



Full wwPDB EM Validation Report ⓘ

Apr 7, 2025 – 08:21 PM JST

PDB ID : 8Z1Z / pdb_00008z1z
EMDB ID : EMD-39741
Title : Cryo-EM structure of Escherichia coli DppAR383D+D436RBCDF in pre-catalytic state
Authors : Li, P.; Huang, Y.
Deposited on : 2024-04-12
Resolution : 3.26 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.dev117
Mogul : 1.8.5 (274361), CSD as541be (2020)
MolProbity : 4.02b-467
buster-report : 1.1.7 (2018)
Percentile statistics : 20231227.v01 (using entries in the PDB archive December 27th 2023)
MapQ : 1.9.13
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.42

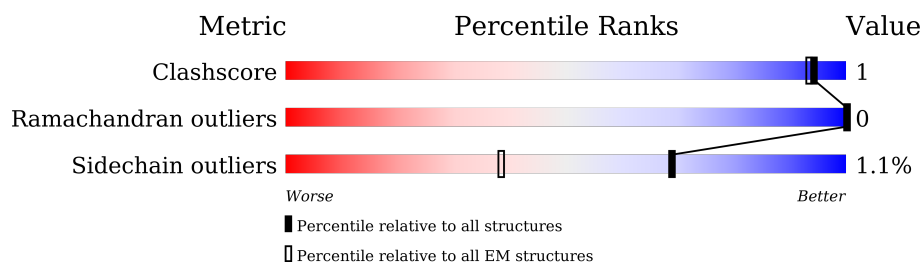
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

ELECTRON MICROSCOPY

The reported resolution of this entry is 3.26 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	210492	15764
Ramachandran outliers	207382	16835
Sidechain outliers	206894	16415

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	339	 77% 9% • 12%
2	B	300	 78% 16% • •
3	C	327	 88% 10% ••
4	D	334	 86% 9% • •
5	F	535	 86% 8% • 5%

2 Entry composition

There are 7 unique types of molecules in this entry. The entry contains 13652 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 Dipeptide transport system permease protein DppB.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	298	Total	C	N	O	S	0	0
			2317	1526	390	384	17		

- Molecule 2 is a protein called Dipeptide transport system permease protein DppC.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	B	289	Total	C	N	O	S	0	0
			2187	1445	359	369	14		

- Molecule 3 is a protein called Dipeptide transport ATP-binding protein DppD.

Mol	Chain	Residues	Atoms					AltConf	Trace
3	C	324	Total	C	N	O	S	0	0
			2486	1559	447	463	17		

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
C	179	GLN	GLU	conflict	UNP P0AAG0

- Molecule 4 is a protein called Dipeptide transport ATP-binding protein DppF.

Mol	Chain	Residues	Atoms					AltConf	Trace
4	D	322	Total	C	N	O	S	0	0
			2537	1597	460	463	17		

There is a discrepancy between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
D	187	GLN	GLU	conflict	UNP P37313

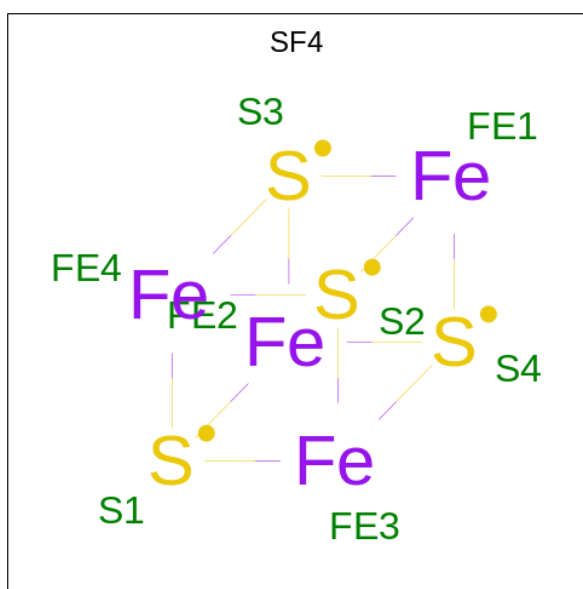
- Molecule 5 is a protein called Dipeptide-binding protein.

Mol	Chain	Residues	Atoms					AltConf	Trace
5	F	507	Total	C	N	O	S	0	0
			4047	2584	676	768	19		

There are 2 discrepancies between the modelled and reference sequences:

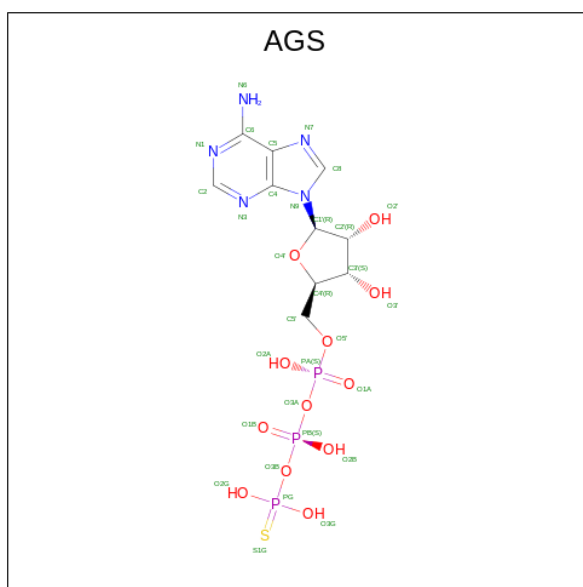
Chain	Residue	Modelled	Actual	Comment	Reference
F	383	ASP	ARG	engineered mutation	UNP P23847
F	436	ARG	ASP	engineered mutation	UNP P23847

- Molecule 6 is IRON/SULFUR CLUSTER (CCD ID: SF4) (formula: Fe_4S_4) (labeled as "Ligand of Interest" by depositor).



Mol	Chain	Residues	Atoms			AltConf
6	C	1	Total	Fe	S	0
			8	4	4	
6	D	1	Total	Fe	S	0
			8	4	4	

- Molecule 7 is PHOSPHOTHIOPHOSPHORIC ACID-ADENYLATE ESTER (CCD ID: AGS) (formula: $\text{C}_{10}\text{H}_{16}\text{N}_5\text{O}_{12}\text{P}_3\text{S}$) (labeled as "Ligand of Interest" by depositor).

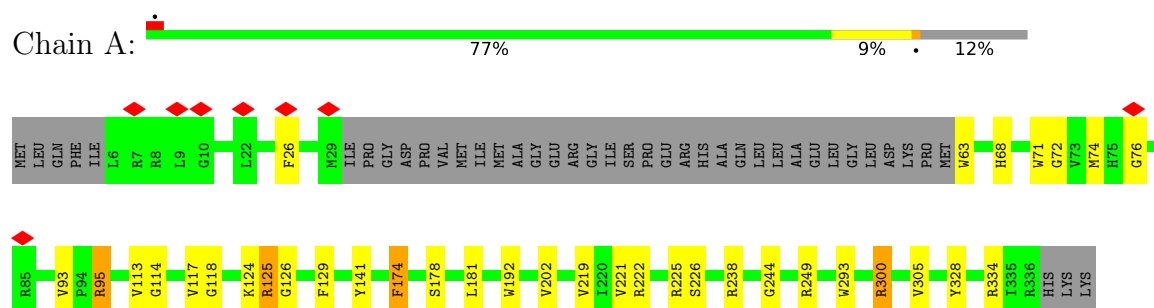


Mol	Chain	Residues	Atoms						AltConf
7	C	1	Total 31	C 10	N 5	O 12	P 3	S 1	0
7	D	1	Total 31	C 10	N 5	O 12	P 3	S 1	0

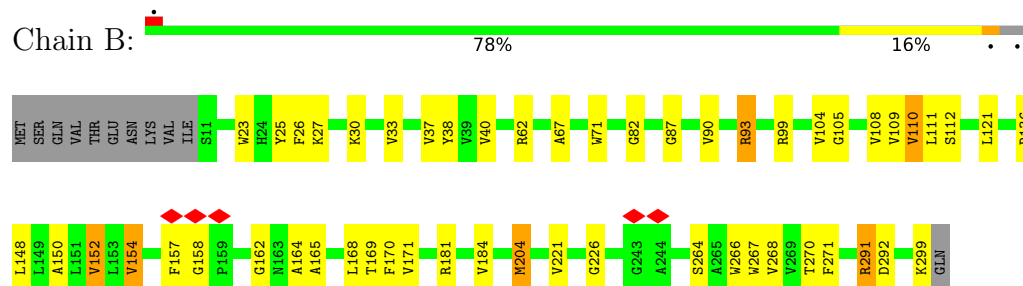
3 Residue-property plots

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and atom inclusion in map density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red diamond above a residue indicates a poor fit to the EM map for this residue (all-atom inclusion < 40%). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

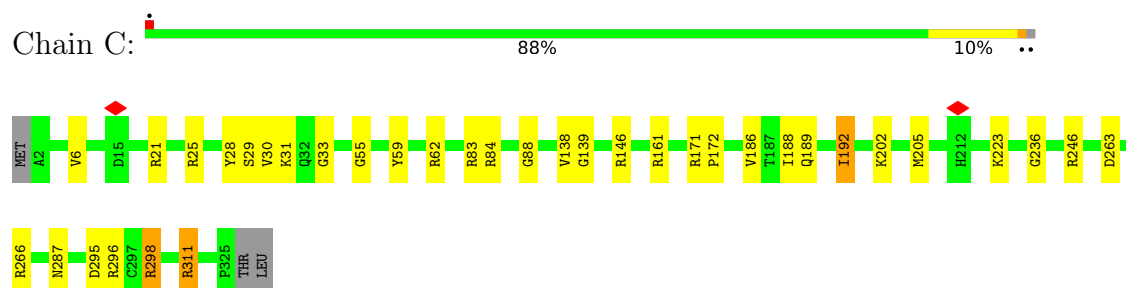
- Molecule 1: Dipeptide transport system permease protein DppB



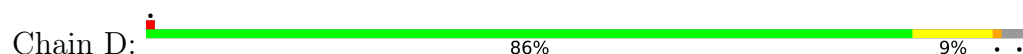
- Molecule 2: Dipeptide transport system permease protein DppC

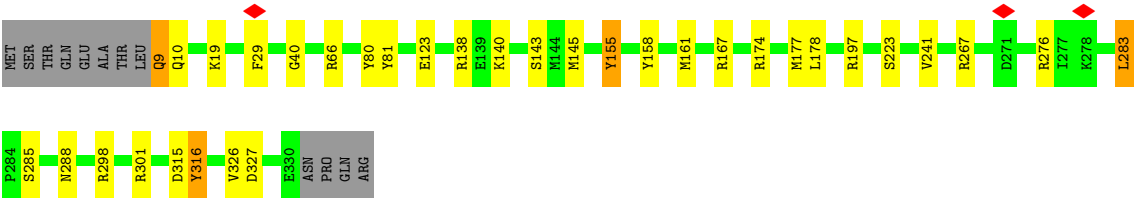


- Molecule 3: Dipeptide transport ATP-binding protein DppD

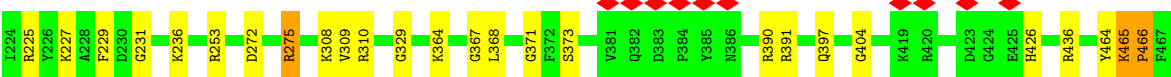
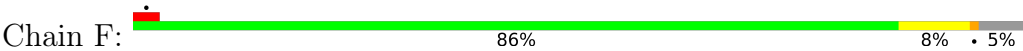


