



Full wwPDB EM Validation Report ⓘ

Jun 15, 2026 – 01:26 PM EDT

PDB ID : 9ZZK / pdb_00009zzk
EMDB ID : EMD-75004
Title : One Lmod2 and incoming actin at the pointed end of F-actin
Authors : Brotzman, S.B.; Palmer, N.J.; Dominguez, R.
Deposited on : 2026-01-07
Resolution : 4.06 Å(reported)
Based on initial model : 8F8S

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:

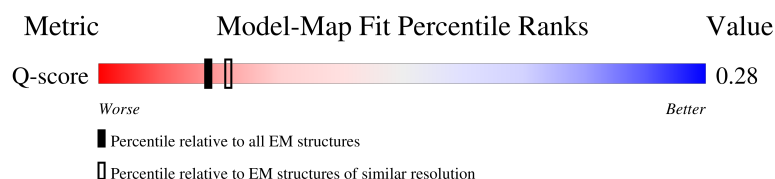
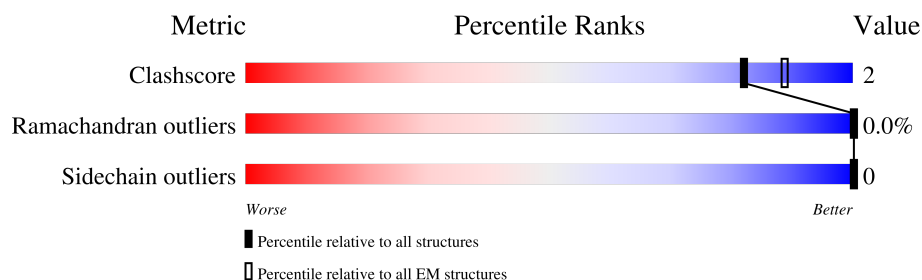
EMDB validation analysis : 0.0.1.dev132
Mogul : 2022.3.0, CSD as543be (2022)
MolProbity : 4-5-2 with Phenix2.0
Buster-report : wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics : 20250101.v01 (using entries in the PDB archive January 1st 2025)
EM percentile statistics : 202505.v01 (Using data in the EMD 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 4.06 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	6515 (3.56 - 4.56)

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	375	<div>91% 5% .</div>
1	B	375	<div>89% 9% ..</div>
1	C	375	<div>92% 7% .</div>
1	D	375	<div>92% 7% .</div>

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Mol	Chain	Length	Quality of chain
1	E	375	<div><div></div><div>92%</div><div>7%</div><div></div></div>
1	O	375	<div><div>37%</div><div></div><div>90%</div><div>6%</div><div></div></div>
2	M	556	<div><div>8%</div><div></div><div>26%</div><div>5%</div><div></div><div>69%</div></div>

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 18791 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 Actin, alpha skeletal muscle.

Mol	Chain	Residues	Atoms					AltConf	Trace
1	A	361	Total	C	N	O	S	0	0
			2830	1795	475	541	19		
1	B	371	Total	C	N	O	S	0	0
			2900	1837	489	553	21		
1	C	371	Total	C	N	O	S	0	0
			2900	1837	489	553	21		
1	D	371	Total	C	N	O	S	0	0
			2900	1837	489	553	21		
1	E	371	Total	C	N	O	S	0	0
			2900	1837	489	553	21		
1	O	361	Total	C	N	O	S	0	0
			2830	1795	475	541	19		

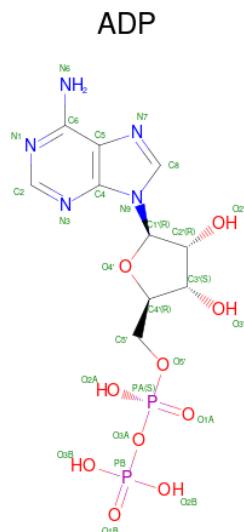
- Molecule 2 is a protein called Leiomodin-2.

Mol	Chain	Residues	Atoms					AltConf	Trace
2	M	172	Total	C	N	O	S	0	0
			1359	841	245	264	9		

There are 9 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
M	-8	MET	-	initiating methionine	UNP Q6P5Q4
M	-7	HIS	-	expression tag	UNP Q6P5Q4
M	-6	HIS	-	expression tag	UNP Q6P5Q4
M	-5	HIS	-	expression tag	UNP Q6P5Q4
M	-4	HIS	-	expression tag	UNP Q6P5Q4
M	-3	HIS	-	expression tag	UNP Q6P5Q4
M	-2	HIS	-	expression tag	UNP Q6P5Q4
M	-1	SER	-	expression tag	UNP Q6P5Q4
M	0	GLY	-	expression tag	UNP Q6P5Q4

- Molecule 3 is ADENOSINE-5'-DIPHOSPHATE (CCD ID: ADP) (formula: C₁₀H₁₅N₅O₁₀P₂).

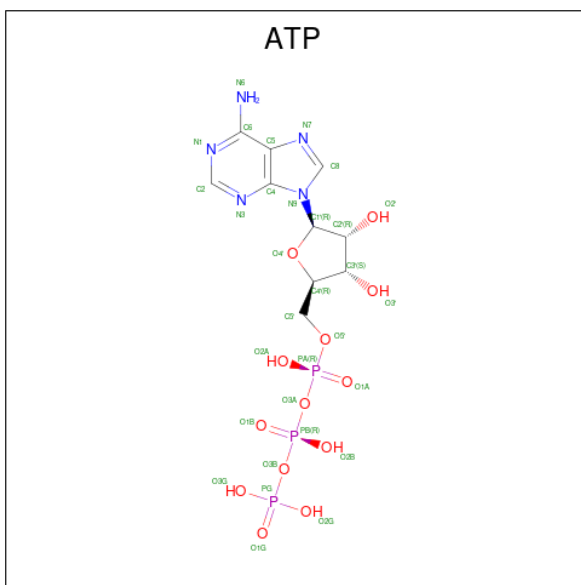


Mol	Chain	Residues	Atoms					AltConf
3	A	1	Total 27	C 10	N 5	O 10	P 2	0
3	B	1	Total 27	C 10	N 5	O 10	P 2	0
3	C	1	Total 27	C 10	N 5	O 10	P 2	0
3	D	1	Total 27	C 10	N 5	O 10	P 2	0
3	E	1	Total 27	C 10	N 5	O 10	P 2	0

- Molecule 4 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		AltConf
4	A	1	Total 1	Mg 1	0
4	B	1	Total 1	Mg 1	0
4	C	1	Total 1	Mg 1	0
4	D	1	Total 1	Mg 1	0
4	E	1	Total 1	Mg 1	0
4	O	1	Total 1	Mg 1	0

- Molecule 5 is ADENOSINE-5'-TRIPHOSPHATE (CCD ID: ATP) (formula: $\text{C}_{10}\text{H}_{16}\text{N}_5\text{O}_{13}\text{P}_3$).

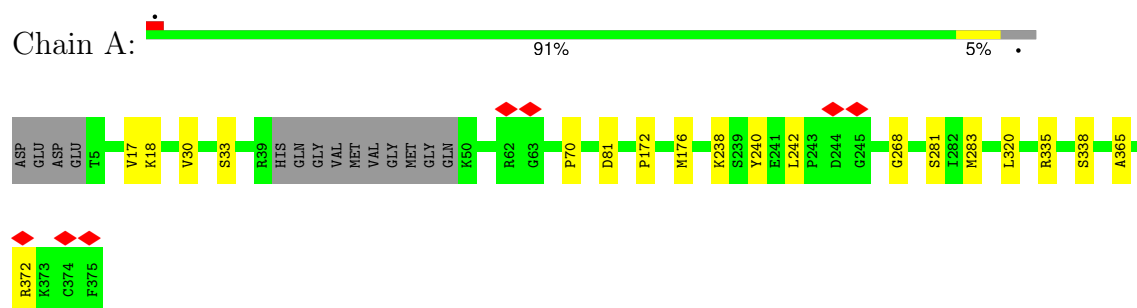


Mol	Chain	Residues	Atoms					AltConf
5	O	1	Total	C	N	O	P	0
			31	10	5	13	3	

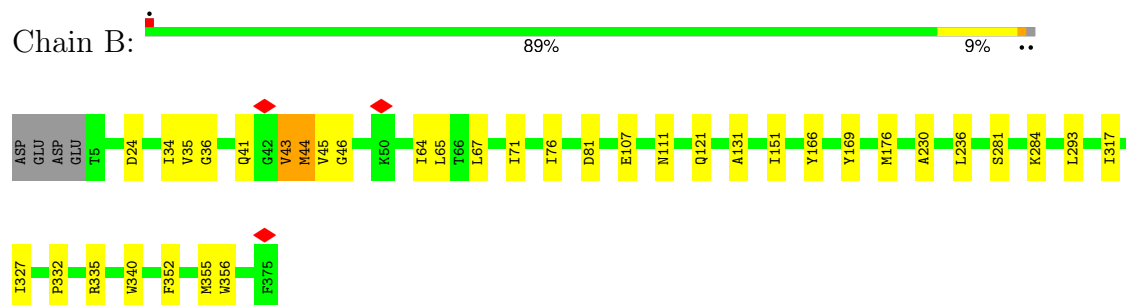
3 Residue-property plots

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.

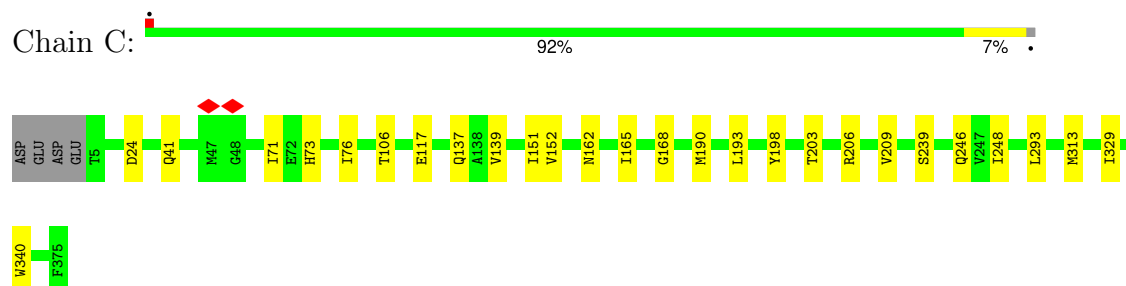
- Molecule 1: Actin, alpha skeletal muscle



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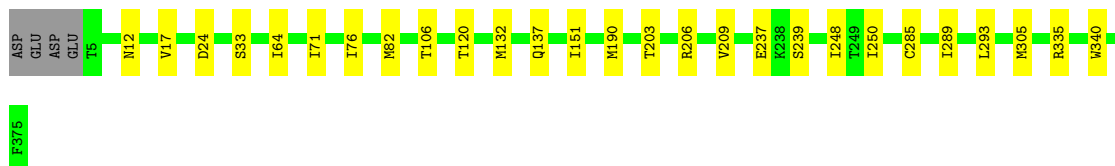


- Molecule 1: Actin, alpha skeletal muscle



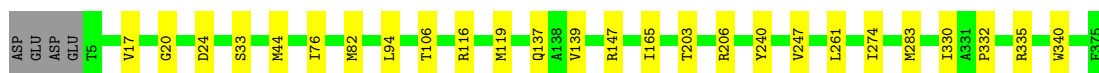
- Molecule 1: Actin, alpha skeletal muscle





