

2 Entry composition

There are 16 unique types of molecules in this entry. The entry contains 31914 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 Chromosome transmission fidelity protein 18.

Mol	Chain	Residues	Atoms				AltConf	Trace
1	C	26	Total	C	N	O	0	0
			206	132	37	37		

- Molecule 2 is a DNA chain called Primer DNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	P	9	Total	C	N	O	P	0	0
			183	88	29	57	9		

- Molecule 3 is a DNA chain called Template DNA.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	T	15	Total	C	N	O	P	0	0
			303	147	54	88	14		

- Molecule 4 is a protein called DNA polymerase epsilon catalytic subunit A.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	E	1123	Total	C	N	O	S	0	0
			8868	5642	1499	1686	41		

- Molecule 5 is a protein called Chromosome transmission fidelity protein 8.

Mol	Chain	Residues	Atoms					AltConf	Trace
5	D	132	Total	C	N	O	S	0	0
			1014	642	171	194	7		

- Molecule 6 is a protein called Sister chromatid cohesion protein DCC1.

Mol	Chain	Residues	Atoms					AltConf	Trace
6	B	171	Total	C	N	O	S	0	0
			1362	868	229	259	6		

- Molecule 7 is a protein called Replication factor C subunit 4.

Mol	Chain	Residues	Atoms					AltConf	Trace
7	4	319	Total	C	N	O	S	0	0
			2457	1545	440	460	12		

- Molecule 8 is a protein called Replication factor C subunit 3.

Mol	Chain	Residues	Atoms					AltConf	Trace
8	3	327	Total	C	N	O	S	0	0
			2563	1613	446	496	8		

- Molecule 9 is a protein called Replication factor C subunit 2.

Mol	Chain	Residues	Atoms					AltConf	Trace
9	2	340	Total	C	N	O	S	0	0
			2675	1690	461	514	10		

- Molecule 10 is a protein called Replication factor C subunit 5.

Mol	Chain	Residues	Atoms					AltConf	Trace
10	5	335	Total	C	N	O	S	0	0
			2613	1658	452	487	16		

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
5	1	MET	-	initiating methionine	UNP P38251
5	2	SER	-	expression tag	UNP P38251
5	3	LEU	-	expression tag	UNP P38251
5	354	ASP	-	expression tag	UNP P38251

- Molecule 11 is a protein called Chromosome transmission fidelity protein 18.

Mol	Chain	Residues	Atoms					AltConf	Trace
11	1	457	Total	C	N	O	S	0	0
			3576	2274	630	658	14		

- Molecule 12 is a protein called Proliferating cell nuclear antigen.

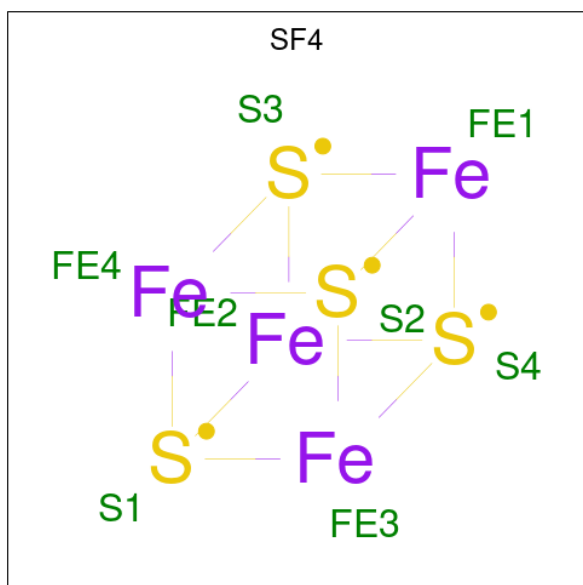
Mol	Chain	Residues	Atoms					AltConf	Trace
12	X	258	Total	C	N	O	S	0	0
			2003	1275	314	404	10		

Continued on next page...

Continued from previous page...

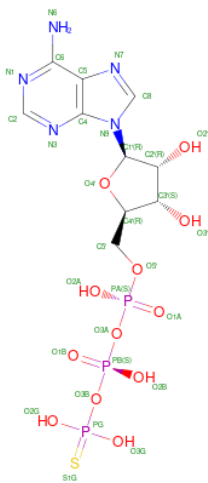
Mol	Chain	Residues	Atoms					AltConf	Trace
12	Y	258	Total	C	N	O	S	0	0
			1997	1272	316	401	8		
12	Z	254	Total	C	N	O	S	0	0
			1963	1258	308	387	10		

- Molecule 13 is IRON/SULFUR CLUSTER (CCD ID: SF4) (formula: Fe_4S_4).



Mol	Chain	Residues	Atoms			AltConf
13	E	1	Total	Fe	S	0
			8	4	4	

- Molecule 14 is PHOSPHOTHIOPHOSPHORIC ACID-ADENYLATE ESTER (CCD ID: AGS) (formula: $\text{C}_{10}\text{H}_{16}\text{N}_5\text{O}_{12}\text{P}_3\text{S}$).

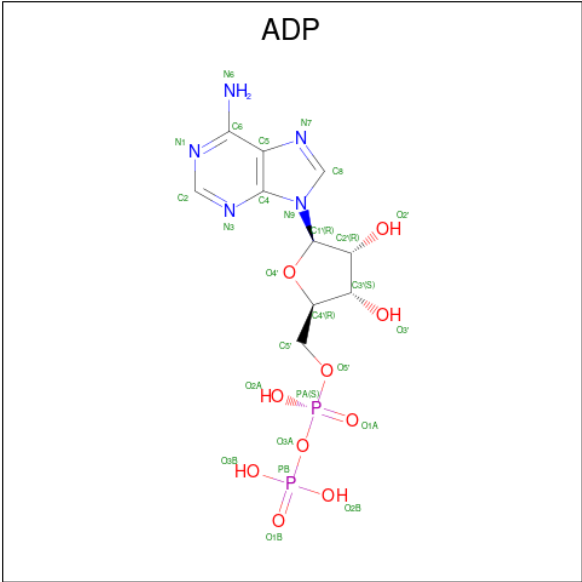


Mol	Chain	Residues	Atoms					AltConf	
14	4	1	Total 31	C 10	N 5	O 12	P 3	S 1	0
14	3	1	Total 31	C 10	N 5	O 12	P 3	S 1	0
14	2	1	Total 31	C 10	N 5	O 12	P 3	S 1	0

- Molecule 15 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms	AltConf
15	4	1	Total Mg 1 1	0
15	3	1	Total Mg 1 1	0
15	2	1	Total Mg 1 1	0

- Molecule 16 is ADENOSINE-5'-DIPHOSPHATE (CCD ID: ADP) (formula: $C_{10}H_{15}N_5O_{10}P_2$).



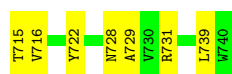
Mol	Chain	Residues	Atoms					AltConf
16	5	1	Total	C	N	O	P	0
			27	10	5	10	2	

3 Residue-property plots

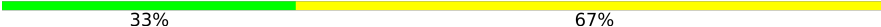
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and atom inclusion 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.

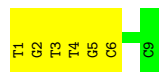
- Molecule 1: Chromosome transmission fidelity protein 18

Chain C: 



- Molecule 2: Primer DNA

Chain P: 



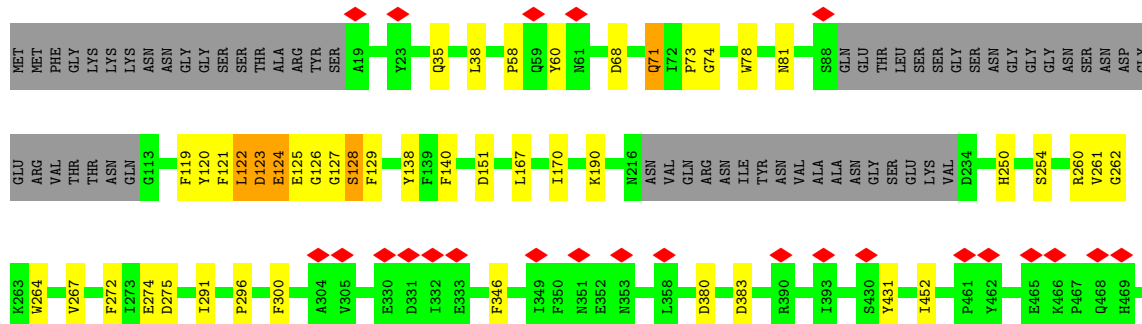
- Molecule 3: Template DNA

Chain T: 

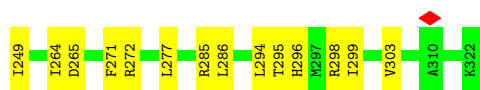


- Molecule 4: DNA polymerase epsilon catalytic subunit A

Chain E: 

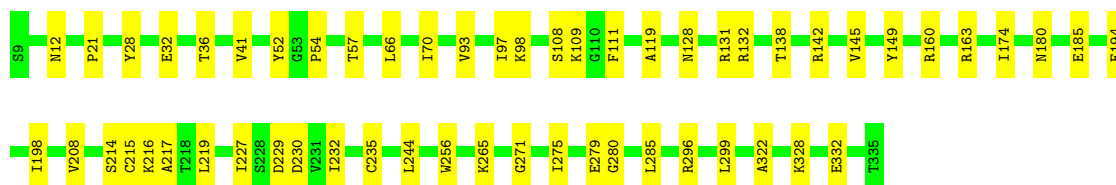






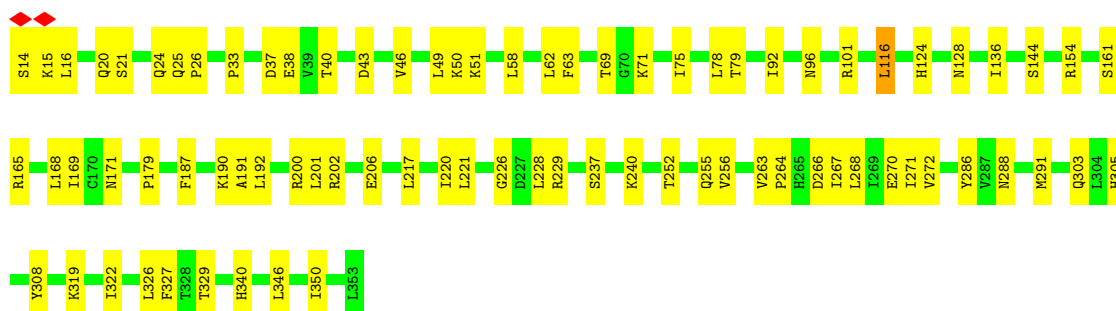
• Molecule 8: Replication factor C subunit 3