- Molecule 4: Dipeptide transport ATP-binding protein DppF





● Molecule 5: Dipeptide-binding protein



4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, Not provided	
Number of particles used	375658	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 ($e^-/\text{\AA}^2$)	45	Depositor
Minimum defocus (nm)	1200	Depositor
Maximum defocus (nm)	1800	Depositor
Magnification	Not provided	
Image detector	GATAN K2 SUMMIT (4k x 4k)	Depositor
Maximum map value	2.387	Depositor
Minimum map value	-0.002	Depositor
Average map value	0.000	Depositor
Map value standard deviation	0.016	Depositor
Recommended contour level	0.03	Depositor
Map size (Å)	399.36, 399.36, 399.36	wwPDB
Map dimensions	384, 384, 384	wwPDB
Map angles (°)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (Å)	1.04, 1.04, 1.04	Depositor

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: AGS, 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	A	1.26	25/2371 (1.1%)	1.30	12/3234 (0.4%)
2	B	1.51	47/2240 (2.1%)	1.33	13/3062 (0.4%)
3	C	1.20	21/2530 (0.8%)	1.23	13/3427 (0.4%)
4	D	1.33	22/2584 (0.9%)	1.32	17/3486 (0.5%)
5	F	1.09	33/4152 (0.8%)	1.16	12/5630 (0.2%)
All	All	1.26	148/13877 (1.1%)	1.26	67/18839 (0.4%)

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
1	A	0	2
3	C	0	3
5	F	0	1
All	All	0	6

All (148) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	F	225	ARG	CZ-NH2	-8.00	1.22	1.33
5	F	96	ARG	CZ-NH2	-8.00	1.22	1.33
5	F	223	ARG	CZ-NH2	-7.94	1.22	1.33
5	F	275	ARG	CZ-NH2	-7.94	1.22	1.33
4	D	138	ARG	CZ-NH2	-7.90	1.22	1.33
3	C	298	ARG	CZ-NH2	-7.89	1.22	1.33
2	B	291	ARG	CZ-NH2	-7.83	1.22	1.33
1	A	125	ARG	CZ-NH2	-7.79	1.23	1.33
5	F	225	ARG	CZ-NH1	-7.49	1.23	1.33
5	F	223	ARG	CZ-NH1	-7.47	1.23	1.33

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	F	96	ARG	CZ-NH1	-7.46	1.23	1.33
3	C	298	ARG	CZ-NH1	-7.41	1.23	1.33
4	D	138	ARG	CZ-NH1	-7.37	1.23	1.33
5	F	275	ARG	CZ-NH1	-7.36	1.23	1.33
1	A	125	ARG	CZ-NH1	-7.33	1.23	1.33
2	B	291	ARG	CZ-NH1	-7.24	1.23	1.33
2	B	158	GLY	N-CA	-6.58	1.36	1.46
2	B	154	VAL	CB-CG2	-6.42	1.39	1.52
2	B	171	VAL	CB-CG1	-6.42	1.39	1.52
2	B	25	TYR	CD1-CE1	-6.02	1.30	1.39
4	D	155	TYR	CD2-CE2	-6.01	1.30	1.39
4	D	316	TYR	CD1-CE1	-5.87	1.30	1.39
4	D	241	VAL	CB-CG2	-5.82	1.40	1.52
4	D	155	TYR	CD1-CE1	-5.78	1.30	1.39
4	D	158	TYR	CD2-CE2	-5.78	1.30	1.39
4	D	316	TYR	CD2-CE2	-5.78	1.30	1.39
4	D	158	TYR	CD1-CE1	-5.74	1.30	1.39
2	B	40	VAL	CB-CG2	-5.73	1.40	1.52
2	B	152	VAL	CB-CG2	-5.73	1.40	1.52
3	C	33	GLY	N-CA	-5.68	1.37	1.46
4	D	80	TYR	CD1-CE1	-5.66	1.30	1.39
4	D	326	VAL	CB-CG1	-5.63	1.41	1.52
3	C	186	VAL	CB-CG1	-5.62	1.41	1.52
5	F	371	GLY	N-CA	-5.62	1.37	1.46
3	C	55	GLY	N-CA	-5.62	1.37	1.46
4	D	19	LYS	CE-NZ	-5.61	1.35	1.49
5	F	518	GLY	N-CA	-5.59	1.37	1.46
3	C	6	VAL	CB-CG2	-5.58	1.41	1.52
3	C	186	VAL	CB-CG2	-5.58	1.41	1.52
2	B	33	VAL	CB-CG2	-5.57	1.41	1.52
3	C	138	VAL	CB-CG1	-5.57	1.41	1.52
1	A	93	VAL	CB-CG2	-5.54	1.41	1.52
1	A	221	VAL	CB-CG1	-5.53	1.41	1.52
5	F	329	GLY	N-CA	-5.52	1.37	1.46
4	D	81	TYR	CD1-CE1	-5.52	1.31	1.39
1	A	178	SER	CB-OG	-5.52	1.35	1.42
2	B	110	VAL	CB-CG1	-5.52	1.41	1.52
1	A	221	VAL	CB-CG2	-5.50	1.41	1.52
3	C	30	VAL	CB-CG1	-5.50	1.41	1.52
2	B	90	VAL	CB-CG2	-5.50	1.41	1.52
1	A	93	VAL	CB-CG1	-5.50	1.41	1.52
2	B	104	VAL	CB-CG2	-5.48	1.41	1.52

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	221	VAL	CB-CG2	-5.48	1.41	1.52
3	C	59	TYR	CD2-CE2	-5.48	1.31	1.39
3	C	88	GLY	N-CA	-5.48	1.37	1.46
2	B	37	VAL	CB-CG2	-5.48	1.41	1.52
3	C	59	TYR	CD1-CE1	-5.48	1.31	1.39
1	A	202	VAL	CB-CG1	-5.47	1.41	1.52
1	A	117	VAL	CB-CG1	-5.47	1.41	1.52
2	B	90	VAL	CB-CG1	-5.47	1.41	1.52
4	D	81	TYR	CD2-CE2	-5.46	1.31	1.39
1	A	113	VAL	CB-CG2	-5.46	1.41	1.52
1	A	126	GLY	N-CA	-5.45	1.37	1.46
2	B	110	VAL	CB-CG2	-5.45	1.41	1.52
3	C	6	VAL	CB-CG1	-5.45	1.41	1.52
4	D	241	VAL	CB-CG1	-5.45	1.41	1.52
2	B	108	VAL	CB-CG2	-5.45	1.41	1.52
5	F	309	VAL	CB-CG1	-5.44	1.41	1.52
1	A	113	VAL	CB-CG1	-5.43	1.41	1.52
5	F	231	GLY	N-CA	-5.43	1.38	1.46
1	A	219	VAL	CB-CG1	-5.43	1.41	1.52
5	F	105	LYS	CE-NZ	-5.43	1.35	1.49
1	A	219	VAL	CB-CG2	-5.42	1.41	1.52
5	F	309	VAL	CB-CG2	-5.42	1.41	1.52
1	A	244	GLY	N-CA	-5.41	1.38	1.46
5	F	373	SER	CB-OG	-5.41	1.35	1.42
5	F	157	LYS	CE-NZ	-5.41	1.35	1.49
5	F	81	LYS	CE-NZ	-5.40	1.35	1.49
2	B	33	VAL	CB-CG1	-5.40	1.41	1.52
5	F	367	GLY	N-CA	-5.39	1.38	1.46
3	C	236	GLY	N-CA	-5.39	1.38	1.46
2	B	82	GLY	N-CA	-5.38	1.38	1.46
2	B	226	GLY	N-CA	-5.37	1.38	1.46
3	C	30	VAL	CB-CG2	-5.37	1.41	1.52
4	D	326	VAL	CB-CG2	-5.37	1.41	1.52
2	B	268	VAL	CB-CG2	-5.37	1.41	1.52
2	B	154	VAL	CB-CG1	-5.36	1.41	1.52
2	B	109	VAL	CB-CG2	-5.35	1.41	1.52
2	B	146	SER	CB-OG	-5.35	1.35	1.42
4	D	40	GLY	N-CA	-5.35	1.38	1.46
5	F	100	LYS	CE-NZ	-5.35	1.35	1.49
2	B	109	VAL	CB-CG1	-5.35	1.41	1.52
5	F	84	VAL	CB-CG2	-5.35	1.41	1.52
1	A	114	GLY	N-CA	-5.34	1.38	1.46

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
5	F	98	GLY	N-CA	-5.33	1.38	1.46
5	F	85	SER	CB-OG	-5.33	1.35	1.42
1	A	202	VAL	CB-CG2	-5.33	1.41	1.52
4	D	80	TYR	CD2-CE2	-5.33	1.31	1.39
4	D	140	LYS	CE-NZ	-5.33	1.35	1.49
2	B	105	GLY	N-CA	-5.33	1.38	1.46
2	B	299	LYS	CE-NZ	-5.32	1.35	1.49
2	B	171	VAL	CB-CG2	-5.32	1.41	1.52
2	B	37	VAL	CB-CG1	-5.31	1.41	1.52
4	D	223	SER	CB-OG	-5.31	1.35	1.42
2	B	264	SER	CB-OG	-5.30	1.35	1.42
2	B	267	TRP	CD1-NE1	-5.30	1.28	1.38
2	B	87	GLY	N-CA	-5.30	1.38	1.46
5	F	227	LYS	CE-NZ	-5.30	1.35	1.49
5	F	364	LYS	CE-NZ	-5.29	1.35	1.49
3	C	138	VAL	CB-CG2	-5.29	1.41	1.52
5	F	308	LYS	CE-NZ	-5.29	1.35	1.49
3	C	223	LYS	CE-NZ	-5.28	1.35	1.49
1	A	117	VAL	CB-CG2	-5.28	1.41	1.52
3	C	31	LYS	CE-NZ	-5.28	1.35	1.49
1	A	72	GLY	N-CA	-5.27	1.38	1.46
1	A	118	GLY	N-CA	-5.27	1.38	1.46
5	F	97	LYS	CE-NZ	-5.27	1.35	1.49
2	B	104	VAL	CB-CG1	-5.27	1.41	1.52
5	F	84	VAL	CB-CG1	-5.27	1.41	1.52
2	B	40	VAL	CB-CG1	-5.26	1.41	1.52
5	F	158	VAL	CB-CG2	-5.26	1.41	1.52
3	C	202	LYS	CE-NZ	-5.26	1.35	1.49
2	B	108	VAL	CB-CG1	-5.25	1.41	1.52
5	F	404	GLY	N-CA	-5.25	1.38	1.46
1	A	124	LYS	CE-NZ	-5.25	1.35	1.49
3	C	139	GLY	N-CA	-5.25	1.38	1.46
2	B	266	TRP	CD1-NE1	-5.24	1.29	1.38
2	B	30	LYS	CE-NZ	-5.23	1.35	1.49
4	D	285	SER	CB-OG	-5.23	1.35	1.42
5	F	158	VAL	CB-CG1	-5.23	1.41	1.52
5	F	236	LYS	CE-NZ	-5.22	1.35	1.49
2	B	25	TYR	CD2-CE2	-5.21	1.31	1.39
2	B	221	VAL	CB-CG1	-5.21	1.41	1.52
1	A	76	GLY	N-CA	-5.21	1.38	1.46
2	B	268	VAL	CB-CG1	-5.21	1.42	1.52
2	B	23	TRP	CD1-NE1	-5.20	1.29	1.38