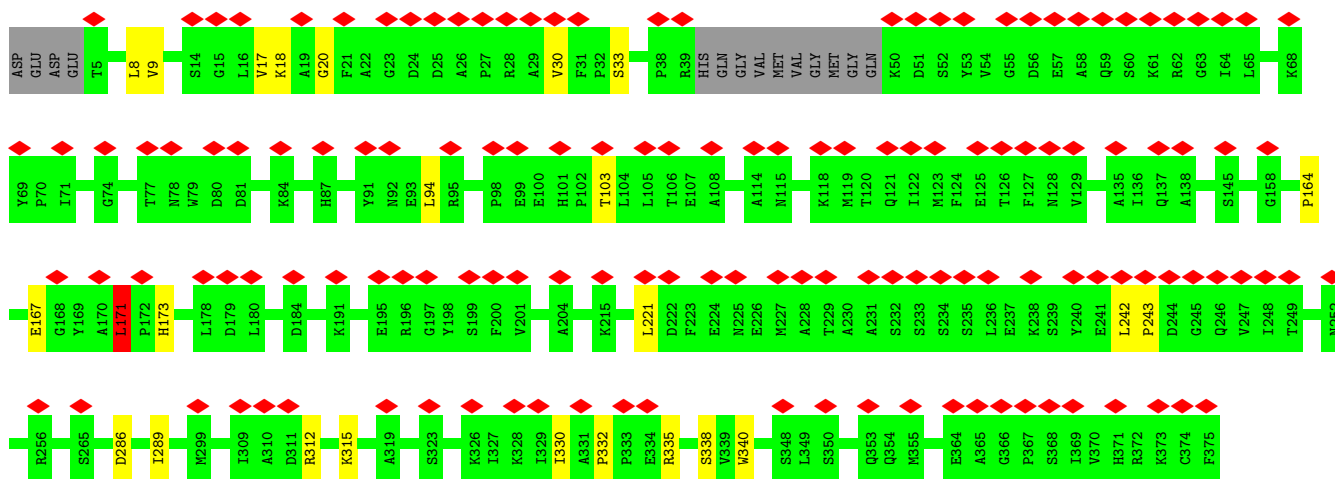
- Molecule 1: Actin, alpha skeletal muscle

Chain E: 92% 7% •



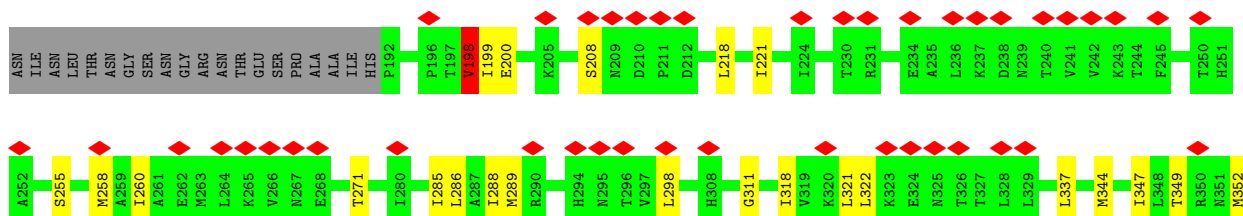
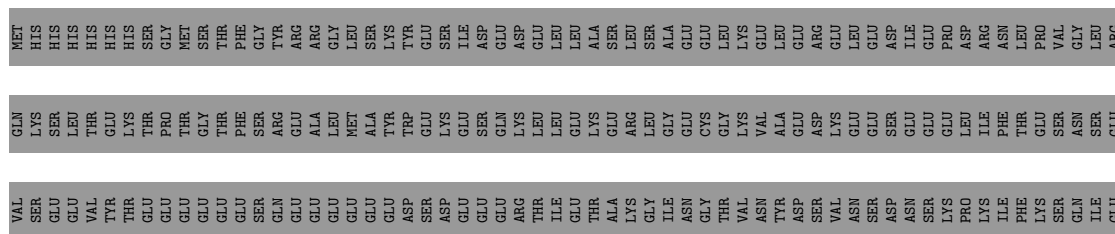
- Molecule 1: Actin, alpha skeletal muscle

Chain O: 37% 90% 6% •



- Molecule 2: Leiomodoin-2

Chain M: 8% 26% 5% 69%



LYS	GLN	ASN	LEU
LEU	GLY	GLN	SER
LYS	LYS	GLY	VAL
ARG	LYS	LYS	ALA
VAL	VAL	LYS	THR
GLU	LYS	LYS	PRO
VAL	GLY	GLY	PRO
PRO	LYS	LYS	PRO
GLU	LYS	LYS	PRO
ALA	VAL	VAL	PRO
ARG	LYS	LYS	GLN
	LYS	LYS	PRO
	GLY	ILE	PRO
	LEU	LYS	SER
	LEU	GLY	SER
	GLY	GLY	GLY
	GLY	GLY	GLY
	PRO	ASN	PRO
	ASN	GLY	ASP
	THR	LEU	THR
	LYS	ARG	LEU
	LYS	ASN	LYS
	VAL	SER	VAL
	GLU	LEU	TRP
	ARG	ARG	GLN
		SER	GLY
		GLN	THR
		LYS	PRO
		LYS	SER
		LYS	SER
		GLY	PRO
		ASP	TYR
		SER	VAL
		SER	SER
		ARG	PRO
		PRO	LYS
		SER	LEU
		ILE	ARG
		THR	HIS
		THR	SER
		PRO	SER
		GLM	TRP
		ARG	PRO
		SER	SER
		ALA	SER
		ALA	PRO
		HIS	LYS
		GLY	VAL
		LEU	LEU
		ASN	PRO
		SER	LYS
		MET	LYS
		GLY	VAL
		ALA	GLY
		ALA	VAL
		ILE	THR
		ARG	VAL
		GLY	ARG
		SER	SER
		TYR	ARG

4 Experimental information

Property	Value	Source
EM reconstruction method	SINGLE PARTICLE	Depositor
Imposed symmetry	POINT, POINT, POINT, POINT, POINT, POINT, POINT, POINT	Depositor
Number of particles used	12955, 12955, 12955, 12955, 12955, 12955, 12955, 12955	Depositor
Resolution determination method	FSC 0.143 CUT-OFF, FSC 0.143 CUT-OFF, FSC 0.143 CUT-OFF, FSC 0.143 CUT-OFF, FSC 0.143 CUT-OFF, FSC 0.143 CUT-OFF, FSC 0.143 CUT-OFF	Depositor
CTF correction method	NONE, NONE	Depositor
Microscope	TFS KRIOS	Depositor
Voltage (kV)	300	Depositor
Electron dose ($e^-/\text{\AA}^2$)	49	Depositor
Minimum defocus (nm)	500	Depositor
Maximum defocus (nm)	2500	Depositor
Magnification	81000	Depositor
Image detector	GATAN K3 (6k x 4k)	Depositor
Maximum map value	0.548	Depositor
Minimum map value	-0.201	Depositor
Average map value	-0.000	Depositor
Map value standard deviation	0.018	Depositor
Recommended contour level	0.105	Depositor
Map size (\AA)	439.712, 439.712, 439.712	wwPDB
Map dimensions	416, 416, 416	wwPDB
Map angles ($^\circ$)	90.0, 90.0, 90.0	wwPDB
Pixel spacing (\AA)	1.057, 1.057, 1.057	Depositor

5 Model quality ⓘ

5.1 Standard geometry ⓘ

Bond lengths and bond angles in the following residue types are not validated in this section: ATP, ADP, HIC, MG

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	0.31	0/2878	0.69	1/3897 (0.0%)
1	B	0.30	0/2950	0.72	3/3994 (0.1%)
1	C	0.28	0/2950	0.65	2/3994 (0.1%)
1	D	0.24	0/2950	0.59	0/3994
1	E	0.26	0/2950	0.63	1/3994 (0.0%)
1	O	0.31	0/2878	0.75	2/3897 (0.1%)
2	M	0.42	0/1375	1.02	4/1857 (0.2%)
All	All	0.30	0/18931	0.70	13/25627 (0.1%)

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	1
1	B	0	2
1	O	0	1
2	M	0	2
All	All	0	6

There are no bond length outliers.

All (13) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	O	171	LEU	CA-CB-CG	6.97	140.71	116.30
1	B	46	GLY	N-CA-C	6.76	129.20	113.18
1	O	167	GLU	CA-CB-CG	5.91	125.91	114.10
1	C	117	GLU	CA-CB-CG	5.81	125.72	114.10
2	M	208	SER	CA-C-N	5.79	131.03	122.82

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	M	208	SER	C-N-CA	5.79	131.03	122.82
1	B	64	ILE	CG1-CB-CG2	-5.59	93.93	110.70
1	B	44	MET	CB-CG-SD	5.58	129.43	112.70
1	C	117	GLU	N-CA-CB	5.40	118.06	110.12
1	E	283	MET	CB-CG-SD	5.14	128.12	112.70
2	M	198	VAL	CA-C-N	5.12	131.19	121.97
2	M	198	VAL	C-N-CA	5.12	131.19	121.97
1	A	283	MET	CB-CG-SD	5.11	128.04	112.70

There are no chirality outliers.

All (6) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	268	GLY	Peptide
1	B	44	MET	Peptide
1	B	45	VAL	Peptide
2	M	198	VAL	Peptide
2	M	199	ILE	Peptide
1	O	171	LEU	Peptide

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	2830	0	2803	10	0
1	B	2900	0	2872	18	0
1	C	2900	0	2872	14	0
1	D	2900	0	2872	15	0
1	E	2900	0	2872	13	0
1	O	2830	0	2803	14	0
2	M	1359	0	1379	15	0
3	A	27	0	12	0	0
3	B	27	0	12	0	0
3	C	27	0	12	0	0
3	D	27	0	12	0	0
3	E	27	0	12	0	0
4	A	1	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	B	1	0	0	0	0
4	C	1	0	0	0	0
4	D	1	0	0	0	0
4	E	1	0	0	0	0
4	O	1	0	0	0	0
5	O	31	0	12	0	0
All	All	18791	0	18545	92	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 2.