Chain 3: 83% 17%



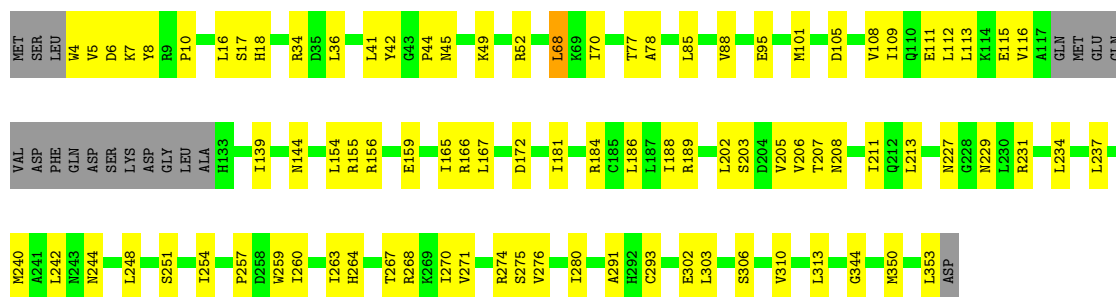
• Molecule 9: Replication factor C subunit 2

Chain 2: 76% 24%



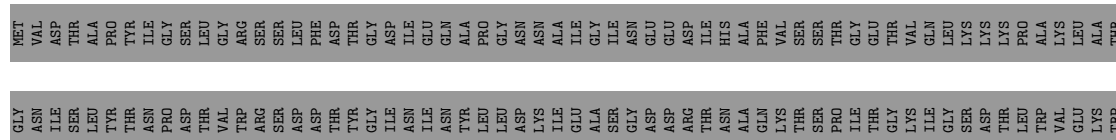
• Molecule 10: Replication factor C subunit 5

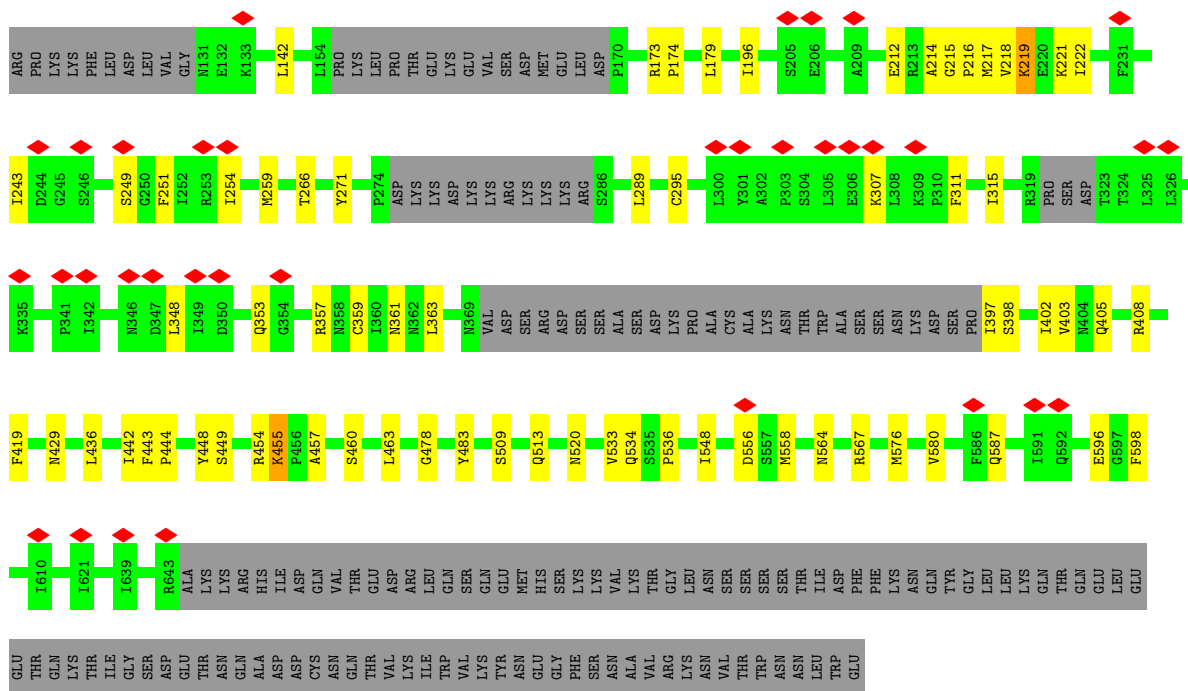
Chain 5: 69% 25% 5%



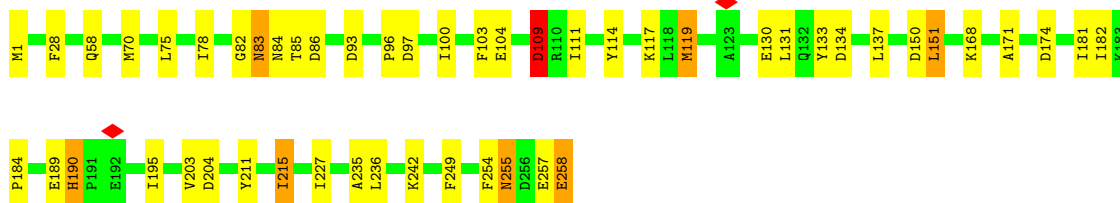
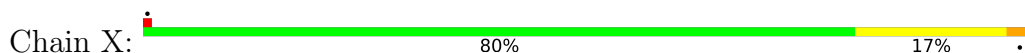
• Molecule 11: Chromosome transmission fidelity protein 18

Chain 1: 5% 52% 9% 38%

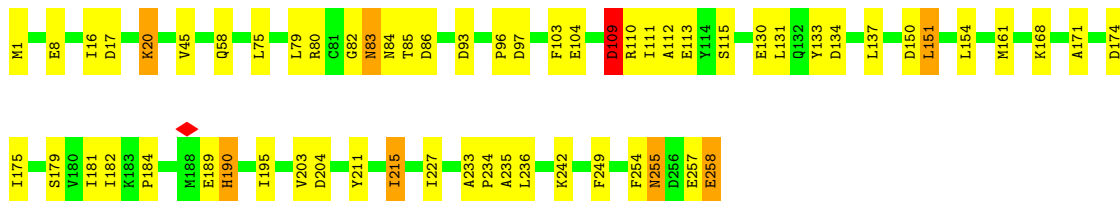
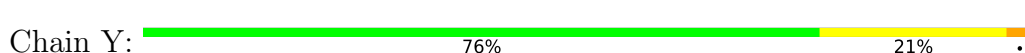




- Molecule 12: Proliferating cell nuclear antigen



- Molecule 12: Proliferating cell nuclear antigen



- Molecule 12: Proliferating cell nuclear antigen





4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	87643	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 ($e^-/\text{\AA}^2$)	60	Depositor
Minimum defocus (nm)	1500	Depositor
Maximum defocus (nm)	2500	Depositor
Magnification	Not provided	
Image detector	GATAN K3 BIOQUANTUM (6k x 4k)	Depositor
Maximum map value	0.963	Depositor
Minimum map value	-0.430	Depositor
Average map value	0.005	Depositor
Map value standard deviation	0.037	Depositor
Recommended contour level	0.144	Depositor
Map size (Å)	298.08002, 298.08002, 298.08002	wwPDB
Map dimensions	360, 360, 360	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	0.82800007, 0.82800007, 0.82800007	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: AGS, MG, ADP, SF4

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	C	0.34	0/211	0.79	0/289
2	P	0.81	0/203	0.69	0/311
3	T	0.73	0/339	0.66	0/521
4	E	0.82	1/9065 (0.0%)	1.30	28/12275 (0.2%)
5	D	0.33	0/1030	0.85	0/1387
6	B	0.63	3/1387 (0.2%)	1.37	13/1871 (0.7%)
7	4	0.25	0/2491	0.44	0/3365
8	3	0.14	0/2602	0.33	0/3521
9	2	0.12	0/2720	0.28	0/3679
10	5	0.14	0/2650	0.31	0/3587
11	1	0.73	0/3639	1.21	5/4921 (0.1%)
12	X	0.74	2/2033 (0.1%)	1.11	12/2745 (0.4%)
12	Y	0.73	2/2026 (0.1%)	1.12	12/2737 (0.4%)
12	Z	0.72	0/1993	1.08	9/2692 (0.3%)
All	All	0.62	8/32389 (0.0%)	1.01	79/43901 (0.2%)

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

Mol	Chain	#Chirality outliers	#Planarity outliers
4	E	0	5
6	B	0	2
7	4	0	1
11	1	0	1
All	All	0	9

The worst 5 of 8 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	B	354	ARG	C-N	14.24	1.54	1.33
4	E	766	GLU	C-N	10.97	1.56	1.33
6	B	355	GLY	C-N	-7.51	1.21	1.33
6	B	334	ARG	C-N	7.21	1.43	1.33
12	Y	258	GLU	C-OXT	-7.02	1.09	1.23

The worst 5 of 79 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	B	334	ARG	O-C-N	-39.26	70.38	122.59
12	Y	257	GLU	N-CA-C	10.60	122.92	110.41
12	X	257	GLU	N-CA-C	10.58	122.90	110.41
4	E	766	GLU	O-C-N	-9.10	111.66	122.95
6	B	334	ARG	CA-C-N	8.71	138.18	121.54

There are no chirality outliers.