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	71	TRP	CD1-NE1	-5.20	1.29	1.38
1	A	71	TRP	CD1-NE1	-5.19	1.29	1.38
2	B	27	LYS	CE-NZ	-5.18	1.36	1.49
5	F	517	LYS	CE-NZ	-5.15	1.36	1.49
2	B	67	ALA	CA-CB	-5.14	1.41	1.52
1	A	226	SER	CB-OG	-5.14	1.35	1.42
1	A	63	TRP	CD1-NE1	-5.13	1.29	1.38
2	B	162	GLY	N-CA	-5.12	1.38	1.46
4	D	143	SER	CB-OG	-5.08	1.35	1.42
2	B	152	VAL	CB-CG1	-5.05	1.42	1.52
3	C	29	SER	CB-OG	-5.04	1.35	1.42
2	B	112	SER	CB-OG	-5.02	1.35	1.42

All (67) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	C	161	ARG	NE-CZ-NH2	9.29	124.94	120.30
4	D	158	TYR	CB-CG-CD2	8.80	126.28	121.00
1	A	225	ARG	NE-CZ-NH2	8.53	124.56	120.30
1	A	95	ARG	NE-CZ-NH2	7.84	124.22	120.30
2	B	181	ARG	NE-CZ-NH2	7.76	124.18	120.30
4	D	197	ARG	NE-CZ-NH2	7.67	124.14	120.30
3	C	62	ARG	NE-CZ-NH2	7.35	123.97	120.30
2	B	25	TYR	CB-CG-CD2	7.31	125.39	121.00
2	B	93	ARG	NE-CZ-NH2	7.28	123.94	120.30
3	C	296	ARG	NE-CZ-NH2	7.27	123.94	120.30
3	C	246	ARG	NE-CZ-NH2	7.22	123.91	120.30
2	B	271	PHE	CB-CG-CD2	7.16	125.81	120.80
1	A	300	ARG	NE-CZ-NH2	7.16	123.88	120.30
1	A	26	PHE	CB-CG-CD2	7.09	125.77	120.80
5	F	391	ARG	NE-CZ-NH2	6.91	123.75	120.30
5	F	229	PHE	CB-CG-CD2	6.87	125.61	120.80
5	F	436	ARG	NE-CZ-NH2	6.82	123.71	120.30
5	F	390	ARG	NE-CZ-NH2	6.75	123.68	120.30
5	F	223	ARG	CD-NE-CZ	6.74	133.04	123.60
2	B	170	PHE	CB-CG-CD2	6.74	125.52	120.80
4	D	301	ARG	NE-CZ-NH2	6.71	123.66	120.30
5	F	310	ARG	NE-CZ-NH2	6.70	123.65	120.30
1	A	125	ARG	CD-NE-CZ	6.66	132.93	123.60
1	A	328	TYR	CB-CG-CD2	-6.66	117.00	121.00
4	D	276	ARG	NE-CZ-NH2	6.57	123.59	120.30
1	A	238	ARG	NE-CZ-NH2	6.36	123.48	120.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	D	167	ARG	NE-CZ-NH2	6.34	123.47	120.30
3	C	298	ARG	CD-NE-CZ	6.29	132.40	123.60
4	D	145	MET	CA-CB-CG	6.14	123.75	113.30
4	D	316	TYR	CB-CG-CD2	6.12	124.67	121.00
2	B	141	MET	CA-CB-CG	6.09	123.66	113.30
4	D	267	ARG	NE-CZ-NH2	6.09	123.35	120.30
2	B	99	ARG	NE-CZ-NH2	6.05	123.33	120.30
1	A	174	PHE	CB-CG-CD2	6.03	125.02	120.80
2	B	62	ARG	NE-CZ-NH2	6.01	123.31	120.30
3	C	205	MET	CA-CB-CG	5.95	123.42	113.30
4	D	174	ARG	NE-CZ-NH2	5.95	123.27	120.30
1	A	222	ARG	NE-CZ-NH2	5.94	123.27	120.30
2	B	38	TYR	CB-CG-CD2	-5.93	117.44	121.00
1	A	249	ARG	NE-CZ-NH2	5.83	123.21	120.30
4	D	177	MET	CA-CB-CG	5.81	123.18	113.30
2	B	93	ARG	CD-NE-CZ	5.77	131.68	123.60
2	B	26	PHE	CB-CG-CD2	5.76	124.83	120.80
4	D	283	LEU	CA-CB-CG	5.74	128.51	115.30
4	D	298	ARG	NE-CZ-NH2	5.62	123.11	120.30
3	C	59	TYR	CB-CG-CD2	5.61	124.37	121.00
3	C	266	ARG	NE-CZ-NH2	5.58	123.09	120.30
5	F	483	ARG	NE-CZ-NH2	5.57	123.08	120.30
4	D	161	MET	CA-CB-CG	5.47	122.59	113.30
2	B	136	ARG	NE-CZ-NH2	5.45	123.03	120.30
4	D	80	TYR	CB-CG-CD2	5.38	124.23	121.00
3	C	189	GLN	CA-CB-CG	5.35	125.16	113.40
5	F	63	ARG	NE-CZ-NH2	5.34	122.97	120.30
1	A	334	ARG	NE-CZ-NH2	5.27	122.94	120.30
3	C	223	LYS	CA-CB-CG	5.21	124.87	113.40
4	D	66	ARG	NE-CZ-NH2	5.21	122.91	120.30
3	C	311	ARG	NE-CZ-NH2	5.20	122.90	120.30
5	F	364	LYS	CA-CB-CG	5.16	124.75	113.40
4	D	155	TYR	CB-CG-CD2	5.16	124.09	121.00
1	A	129	PHE	CB-CG-CD2	5.10	124.37	120.80
5	F	466	PRO	O-C-N	-5.10	114.55	122.70
5	F	275	ARG	CD-NE-CZ	5.08	130.71	123.60
3	C	25	ARG	NE-CZ-NH2	5.06	122.83	120.30
4	D	158	TYR	CD1-CG-CD2	-5.02	112.38	117.90
2	B	157	PHE	CB-CG-CD2	5.02	124.31	120.80
5	F	223	ARG	CA-CB-CG	5.02	124.44	113.40
3	C	21	ARG	NE-CZ-NH2	5.01	122.81	120.30

There are no chirality outliers.

All (6) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	141	TYR	Sidechain
1	A	300	ARG	Sidechain
3	C	146	ARG	Sidechain
3	C	28	TYR	Sidechain
3	C	311	ARG	Sidechain
5	F	253	ARG	Sidechain

5.2 Too-close contacts

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	2317	0	2428	4	0
2	B	2187	0	2275	11	0
3	C	2486	0	2513	5	0
4	D	2537	0	2589	6	0
5	F	4047	0	3945	5	0
6	C	8	0	0	0	0
6	D	8	0	0	0	0
7	C	31	0	12	0	0
7	D	31	0	12	0	0
All	All	13652	0	13774	30	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 1.

All (30) 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:165:ALA:O	2:B:169:THR:HG23	1.86	0.74
5:F:272:ASP:OD1	5:F:275:ARG:NH1	2.24	0.71
2:B:148:LEU:O	2:B:152:VAL:HG23	1.94	0.68
2:B:204:MET:CE	2:B:204:MET:H	2.15	0.59
3:C:295:ASP:OD1	3:C:298:ARG:NH2	2.36	0.59
2:B:291:ARG:NH1	2:B:292:ASP:OD1	2.38	0.56
2:B:150:ALA:O	2:B:154:VAL:HG23	2.08	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
5:F:465:LYS:HB3	5:F:466:PRO:HD3	1.91	0.52
4:D:315:ASP:OD1	4:D:316:TYR:N	2.43	0.52
3:C:188:ILE:O	3:C:192:ILE:HG12	2.12	0.49
2:B:204:MET:H	2:B:204:MET:HE2	1.77	0.49
5:F:464:TYR:O	5:F:465:LYS:C	2.52	0.49
2:B:93:ARG:HH21	2:B:93:ARG:HG3	1.78	0.48
2:B:121:LEU:HD23	2:B:184:VAL:HG21	1.95	0.48
4:D:9:GLN:OE1	4:D:10:GLN:O	2.32	0.47
4:D:123:GLU:OE2	4:D:155:TYR:OH	2.33	0.47
1:A:293:TRP:CZ2	1:A:305:VAL:HG13	2.50	0.46
1:A:125:ARG:NH2	2:B:292:ASP:OD2	2.46	0.46
3:C:287:ASN:C	3:C:287:ASN:OD1	2.55	0.45
2:B:110:VAL:HG13	2:B:111:LEU:N	2.32	0.44
4:D:316:TYR:OH	4:D:327:ASP:OD1	2.32	0.43
3:C:84:ARG:NE	3:C:84:ARG:HA	2.34	0.42
4:D:9:GLN:OE1	4:D:9:GLN:C	2.58	0.42
1:A:95:ARG:HD2	1:A:293:TRP:CD2	2.55	0.42
3:C:171:ARG:N	3:C:172:PRO:HD3	2.34	0.42
1:A:181:LEU:HA	1:A:192:TRP:CZ3	2.55	0.41
5:F:75:ILE:HB	5:F:76:PRO:HD2	2.02	0.41
4:D:29:PHE:O	4:D:29:PHE:CG	2.74	0.41
2:B:164:ALA:O	2:B:168:LEU:HD22	2.21	0.40
5:F:468:GLU:HA	5:F:471:ILE:HG22	2.04	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	294/339 (87%)	287 (98%)	7 (2%)	0	100	100
2	B	287/300 (96%)	282 (98%)	5 (2%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
3	C	322/327 (98%)	314 (98%)	8 (2%)	0	100	100
4	D	320/334 (96%)	313 (98%)	7 (2%)	0	100	100
5	F	505/535 (94%)	482 (95%)	23 (5%)	0	100	100
All	All	1728/1835 (94%)	1678 (97%)	50 (3%)	0	100	100

There are no Ramachandran outliers to report.

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	249/283 (88%)	246 (99%)	3 (1%)	67	79
2	B	228/239 (95%)	226 (99%)	2 (1%)	75	84
3	C	267/270 (99%)	264 (99%)	3 (1%)	70	81
4	D	279/290 (96%)	275 (99%)	4 (1%)	62	77
5	F	434/456 (95%)	430 (99%)	4 (1%)	75	84
All	All	1457/1538 (95%)	1441 (99%)	16 (1%)	69	81

All (16) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	68	HIS
1	A	74	MET
1	A	174	PHE
2	B	204	MET
2	B	270	THR
3	C	83	ARG
3	C	192	ILE
3	C	263	ASP
4	D	9	GLN
4	D	178	LEU
4	D	283	LEU
4	D	288	ASN

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Mol	Chain	Res	Type
5	F	368	LEU
5	F	397	GLN
5	F	426	HIS
5	F	465	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
2	B	72	GLN
5	F	298	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 oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

4 ligands are 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	$\# Z > 2$
6	SF4	C	401	3	0,12,12	-	-	-		
6	SF4	D	401	4	0,12,12	-	-	-		

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
7	AGS	C	402	-	26,33,33	1.05	2 (7%)	26,52,52	1.59	6 (23%)
7	AGS	D	402	-	26,33,33	1.03	1 (3%)	26,52,52	1.58	6 (23%)

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
7	AGS	C	402	-	-	0/17/38/38	0/3/3/3
6	SF4	D	401	4	-	-	0/6/5/5
6	SF4	C	401	3	-	-	0/6/5/5
7	AGS	D	402	-	-	1/17/38/38	0/3/3/3

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
7	C	402	AGS	O4'-C1'	2.27	1.44	1.41
7	D	402	AGS	C5-C4	-2.25	1.35	1.40
7	C	402	AGS	C5-C4	-2.17	1.35	1.40

All (12) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	D	402	AGS	C4-C5-N7	4.35	113.93	109.40
7	C	402	AGS	C4-C5-N7	4.33	113.91	109.40
7	D	402	AGS	PA-O3A-PB	-3.64	120.32	132.83
7	C	402	AGS	PA-O3A-PB	-3.44	121.01	132.83
7	D	402	AGS	O4'-C1'-C2'	-2.77	102.88	106.93
7	C	402	AGS	O2G-PG-O3B	-2.76	95.43	104.64
7	D	402	AGS	N6-C6-N1	-2.43	113.53	118.57
7	C	402	AGS	N6-C6-N1	-2.24	113.93	118.57
7	C	402	AGS	C2-N1-C6	-2.17	115.05	118.75
7	D	402	AGS	C2-N1-C6	-2.16	115.05	118.75
7	C	402	AGS	C3'-C2'-C1'	2.11	104.15	100.98
7	D	402	AGS	C5-C6-N6	2.03	123.44	120.35

There are no chirality outliers.