All (92) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:151:ILE:HG23	1:C:293:LEU:HD12	1.78	0.65
1:D:203:THR:HG22	1:D:206:ARG:HH21	1.64	0.61
2:M:218:LEU:HA	2:M:221:ILE:HD12	1.84	0.59
1:B:35:VAL:HG21	1:B:81:ASP:HB2	1.85	0.58
1:B:121:GLN:HG2	2:M:352:MET:HE3	1.84	0.57
1:O:164:PRO:HG2	1:O:171:LEU:HD23	1.87	0.57
1:E:203:THR:HG22	1:E:206:ARG:HH21	1.70	0.56
1:O:9:VAL:HG11	1:O:340:TRP:HA	1.88	0.56
1:B:41:GLN:HB2	1:B:43:VAL:HG13	1.86	0.56
1:E:76:ILE:HD13	1:E:82:MET:HG2	1.88	0.55
2:M:260:ILE:HG13	2:M:288:ILE:HD13	1.90	0.54
1:O:312:ARG:HA	1:O:315:LYS:HZ3	1.72	0.53
1:A:18:LYS:HG3	1:A:30:VAL:HG22	1.90	0.53
2:M:318:ILE:O	2:M:322:LEU:HB2	2.09	0.53
1:O:171:LEU:HD12	1:O:173:HIS:HB3	1.89	0.53
1:B:230:ALA:HB2	1:B:236:LEU:HD22	1.91	0.52
1:B:36:GLY:HA3	1:B:65:LEU:HD13	1.91	0.52
1:C:106:THR:HB	1:C:137:GLN:HG2	1.92	0.52
1:E:147:ARG:HH22	1:E:330:ILE:HD13	1.75	0.51
1:O:221:LEU:HD12	1:O:315:LYS:HZ2	1.75	0.51
1:B:332:PRO:HG2	1:B:335:ARG:HB3	1.92	0.51
1:D:106:THR:HB	1:D:137:GLN:HG2	1.93	0.51
1:O:242:LEU:HD12	1:O:243:PRO:HD2	1.93	0.51
1:C:203:THR:HG22	1:C:206:ARG:HH21	1.75	0.50
1:E:20:GLY:HA2	1:E:94:LEU:HD11	1.92	0.50
1:O:8:LEU:H	1:O:103:THR:HA	1.77	0.50
1:D:71:ILE:HG12	1:D:76:ILE:HG13	1.93	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:190:MET:HG2	1:D:209:VAL:HG21	1.95	0.49
1:C:139:VAL:HG12	1:C:165:ILE:HD11	1.94	0.49
1:D:24:ASP:HB2	1:D:340:TRP:HH2	1.77	0.48
1:D:305:MET:HA	1:D:335:ARG:HH21	1.78	0.48
1:C:71:ILE:HG12	1:C:76:ILE:HG12	1.95	0.48
2:M:349:THR:O	2:M:353:ASP:HB2	2.12	0.48
1:O:171:LEU:HB3	1:O:173:HIS:H	1.79	0.48
2:M:271:THR:HA	2:M:298:LEU:HA	1.96	0.48
1:E:106:THR:HB	1:E:137:GLN:HG2	1.96	0.47
1:O:17:VAL:HG23	1:O:33:SER:HB2	1.96	0.47
1:D:17:VAL:HG23	1:D:33:SER:HB2	1.96	0.47
1:B:71:ILE:HG12	1:B:76:ILE:HG13	1.96	0.47
1:B:352:PHE:HA	1:B:355:MET:HE3	1.97	0.46
2:M:255:SER:HA	2:M:258:MET:HE2	1.97	0.46
1:E:24:ASP:HB2	1:E:340:TRP:HH2	1.80	0.46
1:B:24:ASP:HB2	1:B:340:TRP:HH2	1.81	0.45
1:B:131:ALA:HB1	1:B:356:TRP:HB3	1.98	0.45
1:O:18:LYS:HG3	1:O:30:VAL:HG22	1.98	0.45
1:A:335:ARG:HA	1:A:338:SER:HB3	1.99	0.45
1:B:151:ILE:HB	1:B:293:LEU:HD12	1.97	0.45
1:C:193:LEU:HB3	1:C:198:TYR:HB2	1.99	0.45
1:B:176:MET:HE1	1:B:284:LYS:HD3	1.99	0.44
2:M:286:LEU:HA	2:M:289:MET:HG3	1.99	0.44
1:D:285:CYS:HB3	1:D:289:ILE:HD11	1.99	0.44
1:A:238:LYS:HA	1:A:238:LYS:HD3	1.82	0.44
1:C:239:SER:HA	1:C:248:ILE:O	2.17	0.44
2:M:285:ILE:HA	2:M:288:ILE:HG22	1.99	0.44
1:B:166:TYR:HB3	1:D:64:ILE:HD11	2.00	0.44
1:B:34:ILE:HD11	1:B:67:LEU:HB3	1.99	0.43
2:M:355:GLN:HA	2:M:358:LYS:HG3	1.99	0.43
1:A:365:ALA:HB1	1:A:372:ARG:HH22	1.83	0.43
1:C:152:VAL:O	1:C:162:ASN:HA	2.18	0.43
1:A:240:TYR:HE2	1:A:242:LEU:HD23	1.84	0.43
1:B:169:TYR:HB2	1:D:64:ILE:HD13	2.01	0.43
1:B:176:MET:HG2	1:B:281:SER:HB2	1.99	0.43
1:E:332:PRO:HG2	1:E:335:ARG:HB3	2.01	0.43
1:C:24:ASP:HB2	1:C:340:TRP:HH2	1.84	0.43
1:D:239:SER:HA	1:D:248:ILE:O	2.19	0.42
1:B:107:GLU:HG3	1:B:111:ASN:HD22	1.85	0.42
1:D:12:ASN:HD21	1:D:82:MET:HE2	1.84	0.42
1:E:139:VAL:HG22	1:E:165:ILE:HD11	2.01	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:176:MET:HG2	1:A:281:SER:HB3	2.01	0.42
1:E:240:TYR:O	1:E:247:VAL:HA	2.19	0.42
1:C:168:GLY:HA2	1:E:44:MET:HG3	2.02	0.42
1:A:172:PRO:HG3	1:C:41:GLN:HE22	1.85	0.42
1:C:313:MET:HE3	1:C:329:ILE:HD12	2.02	0.42
2:M:198:VAL:HG13	2:M:200:GLU:H	1.85	0.42
1:A:17:VAL:HG23	1:A:33:SER:HB2	2.02	0.42
1:C:246:GLN:HG2	2:M:337:LEU:HD11	2.02	0.42
1:D:237:GLU:HA	1:D:250:ILE:O	2.19	0.42
2:M:344:MET:HA	2:M:347:ILE:HG22	2.01	0.41
1:A:320:LEU:HA	2:M:311:GLY:HA3	2.02	0.41
1:C:190:MET:HG3	1:C:209:VAL:HG11	2.03	0.41
1:O:335:ARG:HA	1:O:338:SER:HB3	2.03	0.41
1:D:151:ILE:HG23	1:D:293:LEU:HD22	2.03	0.41
2:M:289:MET:HE1	2:M:321:LEU:HB2	2.03	0.41
1:E:17:VAL:HG23	1:E:33:SER:HB2	2.03	0.41
1:E:116:ARG:HA	1:E:119:MET:HE2	2.02	0.40
1:A:70:PRO:HG3	1:A:81:ASP:HB3	2.03	0.40
1:O:330:ILE:HG22	1:O:332:PRO:HD3	2.03	0.40
1:O:20:GLY:HA2	1:O:94:LEU:HD11	2.03	0.40
1:O:286:ASP:HB3	1:O:289:ILE:HG12	2.03	0.40
1:D:120:THR:HG22	1:D:132:MET:HE1	2.04	0.40
1:B:317:ILE:HG22	1:B:327:ILE:HG12	2.02	0.40
1:E:261:LEU:HD12	1:E:274:ILE:HD13	2.03	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	356/375 (95%)	343 (96%)	13 (4%)	0	100 100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	B	368/375 (98%)	350 (95%)	17 (5%)	1 (0%)	36	70
1	C	368/375 (98%)	359 (98%)	9 (2%)	0	100	100
1	D	368/375 (98%)	352 (96%)	16 (4%)	0	100	100
1	E	368/375 (98%)	353 (96%)	15 (4%)	0	100	100
1	O	356/375 (95%)	340 (96%)	16 (4%)	0	100	100
2	M	170/556 (31%)	152 (89%)	18 (11%)	0	100	100
All	All	2354/2806 (84%)	2249 (96%)	104 (4%)	1 (0%)	100	100

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	43	VAL

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	306/317 (96%)	306 (100%)	0	100	100
1	B	313/317 (99%)	313 (100%)	0	100	100
1	C	313/317 (99%)	313 (100%)	0	100	100
1	D	313/317 (99%)	313 (100%)	0	100	100
1	E	313/317 (99%)	313 (100%)	0	100	100
1	O	306/317 (96%)	306 (100%)	0	100	100
2	M	155/506 (31%)	155 (100%)	0	100	100
All	All	2019/2408 (84%)	2019 (100%)	0	100	100

There are no protein residues with a non-rotameric sidechain to report.

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (18) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	12	ASN
1	A	121	GLN
1	A	161	HIS
1	B	173	HIS
1	C	128	ASN
1	D	12	ASN
1	D	162	ASN
1	E	88	HIS
1	E	115	ASN
1	E	128	ASN
1	E	360	GLN
2	M	220	ASN
2	M	239	ASN
2	M	305	ASN
1	O	88	HIS
1	O	92	ASN
1	O	128	ASN
1	O	297	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

6 non-standard protein/DNA/RNA residues 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	$\# Z > 2$
1	HIC	D	73	1	10,11,12	0.48	0	9,14,16	0.81	0
1	HIC	B	73	1	10,11,12	0.45	0	9,14,16	0.62	0
1	HIC	C	73	1	10,11,12	0.48	0	9,14,16	1.00	1 (11%)
1	HIC	A	73	1	10,11,12	0.46	0	9,14,16	0.60	0
1	HIC	O	73	1	10,11,12	0.47	0	9,14,16	0.61	0
1	HIC	E	73	1	10,11,12	0.47	0	9,14,16	0.72	0

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
1	HIC	D	73	1	-	2/5/6/8	0/1/1/1
1	HIC	B	73	1	-	1/5/6/8	0/1/1/1
1	HIC	C	73	1	-	2/5/6/8	0/1/1/1
1	HIC	A	73	1	-	1/5/6/8	0/1/1/1
1	HIC	O	73	1	-	1/5/6/8	0/1/1/1
1	HIC	E	73	1	-	2/5/6/8	0/1/1/1

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	73	HIC	CA-CB-CG	2.54	120.03	113.77

There are no chirality outliers.

All (9) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	C	73	HIC	N-CA-CB-CG
1	O	73	HIC	N-CA-CB-CG
1	E	73	HIC	CA-CB-CG-ND1
1	C	73	HIC	C-CA-CB-CG
1	E	73	HIC	CA-CB-CG-CD2
1	B	73	HIC	CA-CB-CG-ND1
1	D	73	HIC	CA-CB-CG-ND1
1	D	73	HIC	CA-CB-CG-CD2
1	A	73	HIC	N-CA-CB-CG

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates

There are no oligosaccharides in this entry.

5.6 Ligand geometry

Of 12 ligands modelled in this entry, 6 are monoatomic - leaving 6 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
3	ADP	B	401	4	28,29,29	1.39	4 (14%)	43,45,45	1.86	11 (25%)
5	ATP	O	402	4	32,33,33	0.32	0	48,52,52	0.38	0
3	ADP	A	401	4	28,29,29	1.38	4 (14%)	43,45,45	1.85	9 (20%)
3	ADP	D	401	4	28,29,29	1.39	4 (14%)	43,45,45	1.85	9 (20%)
3	ADP	C	401	4	28,29,29	1.40	4 (14%)	43,45,45	1.84	10 (23%)
3	ADP	E	401	4	28,29,29	1.38	4 (14%)	43,45,45	1.86	11 (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
3	ADP	B	401	4	-	4/16/32/32	0/3/3/3
5	ATP	O	402	4	-	0/22/38/38	0/3/3/3
3	ADP	A	401	4	-	1/16/32/32	0/3/3/3
3	ADP	D	401	4	-	1/16/32/32	0/3/3/3
3	ADP	C	401	4	-	4/16/32/32	0/3/3/3
3	ADP	E	401	4	-	1/16/32/32	0/3/3/3

All (20) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	D	401	ADP	C5-C4	4.73	1.47	1.39
3	B	401	ADP	C5-C4	4.72	1.47	1.39
3	C	401	ADP	C5-C4	4.72	1.47	1.39
3	E	401	ADP	C5-C4	4.67	1.47	1.39
3	A	401	ADP	C5-C4	4.46	1.47	1.39
3	A	401	ADP	C5-C6	2.70	1.48	1.41
3	C	401	ADP	C5-C6	2.68	1.48	1.41

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	E	401	ADP	C5-C6	2.68	1.48	1.41
3	B	401	ADP	C5-C6	2.67	1.48	1.41
3	D	401	ADP	C5-C6	2.66	1.48	1.41
3	A	401	ADP	C8-N7	2.39	1.36	1.31
3	E	401	ADP	C5-N7	-2.34	1.34	1.39
3	B	401	ADP	C8-N7	2.32	1.36	1.31
3	C	401	ADP	C8-N7	2.30	1.36	1.31
3	C	401	ADP	C5-N7	-2.30	1.34	1.39
3	B	401	ADP	C5-N7	-2.30	1.34	1.39
3	D	401	ADP	C5-N7	-2.29	1.34	1.39
3	D	401	ADP	C8-N7	2.29	1.36	1.31
3	E	401	ADP	C8-N7	2.25	1.36	1.31
3	A	401	ADP	C5-N7	-2.18	1.35	1.39

All (50) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	D	401	ADP	C5-C4-N3	-5.73	118.83	126.72
3	C	401	ADP	C5-C4-N3	-5.67	118.91	126.72
3	B	401	ADP	C5-C4-N3	-5.63	118.97	126.72
3	A	401	ADP	C5-C4-N3	-5.63	118.97	126.72
3	E	401	ADP	C5-C4-N3	-5.61	119.00	126.72
3	D	401	ADP	N3-C4-N9	4.64	135.06	127.17
3	B	401	ADP	N3-C4-N9	4.54	134.88	127.17
3	E	401	ADP	N3-C4-N9	4.53	134.88	127.17
3	C	401	ADP	N3-C4-N9	4.52	134.86	127.17
3	A	401	ADP	N3-C4-N9	4.49	134.80	127.17
3	B	401	ADP	C2-N3-C4	3.74	120.97	111.83
3	D	401	ADP	C2-N3-C4	3.72	120.92	111.83
3	E	401	ADP	C2-N3-C4	3.70	120.86	111.83
3	A	401	ADP	C2-N3-C4	3.69	120.85	111.83
3	C	401	ADP	C2-N3-C4	3.69	120.85	111.83
3	B	401	ADP	N3-C2-N1	-3.46	123.34	128.58
3	A	401	ADP	C4-C5-N7	-3.46	106.63	110.58
3	C	401	ADP	C4-C5-N7	-3.44	106.65	110.58
3	A	401	ADP	N3-C2-N1	-3.41	123.42	128.58
3	E	401	ADP	N3-C2-N1	-3.40	123.44	128.58
3	D	401	ADP	C4-C5-N7	-3.37	106.73	110.58
3	D	401	ADP	N3-C2-N1	-3.37	123.49	128.58
3	E	401	ADP	C4-C5-N7	-3.36	106.74	110.58
3	B	401	ADP	C4-C5-N7	-3.33	106.78	110.58
3	C	401	ADP	N3-C2-N1	-3.32	123.55	128.58