5 of 9 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
4	E	123	ASP	Mainchain
4	E	509	ARG	Sidechain
4	E	630	ARG	Sidechain
4	E	766	GLU	Mainchain
4	E	81	ASN	Mainchain

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	C	206	0	183	8	0
2	P	183	0	102	6	0
3	T	303	0	172	15	0
4	E	8868	0	8504	159	0
5	D	1014	0	1007	28	0
6	B	1362	0	1357	38	0
7	4	2457	0	2496	57	0
8	3	2563	0	2577	42	0
9	2	2675	0	2701	57	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
10	5	2613	0	2709	71	0
11	1	3576	0	3538	56	0
12	X	2003	0	1977	36	0
12	Y	1997	0	1979	49	0
12	Z	1963	0	1958	52	0
13	E	8	0	0	6	0
14	2	31	0	12	3	0
14	3	31	0	12	2	0
14	4	31	0	12	3	0
15	2	1	0	0	0	0
15	3	1	0	0	0	0
15	4	1	0	0	0	0
16	5	27	0	12	9	0
All	All	31914	0	31308	573	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 573 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)
4:E:706:ASN:CB	11:1:311:PHE:CE1	2.39	1.06
7:4:156:SER:O	11:1:361:ASN:CB	2.08	1.02
10:5:5:VAL:HG13	16:5:401:ADP:O3'	1.58	1.01
12:X:109:ASP:O	12:Y:181:ILE:O	1.77	1.01
9:2:40:THR:HG21	9:2:200:ARG:HB2	1.43	1.00

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	C	24/26 (92%)	22 (92%)	2 (8%)	0	100	100
4	E	1115/2222 (50%)	1046 (94%)	54 (5%)	15 (1%)	9	41
5	D	130/132 (98%)	127 (98%)	3 (2%)	0	100	100
6	B	167/380 (44%)	150 (90%)	12 (7%)	5 (3%)	3	25
7	4	317/319 (99%)	304 (96%)	12 (4%)	1 (0%)	36	70
8	3	325/327 (99%)	316 (97%)	9 (3%)	0	100	100
9	2	338/340 (99%)	334 (99%)	4 (1%)	0	100	100
10	5	331/354 (94%)	327 (99%)	4 (1%)	0	100	100
11	1	447/741 (60%)	422 (94%)	21 (5%)	4 (1%)	14	49
12	X	256/258 (99%)	239 (93%)	12 (5%)	5 (2%)	6	33
12	Y	256/258 (99%)	239 (93%)	12 (5%)	5 (2%)	6	33
12	Z	252/258 (98%)	237 (94%)	11 (4%)	4 (2%)	7	37
All	All	3958/5615 (70%)	3763 (95%)	156 (4%)	39 (1%)	15	46

5 of 39 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
4	E	833	TYR
4	E	845	GLU
4	E	846	MET
4	E	987	LYS
4	E	1053	SER

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	C	20/24 (83%)	20 (100%)	0	100	100
4	E	942/2014 (47%)	938 (100%)	4 (0%)	84	83
5	D	110/119 (92%)	108 (98%)	2 (2%)	51	67
6	B	153/352 (44%)	152 (99%)	1 (1%)	76	79

Continued on next page...

Continued from previous page...

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
7	4	267/280 (95%)	262 (98%)	5 (2%)	50	67
8	3	279/284 (98%)	279 (100%)	0	100	100
9	2	298/301 (99%)	297 (100%)	1 (0%)	86	85
10	5	299/324 (92%)	297 (99%)	2 (1%)	76	79
11	1	385/671 (57%)	384 (100%)	1 (0%)	86	85
12	X	226/233 (97%)	224 (99%)	2 (1%)	70	76
12	Y	224/233 (96%)	223 (100%)	1 (0%)	84	83
12	Z	220/233 (94%)	218 (99%)	2 (1%)	70	76
All	All	3423/5068 (68%)	3402 (99%)	21 (1%)	76	80

5 of 21 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
10	5	181	ILE
12	X	119	MET
12	Z	198	GLU
12	Y	20	LYS
12	X	117	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 51 such sidechains are listed below:

Mol	Chain	Res	Type
9	2	96	ASN
9	2	352	GLN
12	Y	132	GLN
9	2	124	HIS
9	2	288	ASN

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 [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 8 ligands modelled in this entry, 3 are monoatomic - leaving 5 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
14	AGS	3	401	15	32,33,33	0.45	1 (3%)	45,52,52	0.66	1 (2%)
14	AGS	2	401	15	32,33,33	0.48	1 (3%)	45,52,52	0.65	1 (2%)
16	ADP	5	401	-	28,29,29	0.44	0	43,45,45	0.51	0
14	AGS	4	401	15	32,33,33	0.47	1 (3%)	45,52,52	0.66	1 (2%)
13	SF4	E	2301	4	0,12,12	-	-	-	-	-

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
14	AGS	3	401	15	-	2/21/38/38	0/3/3/3
14	AGS	2	401	15	-	2/21/38/38	0/3/3/3
16	ADP	5	401	-	-	1/16/32/32	0/3/3/3
14	AGS	4	401	15	-	5/21/38/38	0/3/3/3
13	SF4	E	2301	4	-	-	0/6/5/5

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
14	2	401	AGS	PG-S1G	2.15	1.95	1.90
14	4	401	AGS	PG-S1G	2.13	1.95	1.90
14	3	401	AGS	PG-S1G	2.09	1.95	1.90

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
14	3	401	AGS	PB-O3B-PG	-3.55	120.16	133.17
14	4	401	AGS	PB-O3B-PG	-3.52	120.29	133.17
14	2	401	AGS	PB-O3B-PG	-3.51	120.32	133.17

There are no chirality outliers.

5 of 10 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
14	4	401	AGS	PB-O3B-PG-O2G
14	4	401	AGS	PB-O3B-PG-O3G
14	4	401	AGS	C5'-O5'-PA-O1A
14	3	401	AGS	PB-O3B-PG-O2G
14	3	401	AGS	PB-O3B-PG-O3G

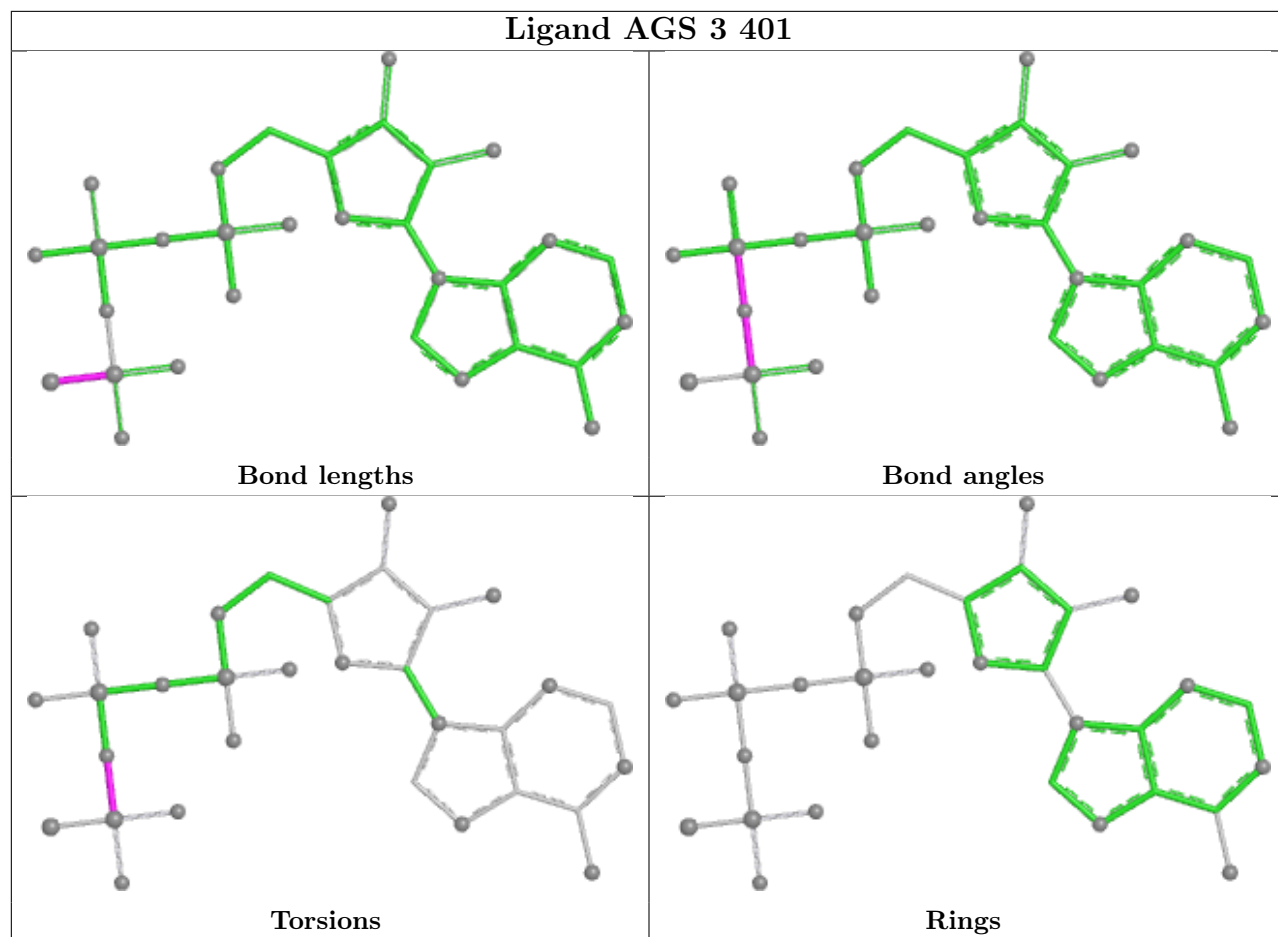
There are no ring outliers.