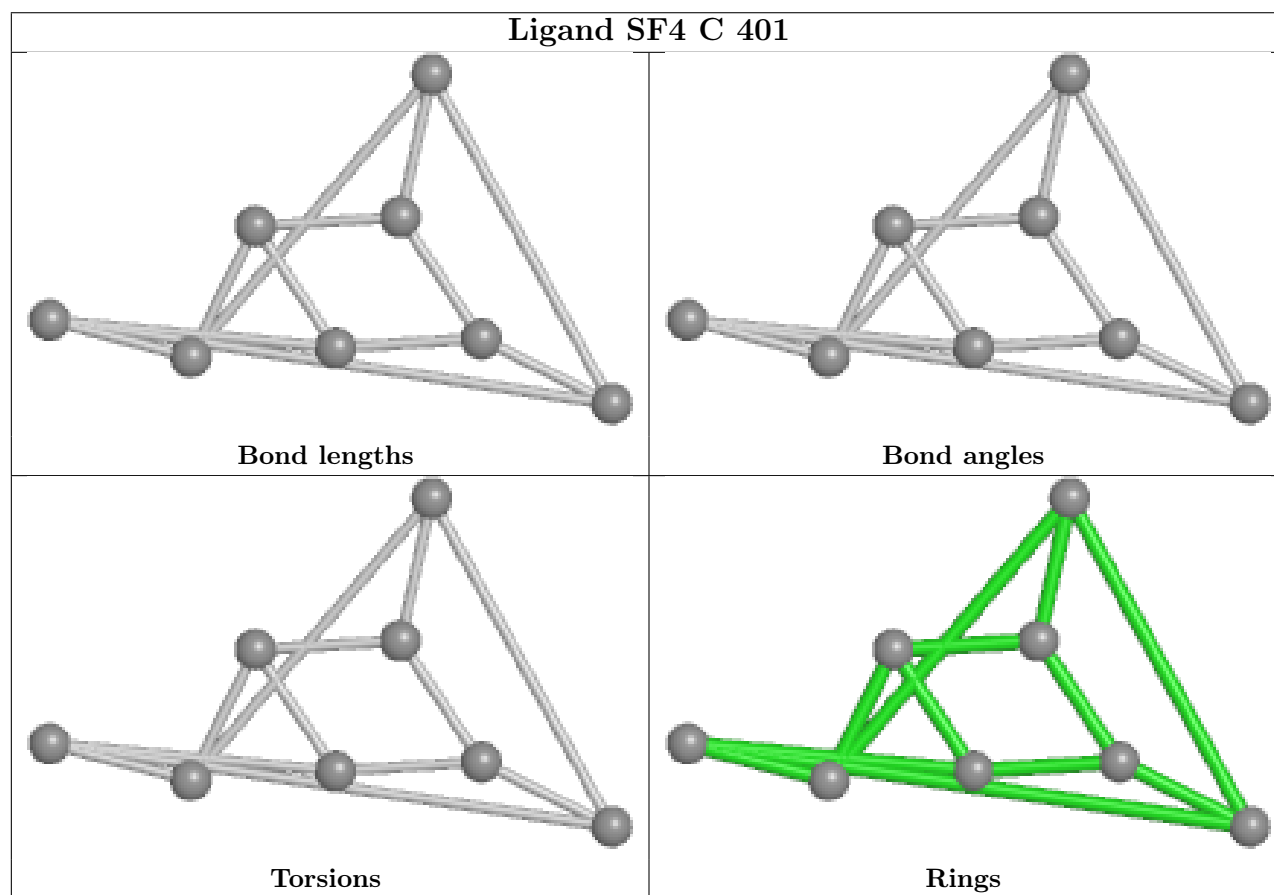
All (1) torsion outliers are listed below:

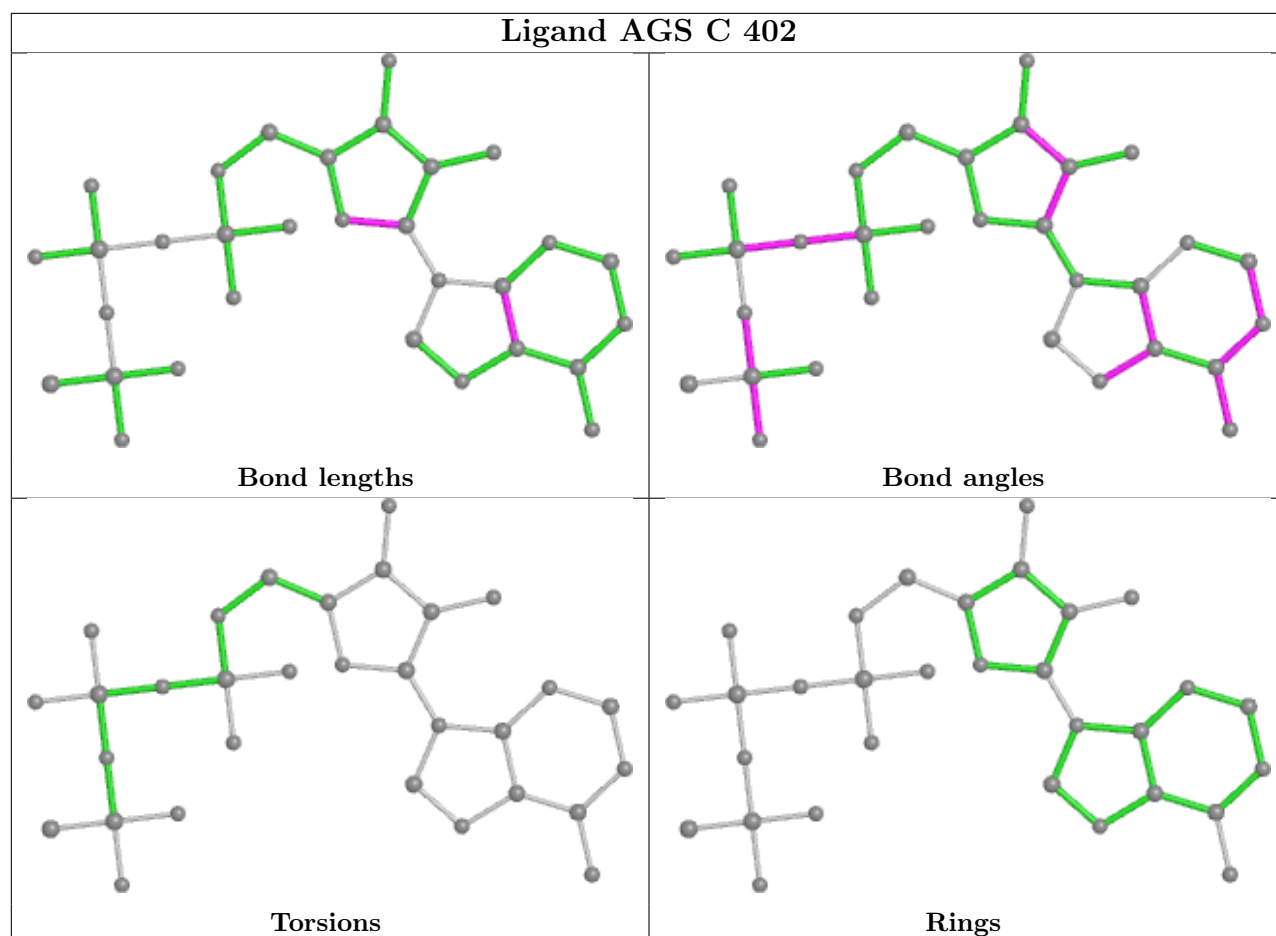
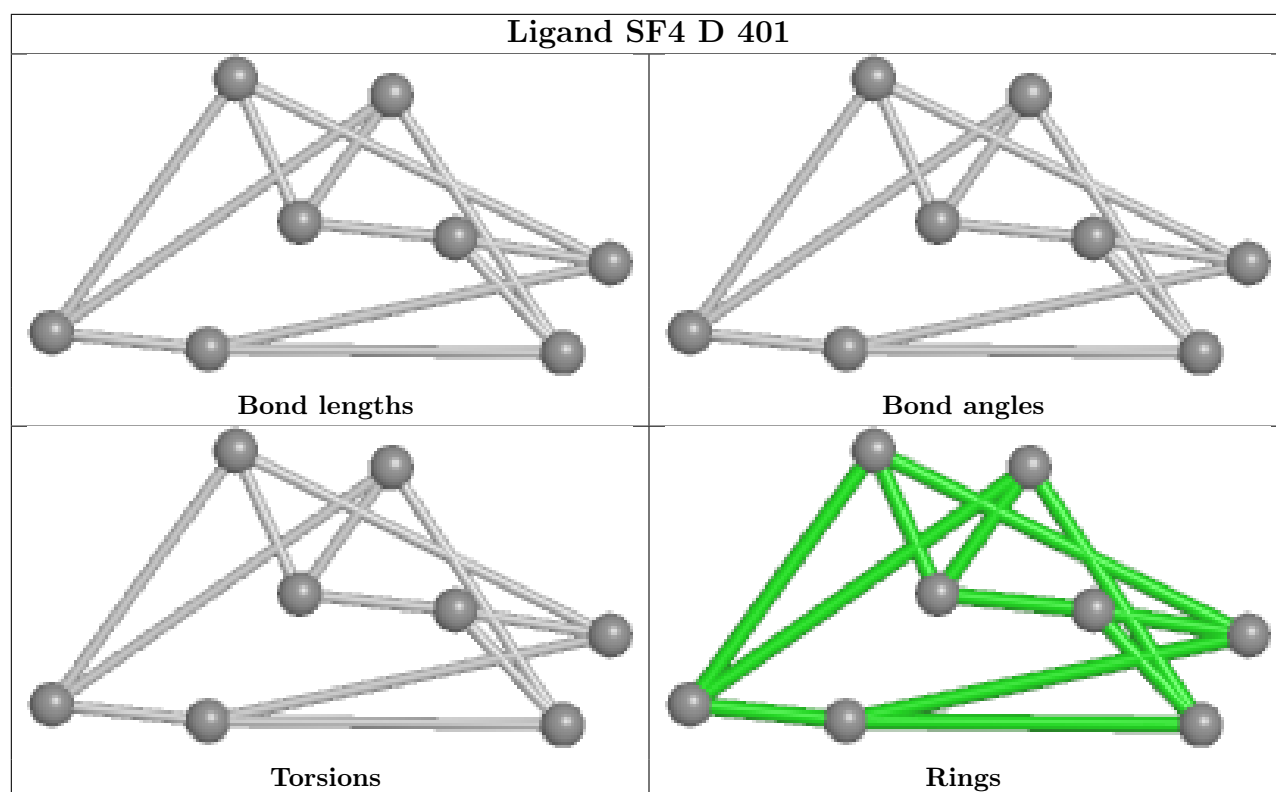
Mol	Chain	Res	Type	Atoms
7	D	402	AGS	PG-O3B-PB-O2B