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	401	ADP	C4-N9-C8	3.04	108.94	105.74
3	E	401	ADP	C4-N9-C8	2.80	108.67	105.74
3	B	401	ADP	C4-N9-C8	2.79	108.67	105.74
3	D	401	ADP	C4-N9-C8	2.79	108.67	105.74
3	C	401	ADP	C4-N9-C8	2.72	108.59	105.74
3	A	401	ADP	C5-N7-C8	2.60	107.54	103.45
3	C	401	ADP	C5-N7-C8	2.54	107.44	103.45
3	D	401	ADP	C5-N7-C8	2.49	107.37	103.45
3	E	401	ADP	C5-N7-C8	2.48	107.34	103.45
3	B	401	ADP	C5-N7-C8	2.47	107.33	103.45
3	D	401	ADP	C3'-C2'-C1'	2.39	105.99	101.46
3	E	401	ADP	C3'-C2'-C1'	2.33	105.87	101.46
3	A	401	ADP	N9-C8-N7	-2.31	110.66	113.94
3	C	401	ADP	C3'-C2'-C1'	2.30	105.81	101.46
3	E	401	ADP	C2'-C1'-N9	-2.30	107.59	113.30
3	B	401	ADP	C3'-C2'-C1'	2.27	105.76	101.46
3	B	401	ADP	C2'-C1'-N9	-2.21	107.81	113.30
3	E	401	ADP	C6-C5-N7	2.18	136.29	132.09
3	A	401	ADP	C6-C5-N7	2.17	136.28	132.09
3	B	401	ADP	C6-C5-N7	2.16	136.25	132.09
3	C	401	ADP	C6-C5-N7	2.16	136.25	132.09
3	D	401	ADP	C6-C5-N7	2.12	136.18	132.09
3	E	401	ADP	O3B-PB-O2B	2.02	115.38	107.80
3	B	401	ADP	N9-C8-N7	-2.02	111.08	113.94
3	C	401	ADP	N9-C8-N7	-2.01	111.08	113.94

There are no chirality outliers.

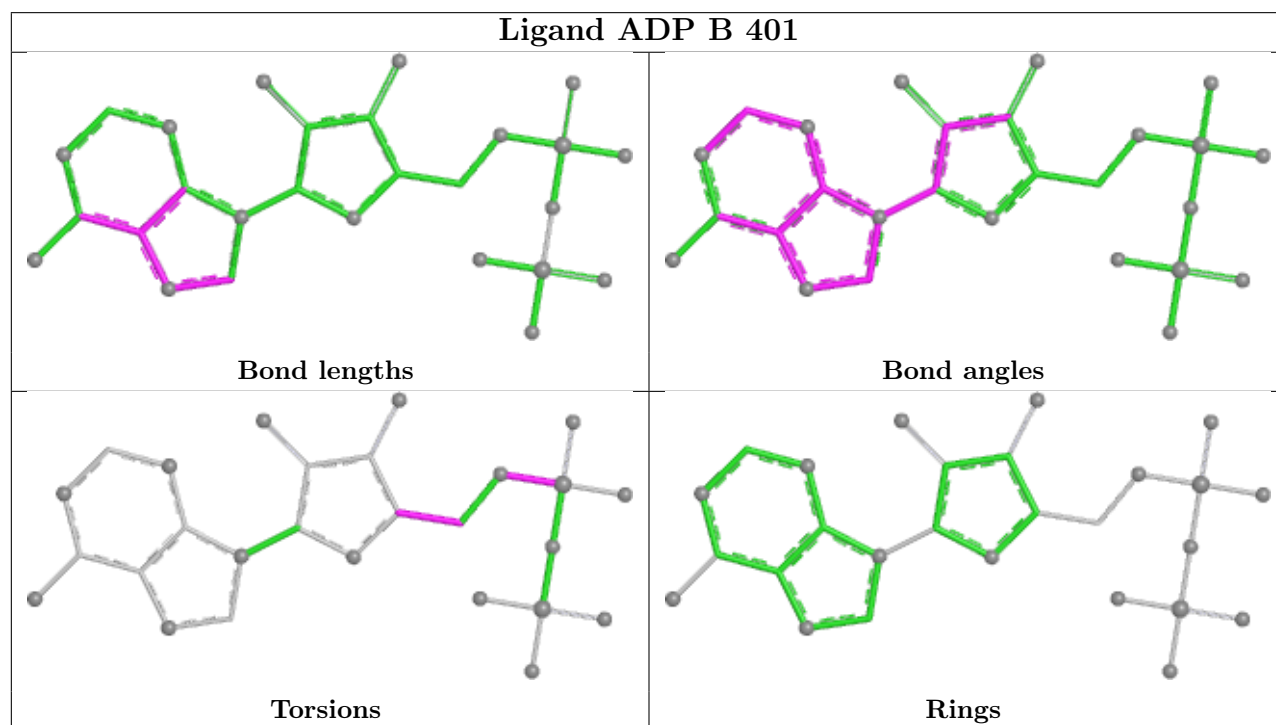
All (11) torsion outliers are listed below:

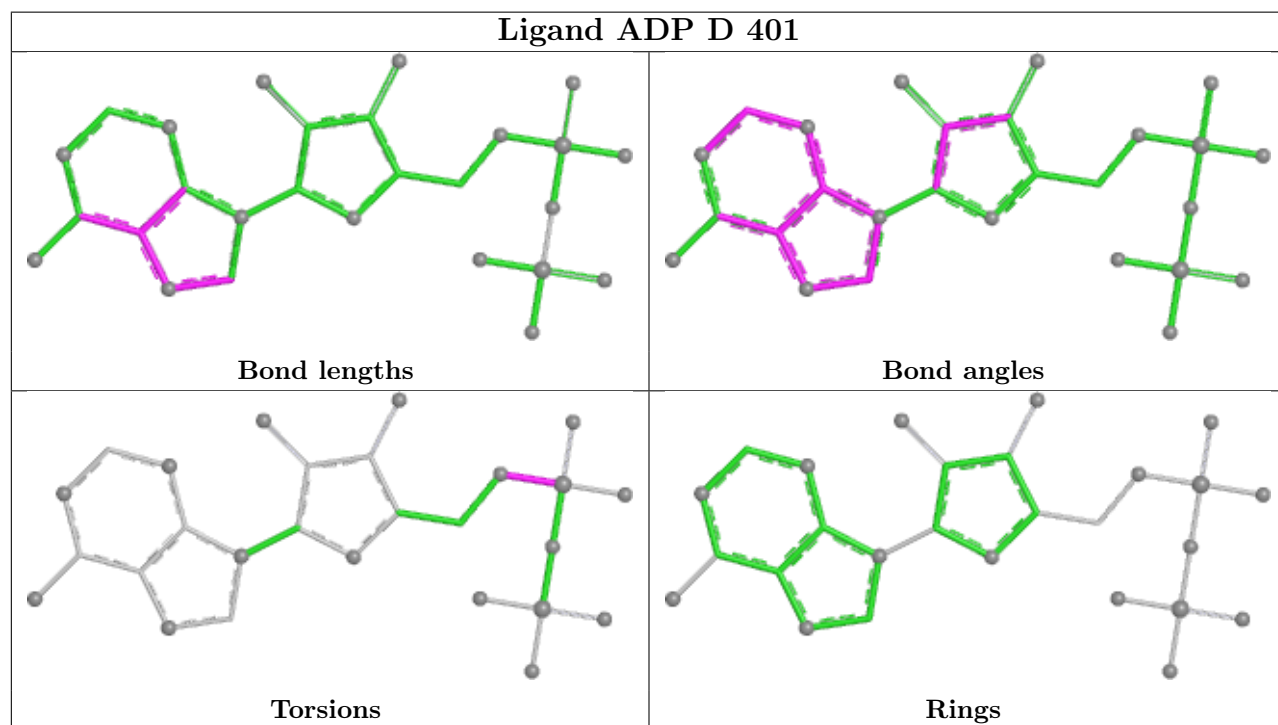
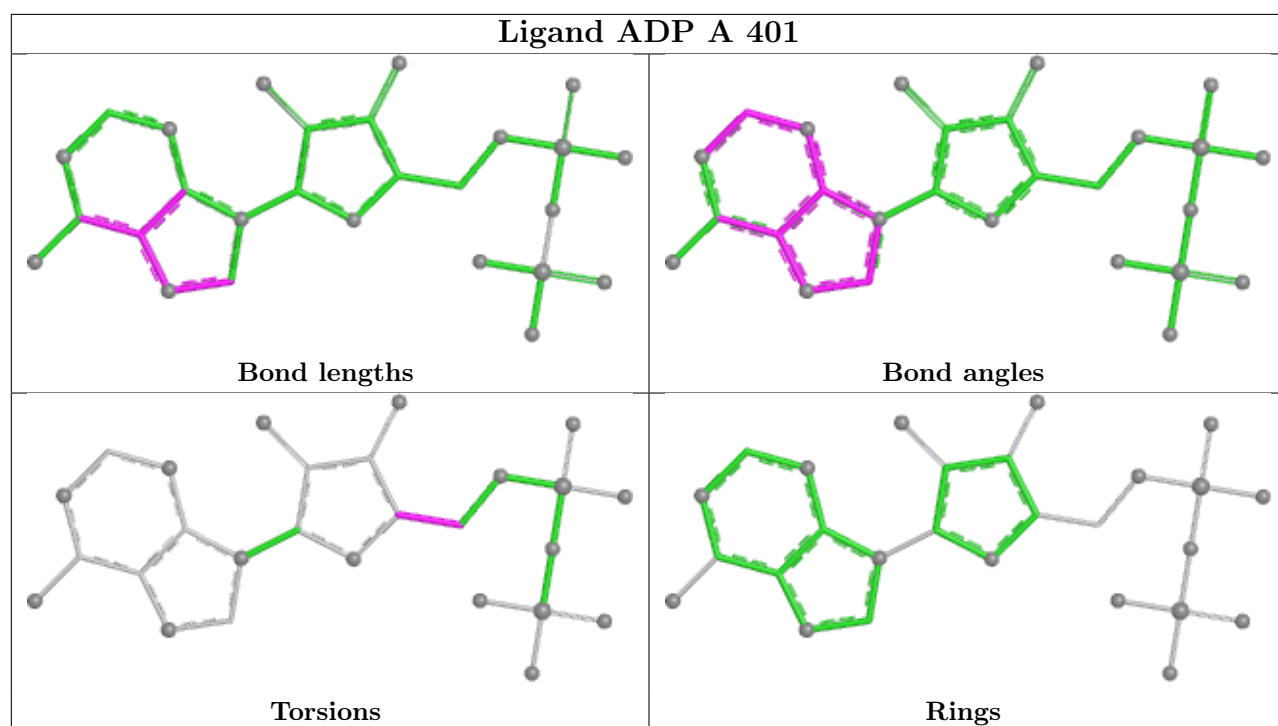
Mol	Chain	Res	Type	Atoms
3	B	401	ADP	C5'-O5'-PA-O2A
3	C	401	ADP	C5'-O5'-PA-O1A
3	C	401	ADP	C5'-O5'-PA-O2A
3	C	401	ADP	C5'-O5'-PA-O3A
3	E	401	ADP	C5'-O5'-PA-O2A
3	C	401	ADP	C3'-C4'-C5'-O5'
3	B	401	ADP	C5'-O5'-PA-O1A
3	B	401	ADP	C5'-O5'-PA-O3A
3	D	401	ADP	C5'-O5'-PA-O2A
3	B	401	ADP	C3'-C4'-C5'-O5'
3	A	401	ADP	C3'-C4'-C5'-O5'