5 monomers are involved in 23 short contacts:

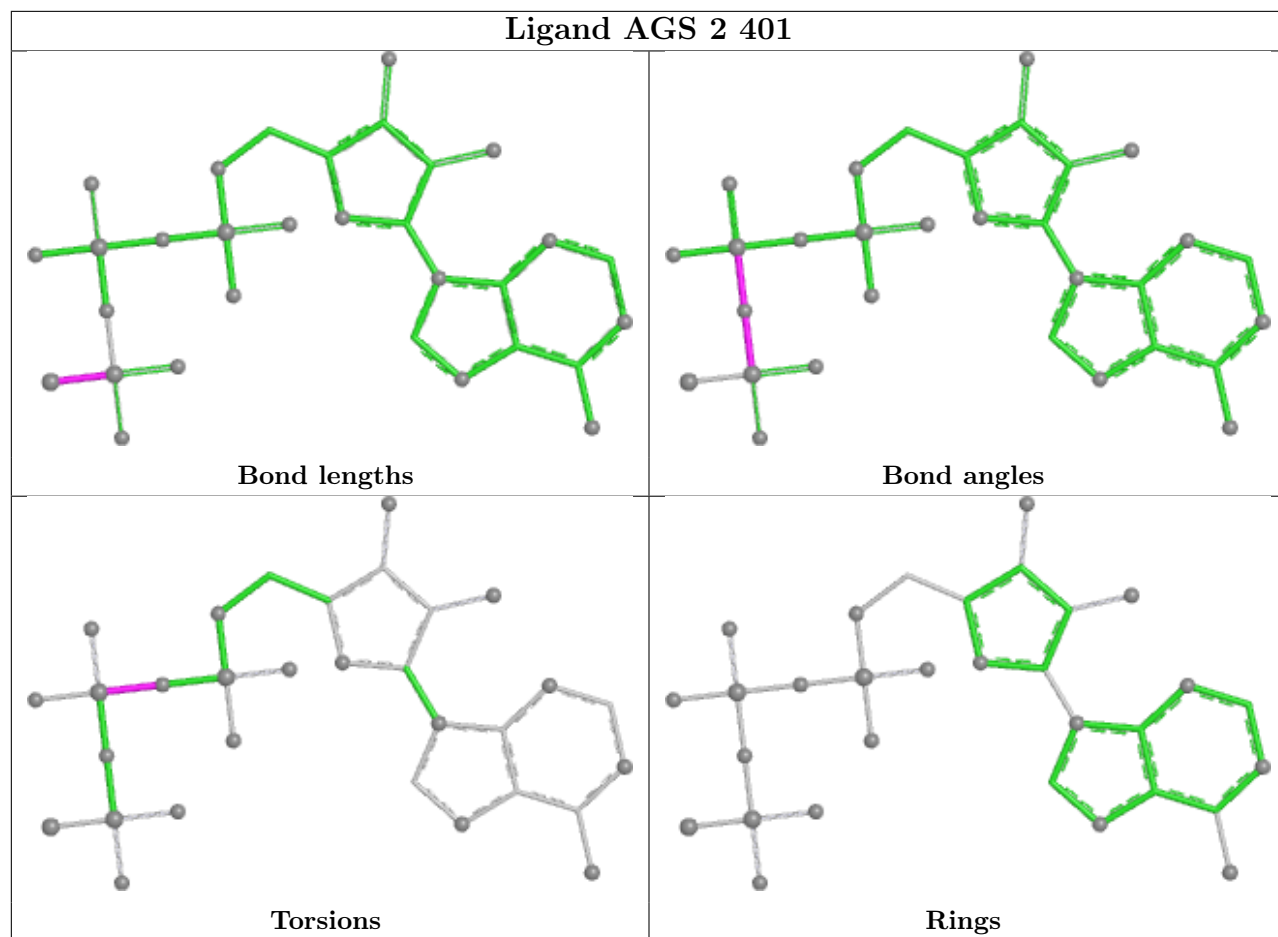
Mol	Chain	Res	Type	Clashes	Symm-Clashes
14	3	401	AGS	2	0
14	2	401	AGS	3	0
16	5	401	ADP	9	0
14	4	401	AGS	3	0
13	E	2301	SF4	6	0

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.

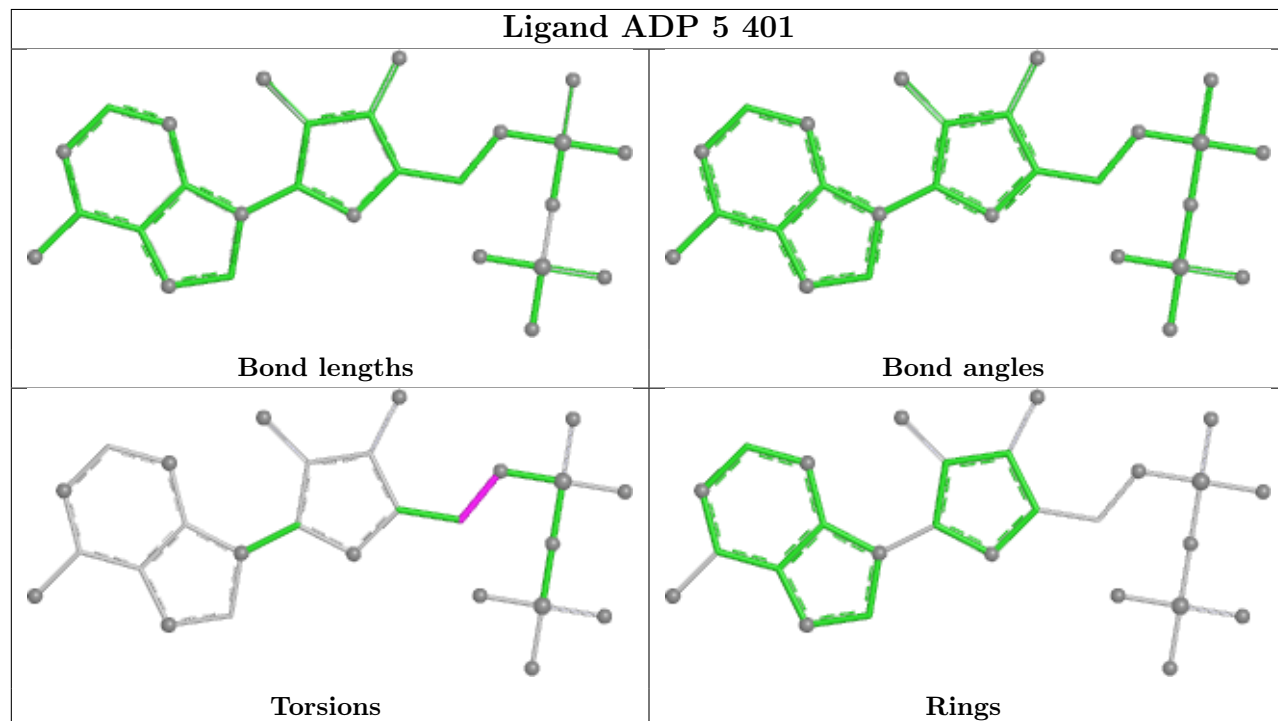
Ligand AGS 3 401

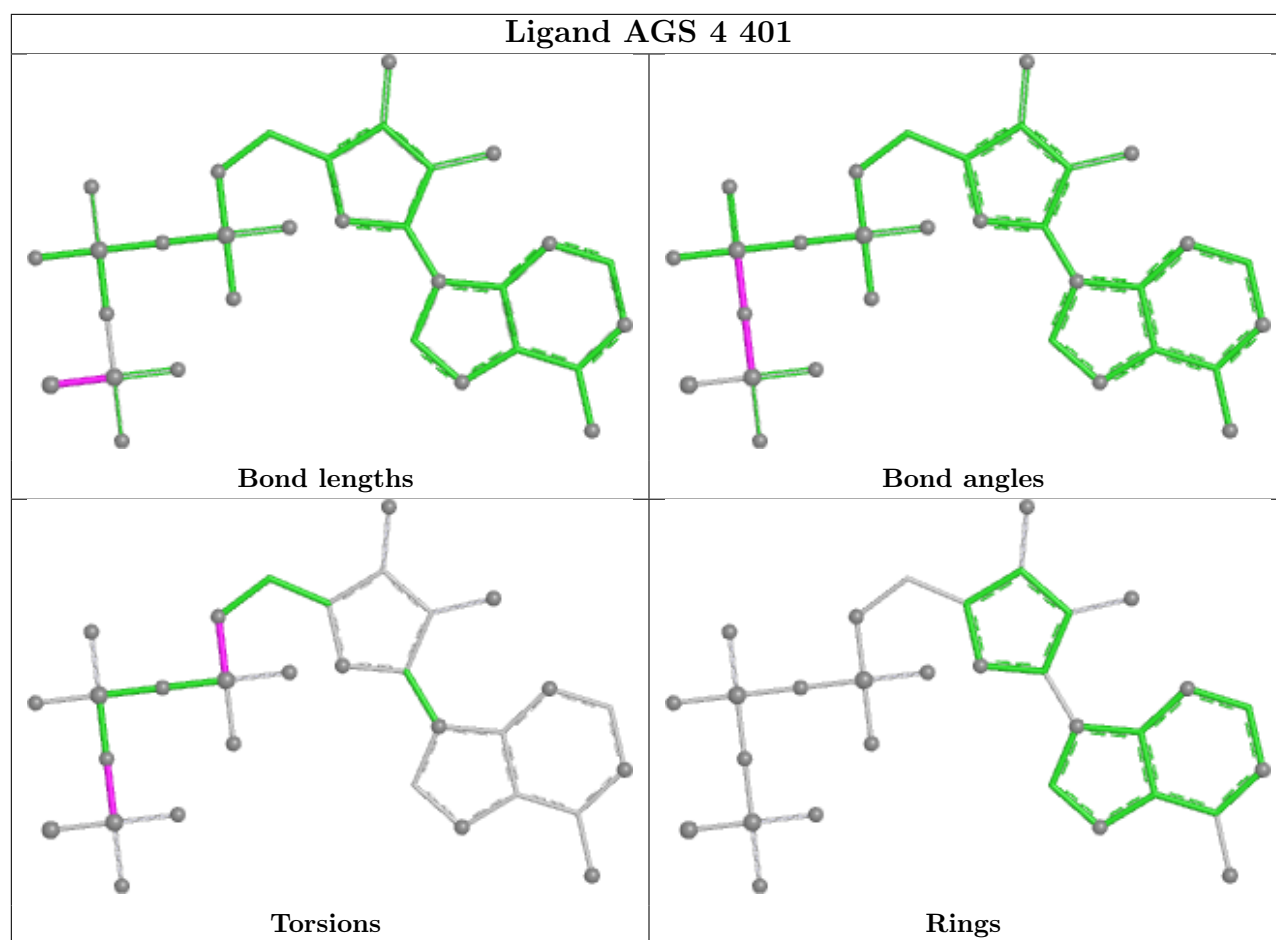


Ligand AGS 2 401



Ligand ADP 5 401





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.

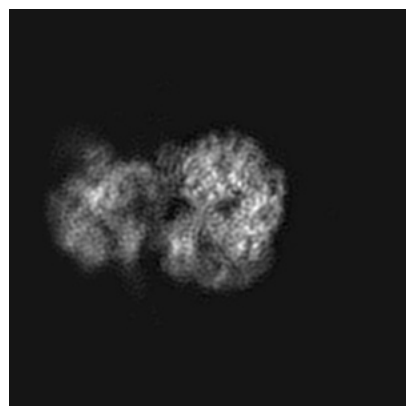
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-41664. These allow visual inspection of the internal detail of the map and identification of artifacts.