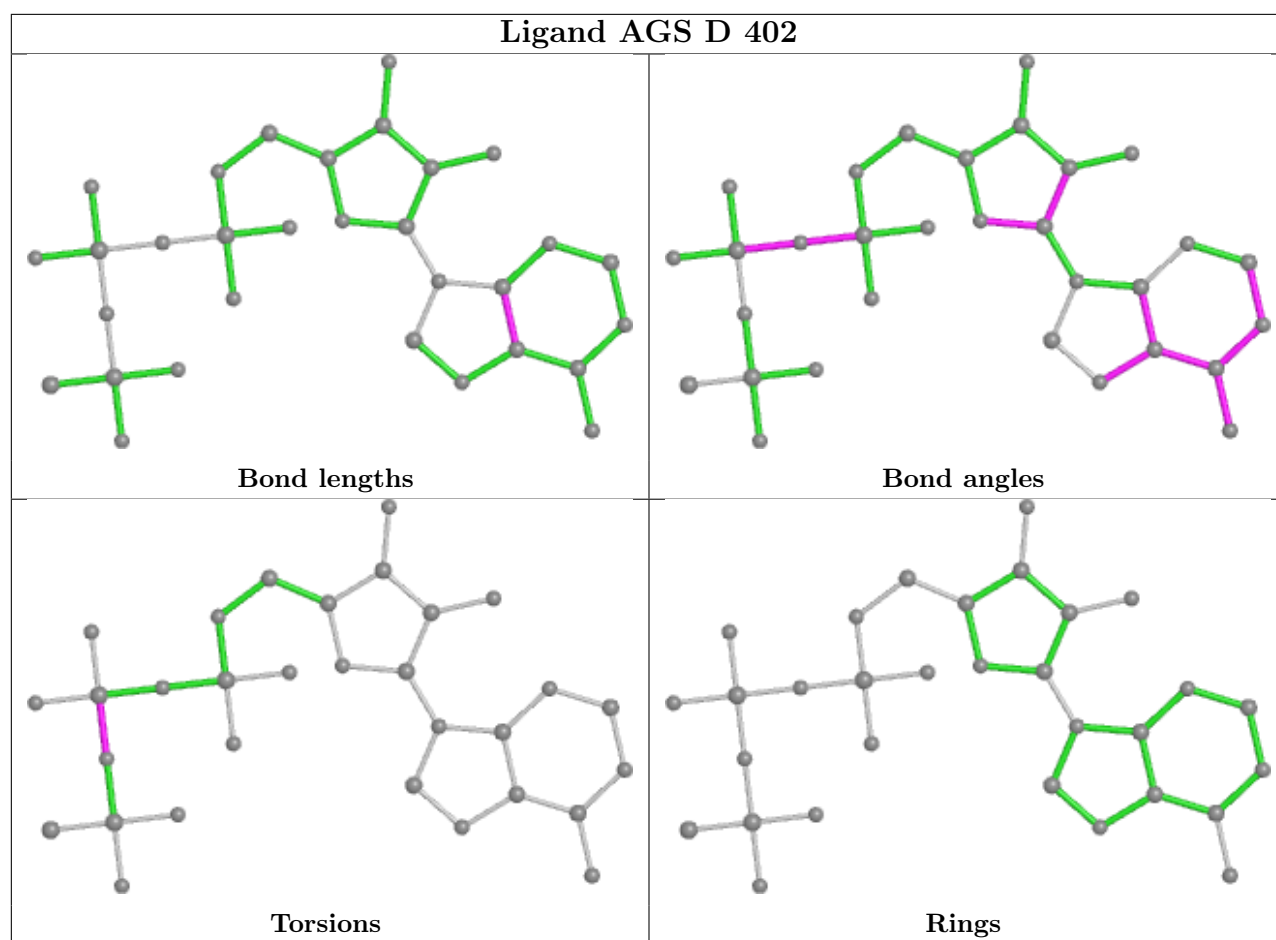
There are no ring outliers.

No monomer is involved in short contacts.

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.

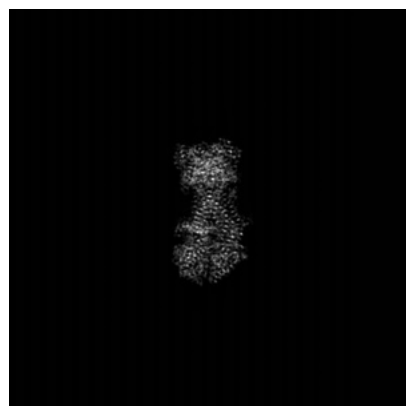
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-39741. These allow visual inspection of the internal detail of the map and identification of artifacts.

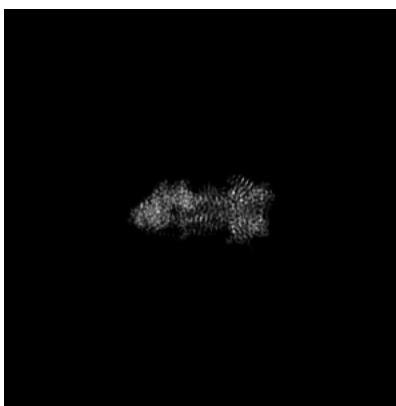
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