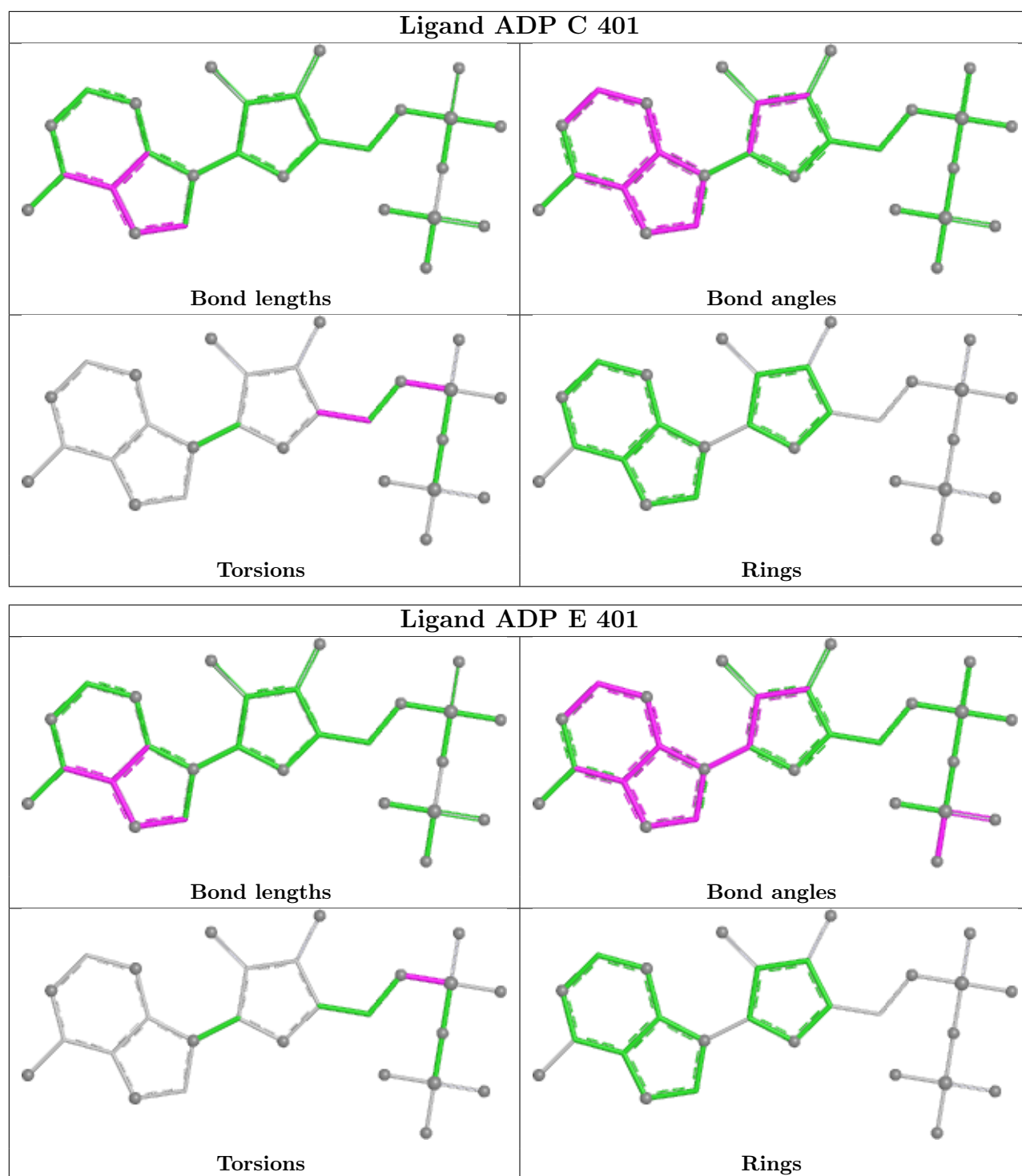
There are no ring outliers.

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 ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

There are no chain breaks in this entry.

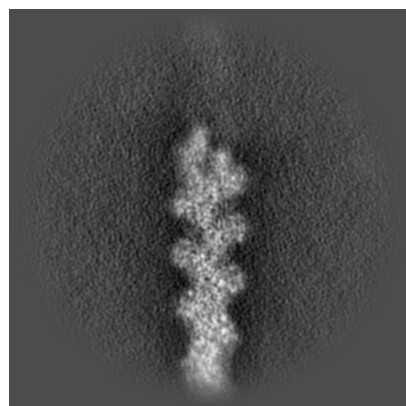
6 Map visualisation [i](#)

This section contains visualisations of the EMDB entry EMD-75004. These allow visual inspection of the internal detail of the map and identification of artifacts.

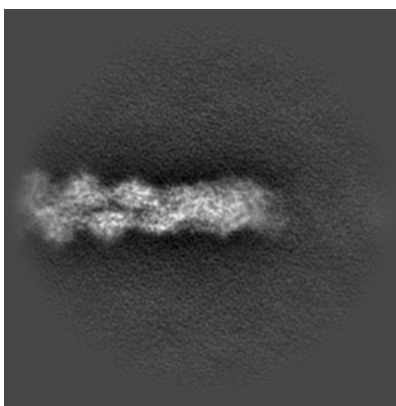
Images derived from a raw map, generated by summing the deposited half-maps, are presented below the corresponding image components of the primary map to allow further visual inspection and comparison with those of the primary map.

6.1 Orthogonal projections [i](#)

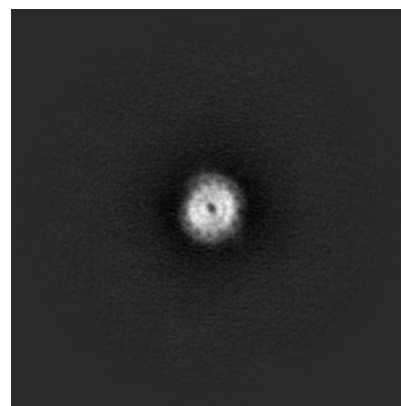
6.1.1 Primary map



X

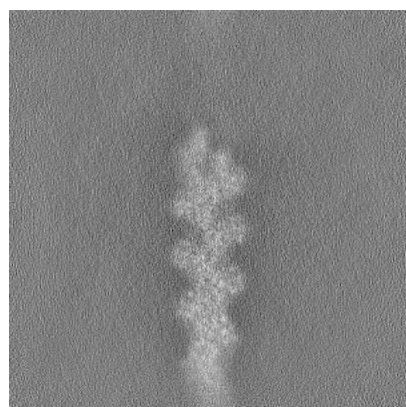


Y

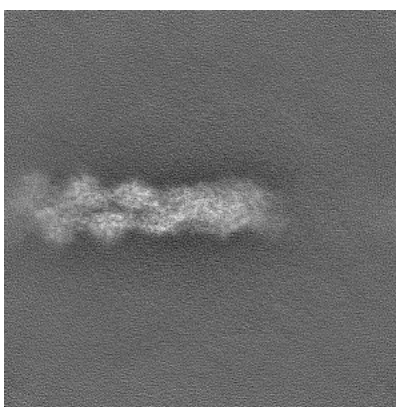


Z

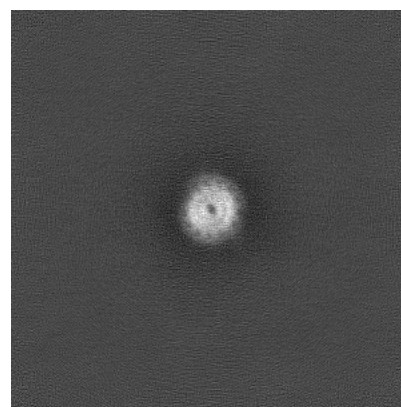
6.1.2 Raw map



X



Y

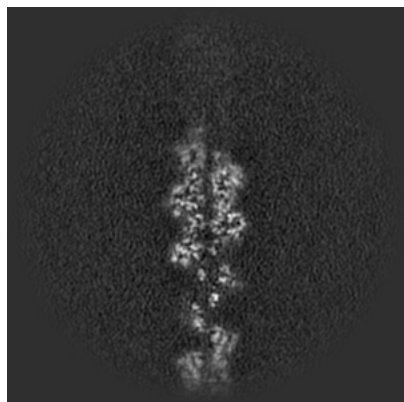


Z

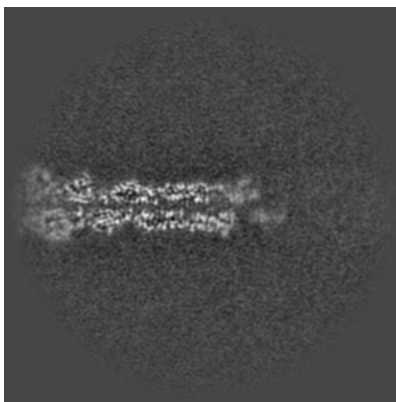
The images above show the map projected in three orthogonal directions.

6.2 Central slices [i](#)

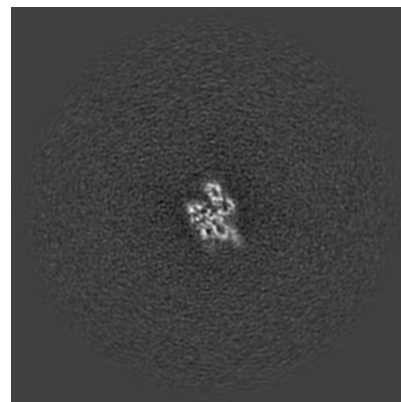
6.2.1 Primary map



X Index: 208

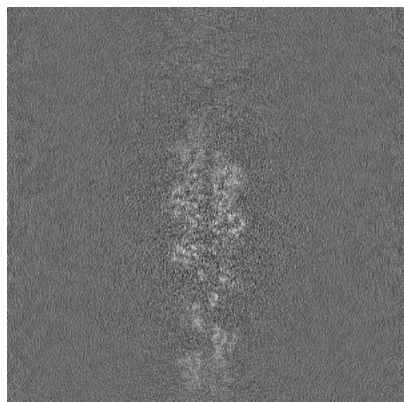


Y Index: 208

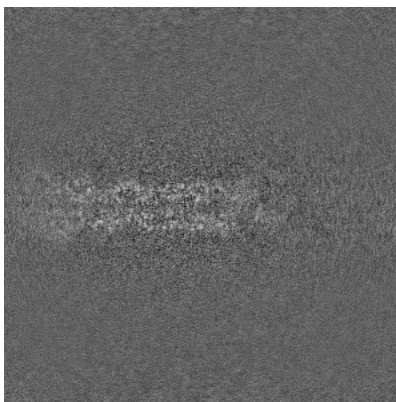


Z Index: 208

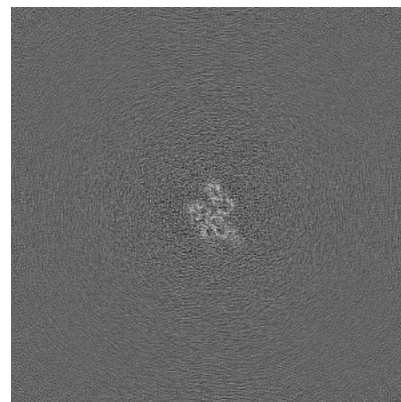
6.2.2 Raw map



X Index: 208



Y Index: 208

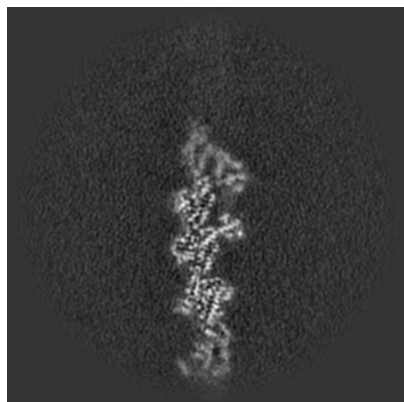


Z Index: 208

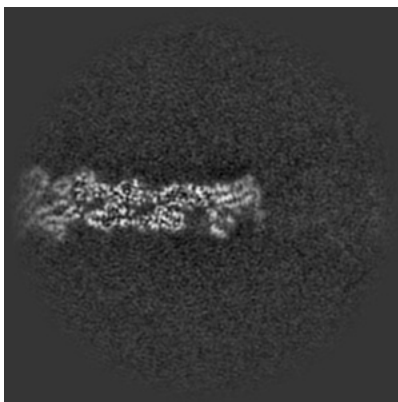
The images above show central slices of the map in three orthogonal directions.