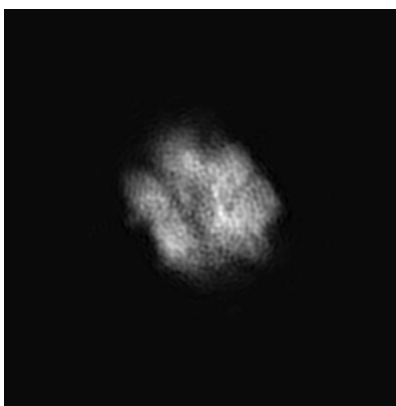
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

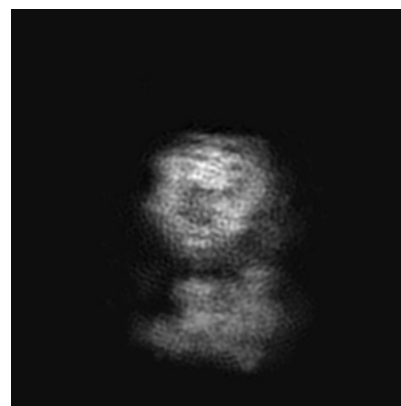
6.1.1 Primary map



X

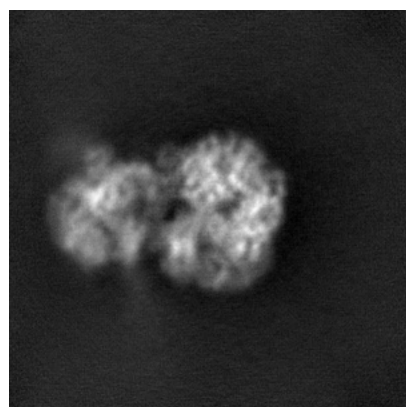


Y

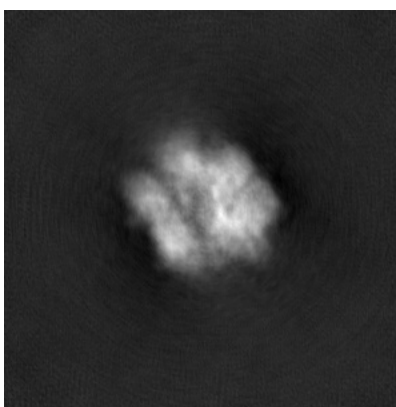


Z

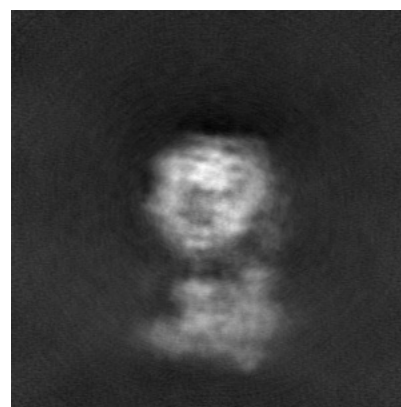
6.1.2 Raw map



X



Y

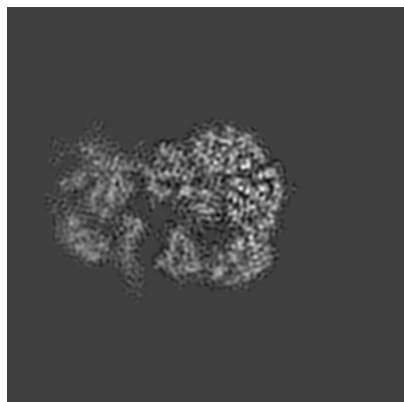


Z

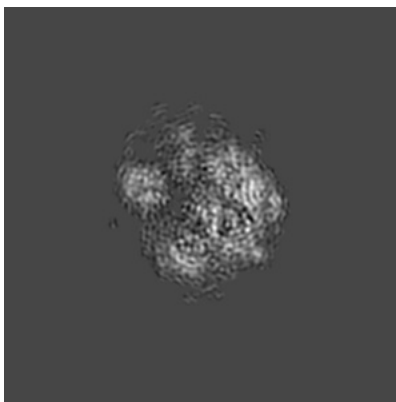
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

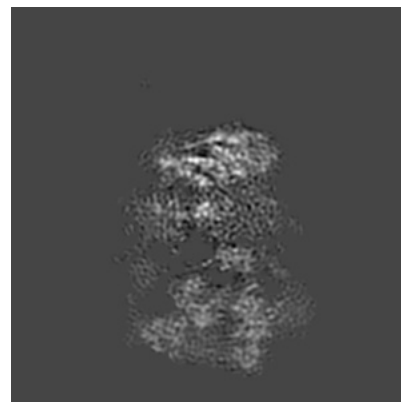
6.2.1 Primary map



X Index: 180

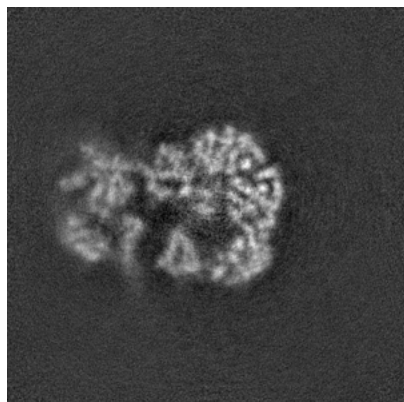


Y Index: 180

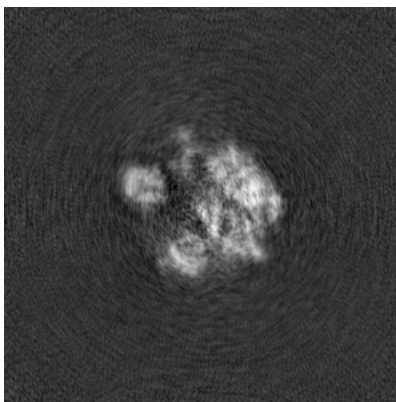


Z Index: 180

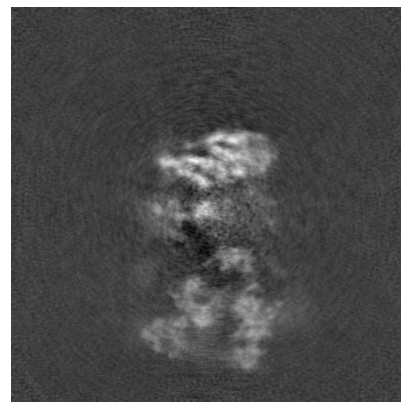
6.2.2 Raw map



X Index: 180



Y Index: 180

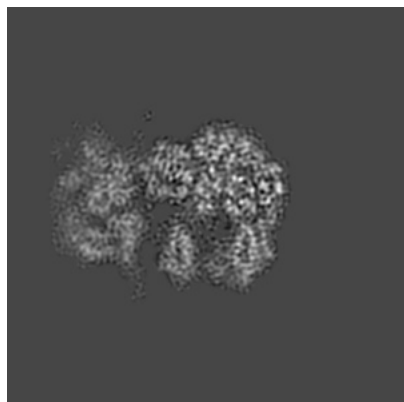


Z Index: 180

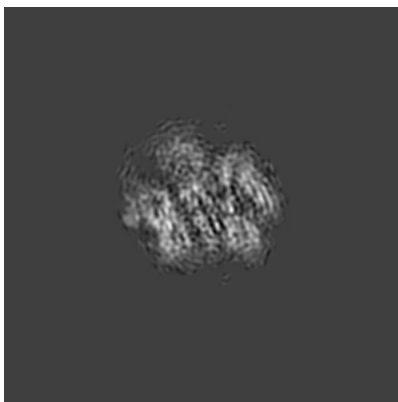
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

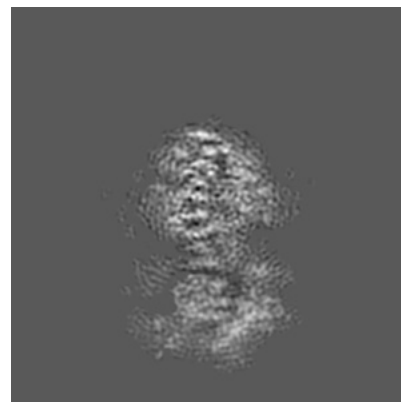
6.3.1 Primary map



X Index: 175

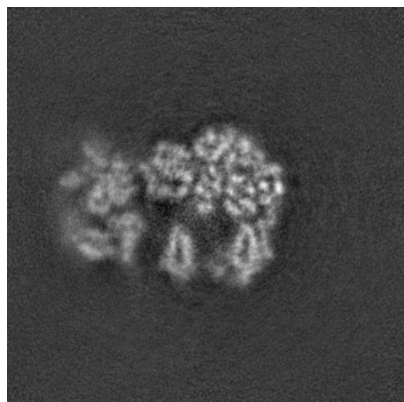


Y Index: 208

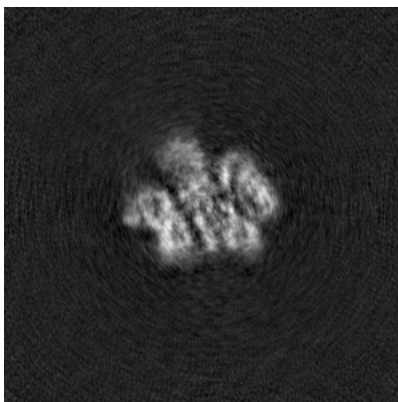


Z Index: 197

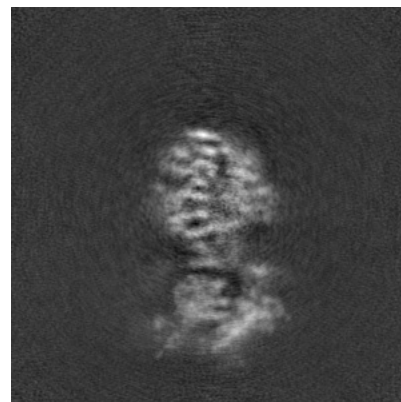
6.3.2 Raw map



X Index: 175



Y Index: 209



Z Index: 197

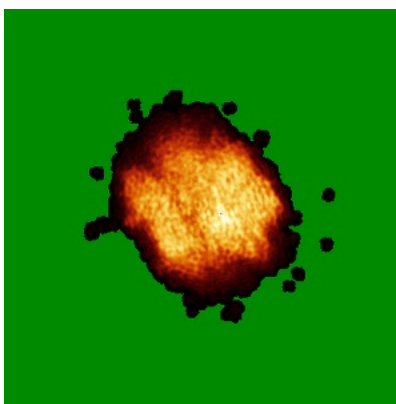
The images above show the largest variance slices of the map in three orthogonal directions.