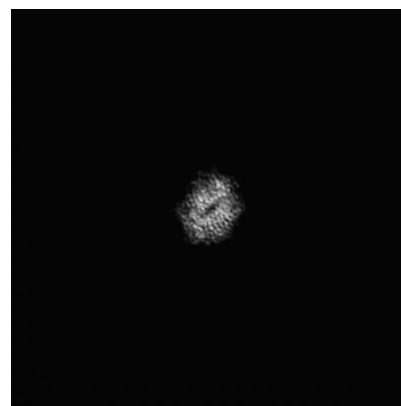
6.1.1 Primary map



X

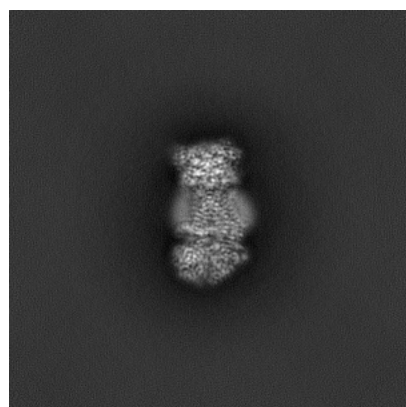


Y

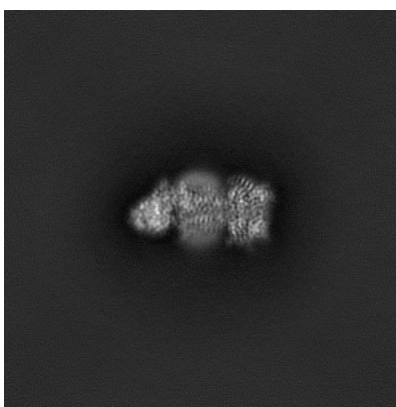


Z

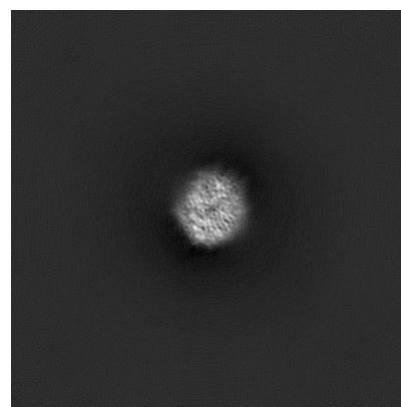
6.1.2 Raw map



X



Y

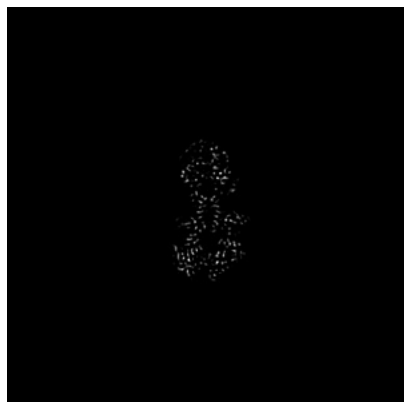


Z

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

6.2 Central slices [i](#)

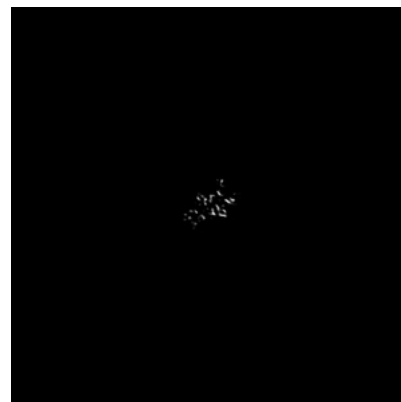
6.2.1 Primary map



X Index: 192

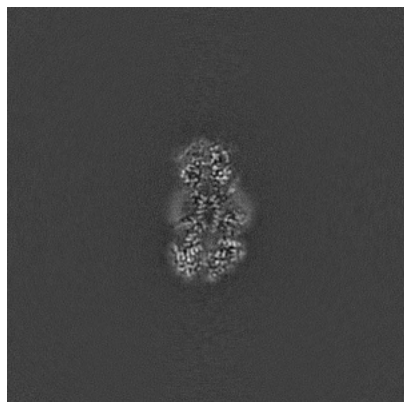


Y Index: 192

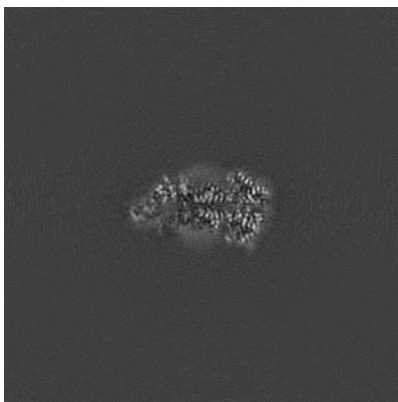


Z Index: 192

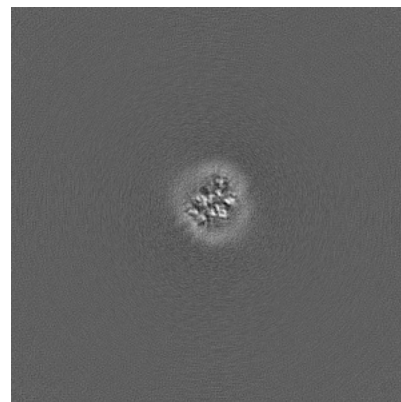
6.2.2 Raw map



X Index: 192



Y Index: 192

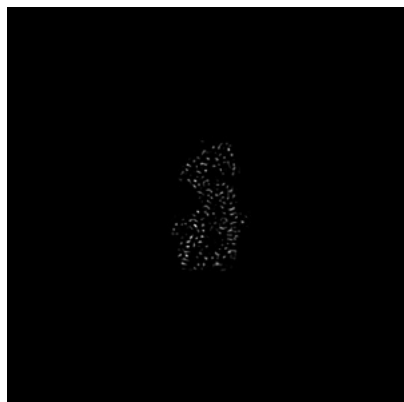


Z Index: 192

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

6.3 Largest variance slices [i](#)

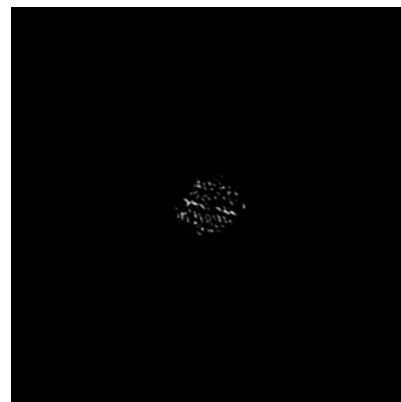
6.3.1 Primary map



X Index: 198

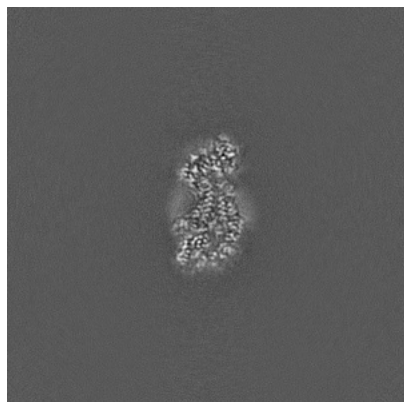


Y Index: 181

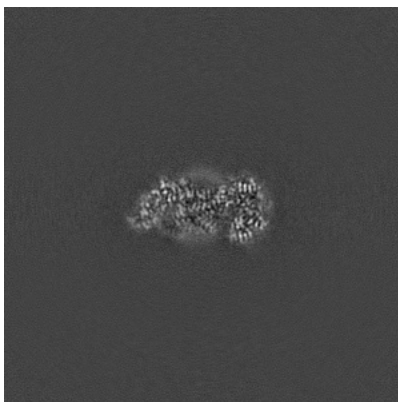


Z Index: 226

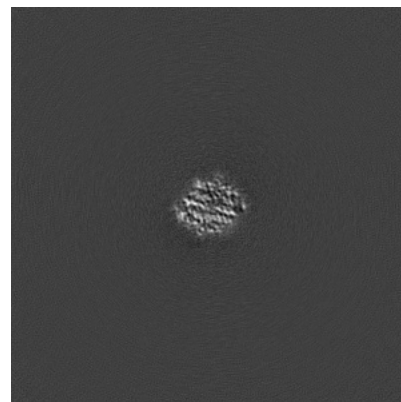
6.3.2 Raw map



X Index: 200



Y Index: 185

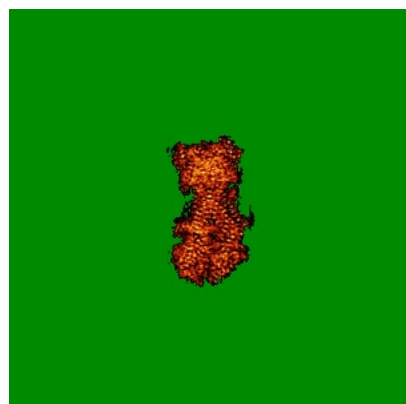


Z Index: 226

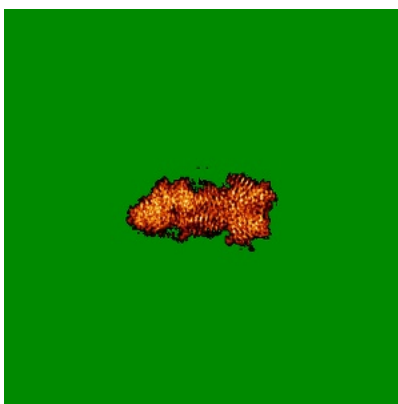
The images above show the largest variance slices of the map in three orthogonal directions.

6.4 Orthogonal standard-deviation projections (False-color) ⓘ

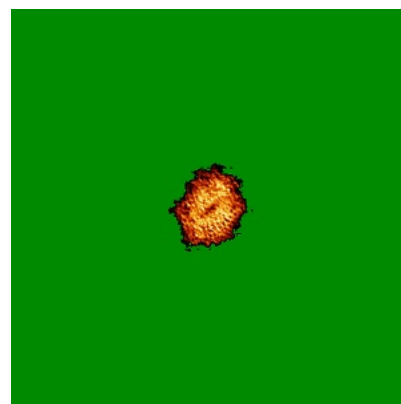
6.4.1 Primary map



X

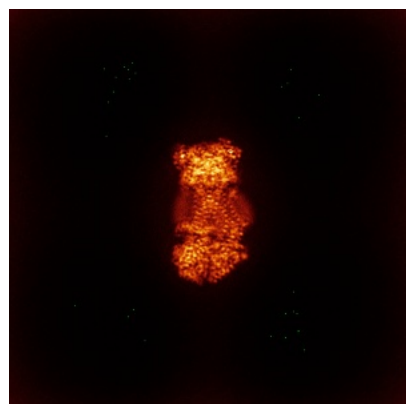


Y

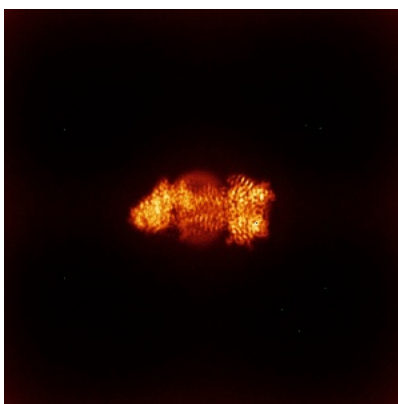


Z

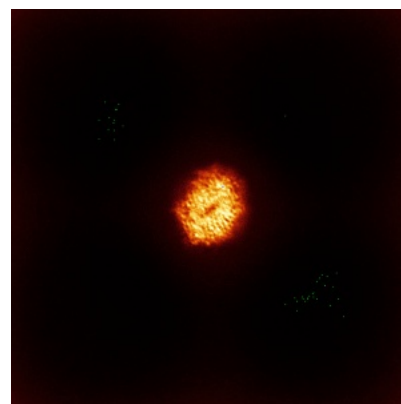
6.4.2 Raw map



X



Y

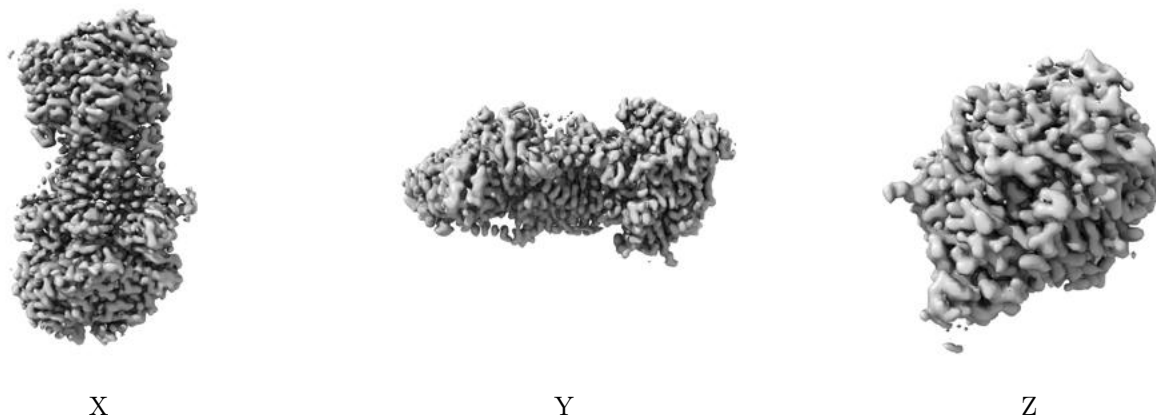


Z

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.

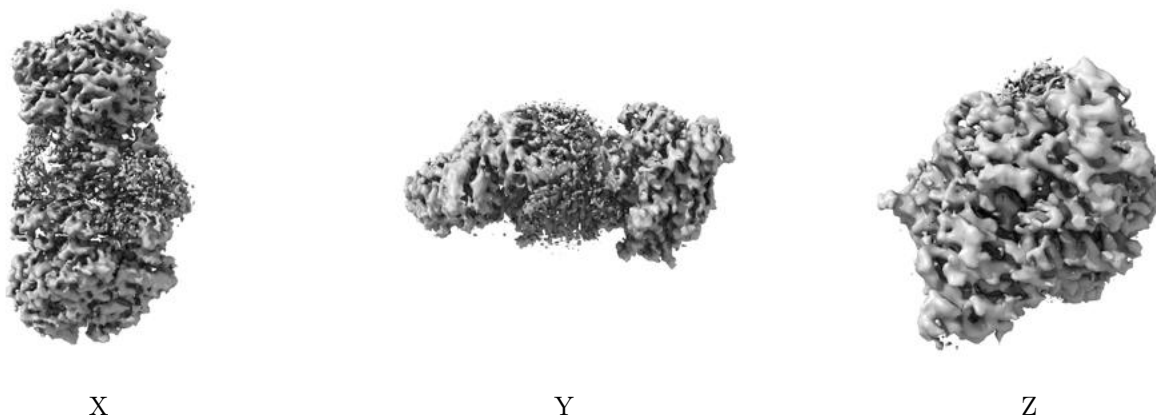
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.03. 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.

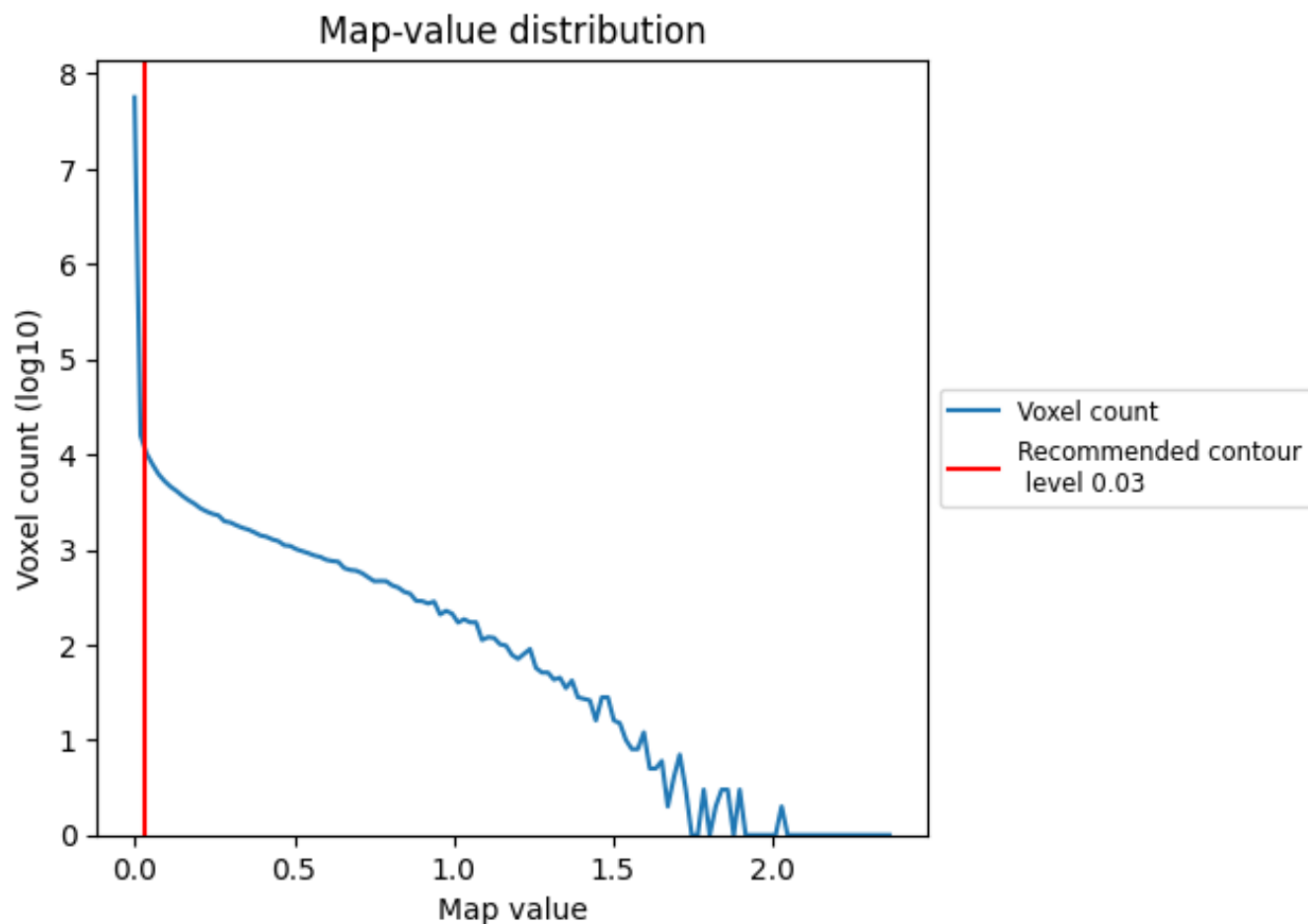
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