6.3 Largest variance slices [i](#)

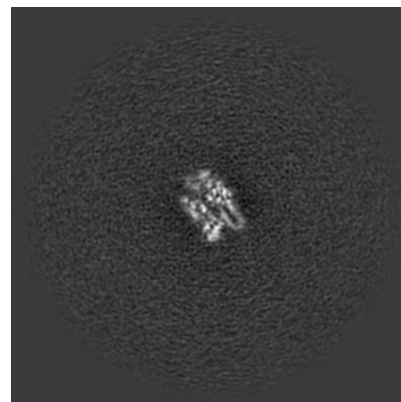
6.3.1 Primary map



X Index: 200

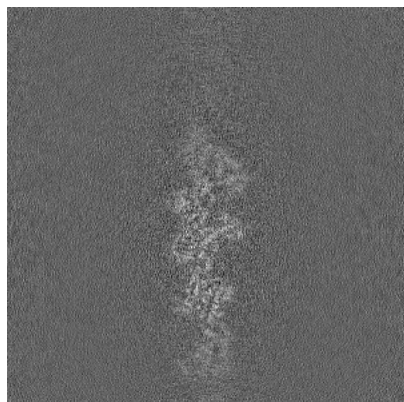


Y Index: 214

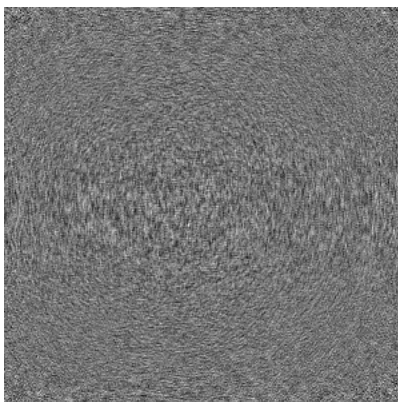


Z Index: 225

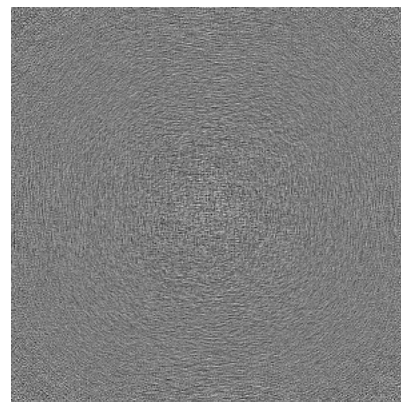
6.3.2 Raw map



X Index: 200



Y Index: 0

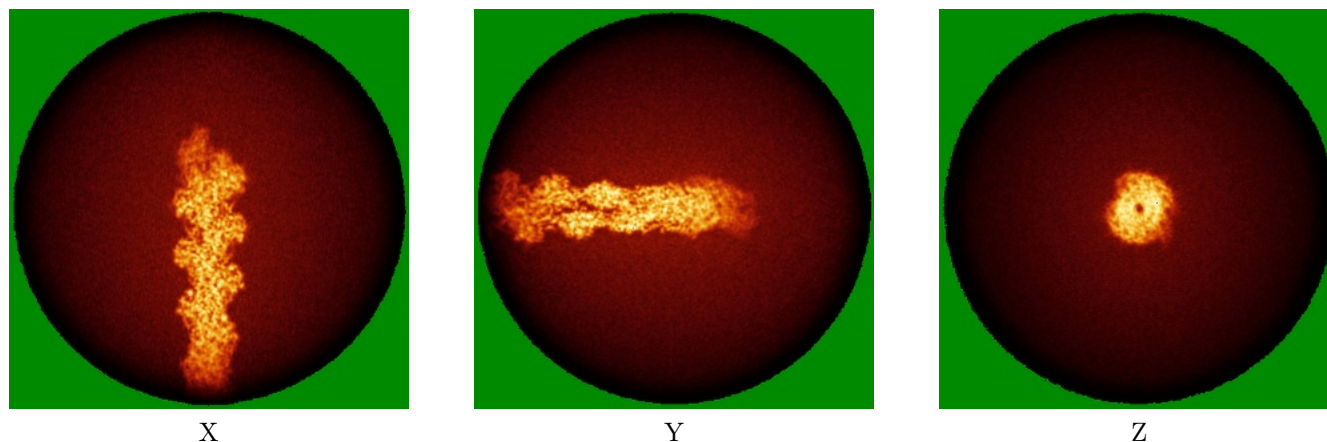


Z Index: 0

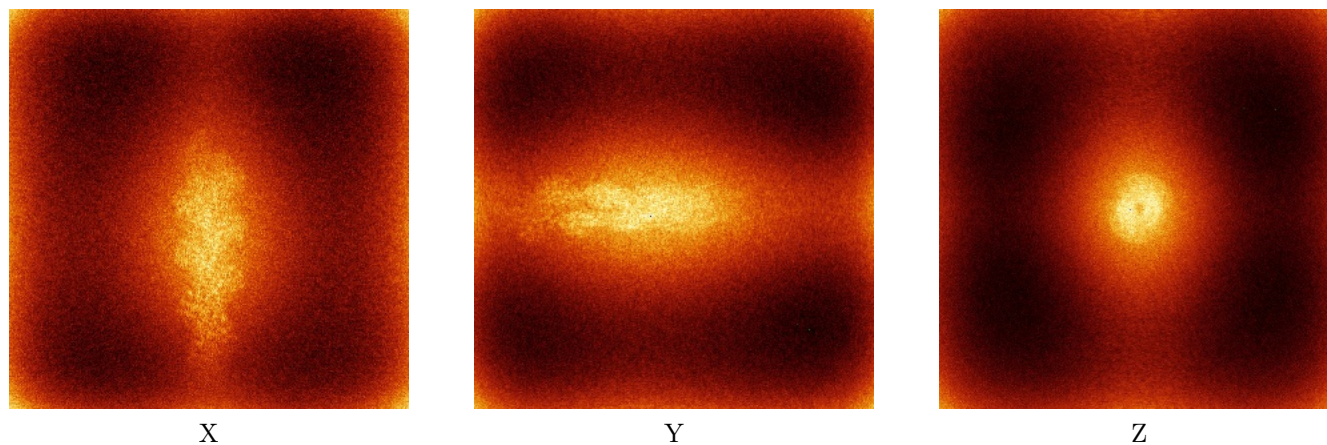
The images above show the largest variance slices of the map in three orthogonal directions.

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

6.4.1 Primary map



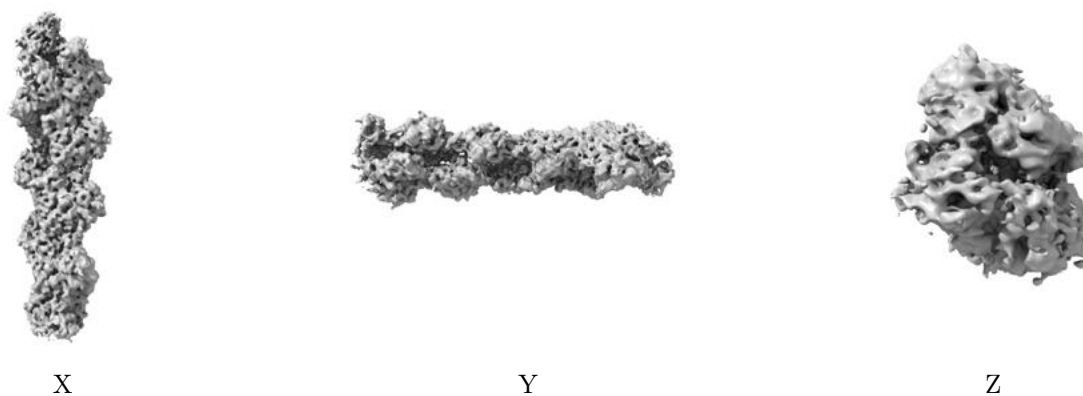
6.4.2 Raw map



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.

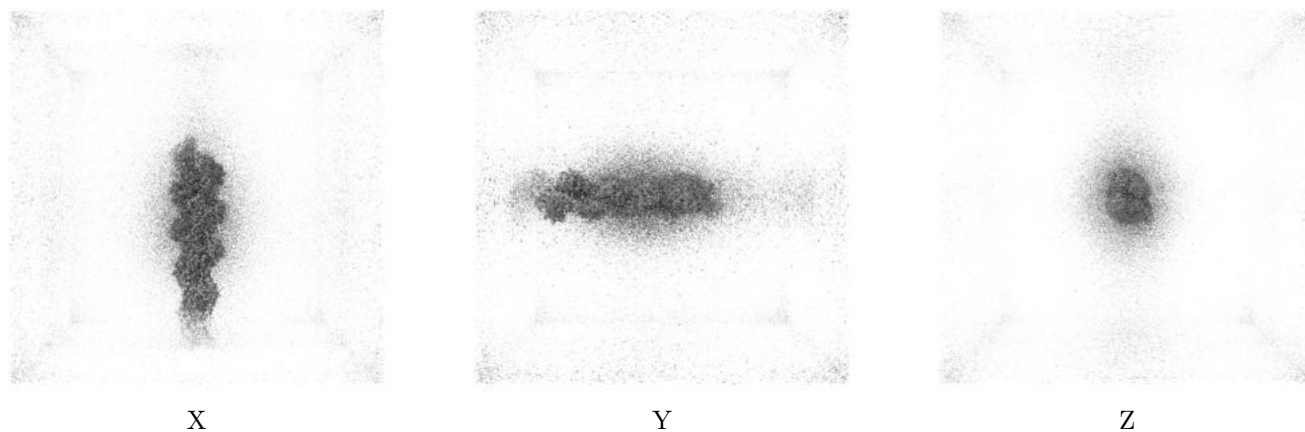
6.5 Orthogonal surface views [i](#)

6.5.1 Primary map



The images above show the 3D surface view of the map at the recommended contour level 0.105. 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.

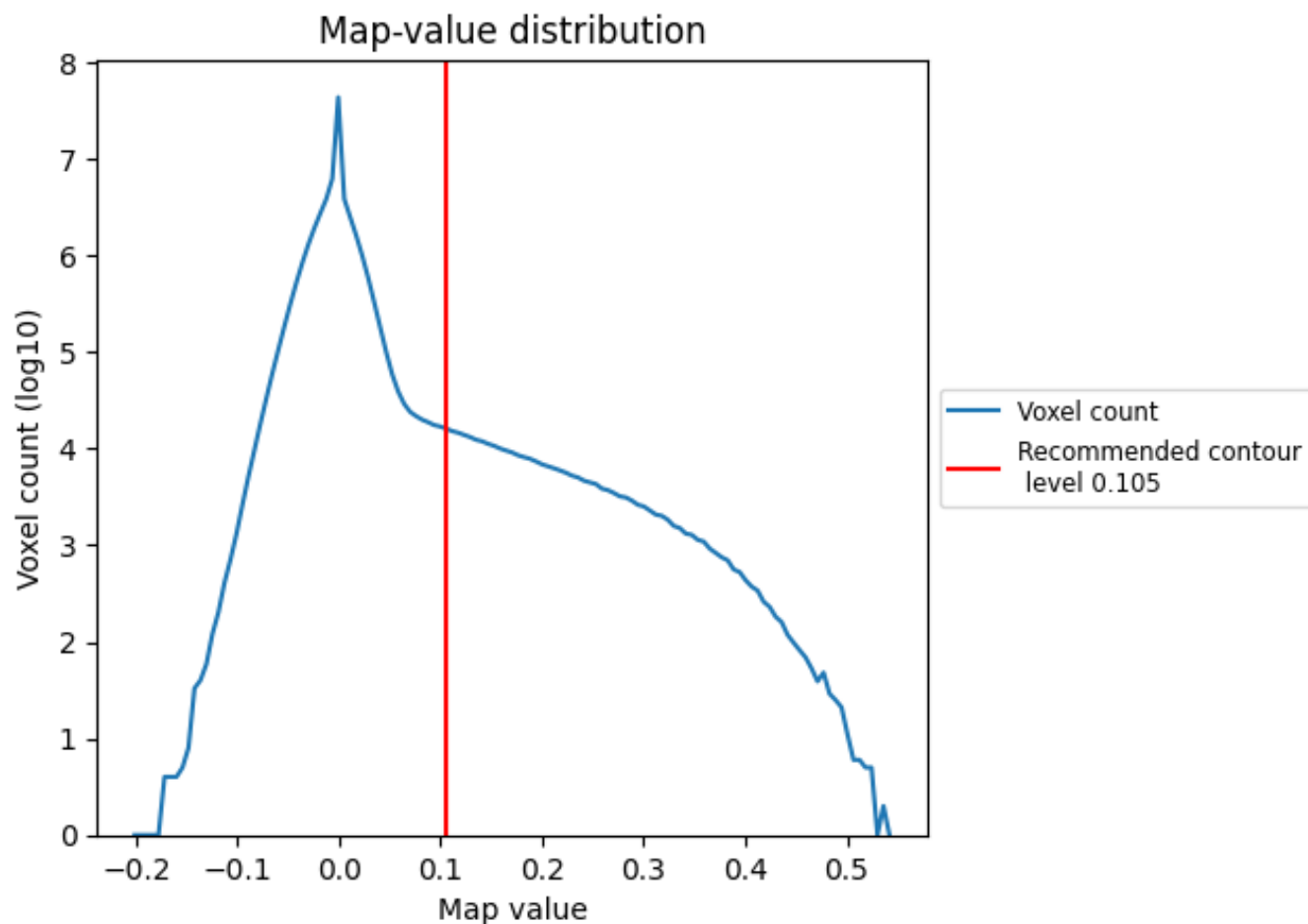
6.6 Mask visualisation [i](#)