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

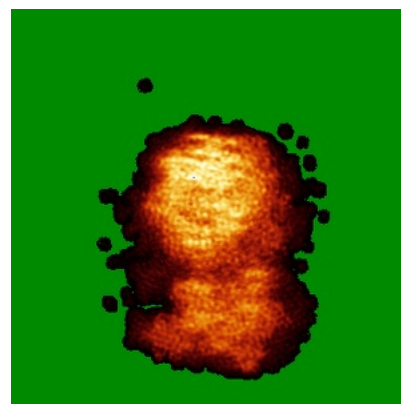
6.4.1 Primary map



X



Y

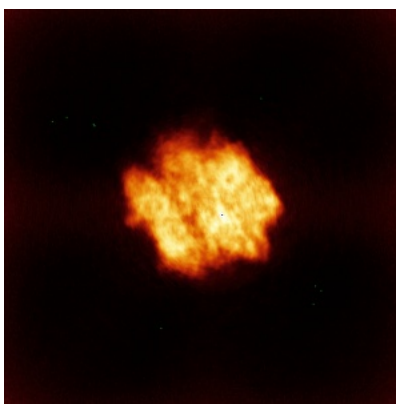


Z

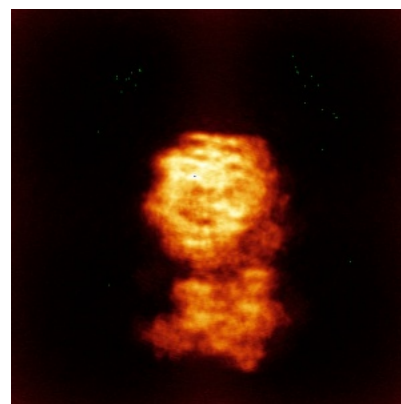
6.4.2 Raw map



X



Y

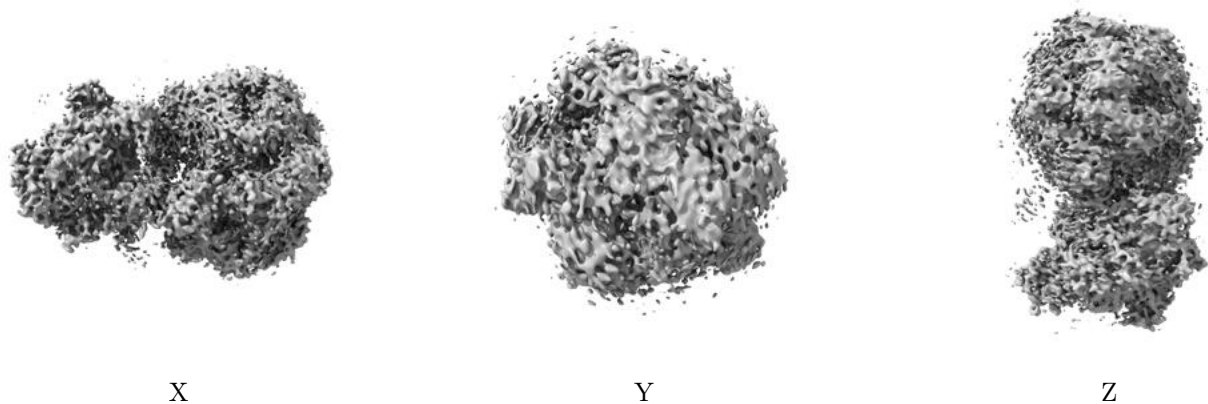


Z

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.

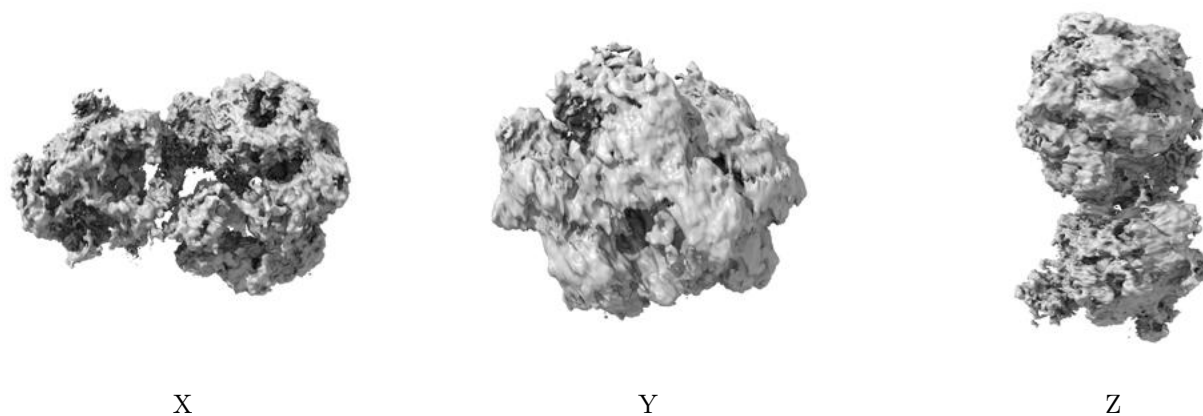
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.144. 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.

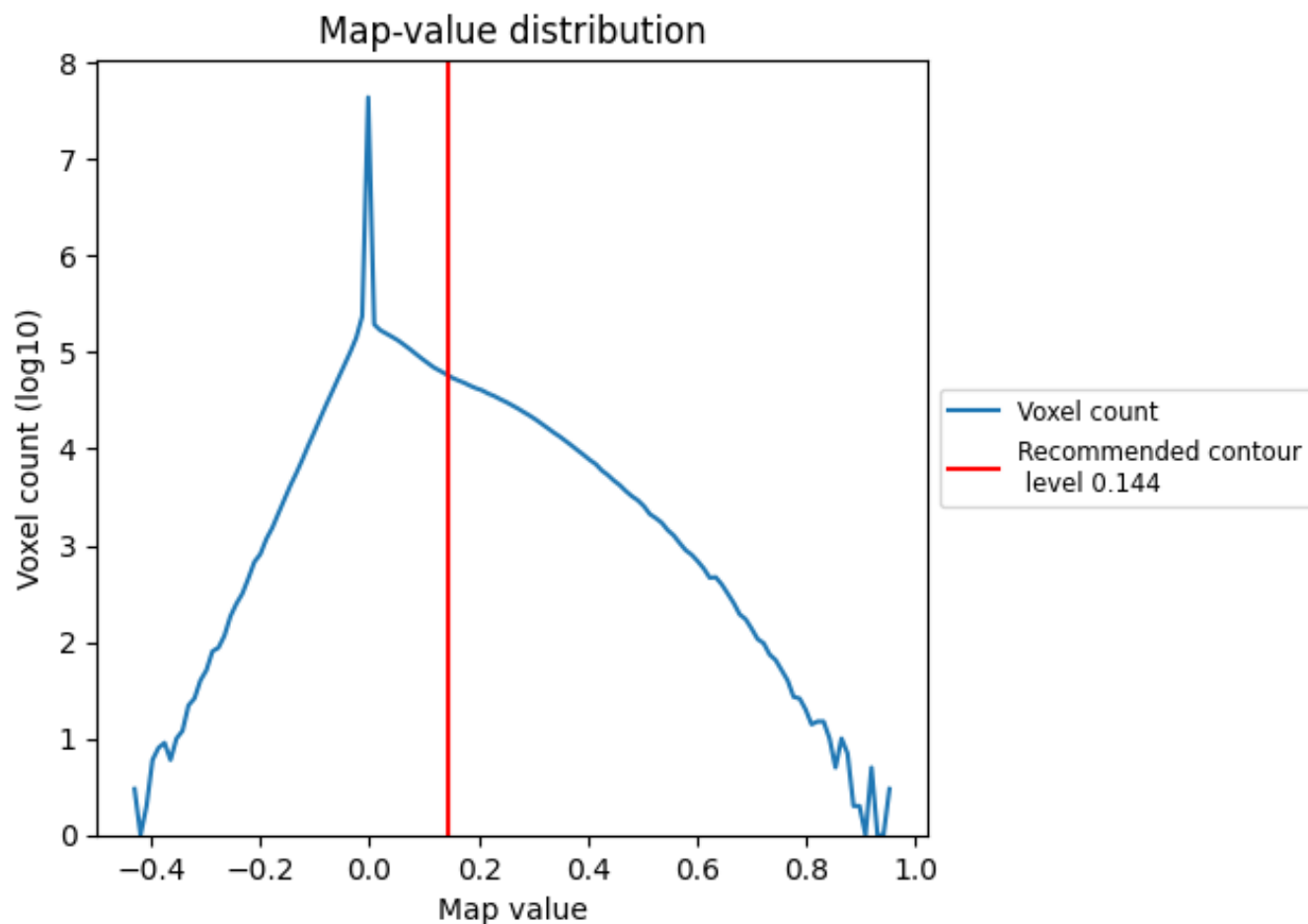
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