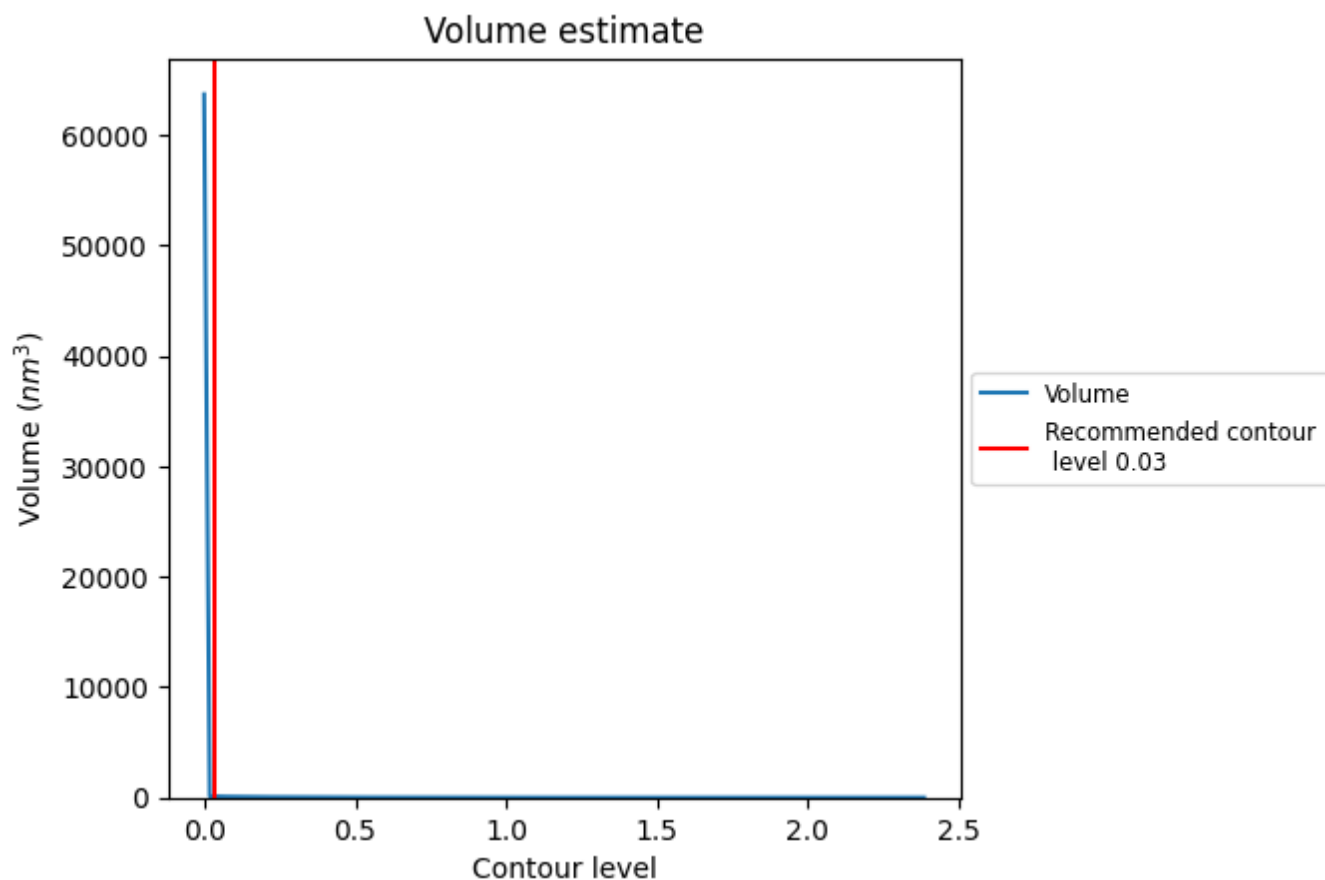
This section contains the results of statistical analysis of the map.

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.

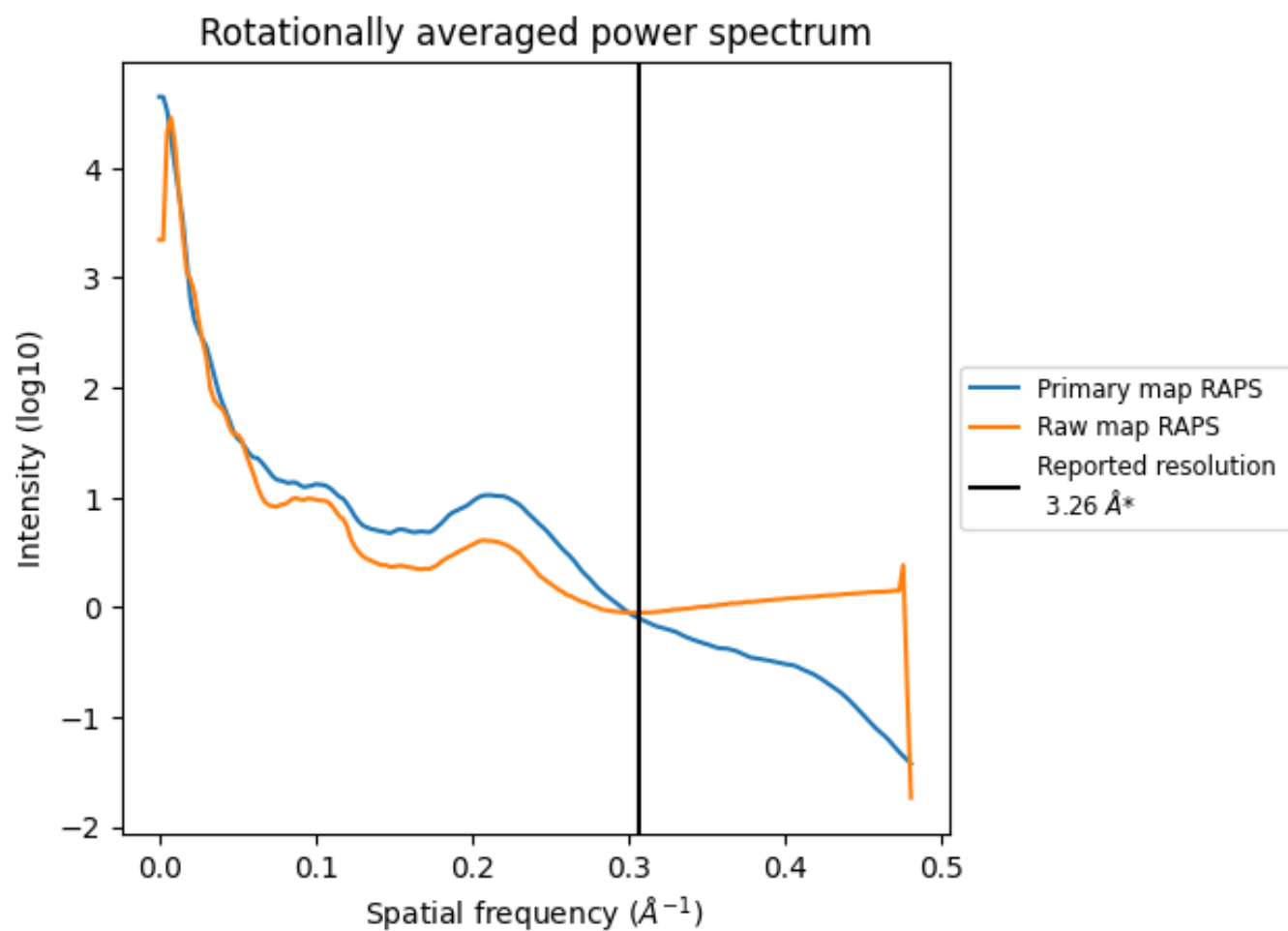
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 110 nm³; this corresponds to an approximate mass of 99 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 ⓘ