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

7 Map analysis [i](#)

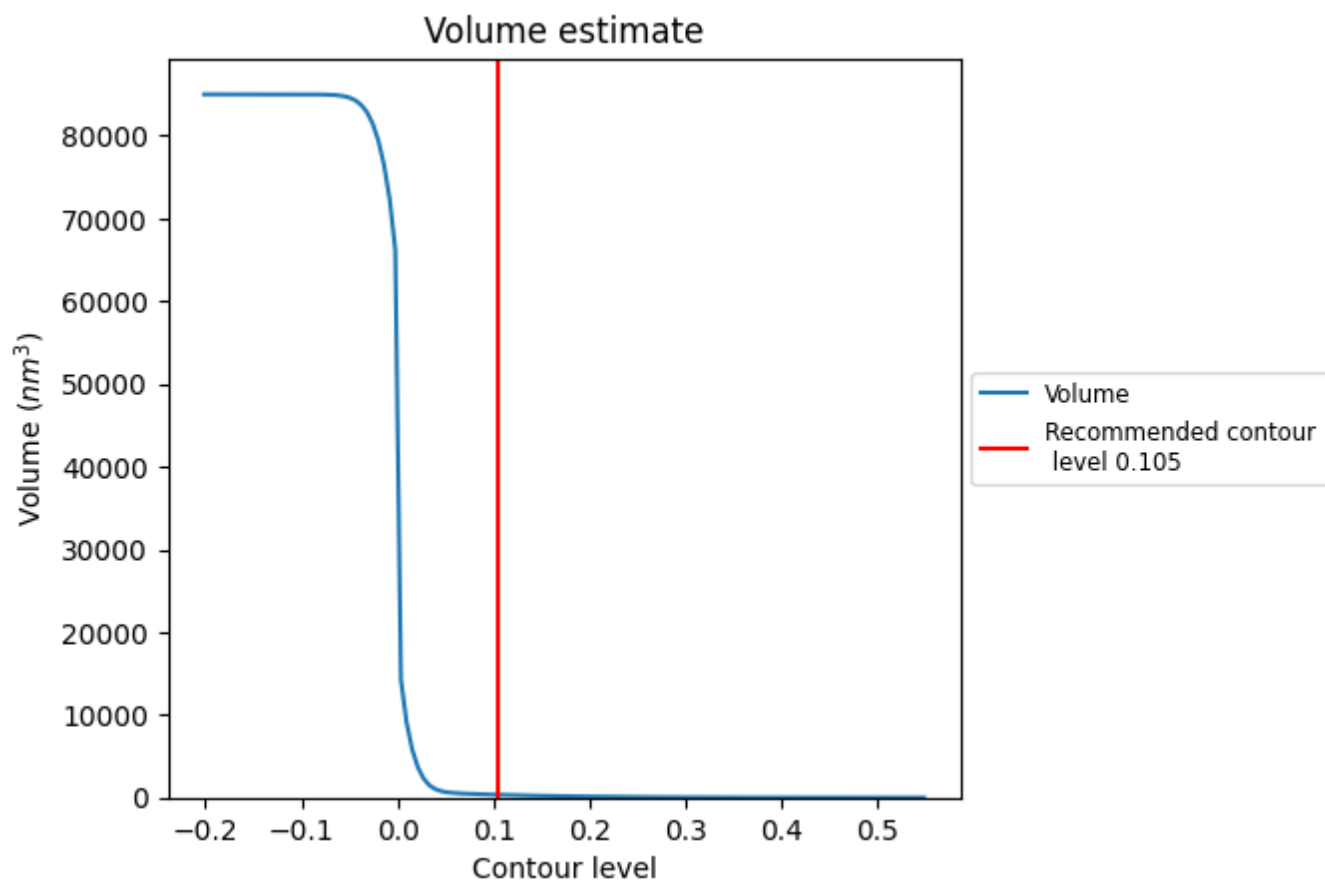
This section contains the results of statistical analysis of the map.

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.

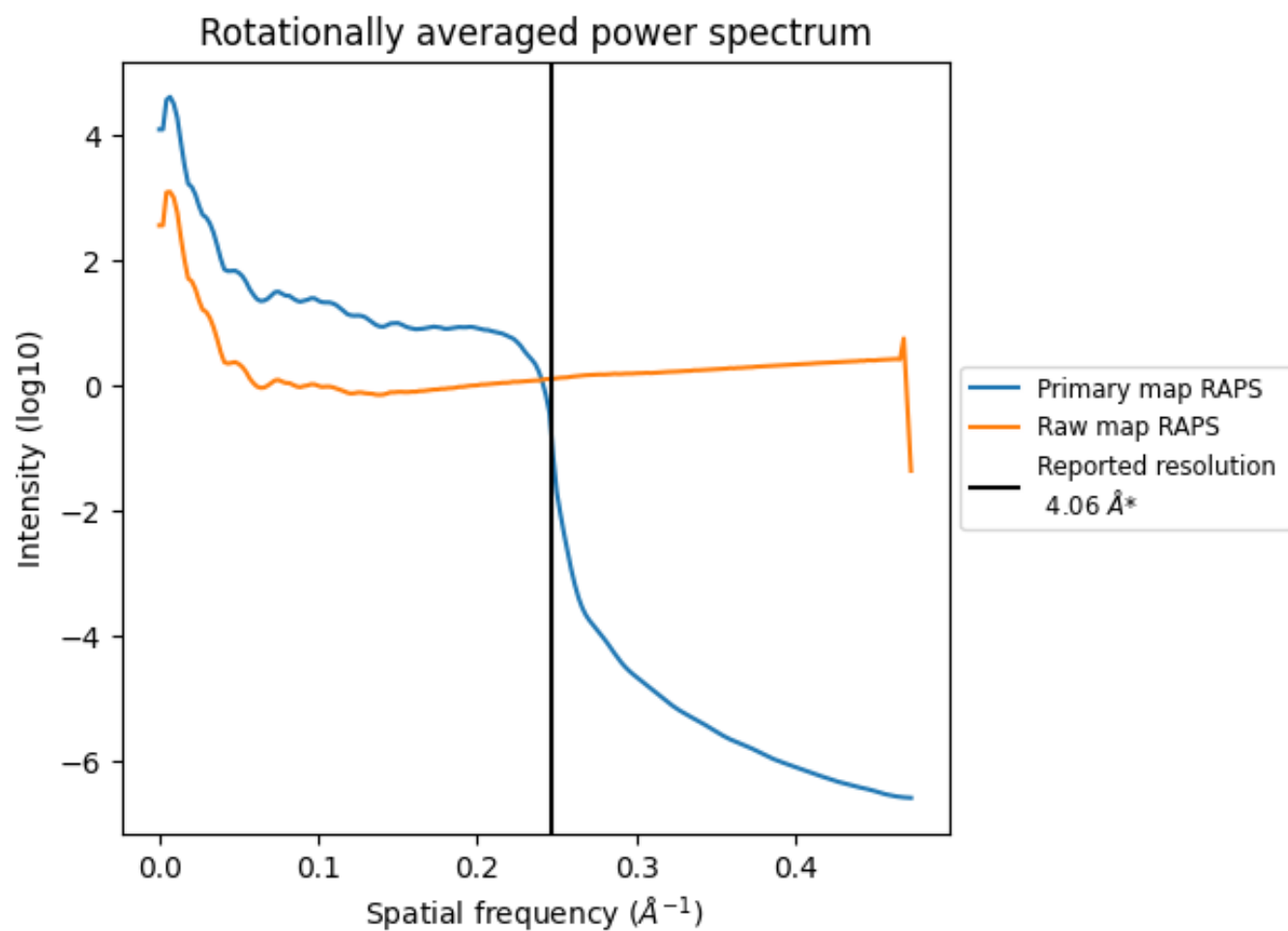
7.2 Volume estimate [i](#)



The volume at the recommended contour level is 336 nm³; this corresponds to an approximate mass of 303 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 ⓘ