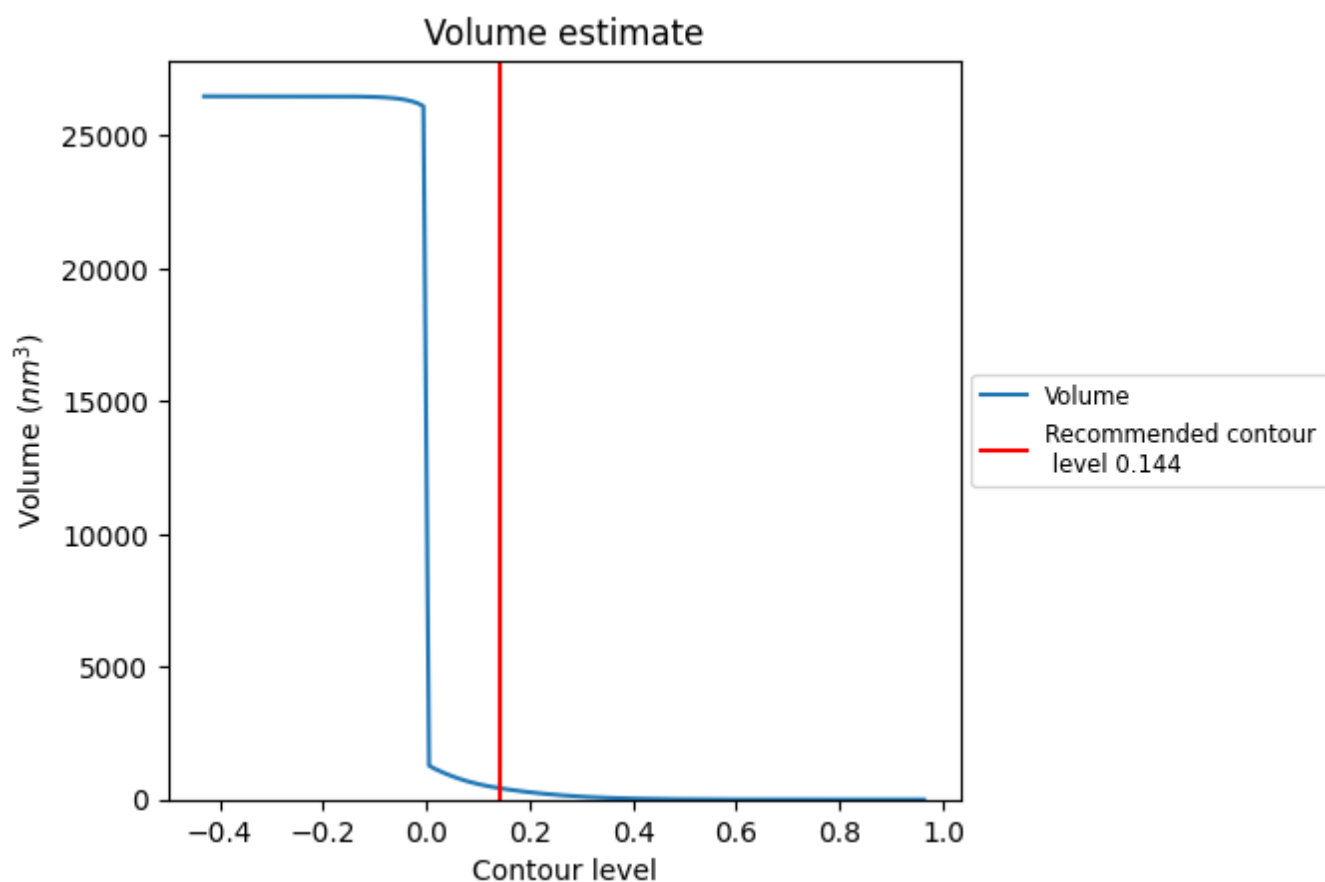
This section contains the results of statistical analysis of the map.

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.

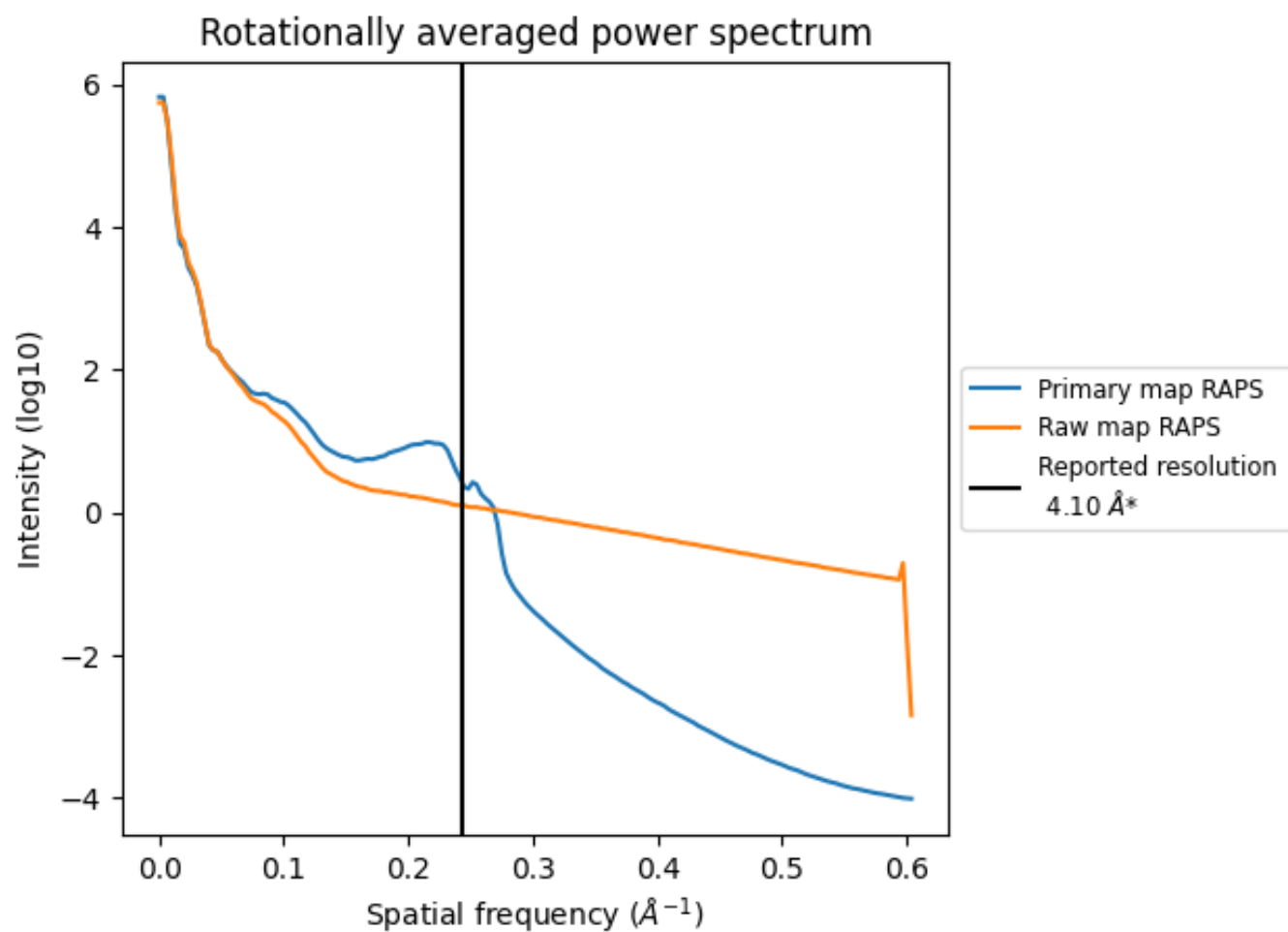
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 422 nm^3 ; this corresponds to an approximate mass of 381 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 ⓘ

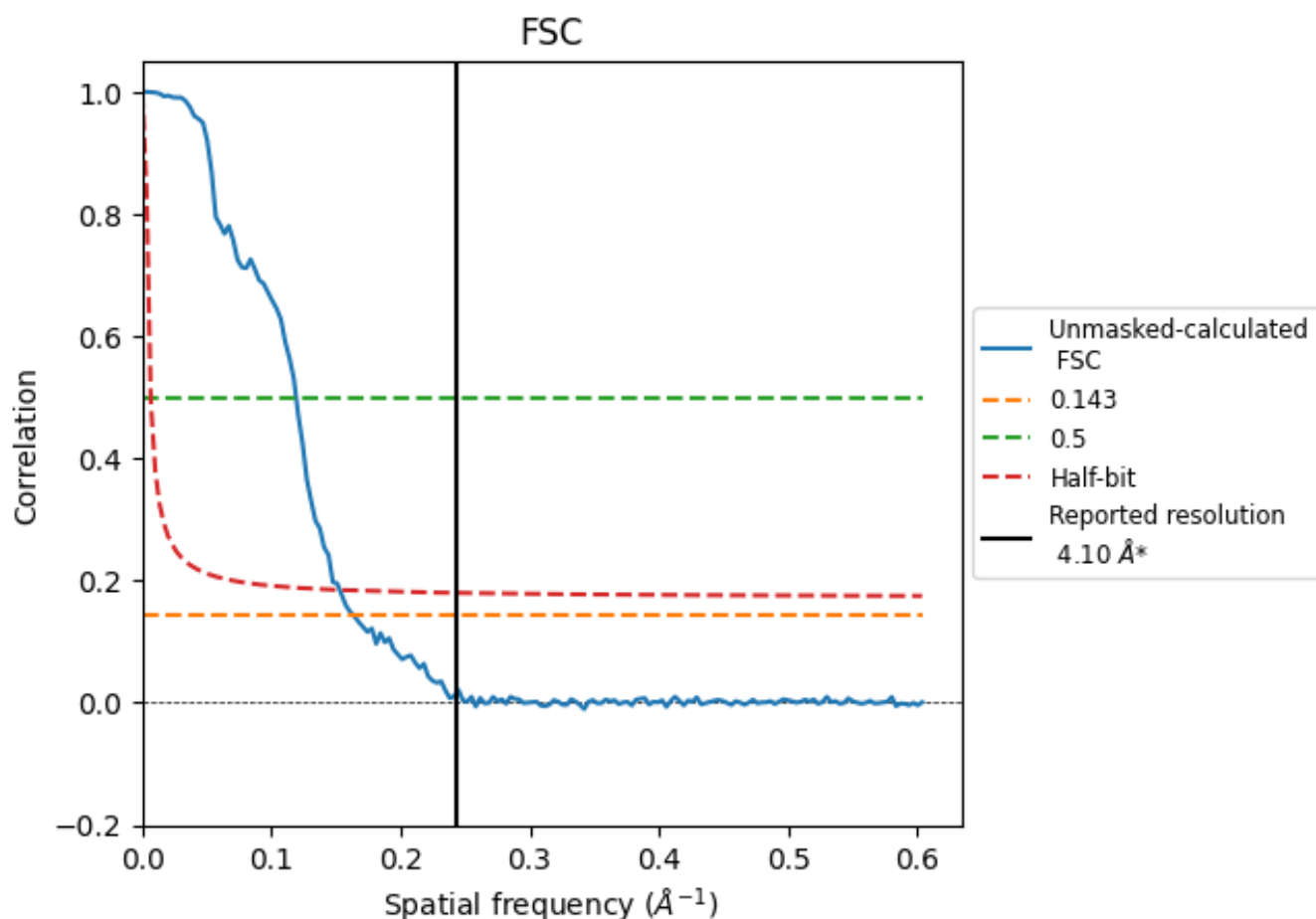


*Reported resolution corresponds to spatial frequency of 0.244 $\text{\AA}^{-1}$

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 0.244 Å⁻¹

8.2 Resolution estimates [i](#)

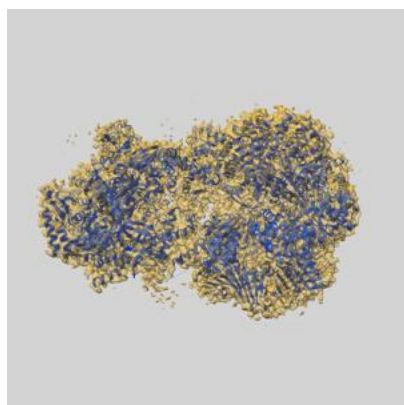
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	4.10	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	6.11	8.40	6.54