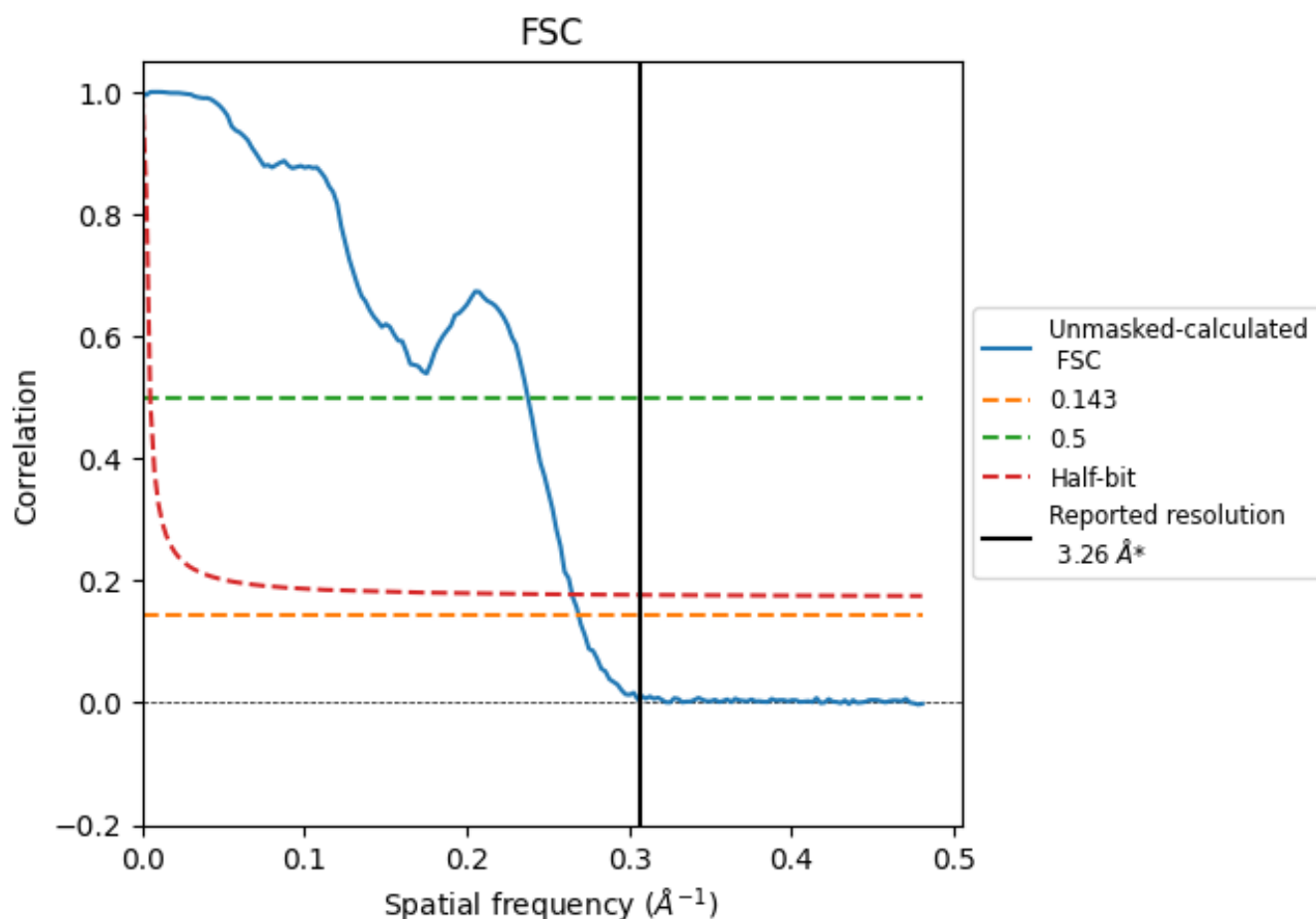


*Reported resolution corresponds to spatial frequency of 0.307 \AA^{-1}

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 0.307 \AA^{-1}

8.2 Resolution estimates [i](#)

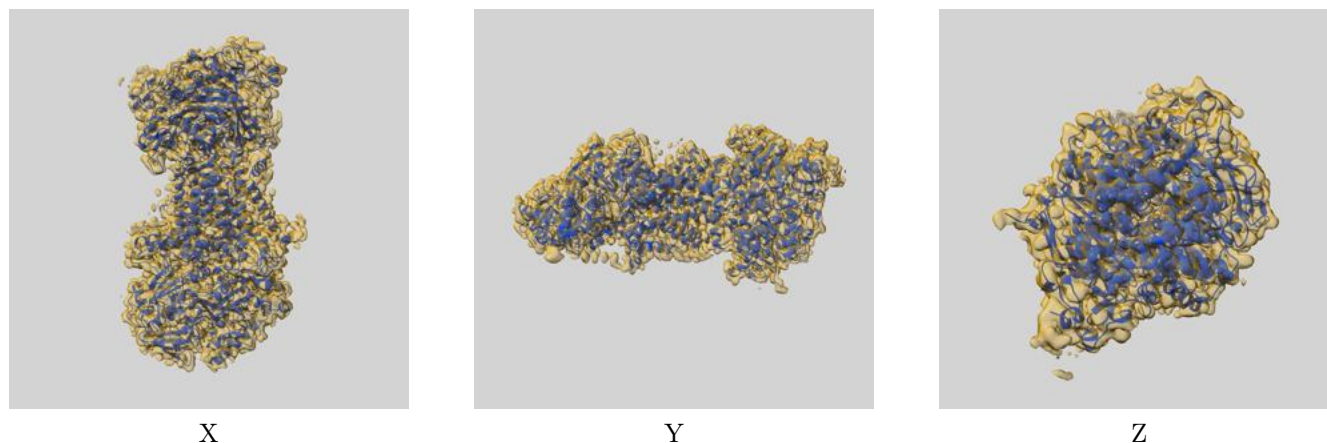
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	3.26	-	-
Author-provided FSC curve	-	-	-
Unmasked-calculated*	3.72	4.21	3.77

*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 3.72 differs from the reported value 3.26 by more than 10 %

9 Map-model fit [i](#)

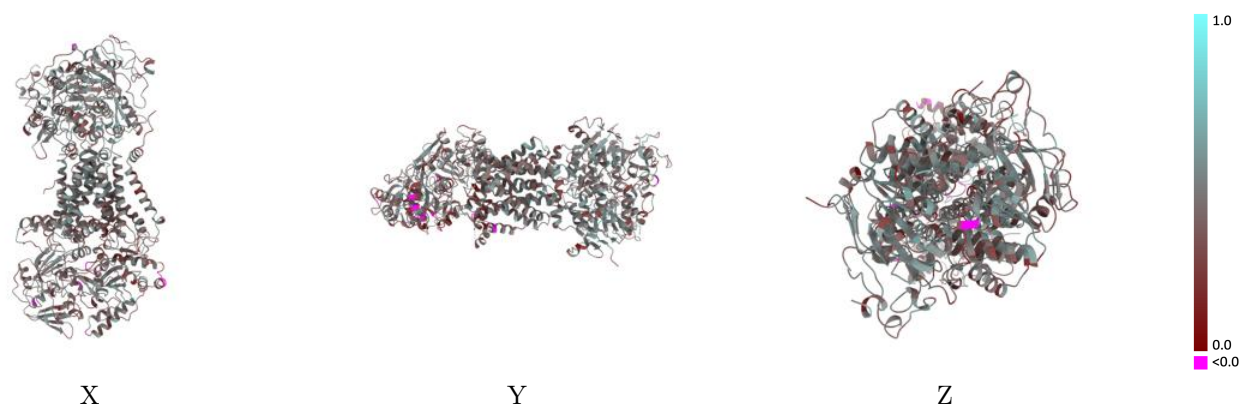
This section contains information regarding the fit between EMDB map EMD-39741 and PDB model 8Z1Z. Per-residue inclusion information can be found in [section 3](#) on [page 6](#).

9.1 Map-model overlay [i](#)



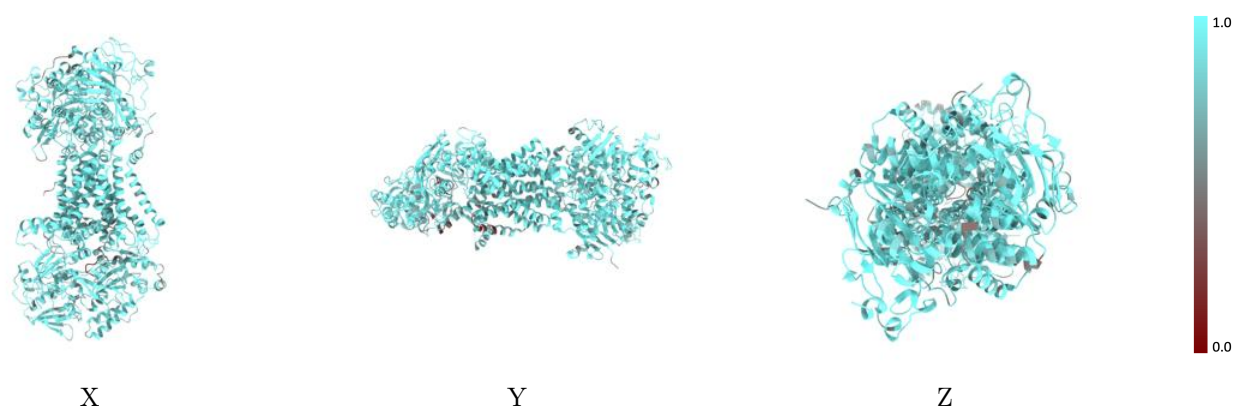
The images above show the 3D surface view of the map at the recommended contour level 0.03 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



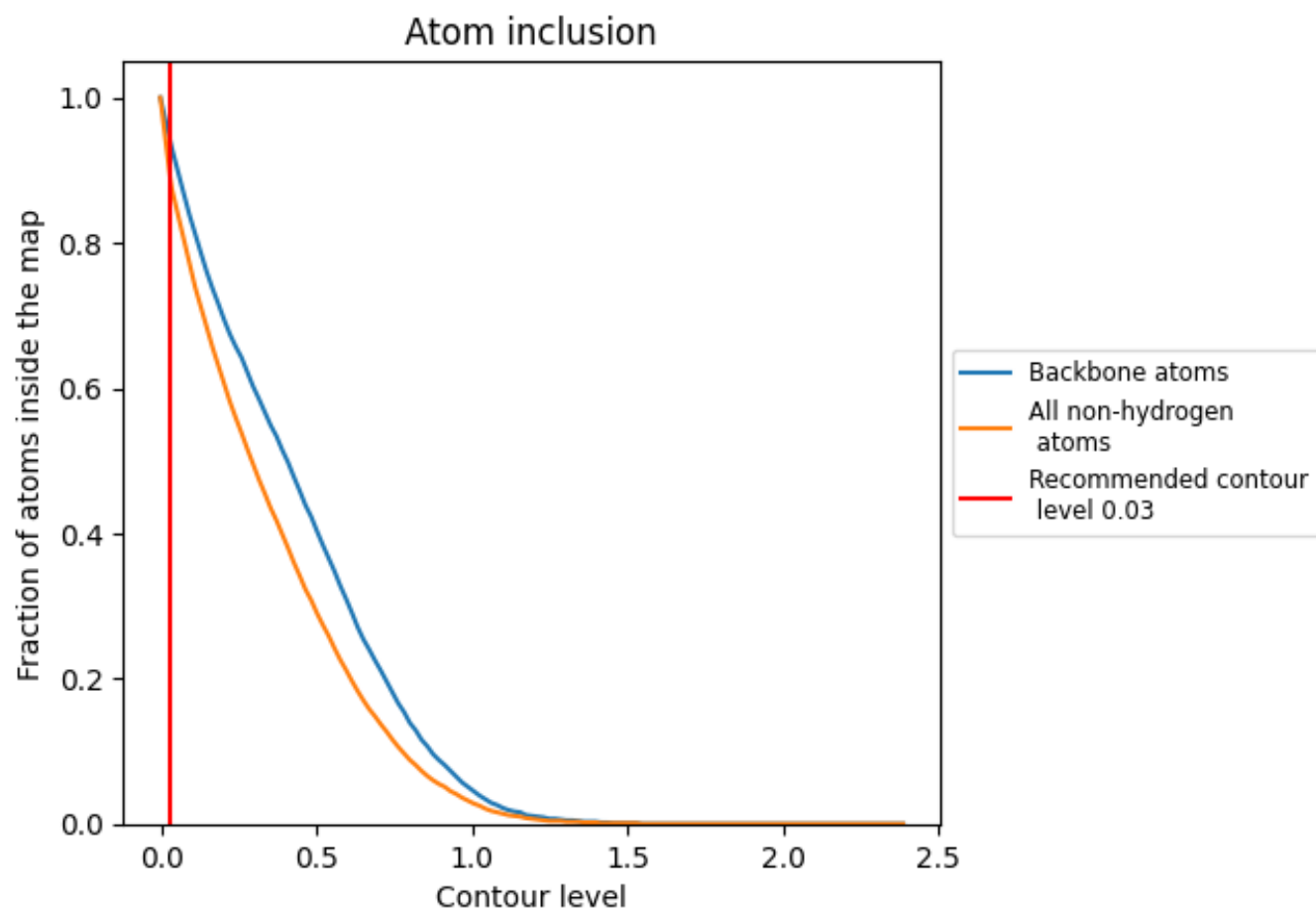
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.03).

9.4 Atom inclusion ⓘ



At the recommended contour level, 94% of all backbone atoms, 89% 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 (0.03) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	<div></div> 0.8890	<div></div> 0.4200
A	<div></div> 0.8920	<div></div> 0.4240
B	<div></div> 0.9060	<div></div> 0.4190
C	<div></div> 0.9060	<div></div> 0.4340
D	<div></div> 0.9070	<div></div> 0.4540
F	<div></div> 0.8560	<div></div> 0.3870