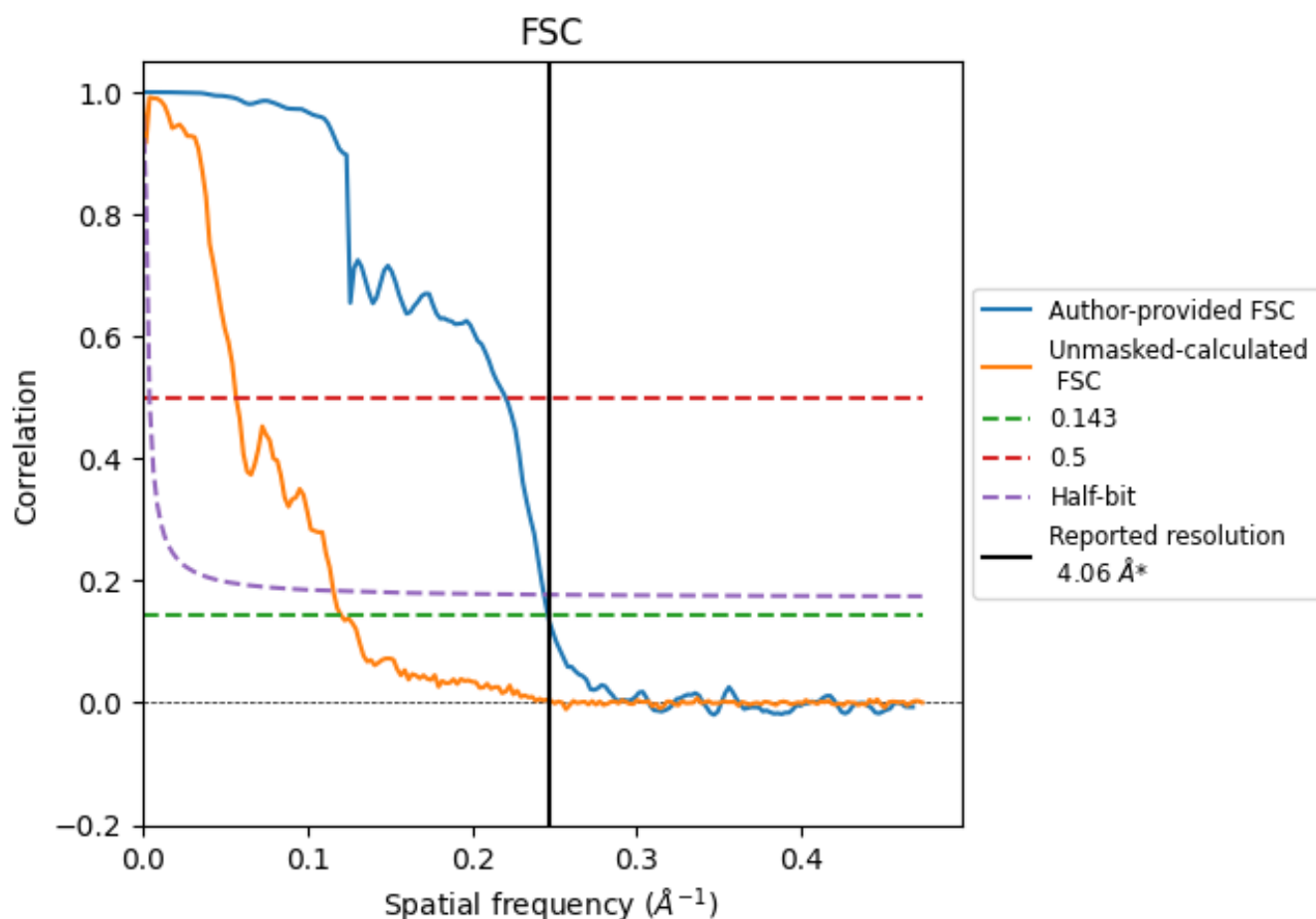


*Reported resolution corresponds to spatial frequency of 0.246 \AA^{-1}

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 0.246 \AA^{-1}

8.2 Resolution estimates [i](#)

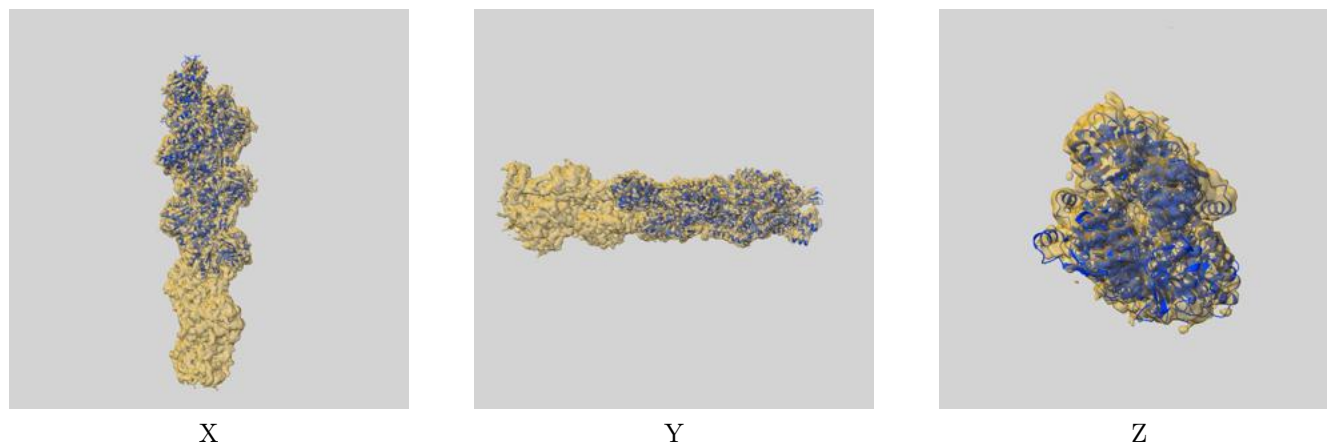
Resolution estimate (Å)	Estimation criterion (FSC cut-off)		
	0.143	0.5	Half-bit
Reported by author	-	-	-
Author-provided FSC curve	4.06	4.54	4.10
Unmasked-calculated*	8.28	17.61	8.63

*Resolution estimate based on FSC curve calculated by comparison of deposited half-maps.

9 Map-model fit [i](#)

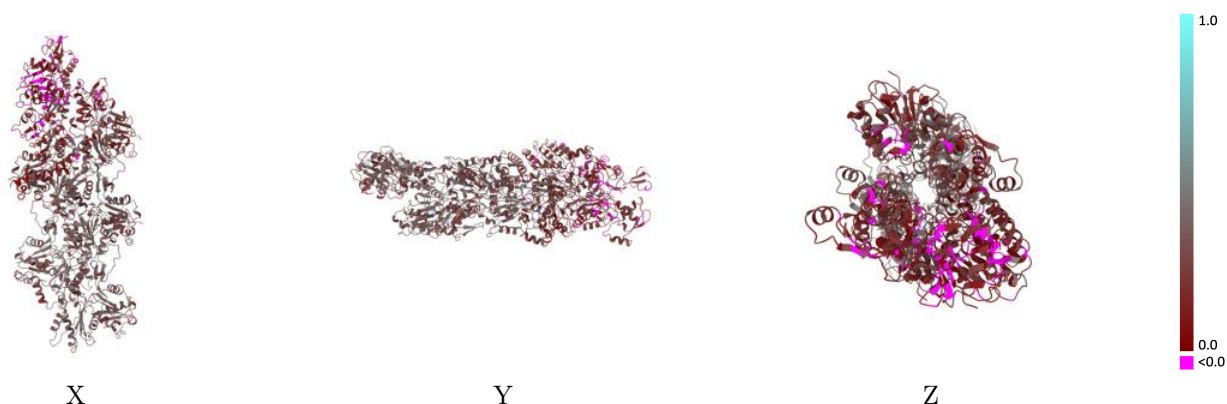
This section contains information regarding the fit between EMDB map EMD-75004 and PDB model 9ZZK. Per-residue inclusion information can be found in [section 3](#) on [page 7](#).

9.1 Map-model overlay [i](#)



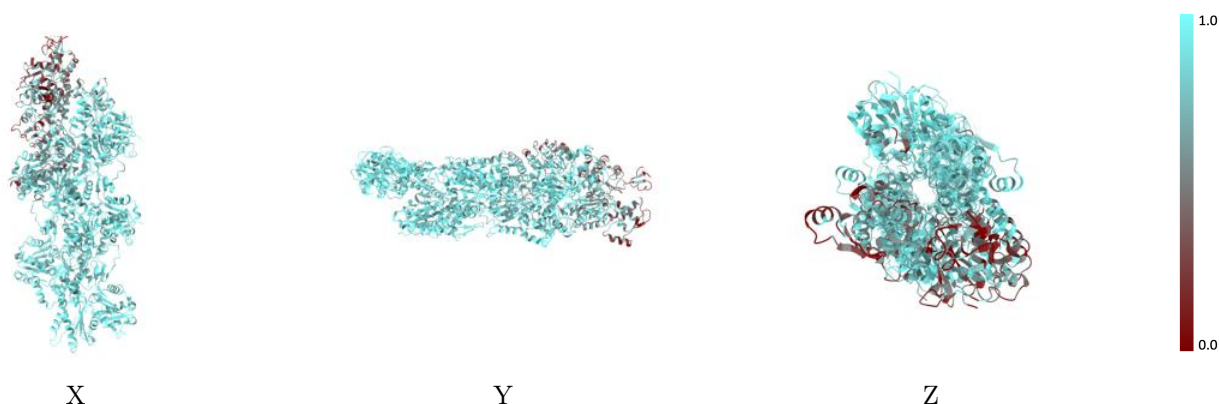
The images above show the 3D surface view of the map at the recommended contour level 0.105 at 50% transparency in yellow overlaid with a ribbon representation of the model coloured in blue. These images allow for the visual assessment of the quality of fit between the atomic model and the map.

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



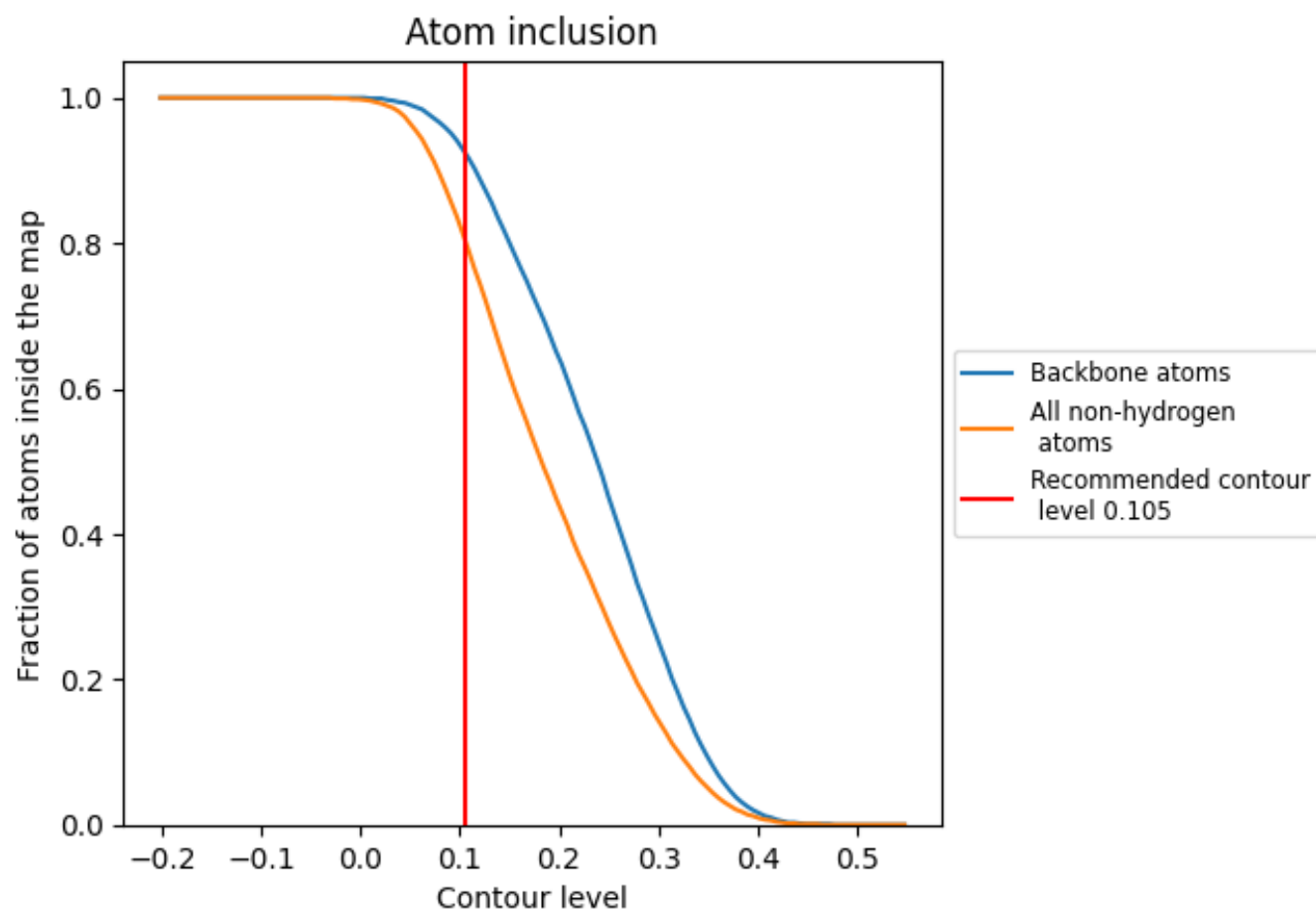
The images above show the model with each residue coloured according to its Q-score. This shows their resolvability in the map with higher Q-score values reflecting better resolvability. Please note: Q-score is calculating the resolvability of atoms, and thus high values are only expected at resolutions 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 (0.105).

9.4 Atom inclusion [i](#)



At the recommended contour level, 92% of all backbone atoms, 80% 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 (0.105) and Q-score for the entire model and for each chain.

Chain	Atom inclusion	Q-score
All	<div><div></div></div> 0.8050	<div><div></div></div> 0.2800
A	<div><div></div></div> 0.8610	<div><div></div></div> 0.2380
B	<div><div></div></div> 0.8530	<div><div></div></div> 0.3030
C	<div><div></div></div> 0.8950	<div><div></div></div> 0.3450
D	<div><div></div></div> 0.8990	<div><div></div></div> 0.3550
E	<div><div></div></div> 0.9000	<div><div></div></div> 0.3620
M	<div><div></div></div> 0.6080	<div><div></div></div> 0.1690
O	<div><div></div></div> 0.5060	<div><div></div></div> 0.1250

1.0

0.0

<0.0