*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 6.11 differs from the reported value 4.1 by more than 10 %

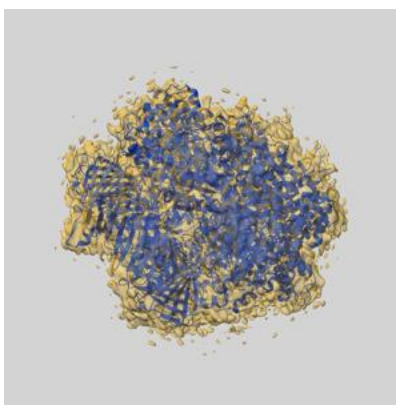
9 Map-model fit [i](#)

This section contains information regarding the fit between EMDB map EMD-41664 and PDB model 8TWA. Per-residue inclusion information can be found in section [3](#) on page [9](#).

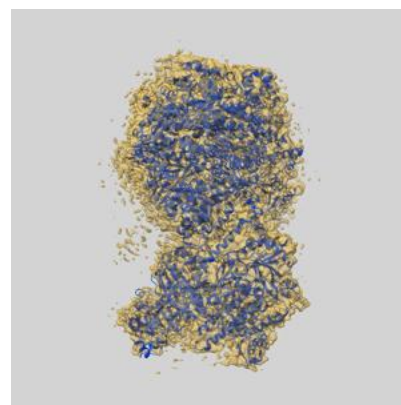
9.1 Map-model overlay [i](#)



X



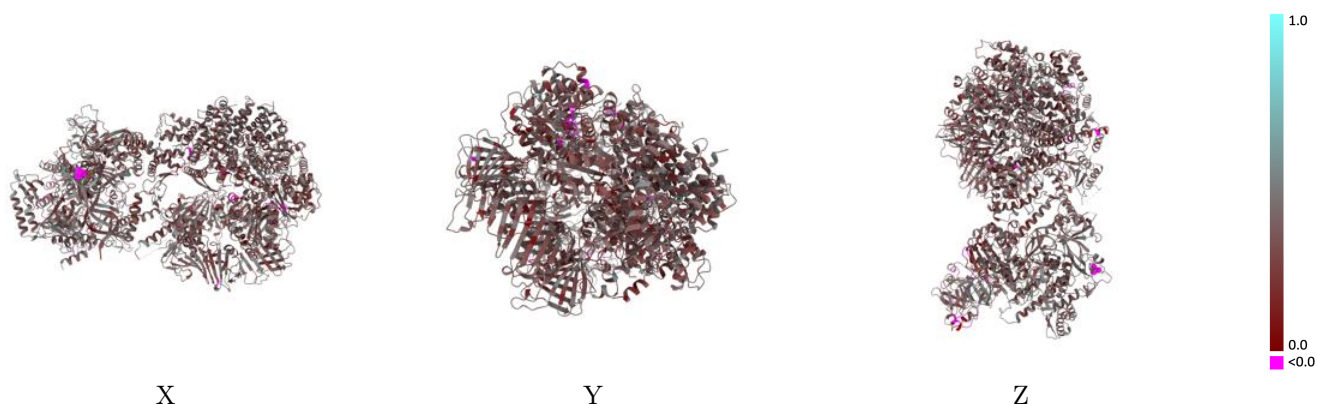
Y



Z

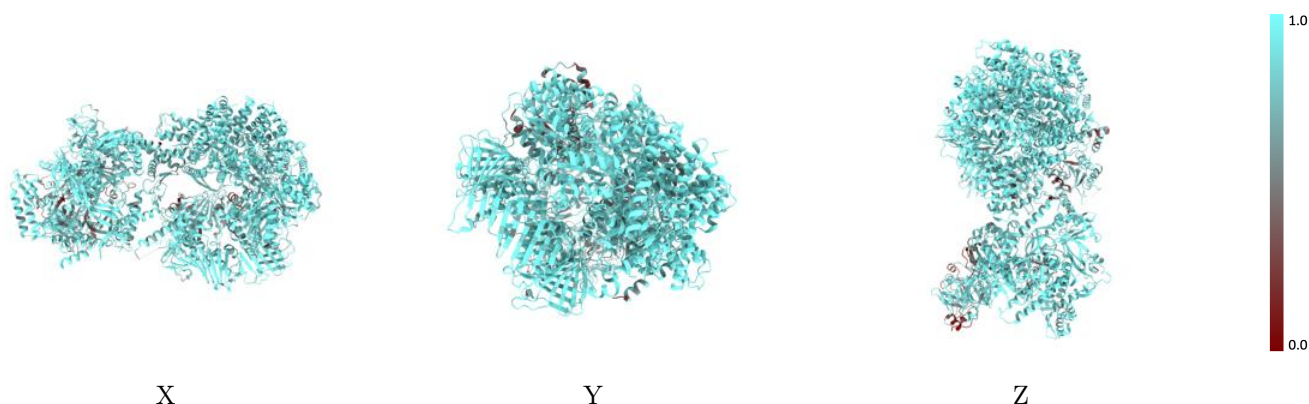
The images above show the 3D surface view of the map at the recommended contour level 0.144 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



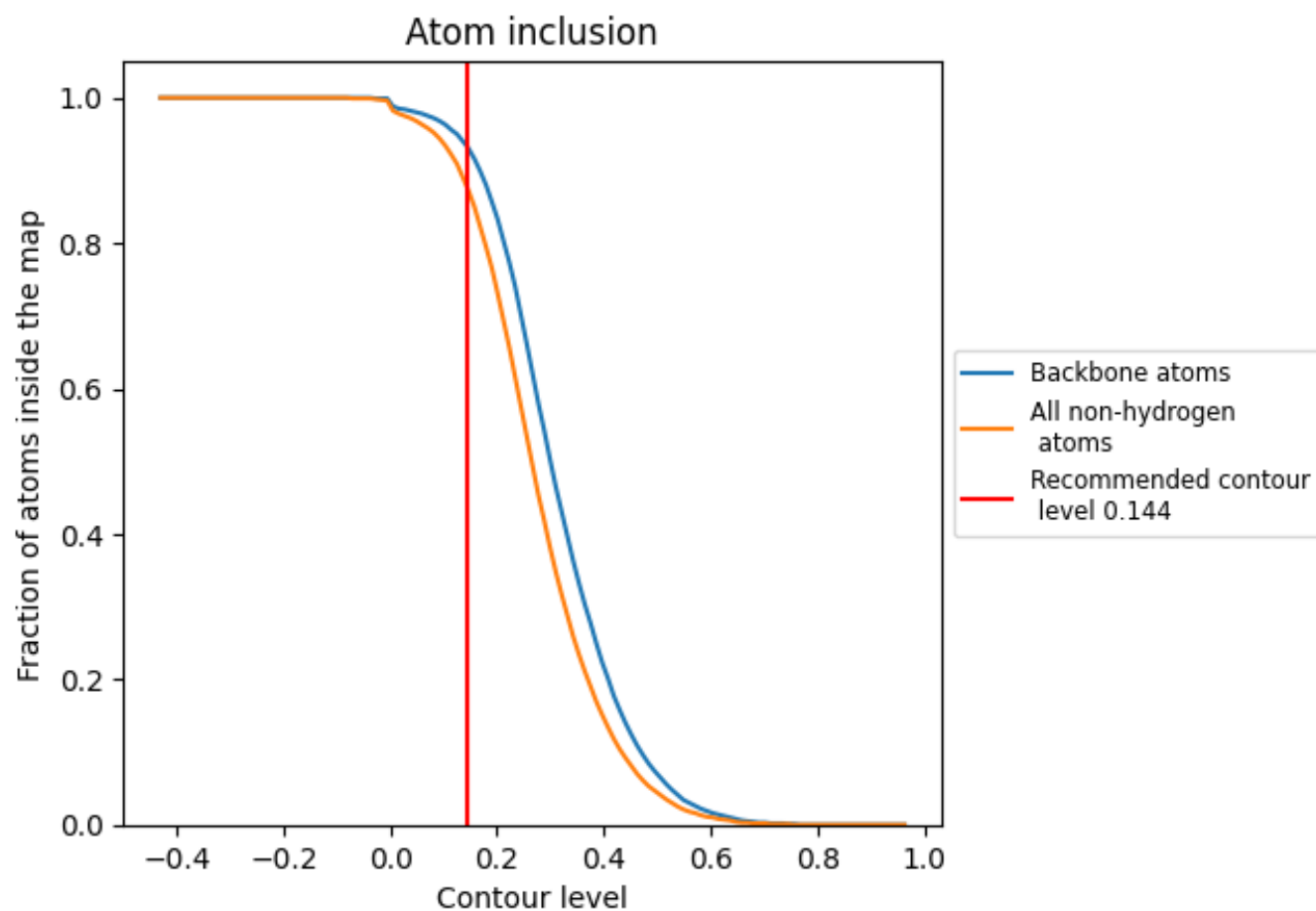
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.144).

9.4 Atom inclusion [i](#)



At the recommended contour level, 93% of all backbone atoms, 88% 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 (0.144) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	 0.8770	 0.3490
1	 0.8110	 0.3280
2	 0.9340	 0.3480
3	 0.9370	 0.3480
4	 0.8950	 0.3300
5	 0.9260	 0.3410
B	 0.6950	 0.3290
C	 0.8710	 0.4140
D	 0.6380	 0.3060
E	 0.8770	 0.3690
P	 0.8690	 0.3290
T	 0.7720	 0.3360
X	 0.9110	 0.3440
Y	 0.9270	 0.3630
Z	 0.9380	 0.3590

